PRELIMINARY ASSESSMENT

Lane Plating Works, Inc.
Dallas, Dallas County, Texas
TXN000605240

REGION 6

Prepared in cooperation with the
U.S. Environmental Protection Agency

May 2016

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5322 Bonnie View Road
Dallas, Dallas County, Texas
TXD007336571

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TABLE OF CONTENTS **Page**

1 INTRODUCTION 4
2 SITE INFORMATION 5
2.1 SITE LOCATION 5
2.2 SITE DESCRIPTION 5
2.3 OWNERSHIP HISTORY 7
2.4 OPERATIONS AND WASTE CHARACTERISTICS 7
2.5 PREVIOUS INVESTIGATIONS 10
2.6 SITE VISIT 18
2.7 SOURCES 18
2.7.1 Source 1: Contaminated Soil 18
2.7.2 Source 2: Containerized Wastes 19
3 MIGRATION/EXPOSURE PATHWAYS 23
3.1 GROUND WATER MIGRATION PATHWAY 23
3.1.1 Geologic Setting 23
3.1.2 Aquifer System 26
3.1.3 Drinking Water Receptors 28
3.2 SURFACE WATER MIGRATION PATHWAY 29
3.2.1 Overland Route 29
3.2.2 Drinking Water Receptors 32
3.2.3 Human Food Chain Receptors 33
3.2.4 Environmental Receptors 34
3.3 SOIL EXPOSURE PATHWAY 36
3.3.1 Site Setting and Sources 36
3.3.2 Receptors 37
3.4 AIR MIGRATION PATHWAY 38
3.4.1 Air Pathway Receptors 38
3.4.2 Environmental Receptors 39
4 REFERENCES 46

FIGURES

Figure 1. Site Location Map 41
Figure 2. Site Features Map- General 42
Figure 3. Site Features Map- Focused 43
Figure 4. 4-Mile Radius Target Distance Limit Map 44
Figure 5. 15-Mile Downstream Target Distance Limit Map 45

TABLES

Table 1. Site Stratigraphy 25

1 INTRODUCTION

The Texas Commission on Environmental Quality (TCEQ) was tasked by the United States Environmental Protection Agency (EPA) Region 6 to conduct a Preliminary Assessment (PA) at the Lane Plating Works, Inc. site in Dallas, Dallas County, Texas. The specific goals for the PA are:

- Determine the potential threat to public health or the environment posed by the site;
- Determine the potential for a release of hazardous constituents into the environment; and
- Determine the potential for placement of the site on the National Priorities List (Ref. 1).

Completion of the PA was consistent with EPA Guidance for Performing Preliminary Assessments under CERCLA, and included reviewing existing site information, collecting receptor information within the range of site influence, determining regional geology, ground water, surface water, determining surrounding population characteristics, and conducting on- and off-site reconnaissance. This document includes a discussion of background site information (Section 2), a discussion of migration/exposure pathways and potential receptors (Section 3), and a list of pertinent references (Section 4) (Ref. 1; Ref. 2; Ref. 3; Ref. 4).

2 SITE INFORMATION

2.1 SITE LOCATION

Site Name:	Lane Plating Works, Inc.
CERCLIS ID No.:	TXN000605240
Location:	Dallas, Dallas County, Texas, 75241
Latitude:	32.687889° N
Longitude:	-96.769484° W
Legal Description:	BLK 6859 PT TR 12 ACS 4.655
Congressional District:	TX-30

2.2 SITE DESCRIPTION

The Lane Plating Works, Inc. site (site) is located at 5322 Bonnie View Road, approximately five miles south of downtown Dallas, Dallas County, Texas (Figure 1). The site is located immediately east of Bonnie View Rd. and is surrounded on all sides by open or wooded land. Single family residences are located approximately 200 to 300 feet west of the site along Bonnie View Road. The Lane residence, owned by Jeffrey and Leticia Lane, is located approximately 500 feet north of the site (Ref. 5, pp. 1). Additional nearby residential areas include several single family residences located approximately 400 to 600 feet north of the Lane residence on Stag Road, the Villas of Sorrento apartments located approximately 0.50 mile northeast of the site on Stag Road, and a neighborhood located approximately 0.50 mile south of the site. Three schools (one preschool, one daycare, and one high school) are located approximately 0.30 to 0.40 mile north and northeast of the site, and a baseball diamond is located 0.12 mile south of the site. Fivemile Creek (referred to as “Five Mile Creek” in some references) is located approximately 0.3 mile to the south of the site and discharges into the Trinity River (Figure 2; Ref. 6, pp. 2-3). An unnamed creek is located approximately 0.1 to 0.2 mile south/southeast of the site near the baseball diamond. Both creeks are located on City of Dallas property and freshwater emergent and forested wetlands (Figure 2; Ref. 7, pp. 1-4; Ref. 8, pp. 1). A secondary unnamed stream, referred to as Stream 5A2 in the Dallas

County Stormwater Infrastructure Assessment, is located approximately 0.20 mile north and 0.10 mile east of the site and flows south into a small, freshwater pond located 0.10 mile southeast of the site (Figures 2 and 3; Ref. 8, pp. 1; Ref. 9, pp. 22, 48). Land use is listed as residential and commercial in the area (Ref. 5, pp. 1-7). Several horses were observed roaming around fields south and east of the site during the PA site visit (Ref. 10, pp. 5; Ref. 11, pp. 10, 12).

The site is a former electroplating operation and is currently inactive. The original facility building and structures containing waste are still present on-site (Figure 3; Ref. 12, pp. 1-13). The property the site is located on is approximately five acres in size with a barbed wire fence that surrounds the facility building. Impermeable cover extends from the site entrance off Bonnie View Road up to the driveway and footprint around the facility building. Soil and vegetation are exposed on all other sides. Two water wells are located on the north side of the facility building (Ref. 10, pp. 3; Ref. 11, pp. 2-5). An unsealed auxiliary metal structure located due south of the facility building currently stores supersacs of soil containing grinding grit that was excavated several years ago (Ref. 12, pp. 13; Ref. 13, pp. 56; Ref. 14, pp. 1-2). Old equipment and trash surround the site in open and wooded areas located to the east and south. Yellow staining and grinding grit were observed on a southern exterior corner of the facility building and on surface soil located south of the facility, respectively, by TCEQ Region 4 in November 2015 (Ref. 13, pp. 56-61; Ref. 15, pp. 1;). Staining and visibly impacted surface and subsurface soils were observed by the TCEQ and EPA Superfund Removals Program in February 2015 (Ref. 12, pp. 1, 3, 9, 11-12). Surface drainage was observed flowing to the east along the north side of the facility building and then due south towards Fivemile Creek during the PA site visit. South of the site, drainage was observed ponding in a low depression along the immediate southern fence line and along a fence line located farther south before flowing into the unnamed creek located south of the site at the probable point of entry (PPE) (Figure 2; Ref. 10, pp. 4-6, 8-9; Ref. 11, pp. 5-12).

2.3 OWNERSHIP HISTORY

According to the Dallas Central Appraisal District (CAD), the site property is currently 100 percent owned by Stag Management, Inc., with John R. Lane listed as the president. The deed transfer date to Stag Management, Inc. is dated December 12, 1997. Stag Management, Inc. also owns the adjoining property east of the site at 5156 Bonnie View Road (Ref. 5, pp. 2-3; Ref. 16, pp. 1-21). Site property use and ownership history prior to the Lane family and Stag Management, Inc. ownership is not available.

Members of the Lane family own surrounding properties to the north at 5156 Bonnie View Road (Lane residence, deed transfer date of November 11, 1900), to the east at 2944 Stag Road (deed transfer date of August 6, 1998), south of the residential neighborhood to the west at 5257 Bonnie View Road (deed transfer date of December 15, 1972), and to the north at 2940 Stag Road (deed transfer date of November 11, 1990) and 5118 Bonnie View Road (deed transfer date June 9, 2000) (Ref. 5, pp. 1-7; Ref. 16, pp. 22-36).

2.4 OPERATIONS AND WASTE CHARACTERISTICS

The site was in operation for approximately 90 years at the 5322 Bonnie View Road location (Ref. 17, pp. 2). Lane Plating Works, Inc. and Stag Management, Inc. were first incorporated in September 27, 1990, and October 7, 1996, respectively (Ref. 18, pp. 1; Ref. 19, pp. 1). The Notice of Registration (NOR) for Lane Plating Works, Inc. lists an initial registration date of February 2, 1978, and the CAD specifies that the office building was built in 1950 (Ref. 16, pp. 2; Ref. 20, pp. 1). Operations ceased in approximately late 2015 coincident with numerous violations, investigations, and bankruptcy filing; however, the business is still listed with active permits in TCEQ and EPA databases (Ref. 21, pp. 1; Ref. 22, pp. 1; Ref. 23, pp. 1-2). Specific operation dates are not included in the site record. Bankruptcy schedules show that Lane Plating Works, Inc. owns equipment and accounts receivables and leases the 5322 Bonnie View Road property from Stag Management Incorporated (Ref. 21, pp. 1).

The site was an electroplating facility that conducted primarily hard chromium and cadmium plating. Additional processes performed at the facility included chromate dips, chromic acid anodize, hard chrome plating, cadmium plating, black oxide coating, electroless nickel, passivation, machining and grinding, and operating a lead melting pot to repair anodes used in plating baths. Electroplating was performed manually and no automated machinery was used (Ref. 17, pp. 3).

The site consists of the main facility building where the majority of operations took place, and an external, unsealed shed structure known as the Hazardous Waste Treatment Building (HWTB) located south of the main facility building (Ref. 13, pp. 56; Ref. 24, pp. 1). The facility building interior layout consists of an office and storage area, set up room, bathroom, and lab in the western portion of the building adjacent to Bonnie View Road (Ref. 13, pp. 5-17; Ref. 24, pp. 1). The center of the facility contains a blasting area, chemical storage area, rectifier room, five tanks (at least four of which are chrome tanks), and an air scrubber unit (Ref. 13, pp. 18-35; Ref. 24, pp. 1). A larger rectifier room, two other tanks and one large chrome tank with a scrubber unit, boiler room, bathroom, set up room, grinding room, and tinning room are located to the east of this area (Ref. 13, pp. 38-42, 50-53; Ref. 24, pp. 1). The tinning room contains four cadmium tanks and six tanks for electroless nickel and chromate dip (Ref. 13, pp. 43-46). A black oxide room is located outside the facility in a shed-like structure immediately adjacent to the facility near the rectifier room (Ref. 13, pp. 54). On the east end of the facility building towards the back are a grinding department, machine shop, air compressor room, and thinner storage area that is covered but open to the outside (Ref. 13, pp. 42, 47-49, 55; Ref. 24, pp. 1). An open area containing a lead dip tank for anodes is located adjacent northwest of the machine shop room next to an open equipment storage area (Ref. 13, pp. 63-65). A larger shed-like storage area is adjacent to the grinding department on the east side of the facility building (Ref. 13, pp. 66-67).

Lane Plating Works, Inc. is registered as a Large Quantity Generator (LQG) of hazardous wastes associated with EPA ID No. TXD007336571 and TCEQ Solid Waste Registration (SWR) No. 31215 (Ref. 17, pp. 3). Antimony, chromium, copper, lead, silver, cadmium,

mercury, nickel, selenium, and zinc are typical wastes associated with electroplating operations. RCRA and TCEQ Notice of Registration (NOR) records for the site document a more specific waste stream including corrosive waste, reactive waste, cadmium, chromium, lead, spent chromic acid solution, spent muriatic acid, chromate, metals filings and dust, cyanide waste, caustic waste, caustic soda solid (tank bottoms), and wastewater treatment sludges from electroplating operations (Ref. 20, pp. 3-10; Ref. 23, pp. 2).

Lane Plating Works, Inc. (Regulated Entity Number RN100597707) is currently listed in the TCEQ Central Registry database as having active permits for air emissions inventory and air new source (DB0528A, 4811300848, 40123, 82475), industrial and hazardous waste (TXD007336571, SWR 31215), pollution prevention planning (P03202), and stormwater (TXRNEU256). The last air emissions inventory date is December 31, 2004. Compliance investigations were conducted in 2012, 2013, and 2014 for the air new source registration permit 82475 and in 2011, 2014, 2015, and 2016 for the industrial and hazardous waste permit SWR 31215. The compliance history reveals a series of unsatisfactory ratings from 2008 through 2011 (Ref. 22, pp. 1-2, 4-8, 10, 15).

TCEQ Region 4 investigators observed grinding grit, a hazardous waste consisting of lead and chromium, on soil near the HWTB in November 2015. Grinding grit was historically disposed of on the south side of the property (Ref. 13, pp. 57-60; Ref. 15, pp. 1; Ref. 17, pp. 2). A soil waste pile composed partially of grinding grit was observed by TCEQ Region 4 at this location in 2011. A soil sample from the area was analyzed by TCEQ Region 4 and contained elevated concentrations of lead. The pile was removed by 2014 and placed into supersacs which are currently stored in the HWTB (Ref. 13, pp. 56; Ref. 14, pp. 1-2; Ref. 25, pp. 2). In February 2016, TCEQ and EPA Removals program investigators also observed surface and subsurface soils impacted by plating wastes seeping underneath the facility building foundation (Ref. 12, pp. 1). An assortment of old equipment and tanks remains on the property to the south and east of the site (Ref. 10, pp. 4; Ref. 11, pp. 8).

According to RCRA facility information, Lane Plating Works, Inc. generated and shipped 15.5 tons of waste in 2001 (Ref 23, pp. 1). The NOR lists the facility as a large quantity handler of waste, accumulating 5,000 kilograms (kg) or more (Ref. 20, pp. 1). Initial generation of specific wastes began on the following dates: spent muriatic acid, metal filings and dust from machining, and spent glass beads from blasting (January 1990), spent chromic acid solution (March 1995), sludge from bottom of chromic acid plating batch (November 1996), spent alkaline solution and sludge (December 1996), cyanide bearing material and tank bottoms (March 2006), and non-pumpable solids from the cadmium tank (October 2007) (Ref. 20, pp. 3-10). As of January 26, 2011, there were three listed units at the facility for managing waste: Unit 001 is a container storage area that previously managed wastewater treatment sludge; Unit 002 consists of containers of waste in the middle of the facility building that managed a variety of waste types; and Unit 003 is a metal trash bin located on the south side of the facility (Ref. 20, pp. 11-12). TCEQ Region 4 indicated they are not aware of available waste manifests. The site reportedly copied and pasted the same annual waste summaries for the last three years of operation under self-reporting, and waste summaries do not appear to be accurate (Ref. 14, pp. 2; Ref. 22, pp. 11-14).

2.5 PREVIOUS INVESTIGATIONS

According to TCEQ Region 4, the site has been investigated by several state and federal agencies over the past 40 years, and releases of plating wastes to on-site soils have been documented by recent TCEQ investigations (Ref. 17, pp. 1-4). Records of historic site investigations were unavailable at the time of this report. Specific information relating to Consolidated Compliance and Enforcement Data System (CCEDS) investigations conducted on August 23, 2006 (No. 509247), May 15, 2007 (No. 560253), August 28, 2008 (No. 700478), and December 14, 2010 (No. 872989), are not included in the site record (Ref. 25, pp. 17).

TCEQ Region 4 conducted an unannounced Industrial Hazardous Waste (IHW)-focused Compliance Evaluation Investigation (CEI) at the site on February 22, 2010 (CCEDS No.

793100), as part of an initiative to identify facilities storing incompatible wastes together. A violation for failure to mark accumulation start dates on hazardous waste storage containers was observed and noted with a necessary follow-up investigation. A Notice of Violation (NOV) letter was submitted to Lane Plating Works, Inc. on February 24, 2010. Alleged violations were resolved on March 29, 2010, during a Record Review Investigation (CCEDS No. 797546) (Ref. 17, pp. 2).

On January 19, 2011, TCEQ Region 4 and Small Business and Local Government Assistance staff conducted an IHW CEI at the site (CCEDS No. 900994) (Ref. 17, pp. 2). Seven drums observed on-site during the March 2010 investigation remained on site in January 2011, exceeding the 180 day allotted time frame. Waste records were not available for review. Region 4 staff found five alleged violations and one additional issue regarding rules for IHW, and they observed five cubic yards of hazardous waste on the southeast corner of the property (Ref. 25, pp. 2). Analyses of soil samples from the area indicated leachable lead concentrations of 8.4 and 15.2 milligrams per liter (mg/l) above the toxicity characteristic leaching procedure (TCLP) regulatory value of 5.0 mg/l. Analytical results from soil samples collected around the foundation of the facility building indicated elevated levels of chromium (168.8 mg/l), cadmium (1.1 to 3.5 mg/l), and mercury (1.98 to 12.6 mg/l) in exceedance of TCLP regulatory levels of 5.0, 1.0, and 0.2 mg/l, respectively (Ref. 25, pp. 2; Ref. 26, pp. 8). Complete sample results and locations are not included in the site record. Formal enforcement action was requested based on the following violations: failure to obtain a permit prior to disposal of hazardous waste, failure to transport hazardous waste off-site within the allotted accumulation time limit, failure to submit annual waste summaries for 2008 and 2009, failure to prevent unauthorized discharge of industrial solid waste, and failure to maintain records of all hazardous and industrial solid waste activities. A Notice of Enforcement (NOE) letter was transmitted to the facility on April 20, 2011 (Ref. 17, pp. 2). A Proposed Agreed Order (AO Docket No. 2011-0662-IHW-E) was transmitted to the facility on July 5, 2011, with a totally penalty of $28,350 (Ref. 17, pp. 2; Ref. 25, pp. 1). The AO (approved August 22, 2012) required the facility to immediately cease additional unauthorized discharges and within 30 days to: remove and properly dispose of all discharged industrial solid waste,

visibly impacted soils, and waste containers, develop and implement procedures to ensure all containers are removed within the allotted accumulation time limit, submit annual waste summaries for 2008 and 2009, and begin maintaining all records of hazardous and industrial solid waste activities. Within 45 days the facility was required to submit an Affected Property Assessment Report (APAR) and comply with all applicable requirements of the Texas Risk Reduction Program (TRRP) if response actions were necessary. The facility was required to submit written certification demonstrating compliance within 60 days of the AO (Ref. 17, pp. 2; Ref. 25, pp. 3).

TCEQ Region 4 personnel conducted a CEI and AO follow-up investigation on October 21, 2014. Several additional issues and alleged violations of IHW management were noted. Failure to install a secondary containment unit for a hazardous waste tank containing liquids and to comply with numerous AO provisions (Docket No. 2011-0662-IHW-E) resulted in the initiation of a formal enforcement action (Ref. 17, pp. 2-3). Investigators also collected seven soil samples. Six samples were analyzed for total metals, hexavalent chromium, and mercury, one sample was analyzed for aliphatic and aromatic hydrocarbons, and two were analyzed for TCLP antimony, chromium, lead, and nickel (Ref. 27, pp. 5-6). Sample location information was not included in the site record. Chromium concentrations exceeded the EPA Superfund Chemical Data Matrix (SCDM) value of 200 milligrams per kilogram (mg/kg) in all six soil samples, with concentrations ranging from 758 to 19,700 mg/kg. Hexavalent chromium concentrations ranged from 32.5 to 561 mg/kg and exceeded the EPA SCDM value of 0.2 mg/kg in five soil samples. Lead was detected above the EPA interim screening level (400 mg/kg) in five soil samples, ranging in concentrations from 500 to 41,200 mg/kg. Other metals with significant concentrations in exceedance of SCDM values included antimony, arsenic, cadmium, nickel, and mercury. The SCDM values for mercury (10 mg/kg) and cadmium (30 mg/kg) were exceeded in four and five soil samples, respectively, with mercury concentrations ranging from 12 to 136 mg/kg and cadmium concentrations ranging from 52.3 to 266 mg/kg. Antimony and arsenic exceeded the SCDM values of 30 and 0.71 mg/kg in two and three soil samples, respectively. Nickel exceeded the SCDM value of 1,000 mg/kg in one soil sample (Ref. 4, pp. 1; Ref 27, pp. 5; Ref. 28, pp. 3). Aliphatic and aromatic

hydrocarbon concentrations ranged from aliphatic detections of 188 to 361,000 mg/kg and aromatic detections of 208 to 23,600 mg/kg (Ref 27, pp. 5). The TCLP lead result of 9.37 mg/l in sample 52317-5 exceeded the regulatory level of 5.0 mg/l. All other TCLP results were below regulatory levels (Ref. 26, pp. 8, 14-15; Ref. 27, pp. 6).

The Department of Labor Occupational Safety and Health Administration (OSHA) issued two citations amounting to $110,200 of proposed penalties to the site on January 28, 2015, from inspections made between August 5 and November 13, 2014 (Inspection No. 989172). The first citation contained 19 items rated as serious violations and the second citation contained two items rated as willful violations. Serious violations were related to the upkeep, use, and provision of required safety equipment and training for employees and proper storage and disposal of chemicals. Specific violations of note included storing a 225 pound barrel of 96-100 percent sodium hydroxide together with a 225 pound barrel of 77-100 percent sulfuric acid in the chrome plating area, not conducting proper air monitoring, exposing employees to hexavalent chromium at a level 1.36 times the OSHA permissible exposure limit (PEL), not making medical surveillance or training available for employees, not requiring employees to wear personal protective equipment in the chrome plating area or to remove equipment contaminated with hexavalent chromium at the end of the work shift, not ensuring that protective equipment contaminated with hexavalent chromium was stored and labeled in sealed, impermeable containers and placed in the trash, not ensuring employees with skin contact with hexavalent chromium wash their hands prior to eating, drinking, smoking, or using the toilet, and not maintaining eating and drinking areas or work surfaces free of hexavalent chromium. Willful violations involved not instituting feasible engineering controls and work practices to reduce and maintain employee exposures to hexavalent chromium and not performing periodic monitoring (Ref. 29, pp. 1, 6-37).

In March 18, 2015, a second NOE letter was transmitted to the facility (Ref. 17, pp. 3; Ref. 22, pp. 18). On June 18, 2015, the Executive Director's Preliminary Report and Petition (EDPRP) was filed recommending the TCEQ enter an enforcement order assessing an administrative penalty against and requiring certain actions of Lane Plating Works, Inc.

in response to violations found during the October 21, 2014, investigation (Docket No. 2015-0423-IHW-E). Lane Plating Works, Inc. and Stag Management, Inc. responded with a request for a hearing on July 20, 2015. The Executive Director requested a referral of enforcement action (Docket No. 2015-0423-IHW-E) to the State Office of Administrative Hearings (SOAH) on August 21, 2015. On September 30, 2015, the Executive Director filed a motion to waive the preliminary hearing because the parties agreed to jurisdiction and a proposed schedule for the evidentiary hearing (SOAH Docket No. 582-15-5607; TCEQ Docket No. 2015-0423-IHW-E). The motion to waive the preliminary hearing was granted on September 30, 2015, with March 18, 2016, for the deadline to complete discovery and April 19, 2016, for the evidentiary hearing. On October 8, 2015, the Executive Director served a request for disclosures to Lane Plating Works, Inc. and Stag Management, Inc. for information in Texas Rule of Civil Procedure 194.2 (Ref. 30, pp. 1-33).

TCEQ Region 4 conducted a site investigation (No. 1300861) on November 4, 2015, to assess the site and provide information to other TCEQ programs to determine if site conditions posed an immediate threat to nearby residents. Grinding grit was observed in an area located south of the HWTB. Representatives from various programs (Region 4, Critical Infrastructure Division, Bankruptcy Program, and Emergency Response), Mr. Lane, and Mr. Sherman (bankruptcy trustee) conducted a site visit on November 19, 2015. It was determined that the facility and site property needed to be secured, product-grade cyanide waste needed to be removed and disposed of, and spent chromic acid from the tank and sump need to be removed and containerized. Emergency removal tasks were assigned to the contractor hired by TCEQ, SWS Environmental Service (Ref. 13, pp. 60; Ref. 17, pp. 2-3).

On November 20, 2015, TCEQ Region 4 conducted an IHW sampling investigation to determine if hazardous waste grinding grit disposed of on-site had generated metal laden dust that may have spread off-site (Ref. 17, pp. 2-3). The grinding grit area appeared to be larger than what Region 4 observed on November 4, 2015, extending to the southeast property line (Ref. 15, pp. 1). Eighteen soil samples were collected from the southern

boundary of the property, where grinding grit was historically disposed of, and analyzed for total metals and mercury. Samples included two duplicates, one background sample, and one piece of grinding grit (Ref. 13, pp. 57-60; Ref. 17, pp. 3, 43, 45). Arsenic was detected in 13 soil samples, one duplicate sample, and the background sample above the SCDM value of 0.71 mg/kg. Chromium was detected in all samples, with concentrations ranging from 17.7 mg/kg in the background sample to 7,580 mg/kg in the grinding grit sample. Chromium exceeded the SCDM value of 200 mg/kg in all nine soil sample locations and two duplicate sample locations located immediately south and east of the facility building, with concentrations ranging from 241 to 2,970 mg/kg (Ref. 4, pp. 1; Ref. 17, pp. 11-28, 43, 45-49). Lead was detected in exceedance of the EPA interim screening level of 400 mg/kg in four soil samples and one duplicate sample, ranging in concentrations from 713 to 2,000 mg/kg (Ref. 17, pp. 11-28, 43, 45-49; Ref. 28, pp. 3). Other metals with significant concentrations in exceedance of SCDM values included antimony, cadmium, and mercury. Mercury exceeded the SCDM value of 10 mg/kg in four soil samples and one duplicate sample, with concentrations ranging from 13.8 to 46.4 mg/kg. Cadmium exceeded the SCDM value of 30 mg/kg in two soil samples and one duplicate sample, with concentrations ranging from 57 to 205 mg/kg. Antimony exceeded the SCDM value of 30 mg/kg in one soil and one duplicate sample. Antimony, arsenic, cadmium, and chromium were detected in exceedance of respective SCDM values and lead was detected in exceedance of the screening value in the grinding grit sample. The highest antimony, cadmium, chromium, lead, and mercury soil concentrations were detected due south/southeast of the HWTB. The grinding grit sample was also collected in this area and contained the highest overall detections of antimony and chromium (Ref. 4, pp. 1; Ref. 17, pp. 11-28, 43, 45-49; Ref. 28, pp. 3).

SWS Environmental Services (SWSES) conducted a limited removal action at the site under the direction of TCEQ Region 4 from November 20 through December 18, 2015. The scope of work included haz-cat analysis and chemical characterization of chemicals in the facility lab and lab pack and re-packaging of select chemicals, the removal of chromic acid sludge from two sumps at the facility, and securing the liquid chromic acid waste into poly totes. All outside doors to the facility building were secured and locked,

and metal cattle panels were used to secure the first floor windows. The site security work was completed on November 25, 2015. From December 1-7, 2015, SWSES conducted chromic acid removal from the two sumps and haz-cat identification and packing of select chemicals. The chromic acid waste was pumped into 300 gallon totes staged adjacent to the sump/chrome tank. During the haz-cat identification, four containers of cyanide material were identified (silver, copper, sodium, and potassium cyanide), lab-packed in five-gallon buckets, secured, and labeled. All containers in the lab were identified and labeled. Two drums of potassium cyanide and sodium cyanide were labeled and secured in 55-gallon drums. SWSES met with the facility owner on December 10, 2015, to obtain signatures for all land disposal restriction forms, waste profiles, and waste manifests. The six containers of cyanide material were transported for disposal on December 18, 2015 (Ref. 31, pp. 1-4).

Lane Plating Works, Inc. and Stag Management Incorporated initially filed for bankruptcy on October 28, 2015 (Ref. 21, pp. 1). A Demand Letter in regards to Investigation No. 1301517 was transmitted to Mr. Lane on December 9, 2015, after the bankruptcy case was dismissed on account of a technical failure (Ref. 17, pp. 3; Ref. 21, pp. 1). Second petitions of bankruptcy were filed by Lane Plating Works, Inc. and Stag Management Incorporated on December 21, 2015. TCEQ filed a motion to dismiss both cases on December 22, 2015, on the basis of the trustee not having enough assets to cover costs of necessary removal and remediation (Ref. 21, pp. 1). The Executive Director submitted a notice of non-suit and withdrawal of the EDPRP on February 12, 2016 (Ref. 30, pp. 37-41). The case was dismissed from the docket of the State Office of Administrative Hearings without prejudice to refiling, and the motion to dismiss both cases was denied on February 18, 2016 (Ref. 21, pp. 1; Ref. 30, pp. 41).

Representatives from the TCEQ and EPA Superfund Removals program conducted a site visit on February 18, 2016, to assess the site for a removal action. Removals program representatives observed incompatible wastes stored next to each other, and large volumes of hazardous wastes were noted throughout the site (Ref. 12, pp. 1). The last filing

of the Stag Management Incorporated case was on February 23, 2016, as an Order denying the motion to dismiss the case (Ref. 21, pp. 1).

On February 24, 2016, a TCEQ Region 4 investigator met with Superfund Preliminary Assessment Site Investigation (PA/SI) personnel on-site for a PA site visit (Ref. 10, pp. 2-3). Grab samples collected by the Region 4 investigator from the two on-site water wells were analyzed for total metals, hexavalent chromium, and mercury (well depths and construction information are unavailable) (Ref. 32, pp. 1, 6). Chromium and hexavalent chromium results were detected at 0.219 and 0.212 mg/l, respectively, in the water well located near the facility entrance (WW-1), exceeding the EPA Maximum Contaminant Level (MCL) of 0.1 mg/l, and the SCDM values of 0.04 and 0.00004 mg/l for chromium and hexavalent chromium, respectively (Figure 3; Ref. 4, pp. 1; Ref. 32, pp. 6). Chromium was detected below the MCL and SCDM values at a concentration of 0.0275 mg/l and hexavalent chromium was detected below the MCL value but above the SCDM value at a concentration of 0.0170 mg/l in the second on-site well, WW-2 (Figure 3; Ref. 4, pp. 1; Ref. 32, pp. 8). Barium was detected below the MCL value of 2.0 mg/l and the SCDM value of 3.0 mg/l at concentrations of 0.126 and 0.131 mg/l in WW-1 and WW-2, respectively. All other results were reported as not detected (Figure 3; Ref. 4, pp. 1; Ref. 32, pp. 6, 8).

In response to observations made during the Superfund Removals site visit, on March 8, 2016, the EPA Removals program agreed to conduct a Removal Assessment at the site. The Removal Assessment sampling event was completed in April 2016. Results of the assessment will be used to estimate removal costs and assess eligibility of the site for a federally-lead Removal Action (Ref. 33, pp. 1-2). The last filing of the Lane Plating Works, Inc. case was on March 30, 2016, as an Order allowing the Trustee to hire counsel (Ref. 21, pp. 1). On April 29, 2015, TCEQ Region 4 conducted an IHW Reporting of the November 2015 sample results. No additional violations or letters were transmitted to Lane Plating Works, Inc. due to the nature of the investigation and bankruptcy filing status (Ref. 17, pp. 1, 4).

2.6 SITE VISIT

TCEQ PA/SI personnel conducted a PA site visit on February 24, 2016, one day after a storm event. TCEQ Region 4 met with PA/SI personnel to provide site access (Ref. 10, pp. 2-3). PA/SI personnel collected GPS points of the two on-site wells and took photographs of the baseball diamond, on-site wells, site topography and drainage, old equipment located off-site on adjacent tracts, the unnamed creek located south of the site, and the small pond located southeast of the site. TCEQ observed site drainage patterns and several horses that were unfenced on adjacent tracts of land (Ref. 10, pp. 2-5, 9; Ref. 11, pp. 1-12). City water lines supply surrounding neighborhoods; however, a potential well house was observed at the corner of Bonnie View Road and Stag Road. TCEQ also noted the absence of a middle school listed as Maynard Jackson Middle School at 2929 Stag Road (Ref. 10, pp. 2).

2.7 SOURCES

Potential sources associated with the site include contaminated soil, located around the footprint of the facility building and south of the HWTB, and containerized wastes located inside the facility building. The facility building containerized wastes are located approximately 150 feet north of the known contaminated soil area (Figure 3).

2.7.1 Source 1: Contaminated Soil

Sampling during the TCEQ Region 4 investigations confirmed that on-site soil is contaminated with antimony, arsenic, cadmium, chromium, hexavalent chromium, nickel, and mercury above SCDM values and with lead above the EPA interim screening level. Concentrations of cadmium, chromium, lead, and mercury exceeded regulatory TCLP concentrations (as discussed in Section 2.5). Contaminated soil exists over an area of approximately 24,000 square feet based on the November 2015 TCEQ Region 4 sample results. Grinding grit was observed by TCEQ Region 4 on an area of approximately 4,500 square feet of surface soil located south of the facility building (Ref. 15, pp. 1). TCEQ and EPA Superfund Removals Program personnel observed surface and subsurface soils

visibly impacted by wastes apparently seeping underneath the facility foundation in February 2015 (Ref. 12, pp. 1, 9, 11-12).

2.7.2 Source 2: Containerized Wastes

Containerized facility waste is currently stored inside the facility building in tanks, drums, and below-ground tanks (sumps) (Ref. 12, pp. 1). In March 2016 TCEQ Region 4 estimated 260 containers and 14 tanks stored on-site, for an approximate amount of 18,726 gallons of waste and 7,523 gallons of tank wastes at full capacity. This amount does not include lab waste (Ref. 34, pp. 1-2). The waste containers and tanks are distributed throughout the facility building in specified locations. Five containers approximately 2 to 3 gallons in size are located in the attic (including aluminum cleaner) and 56 small containers of various sizes of solids and liquids are stored in the lab, including an oxidizer and an unknown acid. In Area 1 (near entrance) there are 25 approximately one-gallon size containers in chemical cabinets (two of which were removed as cyanide waste), 66 containers of mostly 30 to 55-gallon drums and some five-gallon containers, and four tanks (approximately 6,400 gallons). Area 2 (the location of a large chrome tank) contains approximately eight five-gallon containers, one tank and one sump that were pumped out into 24, 300-gallon totes, and a second approximately 280-gallon tank. Approximately 45 gallons are stored in 13 small oil and 2, 5-gallon containers located in Area 3 (Grinding Room) and approximately 1,100 gallons are stored in eight tanks and three containers in Area 4 (Cadmium Plating Room). Thirty-nine containers, including approximately 1,045 gallons stored in 19, 55-gallon containers, are located in Area 5 (Machine Shop). One 55-gallon drum is stored in Area 6 (Black Oxide Room) and seven 55-gallon drums are stored in Area 7 (Thinner Area). There is also one approximately three-gallon lead dip tank with solidified lead (Ref. 34, pp. 1-2). Soil containing grinding grit that was previously a waste pile is currently stored in 12 to 13, 1,365-kg supersacs in fair to good condition, for a total estimate of 16,380 to 17,745 kg of soil inside Area 8 (unenclosed HWTB) (Ref. 12, pp. 13; Ref. 13, pp. 56; Ref. 14, pp. 1-2; Ref. 34, pp. 2).

Specific chemicals were documented inside the facility by Region 4 in November 2015. Nickel strip, lubricant and transmission fluid, and a 500 ml bottle of aluminum cleaner were documented in the attic (Ref. 13, pp. 11-12). Small containers (50 to 100 ml) of potassium iodine, barium chloride, chromium reagent, chrome, sulfuric acid, and magnesium hydroxide, lab pack waste, ammonia acid, myrexide, gallons of latex paint, and seven containers of corrosive and silver oxide were documented in the lab (Ref. 13, pp. 14-17).

In the container and chemical storage area (near Area 1), Region 4 documented waste containers consisting of 55-gallon drums of hydrochloric acid, nitric acid, and caustic soda, two chromium dioxide containers, one 25-30 gallon container of corrosive (black magic 5s), one corrosive (blue magic) container, nickel stripper, several unused bags of basting media, and other various sized containers of unknown chemicals (Ref. 13, pp. 18-22). Chemical cabinets in this area contained 22, one to five-gallon containers of paint waste and adhesive, 1, 10-gallon container of chromium trioxide, and approximately 25 to 30 gallons each of sodium cyanide and potassium cyanide. Waste containers in this area consisted of two, five to ten-gallon containers of corrosive and oxidizer, other alkaline cleaners, acid based salts, barium carbonate, chromium trioxide, acid based corrosives, ammonium hydroxide, hydrochloric acid, sulfuric acid, zinc waste, nitric acid, and unknown chemicals. Leaks in the air duct dedicated to the chromic acid tank were documented (Ref. 13, pp. 23-28). One nickel tank with solids and three chrome tanks were documented; one was filled with chromic acid and another was a chrome rinse tank with trash in it (approximately 13,000 and 800 gallon capacity, respectively) (Ref. 13, pp. 28-30). A chromic acid holding tank and sump and chrome rinse tank are located adjacent to this area. The holding tank is reportedly empty. The sump is approximately 280 square feet and contains approximately 2 inches of chromic acid. The chrome rinse tank is an approximately 1,000-gallon capacity tank filled with sludge-like chromium solution (Ref. 13, pp. 31-33). Additional chemical storage included thirteen labeled hazardous waste drums consisting of two nickel drums, one black oxide solids drum, two chrome sludge drums, one hydrochloric acid solution drum, two sodium hydroxide drums, two cadmium solids drums, one cadmium liquid drum, one sulfuric acid drum, and one unknown drum

(Ref. 13, pp. 34). The chromic acid air scrubber system in this area contained a few inches of liquid (Ref. 13, pp. 35).

In Area 2, Region 4 documented three chrome waste drums and five 10-gallon buckets holding chromic acid leaking from the air duct system in the area adjacent to the Rectifier Room (Ref. 13, pp. 38-39). The chrome tank with associated scrubber system in this area has an approximate holding capacity of 4,400 gallons and is 10 feet deep, with a sump capacity beneath the tank of approximately 6,500 gallons. The tank was filled with chromic acid solution which had mostly leaked into the sump. Floor trenches in this area designed to catch leaks have eroded (Ref. 13, pp. 40). A caustic water tank filled with caustic water is located next to the chrome tank in this area and is approximately 12 feet in length (Ref. 13, pp. 41). Yellow stains thought to be a result of chromium leaks from the chrome tank or sump system were observed on the shared wall between the Rectifier Room and large chrome plating tank area (Ref. 13, pp. 51-53).

The Grinding Room (Area 3) contained grindings, used oil (12 containers of 5 to 30-gallons), and chrome waste (one drum) (Ref. 13, pp. 42). The Tinning Room (Area 4) contained nitric acid (25 percent, 1 drum), nickel solution (140 gallon tank), sodium hydroxide and water mixture (40 gallons), sulfuric acid (0.5 gallon), and clear chromate (five gallons). Four cadmium tanks (192 gallon capacity), one cleaning tank (hydrochloric acid), three rinse tanks, one chromate dip tank, and one nickel tank are located in this room. The center dip line tanks were approximately one third full (Ref. 13, pp. 43-46).

In the Machine Shop (Area 5), wastes included cadmium solids labeled as hazardous waste (one drum), nickel strip (two drums), oil (five gallons), and 35 drums containing caustic cyanide based solutions (half of which were near empty or empty) (Ref. 13, pp. 47-49). One drum of black oxide solution and one empty black oxide tank were documented in the Black Oxide Room (Area 6) (Ref. 13, pp. 54). The Thinner Area (Area 7) contained one drum of paint thinner, three drums of oil, one drum of kerosene, one drum of oil filters (one third full), and one, five-gallon container of oil (Ref. 13, pp. 55). Several old, empty plating tanks, one liner, and one 250-gallon tote of used oil were observed in the

HWTB (Ref. 13, pp. 56). Yellow staining was observed on the exterior southeast corner of the building (Ref. 13, pp. 61). Additional old, empty plating tanks (10 to 12) and other process equipment are located in the Equipment Storage Area located east of the Grinding Room (Ref. 13, pp. 65-67).

During the waste removal authorized by TCEQ Region 4 in December 2015, the chromic acid waste was removed from the two main sump areas and pumped into 24, 300-gallon totes staged adjacent to the sump and chrome tank. Four containers of cyanide material (silver, copper, sodium, and potassium cyanide) were identified and packed into five-gallon buckets. Two drums of potassium cyanide and sodium cyanide were labeled and secured in 55-gallon drums. The six containers of cyanide material were transported for disposal on December 18, 2015 (Ref. 31, pp. 1-4; Ref. 34, pp. 2).

Representatives from the TCEQ and EPA Superfund Removals program conducted a site visit on February 18, 2016, to assess the site for a removal action. Removals program representatives observed cyanide waste drums staged with one drum of acid in the Machine Shop area located on the east side of the facility building. These are incompatible wastes that could lead to immediately dangerous to life and health conditions. Representatives also observed air ducts throughout the facility dripping suspected caustics from the former air scrubber unit, plating baths and sumps still containing corrosive and cyanide compounds, large volumes of hazardous wastes throughout the site in fair to poor condition containers, and a leaking secondary containment structure (Ref. 12, pp. 1, 11). The site previously failed to install secondary containment units for hazardous waste tanks (Ref. 17, pp. 2-3).

3 MIGRATION/EXPOSURE PATHWAYS

The following sections describe migration/exposure pathways and potential receptors within the site's range of influence.

3.1 GROUND WATER MIGRATION PATHWAY

The target distance limit (TDL) for the ground water migration pathway is a 4-mile radius that extends from the sources at the site. Figure 4 depicts the ground water 4-mile TDL.

3.1.1 Geologic Setting

The surface soil at the site is composed of Quaternary alluvium and Pleistocene fluviatile terrace deposits. The Quaternary alluvium is comprised of flood plain deposits of gravel, sand, silt, silty clay, and organic matter. Fluviatile terrace deposits consist of gravel, sand, silt, and clay in contiguous terraces. These deposits range in thickness from approximately zero to 75 feet below ground surface (feet bgs) (Ref. 35, pp. 3-4, 13; Ref. 36, pp. 16). The Quaternary sediments are underlain by Cretaceous-age Austin Chalk. The upper and lower parts of the Austin Chalk consist of mostly massive microgranular calcite and some interbeds and partings of calcareous clay, with thin bentonitic beds locally in the lower part. The middle part of the Austin Chalk is mostly thin-bedded marl with interbeds of massive chalk. The Austin Chalk has a thickness of approximately 300 to 500 feet (Ref. 35, pp. 3, 15).

Underlying the Austin Chalk is the Eagle Ford Group of Cretaceous age, which is 200-300 feet thick and comprised predominantly of shale with thin beds of limestone and bentonite. The mostly sandstone Cretaceous-age Woodbine Formation underlies the Eagle Ford Group and is approximately 175-250 feet thick (Ref. 35, pp. 15). The Woodbine is underlain by the Cretaceous-age Washita and Fredericksburg Groups, which consist primarily of limestone, dolomite, marl, and shale. The Fredericksburg and Washita

Groups have a combined thickness of approximately 1,250 feet and separate the Woodbine from the underlying Paluxy Formation of the Trinity Group (Ref. 36, pp. 16; Ref. 37, pp. 39). The Paluxy Formation is the upper member of the Trinity Group, approximately 400 feet thick, and is comprised mostly of sand/sandstone and some shale and limestone. The Glen Rose Formation divides the two Trinity Group aquifer formations in the area and consists of limestone, marl, shale, and anhydrite. It can reach thicknesses of up to 1,500 feet. The Twin Mountains Formation, originally named the Travis Peak Formation, consists of sand, silty clay, and siliceous conglomerates of chert, quartzite, and quartz pebbles and has a thickness of up to 1,000 feet (Ref. 35, pp. 17; Ref. 36, pp. 15-20; Ref. 37, pp. 39). Table 1 shows the general stratigraphy of the site vicinity.

Average annual precipitation in the site area is approximately 40 inches (Ref. 38, pp. 1).

Ground water is not known to be used for large scale irrigation, livestock watering, commercial aquaculture, or recreation in the immediate vicinity of the site, however in general the Woodbine Aquifer provides water for industrial, livestock, and small irrigation supplies, and a small portion of the Trinity Aquifer is used for irrigation and livestock (Ref. 36, pp. 42, 47; Ref. 39, pp. 33-34, 41).

Table 1. Site Stratigraphy

System	Series	Group	Stratigraphic Units	Approximate Maximum Thickness	Water-Bearing Characteristics
Quaternary	Recent		Alluvium	75	Yields small to large amounts of water to wells along the Red River.
	Pleistocene		Fluviatile terrace deposits		Yields small quantities of water to wells in the eastern part of the area.
Cretaceous	Gulf	Austin	Undifferentiated	700	Yields small to moderate quantities of water in northeastern part of North Central Texas. Very limited as an aquifer.
		Eagle Ford		650	Yields small quantities of water to shallow wells.
		Woodbine		700	Yields moderate to large quantities of water to municipal, industrial and irrigation wells.
	Comanche	Washita	Grayson Marl	1000	Yields small quantities of water to shallow wells.
			Mainstreet, Pawpaw, Weno, Denton		
			Fort Worth, Duck Creek		
			Kiamichi		
		Fredericksburg	Goodland	250	Yields small quantities of water to shallow wells.
			Walnut Clay		
		Trinity	Paluxy Formation	400	Yields small to moderate quantities of water to wells.
			Glen Rose Formation	1500	Yields small quantities of water in localized areas.
			Twin Mountains Formation	1000	Yields moderate to large quantities of water to wells.

(Ref. 36, pp. 16)

3.1.2 Aquifer System

The site overlies the Quaternary alluvium and Pleistocene fluviatile terrace deposits and the Austin Chalk (Ref. 35, pp. 3-4, 6). Several monitor wells are installed in the immediate site vicinity at depths of 40 feet bgs in the unconfined alluvium and terrace deposits, with static water levels around 10 feet bgs (Ref. 40, pp. 2, 4-7). Ground water gradient information is not available for the shallow aquifer. Hydraulic conductivity is low in the Austin Chalk, which is very limited as an aquifer (Ref. 36, pp. 16; Ref. 37, pp. 57). The Woodbine Aquifer and Twin Mountains Formation of the Trinity Aquifer are also present below the site based on area well drilling logs (Ref. 40, pp. 1, 3, 8-20, 27-38).

Underlying the Austin Chalk is the Eagle Ford Group. The 200-300 foot thick Eagle Ford Group unconformably overlays the Woodbine Aquifer and acts as a confining unit (Ref. 35, pp. 6-7, 15; Ref. 37, pp. 57). The Woodbine Aquifer is categorized by the Texas Water Development Board (TWDB) as a minor aquifer consisting of sandstone interbedded with shale and clay that form three distinct water bearing zones. The Woodbine Aquifer occurs from approximately 700 to 1,100 feet bgs and reaches 600 to 700 feet in thickness in subsurface areas, with freshwater saturated thickness averages of about 160 feet (Ref. 36, pp. 19-20; Ref. 37, pp. 45; Ref. 39, pp. 41; Ref. 40, pp. 20). Based on area well drilling logs, water levels in the Woodbine around the site area range from 100 to 230 feet bgs, with total depths of approximately 853 to 1,100 feet bgs. Ground water gradient in the Woodbine Aquifer is generally to the east-southeast (Ref. 36, pp. 51; Ref. 40, pp. 8-40).

The Washita Group underlies the Woodbine and overlies the Fredericksburg Group. The two groups are generally considered a confining unit above the Trinity Aquifer and yield only small amounts of water (Ref. 36, pp. 15-16; Ref. 37, pp. 13).

The Trinity Aquifer underlies the Fredericksburg Group. The two water-bearing formations of the Trinity Group in the site vicinity are the Paluxy and Twin Mountains Formations, separated by the Glen Rose Formation (Table 1; Ref. 36, pp. 15-16). The Glen Rose Formation yields small amounts of water to localized areas only (Ref. 36, pp. 16).

The top of the Paluxy Formation occurs from approximately 1,700 to 2,000 feet bgs, with a maximum thickness of approximately 400 feet. The Paluxy Formation yields small to moderate quantities of fresh to slightly saline water to municipal, industrial, domestic, and livestock wells (Ref. 36, pp. 19, 44; Ref. 37, pp. 45). The Twin Mountains Formation has a maximum thickness of up to 1,000 feet and the top of the formation occurs from approximately 2,300 to 2,800 feet bgs. It is the primary Cretaceous-age water-bearing formation in the region and yields moderate to large quantities of fresh to slightly saline water to municipal and industrial wells (Ref. 36, pp. 16, 19; Ref. 37, pp. 45). Ground water gradient in both aquifers is generally to the east (Ref. 36, pp. 41, 44). The Trinity is the largest and most prolific aquifer in the region; however, the aquifer has been overdeveloped, resulting in significant water level declines across the region (Ref. 36, pp. 8-9).

The Quaternary alluvium and Pleistocene fluviatile terrace deposits are generally irregular in thickness and extent and within the study area are concentrated across Fivemile Creek and the Trinity River to the east of the site. The alluvium and terrace deposits are discontinuous within the TDL to the west, north, and south. The Woodbine and Trinity Aquifers extend well across the TDL over multiple north Texas counties (Ref. 35, pp. 3; Ref. 36, pp. 17; Ref. 37, pp. 22, 26-27).

The unconfined alluvium, Woodbine Aquifer, and Paluxy Formation of the Trinity Aquifer are unlikely to have interconnectivity in this area as the three aquifers are separated from one another by confining units of the Eagle Ford and Washita/Fredericksburg Groups, as discussed earlier in this section (Ref. 36, pp. 16). Interconnectivity between the Paluxy and Twin Mountains Formations of the Trinity Aquifer is also unlikely in the site vicinity as they are separated by the Glen Rose Formation, which yields small amounts of water (Ref. 36, pp. 16; Ref. 39, pp. 35). Additionally, the upper part of the Twin Mountains Formation is mostly claystone and few wells are developed in the upper part of the formation (Ref. 35, pp. 18; Ref. 36, pp. 19). The Glen Rose Formation pinches out towards the north and is absent in northern Texas counties where the Paluxy and Twin Mountains

Formations coalesce into the Antlers Formation; however, this area is located outside the TDL (Ref. 37, pp. 108; Ref. 39, pp. 35).

3.1.3 Drinking Water Receptors

The Trinity Aquifer supplies wells for pubic supply, industrial, irrigation, domestic, and livestock use. Irrigation use constitutes a small portion of overall pumpage in the Paluxy and Twin Mountains Formations and is generally limited to irrigation of golf courses and lawns. Irrigation of crops from the Twin Mountains Formation is confined to the outcrop areas located in Hood, Parker, and Wise Counties. Approximately 55 percent of total ground water use in the Twin Mountains Formation is for municipal and industrial purposes. Municipal and domestic use of the Paluxy Formation accounted for approximately 50 and 24 percent of total ground water pumpage, respectively (Ref. 36, pp. 8, 19, 42-44, 47). There is no evidence at this time that ground water is used for irrigation of food or forage crops of five or more acres, for commercial livestock watering, as an ingredient in commercial food preparation, for commercial aquaculture, or for major or designated recreation in the 4-mile TDL.

Within the 4-mile TDL, there is one domestic well, three public water supply (PWS) wells, two stock wells, eight irrigation wells, and seven industrial wells. The only well located within a mile of the site is an irrigation well. Additional irrigation wells are located within two miles to the northeast and southwest (three wells), within three miles to the east and west (three wells), and within four miles northeast. The nearest PWS wells are located within two, three, and four miles west and southwest of the site and are screened in the Woodbine Aquifer. The only domestic well within the 4-mile TDL is located within three miles east of the site, and two stock wells are located within three and four miles east of the site, all screened within shallow alluvium. Industrial wells are situated within two miles east-northeast (two wells) and four miles north (five wells) of the site. Irrigation and industrial wells within the 4-mile TDL are screened in the shallow alluvium and Woodbine Aquifer (Ref. 40, pp. 1-3). Figure 4 shows the locations of well distributions within the 4-mile TDL.

Water analytical results were not available for the domestic and PWS wells within the four-mile TDL. The TCEQ Texas Drinking Water Watch (TXDWW) website lists one of the PWS facilities (Community Water Service Grand Prairie) as buying their water from the City of Grand Prairie, who buys from the Cities of Fort Worth and Midlothian and the Dallas Water Utility. These are all surface water sources of drinking water located west or north of the site (Ref. 41, pp. 2-3, 5, 11, 15). The other PWS facilities are not listed on the TXDWW website. Installation dates of the domestic and PWS wells are old, ranging from the 1940s to the 1970s, and it is unknown if these wells are still in use (Ref. 40, pp. 8, 24).

There are two on-site shallow wells of unknown historical use located adjacent north of the facility building (Figure 3). As discussed in Section 2.5, on-site wells were sampled in February 2016 for metals. Chromium and hexavalent chromium exceeded the MCL and SCDM values in WW-1 and hexavalent chromium exceeded the SCDM value in WW-2 (Ref. 4, pp. 1; Ref. 32, pp. 1, 4-8).

The site is not located within a wellhead protection area (Ref. 42, pp. 1-2).

The total population in Dallas County is approximately 2,553,385, with 2,718 people per square mile and 2.78 people per household (Ref. 43, pp. 1-2).

3.2 SURFACE WATER MIGRATION PATHWAY

The surface water migration pathway TDL begins at the probable point of entry (PPE) of surface water runoff from the site to a surface water body and extends downstream for 15 miles. Figure 5 depicts the surface water 15-mile TDL.

3.2.1 Overland Route

The site is predominantly situated on the Lewisville-Urban Land Complex with zero to four percent slopes. The Lewisville-Urban Land Complex soil is a Quaternary alluvium more than 80 inches thick, well drained, and composed of up to 40 percent calcium

carbonate. A typical soil profile is silty clay from 0 to 75 inches. The southern and eastern sections of the site are composed of the Frio-Urban Land Complex and Frio Silty Clay. The Frio Silty Clay is a calcareous clayey alluvium with zero to one percent slopes. The Frio-Urban Land Complex is a loamy alluvium with zero to two percent slopes. Both units are frequently flooded (Ref. 44, pp. 8, 10, 12-15).

The site is bordered by Bonnie View Road to the west, which is slightly elevated from the site and creates a high ridge on the west side of the baseball diamond, located south of the site (Figure 2; Ref. 10, pp. 2; Ref. 11, pp. 1). Fivemile Creek is located approximately 0.3 mile to the south of the site and discharges into the Trinity River (Ref. 6, pp. 2-3). An unnamed creek flows underneath Bonnie View Road approximately 500 to 1,000 feet south/southeast of the site and is situated north of the baseball diamond and south of the site (Figure 2; Ref. 10, pp. 2; Ref. 11, pp. 1-2). A secondary unnamed stream, referred to as Stream 5A2 in the Dallas County Stormwater Infrastructure Assessment, is located approximately 500 to 600 feet east of the site (Ref. 9, pp. 22, 48). A small pond is located approximately 500 feet southeast of the site (Figure 2; Ref. 10, pp. 4-5, 9; Ref. 11, pp. 9-11).

Site and area topography slope gently to the south and southeast (Ref. 6, pp. 4). The PA site visit was made one day after a storm event while site conditions were still wet (Ref. 10, pp. 4). A low depression filled with rain water was observed along the southern fence line of the site near Bonnie View Road. Water drainage and site runoff were observed flowing adjacent north of the facility building towards the east and then along the east side of the facility building to the south. Runoff was observed to continue south through a low depression/ponding area towards the PPE in the unnamed creek (Figure 2; Ref. 10, pp. 4-6, 8-9; Ref. 11, pp. 5-10). Stream 5A2 crosses Bonnie View Road at a location northwest of the site and south of Stag Road, and then continues south on a pathway that flows east of the facility building into the northeast corner of the small pond. This stream was observed exiting the southwest corner of the pond, continuing south until it connected to site drainage coming from the east side of the facility building into the unnamed creek PPE (Figure 2; Ref. 9, pp. 48; Ref. 10, pp. 4-5, 9; Ref. 11, pp. 10-11). Trash

was observed collecting in the drainage out of the pond to the south (Ref. 11, pp. 9). The straight-line distance to the PPE from the facility building is approximately 800 feet and from the small pond is approximately 280 feet (Figure 2). Stream 5A2 continues to flow past the small pond towards the east/southeast and likely merges with the unnamed creek at a location east of the PPE (Figure 2; Ref. 9, pp. 48; Ref. 10, pp. 9). Roaming horses were observed walking around additional branches of Stream 5A2 north of the small pond. A field located west of the small pond was saturated and appears to collect drained water in the area (Ref. 10, pp. 5, 9; Ref. 11, pp. 10, 12-13).

Fivemile Creek is listed as an intermittent, unclassified freshwater stream (Segment 0805D) that flows into the perennial Upper Trinity River (Segment 0805) at a point approximately 0.25 miles north of Interstate 20 (Ref. 6, pp. 2-4; Ref. 45, pp. 1). Fivemile Creek forms a dendritic drainage pattern and has been channelized east of Interstate 35 and re-routed (Ref. 45, pp. 1; Ref. 46, pp. 1; Ref. 47, pp. 3). It is the main tributary to the Trinity River in the site vicinity and capable of flooding the site and connecting with the unnamed creek and Stream 5A2 during storm events (Figures 2 and 5; Ref. 48, pp. 3). Although the unnamed creek is likely intermittent and may connect to Fivemile Creek during flood events, a connection upstream to the west of the site with Fivemile Creek is not clear (Ref. 6, pp. 4; Ref. 9, pp. 48; Ref. 45, pp. 1; Ref. 48, pp. 3). The braided pattern and dendritic drainage of Fivemile Creek and Stream 5A2 make the surface water pathway uncertain (Ref. 6, pp. 4; Ref. 7, pp. 2; Ref. 9, pp. 22; Ref. 10, pp. 9; Ref. 45, pp. 1). For the purpose of this assessment, the unnamed creek is currently treated as a separate water body from Fivemile Creek. The unnamed creek appears to flow east and connect with Stream 5A2, continuing to the east in a braided stream pattern across Interstate 45 into a small ditch towards Highway 310 and across. The creek was observed crossing I-45 and flowing east during the PA site visit (Figures 2 and 5; Ref. 6, pp. 4; Ref. 7, pp. 2; Ref. 10, pp. 5; Ref. 11, pp. 14). The channelized stream in this section was redone in 2008-2009 when the Trinity Forest Trail was constructed to bypass Lemmon Lake in the Joppa Preserve and now apparently connects directly to the Trinity River PPE (Figure 5; Ref. 49, pp. 2). The apparent course of the stream from the site PPE towards the Trinity River PPE

is approximately two miles. The 15-mile TDL from the site PPE is located approximately where the Trinity River crosses E. Belt Line Road (Figure 5).

The site and the section of Stream 5A2 located east of the site are situated within the Special Flood Hazard Area (SFHA) subject to inundation by the one percent annual chance flood, also known as the 100-year flood or base flood area. Fivemile Creek and the site PPE area are situated in the regulatory floodway, which is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so the one percent annual chance flood can be carried without substantial increases in flood heights. These flood areas continue east to I-45 (Ref. 48, pp. 1-3).

The two-year, 24-hour rainfall for the site is 3.5 to 4.5 inches (Ref. 50, pp. 6). The average flow rate of the Upper Trinity River near Lemmon Lake is 3,570 cubic feet per second (ft^3/sec) over a 56 year record, with a 2015 annual average flow of 5,665 ft^3/sec (Ref. 51, pp. 1, 4, 6, 10). Flow rates were not available for Fivemile Creek.

3.2.2 Drinking Water Receptors

Although the Dallas Water Utility predominantly uses surface water as a drinking water source and supplies water to several municipalities in the area, including Hutchins, located approximately four miles southeast of the site, there is no nearby downstream surface water intake to the site. The nearest intake downstream is located over 54 miles south at a City of Trinidad intake from Cedar Creek Reservoir. This intake does not appear to be connected to the Trinity River. Surface water intakes that supply the Dallas Water Utility are located northwest and northeast of the site area (Ref. 52, pp. 1).

The average number of persons per household in Dallas County is 2.78 (Ref. 43, pp. 1).

3.2.3 Human Food Chain Receptors

Fishing was not observed during the PA site visit in the creeks and streams or PPE adjacent south of the site. The small pond and portions of the creeks leading to the unnamed creek and Stream 5A2 PPE are located on private, fenced land owned by the Lanes or Stag Management, Inc. and would not be easily accessed by the public. The unnamed creek and Stream 5A2 PPE is located near the baseball diamond on City of Dallas property (Figure 2; Ref. 7, pp. 1-4). Aquatic life use for Fivemile Creek is listed as fish, shellfish, and wildlife protection and propagation by the EPA with a status of not assessed. The designated use for fish consumption is aquatic life harvesting (Ref. 53, pp. 1-2). The western section of Fivemile Creek located in Oak Cliff, west of Interstate 35, is known as a quality fishing area for sunfish, bass, and catfish that is not widely used by the public. The quality of fishing east of Interstate 35 and in the site vicinity is not as good resulting from the creek channelization that occurred in the 1960s-1970s (Ref. 47, pp. 1-3). Fishing in Fivemile Creek would most likely be categorized as sport or subsistence.

The Joppa Preserve is situated approximately two miles east of the site and located on the Trinity Trail. The preserve was formerly known as Lemmon Lake and is popular with fishermen. Hunting, swimming, and boating are not permitted (Ref. 54, pp. 1-2). A fish kill most likely resulting from oxygen depletion was documented in a small lake known as West Pond, situated on the west side of Lemmon Lake and the Joppa Preserve, on June 8, 2013. The lake is approximately five acres and most likely an old gravel pit. There is no inlet or outlet to this lake since the 2008-2009 construction of the Trinity Forest Trail (Ref. 49, pp. 1-5). Fishing in the Lemmon Lake area would most likely be categorized as sport or subsistence. Information on specific types of fish was not available and there is no evidence of a commercial fishery.

The Upper Trinity River segments that connect the area near Lemmon Lake to the downstream 15-mile TDL (0805_03 and 0805_06) have a designated use of aquatic life for fish, shellfish, wildlife protection and propagation, fish consumption, and recreation. The status for aquatic life use is rated as good; however, fish consumption and recreation

uses are rated as impaired. Cause of impairments are listed as bacteria for recreation and dioxin and polychlorinated biphenyls (PCBs) in fish tissue for fish consumption use. Total Maximum Daily Loads (TMDLs) are listed as needed for all impairments and were applied for bacteria to Cedar Creek and Fivemile Creek in August 2011 (Ref.53, pp. 3-11). Nine TMDLs for legacy pollutants were approved in June 2001 for Upper Trinity River Segment 0805. Fish consumption use was banned by the Texas Department of Health (DSHS) based on chlordane concentrations through the upper 19 miles of the segment, from the Elm Fork Trinity River confluence downstream to Interstate 20 in southeast Dallas County (Ref. 55, pp. 4-5). Dioxin and PCBs are listed in the 2014 Texas 303(d) List of Impaired Waters as parameters that do not meet assigned water quality standards with TMDLs underway in Upper Trinity River segments within the 15-mile TDL. Dioxins and PCBs were first listed as parameters in 2010 and 2002, respectively (Ref. 56, pp. 2). Fishing is a listed feature in the McCommas Bluff Preserve, a 111-acre preserve located along the winding Trinity River segment approximately 1.3 miles east of Lemmon Lake (Ref. 57, pp. 1). As of December 18, 2015, the DSHS released a fish consumption advisory for portions of the Trinity River from U.S. 287 downstream to U.S. 90 due to dioxins and PCBs found in fish tissue. The advisory specified blue catfish, flathead catfish, freshwater drum, gar, smallmouth buffalo, striped bass, and white bass (Ref. 58, pp. 1). Fishing in the Upper Trinity River segments within the 15-mile TDL would most likely be categorized as sport or subsistence. There is no evidence of a commercial fishery in this area.

Information was not available for pounds of fish caught for human consumption.

3.2.4 Environmental Receptors

Endangered species in Dallas County include: white-faced ibis (*Plegadis chihi*), wood stork (*Mycteria americana*), bald eagle (*Haliaeetus leucocephalus*), peregrine falcon (*Falco peregrinus*), American peregrine falcon (*Falco peregrinus anatum*), whooping crane (*Grus americana*), piping plover (*Charadrius melodus*), red knot (*Calidris canutus rufa*), interior least tern (*Sterna antillarum athalassos*), black-caped vireo (*Vireo*

atricapilla), golden-cheeked warbler (*Setophaga chrysoparia*), alligator snapping turtle (*Macrochelys temminckii*), Texas horned lizard (*Phrynosoma cornutum*), timber rattlesnake (*Crotalus horridus*), Texas pigtoe (*Fusconaia askewi*), sandbank pocketbook (*Lampsilis satura*), Louisiana pigtoe (*Pleurobema riddellii*), and Texas heelsplitter (*Potamilus amphichaenus*) (Ref. 59, pp. 1-4).

Potential sensitive environments that are located within the 15-mile TDL are designated as Dallas County open space preserves and include the Joppa/Lemmon Lake Preserve, McCommas Bluff Preserve, and Goat Island Preserve. The 307-acre Joppa Preserve is a major stopping point for migratory water birds, including the endangered white-faced ibis and wood stork (Ref. 54, pp. 1; Ref. 59, pp. 1-4; Ref. 60, pp. 1; Ref. 61, pp. 8-10, 20-22). The McCommas Bluff Preserve is 111 acres, situated along the Trinity River, and located close to the Trinity River Audubon Center (Ref. 57, pp. 1). The Goat Island Preserve, the second largest preserve in Dallas County at 348 acres, is located in an unincorporated area of southeastern Dallas County in part of the Trinity River Greenbelt (Ref. 62, pp. 1-2). All three preserves contain wetlands (Figure 5).

The Trinity River Trail is a 4.5-mile long Dallas County trail that connects the Joppa Preserve with the Trinity River Audubon Center, a 120-acre natural center located in the Great Trinity Forest (Figure 5; Ref. 63, pp. 1-2). The Trinity River Audubon Center is a reclaimed former illegal dump site and serves as a haven for birds and wildlife. Priority birds that are protected in this center include: little blue heron (*Egretta caerulea*), northern harrier (*Circus cyaneus*), American kestrel (*Falco sparverius*), pileated woodpecker (*Dryocopus pileatus*), scissor-tailed flycatcher (*Tyrannus forficatus*), Harris's sparrow (*Zonotrichia querula*), and painted bunting (*Passerina ciris*). These species are listed as Species of Greatest Conservation Need for Texas under Texas Parks and Wildlife Texas Conservation Plan (TCAP) and/or Climate Threatened or Climate Endangered status based on National Audubon's Climate Initiative. Five miles of trails containing hardwood forests, pond, wetland, and prairie ecosystems are located in this center (Ref. 64, pp. 2, 4-7).

The 6,000 acre Great Trinity Forest is the largest urban hardwood forest in the United States. It follows the Trinity River and contains a mixture of bottomland hardwoods, wetlands, and grasslands, and supports a diverse community of plant and animal species, including bald eagles, wood storks, and ibises. It contains the Joppa Preserve, McCommas Bluff Preserve, and Trinity River Audubon Center. It is not currently listed as a specific preserve area; however, the City of Dallas may develop it for outdoor recreational use in the future (Ref. 61, pp. 1-4, 8-11, 17-18; Ref. 64, pp. 2).

The following environmental areas may qualify as HRS sensitive environments based on endangered species or areas important to the maintenance of unique biotic communities: the Joppa Preserve (white-faced ibis and wood stork, State-listed endangered or threatened species), Trinity River Audubon Center (important to maintenance of unique bird communities and prairie ecosystems), and the Great Trinity Forest (bald eagle and wood stork, State-listed endangered or threatened species) (Ref. 54, pp. 1; Ref. 59, pp. 1-4; Ref. 60, pp. 1; Ref. 61, pp. 3, 8-10, 20-22; Ref. 64, pp. 2, 4-7).

There are approximately 22 miles of freshwater forested/shrub, freshwater emergent, and freshwater pond wetlands located along linear frontage of the surface water pathway within the 15-mile TDL (Figure 5; Ref. 65, pp. 1, 6-9).

3.3 SOIL EXPOSURE PATHWAY

The soil exposure pathway is evaluated based on the threat to resident and nearby populations from hazardous substances present within two feet of the surface.

3.3.1 Site Setting and Sources

TCEQ Region 4 observed yellow staining on a southern exterior corner of the facility building and grinding grit on surface soil located south of the facility building and around the HWTB in November 2015. The grinding grit area extended to the southeast property line (Ref. 13, pp. 57, 60-61; Ref. 15, pp. 1; Ref. 17, pp. 3). Visibly impacted surface and subsurface soils were observed near the facility building by the TCEQ and EPA Superfund

Removals Program in February 2015 (Ref. 12, pp. 1, 3, 12). TCEQ Region 4 investigations confirmed on-site soil is contaminated with antimony, arsenic, cadmium, chromium, hexavalent chromium, lead, nickel, and mercury above the SCDM and/or RSL values (discussed in Section 2.5; Ref. 17, pp. 46-49; Ref. 27, pp. 5-6). Contaminated soil and observed grinding grit exist over areas of approximately 23,700 and 4,500 square feet, respectively, based on November 2015 sample locations and observations (Figure 3; Ref. 15, pp. 1; Ref. 17, pp. 43).

The site property and adjacent lots are fenced off with barbed-wire fence north and east of the facility building and along the creek and are generally not accessible to the public. A chain-link fence isolates the site from Bonnie View Road. Parts of the barbed-wire fence are in disrepair along the creek; however, dense vegetation contributes to limiting site access. Loose dogs were observed on the site property, and horses were observed roaming several adjacent property lots during the PA site visit in February 2016. The site entrance is locked and requires a key for entry (Ref. 11, pp. 7, 10; Ref. 14, pp. 1). During the removal action initiated by TCEQ Region 4, all outside doors to the facility building were secured and locked and metal cattle panels were used to secure the first floor of the facility building windows. This work was completed on November 25, 2015 (Ref. 31, pp. 3).

3.3.2 Receptors

The site is currently inactive with waste and original facility structures still present. There are no workers on-site (Ref. 12, pp. 1; Ref. 21, pp. 1). Single family residences are located west of the site along Bonnie View Road, and a Lane family residence is located north of the site. Additional nearby residential areas are located north of the site on Stag Road and south of the site past Fivemile Creek. The nearest residence is located approximately 250 to 300 feet northwest of the contaminated soil area on-site (Figure 2; Ref. 5, pp. 1; Ref. 17, pp. 3, 43). There are no HRS sensitive environments within 200 feet of the site; the nearest sensitive environments are a freshwater forested/shrub wetland (near the unnamed creek located south of the site) and a freshwater pond located approximately 300 feet south/southeast and east, respectively, of the contaminated soil area (Figures 2

and 3). Horses were observed roaming and potentially grazing on the property adjacent east of the site within 200 feet of the contaminated soil area. There are no schools or day care facilities within 200 feet of the contaminated soil area (Figures 2 and 3; Ref. 11, pp. 10).

Shallow ground water sampled from the on-site water well located near the facility entrance (WW-1) exceeded the MCL and SCDM values for chromium and hexavalent chromium. Hexavalent chromium exceeded the SCDM value in the second on-site water well (WW-2) (Figure 3; Ref. 4, pp. 1; Ref. 32, pp. 1, 4-8). As discussed in Section 3.2.1, surface water drainage and runoff were observed flowing adjacent north of the facility building towards the east and then along the east side of the facility building to the south towards the unnamed creek along the south property line. A depression/ponded area was observed along the southern fence line near Bonnie View Road. These pathways directly cross areas of contaminated soil on-site and have the potential to serve as migration routes to the surface water pathway towards the PPE (Figure 3; Ref. 10, pp. 4-5, 8-9; Ref. 11, pp. 5-8; Ref. 17, pp. 43). It is possible there could be exposure to the air migration pathway if contaminated surface soils and grinding grit are wind-blown off-site (Ref. 14, pp.1; Ref. 17, pp. 2).

3.4 AIR MIGRATION PATHWAY

The air migration pathway TDL is a 4-mile radius that extends from sources at the site (Figure 4).

3.4.1 Air Pathway Receptors

No known citizen complaints against Lane Plating Works, Inc. have been recorded or included in the site record; however, OSHA issued numerous citations in January 2015 (when the site was still active) for failure to conduct proper air monitoring to ensure that employees were not exposed to airborne concentrations of hexavalent chromium above

the OSHA PEL, or to provide and implement a respirator use and a medical monitoring program (Ref. 29, pp. 12-13, 18-20, 32, 35, 36).

The shortest straight line distance to a residence from contaminated soils at the site is approximately 250 to 300 feet northwest. Neighboring residences are located approximately 400 to 600 feet northwest and north, respectively, and approximately 0.40 miles south of contaminated site soil (Figures 2 and 3).

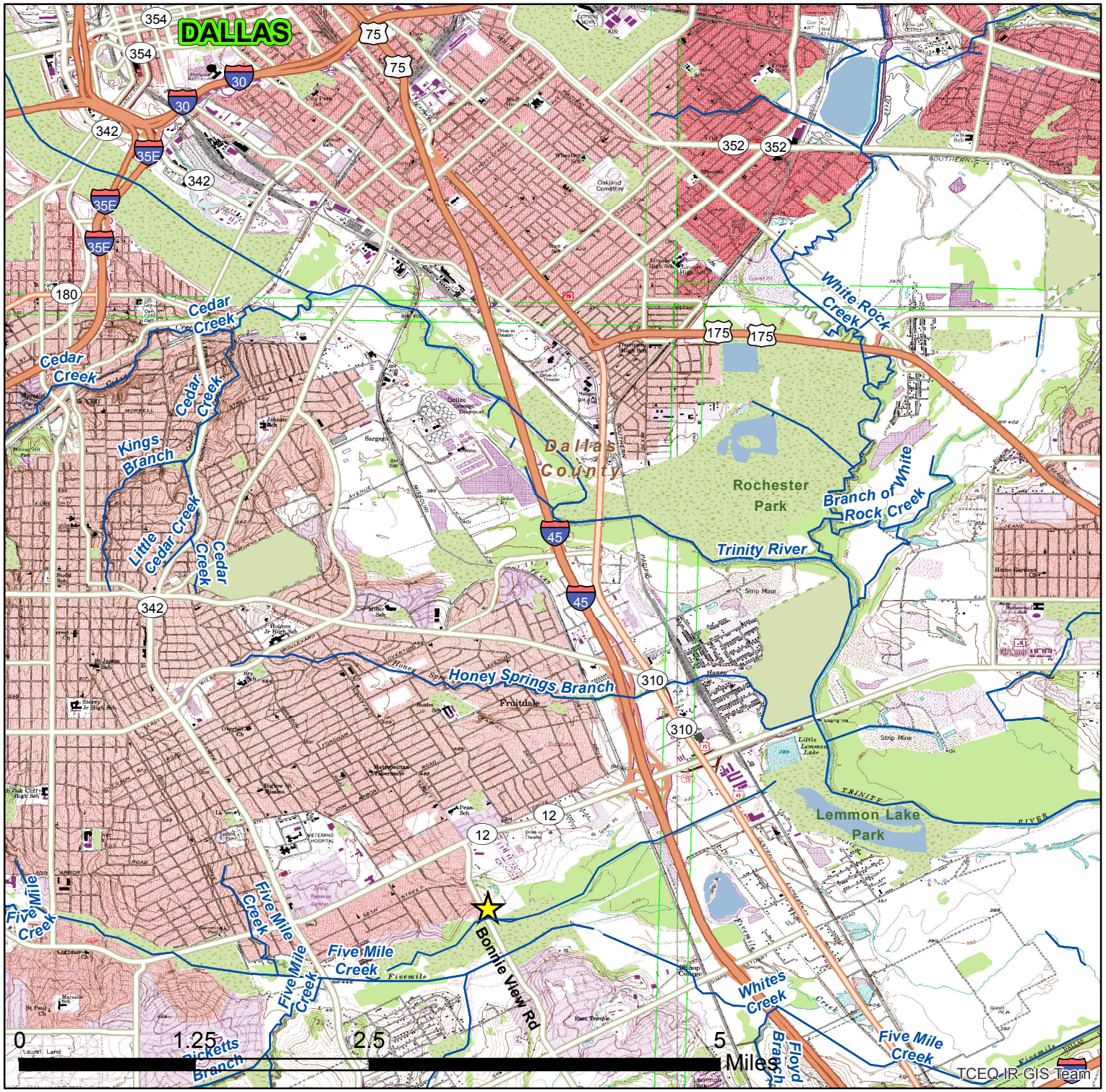
In a 0.25 mile ring from the site, there are approximately 74 residences (equating to roughly 205 residents) and no day care facilities, schools, or businesses. From 0.25 to 0.5 miles, there are three day care facilities with combined maximum capacities of 368 children, one high school with an enrollment of 432 students, 12 businesses (including four churches, four restaurants, one gas station, one food store, one cigarette store, and one bank), and approximately 380 residences (approximately 1,056 residents). From 0.5 to 1.0 mile, there are two day care facilities, five schools, at least 10 to 15 businesses, and approximately 2,380 residences (approximately 6,616 residents). From 1.0 to 2.0 miles, there are four day care facilities, six schools, at least 30 businesses, and approximately 7,900 residences (approximately 21,962 residents). From 2.0 to 3.0 miles, there are at least two day care facilities, eight schools, 30 to 40 businesses, and approximately 8,128 residences (approximately 22,595 residents). From 3.0 to 4.0 miles, there are at least 13 schools, 60 businesses, and approximately 11,257 residences (approximately 31,294 residents) (Figure 4; Ref. 43, pp. 1; Ref. 66, pp. 1-6; Ref. 67, pp. 1; Ref. 68, pp. 1).

3.4.2 Environmental Receptors

There are no commercial agriculture or commercial silviculture areas within a 0.5 mile of the on-site sources. A baseball diamond is located approximately 500 feet south of the on-site contaminated soil area on City of Dallas property; no information is available on frequency of use. Fivemile Creek is an unclassified water body with a recreational designated use located 0.30 miles south of the site source area. Dallas Parks and Recreation maintain College Park 0.40 to 0.50 miles southeast of the contaminated soil

area on-site. College Park is a 17.2-acre community park with a football field, outdoor basketball court, playground, softball field, and tennis court (Figures 3 and 4; Ref. 7, pp. 1-4; Ref. 53, pp. 1-2; Ref. 69, pp. 2). There are 170 areas considered wetlands within the TDL, together totaling approximately 2,931 acres (Figure 4; Ref. 65, pp. 2-5).

FIGURE 1: SITE LOCATION MAP

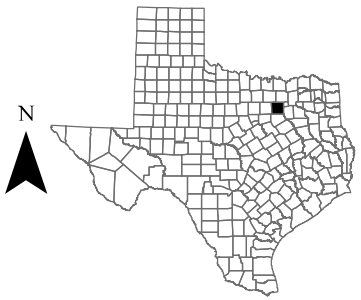


TCEQ

Lane Plating Works, Inc.

5322 Bonnie View Rd
Dallas, Dallas
County, Texas

★ Site



The base map is an Arc GIS Image Service topographic map layer of UTM Zone 14. Projection: NAD 1983. This map was generated by the Remediation Division of the Texas Commission on Environmental Quality. It is intended for illustrative or informational purposes only, and is not suitable for legal, engineering, or survey purposes. This map does not represent an on-the-ground survey conducted by or under the supervision of a registered professional land surveyor. In cases where property boundaries are shown, it only represents their approximate relative location. No claims are made to the accuracy or completeness of the data or to its suitability for a particular use. For more information concerning this map, contact the Remediation Division at 800-633-9363. Map created by Rebecca Comeaux in May 2016.

FIGURE 2: SITE FEATURES MAP - GENERAL

TCEQ

Lane Plating Works, Inc.

5322 Bonnie View Rd
Dallas, Dallas
County, Texas

- Site
- Park
- PPE
- School
- Approximate Property Boundary

WETLAND_TYPE

- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Lake
- Other
- Riverine

N

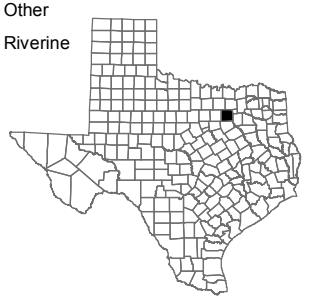


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FIGURE 3: SITE FEATURES MAP - FOCUSED

Lane Plating Works, Inc.

5322 Bonnie View Rd
Dallas, Dallas
County, Texas

Site
Onsite Well
HWTB
Approximate Property Boundary

WETLAND_TYPE

Freshwater Emergent Wetland
Freshwater Forested/Shrub Wetland
Freshwater Pond
Lake
Other
Riverine

N

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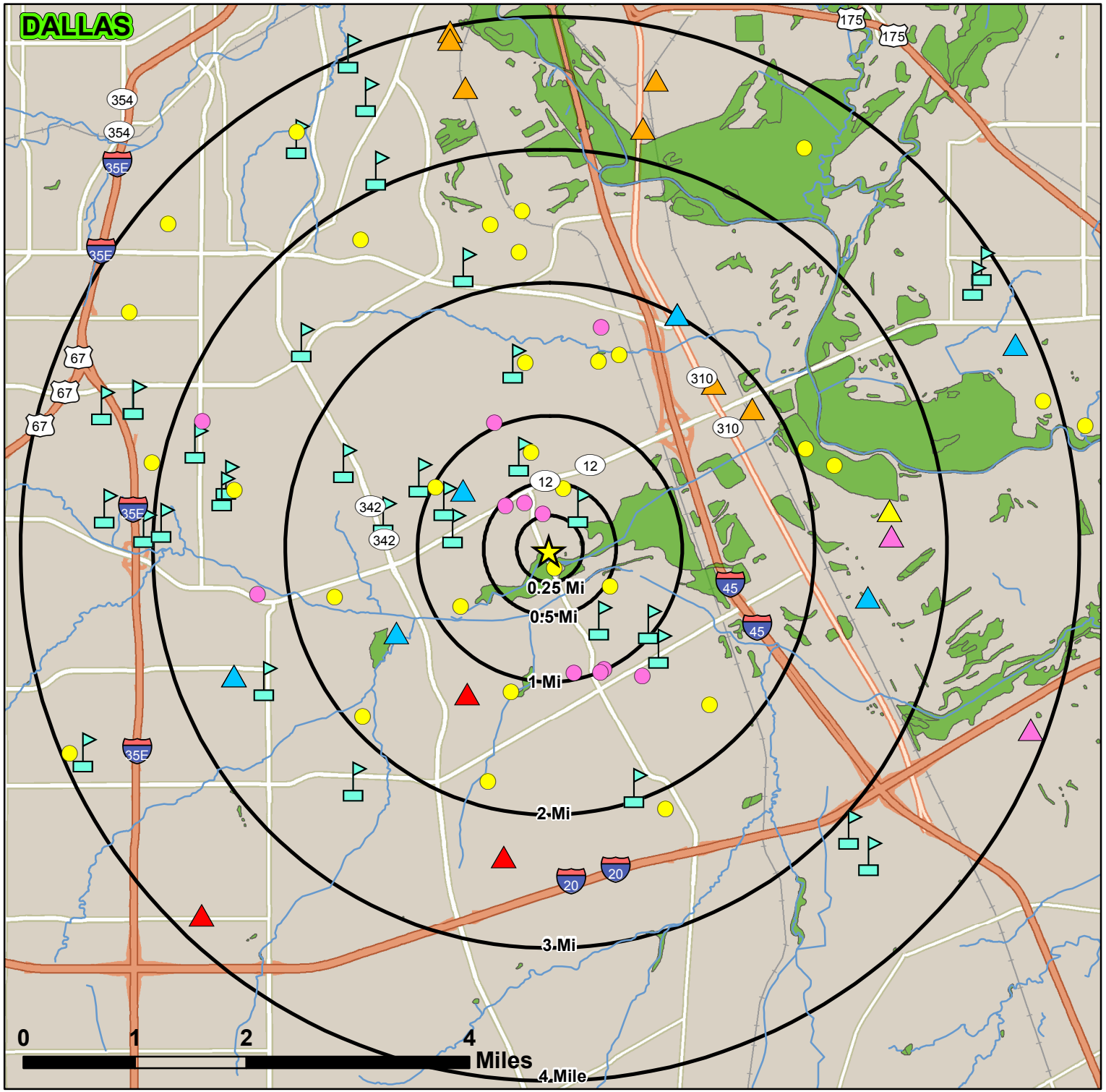
FIGURE 4: 4-MILE RADIUS TARGET DISTANCE LIMIT MAP



TCEQ

Lane Plating Works, Inc.

5322 Bonnie View Rd
Dallas, Dallas
County, Texas

- Site
- Parks
- Day Care Facilities
- Schools
- Industrial Wells
- Irrigation Wells
- Irrigation Wells
- Public Supply Wells
- Domestic Wells
- Stock Wells
- Wetlands

N

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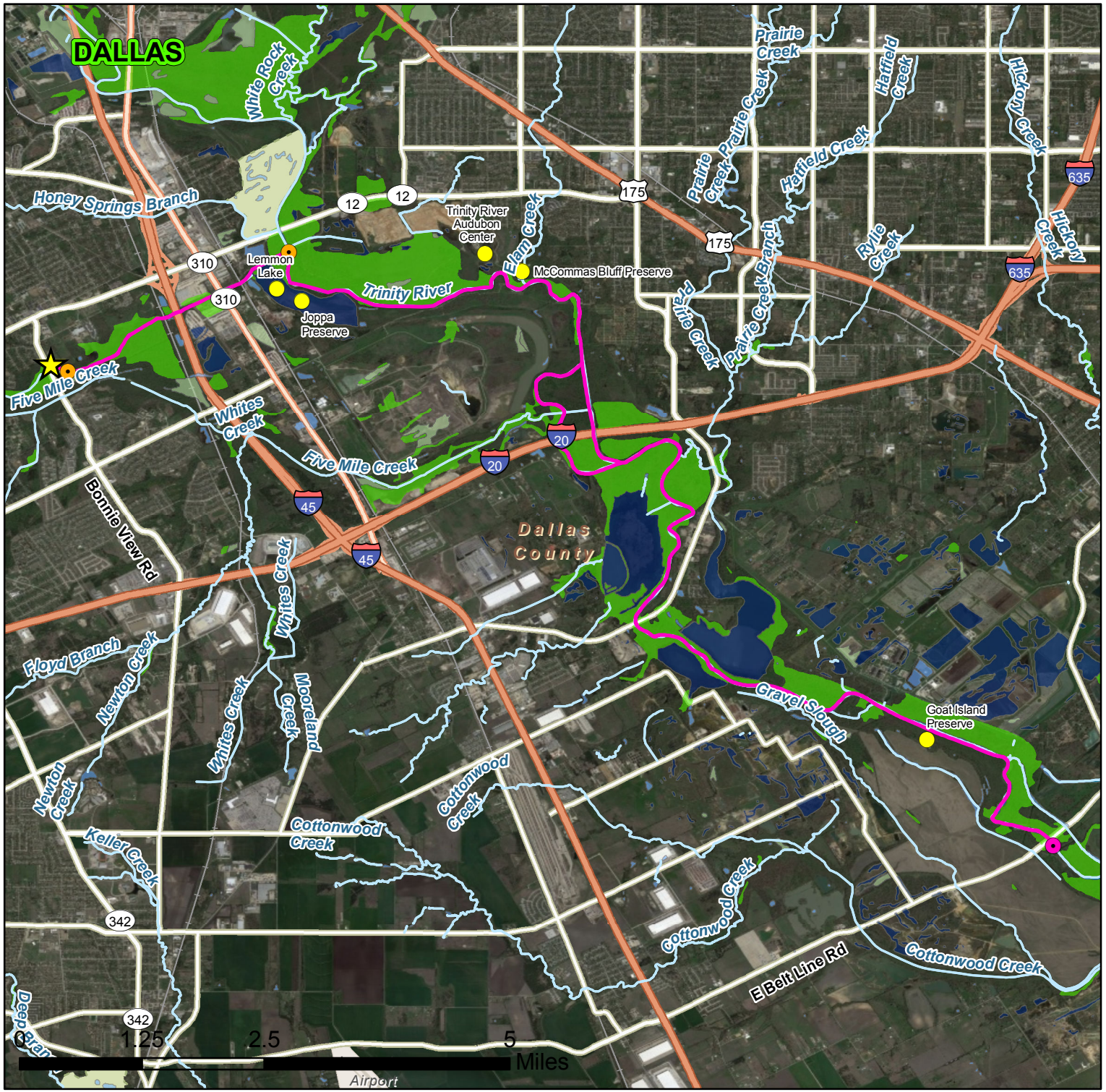
FIGURE 5: 15-MILE DOWNSTREAM TARGET DISTANCE LIMIT MAP



Lane Plating Works, Inc.
TXD007336571

TCEQ

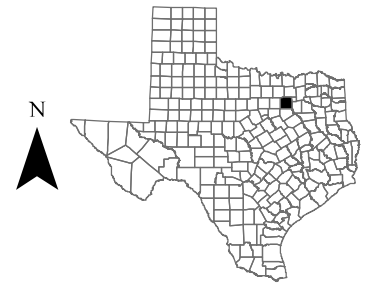
Lane Plating Works, Inc.

5322 Bonnie View Rd
Dallas, Dallas
County, Texas

- Site
- Receptors
- PPE
- 15 mile marker
- Surface Water Pathway

WETLAND_TYPE

- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Lake
- Other
- Riverine



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Reference 1

federal register

Friday
December 14, 1990

Part II

Environmental Protection Agency

40 CFR Part 300
Hazard Ranking System; Final Rule

Reference 2

United States
Environmental Protection
Agency

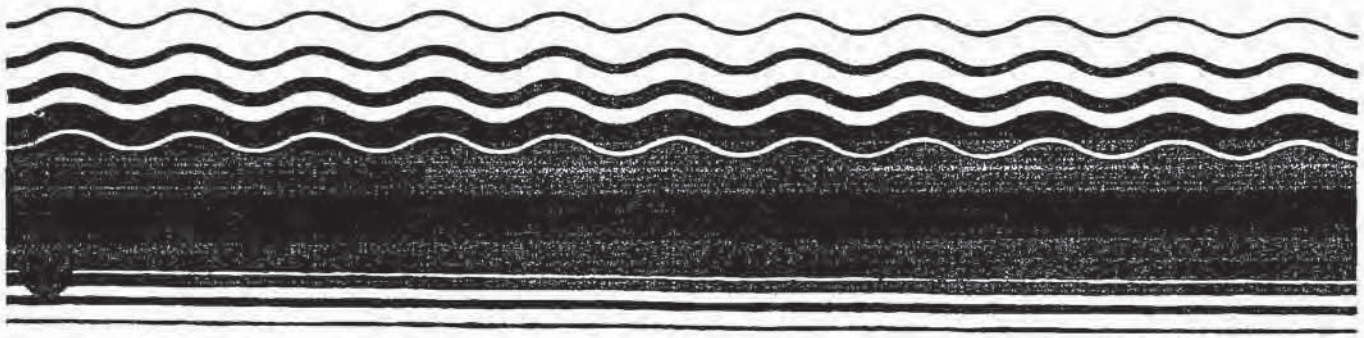
Office of Solid Waste
and Emergency
Response

Publication 9345.1-07
PB92-963377
EPA 540-R-92-026
November 1992

Superfund

EPA

Hazard Ranking System Guidance Manual



Reference 3

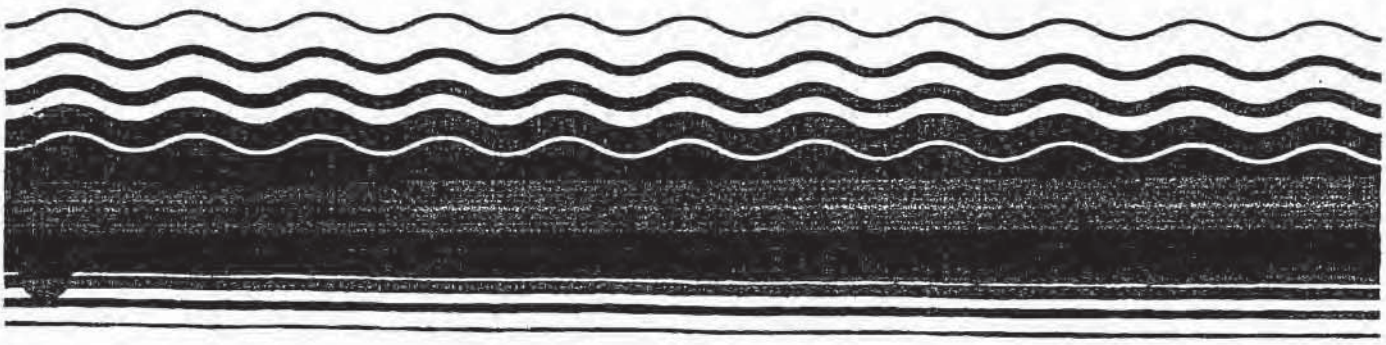
United States
Environmental Protection
Agency

Office of Emergency and
Remedial Response
Washington DC 20460

EPA/540/G-91/013
September 1991

EPA

Guidance for Performing Preliminary Assessments Under CERCLA



Reference 4

SUPERFUND CHEMICAL DATA MATRIX METHODOLOGY

Prepared For EPA
January 2004

Reference 5

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- DCAD Videos
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- About DCAD
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  - By Address
  - By Business
- Find Property on Map
- Online BPP Rendition

Find Property By Account Number

Search By: Owner Name | Account Number | Street Address | Business Name | Map

Enter your 17 character account number:

Account Number: 00685900000120400 Search

< PREV matches 1 - 1 of 1 properties. NEXT >					Page 1 of 1
#	Property Address	City	Owner Name / Business Name	Total Value	Type
1	5156 BONNIE VIEW RD	DALLAS	LANE JEFFREY T & LETICIA	$60,600	COMMERCIAL
< PREV matches 1 - 1 of 1 properties. NEXT >					Page 1 of 1

Dallas Central Appraisal District

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- Annual Report
- About DCAD
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- Online BPP Rendition
- Online TaxRep Website

Find Property By Account Number

Search By: Owner Name | Account Number | Street Address | Business Name | Map

Enter your 17 character account number:

Account Number: 00685900000120600 Search

< PREV matches 1 - 1 of 1 properties. NEXT >				Page 1 of 1
#	Property Address	City	Owner Name / Business Name	Total Value	Type
1	5156 BONNIE VIEW RD	DALLAS	STAG MANAGEMENT INC	$79,200	COMMERCIAL
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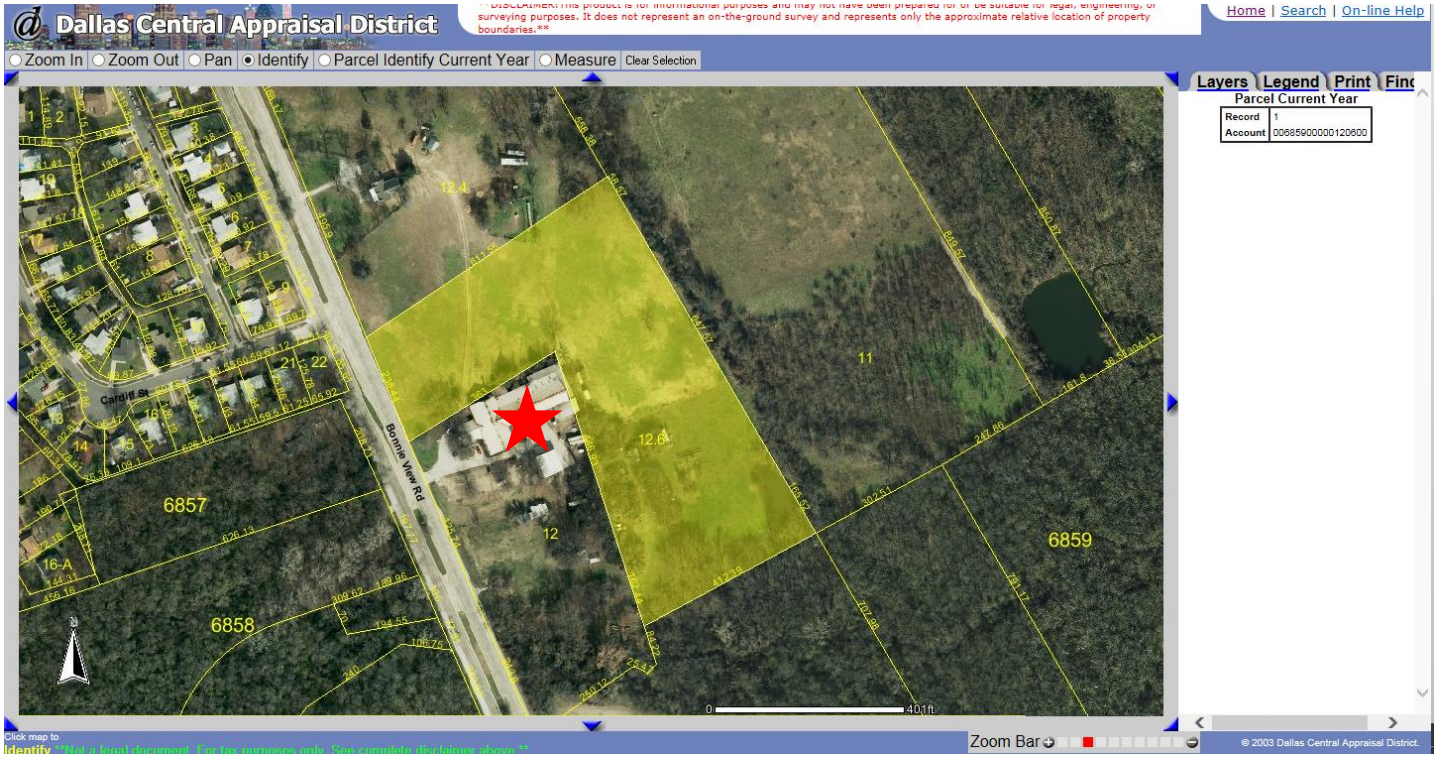

Window on State Government — Glenn Hegar Texas Comptroller of Public Accounts

Taxable Entity Search Results
Taxable Entity Search

Officers and Directors

STAG MANAGEMENT INCORPORATED
Report Year: 2015

Return to: Taxable Entity Search Results

Officer and director information on this site is obtained from the most recent Public Information Report (PIR) processed by the Secretary of State (SOS). PIRs filed with annual franchise tax reports are forwarded to the SOS. After processing, the SOS sends the Comptroller an electronic copy of the information, which is displayed on this web site. The information will be updated as changes are received from the SOS.

You may order a copy of a Public Information Report from open.records@cpa.state.tx.us or Comptroller of Public Accounts, Open Government Division, PO Box 13528, Austin, Texas 78711.

Title	Name and Address
DIRECTOR	**J R LANE** PO BOX 41098 DALLAS , TX 75241
PRESIDENT	**J R LANE** PO BOX 41098 DALLAS , TX 75241
SECRETARY	**JOE D LANE** PO BOX 41098 DALLAS , TX 75241
DIRECTOR	**JOE D LANE** PO BOX 41098 DALLAS , TX 75241

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- Forms

Find Property By Account Number

Search By: Owner Name | Account Number | Street Address | Business Name | Map

Enter your 17 character account number:

Account Number: 00000636400000000 Search

< PREV matches 1 - 1 of 1 properties. NEXT >					Page 1 of 1
#	Property Address	City	Owner Name / Business Name	Total Value	Type
1	5322 BONNIE VIEW RD	DALLAS	STAG MANAGEMENT INC	$270,410	COMMERCIAL
< PREV matches 1 - 1 of 1 properties. NEXT >					Page 1 of 1

Window on State Government — Glenn Hegar Texas Comptroller of Public Accounts

Taxable Entity Search Results
Taxable Entity Search

Officers and Directors

STAG MANAGEMENT INCORPORATED
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DIRECTOR	**J R LANE** PO BOX 41098 DALLAS , TX 75241
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DIRECTOR	**JOE D LANE** PO BOX 41098 DALLAS , TX 75241

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Enter your 17 character account number:

Account Number: 00000636394000000 Search

< PREV matches 1 - 1 of 1 properties. NEXT >					Page 1 of 1
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1	2944 STAG RD	DALLAS	LANE J R & C E	$293,540	COMMERCIAL
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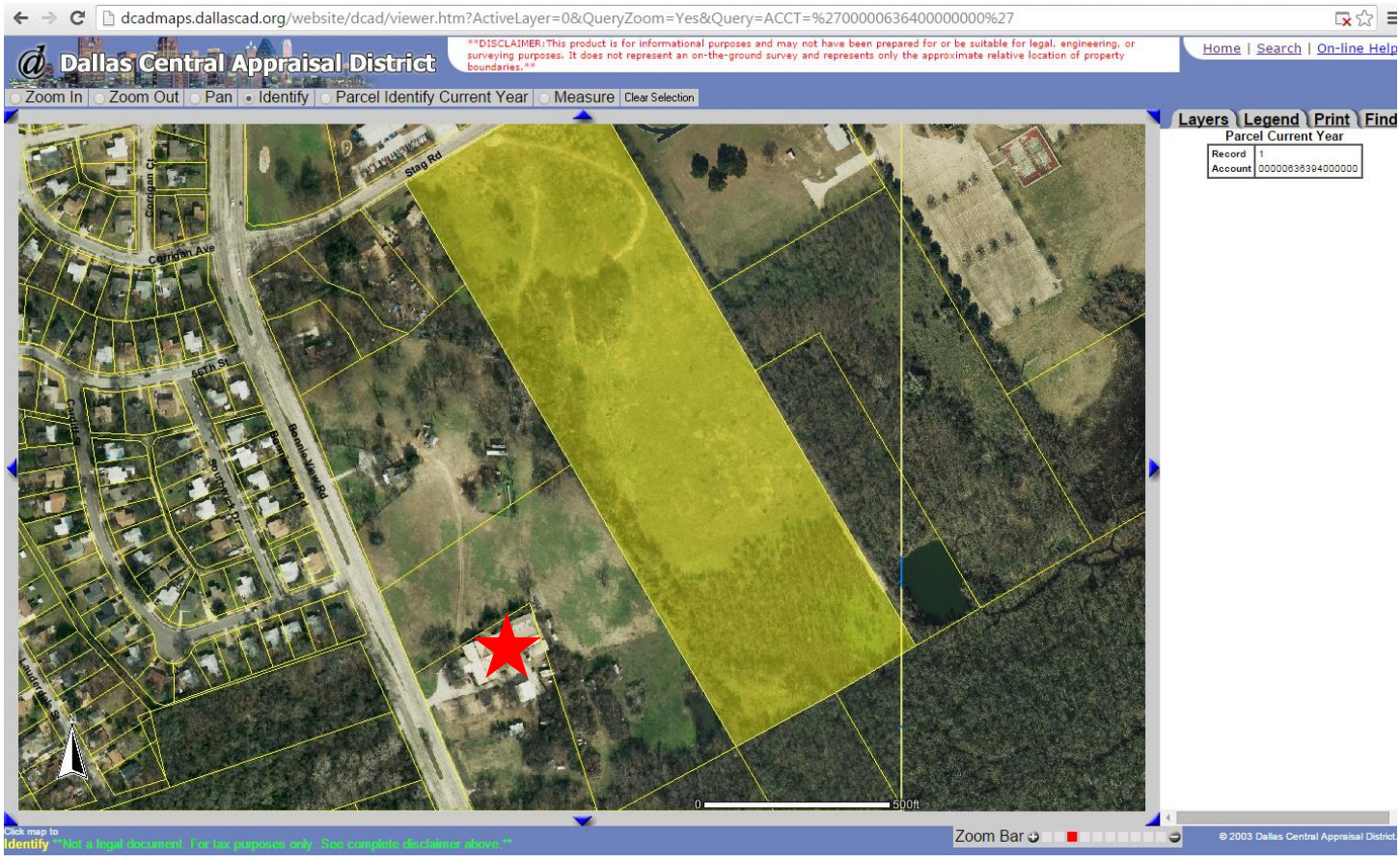

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- Forms

Find Property By Account Number

Search By: Owner Name | Account Number | Street Address | Business Name | Map

Enter your 17 character account number:

Account Number: 00000635944000000 Search

< PREV matches 1 - 1 of 1 properties. NEXT >					Page 1 of 1
#	Property Address	City	Owner Name / Business Name	Total Value	Type
1	5267 BONNIE VIEW RD	DALLAS	LANE CHARLES EDWARD & JOHN REIB	$58,590	COMMERCIAL
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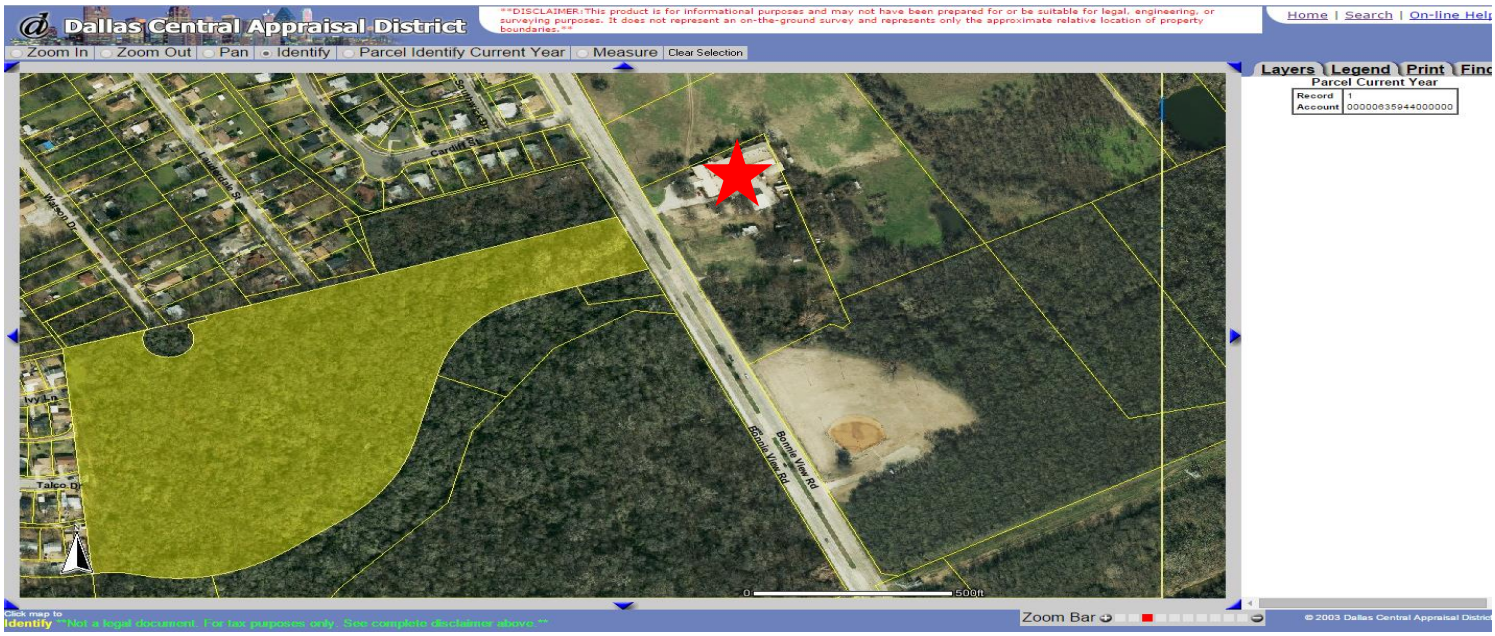

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Find Property By Account Number

Search By: Owner Name Account Number Street Address Business Name Map

Enter your 17 character account number:

Account Number: 00000636403000000 Search

< PREV matches 1 - 1 of 1 properties. NEXT >					Page 1 of 1
#	Property Address	City	Owner Name / Business Name	Total Value	Type
1	2940 STAG RD	DALLAS	LANE JOHN REIB	$65,000	RESIDENTIAL
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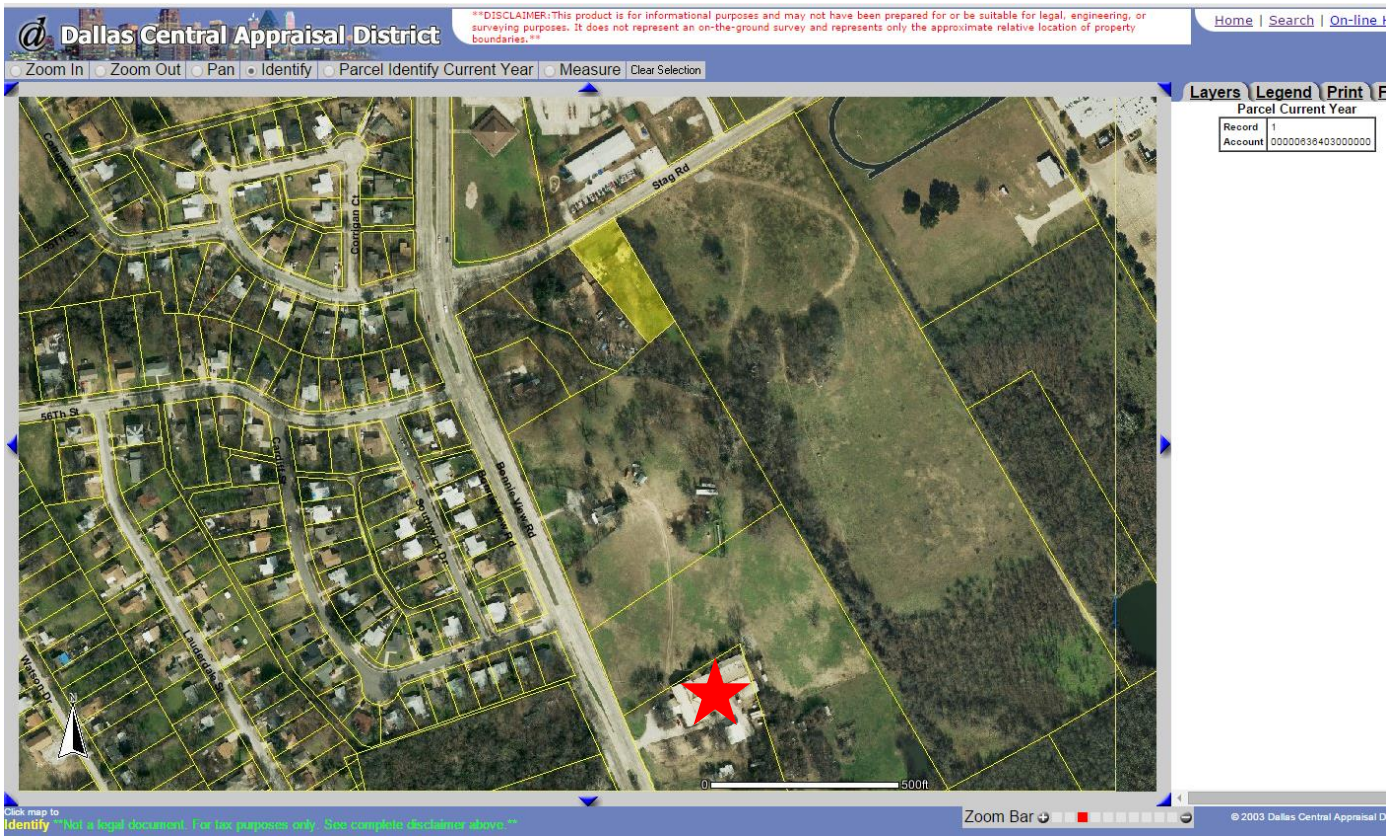

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Find Property By Account Number

Search By: Owner Name | Account Number | Street Address | Business Name | Map

Enter your 17 character account number:

Account Number: 00000636406000000 Search

< PREV matches 1 - 1 of 1 properties. NEXT >					Page 1 of 1
#	Property Address	City	Owner Name / Business Name	Total Value	Type
1	5118 BONNIE VIEW RD	DALLAS	LANE JOHN R	$4,900	COMMERCIAL
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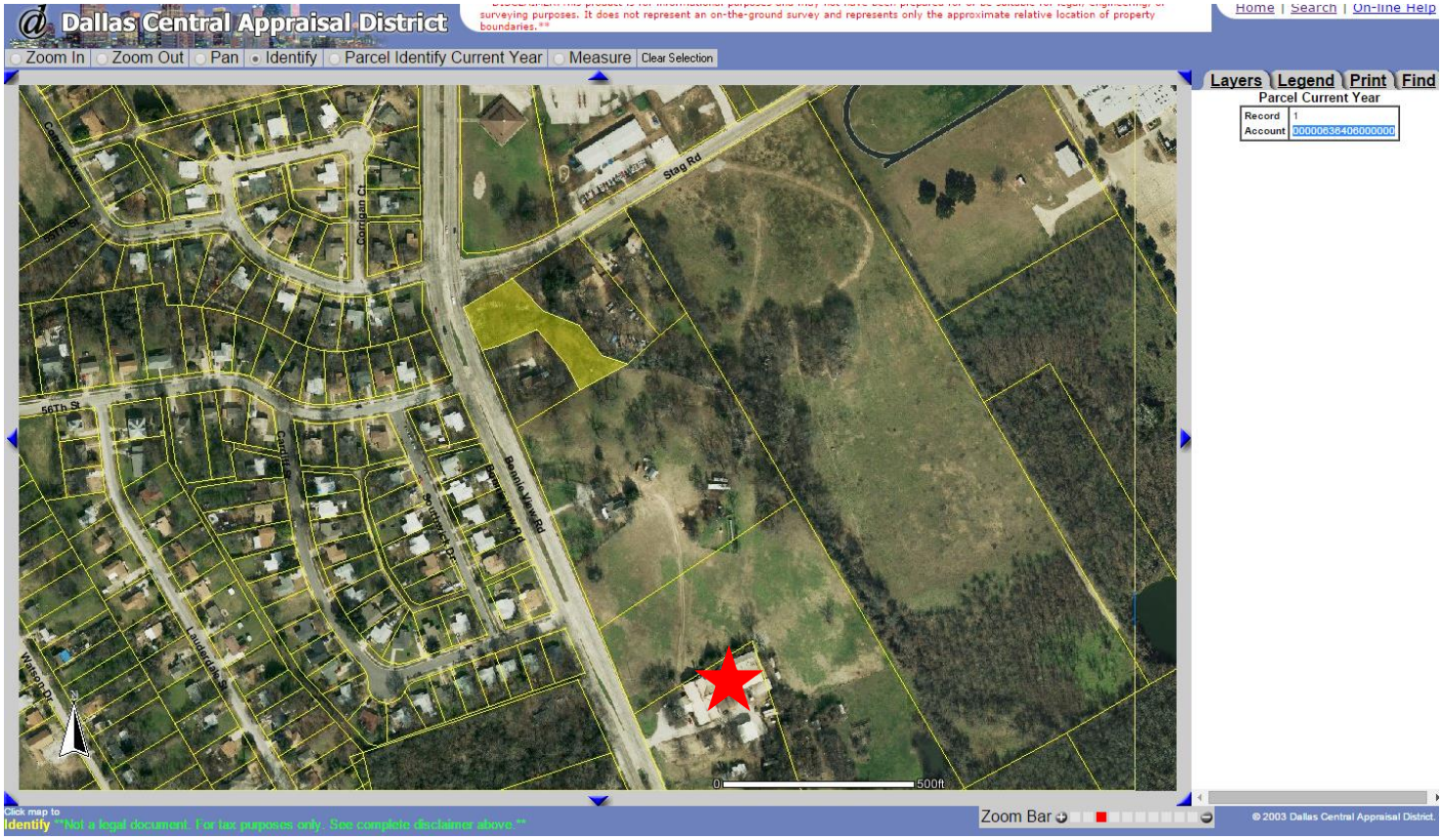


Reference 6

Surface Water Quality (Segments) Viewer

This viewer allows users to view the stream segments and water bodies (including impairment status) for any body of water in Texas that the TCEQ monitors. Surface Water Quality Monitoring (SWQM) Stations are also included in the viewer.

Using this interactive map viewer, users can view stream segments and water bodies monitored by TCEQ. Users can also select a particular segment or water body to view additonal information such as segment name, ID number, description, and impairment status.

Also included in the viewer are:

The locations of the Surface Water Quality Monitoring (SWQM) Stations.
Customized tools allow the user to search by address, obtain coordinates, measure distances, and create bookmarks.
Choose from a selection of basemaps including streets, aerial imagery, and topographic maps.
Pan and zoom using simple navigation tools.

Go to the Viewer[3] - Best viewed using Internet Explorer V9.0 and above, Firefox V22.0 and above, or Google Chrome V28.0 and above.

User Guide[4] - **Read this first.** This downloadable PDF document explains how to use the tools available in the viewer. NEW

[1] https://www.tceq.texas.gov

[2] https://www.tceq.texas.gov/gis

[3] https://gisweb.tceq.texas.gov/segments/default.htm

[4] http://www.tceq.texas.gov/assets/public/gis/docs/segments_userguide.pdf

- **Cleanups, Remediation**
- **Emergency Response**
- **Licensing**
- **Permits, Registration**
- **Preventing Pollution**

https://gisweb.tceq.texas.gov/segments/default.htm

Apps | Wetlands Mapper | Find People, Phone N | New Tab | Water Well Report Vie | TWDB WWs | FEMA's National Floo | Surface Water Quality | Soil Survey | NRCS So

Surface Water Quality Viewer Version 3.4

Lat: 32.721049, Long: -96.792637

5322 bonnie view road, dallas,

Identify | Measure | Bookmark | Layers | Legend | Clear | Basemap | Help

Segments (Streams)

Segment ID : 0805D
Segment Name : Fivemile Creek
Segment Class : Unclassified
Segment Type : Freshwater Stream
Segment Size : 17.02 Miles
Segment Desc : A 17 mile stretch of Fivemile Creek extending from confluence with segment 0805 Trinity River upstream to upper end of NHD stream Fivemile Creek (NHD RC 12030105000066).
Basin Name : Trinity River Basin
Impaired : N

Zoom to

https://gisweb.tceq.texas.gov/segments/default.htm

Apps | Wetlands Mapper | Find People, Phone N | New Tab | Water Well Report Vie | TWDB WWs | FEMA's National Floo | Surface Water Quality | Soil Survey | NRCS So

Surface Water Quality Viewer Version 3.4

Lat: 32.721193, Long: -96.793581

5322 bonnie view road, dallas,

Identify | Measure | Bookmark | Layers | Legend | Clear | Basemap | Help

Segments (Streams)

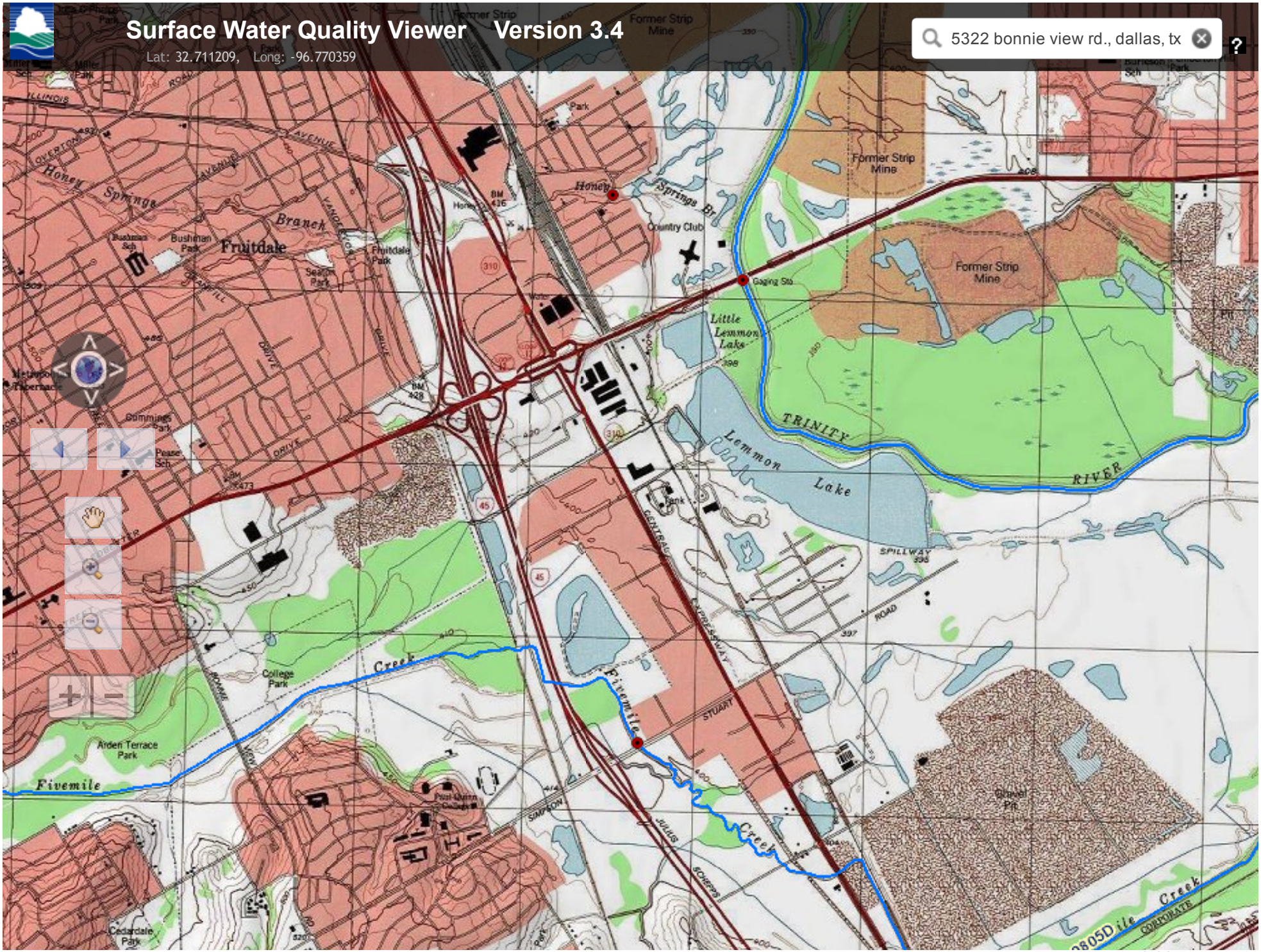
Segment ID : 0805
Segment Name : Upper Trinity River
Segment Class : Classified
Segment Type : Freshwater Stream
Segment Size : 97.28 Miles
Segment Desc : From a point immediately upstream of the confluence of the Cedar Creek Reservoir discharge canal in Henderson/Navarro County to a point immediately upstream of the confluence of Elm Fork Trinity River in Dallas County
Basin Name : Trinity River Basin
Impaired : Y

Zoom to

0805D

0805

Esri, HERE,


Surface Water Quality Viewer Version 3.4
Lat: 32.711209, Long: -96.770359
5322 bonnie view rd., dallas, tx
Former Strip Mine
Honey Springs Branch
Fruitdale
Country Club
Gaging Sta
Little Lemmon Lake
Lemmon Lake
TRINITY RIVER
SPILLWAY
ROAD
College Park
Creek
Fivemile
Arden Terrace Park
STUART
SIMPSON
JULIUS
SCHEPPS
Gravel Pit
Cedardale Park
CORPORATE

Reference 7

Commercial Account #00000636401500000

Location Owner Legal Desc Value Improvements Land Exemptions Estimated Taxes Building Footprint History

Location (Current 2016)

Address: 5156 BONNIE VIEW RD
Market Area: 0
Mapsco: 66-F (DALLAS)

DCAD Property Map

View Photo

Electronic Documents (ENS)

Print Homestead Exemption Form

Owner (Current 2016)

DALLAS CITY OF
1500 MARILLA ST
DALLAS, TEXAS 752016318

Multi-Owner (Current 2016)

Owner Name	Ownership %
DALLAS CITY OF	100%

Legal Desc (Current 2016)

1: BLK 6859
2: TR 13 AC 66.201
3: BONNIE VIEW RD
4: CO-DALLAS
5: 6859 000 013 2006859 000
Deed Transfer Date: 11/11/1900

Value

2015 Certified Values	
Improvement:	$0
Land:	+ $132,400
Market Value:	=$132,400
Revaluation Year:	2015
Previous Revaluation Year:	2012

Improvements (Current 2016)

No Improvements.

dcadmaps.dallascad.org/website/dcad/viewer.htm?ActiveLayer=0&QueryZoom=Yes&Query=ACCT=%27000006364015000000%27

Apps | Wetlands Mapper | Find People, Phone N | New Tab | Water Well Report Vie | TWDB WWs | FEMA's National Floo | Surface Water Quality | Soil Survey | NRCS So

Dallas Central Appraisal District

DISCLAIMER:This product is for informational purposes and may not have been prepared for or be suitable for legal, engineering, or surveying purposes. It does not represent an on-the-ground survey and represents only the approximate relative location of property boundaries.

Home |

Zoom In | Zoom Out | Pan | Identify | Parcel Identify Current Year | Measure | Clear Selection

Layers | Legend | Print | Find

Parcel Current Year

Record	1
Account	00000636401500000

Click map to Identify **Not a legal document. For tax purposes only. See complete disclaimer above.**

Zoom Bar

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Commercial Account #00000636394500000

Location Owner Legal Desc Value Improvements Land Exemptions Estimated Taxes Building Footprint History

Location (Current 2016)

Address: 5156 BONNIE VIEW RD
Market Area: 0
Mapsco: 66-K (DALLAS)

DCAD Property Map

View Photo

Electronic Documents (ENS)

Print Homestead Exemption Form

Owner (Current 2016)

DALLAS CITY OF
EXEMPT 1975
1500 MARILLA ST
DALLAS, TEXAS 752016318

Multi-Owner (Current 2016)

Owner Name	Ownership %
DALLAS CITY OF	100%

Legal Desc (Current 2016)

1: BLK 6859
2: PT LT 11 ACS 5.095
3: INSIDE 902FR BONNIE VIEW
4: CO-DALLAS
5: 6859 000 011 2006859 000
Deed Transfer Date: 11/11/1900

Value

2015 Certified Values	
Improvement: **Land:** **Market Value:**	$0 + $10,190 =$10,190
Revaluation Year:	2015
Previous Revaluation Year:	2012

Improvements (Current 2016)

No Improvements.

dcadmaps.dallascad.org/website/dcad/viewer.htm?ActiveLayer=0&QueryZoom=Yes&Query=ACCT=%27000006363945000000%27

Apps | Wetlands Mapper | Find People, Phone N | New Tab | Water Well Report Vie | TWDB WWs | FEMA's National Floo | Surface Water Quality | Soil Survey | NRCS So

Dallas Central Appraisal District

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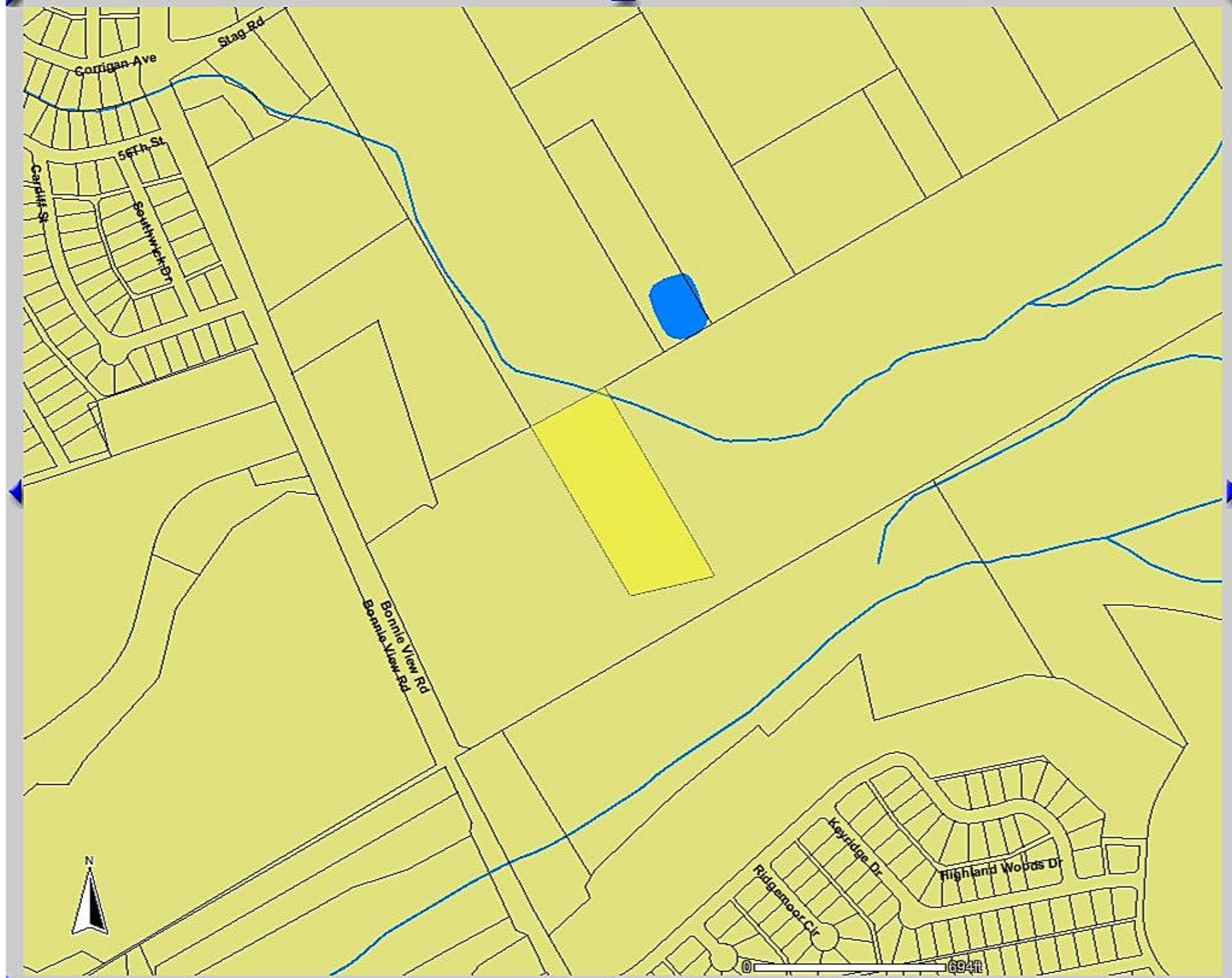
Layers | Legend | Print | Find

Parcel Current Year

Record	1
Account	00000636394500000



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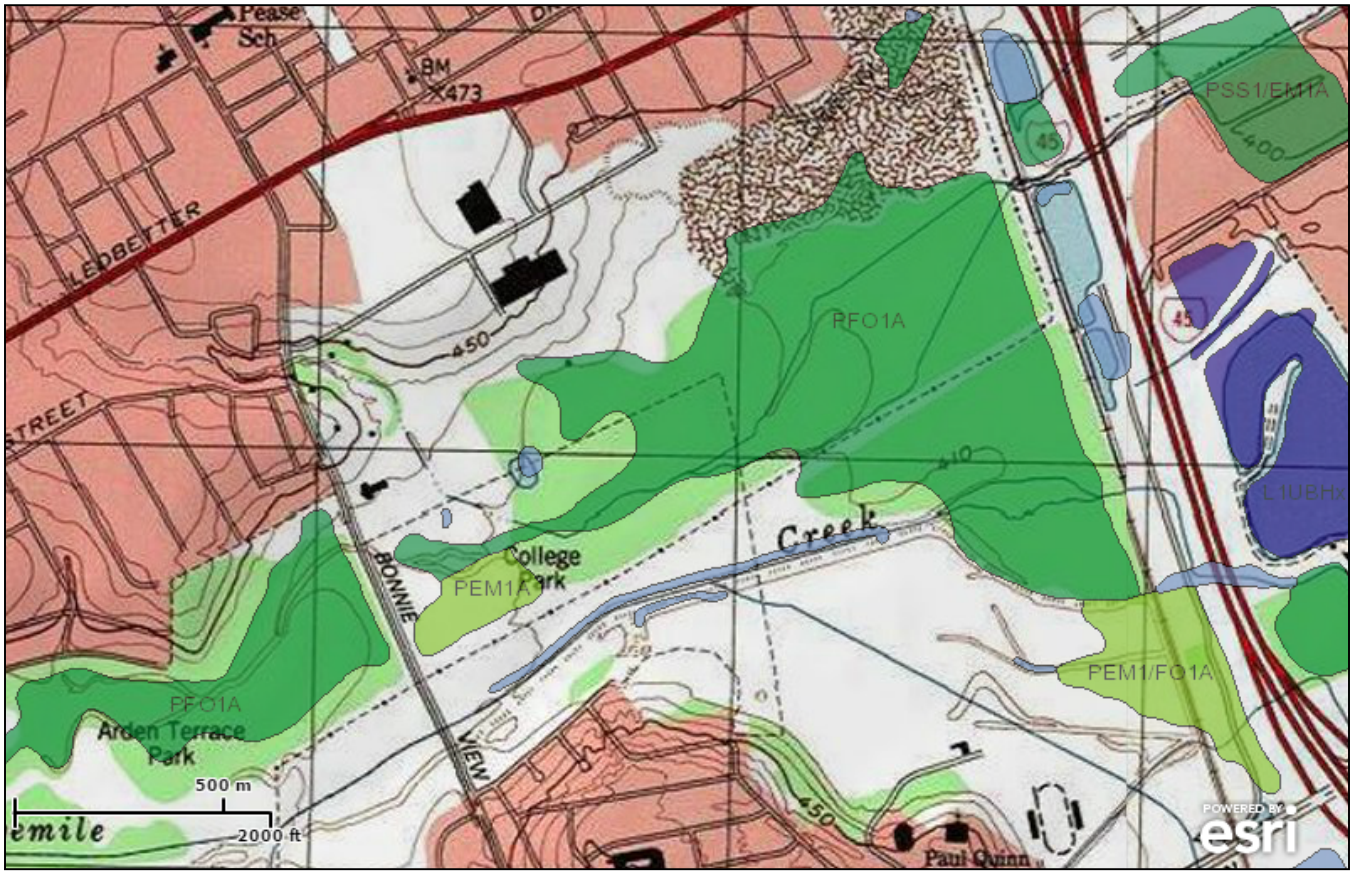
Reference 8

U.S. Fish and Wildlife Service

National Wetlands Inventory

wetlands topo

Feb 17, 2016



Wetlands

- Freshwater Emergent
- Freshwater Forested/Shrub
- Estuarine and Marine Deepwater
- Estuarine and Marine
- Freshwater Pond
- Lake
- Riverine
- Other

This map is for general reference only. The US Fish and Wildlife Service is not responsible for the accuracy or currentness of the base data shown on this map. All wetlands related data should be used in accordance with the layer metadata found on the Wetlands Mapper web site.

User Remarks:

Reference 9

Southern Dallas County Infrastructure Analysis

North Central Texas Council of Governments
City of Dallas
City of Ferris
City of Hutchins
City of Lancaster
City of Wilmer
Dallas County

Final Report

October 2012

Southern Dallas County Infrastructure Analysis

Final Report

Prepared For:

North Central Texas Council of Governments
City of Dallas
City of Ferris
City of Hutchins
City of Lancaster
City of Wilmer
Dallas County

Prepared By:

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In Association With:

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October 2012

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October 22, 2012

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Subject: Southern Dallas County Infrastructure Analysis

Dear Ms. Weaver:

CDM Smith is pleased to submit to you the final report for the Southern Dallas County Infrastructure Analysis project. The report summarizes the results of the study, which included development of infrastructure recommendations for future water, wastewater, stormwater, transportation and private utilities needs in the Southern Dallas County area.

Our project team, including Halff Associates, Arredondo, Zepeda & Brunz, Baker Consulting Associates, Insight Research Corporation, Weinstein, Clower & Associates and others, gratefully acknowledge the assistance and cooperation received from NCTCOG and the Project Advisory Committee as well as others contacted during the course of the study. CDM Smith sincerely appreciates the opportunity to have participated in this important project.

Respectfully submitted,

Michael W. Copeland, AICP
Group Leader
CDM Smith, Inc.

Table of Contents

Table of Contents ..... **i**

Signatures ..... **iii**

Executive Summary **ES-1**
- Project Purpose ES-1
- Historical Document Review ES-2
- Infrastructure Needs Assessment ES-3
- Public Involvement ES-10
- Summary of Recommendations ES-11

Section 1: Introduction **1-1**
- Project Purpose 1-1
- Project Tasks 1-1

Section 2: Demographic and Economic Analysis **2-1**
- Project Area 2-1
- Summary of SDCIA Area Advantages and Challenges 2-1
- Demographic Baseline and Future Trends 2-3
- Further DFW MSA Industrial Market Background 2-13
- SDCIA Area Housing Profile 2-15
- Housing-Workforce Balance Assessment 2-18
- Labor Force Analysis 2-21

Section 3: Water Infrastructure Assessment **3-1**
- Existing Infrastructure Inventory 3-1
- Projected Water Demands 3-7
- Water Supply and Treatment Infrastructure Needed to Meet Future Demands 3-10
- Water Distribution Infrastructure Needed to Meet Future Demands 3-15
- Budgetary Cost Estimates 3-24
- Summary 3-27

Section 4: Wastewater Infrastructure Assessment **4-1**
- Existing Infrastructure Inventory 4-1
- Projected Wastewater Flows 4-7
- Wastewater Infrastructure Needed to Meet Future Flows 4-9
- Budgetary Cost Estimates 4-17
- Summary 4-19

Section 5: Stormwater Infrastructure Assessment **5-1**
- Adopted Floodplain Ordinances and Regulations 5-1
- Stormwater Ordinances 5-4
- Stormwater Inventory 5-5
- Recommended Stormwater Infrastructure 5-27
- Summary 5-39

Section 6: Transportation Infrastructure Assessment 6-1
Existing Transportation Inventory 6-1
Planned Improvements 6-18
Future Roadway Needs Assessment 6-30
Summary 6-42

Section 7: Private Sector Utilities Assessment 7-1
Electricity 7-2
Natural Gas 7-12
Telecommunications 7-20
Municipal Solid Waste Management 7-26
Summary 7-30

Section 8: Conclusions and Summary of Recommendations 8-1
Historical Document Review 8-1
Infrastructure Needs Assessment 8-1
Key Conclusions and Recommendations 8-7

Appendices
Appendix A: Historical Document Review A-1
Project Purpose A-1
Project Background A-2
Historical Document Review A-3
Stakeholder Interview Summary A-6
Public Outreach Activities A-8
Applicability of Existing Documents A-9
Findings and Conclusions A-19
Additional Detailed Information A-20
Appendix B: Public Involvement B-1
Appendix C: Detailed Water Cost Estimates C-1
Appendix D: Detailed Wastewater Cost Estimates D-1
Appendix E: Detailed Stormwater Cost Estimates E-1
Appendix F: Funding Options for Water, Wastewater and Stormwater F-1
Appendix G: Transportation Policy and Design Strategies G-1

Signatures

Section 3 – Water Infrastructure Assessment and Section 4 – Wastewater Infrastructure Assessment 	**Section 5 – Stormwater Infrastructure Assessment**
Section 6 – Transportation Infrastructure Assessment 	

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Southern Dallas County Infrastructure Analysis

Section 5: Stormwater Infrastructure Assessment

This section presents the infrastructure capacity and needs assessment for stormwater and drainage infrastructure in the project area. This assessment is based on the following:

- Current floodplain/stormwater/drainage ordinances and drainage manuals
- Current Federal Emergency Management Agency (FEMA) maps and Flood Insurance Study stream profiles
- Previous planning studies developed for the cities in the project area
- Information obtained previously for the demographic alternative analysis (Task 2.3)

Conveyance of stormwater can be achieved by several different means. These include: curb and gutter, ditches, detention/retention structures, closed conduits (storm sewers), open channels, and culverts and bridges. Detention/retention structures are included in this list due to their ability to reduce flood flows back to predevelopment conditions.

With the goal of this infrastructure project to promote growth in the southern sector of Dallas County, having a basis of where the area currently stands on infrastructure needs plays an important role on how future infrastructure projects are implemented before development occurs. For the stormwater and drainage infrastructure section of this study, this means having an understanding of what floodplain and stormwater policies have been adopted by each of the member cities and recommending policies that would be beneficial to all. It means developing an inventory of existing mapped streams, structures and other stormwater related features, determining areas of deficiencies, and understanding what planning studies have been previously developed and how to apply them as development occurs.

Categories on which this assessment is based include: floodplain ordinance and regulations, stormwater ordinances, existing inventory, and planning studies. To distinguish between the two: floodplain ordinances are those policies which the member cities have adopted when it pertains to flooding along a mapped stream, and stormwater ordinances are those policies the member cities have adopted when it pertains to drainage associated with storm sewers, street drainage, and ditches.

ADOPTED FLOODPLAIN ORDINANCES AND REGULATIONS

Each community in the project area is a member of the National Flood Insurance Program (NFIP). In order to be eligible for flood insurance, member communities are required to adopt and enforce floodplain management regulations that meet or exceed the criteria established under Section 1361 (c) of the 1968 National Flood Insurance Act. **Table 5-1** shows the level of adopted regulations for the cities in the project area.

Section 1361(c) is intended to protect lives and property from flood-prone areas. The minimum requirements include:

- Permit for all proposed construction
- Review proposed developments
- Review permit applications
- Review subdivision proposals and all new development
- Require new and replacement water supply systems to minimize infiltration of floodwaters
- Require sanitary sewage and on-site disposal systems be protected
- Require elevation of lowest floor to or above Base Flood Elevation for residential
- Require elevation or floodproofing to or above Base Flood Elevation for commercial
- Certification by registered engineer
- Fully enclosed areas below elevated lowest floor automatically equalize (vents)
- Manufactured homes lowest floor elevated to or above Base Flood Elevation or the chassis 36 inches above grade and anchored
- Until Floodway is designated, permit no development within Zones A or AE unless it is demonstrated that water surface elevations will not increase by more than one foot.
- Require that recreational vehicles placed in a Special Flood Hazard Area be there for less than 180 days and be fully licensed and road ready
- Adopt floodways
- Prohibit encroachments within floodway unless engineering study shows no rise in water surface elevations.

Table 5-1. Floodplain Management Regulations

City/County	NFIP Criteria
City of Dallas	Exceeds Minimum Required
City of Ferris	Meets Minimum Required
City of Hutchins	Meets Minimum Required
City of Lancaster	Exceeds Minimum Required
City of Wilmer	Meets Minimum Required
Dallas County	Meets Minimum Required

Source: Current Adopted Floodplain Ordinance and Drainage Manuals.

CITIES OF FERRIS, HUTCHINS, WILMER AND DALLAS COUNTY

While the cities of Ferris, Hutchins, and Wilmer and Dallas County are not required to adopt a higher standard of floodplain regulations under NFIP, it is recommended that they do adopt more stringent floodplain rules similar to those of Dallas and Lancaster as the area develops. By adopting similar rules, it will ensure that all cities are following the same criteria when it comes to development. It will also ensure that as development occurs, hydraulic impacts to adjacent property owners and/or upstream and downstream communities are not created. Another added benefit of going with higher standards is that the communities can receive a discount on flood insurance premiums.

CITY OF DALLAS

The Dallas floodplain ordinance exceeds FEMAs criteria. Dallas requires that all stream corridor studies be based on fully developed watershed condition discharges. However, FEMA studies are based on existing watershed condition discharges. Preservation of the natural condition of stream corridors is preferred, but development within the floodplain is allowed as long as the development abides by the city's ordinance for filling in the floodplain. These criteria include:

- Except for detention basins, an increase in the design flood water surface elevations is not allowed upstream, downstream, or through the project area.
- Project may not create or increase erosive velocities.
- Water surface elevations must be determined using existing and proposed public and private improvements.
- No loss in valley storage is permitted for those projects which have contributing drainage areas of more than three square miles. For project located between three square miles and 130 acres, valley storage loss shall not exceed 15 percent. No limit exists on the amount of valley storage loss for projects located in contributing drainage areas less than 130 acres.
- Before relocation or alteration of a natural stream, an environmental impact study must be prepared for the project.
- The toe of the fill placed in the floodplain must parallel the flow of the channel.
- Fill slopes should be 4:1 for half of the distance and 6:1 for the other half. Vertical walls are allowed as long as they do not cause hydraulic issues.
- Excavation in the overbank areas is allowed as long as the depth of excavation does not exceed one-third the depth of the natural stream, and is at least 50 feet away from the natural stream.
- A landscape and erosion control plan must be submitted and approved.
- Projects that remove areas from the floodplain shall not cause additional expenses on existing or proposed public improvements.

The City of Dallas is currently in the process of changing its floodplain management criteria to correlate better with the Integrated Stormwater Management (ISWM) program developed by the North Central Texas Council of Governments.

CITY OF LANCASTER

The City of Lancaster floodplain ordinance also exceeds FEMAs criteria. Lancaster requires that all stream corridor studies must be based on fully developed watershed condition discharges. Preservation of natural channels and floodplains is encouraged due to the benefits this approach provides. Lancaster allows all future developments as long as they adhere to the following criteria:

- The receiving drainage system or natural stream can convey the design storm runoff without adverse impacts to structures, property, or receiving water quality, and there is no significant increase in shear stress or erosion potential.
- Detailed erosion control plans must be provided prior to construction.
- Detailed engineering and technical analysis shall be performed before any development is allowed in a basin which contains a regional detention/retention pond.
- Proposed detention/retention ponds must comply with Texas Commission on Environmental Quality dam safety requirements.
- Design storages of detention/ retention ponds must be maintained.
- Reclamation from the floodplain is allowed as long as water surface elevations do not increase, valley storage is not decreased, and velocities are maintained.
- Finished floors of residential and nonresidential structures shall be a minimum of one foot above the design flood (100-year fully developed) elevation.
- Low beam of new bridges shall be a minimum of one foot above the design flood elevation.

- Encroachments into a designated floodway are prohibited unless it is demonstrated through a detailed hydrologic and hydraulic analysis that the encroachment will not increase flood elevations during a design or base flood storm event.

CORRIDOR DEVELOPMENT CERTIFICATE (CDC) CRITERIA

Proposed developments that will be located in the City of Dallas or in the unincorporated portion of Dallas County, and within the Trinity River floodplain must follow a set of regional criteria and procedures for development which exceed the minimum floodplain criteria required by FEMA. The criteria include:

- Based on anticipated fully developed watershed conditions (year 2050 discharges), proposed projects cannot increase water surface elevations for the Regulatory Flood (100-year) and Standard Project Flood events.
- Maximum allowable valley storage loss for the 100-yr and SPF is zero percent and five percent, respectively.
- Floodplain alterations may not create or increase erosive velocities either on-site or off-site.

Determination of whether a proposed site must adhere to CDC criteria is dependent on the site location within the one percent Annual Chance of Exceedance (ACE) or 100-year floodplain as shown on FEMA regulatory maps for the Trinity River.

STORMWATER ORDINANCES

Of the cities located in the study area, availability of storm sewer information (ordinance, design requirements, and inventory) was only found for Dallas, Lancaster, Ferris, and Wilmer. It is recommended that further investigation be conducted in determining the existing inventory in the area and determining the future inventory needs of the area.

CITY OF DALLAS

Dallas requires all storm sewers to be designed to convey the 100-year frequency storm event, or the storm of record, whichever is greater. Gutters and inlets must be designed in a way that prevents the 100-year storm from overtopping the curb or being greater than six inches in depth, and allowing for one lane of traffic in each direction to remain open.

CITY OF LANCASTER

Both the projected ultimate land use condition within a watershed and the 100-year frequency storm event is required for design of stormwater infrastructure in the City of Lancaster, except for enclosed pipe systems. For enclosed pipe systems that do not drain to sump or detention areas, a 25-year storm frequency with one foot of freeboard (at throat of inlet) is required. Curbs and gutters must be designed using a 25-year storm event and ensure that the 100-year event does not overtop the curbs on each side of the roadway. For major streets, one lane of traffic in both directions should remain open, and for minor streets, one lane of traffic should remain open.

STORMWATER INVENTORY

CITY OF DALLAS

Figure 5-1 shows the location of the existing storm sewer infrastructure located in the study area for the City of Dallas. The storm sewers in this area consist of 21 inch to 78 inch diameter reinforced concrete pipe. Information on whether these lines are designed to the proper size according to City of Dallas requirements is not known or available. Further investigation is recommended.

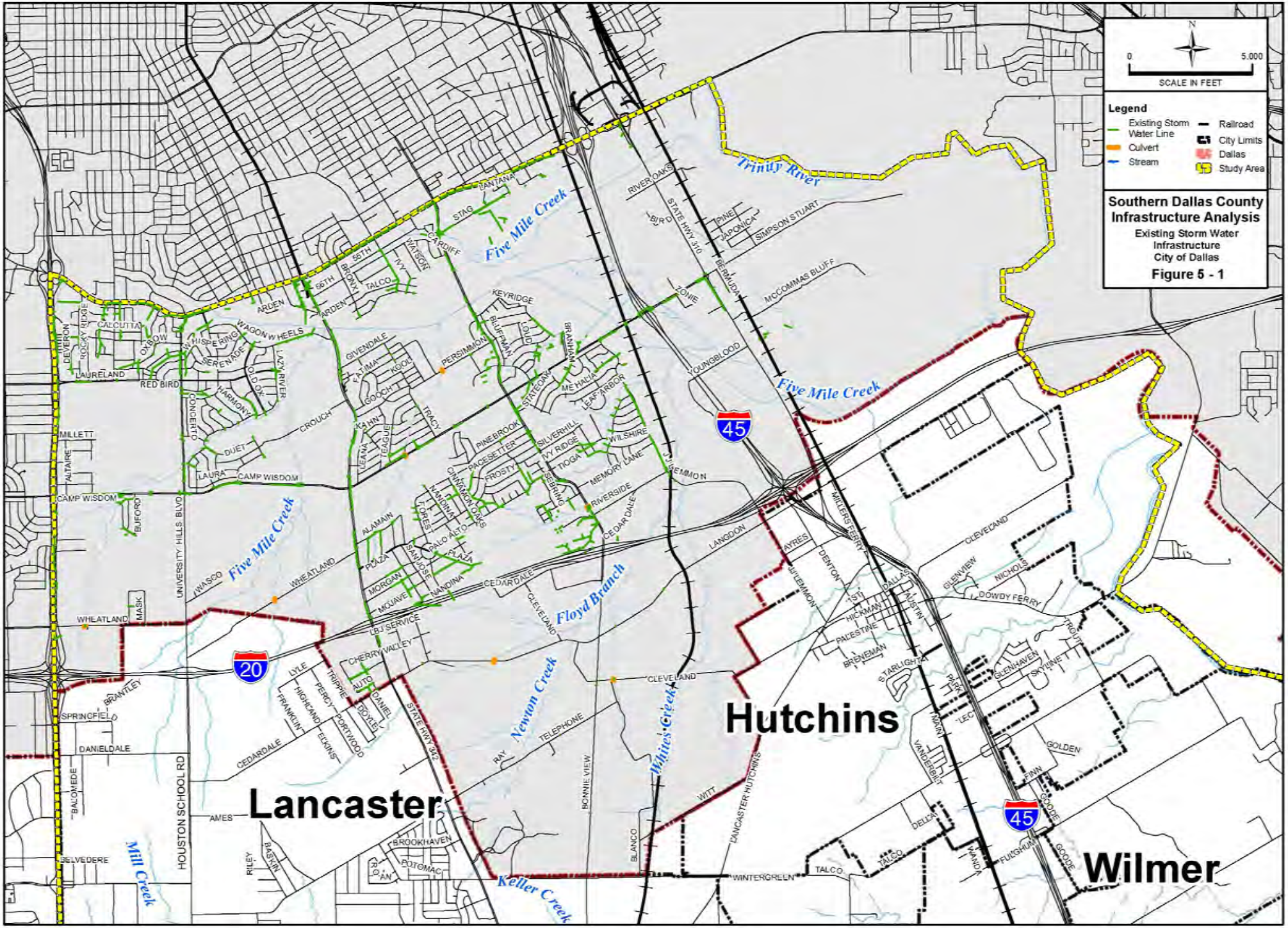
CITY OF FERRIS

An inventory of existing drainage structures was developed as part of a 2007 planning study for the City of Ferris. This study quantifies culverts that the city is responsible for and the number of culverts that other entities (TxDOT and County) are responsible for. The condition of these structures and the cost to repair or replace these culverts was also discussed. Estimated cost to the City of Ferris to repair the seven culverts was estimated at $15,000 in the study. The study further states that Ferris has approximately 132,500 linear feet of curb and gutter that works well in removing stormwater from the streets. However, the study states that repairs or replacements are needed in the central business district. The study estimates the cost for these repairs or replacements at $100,000. The location of these structures requiring repair was not provided. **Table 5-2** lists the existing storm sewer infrastructure within the City of Ferris.

Table 5-2. Existing Stormwater Inventory – Ferris

Total Count		Maintenance Responsibility		Number Damaged (within City Limits)
		City	TxDOT/County	
Corrugated Metal Pipe	34	17	17	3
Reinforced Concrete Pipe	61	46	15	4
Reinforced Concrete Box Culvert	25	10	15	0
Total	**120**	**73**	**47**	**7**

Source: City of Ferris Planning Studies, 2007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5,000
SCALE IN FEET
Legend
Existing Storm Water Line
Culvert
Stream
Railroad
City Limits
Dallas
Study Area
Southern Dallas County Infrastructure Analysis
Existing Storm Water Infrastructure
City of Dallas
Figure 5 - 1
Trinity River
Five Mile Creek
Floyd Branch
Newton Creek
Whites Creek
Mill Creek
Keller Creek
Hutchins
Lancaster
Wilmer
45
20
STATE HWY 310
STATE HWY 342
HOUSTON SCHOOL RD
UNIVERSITY HILLS BLVD
CAMP WISDOM
WHEATLAND
CEDARDALE
CLEVELAND
LANGDON
YOUNGBLOOD
MCCOMMAS BLUFF
WINTERGREEN
TALCO
LBJ SERVICE
CHERRY VALLEY
MILLER FERRY
DOWDY FERRY
RIVER OAKS
LAUREL LAND
RED BIRD
DANIELDALE
SPRINGFIELD
BELVEDERE
BROOKHAVEN
POTOMAC
AMES
RILEY
BASKIN
RAY
TELEPHONE
BONNIE VIEW
BLANCO
WITT
LANCASTER HUTCHINS
DELLER
FULGHUM
GOODE
FINN
GOLDEN
VANDERBILT
PARK
STARLIGHT
BRENEMAN
PALESTINE
HICKMAN
AUSTIN
1ST
DALLAS
CLEVELAND
GLENVIEW
NICHOLS
TROUT
SKYLINE
GLENHAVEN
LEO
MARY
WANDA
TALCO
DENTON
AYRES
LITTLEMON
JUBILEE
SIMPSON STUART
PINE
JAPONICA
BIRD
BERMUDA
ZONIE
RIVER OAKS
STAG
CARDIFF
WATSON
IVY
TALCO
BRONX
56TH
ARDEN
CANTANA
KEYRIDGE
BLUFFMAN
LOUD
GIVENDALE
FATIMA
KOOK
PERSIMMON
GOOCH
KAHN
LEANA
TEAGUE
TRACY
CROUCH
DUET
LAURA
CAMP WISDOM
HARMONY
OLD OAK
LAZY RIVER
SERENADE
WHISPERING
WAGON WHEELS
OXBOW
CALCUTTA
ROCKY RIDGE
DEVERON
MILLETT
ALTAIRE
BUFORD
WASCO
MASK
BRANTLEY
LYLE
HIGHLAND
FRANKLIN
TRIPPIE
PERCY
PORTWOOD
ELKINS
DOYLE
DANIEL
AUTO
BALOMEDE
PINEBROOK
PACESETTER
FROSTY
CINNAMON OAKS
MANDINA
LORES
SAN JOSE
PLAZA
ALAMAIN
MORGAN
MOJAVE
CALO ALTO
SILVERHILL
IVY RIDGE
TIOGA
SEBRING
STATEDALE
MEHALIA
LEAF ARBOR
BRAHAM
WILSHIRE
MEMORY LANE
RIVERSIDE
CEDAR DALE
SIMMON
MILLER FERRY

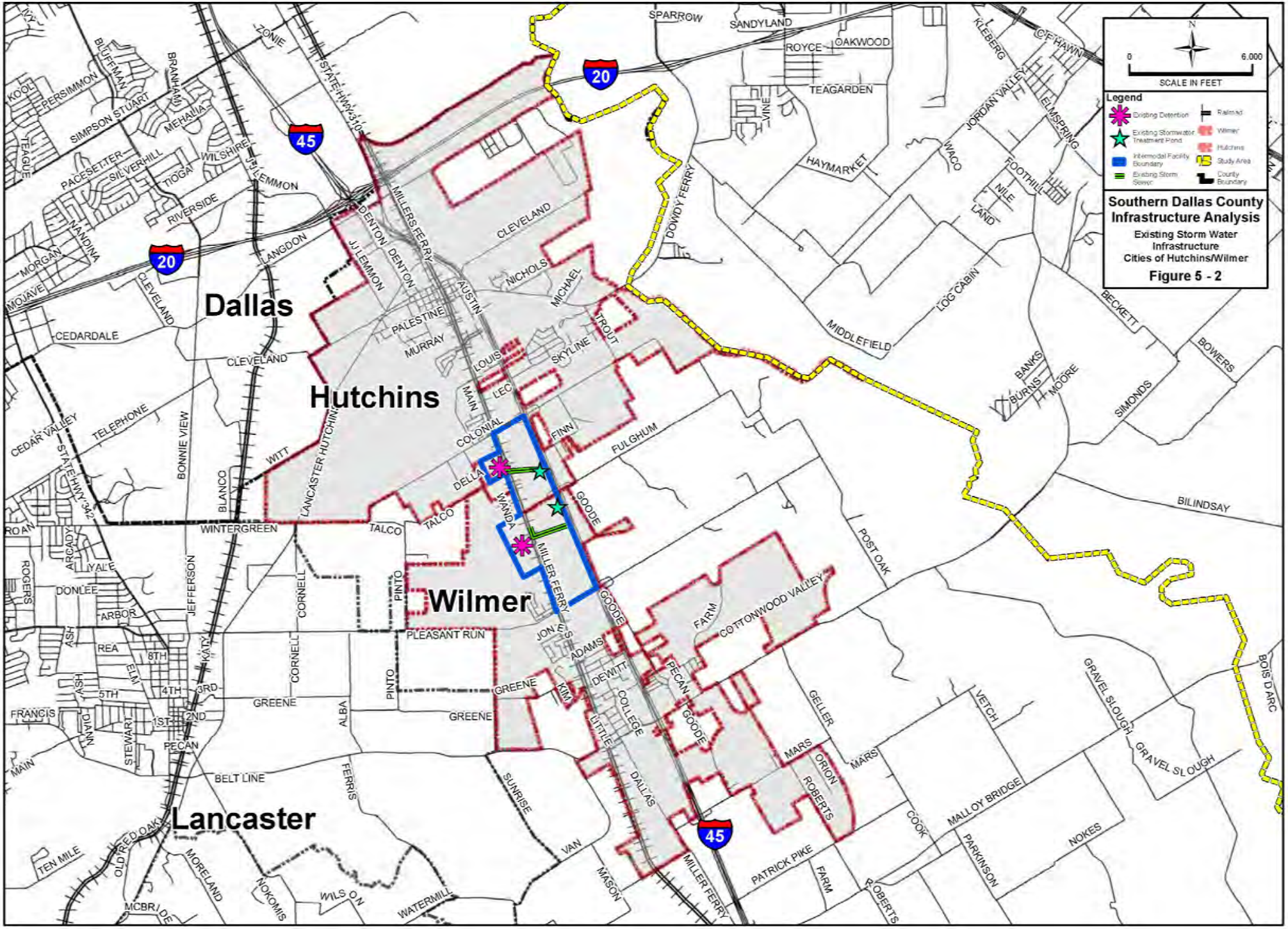
CITY OF HUTCHINS, CITY OF WILMER

Existing stormwater infrastructure information in Hutchins and Wilmer was limited to the Kissell Street Bridge and the Union Pacific Intermodal Facility. The Kissell Street Bridge over the Cottonwood Creek tributary of Tenmile Creek in Wilmer was rebuilt in 1997. The new structure was designed to pass the one hundred year (1% Annual Chance of Exceedance) storm event without the structure overtopping. Current FEMA floodplain mapping and existing Flood Insurance Study (FIS) profile for Cottonwood Creek tributary of Tenmile Creek still reflects the original pre-1997 steel truss bridge. The Union Pacific Intermodal Facility next to Interstate Highway 45 includes several detention ponds, stormwater treatment ponds, and storm sewers. All features were designed to either convey the one hundred year (1% Annual Chance of Exceedance) storm event or detain back to predevelopment discharges in order to prevent increased discharges on downstream properties. **Table 5-3** lists the existing infrastructure features in the intermodal facility. **Figure 5-2** shows a map of these features. Other existing stormwater infrastructure in Hutchins and Wilmer has not been inventoried due to a lack of available information. Further investigation and the development of a plan for each city is recommended. The cost to develop such a plan can range from $50,000 per community for a limited investigation to as much as $100,000 per square mile for a detailed investigation.

Table 5-3. Existing Stormwater Inventory – Union Pacific Intermodal Facility

Stream	Infrastructure	Size
4A4	Detention Pond	29 acre-ft
	Stormwater Treatment Pond	17 acre-ft
	Storm Sewer	72" RCP
4A5	Detention Pond	100 acre-ft
	Stormwater Treatment Pond	22 acre-ft
	Storm Sewer	60" RCP

Source: November 2005 Request for a Letter of Map Revision for a portion of a 342 Acre Tract on Stream 4A4 and Stream 4A5, tributaries of the Trinity River, City of Hutchins, TX and City of Wilmer, TX.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0
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SCALE IN FEET
Legend
Existing Detention
Existing Stormwater Treatment Pond
Intermodal Facility Boundary
Existing Storm Sewer
Railroad
Wilmer
Hutchins
Study Area
County Boundary
Southern Dallas County Infrastructure Analysis
Existing Storm Water Infrastructure
Cities of Hutchins/Wilmer
Figure 5 - 2
Dallas
Hutchins
Wilmer
Lancaster
20
45
SPARROW
SANDYLAND
ROYCE
OAKWOOD
TEAGARDEN
HAYMARKET
VINE
KLEBERG
C F HAWN
JORDAN VALLEY
ELMSPRING
WACO
FOOTHILL
NILE
LAND
LOG CABIN
MIDDLEFIELD
BECKETT
BOWERS
SIMONDS
BANKS
BURNS
MOORE
BILINDSAY
POST OAK
COTTONWOOD VALLEY
FARM
GELLER
VETCH
MARS
ORION
ROBERTS
MALLOY BRIDGE
COOK
PARKINSON
NOKES
PATRICK PIKE
GRAVEL SLOUGH
BOIS D'ARC
MILLER FERRY
DOWDY FERRY
DENTON
J J LEMMON
CLEVELAND
NICHOLS
MICHAEL
AUSTIN
TROUT
SKYLINE
LOUIS
LEC
MAIN
COLONIAL
FINN
FULGHUM
DELLA
WANDA
GOODE
PALESTINE
MURRAY
CEDARDALE
TELEPHONE
CEDAR VALLEY
BONNIE VIEW
BLANCO
WITT
LANCASTER HUTCHINS
WINTERGREEN
TALCO
ROAN
ARCADY
YALE
DONLEE
ARBOR
ROGERS
JEFFERSON
CORNELL
PINTO
PLEASANT RUN
JONES
ADAMS
DEWITT
KIM
LITTLE
COLLEGE
PECAN
GREENE
REA
8TH
5TH
4TH
3RD
2ND
1ST
ASH
ELM
KATY
HASY
DIANN
STEWART
FRANCIS
MAIN
PECAN
BELT LINE
ALBA
FERRIS
SUNRISE
DALLAS
VAN
MASON
WATERMILL
WILSON
NOKOMIS
MORELAND
MCBRIDE
OLD RED OAK
TEN MILE
STATE HWY 342
STATE HWY 310
ZONIE
BLUFFMAN
PERSIMMON
KOOL
TEAGUE
SIMPSON STUART
MEHALIA
BRANHAM
PACESETTER
SILVERHILL
TIOGA
WILSHIRE
RIVERSIDE
NANDINA
MORGAN
MOJAVE
LANGDON

CITY OF LANCASTER

Existing stormwater information was provided by the City of Lancaster in addition to available information for the ProLogis Park I20/I35. ProLogis Park I20/I35 is a private development located just south of IH20 and east of Houston School Road. A list of the detention ponds for this project is shown in **Table 5-4**. All structures were designed according to the City of Lancaster's Stormwater Design Manual. A list of the other detention ponds located in Lancaster is shown in **Table 5-5.** The surface area covered by these ponds is listed; however, volume for these ponds is unknown. Whether these other ponds are designed according to the City of Lancaster's Stormwater Design Manual is unknown. **Figure 5-3** shows a map of the area and includes storm sewers. The storm sewers shown in the area consist of 8 inch to 84 inch diameter reinforced concrete pipe. Information on whether these lines are designed to the proper size according to City of Lancaster requirements is not known or available. Further investigation is recommended.

Table 5-4. Existing Stormwater Inventory – ProLogis Park I20/I35

Stormwater Feature	Size
Detention Pond 1	27 acre-feet
Detention Pond 2	28.8 acre-feet
Detention Pond 3	17.1 acre-feet

Source: May 2008 Request for a Letter of Map Revision for ProLogis Park I20/I35 on Barney Branch and Runyon Springs Tributary 1, Lancaster, TX

Table 5-5. City of Lancaster Existing Stormwater Inventory

Location	Area (acres)
Pleasant Run and Rawlings	0.37
East side along Beckley Avenue between Gateway Drive and Muttick Lane	0.05
East side along Beckley Avenue between Gateway Drive and Muttick Lane	0.04
Southwest of Cedar Valley Drive and State Highway 342	0.14
East side along Beckley Avenue between Gateway Drive and Muttick Lane	0.46
Near Riley Drive and Myrtle Street	0.80
Southeast of Wintergreen Road and Houston School Road	0.51
Southeast of Chapman Drive at Randolph Street	1.00
South of Cedardale Road near Elkins Avenue	4.15
Northwest of Telephone Road and Wintergreen Road	2.12
East of the intersection of Shasta Drive and Sherwood Avenue	0.85
Southeast of the intersection of Shasta Drive and Sherwood Avenue	1.78
Southeast of the intersection of Shasta Drive and Sherwood Avenue	0.24
North of Spring Hill Lane and Wild Grove Lane	3.28

Source: City of Lancaster, TX GIS data. Pond volume is unknown.
This does not include ponds from ProLogis Park

MAPPED/STUDIED STREAMS

Sixty Five streams within the study area have been studied and/or mapped for FEMA purposes. Of the 65 streams, approximately 62 percent of the streams are Zone AE while approximately nine percent are Zone A streams (see **Table 5-6** below). Zone AE streams are streams in which Base Flood Elevations (100-year) and inundation maps showing the one percent Annual Chance of Exceedance (100-year) floodplain have been determined. Flood insurance and floodplain management is required in these areas. Zone A streams are those streams in which a study has been done using approximate methods and Base Flood Elevations have not been determined. Zone X (shaded) areas are defined as: an area located between the 100-year and 500-year flood limits, protected by a levee, depth of flooding less than 1 foot, or having drainage areas less than 1 square mile. Zone X (unshaded) areas are defined as an area located above the 500-year flood level. FEMA policy is to only map those streams which have a drainage area of one square mile or larger. Therefore, there will be those streams that exist on a map or aerial that has less than a square mile in drainage area and will be shown on a FEMA map as either Zone A or Zone X. **Figures 5-4** through **5-8** show the location of these streams in the study area.

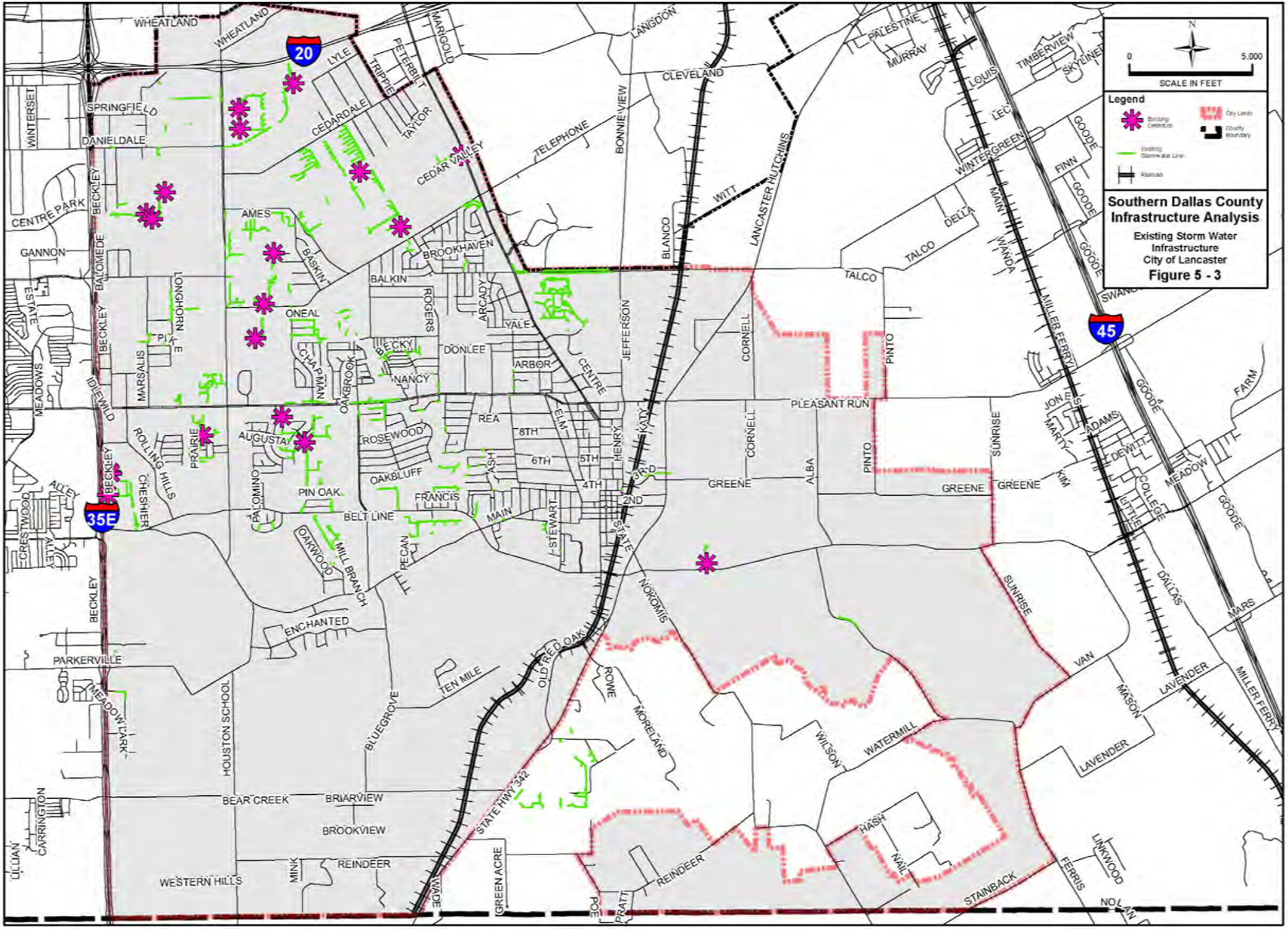
Table 5-6. Percent of Streams Mapped Per Zone

Zone	Feet	Percent of Total
Zone A	106,018	9.14
Zone AE	714,870	61.66
Zone X	338,477	29.20

Source: 2010 Dallas County Preliminary DFIRM and 2010 Ellis County Preliminary DFIRM

During the review of the FEMA flood profiles and floodplain maps several discrepancies between the two sources were noticed. In most cases, structures shown in the FEMA flood profiles do not exist any longer compared to aerial mapping. To correct these inaccuracies, it is recommended that a hydrology and hydraulic models of these streams in the south Dallas County area be restudied. Estimated cost of this restudy is approximately $2,000,000.

An existing infrastructure inventory of bridges and culverts was developed using current Flood Insurance Study (FIS) profiles for the mapped/studied streams. Furthermore, based on the profiles of these streams an assessment was developed showing the storm frequency for the bridge or culvert that it passes before overtopping occurs. Each city is broken out individually (see **Tables 5-7** to **5-12**) and structures that cross streams which also serve as community boundaries are only listed once. **Figures 5-9** through **5-13** show structures that do not pass the one percent Annual Chance of Exceedance (100-year) storm event.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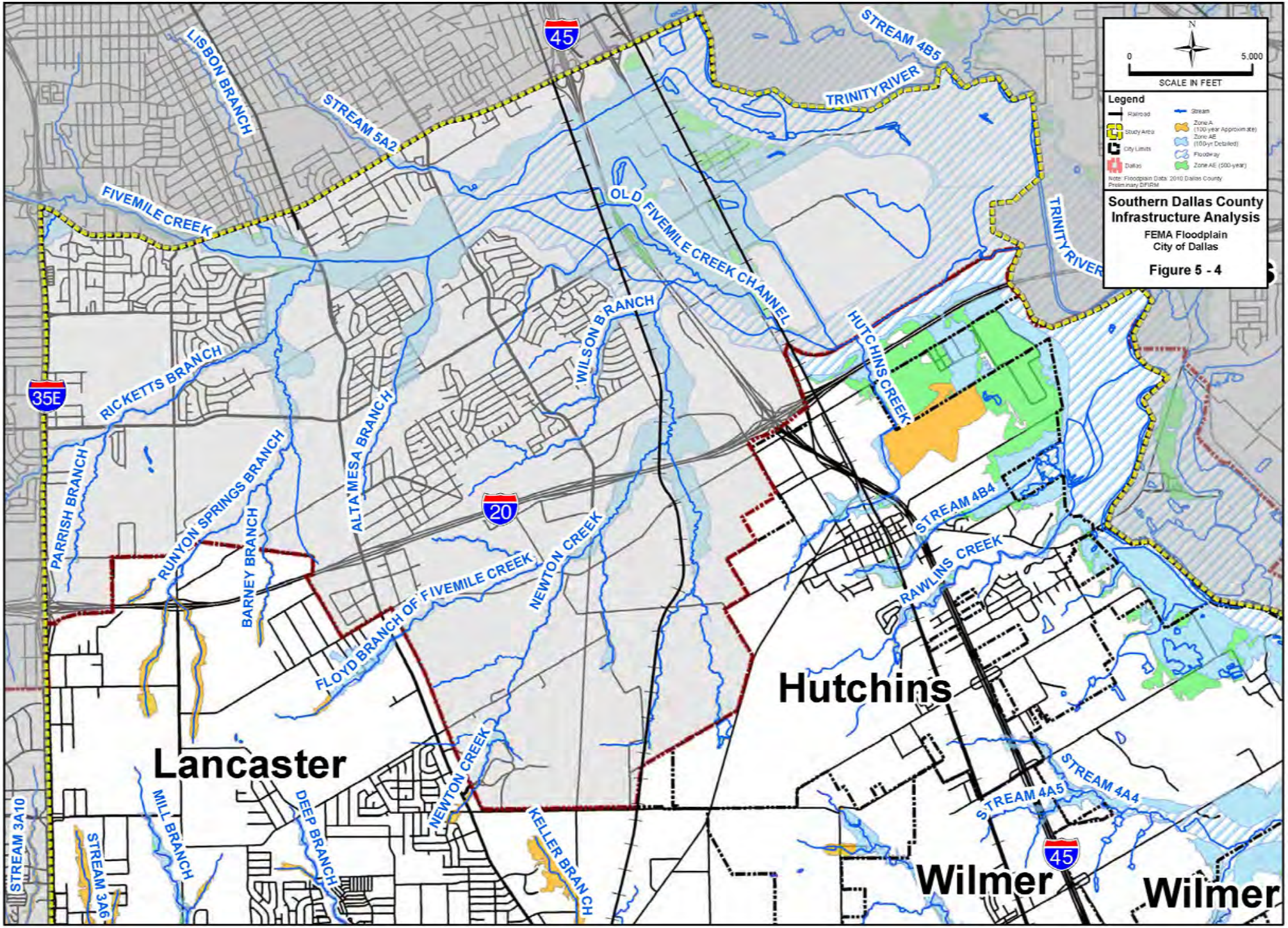
SCALE IN FEET
Legend
Existing Detention
City Limits
County Boundary
Existing Storm water Line
Railroad
Southern Dallas County
Infrastructure Analysis
Existing Storm Water
Infrastructure
City of Lancaster
Figure 5 - 3
WHEATLAND
SPRINGFIELD
DANIELDALE
WINTERSET
CENTRE PARK
GANNON
MEADOWS
CRESTWOOD
ALLEY
BECKLEY
BALOMEDE
ESTATE
IDLEWILD
MARSALIS
LONGHORN
PYLE
PRAIRIE
ROLLING HILLS
CHESHIER
PALOMINO
AUGUSTA
AMES
BASKIN
ONEAL
CYNTHIA
OAKBROOK
BECKY
NANCY
DONLEE
ROGERS
BALKIN
BROOKHAVEN
ARCADY
YALE
ARBOR
CENTRE
JEFFERSON
REA
8TH
6TH
5TH
4TH
3RD
2ND
ELM
ASH
HENRY
KATY
ROSEWOOD
OAKBLUFF
PIN OAK
FRANCIS
BELT LINE
MAIN
STEWART
STATE
OAKWOOD
MILL BRANCH
PECAN
ENCHANTED
PARKERVILLE
MEADOWPARK
HOUSTON SCHOOL
BLUEGROVE
TEN MILE
OLD RED OAK
NOKOMIS
ROWE
MORELAND
WILSON
WATERMILL
HASH
NAIL
STAINBACK
REINDEER
MINK
WESTERN HILLS
BEAR CREEK
BRIARVIEW
BROOKVIEW
CARRINGTON
LILIAN
STATE HWY 342
GREEN ACRE
POE
PRATT
WADE
FERRIS
LINKWOOD
NOLAN
CLEVELAND
LANGDON
MARIGOLD
PETERBILT
TRIPPIE
LYLE
CEDARDALE
TAYLOR
CEDAR VALLEY
TELEPHONE
BONNIE VIEW
WITT
BLANCO
LANCASTER HUTCHINS
PALESTINE
MURRAY
LOUIS
LEO
TIMBERVIEW
SKYLINE
WINTERGREEN
GOODE
FINN
DELLA
TALCO
MAIN
WANDA
MILLER FERRY
SWANS
CORNELL
PINTO
PLEASANT RUN
GREENE
ALBA
SUNRISE
JON
MARTY
ADAMS
DEWITT
KIM
COLLEGE
LITTLE
MEADOW
FARM
DALLAS
MARS
VAN
MASON
LAVENDER
I-20
I-35E
I-45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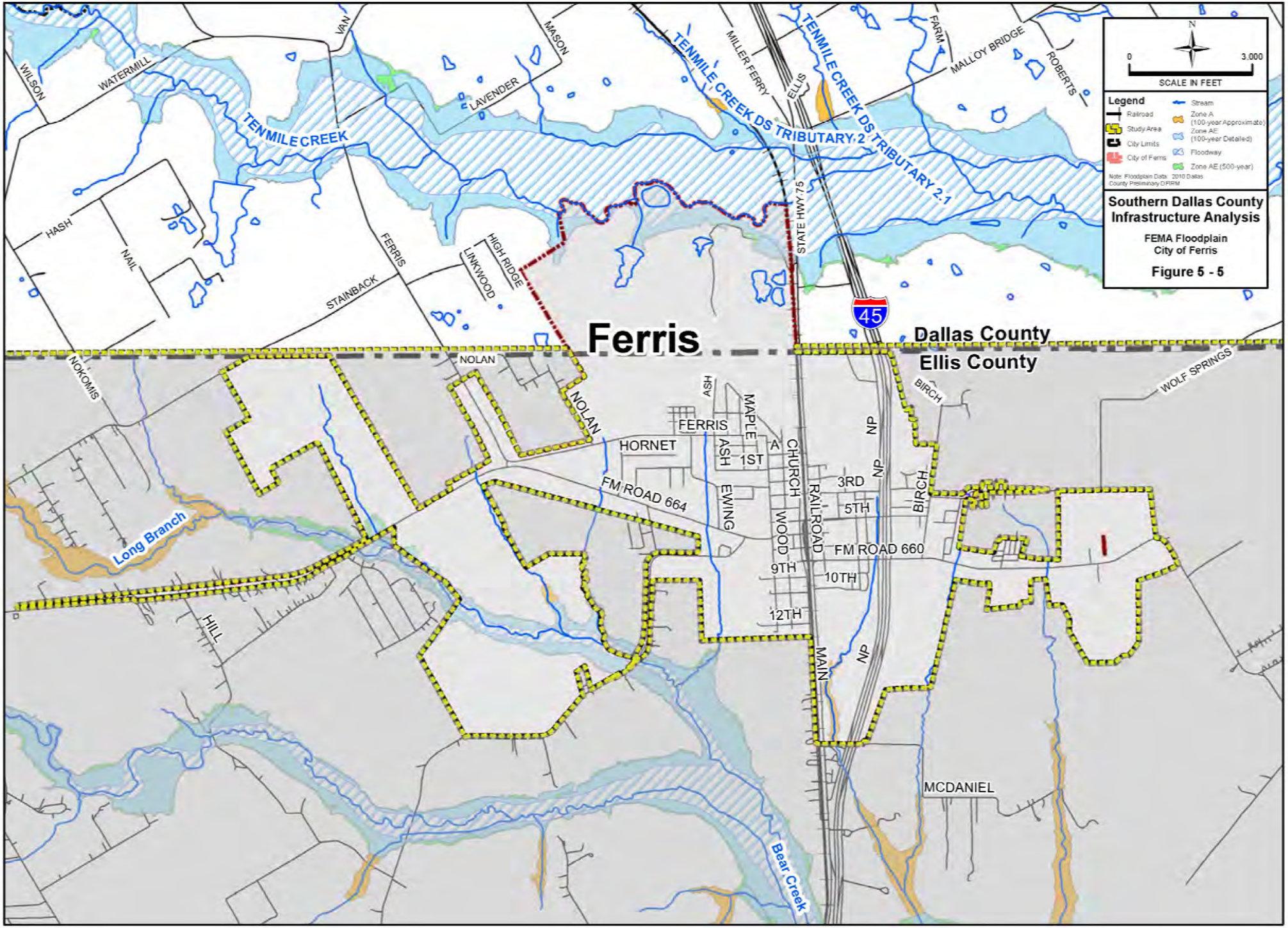
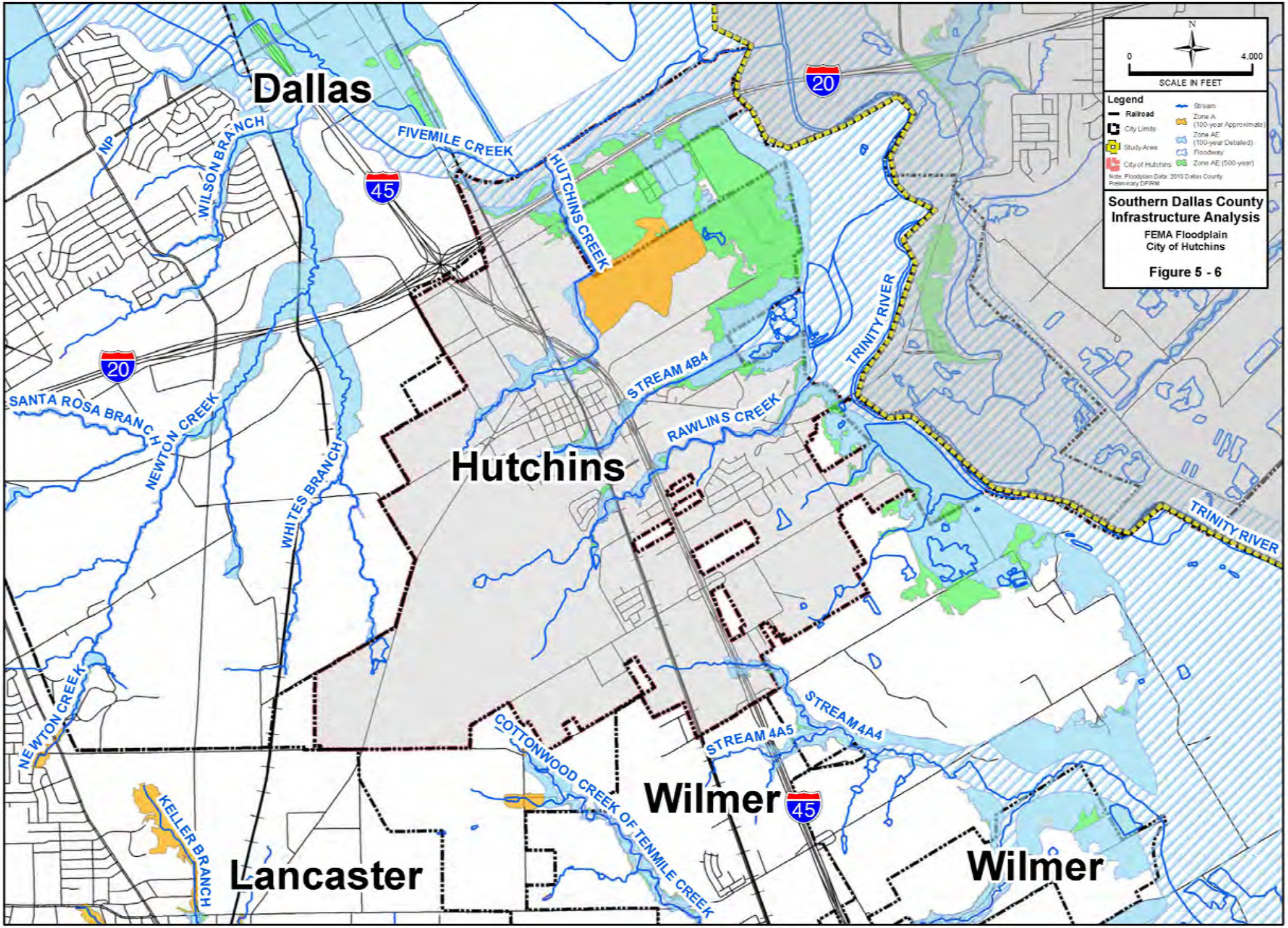
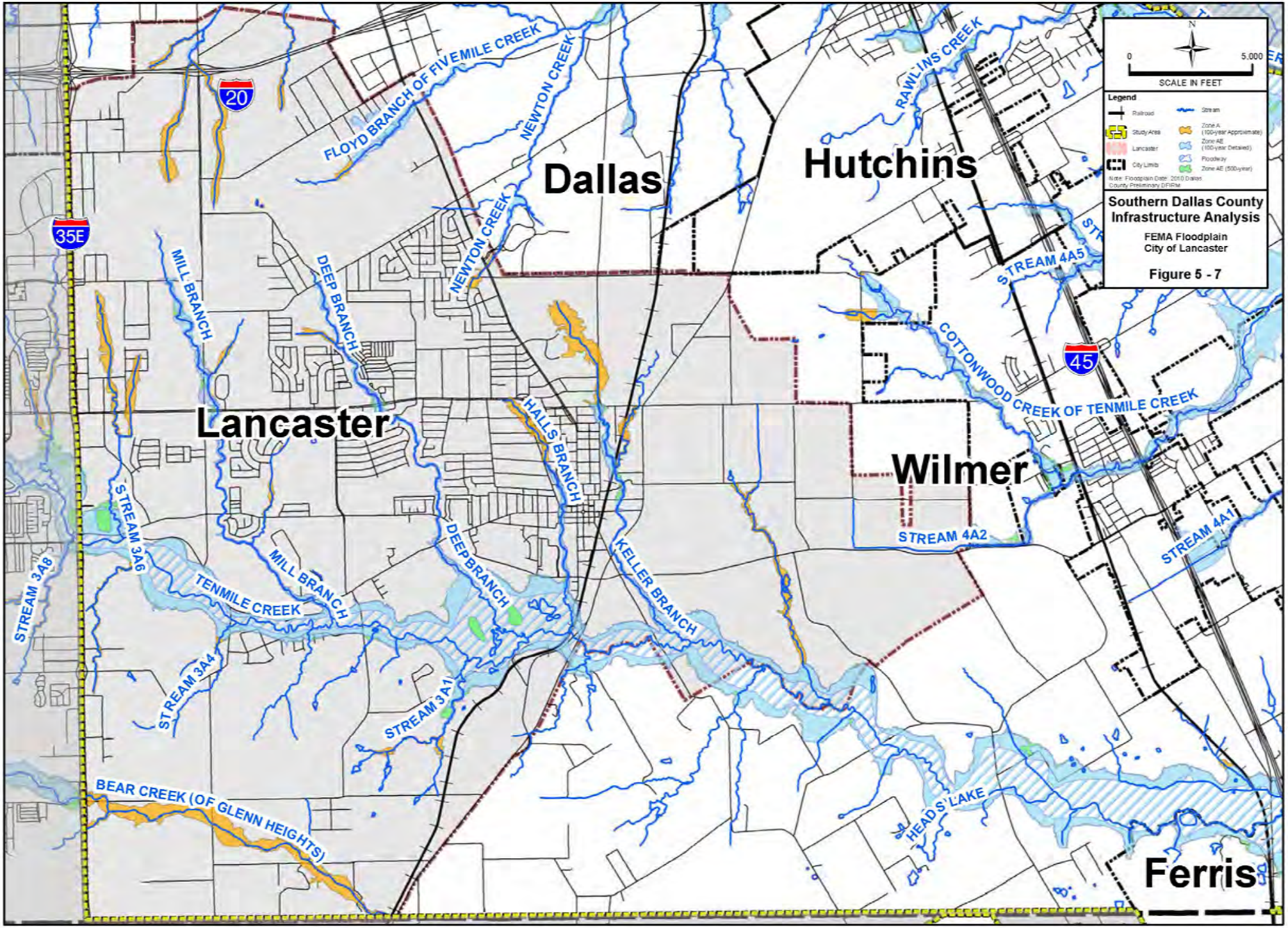
STREAM 5A2
FIVEMILE CREEK
45
STREAM 4B5
TRINITY RIVER
OLD FIVEMILE CREEK CHANNEL
WILSON B RANCH
HUTCHINS CREEK
TRINITY RIVER
35E
RICKETTS BRANCH
PARRISH BRANCH
RUNYON SPRINGS BRANCH
BARNEY BRANCH
ALTA MESA BRANCH
20
NEWTON CREEK
FLOYD BRANCH OF FIVEMILE CREEK
STREAM 4B4
RAWLINS CREEK
Hutchins
Lancaster
NEWTON CREEK
KELLER BRANCH
STREAM 4A4
STREAM 4A5
45
Wilmer
Wilmer
STREAM 3A10
STREAM 3A6
MILL BRANCH
DEEP BRANCH
N
0
5,000
SCALE IN FEET
Legend
Railroad
Study Area
City Limits
Dallas
Stream
Zone A (100-year Approximate)
Zone AE (100-yr Detailed)
Floodway
Zone AE (500-year)
Note: Floodplain Data: 2010 Dallas County Preliminary DFIRM
Southern Dallas County Infrastructure Analysis
FEMA Floodplain
City of Dallas
Figure 5 - 4


N
0
3,000
SCALE IN FEET
Legend
Railroad
Study Area
City Limits
City of Ferris
Stream
Zone A (100-year Approximate)
Zone AE (100-year Detailed)
Floodway
Zone AE (500-year)
Note: Floodplain Data: 2010 Dallas County Preliminary DFIRM
Southern Dallas County Infrastructure Analysis
FEMA Floodplain
City of Ferris
Figure 5 - 5
Ferris
Dallas County
Ellis County
TENMILE CREEK
TENMILE CREEK DS TRIBUTARY 2
TENMILE CREEK DS TRIBUTARY 2.1
Long Branch
Bear Creek
WILSON
WATERMILL
VAN
MASON
LAVENDER
MILLER FERRY
ELLIS
FARM
MALLOY BRIDGE
ROBERTS
HASH
NAIL
STAINBACK
FERRIS
LINKWOOD
HIGH RIDGE
STATE HWY 75
45
NOKOMIS
NOLAN
ASH
MAPLE
FERRIS
HORNET
ASH
1ST
A
CHURCH
NP
BIRCH
WOLF SPRINGS
FM ROAD 664
EWING
WOOD
RAILROAD
3RD
5TH
FM ROAD 660
9TH
10TH
12TH
HILL
MAIN
MCDANIEL


Dallas
Hutchins
Lancaster
Wilmer
Wilmer
FIVEMILE CREEK
WILSON BRANCH
NP
HUTCHINS CREEK
TRINITY RIVER
STREAM 4B4
RAWLINS CREEK
SANTA ROSA BRANCH
NEWTON CREEK
WHITES BRANCH
NEWTON CREEK
KELLER BRANCH
COTTONWOOD CREEK OF TENMILE CREEK
STREAM 4A5
STREAM 4A4
TRINITY RIVER
20
45
20
45
N
0
4,000
SCALE IN FEET
Legend
Railroad
City Limits
Study Area
City of Hutchins
Stream
Zone A (100-year Approximate)
Zone AE (100-year Detailed)
Floodway
Zone AE (500-year)
Note: Floodplain Data: 2010 Dallas County Preliminary DFIRM
Southern Dallas County Infrastructure Analysis
FEMA Floodplain
City of Hutchins
Figure 5 - 6

9 024


Dallas
Hutchins
Lancaster
Wilmer
Ferris
20
35E
45
FLOYD BRANCH OF FIVEMILE CREEK
NEWTON CREEK
NEWTON CREEK
RAWLINS CREEK
MILL BRANCH
DEEP BRANCH
HALLS BRANCH
KELLER BRANCH
COTTONWOOD CREEK OF TENMILE CREEK
STREAM 4A5
STREAM 4A2
STREAM 4A1
STREAM 3A8
STREAM 3A6
STREAM 3A4
STREAM 3A1
TENMILE CREEK
MILL BRANCH
DEEP BRANCH
BEAR CREEK (OF GLENN HEIGHTS)
HEADS LAKE
N
0
5,000
SCALE IN FEET
Legend
Railroad
Stream
Study Area
Zone A (100-year Approximate)
Lancaster
Zone AE (100-year Detailed)
City Limits
Floodway
Zone AE (500-year)
Note: Floodplain Date: 2010 Dallas County Preliminary DFIRM
Southern Dallas County Infrastructure Analysis
FEMA Floodplain
City of Lancaster
Figure 5 - 7

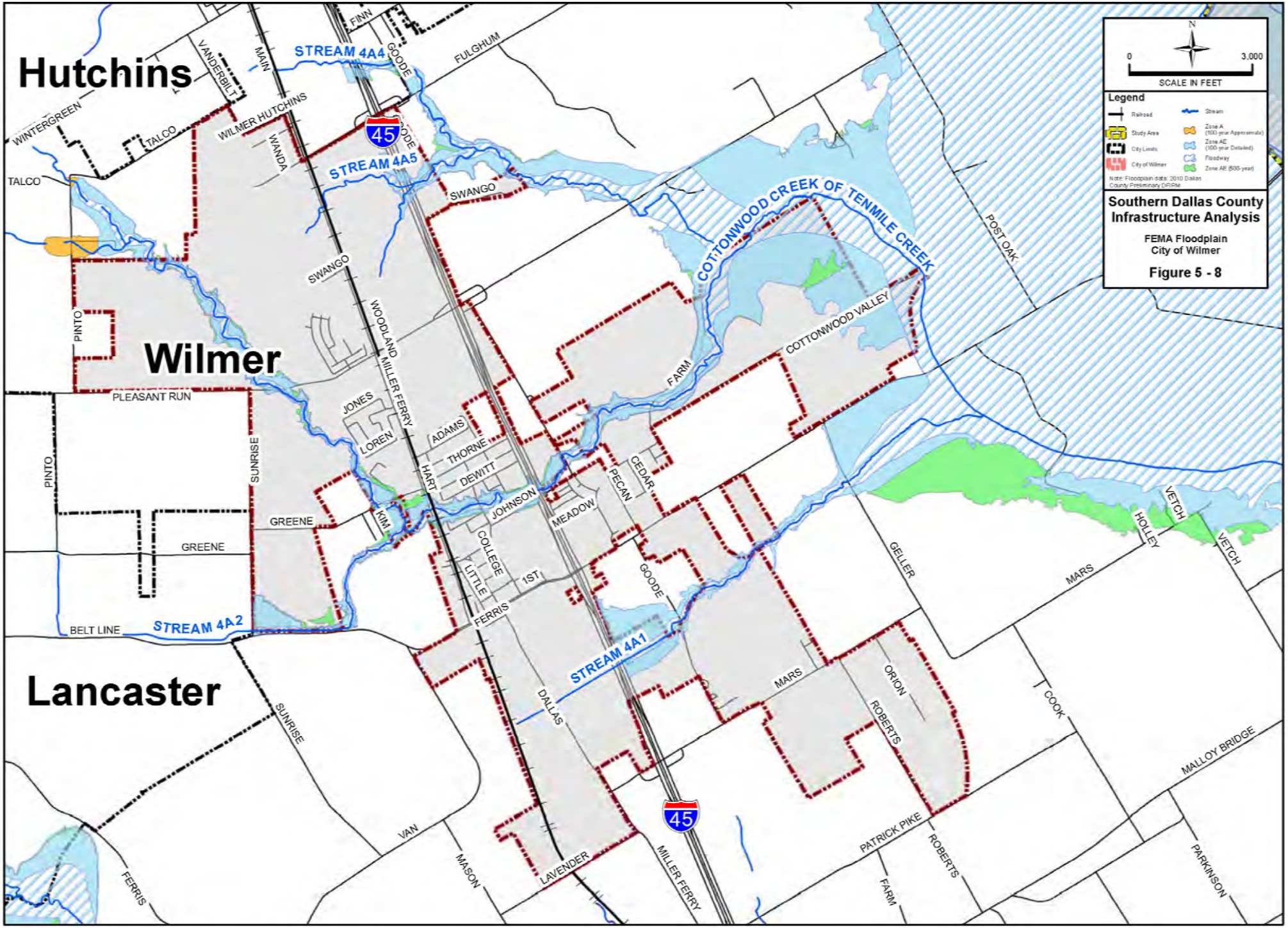

Hutchins
Wilmer
Lancaster
STREAM 4A4
STREAM 4A5
STREAM 4A2
STREAM 4A1
COTTONWOOD CREEK OF TENMILE CREEK
COTTONWOOD VALLEY
FARM
SWANGO
WOODLAND
MILLER FERRY
JONES
LOREN
ADAMS
THORNE
DEWITT
HART
JOHNSON
MEADOW
PECAN
CEDAR
KIM
COLLEGE
LITTLE
1ST
FERRIS
GOODE
FULGHUM
FINN
MAIN
VANDERBILT
WILMER HUTCHINS
WANDA
WINTERGREEN
TALCO
PINTO
PLEASANT RUN
SUNRISE
GREENE
BELT LINE
DALLAS
LAVENDER
VAN
MASON
POST OAK
GELLER
MARS
HOLLEY
VETCH
ORION
ROBERTS
COOK
MALLOY BRIDGE
PATRICK PIKE
FARM
PARKINSON
45
N
0
3,000
SCALE IN FEET
Legend
Railroad
Stream
Study Area
Zone A (100-year Approximate)
City Limits
Zone AE (100-year Detailed)
City of Wilmer
Floodway
Zone AE (500-year)
Note: Floodplain data: 2010 Dallas County Preliminary DFIRM
Southern Dallas County Infrastructure Analysis
FEMA Floodplain City of Wilmer
Figure 5 - 8

Table 5-7. Existing Freeboard based on FEMA Storm Frequency Zone AE Streams for the City of Dallas

Current Mapped/ Studied Streams	Road	Storm Frequency			
		10% ACE	2% ACE	1% ACE	0.2% ACE
Alta Mesa Branch	Persimmon Rd. Culvert	Overtopped	Overtopped	Overtopped	Overtopped
	Tracy Rd. Bridge	Overtopped	Overtopped	Overtopped	Overtopped
	Simpson Stuart Rd. Culvert	Overtopped	Overtopped	Overtopped	Overtopped
Fivemile Creek	Railroad Bridge	N/A	N/A	Passes	N/A
	SH 310 Bridge	N/A	N/A	Passes	N/A
	IH 45 Bridge	N/A	N/A	Passes	N/A
	IH 45 Bridge	N/A	N/A	Passes	N/A
	Railroad Bridge	N/A	N/A	Overtopped	N/A
	Simpson Stuart Rd. Bridge (Double)	N/A	N/A	Passes	N/A
	Bonnie View Rd. Bridge (Double)	N/A	N/A	Passes	N/A
	Loop 12 Bridge (Double)	Passes	Passes	Passes	Overtopped
Lisbon Branch	Loop 12 Bridge (Double)	Passes	Passes	Passes	Passes
Newton Creek	IH 45 Bridge	Passes	Passes	Passes	Passes
	IH 45 Bridge	Passes	Passes	Passes	Passes
	J J Lemmon Rd. Bridge	Passes	Passes	Passes	Overtopped
	Railroad Bridge	Passes	Passes	Passes	Passes
	Bonnie View Rd. Bridge	Passes	Passes	Passes	Passes
	Cedar Valley College (Downstream) Bridge	Passes	Passes	Passes	Passes
	Cedar Valley College (Upstream) Bridge	Passes	Passes	Passes	Overtopped
	IH 20 Bridge (Double)	Passes	Passes	Passes	Passes
	Langdon Rd. Bridge	Passes	Passes	Passes	Passes
	Telephone Rd. Bridge	Passes	Passes	Passes	Passes
Ricketts Branch	Houston School Rd. Bridge	Passes	Passes	Passes	Passes
	Camp Wisdom Rd. Bridge	Passes	Overtopped	Overtopped	Overtopped
	Camp Wisdom Rd. Bridge	Passes	Overtopped	Overtopped	Overtopped
	Private Rd. Bridge	Passes	Passes	Passes	Passes
	IH 35E Service	Passes	Overtopped	Overtopped	Overtopped

Current Mapped/ Studied Streams	Road	Storm Frequency			
		10% ACE	2% ACE	1% ACE	0.2% ACE
	Bridge				
	IH 35E Bridge	Passes	Passes	Passes	Passes
	IH 35E Bridge	Passes	Passes	Passes	Passes
	IH 35E Service Bridge	Passes	Overtopped	Overtopped	Overtopped
Runyon Springs Branch	Crouch Rd. Bridge	Overtopped	Overtopped	Overtopped	Overtopped
Trinity River	Loop 12 Bridge	Passes	Passes	Passes	Passes
Whites Branch	Cleveland Rd. Bridge	Passes	Passes	Passes	Passes
	IH 20 Bridge (Double)	Passes	Passes	Passes	Passes
	Langdon Rd. Bridge	Passes	Passes	Overtopped	Overtopped
Wilson Branch	Railroad Bridge	Passes	Overtopped	Overtopped	Overtopped
	J J Lemmon Rd. Bridge	Overtopped	Overtopped	Overtopped	Overtopped
	Tioga St. Bridge	Overtopped	Overtopped	Overtopped	Overtopped
	Bonnie View Rd. Culvert	Overtopped	Overtopped	Overtopped	Overtopped
Woody Branch	Loop 12 (LEDBETTER DR.) Bridge	Passes	Overtopped	Overtopped	Overtopped
	IH 35E Service Bridge	Passes	Passes	Passes	Passes
	IH 35E Bridge	Passes	Passes	Passes	Passes
	IH 35E Service Bridge	Passes	Passes	Passes	Passes

* Freeboard is the level of protection provided before flooding, overtopping, or inundation of a structure occurs.

** 10 year storm event = 10% ACE, 50 year storm event = 2% ACE, 100-year storm event = 1% ACE, and 500 year storm event = 0.2% ACE (ACE = Annual Chance of Exceedance)

*** N/A = Flood Insurance Study (FIS) profile information not available.

Source: 2010 Dallas County Preliminary DFIRM and Dallas County Flood Insurance Study

Table 5-8. Existing Freeboard based on FEMA Storm Frequency Zone AE Streams for the City of Ferris

Current Mapped/ Studied Streams	Road	Storm Frequency			
		10% ACE	2% ACE	1% ACE	0.2% ACE
Long Branch	FM Road 664 Bridge	Passes	Passes	Passes	Passes
	FM Road 983 Bridge	Passes	Passes	Passes	Passes
Tenmile Creek	Railroad Bridge	Passes	Passes	Passes	Passes

* Freeboard is the level of protection provided before flooding, overtopping, or inundation of a structure occurs.

** ACE = Annual Chance of Exceedance (10% = 10 year storm event, 2% = 50 year storm event, 1% = 100-year storm event, and 0.2% = 500 year storm event)

Source: 2010 Dallas County Preliminary DFIRM, Dallas County Flood Insurance Study, 2010 Ellis County Preliminary DFIRM and Ellis County Flood Insurance Study

Table 5-9. Existing Freeboard based on FEMA Storm Frequency
Zone AE Streams for the City of Hutchins

Current Mapped/ Studied Streams	Road	Storm Frequency			
		10% ACE	2% ACE	1% ACE	0.2% ACE
Hutchins Creek	Denton St. Culvert	Overtopped	Overtopped	Overtopped	Overtopped
	IH 20 Culvert	Passes	Passes	Passes	Passes
	IH 45 Culvert	Passes	Passes	Passes	Passes
	J J Lemmon St. Culvert	Overtopped	Overtopped	Overtopped	Overtopped
	Lancaster-Hutchins Culvert	Passes	Passes	Passes	Passes
	Langdon Rd. Culvert	Passes	Passes	Passes	Overtopped
	Main St. Culvert	Overtopped	Overtopped	Overtopped	Overtopped
	Millers Ferry Rd. Culvert*	Overtopped	Overtopped	Overtopped	Overtopped
	Railroad Culvert	Passes	Passes	Passes	Passes
Rawlins Creek	Dowdy Ferry Rd. Culvert	Passes	Overtopped	Overtopped	Overtopped
	IH 45 Culvert	Overtopped	Overtopped	Overtopped	Overtopped
	Main St. Culvert	Overtopped	Overtopped	Overtopped	Overtopped
	Millers Ferry Rd. Culvert	Passes	Overtopped	Overtopped	Overtopped
	Railroad Culvert	Passes	Passes	Passes	Passes
Stream 4A4	Goode Rd. Culvert	Overtopped	Overtopped	Overtopped	Overtopped
	IH 45 Culvert	Overtopped	Overtopped	Overtopped	Overtopped
Stream 4B4	Austin St. Culvert	Overtopped	Overtopped	Overtopped	Overtopped
	Crestridge Dr. Culvert	Overtopped	Overtopped	Overtopped	Overtopped
	Denton St. Culvert	Overtopped	Overtopped	Overtopped	Overtopped
	Dowdy Ferry Rd. Culvert	Passes	Passes	Passes	Passes
	IH 45 Culvert	Passes	Passes	Passes	Passes
	Main St. Culvert	Passes	Passes	Passes	Overtopped
	Millers Ferry Rd. Culvert*	Overtopped	Overtopped	Overtopped	Overtopped
	Private Driveway Culvert	Overtopped	Overtopped	Overtopped	Overtopped
	Railroad Culvert	Passes	Passes	Passes	Passes
	Willowgrove Dr. Culvert	Overtopped	Overtopped	Overtopped	Overtopped
Trinity River	Dowdy Ferry Rd. Bridge	Passes	Passes	Passes	Passes

* Structure is shown in FIS profile and on FEMA floodplain maps, but does not appear on aerials.
** Freeboard is the level of protection provided before flooding, overtopping, or inundation of a structure occurs.
*** 10 year storm event = 10% ACE, 50 year storm event = 2% ACE, 100-year storm event = 1% ACE, and 500 year storm event = 0.2% ACE (ACE = Annual Chance of Exceedance)

Source: 2010 Dallas County Preliminary DFIRM and Dallas County Flood Insurance Study

Table 5-10. Existing Freeboard based on FEMA Storm Frequency Zone AE Streams for the City of Lancaster

Current Mapped/ Studied Streams	Road	Storm Frequency			
		10% ACE	2% ACE	1% ACE	0.2% ACE
Bear Creek	IH 35E Bridge (Double)	Passes	Passes	Passes	Passes
	IH 35E Ramp Bridge	Passing	Passes	Passes	Passes
Deep Branch	Main St. Bridge	Passes	Passes	Passes	Passes
	Pleasant Run Rd. Bridge	Passes	Passes	Passes	Overtopped
Halls Branch	1ST St. Bridge	Overtopped	Overtopped	Overtopped	Overtopped
	4TH St. Bridge	Overtopped	Overtopped	Overtopped	Overtopped
	6TH St. Bridge	Overtopped	Overtopped	Overtopped	Overtopped
	Cedar St. Bridge	Overtopped	Overtopped	Overtopped	Overtopped
	Main St. Bridge	Overtopped	Overtopped	Overtopped	Overtopped
	Redbud Ln. Bridge	Overtopped	Overtopped	Overtopped	Overtopped
Keller Branch	2ND St. Bridge	Passes	Passes	Passes	Overtopped
	3RD St. Bridge	Passes	Passes	Passes	Passes
	Beltline Rd. Bridge	Passes	Passes	Passes	Passes
	Jefferson St. Bridge	Passes	Overtopped	Overtopped	Overtopped
	Lancaster-Hutchins Bridge	Passes	Passes	Passes	Passes
	Main St. Bridge	Passes	Passes	Overtopped	Overtopped
	Pleasant Run Rd. Bridge	Overtopped	Overtopped	Overtopped	Overtopped
	Railroad Bridge	Passes	Overtopped	Overtopped	Overtopped
Mill Branch	Houston School Rd. Bridge	Passes	Passes	Overtopped	Overtopped
	Main St. Bridge	Passes	Passes	Passes	Passes
	Pleasant Run Rd. Culvert	Passes	Passes	Passes	Passes
	Wintergreen Rd. Bridge	Overtopped	Overtopped	Overtopped	Overtopped
Runyon Springs Branch	Houston School Rd. Bridge	Overtopped	Overtopped	Overtopped	Overtopped
Stream 3A1	Tenmile Rd. Bridge	Overtopped	Overtopped	Overtopped	Overtopped
Stream 3A6	Beltline Rd. Culvert	Overtopped	Overtopped	Overtopped	Overtopped
Tenmile Creek	Bluegrove Rd. Bridge	Overtopped	Overtopped	Overtopped	Overtopped
	Houston School Rd. Bridge	Overtopped	Overtopped	Overtopped	Overtopped
	IH 35E Bridge (Double)	Passes	Passes	Passes	Passes
	IH 35E Service Bridge	Overtopped	Overtopped	Overtopped	Overtopped
	IH 35E Service (County Highway 1382) Bridge	Overtopped	Overtopped	Overtopped	Overtopped
	Nokomis Rd. Bridge	Overtopped	Overtopped	Overtopped	Overtopped
	Old Red Oak Rd. Bridge	Overtopped	Overtopped	Overtopped	Overtopped
	Railroad Bridge	Overtopped	Overtopped	Overtopped	Overtopped
	SH 342 Bridge	Overtopped	Overtopped	Overtopped	Overtopped

* Freeboard is the level of protection provided before flooding, overtopping, or inundation of a structure occurs.

** 10 year storm event = 10% ACE, 50 year storm event = 2% ACE, 100-year storm event = 1% ACE, and 500 year storm event = 0.2% ACE (ACE = Annual Chance of Exceedance)

Source: 2010 Dallas County Preliminary DFIRM and Dallas County Flood Insurance Study

Table 5-11. Existing Freeboard based on FEMA Storm Frequency (Zone AE Streams for the City of Wilmer)

Current Mapped/ Studied Streams	Road	Storm Frequency			
		10% ACE	2% ACE	1% ACE	0.2% ACE
Cottonwood Creek of Tenmile Creek	Beltline Rd. Bridge	Passes	Passes	Passes	Overtopped
	Goode Rd. Bridge	Passes	Overtopped	Overtopped	Overtopped
	IH 45 Bridge (Double)	Passes	Overtopped	Overtopped	Overtopped
	IH 45 Service Rd. Bridge	Overtopped	Overtopped	Overtopped	Overtopped
	IH 45 Service Rd. Bridge	Passes	Passes	Overtopped	Overtopped
	Kissell (College) Rd. Bridge*	Overtopped	Overtopped	Overtopped	Overtopped
	Millers Ferry Rd. Bridge	Passes	Overtopped	Overtopped	Overtopped
	Pleasant Run Rd. Bridge	Passes	Overtopped	Overtopped	Overtopped
	Railroad Bridge	Passes	Passes	Passes	Passes
Stream 4A1	Goode Rd. Bridge	Overtopped	Overtopped	Overtopped	Overtopped
Stream 4A5	Goode Rd. Bridge	Overtopped	Overtopped	Overtopped	Overtopped
	IH 45 Culvert	Overtopped	Overtopped	Overtopped	Overtopped
Tenmile Creek	Central St. Bridge	Passes	Passes	Passes	Passes
	Ferris Rd. Bridge	Passes	Passes	Overtopped	Overtopped
	IH 45 Bridge (Double)	Passes	Passes	Passes	Passes
	IH 45 RAMP Bridge	Passes	Passes	Passes	Passes
	IH 45 RAMP Bridge	Passes	Passes	Passes	Passes
	Parkinson Rd. (Downstream)	Passes	Passes	Passes	Overtopped
	Parkinson Rd. (Upstream)	Passes	Passes	Passes	Overtopped
	Railroad Bridge	Passes	Passes	Passes	Passes

* Freeboard is the level of protection provided before flooding, overtopping, or inundation of a structure occurs.
** 10 year storm event = 10% ACE, 50 year storm event = 2% ACE, 100-year storm event = 1% ACE, and 500 year storm event = 0.2% ACE (ACE = Annual Chance of Exceedance)
*** Note: Kissell (College) Road was recently replaced with a structure that passes the 100 year storm.

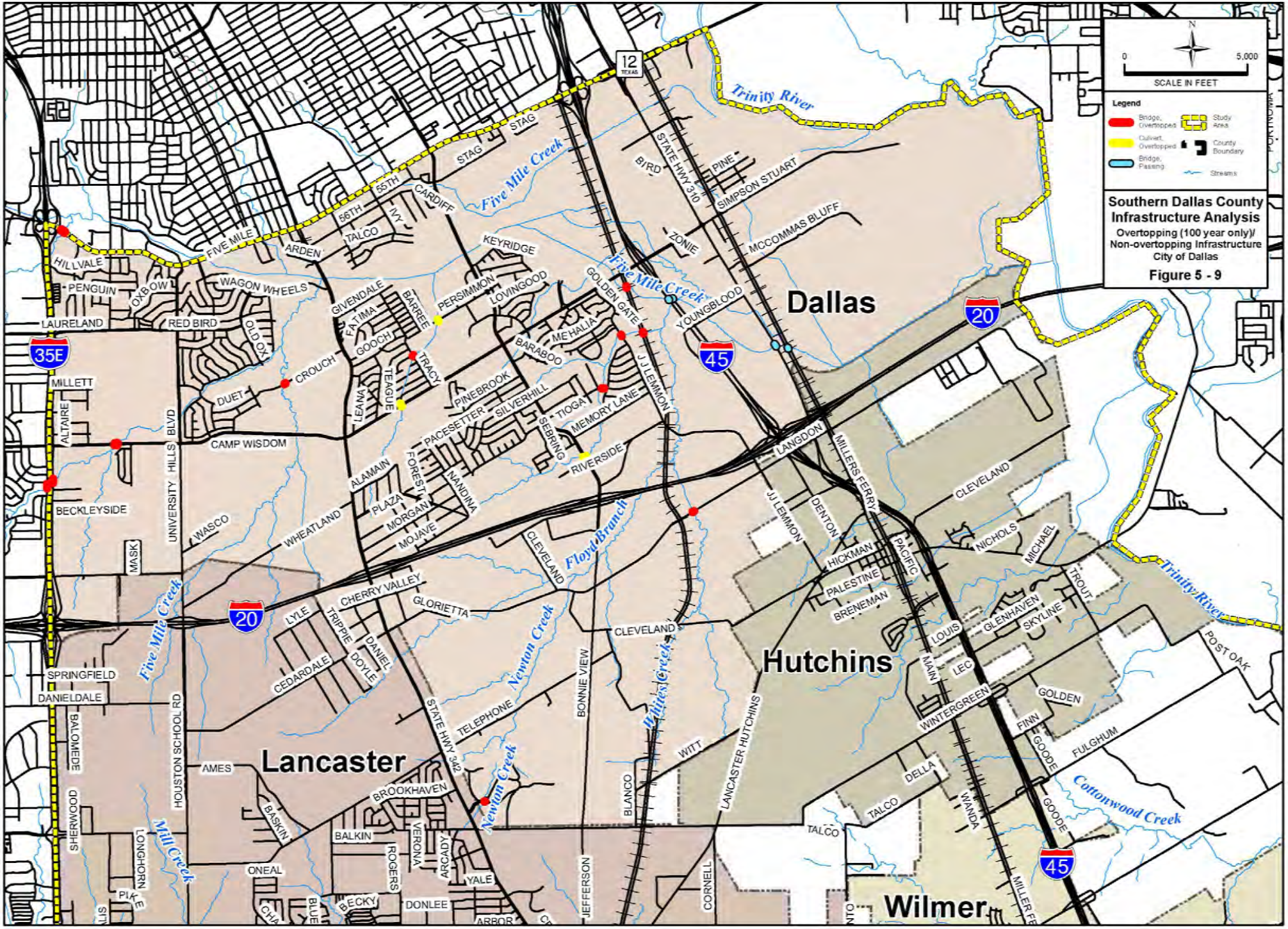
Source: 2010 Dallas County Preliminary DFIRM and Dallas County Flood Insurance Study

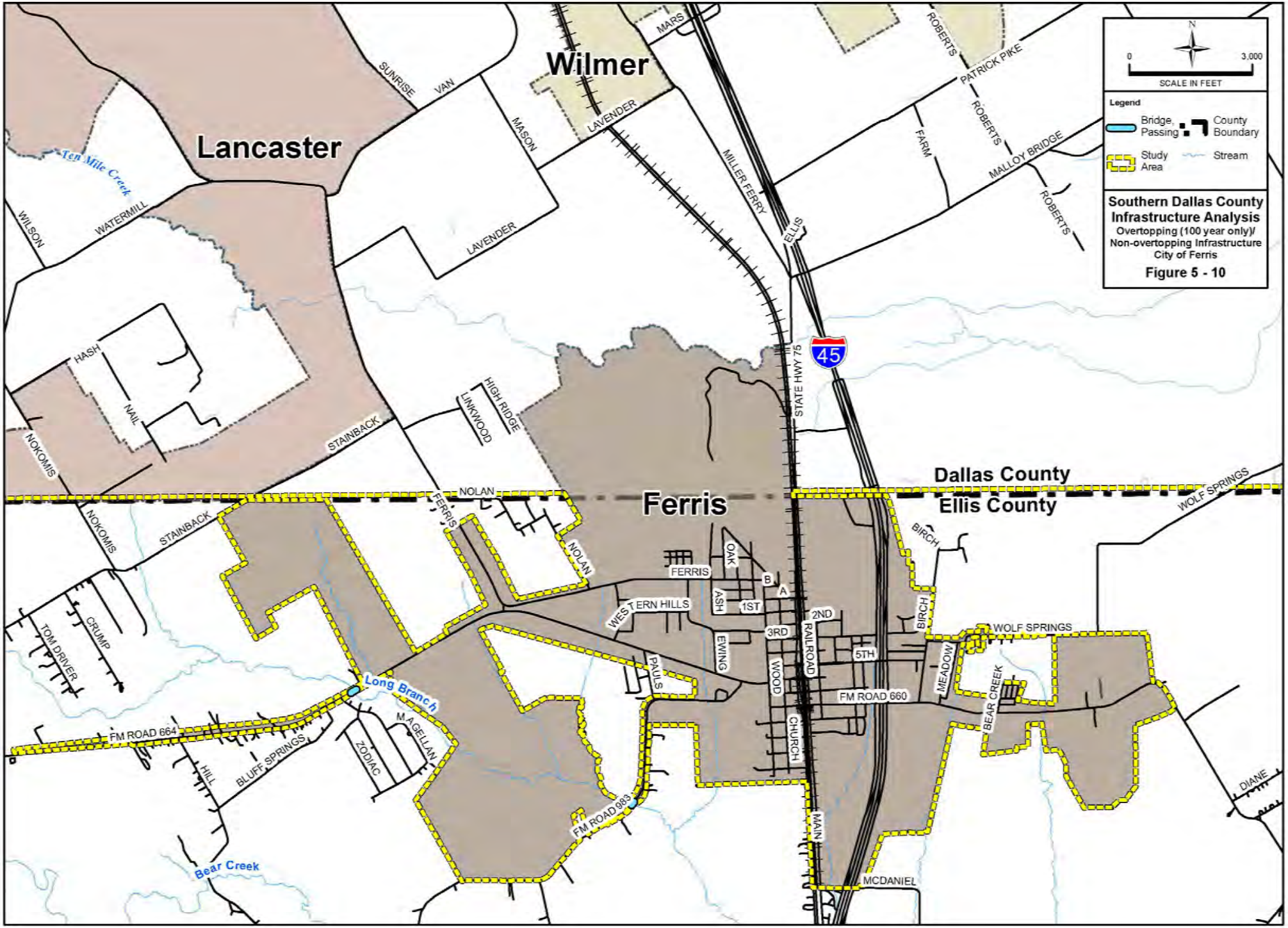
Table 5-12. Existing Freeboard based on FEMA Storm Frequency (Zone AE Streams for Dallas County)

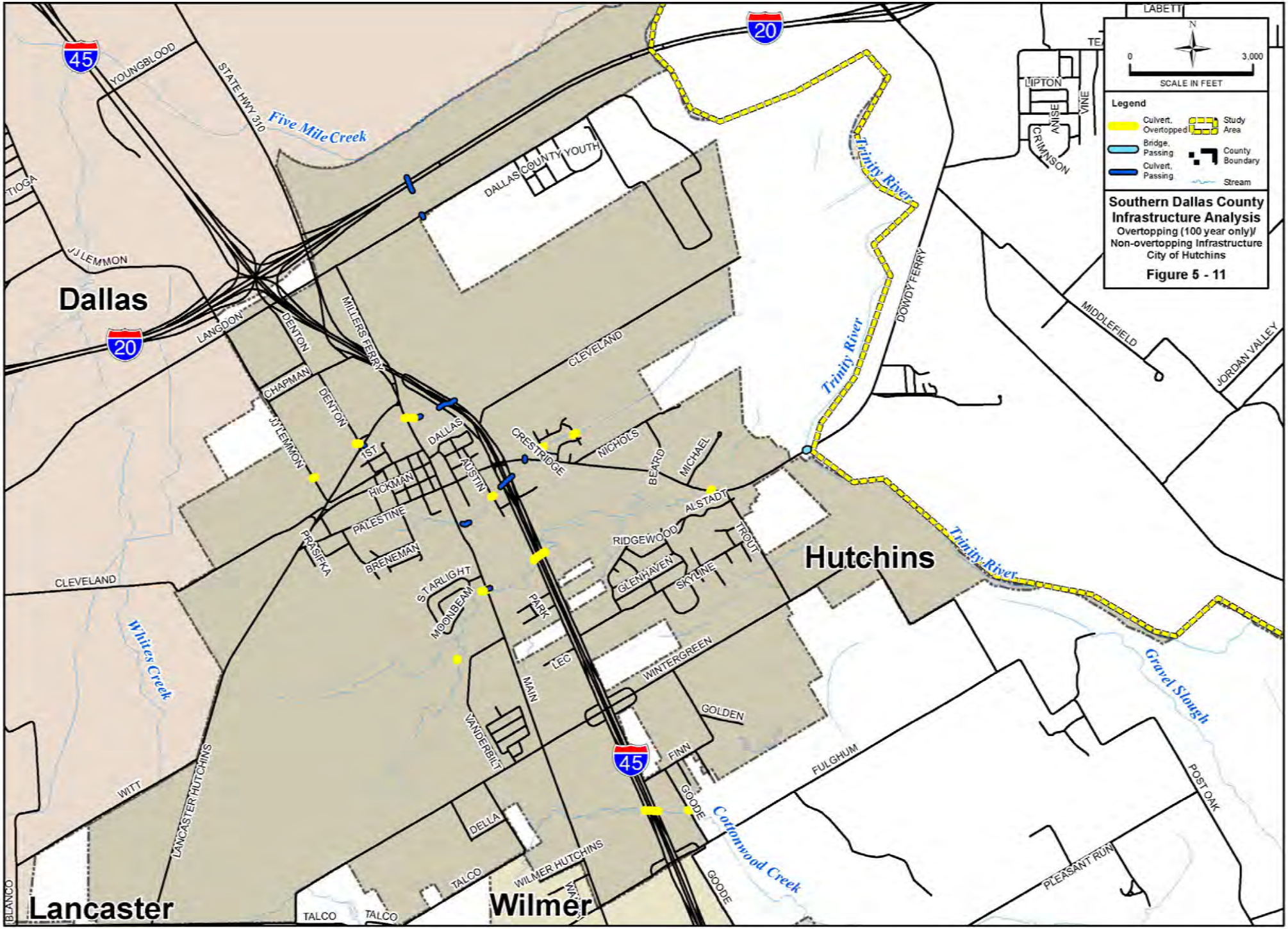
Current Mapped/ Studied Streams	Road	Storm Frequency			
		10% ACE	2% ACE	1% ACE	0.2% ACE
Cottonwood Creek of Tenmile Creek	Malloy Bridge Rd.	Passes	Passes	Passes	Overtopped
Stream 4A1	Geller Rd. Bridge	Overtopped	Overtopped	Overtopped	Overtopped
Stream 4A4	Fulghum Rd. Culvert	Overtopped	Overtopped	Overtopped	Overtopped
	Pleasant Run Rd. Bridge	Passes	Passes	Passes	Passes
Trinity River	Beltline Rd. Bridge	Passes	Passes	Passes	Passes
	Malloy Bridge Rd. Bridge	Passes	Passes	Passes	Passes

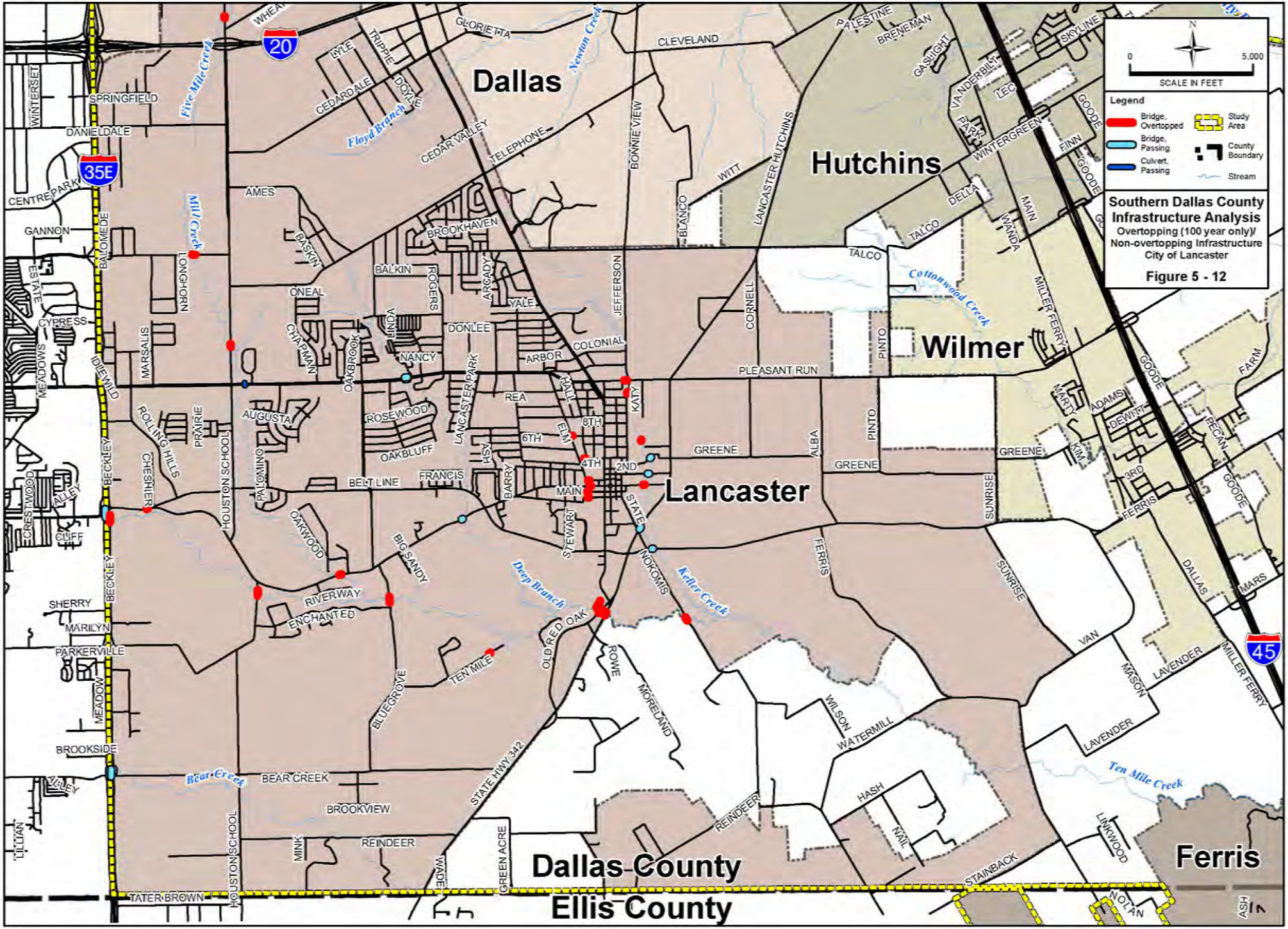
* Freeboard is the level of protection provided before flooding, overtopping, or inundation of a structure occurs.
** 10 year storm event = 10% ACE, 50 year storm event = 2% ACE, 100-year storm event = 1% ACE, and 500 year storm event = 0.2% ACE (ACE = Annual Chance of Exceedance)

Source: 2010 Dallas County Preliminary DFIRM and Dallas County Flood Insurance Study


N
0
5,000
SCALE IN FEET
Legend
Bridge, Overtopped
Culvert, Overtopped
Bridge, Passing
Study Area
County Boundary
Streams
Southern Dallas County Infrastructure Analysis
Overtopping (100 year only)/ Non-overtopping Infrastructure
City of Dallas
Figure 5 - 9
Dallas
Hutchins
Lancaster
Wilmer
Trinity River
Five Mile Creek
Floyd Branch
Newton Creek
Mill Creek
Cottonwood Creek
White Rock Creek
12
35E
20
45
FIVE MILE
ARDEN
55TH
56TH
IVY
TALCO
CARDIFF
STAG
KEYRIDGE
PERSIMMON
LOVINGOOD
GOLDEN GATE
YOUNGBLOOD
BIRD
PINE
SIMPSON STUART
MCCOMMAS BLUFF
ZONIE
STATE HWY 310
HILLVALE
PENGUIN
OXBOW
WAGON WHEELS
LAURELAND
RED BIRD
OLD OX
GIVENDALE
FATIMA
BARREE
GOOCH
TEAGUE
TRACY
CROUCH
DUET
MILLETT
ALTAIRE
UNIVERSITY HILLS BLVD
CAMP WISDOM
BECKLEYSIDE
MASK
WASCO
WHEATLAND
ALAMAIN
FOREST
PLAZA
MORGAN
MOJAVE
NANDINA
PACESETTER
PINEBROOK
SILVERHILL
SEBRING
TIOGA
MEMORY LANE
RIVERSIDE
BARABOO
MEHALIA
J J LEMMON
LANGDON
MILLERS FERRY
DENTON
CLEVELAND
NICHOLS
MICHAEL
PACIFIC
HICKMAN
PALESTINE
BRENEMAN
TROUT
GLENHAVEN
SKYLINE
LOUIS
MAIN
LEC
WINTERGREEN
GOLDEN
FINN
GOODE
FULGHUM
POST OAK
DELLA
WANDA
TALCO
LANCASTER HUTCHINS
WITT
BLANCO
BONNIE VIEW
JEFFERSON
CORNELL
MILLER FERRY
CHERRY VALLEY
GLORIETTA
LYLE
TRIPPIE
DANIEL
DOYLE
CEDARDALE
SPRINGFIELD
DANIELDALE
BALMORHEA
SHERWOOD
LONGHORN
PIKE
HOUSTON SCHOOL RD
AMES
BROOKHAVEN
BASKIN
BALKIN
ROGERS
VERONA
ARCADY
YALE
ONEAL
BECKY
DONLEE
ARBOR
TELEPHONE
STATE HWY 342


Wilmer
Lancaster
Ferris
Dallas County
Ellis County
Ten Mile Creek
Long Branch
Bear Creek
SUNRISE
VAN
MASON
LAVENDER
MARS
ROBERTS
PATRICK PIKE
FARM
MALLOY BRIDGE
MILLER FERRY
ELLIS
STATE HWY 75
45
WILSON
WATERMILL
HASH
NAIL
STAINBACK
NOKOMIS
LINKWOOD
HIGH RIDGE
NOLAN
FERRIS
OAK
ASH
1ST
2ND
3RD
5TH
A
B
WESTERN HILLS
EWING
PAULS
WOOD
RAILROAD
CHURCH
MAIN
BIRCH
WOLF SPRINGS
MEADOW
BEAR CREEK
DIANE
MCDANIEL
FM ROAD 660
FM ROAD 664
FM ROAD 983
TOM DRIVER
CRUMP
HILL
BLUFF SPRINGS
ZODIAC
M AGELLAN
N
0
3,000
SCALE IN FEET
Legend
Bridge, Passing
County Boundary
Study Area
Stream
Southern Dallas County Infrastructure Analysis
Overtopping (100 year only)/ Non-overtopping Infrastructure
City of Ferris
Figure 5 - 10


Southern Dallas County Infrastructure Analysis
Overtopping (100 year only)/ Non-overtopping Infrastructure
City of Hutchins
Figure 5 - 11
Legend
Culvert, Overtopped
Bridge, Passing
Culvert, Passing
Study Area
County Boundary
Stream
N
0
3,000
SCALE IN FEET
Dallas
Hutchins
Lancaster
Wilmer
Five Mile Creek
Trinity River
Whites Creek
Cottonwood Creek
Gravel Slough
20
45
YOUNGBLOOD
STATE HWY 310
DALLAS COUNTY YOUTH
TIOGA
JJ LEMMON
LANGDON
DENTON
MILLERS FERRY
CLEVELAND
CHAPMAN
1ST
DALLAS
AUSTIN
HICKMAN
PALESTINE
BRENEMAN
PRASIFKA
CRESTRIDGE
NICHOLS
BEARD
MICHAEL
ALSTADT
TROUT
RIDGEWOOD
GLENHAVEN
SKYLINE
STARLIGHT
MOONBEAM
PARK
LEC
MAIN
VANDERBILT
WINTERGREEN
GOLDEN
FINN
FULGHUM
GOODE
POST OAK
PLEASANT RUN
DELLA
TALCO
WILMER HUTCHINS
WITT
LANCASTER HUTCHINS
BLANCO
DOWDY FERRY
MIDDLEFIELD
JORDAN VALLEY
LIPTON
VINE
ANISE
CRIMSON
LABETT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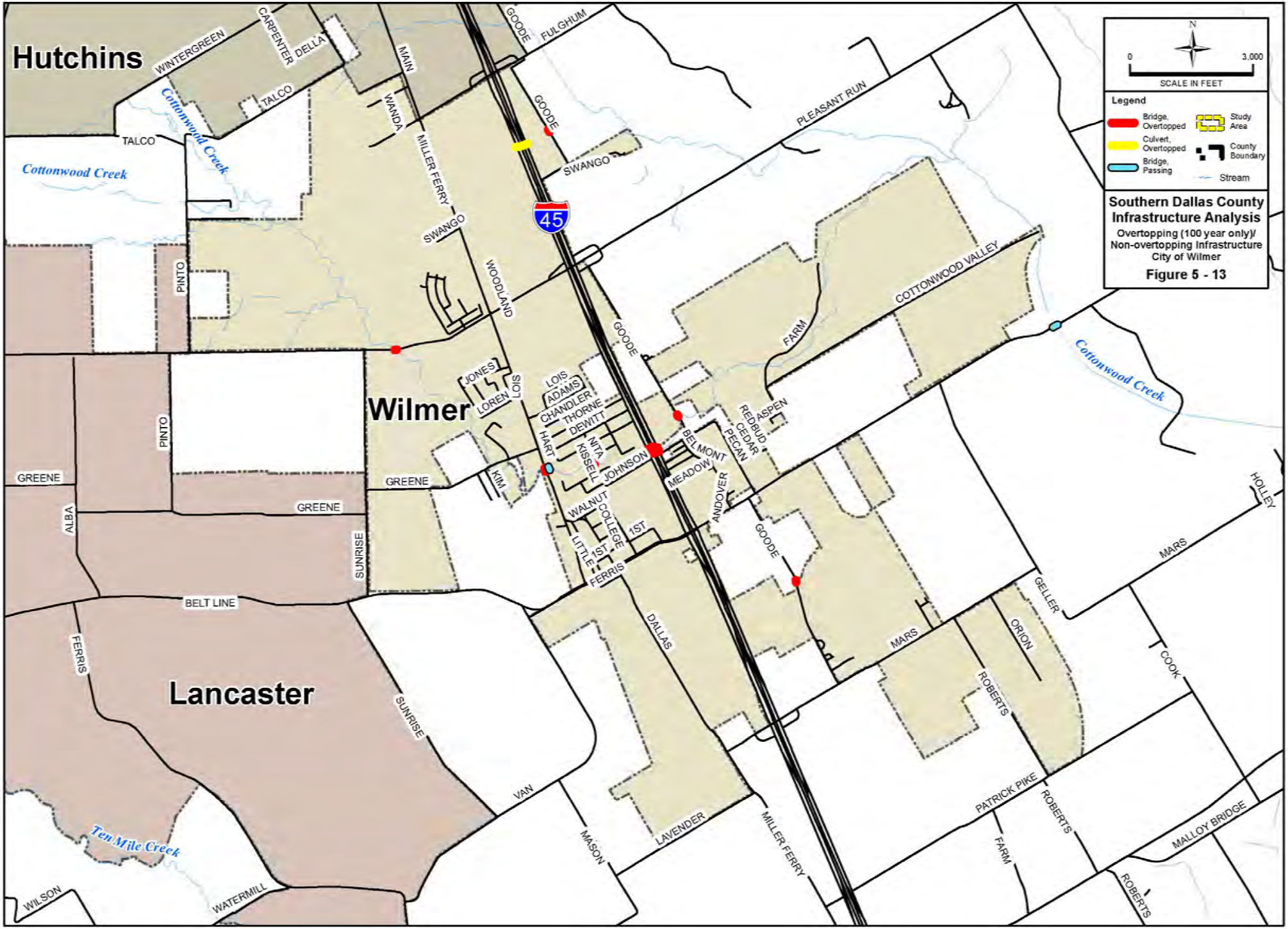
SCALE IN FEET
Legend
Bridge, Overtopped
Bridge, Passing
Culvert, Passing
Study Area
County Boundary
Stream
Southern Dallas County Infrastructure Analysis
Overtopping (100 year only)/ Non-overtopping Infrastructure
City of Lancaster
Figure 5 - 12
Dallas
Hutchins
Wilmer
Lancaster
Ferris
Dallas County
Ellis County
Five Mile Creek
Floyd Branch
Newton Creek
Mill Creek
Cottonwood Creek
Deep Branch
Keller Creek
Bear Creek
Ten Mile Creek
20
35E
45
SPRINGFIELD
DANIELDALE
CENTRE PARK
GANNON
CYPRESS MEADOWS
CRESTWOOD
CLIFF
SHERRY
MARILYN
PARKERVILLE
BROOKSIDE
LILLIAN
VALLEY
MEADOW
BECKLEY
IDLEWILD
BALMORE
ESTATE
LONGHORN
MARSALIS
ROLLING HILLS
CHESHIER
PRAIRIE
HOUSTON SCHOOL
PALOMINO
AUGUSTA
ROSEWOOD
OAKBLUFF
OAKWOOD
BIG SANDY
RIVERWAY
ENCHANTED
TEN MILE
BLUEGROVE
BEAR CREEK
BROOKVIEW
MINK
REINDEER
WADE
GREEN ACRE
STATE HWY 342
TATER BROWN
WHEAT
GLORIETTA
CLEVELAND
CEDARDALE
LYLE
TRIPPIE
DOYLE
CEDAR VALLEY
TELEPHONE
AMES
BASKIN
BROOKHAVEN
BALKIN
ROGERS
ARCADY
YALE
ONEAL
CHAPMAN
OAKBROOK
LINDA
NANCY
DONLEE
ARBOR
COLONIAL
REA
LANCASTER PARK
HALL
ELM
ASH
BARRY
JEFFERSON
BONNIE VIEW
BLANCO
WITT
LANCASTER HUTCHINS
CORNELL
PINTO
KATY
ALBA
SUNRISE
STEWART
STATE
NOKOMIS
OLD RED OAK
ROWE
MORELAND
WILSON
WATERMILL
HASH
NAIL
STAINBACK
LINKWOOD
MASON
VAN
LAVENDER
MILLER FERRY
DALLAS
MARS
FERRIS
PALESTINE
BRENEMAN
GASLIGHT
VANDERBILT
LEC
SKYLINE
GOODE
FINN
WINTERGREEN
DELLA
MAIN
WANDA
TALCO
PLEASANT RUN
FARM
MART
ADAMS
DEWITT
KIM
PECAN
GREENE
6TH
8TH
4TH
2ND
3RD
MAIN
BELT LINE
FRANCIS
NOLAN
ASH


Hutchins
Wilmer
Lancaster
N
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SCALE IN FEET
Legend
Bridge, Overtopped
Culvert, Overtopped
Bridge, Passing
Study Area
County Boundary
Stream
Southern Dallas County Infrastructure Analysis
Overtopping (100 year only)/ Non-overtopping Infrastructure
City of Wilmer
Figure 5 - 13
WINTERGREEN
CARPENTER
DELLA
MAIN
WANDA
MILLER FERRY
GOODE
FULGHUM
PLEASANT RUN
TALCO
Cottonwood Creek
SWANGO
45
PINTO
WOODLAND
JONES
LOREN
LOIS
LOIS ADAMS
CHANDLER
THORNE
DEWITT
HART
NITA
KISSELL
JOHNSON
KIM
BEL MONT
MEADOW
ASPEN
REDBUD
CEDAR
PECAN
FARM
COTTONWOOD VALLEY
GREENE
ALBA
SUNRISE
WALNUT
COLLEGE
1ST
LITTLE
FERRIS
ANDOVER
HOLLEY
MARS
GELLER
ORION
ROBERTS
COOK
DALLAS
BELT LINE
VAN
MASON
LAVENDER
PATRICK PIKE
FARM
MALLOY BRIDGE
Ten Mile Creek
WILSON
WATERMILL

RECOMMENDED STORMWATER INFRASTRUCTURE

RECOMMENDED UPGRADES TO EXISTING BRIDGE AND CULVERTS

Safety of the public during a flooding event is paramount. Replacing the overtopped structures shown in **Tables 5-7** through **5-12** with structures that pass the one hundred year (1% Annual Chance of Exceedance) storm event as the area develops is highly recommended. Determination of the recommended replacement structure was based on the depth of flow in the existing stream. A bridge is recommended for depths greater than ten feet, a culvert or culverts are recommended for depths below ten feet.

Preliminary cost estimates for replacing these structures are listed in **Tables 5-13** through **5-17**. A more detailed breakdown of these cost estimates can be found in Appendix E. Cost estimates for bridges were based on a typical unit cost for this region of $50 per square foot of bridge deck. For culverts, cost estimates were based on February 2012 Texas Department of Transportation Average Low Bid prices. While overtopping of railroad bridges and private driveways exist and should be replaced, replacement of these structures was not included in the cost estimates provided below. Cost of replacement was assumed to be the responsibility of the railroad and driveway owner to pay for the replacement of these structures.

Table 5-13. Recommend Structure Replacements and Cost Estimates – City of Dallas

Current Mapped/ Studied Streams	Road	Recommendation	Total Cost
Alta Mesa Branch	Persimmon Rd.	New Bridge	$280,000
	Tracy Rd.	New Bridge	$280,000
	Simpson Stuart Rd.	New Culvert	$42,000
Ricketts Branch	Camp Wisdom Rd.	New Bridge	$644,000
	Camp Wisdom Rd.	New Bridge	$644,000
	IH 35E Service	New Bridge	$518,000
	IH 35E Service	New Bridge	$504,000
Runyon Springs Branch	Crouch Rd.	New Bridge	$602,000
Whites Branch	Langdon Rd.	New Bridge	$252,000
Wilson Branch	J J Lemmon Rd.	New Bridge	$350,000
	Tioga St.	New Bridge	$434,000
	Bonnie View Rd.	New Bridge	$1,232,000
Woody Branch	Loop 12 (LEDBETTER DR.)	New Bridge	$2,618,000
			Grand Total
			$8,400,000

Source: 2010 Dallas County Preliminary DFIRM and Dallas County Flood Insurance Study

Table 5-14. Recommended Structure Replacements and Cost Estimates – City of Hutchins

Current Mapped/ Studied Streams	Road	Recommendation	Total Cost
Hutchins Creek	Denton Street	New Culvert	$238,000
	J J Lemmon St.	New Bridge	$224,000
	Main Street	New Bridge	$294,000
	Millers Ferry Rd.	New Bridge	$434,000
Rawlins Creek	Dowdy Ferry Rd.	New Bridge	$238,000
	IH 45	New Bridge	$3,094,000
	Main Street	New Bridge	$462,000
Stream 4A4	Goode Road	New Bridge	$252,000
	IH 45	New Bridge	$1,414,000
Stream 4B4	Austin Street	New Culvert	$56,000
	Crestridge Drive	New Culvert	$84,000
	Denton Street	New Culvert	$70,000
			Grand Total
			$6,860,000

Source: 2010 Dallas County Preliminary DFIRM and Dallas County Flood Insurance Study

Table 5-15. Recommended Structure Replacements and Cost Estimates – City of Lancaster

Current Mapped/ Studied Streams	Road	Recommendation	Total Cost
Halls Branch	1ST St.	New Bridge	$294,000
	4TH St.	New Bridge	$294,000
	6TH St.	New Bridge	$280,000
	Cedar St.	New Bridge	$294,000
	Main St.	New Bridge	$336,000
	Redbud Ln.	New Bridge	$308,000
Keller Branch	Jefferson St.	New Bridge	$294,000
	Main St.	New Bridge	$350,000
	Pleasant Run Rd.	New Bridge	$280,000
Mill Branch	Houston School Rd.	New Bridge	$336,000
	Wintergreen Rd.	New Bridge	$224,000
Stream 3A1	Tenmile Rd.	New Bridge	$308,000
Stream 3A6	Beltline Rd.	New Bridge	$2,814,000
Tenmile Creek	Bluegrove Rd.	New Bridge	$2,184,000
	Houston School Rd.	New Bridge	$2,086,000
	IH 35E Service	New Bridge	$3,038,000
	IH 35E Service (County Highway 1382)	New Bridge	$3,710,000
	Nokomis Rd.	New Bridge	$2,170,000
	Old Red Oak Rd.	New Bridge	$2,100,000
	SH 342	New Bridge	$2,632,000
			Grand Total
			$24,322,000

Source: 2010 Dallas County Preliminary DFIRM and Dallas County Flood Insurance Study

Table 5-16. Recommended Structure Replacements and Cost Estimates – City of Wilmer

Current Mapped/ Studied Streams	Road	Recommendation	Total Cost
Cottonwood Creek of Tenmile Creek	Goode Rd.	New Bridge	$448,000
	IH 45	New Bridge	$1,610,000
	IH 45 Service Rd.	New Bridge	$434,000
	IH 45 Service Rd.	New Bridge	$448,000
	Millers Ferry Rd.	New Bridge	$560,000
	Pleasant Run Rd.	New Bridge	$420,000
Stream 4A1	Goode Rd.	New Bridge	$336,000
Stream 4A5	Goode Rd.	New Bridge	$210,000
	IH 45	New Bridge	$1,400,000
Tenmile Creek	Ferris Rd.	New Bridge	$2,142,000
			Grand Total
			$8,008,000

Source: 2010 Dallas County Preliminary DFIRM and Dallas County Flood Insurance Study

Table 5-17. Recommended Structure Replacements and Cost Estimates – Dallas County

Current Mapped/ Studied Streams	Road	Recommendation	Total Cost
Stream 4A1	Geller Rd.	New Bridge	$336,000
Stream 4A4	Fulghum Rd.	New Bridge	$238,000
			Grand Total
			$574,000

Source: 2010 Dallas County Preliminary DFIRM and Dallas County Flood Insurance Study

Prioritization of structure replacement was developed based on the level of risk to public safety and the structure's location within each community. The level of risk for each structure was determined from computations made for inundation depth and velocity, as well as **Figures 5-14** and **5-15**, which are from the U.S. Department of the Interior Assistant Commissioner – *Engineering and Research Technical Memorandum No. 11, Downstream Hazard Classification Guidelines*. In each of the figures, danger zones are divided into three separate zones: High, Judgment, and Low for both children and passenger vehicles. A third figure for "Adults" exists within the referenced memorandum; however, it recommends that the figure for children be used for areas where the population is mixed. Each of the structures was located on an aerial map. Factors impacting replacement priority include: proximity to a school or residential area, if the structure is located on a major road, and if the structure is in a rural or urban location. **Table 5-18** shows the computational depths and velocities for both the 10 percent (10-year) and 1 percent (100-year) Annual Chance of Exceedance storm events, resulting danger zone classifications determined from **Figures 5-14** and **5-15**, and resulting priority of replacement for each of the structures. Prioritization ranged from 1 (high importance) to 3 (low importance). The priority shown in **Table 5-18** is a recommendation only and a change in replacement priority could be development driven. Until these structures are replaced, installation of guardrails, warning signs or systems, and flood gages with easy-to-read depth markings are recommended.

Table 5-18. Danger Classification and Replacement Priority Per City

City/County	Current Mapped/Studied Streams	Flooded Structures	Depth of Inundation (feet)		Velocity (feet per second)		Danger Level for Pedestrians		Danger Level for Vehicles		Priority*
			10 yr	100 yr	10 yr	100 yr	10 yr	100 yr	10 yr	100 yr	
Dallas	Alta Mesa Branch	Persimmon Rd.	2.5	3.75	4.11	5.03	High	High	Judge	High	2
	Alta Mesa Branch	Simpson Stuart Rd.	2	2.2	3.68	3.86	High	High	High	Judge	1
	Alta Mesa Branch	Tracy Rd.	4	4.5	5.20	5.52	High	High	High	High	2
	Ricketts Branch	Camp Wisdom Rd.	-	2	-	3.68		High		Judge	3
	Ricketts Branch	Camp Wisdom Rd.	-	2	-	3.68		High		Judge	3
	Ricketts Branch	IH 35E Service	-	1.5	-	3.18		High		Low	3
	Ricketts Branch	IH 35E Service	-	1	-	2.60		High		Low	3
	Runyon Springs Branch	Crouch Rd.	0.1	1.5	0.82	3.18	Low	High	Low	Low	3
	Whites Branch	Langdon Rd.	-	0.2	-	1.16		Low		Low	3
	Wilson Branch	Bonnie View Rd.	1.9	3	3.58	4.50	High	High	Judge	High	1
	Wilson Branch	J J Lemmon Rd.	0.5	1.5	1.84	3.18	Judge	High	Low	Low	1
	Wilson Branch	Tioga St.	0.5	1.75	1.84	3.44	Judge	High	Low	Low	1
	Woody Branch	Loop 12 (LEDBETTER DR.)	-	2.5	-	4.11		High		Judge	3
Hutchins	Hutchins Creek	Denton Street	1.75	2.25	3.44	3.90	High	High	Low	Judge	3
	Hutchins Creek	J J Lemmon St.	0.2	1	1.16	2.60	Low	High	Low	Judge	3
	Hutchins Creek	Main Street	2	3	3.68	4.50	High	High	Judge	High	1
	Rawlins Creek	Dowdy Ferry Rd.	-	1	-	2.60		High		Low	3
	Rawlins Creek	IH 45	-	1	-	2.60		High		Low	3
	Rawlins Creek	Main Street	2	8	3.68	7.35	High	High	Judge	High	1
	Stream 4A4	Goode Road	2	2.75	3.68	4.31	High	High	Judge	High	3
	Stream 4A4	IH 45	1	2	2.60	3.68	High	High	Low	Judge	2
	Stream 4B4	Austin Street	1.25	1.6	2.91	3.29	High	High	Low	Low	2
	Stream 4B4	Crestridge Drive	1	1.5	2.60	3.18	High	High	Low	Low	2
	Stream 4B4	Denton Street	0.5	1.5	1.84	3.18	Judge	High	Low	Low	2
Lancaster	Halls Branch	1ST St.	1.5	2	3.18	3.68	High	High	Low	Judge	2
	Halls Branch	4TH St.	1	2	2.60	3.68	High	High	Low	Judge	2
	Halls Branch	6TH St.	1	1.5	2.60	3.18	High	High	Low	Low	3
	Halls Branch	Cedar St.	1	1.5	2.60	3.18	High	High	Low	Low	2
	Halls Branch	Main St.	0.2	1.2	1.16	2.85	Low	High	Low	Low	1
	Halls Branch	Redbud Ln.	-	2	-	3.68		High		Judge	3
	Keller Branch	Jefferson St.	-	1.2	-	2.85		High		Low	3
	Keller Branch	Main St.	-	0.2	-	1.16		Low		Low	3
Lancaster	Keller Branch	Pleasant Run Rd.	0.3	1	1.42	2.60	Low	High	Low	Low	2
	Mill Branch	Houston School Rd.	-	0.1	-	0.82		Low		Low	3
	Mill Branch	Wintergreen Rd.	0.75	1	2.25	2.60	Judge	High	Low	Low	3
	Stream 3A1	Tenmile Rd.	4.8	7.2	5.70	6.98	High	High	High	High	2
	Stream 3A6	Beltline Rd.	3.2	6	4.65	6.37	High	High	High	High	1
	Tenmile Creek	Bluegrove Rd.	0.25	3.25	1.30	4.69	Low	High	Low	High	3
	Tenmile Creek	Houston School Rd.	0.75	4.75	2.25	5.67	Judge	High	Low	High	2
	Tenmile Creek	IH 35E Service	1.5	5	3.18	5.81	High	High	Low	High	2

City/County	Current Mapped/Studied Streams	Flooded Structures	Depth of Inundation (feet)		Velocity (feet per second)		Danger Level for Pedestrians		Danger Level for Vehicles		Priority*
	Tenmile Creek	IH 35E Service (County Highway 1382)	0.5	4	1.84	5.20	Low	High	Low	High	2
	Tenmile Creek	Nokomis Rd.	0.75	3	2.25	4.50	Judge	High	Low	High	2
	Tenmile Creek	Old Red Oak Rd.	1.5	5.75	3.18	6.23	High	High	Low	High	2
	Tenmile Creek	SH 342	-	3	-	4.50		High		High	3
Wilmer	Cottonwood Creek of Tenmile Creek	Goode Rd.	-	3.1	-	4.58		High		High	3
	Cottonwood Creek of Tenmile Creek	IH 45	-	3.2	-	4.65		High		High	3
	Cottonwood Creek of Tenmile Creek	IH 45 Northbound Service Rd.	-	1	-	2.60		High		Low	3
	Cottonwood Creek of Tenmile Creek	IH 45 Southbound Service Rd.	2.5	7.2	4.11	6.98	High	High	Judge	High	1
	Cottonwood Creek of Tenmile Creek	Kissell (College) Rd.	5	7.5	5.81	7.12	High	High	High	High	1
	Cottonwood Creek of Tenmile Creek	Millers Ferry Rd.	-	3.5	-	4.86		High		High	3
	Cottonwood Creek of Tenmile Creek	Pleasant Run Rd.	-	1.5	-	3.18		High		Low	3
	Stream 4A1	Goode Rd.	0.2	2.2	1.16	3.86	Low	High	Low	Judge	2
	Stream 4A5	Goode Rd.	1.2	1.5	2.85	3.18	High	High	Low	Low	2
	Stream 4A5	IH 45	0.5	1	1.84	2.60	Low	High	Low	Low	2
	Tenmile Creek	Ferris Rd.	-	0.2	-	1.16		Low		Low	3
Dallas County	Stream 4A4	Fulghum Rd.	1	1.5	2.60	3.18	High	High	Low	Low	2
	Stream 4A1	Geller Rd.	1.5	2.5	3.18	4.11	High	High	Low	Judge	2

Priority - 1 = High Importance, 2 = Medium Importance, and 3 = Low Importance

Source: 2010 Dallas County Preliminary DFIRM, Dallas County Flood Insurance Study, and U.S. Department of the Interior Assistant Commissioner – *Engineering and Research Technical Memorandum No. 11, Downstream Hazard Classification Guidelines*

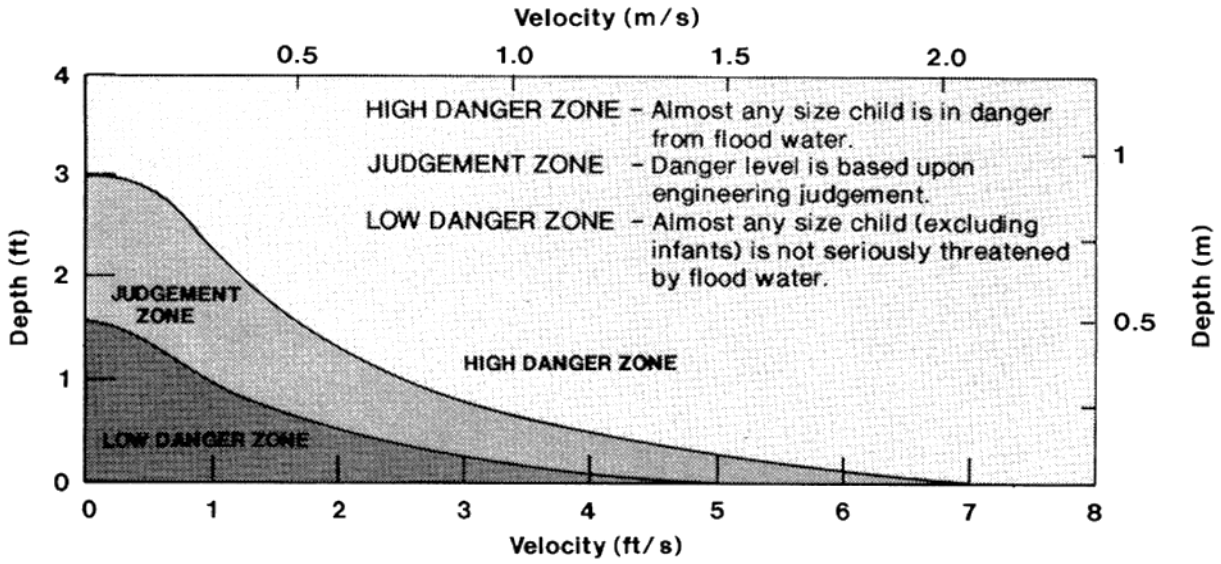


Figure 5-14. Depth –Velocity Flood Danger Level Relationship for Children

Source: U.S. Department of the Interior Assistant Commissioner – Engineering and Research Technical Memorandum N0. 11, Downstream Hazard Classification Guidelines

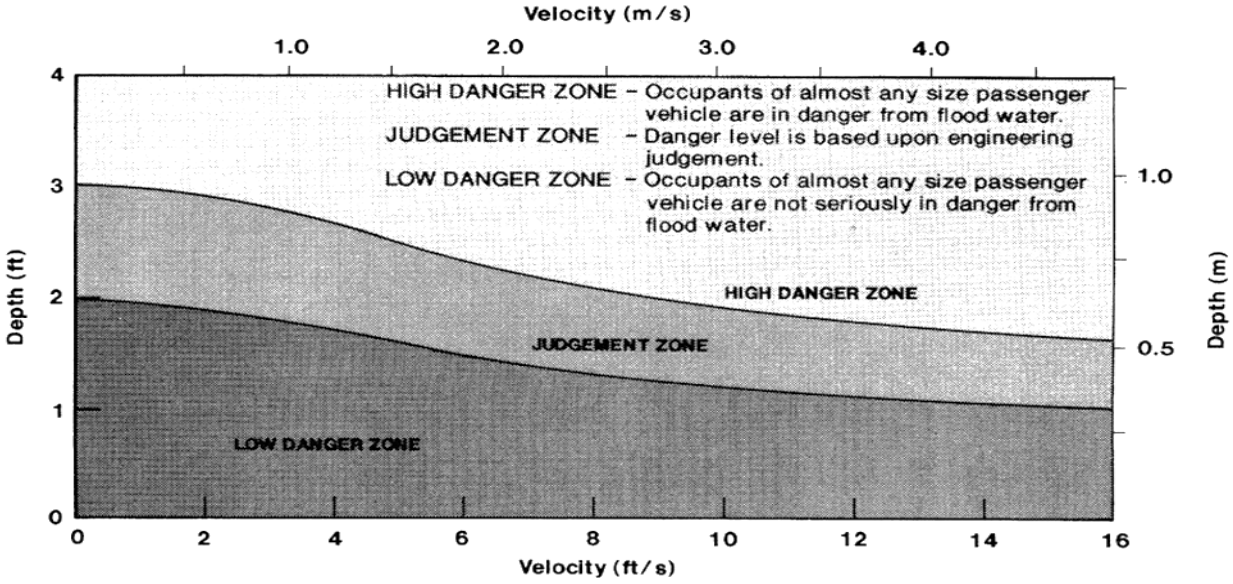


Figure 5-15. Depth-Velocity Flood Danger Relationship for Passenger Vehicles

Source: U.S. Department of the Interior Assistant Commissioner – Engineering and Research Technical Memorandum N0. 11, Downstream Hazard Classification Guidelines

The replacement cost of five structures could be shared since the creek each structure crosses is the boundary between two jurisdictions. These structures are listed in **Table 5-19**.

Table 5-19. Potential Cost Sharing for Recommended Replacement Structures

Stream	Road	Community
Stream 4A4	Goode Road	City of Hutchins/Dallas County
Cottonwood Creek of Tenmile Creek	Goode Road	City of Wilmer/Dallas County
Stream 4A1	Goode Road	City of Wilmer/Dallas County
Stream 4A5	Goode Road	City of Wilmer/Dallas County
Tenmile Creek	Ferris Road	City of Wilmer/Dallas County

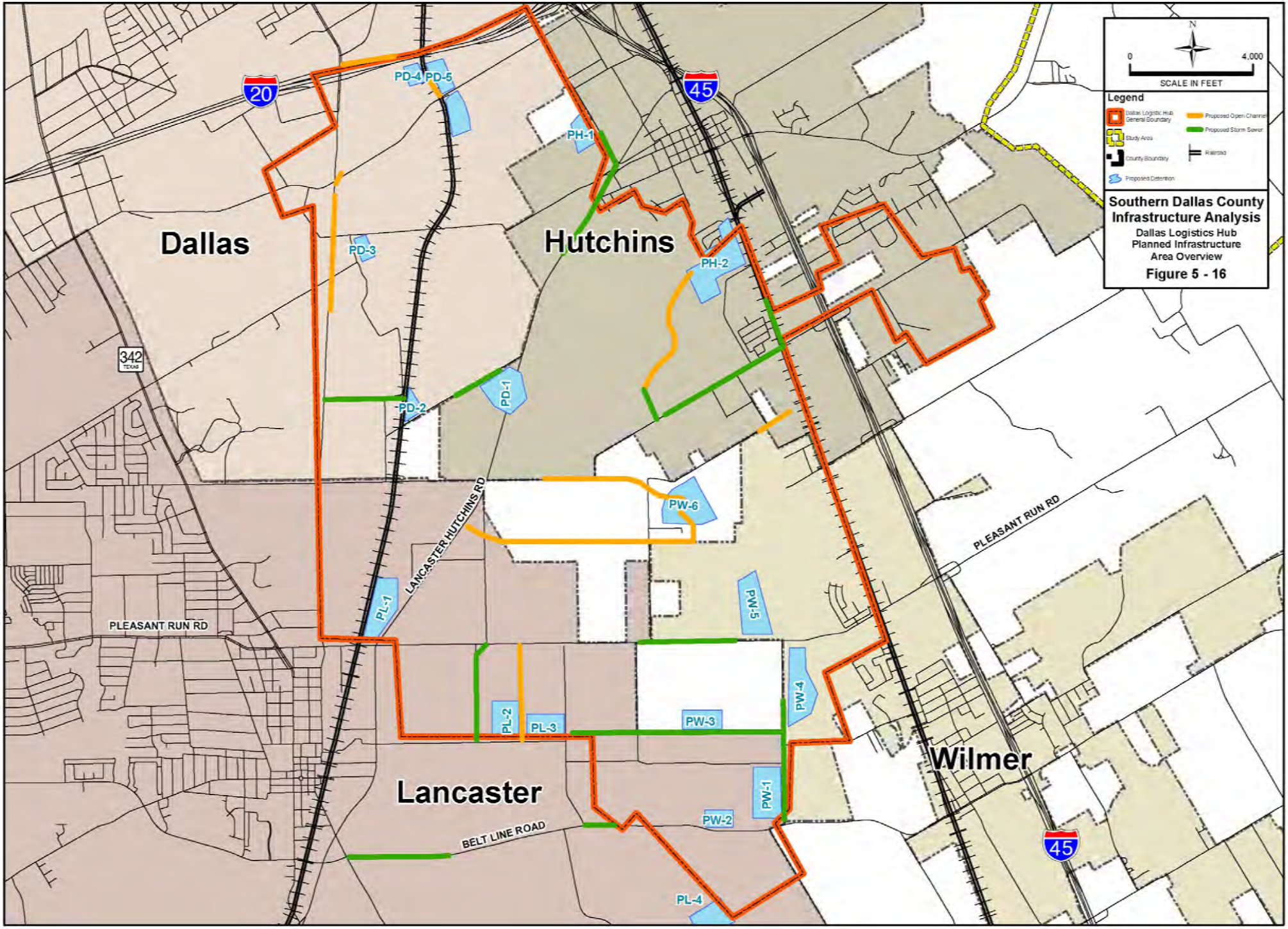
Source: 2010 Dallas County Preliminary DFIRM and Dallas County Flood Insurance Study

Some structures listed in **Tables 5-13** through **5-17** may have already been reconstructed and cost estimates provided may not be valid. Until a Letter of Map Revision (LOMR) to FEMA is prepared for those reconstructed structures, a new detailed study by FEMA is conducted, or a stream study is paid for by the city, the Flood Insurance Study profiles from which the freeboard was based will reflect conditions which may no longer exist or structures which are not correctly shown on the profiles. Submission of required models, reports, and forms to FEMA as development occurs in the area is highly recommended. As the study area develops and impervious cover increases, runoff from the developed areas will increase, as will the potential for higher and more frequent flooding along these streams. Consequently, these structures may become inundated more frequently by storm events. A more stringent floodplain management approach could prevent significant increases in future discharges, thereby preventing the need to reconstruct some bridges and culverts.

PLANNED INFRASTRUCTURE

In 2006 and 2007, a master drainage plan was developed as part of the proposed Dallas Logistics Hub (DLH) development (see **Figure 5-16)**. In this study, which included portions of Dallas, Hutchins, Lancaster, and Wilmer, a list of proposed infrastructure needs both inside and outside the DLH area was developed in order to maintain existing fully developed discharges at predevelopment levels. The infrastructure features included: open channels, detention/retention ponds, culverts, and storm sewers. While the development never materialized, it was accepted by the member cities as a standard or level of care that should be adopted for stormwater related infrastructure as development occurs.

The former DLH development area is just a small piece of a much larger planned development referred to as the International Inland Port of Dallas (IIPOD). As shown in **Figure 5-17,** the core of this development centers on the area bounded by Loop 12 (North side), Trinity River (East side), the Dallas/Ellis County Line (South side), and Interstate Highway 35 (West Side) or approximately 77,440 acres (121 square miles). No two city ordinances or design standards are the same when it comes to addressing stormwater related issues in the proposed IIPOD area. Therefore, like the DLH development, IIPOD should consider adopting stormwater infrastructure standards which all member cities can agree upon as the development occurs. Based on the estimated construction cost and acreage associated with the DLH stormwater infrastructure features, an estimated cost per acre for stormwater was developed. The estimated construction cost was computed to be approximately $3400 per acre. If the IIPOD development implements a similar standard or level of care for stormwater as that developed for the DLH development the total cost of the storm water infrastructure would be approximately $206,500,000. Please note that this cost does not include that portion of the IIPOD located within the Trinity River 100-year floodplain (approximately 16,710 acres or 26 square miles). It is assumed that the cost of constructing these stormwater features will be the responsibility of the private developer and/or the city in which they are located.


N
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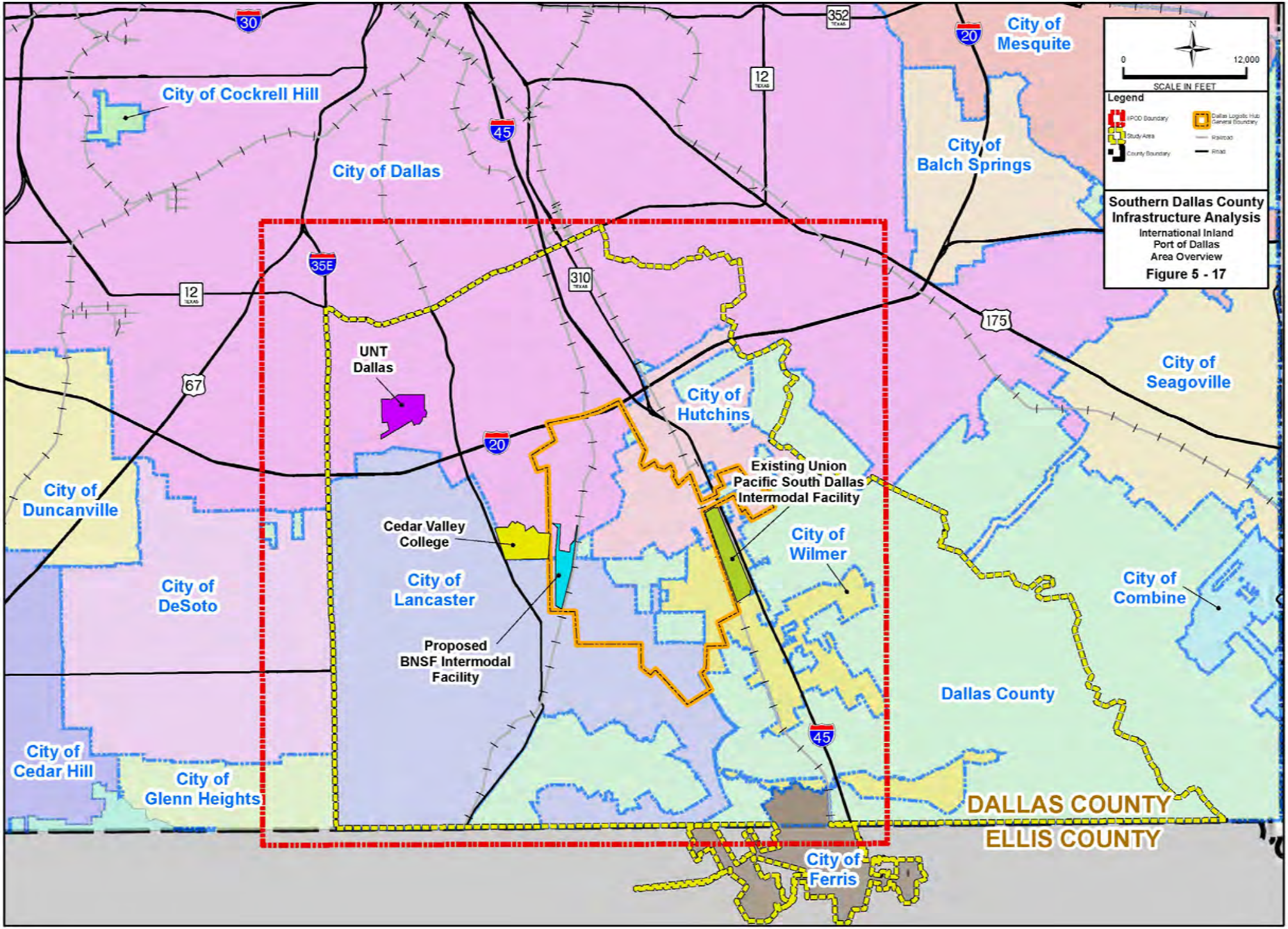
SCALE IN FEET
Legend
Dallas Logistic Hub General Boundary
Study Area
County Boundary
Proposed Detention
Proposed Open Channel
Proposed Storm Sewer
Railroad
Southern Dallas County Infrastructure Analysis
Dallas Logistics Hub
Planned Infrastructure
Area Overview
Figure 5 - 16
Dallas
Hutchins
Lancaster
Wilmer
20
45
342
TEXAS
PD-1
PD-2
PD-3
PD-4
PD-5
PH-1
PH-2
PL-1
PL-2
PL-3
PL-4
PW-1
PW-2
PW-3
PW-4
PW-5
PW-6
LANCASTER HUTCHINS RD
PLEASANT RUN RD
PLEASANT RUN RD
BELT LINE ROAD


City of Cockrell Hill
City of Dallas
City of Mesquite
City of Balch Springs
City of Seagoville
City of Hutchins
UNT Dallas
Existing Union Pacific South Dallas Intermodal Facility
Cedar Valley College
City of Wilmer
City of Combine
City of Lancaster
City of DeSoto
City of Duncanville
Proposed BNSF Intermodal Facility
Dallas County
City of Cedar Hill
City of Glenn Heights
DALLAS COUNTY
ELLIS COUNTY
City of Ferris
30
352
20
12
45
35E
310
175
67
N
0
12,000
SCALE IN FEET
Legend
IPOD Boundary
Dallas Logistic Hub General Boundary
Study Area
Railroad
County Boundary
Road
Southern Dallas County Infrastructure Analysis
International Inland Port of Dallas Area Overview
Figure 5 - 17

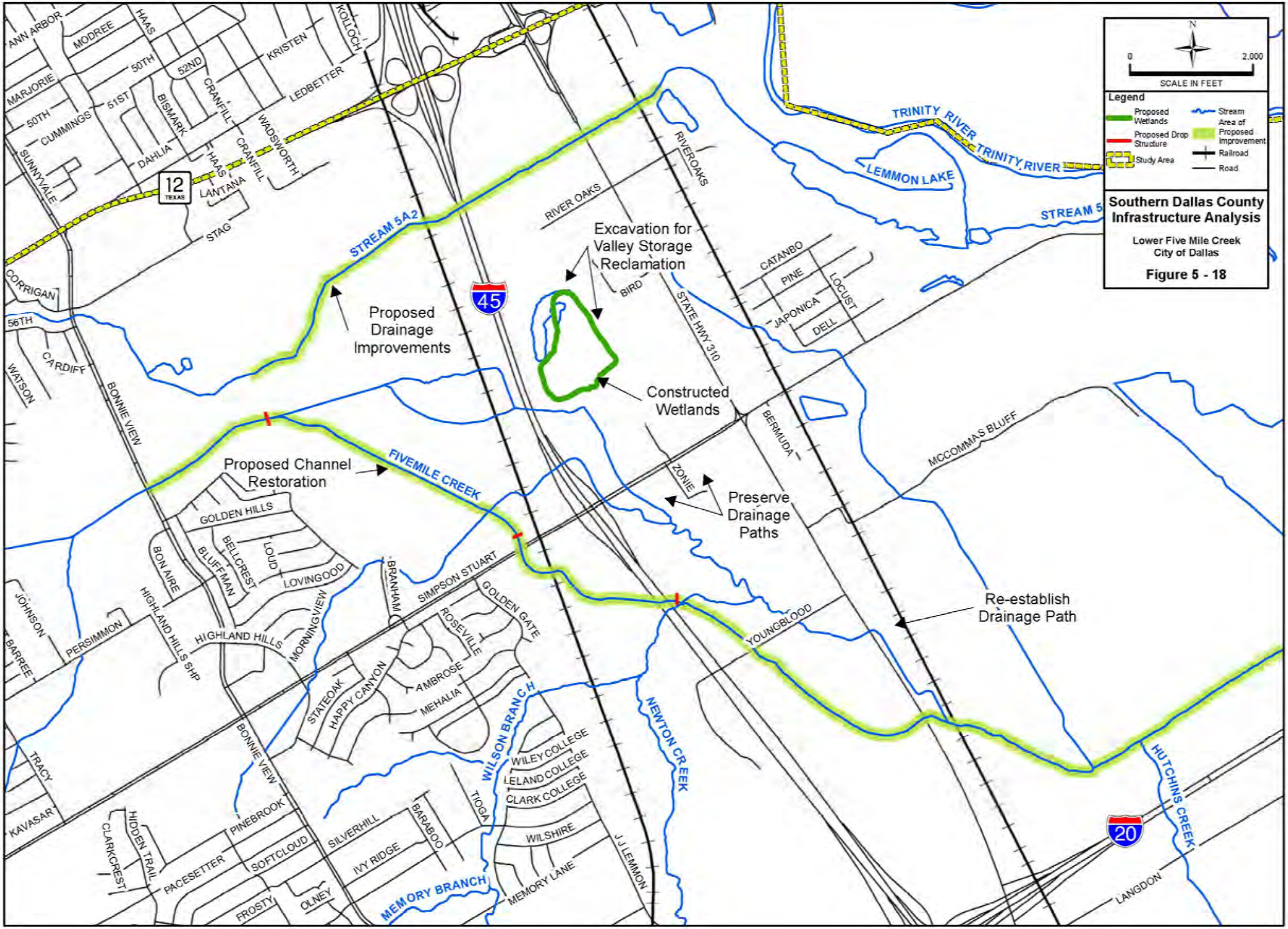
In 2006, a Floodplain Management Plan was prepared for the City of Dallas for Lower Fivemile Creek (Bonnie View to the Trinity River). Recommendations from the plan included: channel restoration and channel improvements, construction of wetlands and restoration of valley storage, preservation of existing drainage paths, erosion control, and the potential of economic development. **Table 5-24** shows the estimated cost of the recommended alternative at the time of the study. **Figure 5-18** shows the location of the proposed drainage features for this planning study.

Table 5-24. 2006 Lower Fivemile Floodplain Management Plan

Item (Responsibility)	Estimated Cost
Channel Restoration (City of Dallas)	$6,500,000
Mitigation, Landscape, and Trails (City of Dallas)	$2,400,000
Floodplain Reclamation (Private)	$12,100,000
Total	**$21,000,000**

Source: August 2006 Lower Fivemile Creek Floodplain Management Study

A 1976 Floodplain Management study exists for the entire Fivemile Creek Basin; however, for the portion of Fivemile below Bonnie View the 2006 study above supersedes the 1976 study recommendations. Between Bonnie View and IH35, the 1976 plan recommends that a series of small dams and lakes be created starting just downstream of Bonnie View and extending up Fivemile Creek to Marsalis Avenue. Based on the 1976 cost estimate, total project cost for this recommendation was $5,800,000. Before implementation of the 1976 plan, it is highly recommended that the reach of Fivemile Creek between Bonnie View and IH35 be reevaluated in order to check the continued validity of the original recommendation. The cost of this reevaluation could be as much as $250,000.


N
0
2,000
SCALE IN FEET
Legend
Proposed Wetlands
Proposed Drop Structure
Study Area
Stream
Area of Proposed Improvement
Railroad
Road
Southern Dallas County Infrastructure Analysis
Lower Five Mile Creek
City of Dallas
Figure 5 - 18
Excavation for Valley Storage Reclamation
Proposed Drainage Improvements
Constructed Wetlands
Proposed Channel Restoration
Preserve Drainage Paths
Re-establish Drainage Path
STREAM 5A2
STREAM 5
TRINITY RIVER
TRINITY RIVER
LEMMON LAKE
FIVEMILE CREEK
WILSON BRANCH
NEWTON CREEK
MEMORY BRANCH
HUTCHINS CREEK
RIVER OAKS
RIVEROAKS
STATE HWY 310
BERMUDA
MCCOMMAS BLUFF
YOUNGBLOOD
LANGDON
ANN ARBOR
MODREE
HAAS
KOLLOCH
KRISTEN
MARJORIE
50TH
52ND
CRANFILL
LEDBETTER
CUMMINGS
51ST
BISMARK
WADSWORTH
SUNNYVALE
DAHLIA
LANTANA
STAG
CORRIGAN
56TH
CARDIFF
WATSON
BONNIE VIEW
CATANBO
PINE
JAPONICA
LOCUST
DELL
BIRD
ZONIE
GOLDEN HILLS
BON AIRE
BELLCREST
BLUFFMAN
LOUD
LOVINGOOD
BRANHAM
SIMPSON STUART
GOLDEN GATE
ROSEVILLE
JOHNSON
PERSIMMON
BARREE
HIGHLAND HILLS SHP
HIGHLAND HILLS
MORNINGVIEW
STATEOAK
HAPPY CANYON
AMBROSE
MEHALIA
TRACY
KAVASAR
CLARKCREST
HIDDEN TRAIL
PACESETTER
PINEBROOK
SOFTCLOUD
FROSTY
OLNEY
SILVERHILL
IVY RIDGE
BARABOO
TIOGA
WILEY COLLEGE
LELAND COLLEGE
CLARK COLLEGE
WILSHIRE
MEMORY LANE
J J LEMMON
45
12
TEXAS
20

SUMMARY

All members of the South Dallas County Infrastructure Analysis (SDCIA) area have adopted the minimum required floodplain regulations in order to be a part of the Nation Flood Insurance Program. Dallas and Lancaster have taken their floodplain ordinance and stormwater ordinances a step further than the minimum and require more stringent conditions for developments in order to limit impacts to adjacent properties and communities. Based on the assessment, adopting similar floodplain regulations by the other members of the SDCIA area is recommended for consistency in all communities.

Existing information on storm sewers, detention/retention ponds, ditches, and curb and gutters is lacking except in the areas where new construction has occurred. Field surveys are highly recommended to document the locations and sizes of existing infrastructure and to assess its condition. This information is critical to the process of determining what new infrastructure is needed as future development occurs. The cost of such an investigation can range from $50,000 per community (for a limited investigation) or to as much as $100,000 per square mile for a detailed investigation.

As for floodplain related information, a significant number of streams in the area have been studied and mapped. However, a review of the FEMA flood profiles and maps reveal that there are several instances where discrepancies exist. An update of the hydrology and hydraulics of the streams in the SDCIA area is recommended. Updating the models would allow for the correction of inaccuracies shown in the current Flood Insurance Study and Federal Emergency Management Agency floodplain maps, and allow the communities to better manage their floodplains as development occurs. The cost of such a study is estimated at $2,000,000 for all streams in the SDCIA area. Additionally, as the area develops, communities need to make sure that Letters of Map Revision (LOMR) are submitted to FEMA so that FEMA profiles and maps are updated.

Even before the area develops, the communities in the SDCIA should consider reconstructing those bridges and culverts that are overtopped by the one percent annual chance of exceedance (100-year) floodplain for the safety of the public. Replacement of these structures should start with those listed as having a priority of “1”, and then followed by those having a priority of “2” and”3”, respectively, unless future development dictates differently. The total estimated cost of reconstructing all the structures inundated is $48,200,000.

The Dallas Logistics Hub development provided an example of cities within the SDCIA area working together to address stormwater related issues before development occurs. Adoption of a similar agreement by the member cities that will be impacted by the IIPOD development is recommended. The cost of implementing such an agreement would require the construction of approximately $206,500,000 worth of stormwater related infrastructure as part of the IIPOD development. The implementation of the features associated with Lower Fivemile Creek is also recommended. This project is located entirely in the City of Dallas and would require either the City of Dallas and/or a developer to fund the construction of the stormwater features. The total cost associated with the 2004 Lower Fivemile Plan was estimated to be approximately $21,000,000.

A master drainage study for the entire SDCIA area similar to what was prepared for the Dallas Logistics Hub should also be considered. This will allow for consistency across the entire SDCIA area. This effort will develop a floodplain management plan that includes a detailed evaluation of alternatives for channelization, structure improvements, detention, diversions, water quality issues,

and nonstructural alternatives. The cost associated with such a study is approximately $1,800,000, which would be performed subsequent to the recommended hydrology and hydraulic model updates mentioned previously.

At the time of this report, none of the projects mentioned above have been funded, studied, designed, or constructed.

Reference 10

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Lane Plating Works, Inc. PCA: 78434

5322 Bonnie View Rd., Dallas, Dallas Co., TX

TCEQ PM: Rebecca Comeaux (512) 239-2466

Texas Commission on Environmental Quality (TCEQ)
Superfund Program, Remediation Division
12100 Park 35 Circle, Bldg. D, Austin, TX MC-136

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Contents Lane Plating Works, Inc.

	Page
PA Site Visit - Rebecca Comeaux and Stephen Ellis	1-9

Contents

Page

Lane Plating Works, PA Site Visit 2/24/10

0840 Depart TCEQ for Dallas for Lane Plating PA Site Visit. Stephen Ellis and Rebecca Comeaux.

1135 Phone call to Dorothy Lewis, RP - will meet her on-site at 12:15 - 12:30 PM.

1143 Served - Out has DUST air particulate monitor in the car - reading of 0.01 to 0.02.

1204 TCEQ arrives on-site, waiting for Dorothy Lewis.

1218 56th + Cardiff - fire hydrant - Neighborhood NW of site, City water. Fire hydrant on Bonnie View across from neighborhood.

1225 "photo 2692" - N View Baseball Diamond - ridge along Bonnie View "2693" N View 2, ~~2695~~ misc "2694" NW View Baseball Diamond "2695" S View from Baseball Diamond - creek "26996 + 26997" E View creek N of Baseball Diamond & S. of Site. All photos taken by Rebecca Comeaux

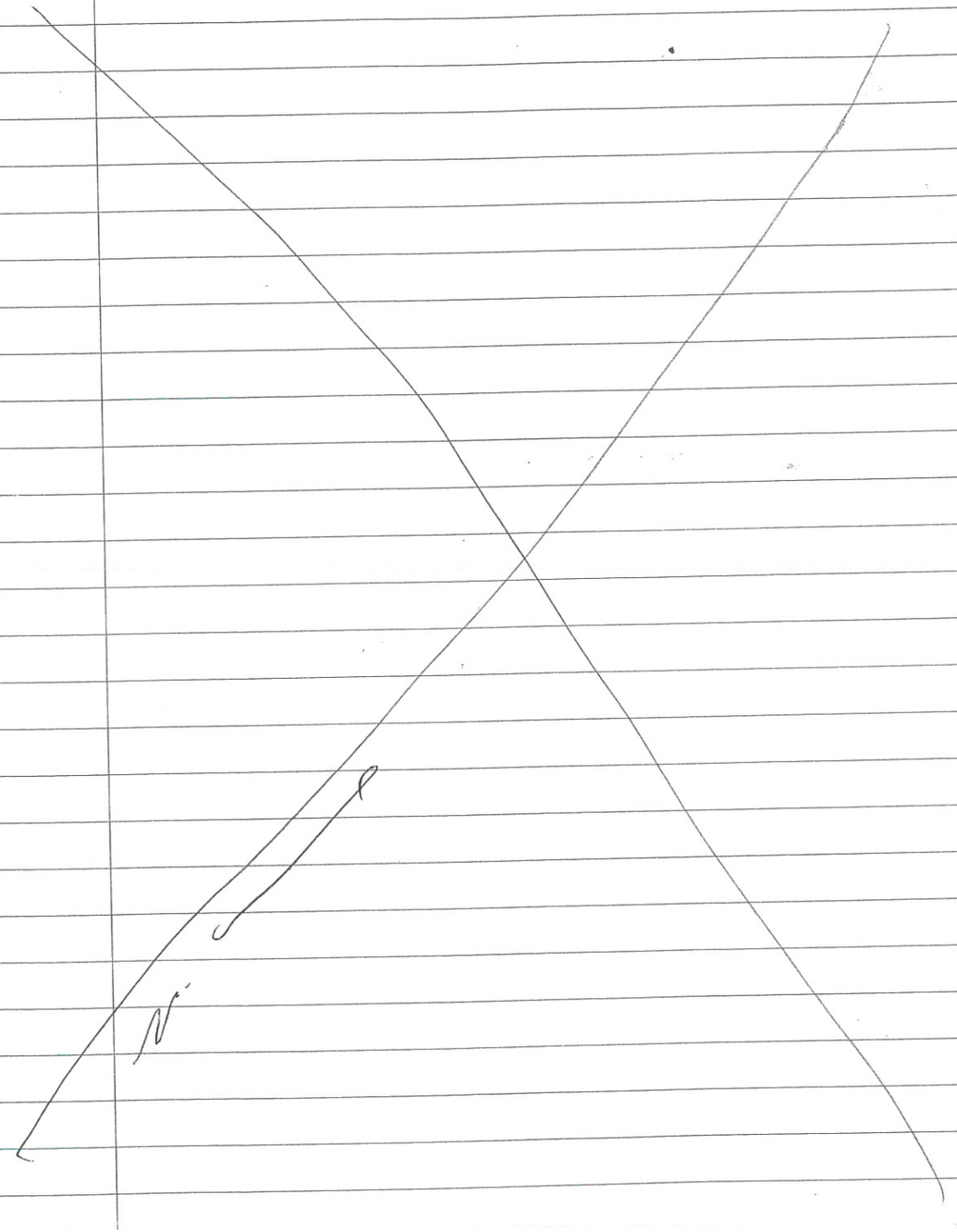
1245 potential well house at corner of Bonnie View & Stagg. middle school not present by High School on Stagg - preschool is present.

1247 waiting for Dorothy Lewis to arrive on-site. Prevailing winds from the N/NW. 52°, clear & sunny, windy.

1249 - Calculating bkgd. air reading N. of site. 1st reading 0.14 mg/m^3.

1250 1.13 mg/m^3 - N/A because walking around.

1252 0.14 to 0.55 mg/m^3 - sharp turns while walking



Lane Plating Works, PA Site Visit 2/24/10

appear to influence reading.

1258 0.02 to 0.20 – TCEQ will retake readings while standing still to avoid fluctuations.

1259 Dorothy Lewis on site. Reading 1 – 0.08

1300 Reading 2 – 0.02

1301 Reading 3 – 0.01, Average (standing still) = 0.036

= 0.04 mg/m3

Fluctuates at 0.50 – 1.0 while moving.

1311 HTS meeting.

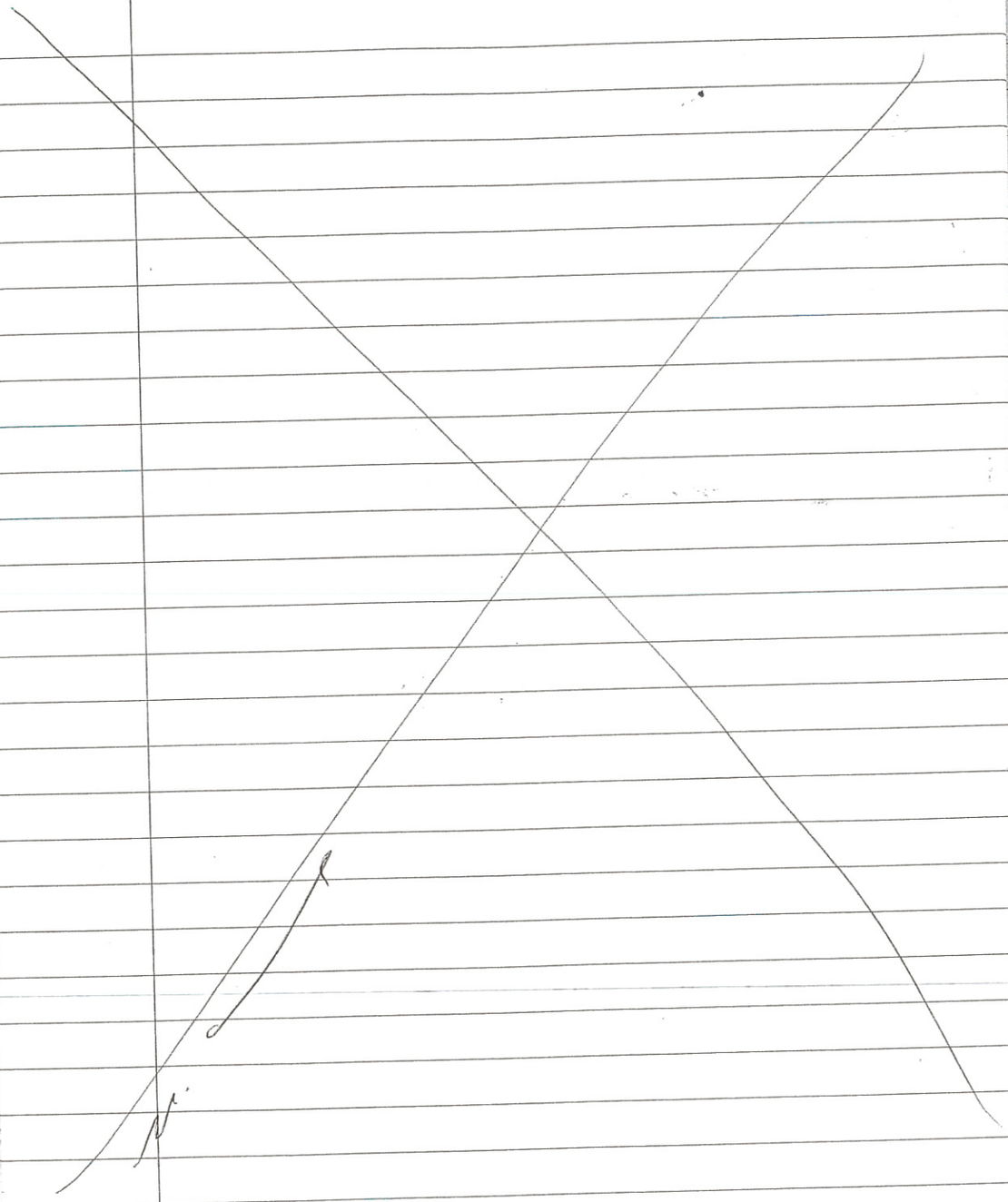
1326 Start site walk – 2 wells located on N. side of facility bldg. Both open (can look down into water). "photo 2698" – NW view WW-1, "2699" – E view WW-1, "2700" – WW-1 aerial. "Photo 2701" – NW view WW-2, "2702" – E view WW-2, "2703" – NW view WW-2, "2704" aerial view WW-2.

1329 GPS points – all taken by Rebecca Comeaux of both wells. WW-1 (NW corner of bldg.): "A022413A-WW-1." WW-2 (N bldg., central): "A022413B-WW-2."

1500 Finish site walk – general sketch of immediate drainage.

1510 Dorothy Lewis off-site – RH (TCEQ) sampled both on-site wells w/ bailers today for metals (1st time wells sampled). Dorothy indicated site was connected to city water & did not drink from wells.

1530 TCEQ depart site – drive down I-45 to look at potential creek crossing.



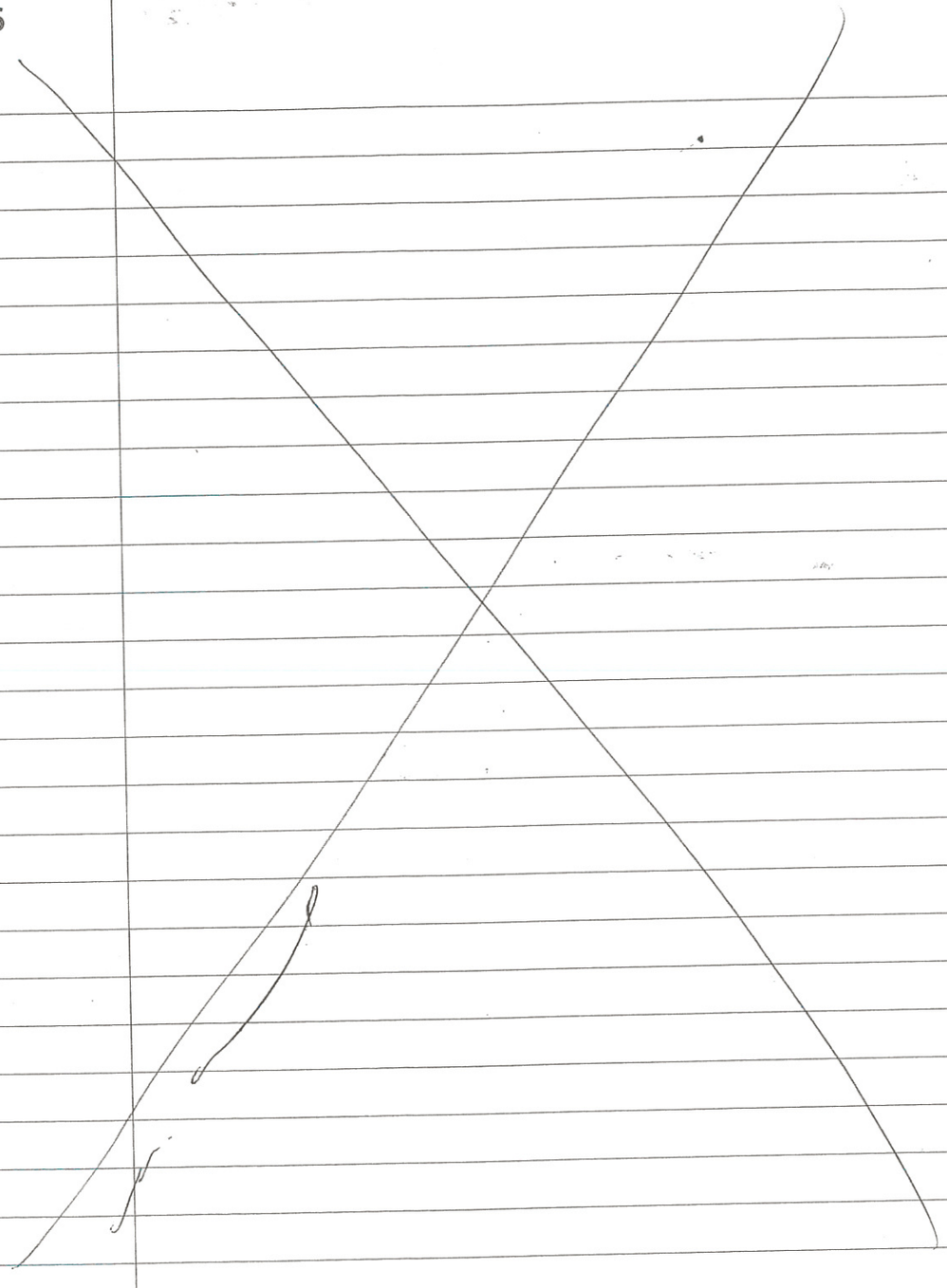
Lane Plating Works, PA Site Visit 2/24/16

1545 Stop at gas station for restroom & snacks.

1557 Depart for Austin - Rebecca to document photos/GPS taken during site walk.

1600 GPS points (site walk): "A022414D-pond" - area where drainage ditch coming from site starts to pond up. Heavy rains on 2/23/16 made drainage off-site pathways apparent. "A022414E-POE creek": confluence of ditch drainage coming from adjacent OF facility building on E side, South, to larger creek coming from W under-neath Bonnie View Rd. A secondary, larger ditch also enters this point from a northern small pond, located SE of the site. "A022414F-main pond" - pond located SE of site, took (ex) SW corner of pond, where it connects to creek draining S towards POE.

1605 pictures taken (site walk): "2705" - ponding near Bonnie View Rd, S of site at fenceline, "2709" - View looking N from NE corner of facility bldg. - drainage pathway coming from W side of property, "2710" - same NE bldg. corner, View of drainage pathway turning S, adjacent to facility on E side. "2711" - tank with "acid" sticker on it located S of site (E of fenceline), "2712"/"2713" "2714" - ponding area of drainage pathway followed S of site, "2715" - secondary drainage ditch near pond, view to W, "2716" - secondary drainage ditch, view to N with pond in background. "2717 +



Lane Plating Works, PA Site Visit 2/24/16

2718" - POE confluence of bam drainage ditches with creek that runs W underneath Bonnie View Rd. (from W.) "2719" - N view of small pond located SE of site, secondary drainage ditch connected + flowing S at SW pond corner. "2720" N view small pond. "2721" - SW view of small pond - stream seen entering pond's NE corner from the N. "2722 + 2723". N. view of land north of small pond (facility + house). "2724" S view small pond. "2725" closeup view of W. side of pond - horse tracks. "2726" field located W of small pond - appears to flood / collect general drained water in the area. "2727" - rectangular depression, filled w/ water, located E of facility + fenceline + 1st drainage pathway + W of small pond, view to N. "2728" - view at rectangular depression looking SE. "2729" 1st drainage pathway, located adjacent E to the E side of facility building, looking S. "2730 + 2731" - 1st drainage pathway looking N. "2732" ponded area S. of site + close to S. fenceline / Bonnie View Rd., looking W, "2733" - ponded area from "2732" looking S. "2734" - drainage creek that crosses I-45 just S. of entrance ramp from I2, looking SW. "2735 + 2736" - creek crossing I-45 looking SE/E.

Lane Plating Works, PA Site Visit 2/24/14

1042 Site sketch - 2 aerial photos. : (1) Closeup photo site vicinity - 1st drainage path shown immediately N + E of facility bldg - (2) Zoomed-out photo, shows secondary drainage path located farther E of site, connects to small pond, and shows confluence with 1st drainage path at approximate POE location.

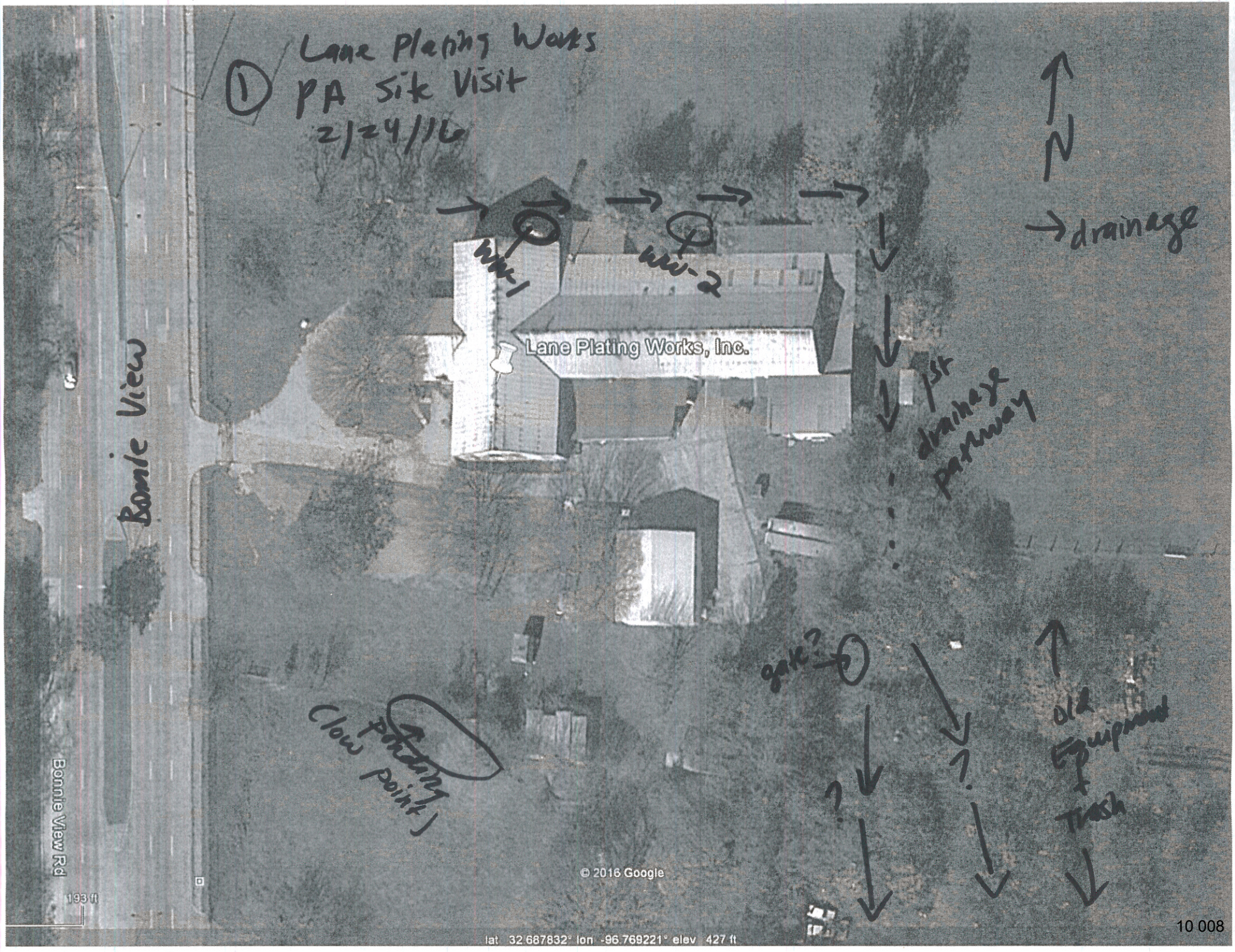
1052 Arrive back at TCCQ headquarters. End of day.

(PSC)

Health and Safety Checklist

2/24/16

- ✓ 1. Safety briefing
- ✓ 2. Initial site survey
- ✓ 3. PPE: Tyvek coveralls, boots, inner and outer gloves, respirator, organic and particulate filter canisters, hard hat, goggles and tape
- ✓ 4. Field Inspection equipment: watch, field notebook, site map, pencils and pens, PA reconnaissance checklist, camera, steel measuring tape, telephone
- ✓ 5. First aid and snakebite kits
- ✓ 6. Calibrated air monitoring device
- ✓ 7. Water
- ✓ 8. Emergency contact list and map to hospital
- ✓ 9. Weather gear: rain gear, cold weather gear, etc.


① Lane Plating Works
PA Site Visit
2/24/16
N
→drainage
MW-1
MW-2
Lane Plating Works, Inc.
1st drainage pathway
Bonnie View
Bonnie View Rd
193 ft
gate?
old Equipment
Trash
Potential flow point
© 2016 Google
lat 32.687832° lon -96.769221° elev 427 ft
10 008

Southwick Dr
Cardiff St
Lauderdale St
Bonnie View Rd
Lane Plating Works, Inc.
(2) Lane Plating Works PA site visit 2/24/16
1st drainage pathway
drainage
N
parking
grassy field (not sports)
major creek
pond
2nd drainage pathway
dumpster
© 2016 Google
708 ft
10 009

Reference 11

Lane Plating Works, Inc. Site Photographs
Photographs 1-18, 20-28 taken by Rebecca Comeaux on February 24, 2016.
Photograph 19 taken by Stephen Ellis on February 24, 2016.

Photo 1 (2692): Bonnie View Rd. and baseball diamond located South of site with. Steep ridge from road to baseball diamond, facing North.

Photo 2 (2695): Creek that crosses Bonnie View Rd., facing North.

Lane Plating Works, Inc. Site Photographs
Photographs 1-18, 20-28 taken by Rebecca Comeaux on February 24, 2016.
Photograph 19 taken by Stephen Ellis on February 24, 2016.

Photo 3 (2696): Creek that crosses Bonnie View Rd., located South of site and North of baseball diamond, facing East from Bonnie View Rd.

Photo 4 (2698): Onsite well 1 (WW-1) located on Northwest side of facility building, facing Northwest.

Lane Plating Works, Inc. Site Photographs
Photographs 1-18, 20-28 taken by Rebecca Comeaux on February 24, 2016.
Photograph 19 taken by Stephen Ellis on February 24, 2016.

Photo 5 (2699): WW-1, facing East.

Photo 6 (2700): WW-1, aerial view.

Lane Plating Works, Inc. Site Photographs
Photographs 1-18, 20-28 taken by Rebecca Comeaux on February 24, 2016.
Photograph 19 taken by Stephen Ellis on February 24, 2016.

Photo 7 (2702): Onsite well 2 (WW-2) located on North/Northwest side of facility building, facing East.

Photo 8 (2703): WW-2, facing Northwest.

Lane Plating Works, Inc. Site Photographs
Photographs 1-18, 20-28 taken by Rebecca Comeaux on February 24, 2016.
Photograph 19 taken by Stephen Ellis on February 24, 2016.

Photo 9 (2704): WW-2, aerial view.

Photo 10 (2705): Water collection and ponding area after rain event, located on south end of site at fence line, facing West.

Lane Plating Works, Inc. Site Photographs
Photographs 1-18, 20-28 taken by Rebecca Comeaux on February 24, 2016.
Photograph 19 taken by Stephen Ellis on February 24, 2016.

Photo 11 (2709): Drainage pathway coming from Northwest side of site property along facility building, facing West from Northeast corner of building.

Photo 12 (2710): Drainage pathway continuing from Northeast corner of building towards the South along the East side of the facility building, facing South.

Lane Plating Works, Inc. Site Photographs
Photographs 1-18, 20-28 taken by Rebecca Comeaux on February 24, 2016.
Photograph 19 taken by Stephen Ellis on February 24, 2016.

Photo 13 (2729): Drainage pathway East of the facility building flowing towards the South, facing South.

Photo 14 (2730): Drainage pathway East of the facility building, facing North.

Lane Plating Works, Inc. Site Photographs
Photographs 1-18, 20-28 taken by Rebecca Comeaux on February 24, 2016.
Photograph 19 taken by Stephen Ellis on February 24, 2016.

Photo 15 (2713): Old tank with “Danger Acid” sticker located South of main site property and East of fence line near drainage pathway, facing Southwest.

Photo 16 (2714): Water collection and ponding area along drainage pathway South of site, facing South. Merges into creek that flows South/Southeast.

Lane Plating Works, Inc. Site Photographs
Photographs 1-18, 20-28 taken by Rebecca Comeaux on February 24, 2016.
Photograph 19 taken by Stephen Ellis on February 24, 2016.

Photo 17 (2715): Second creek near small pond (located Southeast of site), facing West.

Photo 18 (2716): Second creek/drainage ditch near small pond (in background), facing North.

Lane Plating Works, Inc. Site Photographs
Photographs 1-18, 20-28 taken by Rebecca Comeaux on February 24, 2016.
Photograph 19 taken by Stephen Ellis on February 24, 2016.

Photo 19 (2718): PPE confluence of two creeks (Southern drainage pathway from site/creek and creek that branches from small pond) with creek that crosses Bonnie View Rd. South of site and North of baseball diamond, facing South.

Photo 20 (2719): Small pond located Southeast of site, with second creek flowing out of the Southwest corner towards the south, facing North.

Lane Plating Works, Inc. Site Photographs
Photographs 1-18, 20-28 taken by Rebecca Comeaux on February 24, 2016.
Photograph 19 taken by Stephen Ellis on February 24, 2016.

Photo 21 (2721): Small pond located Southeast of site, with creek flowing into the northeast corner of the pond from the North, facing Southwest.

Photo 22 (2723): Area North of small pond with site located on West side, facing North.

Lane Plating Works, Inc. Site Photographs
Photographs 1-18, 20-28 taken by Rebecca Comeaux on February 24, 2016.
Photograph 19 taken by Stephen Ellis on February 24, 2016.

Photo 23 (2724): Small pond located Southeast of site, facing South.

Photo 24 (2725): Close-up view of West edge of small pond with horse tracks, facing Southeast.

Lane Plating Works, Inc. Site Photographs
Photographs 1-18, 20-28 taken by Rebecca Comeaux on February 24, 2016.
Photograph 19 taken by Stephen Ellis on February 24, 2016.

Photo 25 (2726): Field located South of site and West of small pond, saturated with water drainage from recent rain event, facing South.

Photo 26 (2727): Rectangular depression in ground, filled with rain water, located East of site and southern drainage pathway and West of small pond, facing North.

Lane Plating Works, Inc. Site Photographs
Photographs 1-18, 20-28 taken by Rebecca Comeaux on February 24, 2016.
Photograph 19 taken by Stephen Ellis on February 24, 2016.

Photo 27 (2734): Drainage ditch/creek that crosses I-45 to the East of the site, just South of the entrance ramp from Loop 12, facing Southwest.

Photo 28 (2735): Drainage ditch/creek that crosses I-45 to the East of the site, just South of the entrance ramp from Loop 12, facing East.

Reference 12

Rebecca Comeaux

From: Sharon Barker
Sent: Monday, February 22, 2016 11:43 AM
To: Stephen Ellis; Rebecca Comeaux
Subject: FW: Lane Plating: February 18, 2016 Site Recon
Attachments: IMG_1229.JPG; IMG_1206.JPG; IMG_1208.JPG; IMG_1213.JPG; IMG_1215.JPG; IMG_1218.JPG; IMG_1228.JPG

Importance: High

Follow Up Flag: Follow up
Flag Status: Flagged

FYI

Sharon Barker, P.G.
Superfund Section, MC-136
Remediation Division
Texas Commission on Environmental Quality
Phone: 512-239-2473
Email: Sharon.Barker@tceq.texas.gov

From: Omar Valdez
Sent: Monday, February 22, 2016 11:39 AM
To: Monica Harris <monica.harris@tceq.texas.gov>; Sharon Barker <Sharon.Barker@tceq.texas.gov>
Subject: Lane Plating: February 18, 2016 Site Recon
Importance: High

Good morning,

I wanted to provide you with an update from the site recon last week with EPA at the subject site. Site conditions were consistent with what Region 4 staff had documented and per the emergency response conducted by CID. Ongoing releases (dripping) of suspected caustics from the ducts pertaining to their air scrubber were observed throughout the site. Plating baths and sumps still contain corrosive and cyanide compound containing wastes. There are large volumes of hazardous wastes throughout the site in containers that are in fair to poor condition. Incompatible materials and wastes whose reactions could lead to IDLH conditions are staged in close proximity throughout the facility. Surface and subsurface soils are visibly impacted by plating wastes apparently seeping underneath the foundation from plating baths and sumps. It appears that *wholesale demolition of the site may be necessary* to access what could be a significant amount of source wastes- wastes that very likely have been migrating to the subsurface for decades after nearly a century of plating operations. Both EPA and I agreed that response costs could conceivably near the federal $2 mil cap, although this very rough cost estimate is based on this preliminary visual assessment only at this time.

The site is clearly an imminent threat to human health and the environment and the only question is whether it is a time-critical situation or whether the threats rise to requiring an emergency response. EPA representatives were intimating that a case could be made on their end for ER work to stabilize the site and then a more methodical removal

assessment could ensue. The participating OSCs were to brief their management on their findings and I expect to hear back from them or Susan Webster in the next several business days.

A preliminary inventory of soil, groundwater, and surface water pathway receptors suggests this site is not likely to generate a state or federal qualifying HRS site score.

Let me know of you would like more detailed information or if clarification is needed.

Thanks!

Omar.

12 003

12 004

12 005

12 006

12 007

USA/M5648/____/____/RL

12 008

CHROMIUM (VI) TRIOXIDE

Index №.024-001-00-0

DANGER

(EN) DANGER. CHROMIUM (VI) TRIOXIDE. May cause fire or explosion; strong oxidizer. May cause skin sensitization. Suspected of damaging fertility or the unborn child. Fatal if inhaled. Fatal in contact with skin. Toxic if swallowed. Causes damage through prolonged or repeated exposure. Causes severe skin burns and eye damage. May cause lung damage. May cause respiratory difficulties if inhaled. May cause an allergic skin reaction. Very toxic to aquatic life with long lasting effects. Do not handle until all safety precautions have been read and understood. Obtain special instructions before use. Keep away from heat/sparks/open flames/hot surfaces. No smoking. Do not breathe dust/fume/gas/mist/vapours/spray. Wear protective gloves/protective clothing/eye protection/face protection. Keep only in original container. Avoid release to the environment. Collect spillage. Store away from combustibles materials. Wear protective gloves/protective clothing/eye protection/face protection. Wash thoroughly after handling. Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER or doctor/physician.

MADE IN KAZAKHSTAN
JSC Aktyubinsk Chromium Chemicals Plant
030015, Aktobe, Kazakhstan

Phone:
Emergency phone: +7 (7132) [illegible]

Synthetic
Compressor Oil
ISO-32 (PCH)

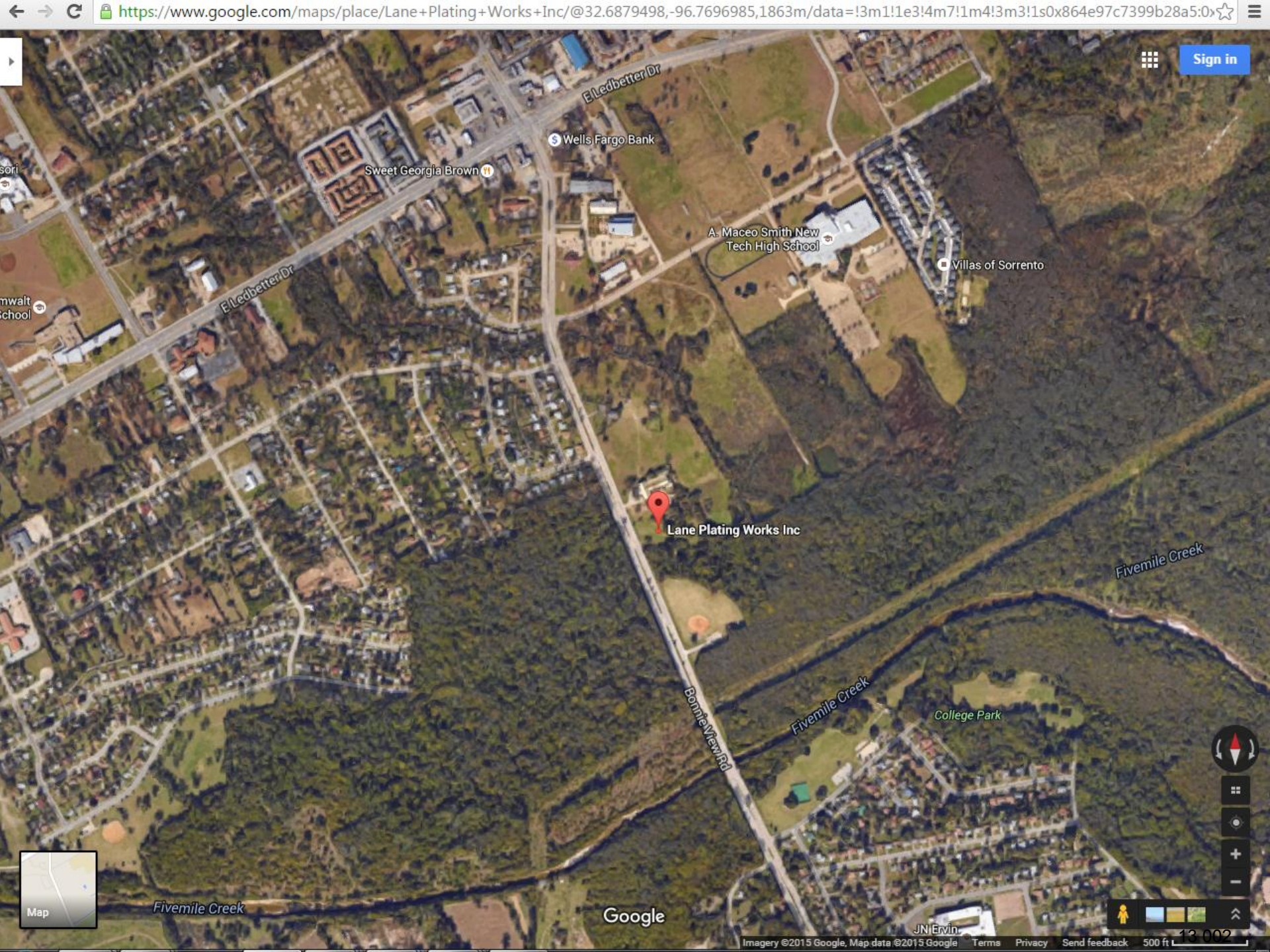
AWARNING AWARNING AWARNING
USA

GALAXY
WASTE
CONTAINER
13H4 / X / 0312 / IND / 2253790 / 2457 / 1365
1365 kg max
QUESTAR, INC.™
GALAXY
WASTE
CONTAINER
13H4 / X / 0312 / IND / 2253790 / 2457 / 1365
1365 kg max
QUESTAR, INC.™

Reference 13

Lane Plating Works

5322 Bonnie View Rd, Dallas, TX 75241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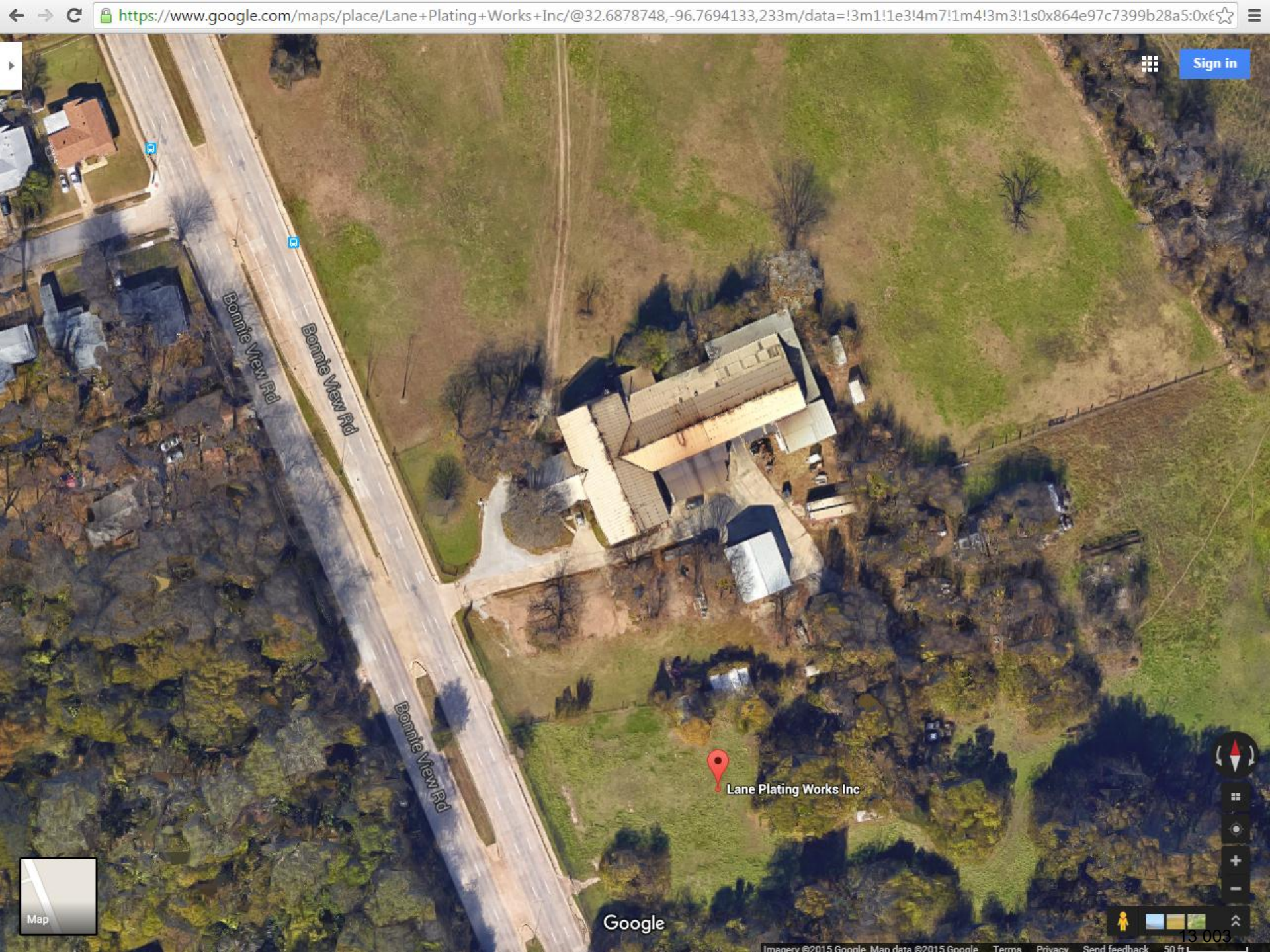
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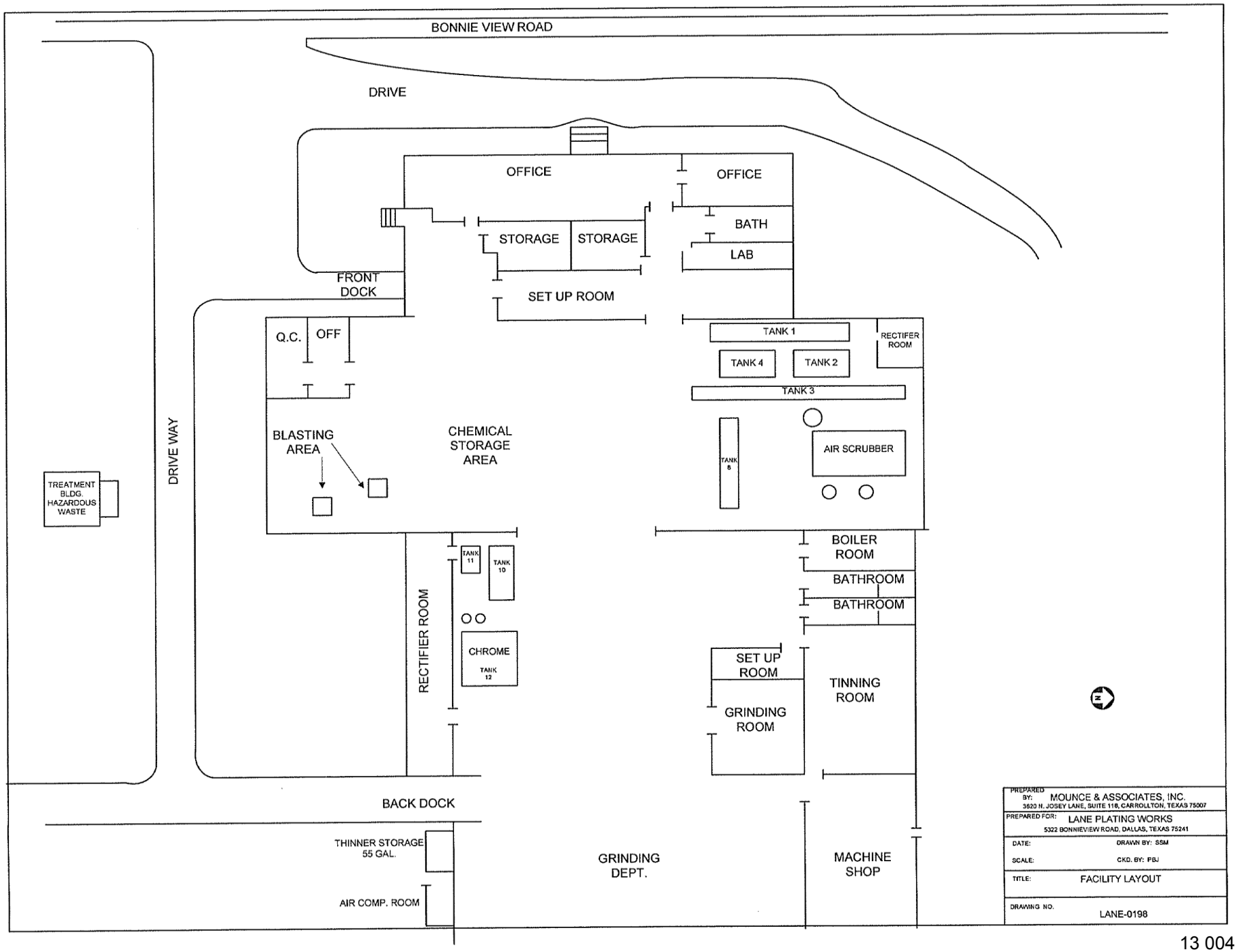
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AIR COMP. ROOM
GRINDING DEPT.
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DATE:
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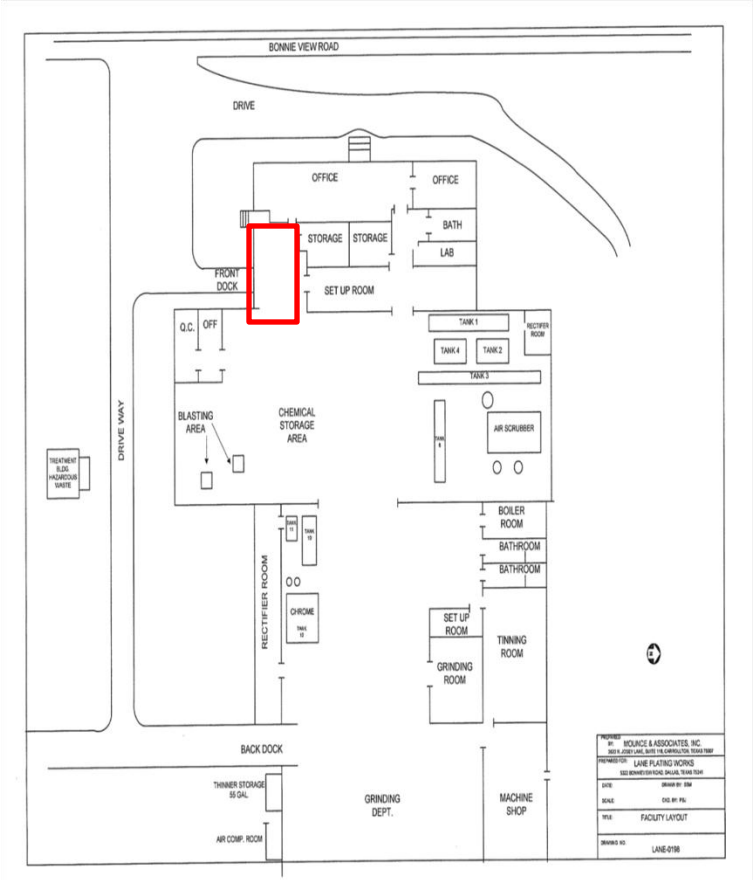
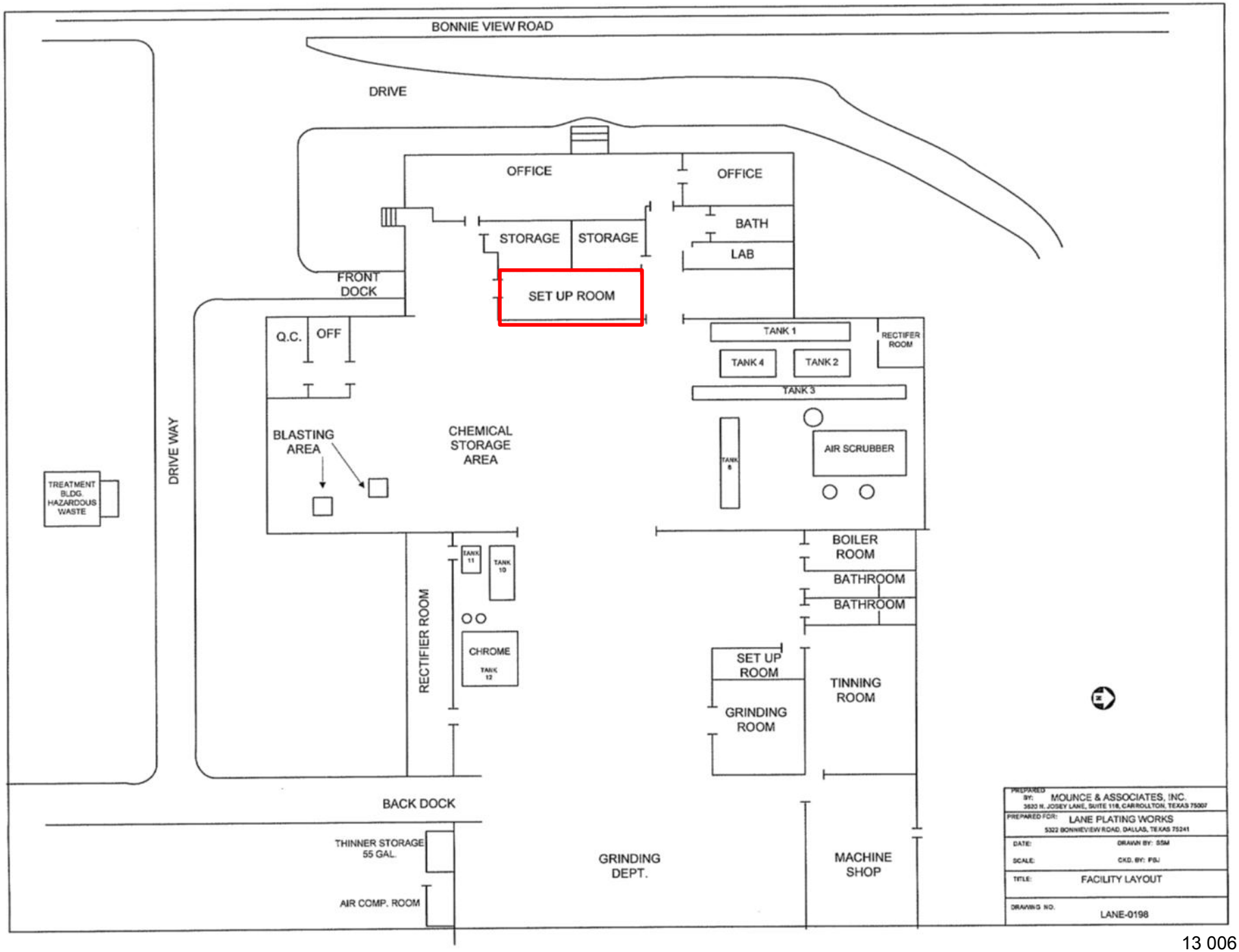
SCALE:
CKD. BY: PBJ
TITLE: FACILITY LAYOUT
DRAWING NO. LANE-0198

Cabinet on the north side of an unnamed space between the office and the Set Up Room

- One container of Nickel Strip

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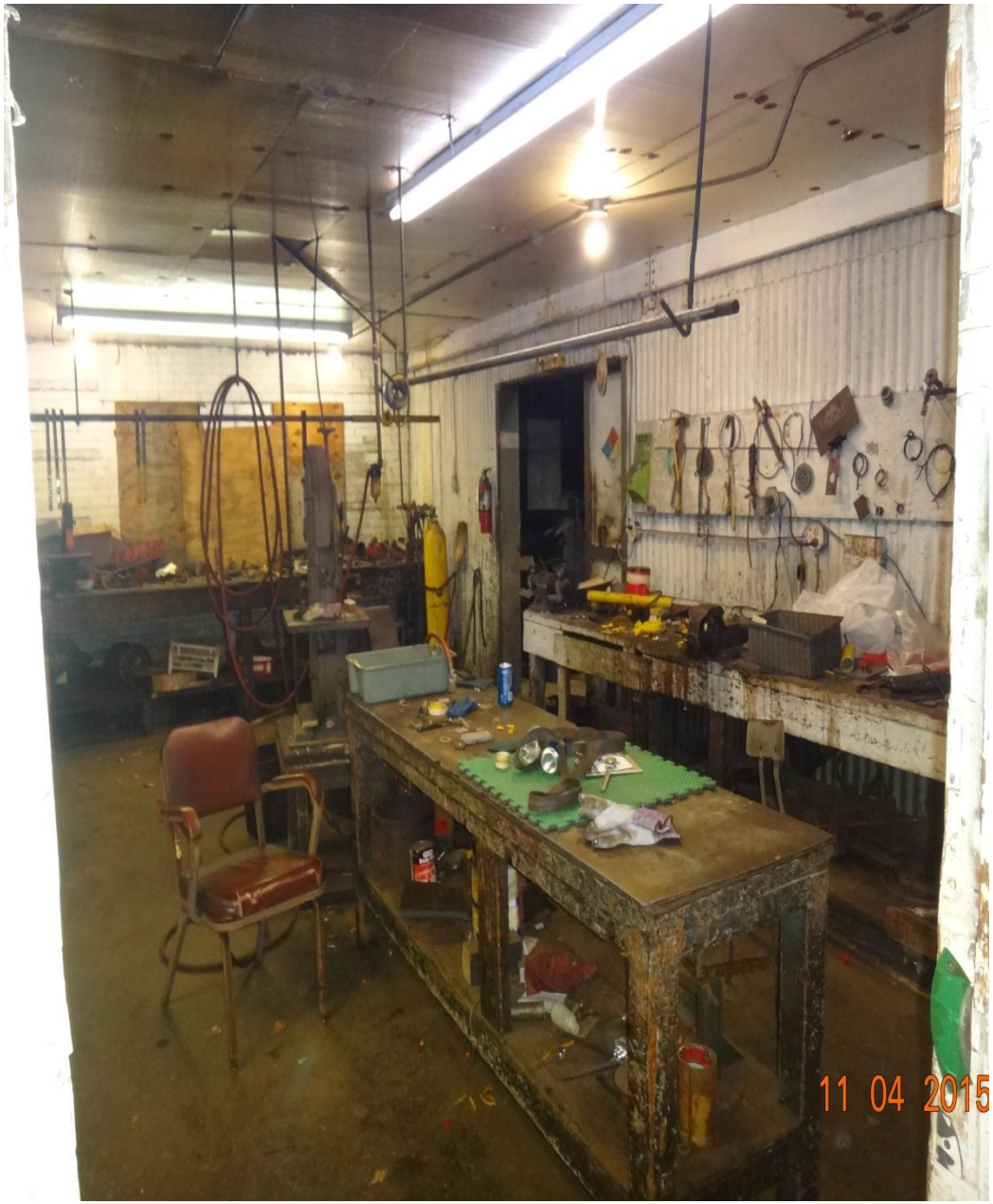
View of Set Up Room (facing northeast)

- Tools
- Lead Anodes



View of Set Up Room (North Side)

- Hanging Lead Anodes
- Equipment
- Tools

Set Up Room Cabinet

- Small Equipment Parts
- Lead Anodes

Attic Above Setup Room

- Storage of misc. plant and office equipment and documents.

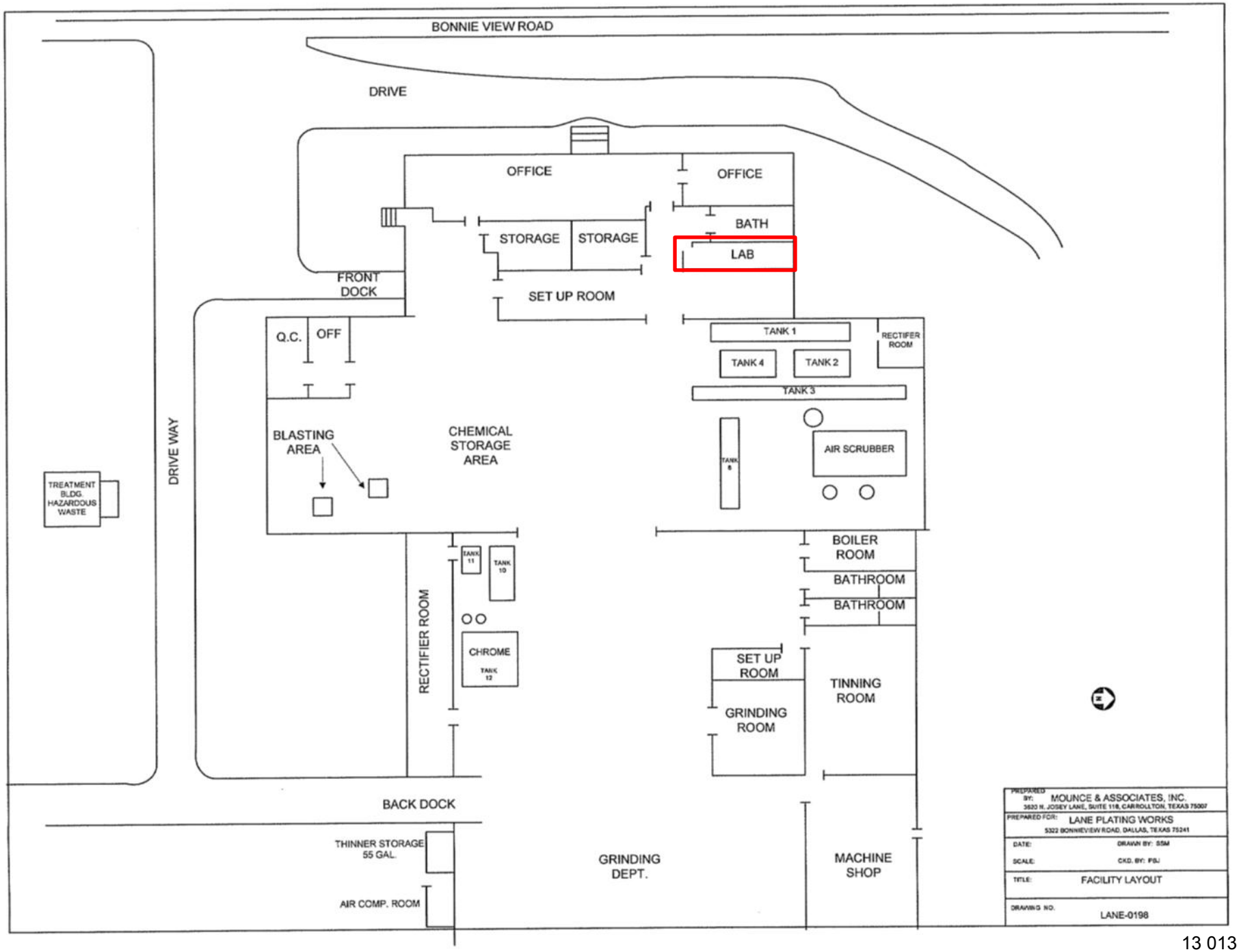
Attic Above Set Up Room

- Used for Storage of misc. plant and office equipment
- Lead Anodes
- One 2-gallon container of unknown liquid
- Container of Stripper

Attic Above Set Up Room Cabinet

- Containers of lubricant including transmission fluid

- Top shelf
  - -Four small containers of unknown
  - -500 mL bottle of etch aluminum cleaner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QA/QC Lab

- Lab Pack Waste
- 13 (~250 mL) containers of what appears to be plating samples on second shelf
- 15 (≤~100 mL) containers of potassium iodine, barium chloride, chromium reagent, chrome, and unknowns on the third shelf
- 18 (~50-75 mL) of sulfuric acid, magnesium hydroxide, and unknowns of fourth shelf
- 10 (various sizes) of containers of bench. One container is labeled oxidizer and one was an unknown acid with white crystals around the top.

QA/QC Lab

- Lab Pack Waste
- Additional waste on the 4th shelf and the bench. Bench waste in box contains unknowns. The 4th shelf containers are labeled barium chloride, chromium reagent, chromium, and unknown.

QA/QC Lab
View of Bottom Shelf

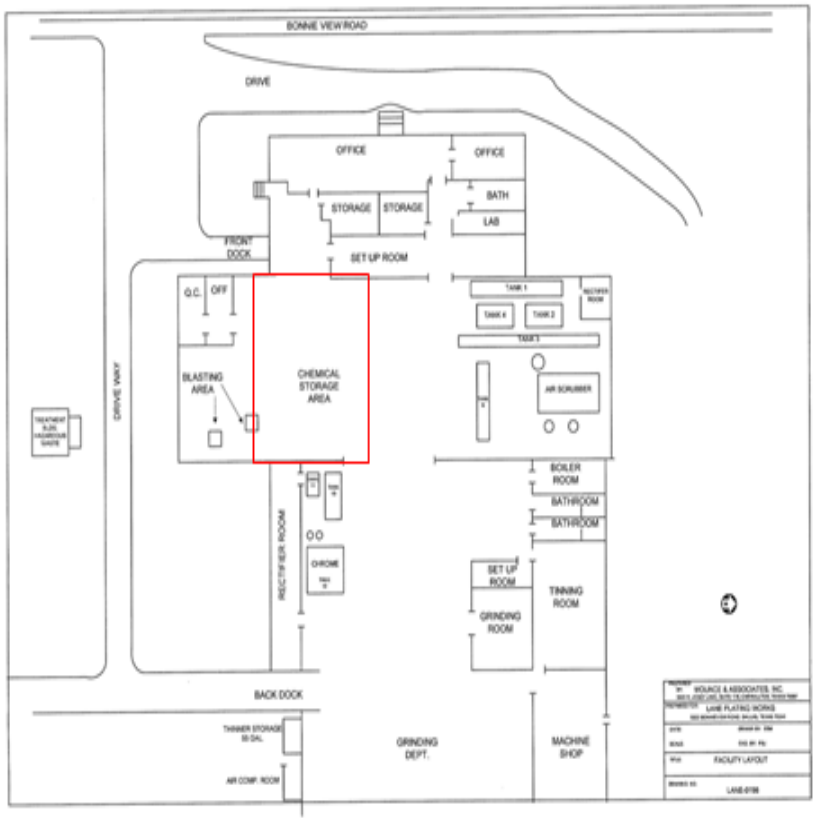
- Lab Pack Waste
- Gallons of latex paint
- One gallon of unknown in two containers
- 7 containers of labeled corrosive and silver oxide

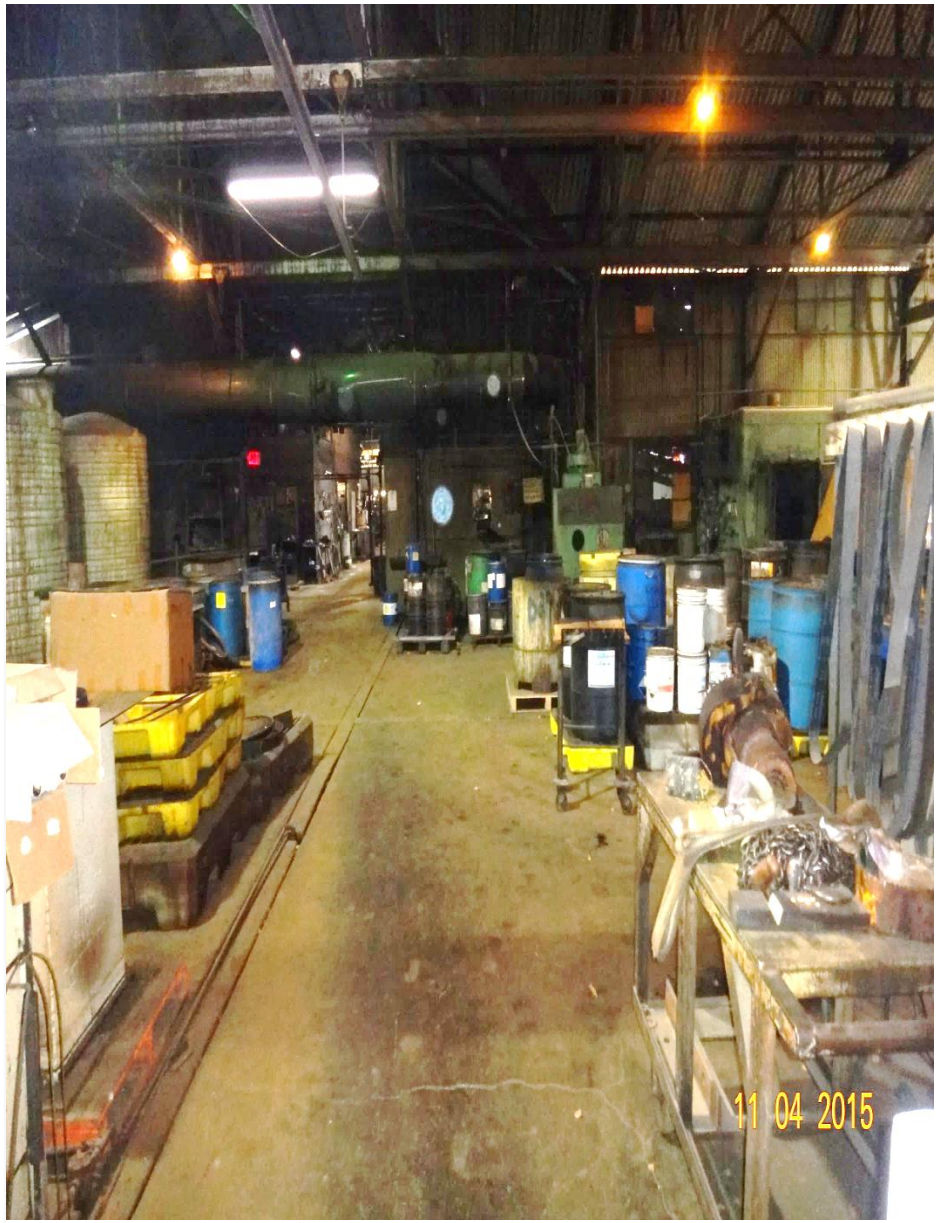
QA/QC Lab
Plastic Storage Drawers

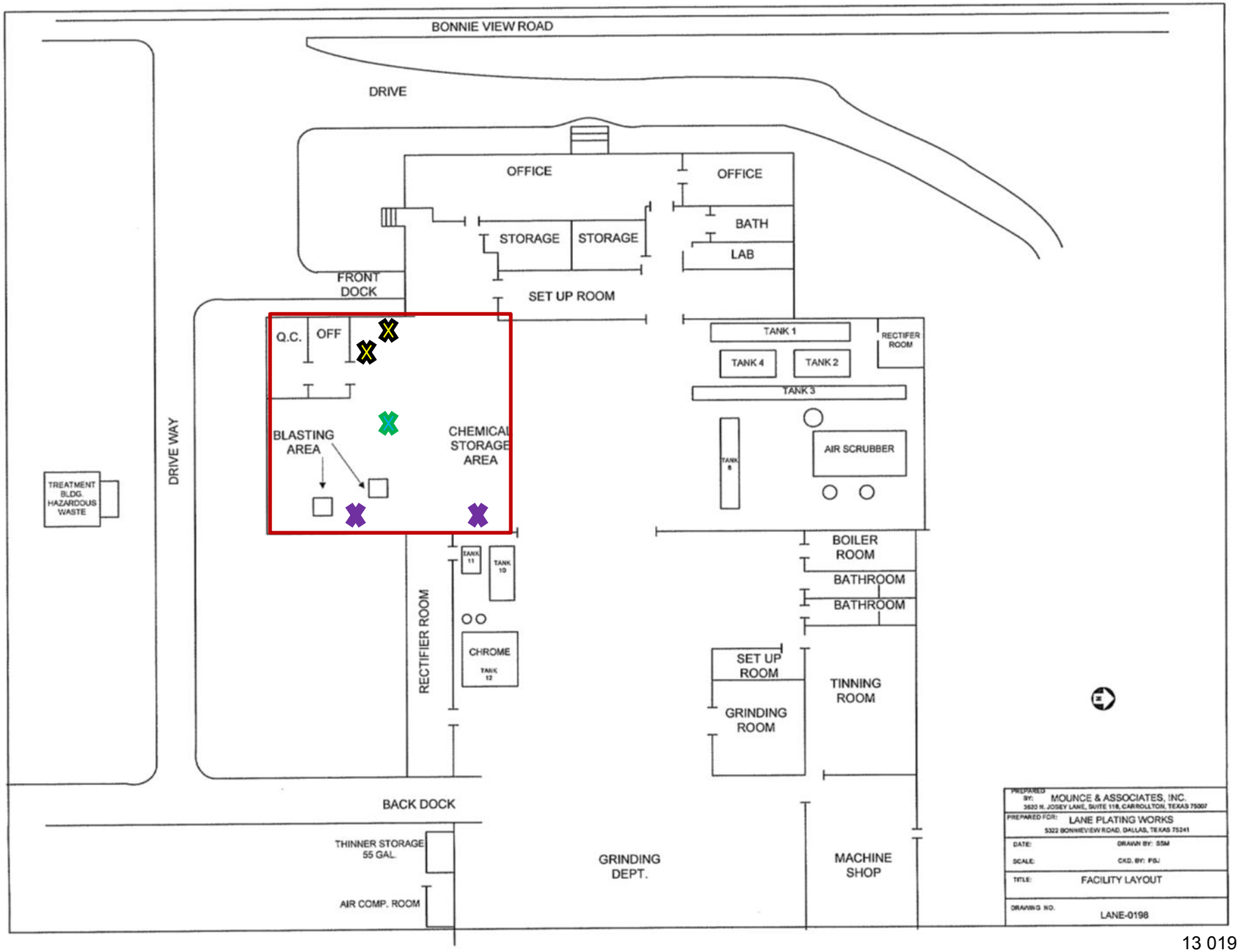
- Lab Pack Wastes
- Very small containers
- 9 (~750 mL) containers of unknown in the bottom drawer
- One ammonia aid container and one container of myrexide indicator in the middle drawer.
- Top drawer contained glassware

Container Storage Area (left)
Chemical Storage Area (right)

- Walking into the Waste Container Storage Areas facing east



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Waste Containers

- View of waste containers in the chemical storage area

CSA (facing south)

- 1st and 2nd rows of waste containers
- (22) 55-gallon drums of hydrochloric acid, caustic soda, and unknowns
- 2 unlabeled 10-gallon containers of unknowns
- 5 unlabeled 5-gallon containers of unknowns
- 4 unlabeled 5-gallon buckets
- 2 chromium dioxide containers

CSA (facing south)

- 3nd row of waste containers
- 10 unlabeled 55-gallon containers of unknown. One may be nitric acid.
- (1) 25-30 gallon container of corrosive (black magic 5S)
- (1) 5-gallon container of unknown on top of corrosive (blue magic) container
- (1) 35-40-gallon container of unknown
- 1 overpack containing nickel stripper
- Several bags of basting media (unused)

1st Chemical Cabinet

- Southwest Corner of Container Storage Area near Office/QA on west wall.
- Flammable Cabinet
- 22 containers of paint waste and adhesive. Assorted sizes 1-5 gallons.
- One 10 gallon container of chromium trioxide.

2nd Chemical Cabinet

- Southwest Corner of Container Storage Area near Office/QA on south wall.
- ~25-30 gallons of sodium cyanide (black container)
- ~25-30 gallons of potassium cyanide (blue container)

Waste Containers

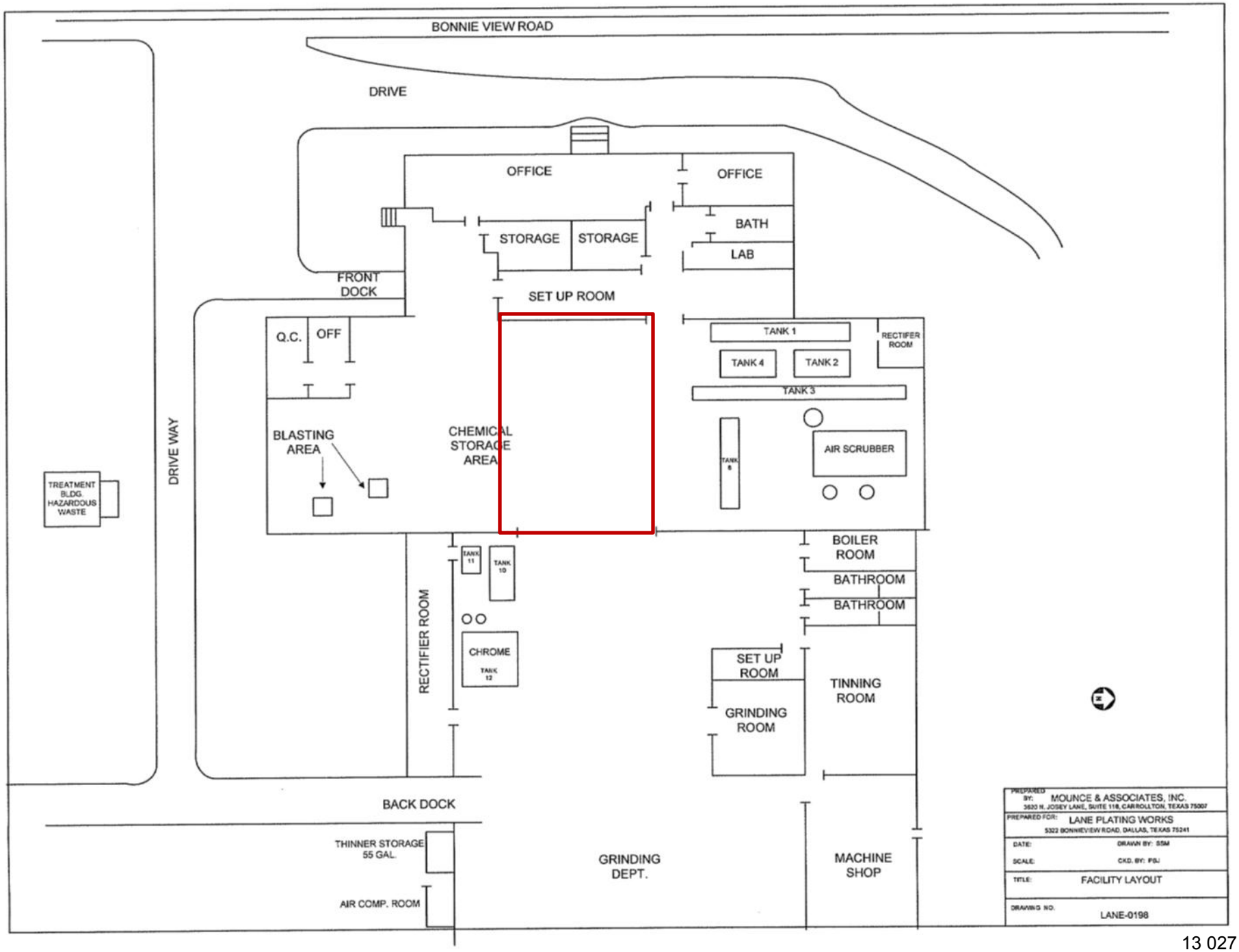
- 10 (~25 gallon) containers of unknown
- 8 smaller containers (5-10 gallons); one is corrosive, one is an oxidizer, and others are unknown
- Mr. Lane stated they may be alkaline cleaners.

Waste Containers

- Leaks from ~120 ft air duct dedicated to chromic acid tank

- Right photo
  - -(9) 55-gallon containers; one feels empty
  - -(4) 10-gallon containers
  - -Some containers labeled acid based salts, barium carbonate, and chromium trioxide

- Left photo
  - -(15) ~25-30 gallon containers of unknowns, acid based corrosives, ammonium hydroxide, hydrochloric acid, and sulfuric acid
  - -Four of these containers appeared empty.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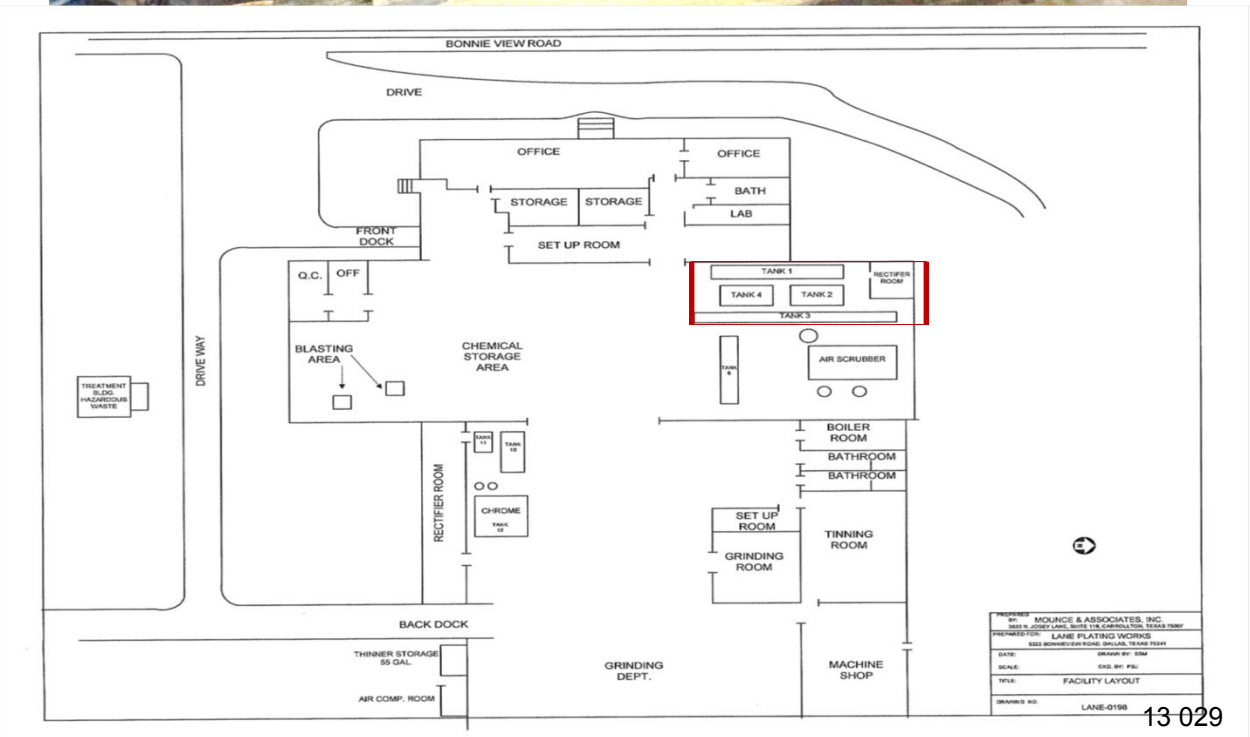
Container Storage Area

- Chemical Waste
- Top picture (north west)
  Nickel tank with solids in the white container

- Bottom picture (facing south west)
  -3 containers of zinc waste (1) and rinse water (2)
  -1 container of nitric acid

Chrome Tanks

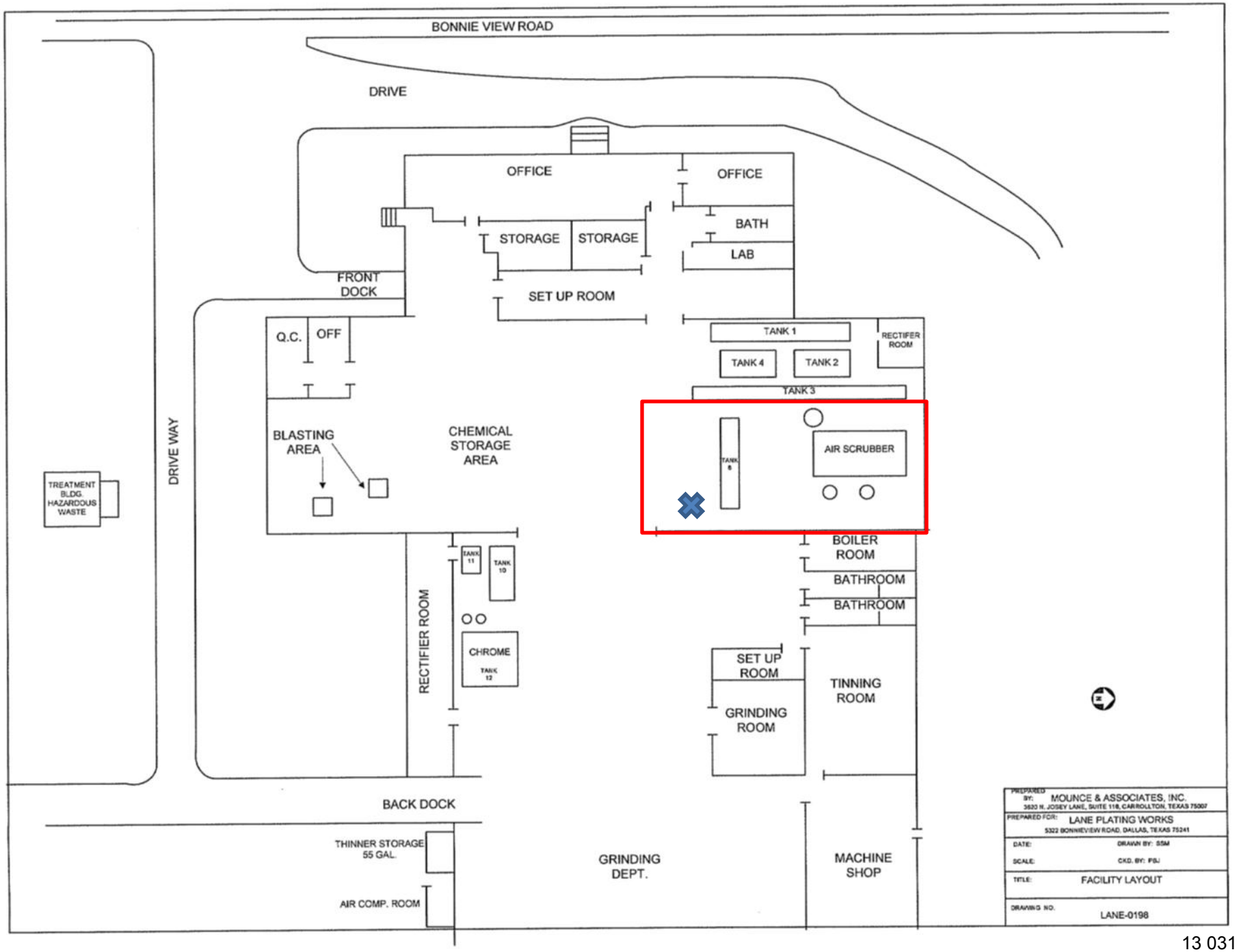
- Tanks 1, 2, and 4.



Chrome Tanks

- Tank 1
  - -Filled with chromic acid
  - ~13,000 gallon tank capacity

- Tank 4
  - -Chrome Rinse Tank with trash in it.
  - -~800 gallon tank capacity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Chromic Acid Holding Tank and Sump

- According to Mr. Lane, the tank, one of three former wastewater treatment tanks, should be empty.
- The ~280 sq. ft. sump below contained approximate 2 inches of chromic acid.

Tank 8

- Chrome rinse tank filled with a sludge-like chromium solution.
- ~1000 gallon capacity

Chemical Storage Area

- (13) 55-gallon drums labeled hazardous waste.

- 2 nickel
- 1 black oxide solids
- 2 chrome sludge
- 1 hydrochloric acid solution
- 2 sodium hydroxide
- 2 cadmium solids
- 1 cadmium liquid
- 1 sulfuric acid
- 1 unknown
- Some dated in 2014

Part of the Chromic Acid Scrubber System

- Part of the air scrubber system that contained a few inches of liquid.

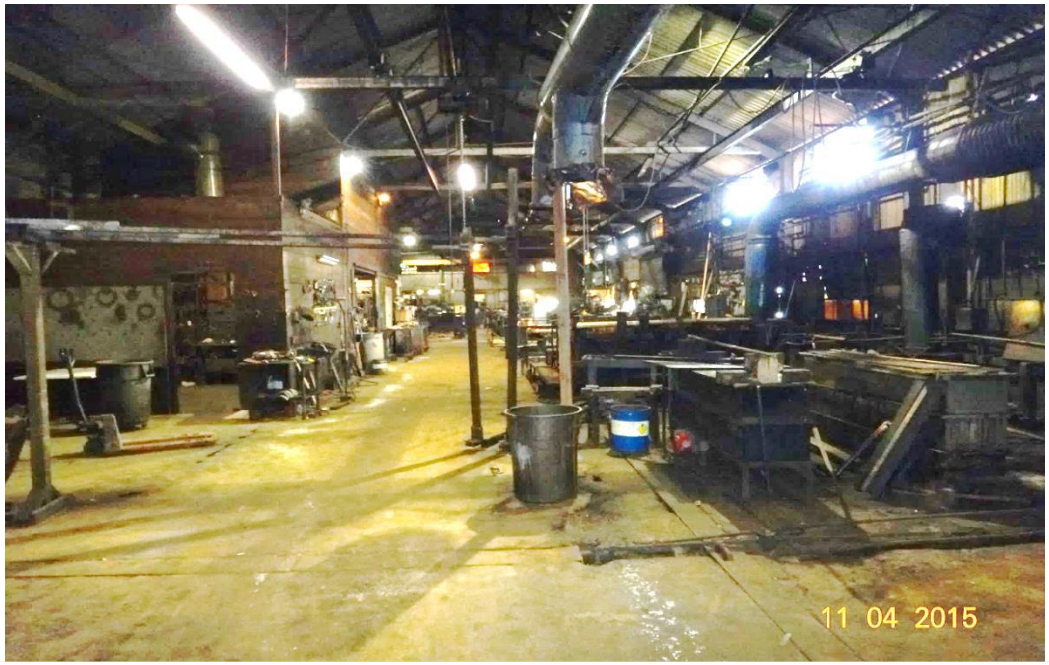
See Part 2

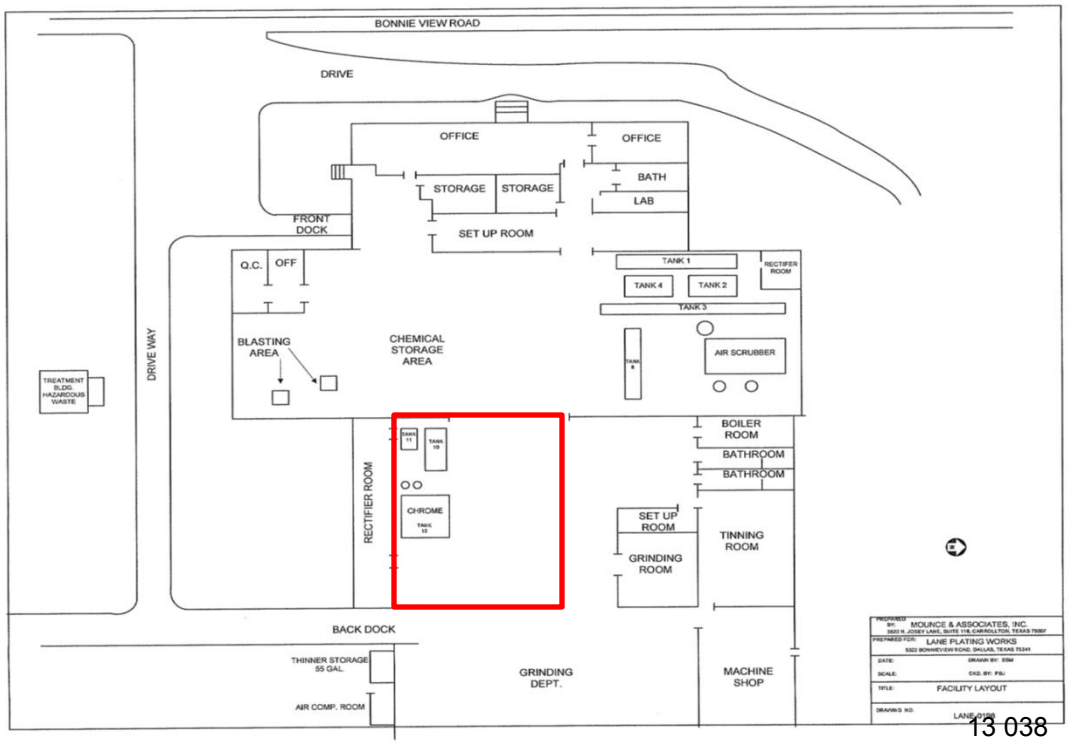
Lane Plating

Part 2

View into Unit from the Entrance

- Tanks and containers to the right





Waste Drums

- Three 55-gallon drums of chrome waste
- Five 10-gallon buckets holding chromic acid leaking from air duct system

Chrome Tank

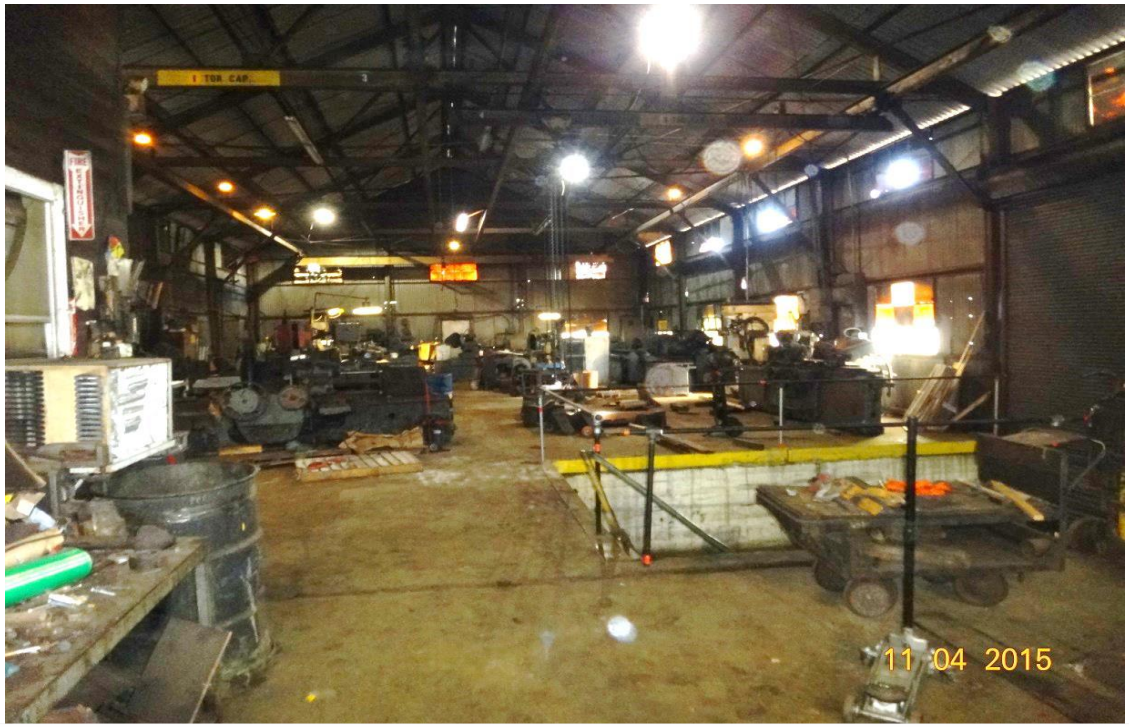
- This tank has an air pollution control device (scrubber) associated to it. The ~120 foot air duct was observed leaking
- The capacity on the this tank is approximately 4,400 gallons. It is 10 feet deep.
- There is a sump beneath this unit that has a capacity of approximately of 6,500 gallons.
- This tank was filled with chromic acid solution in which the majority of the solution had leaked out into the sump.
- There are also floor trenches to catch leaks. These trenches have eroded.

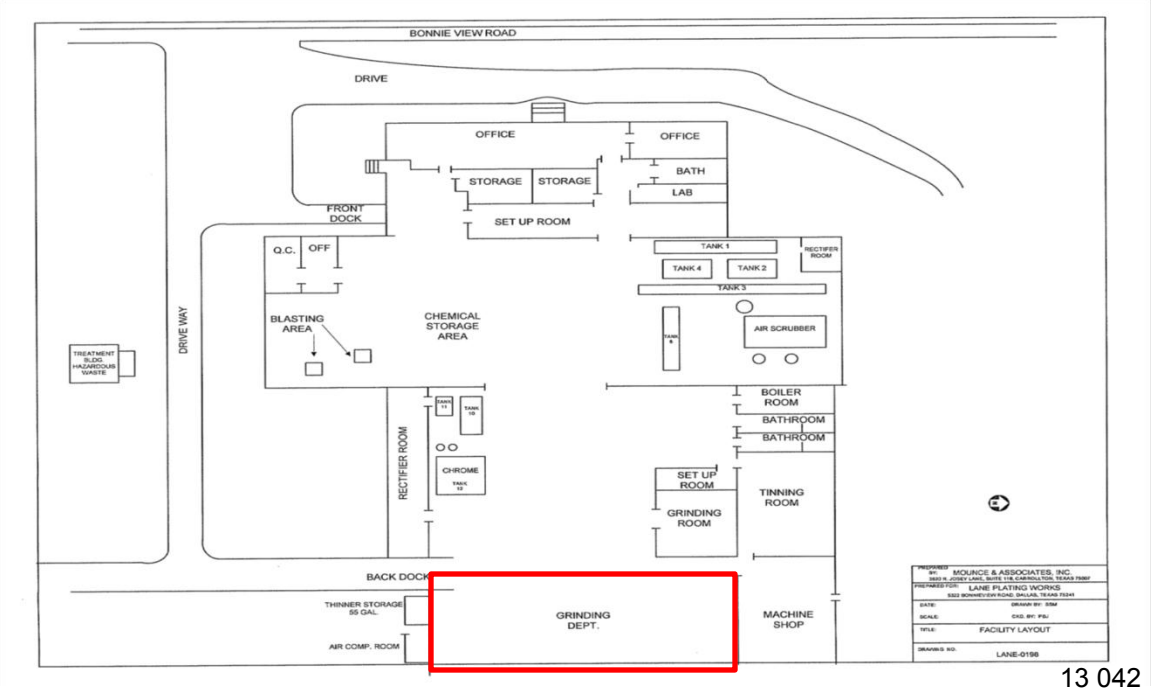
Caustic Water Tank

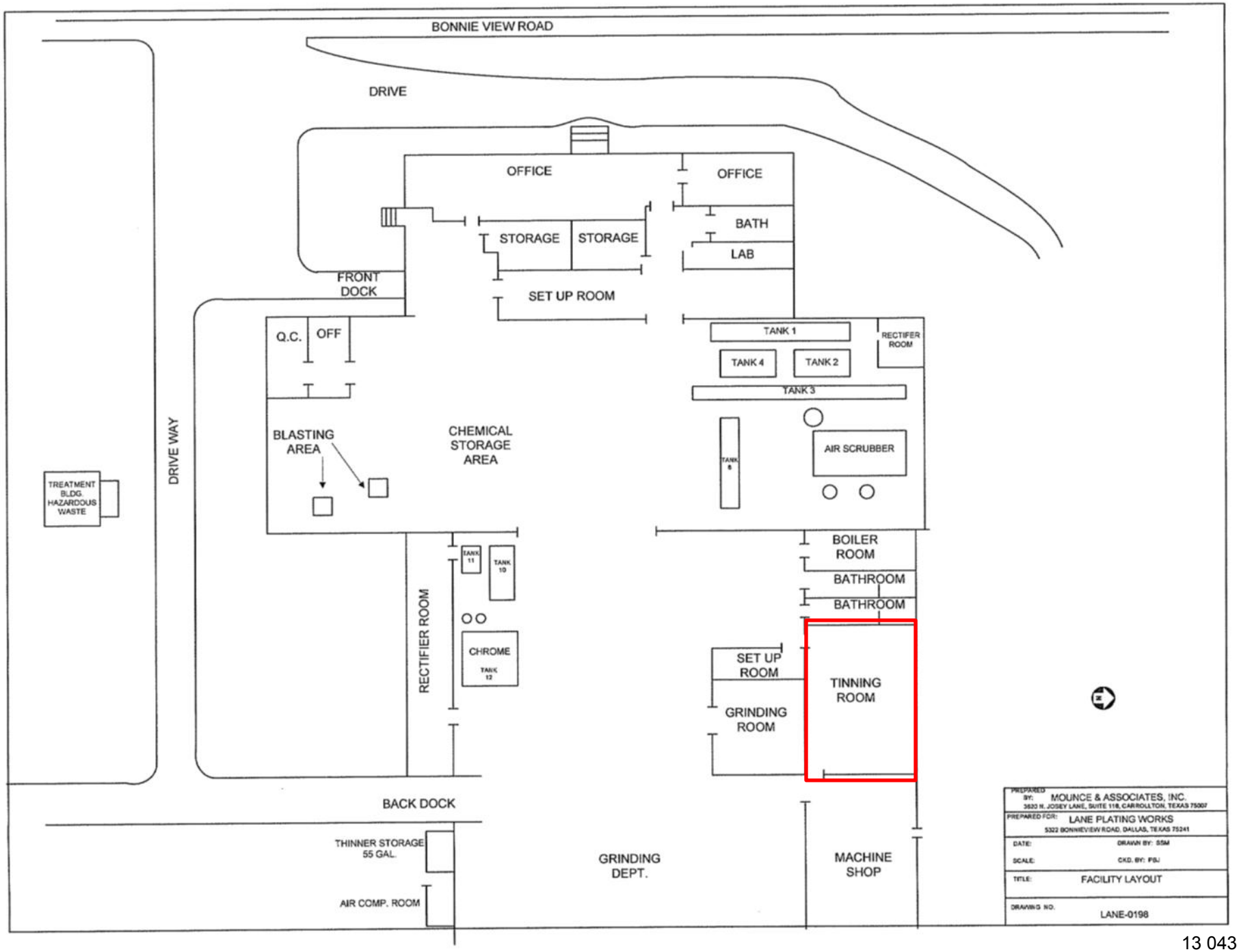
- Located next to the chrome tank and shares the same sump.
- This tank is approximately 12 feet in length.
- It is filled with caustic water.

Grinding Room

- Waste observed here were grindings and used oil
- 12 containers ranging from 5 to 30 gallons of used oil
- One 55-gallon drum of chrome waste.



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Tinning Room

- Cadmium plating
- Chromate dips
- Nickel plating
- Lead anodes

- Left wall
  - -One 55-gallon container of 25% nitric and water
  - -A 140 gallon tank of nickel solution
  - -40 gallons of sodium hydroxide and water
  - -1 gallon of sulfuric acid (half full)
  - -5 gallon container of clear chromate

- Right wall
  - -4 cadmium tanks

- Middle
  - -Tanks for electroless nickel and chromate dip

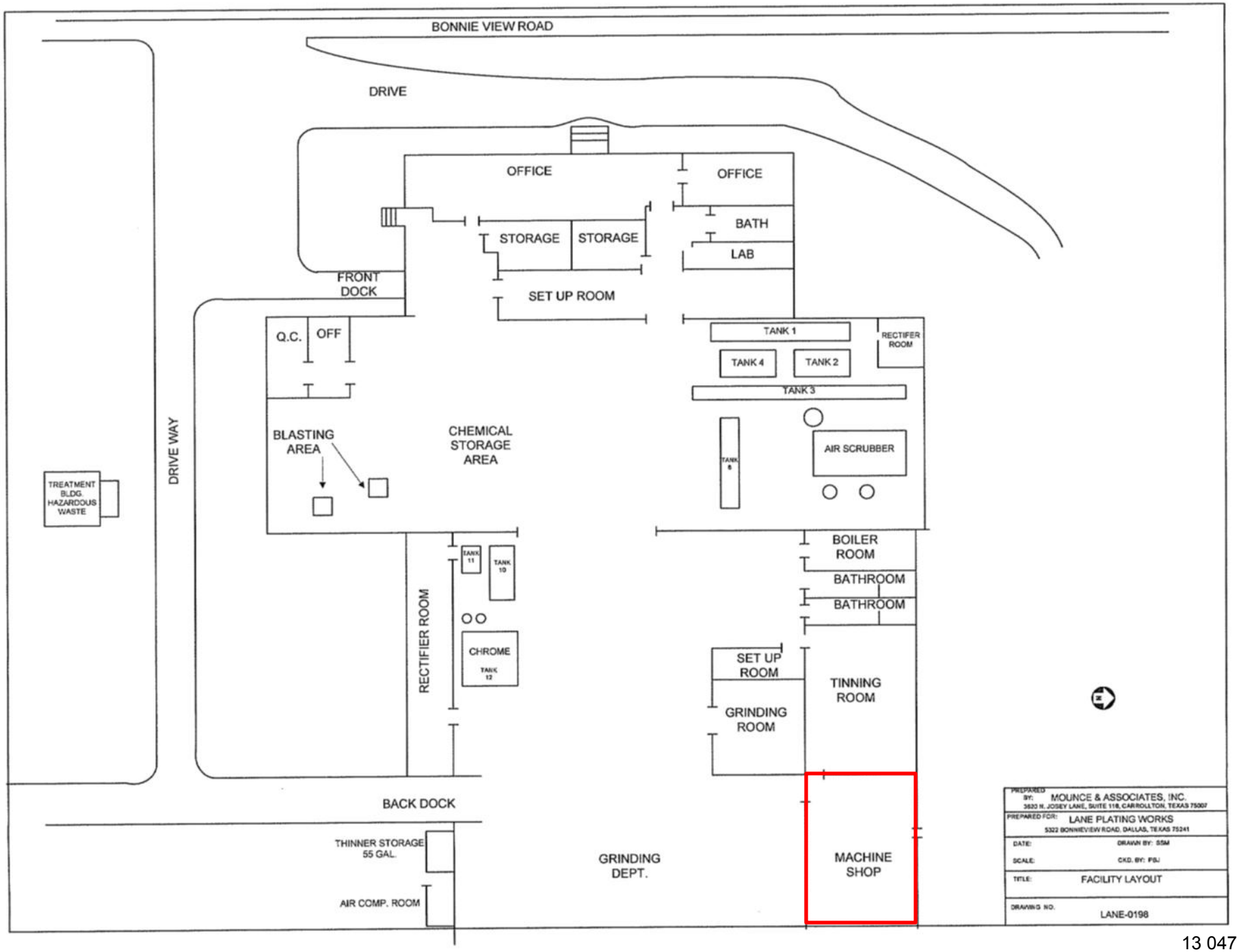
Cadmium Tanks

- Four cadmium tanks located on northern wall
- Both tanks on each end contained cadmium solution and the two in the middle were empty
- Cadmium tanks have 192 gallon capacity.

Center Dip Line

- One cleaning tank (hydrochloric acid), three rinse tanks, a chromate dip tank, and a nickel tank

- These tanks contained solutions and were approximately a third full.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LAB
STORAGE
STORAGE
SET UP ROOM
FRONT DOCK
Q.C.
OFF
TANK 1
RECTIFER ROOM
TANK 4
TANK 2
TANK 3
TANK 5
AIR SCRUBBER
BLASTING AREA
CHEMICAL STORAGE AREA
TREATMENT BLDG. HAZARDOUS WASTE
DRIVE WAY
TANK 11
TANK 10
RECTIFIER ROOM
CHROME TANK 12
BOILER ROOM
BATHROOM
BATHROOM
SET UP ROOM
TINNING ROOM
GRINDING ROOM
BACK DOCK
THINNER STORAGE 55 GAL.
AIR COMP. ROOM
GRINDING DEPT.
MACHINE SHOP
PREPARED BY: MOUNCE & ASSOCIATES, INC.
3620 N. JOSEY LANE, SUITE 118, CARROLLTON, TEXAS 75007
PREPARED FOR: LANE PLATING WORKS
5322 BONNIEVIEW ROAD, DALLAS, TEXAS 75241
DATE:
DRAWN BY: SSM
SCALE:
CKD. BY: PSJ
TITLE: FACILITY LAYOUT
DRAWING NO. LANE-0198

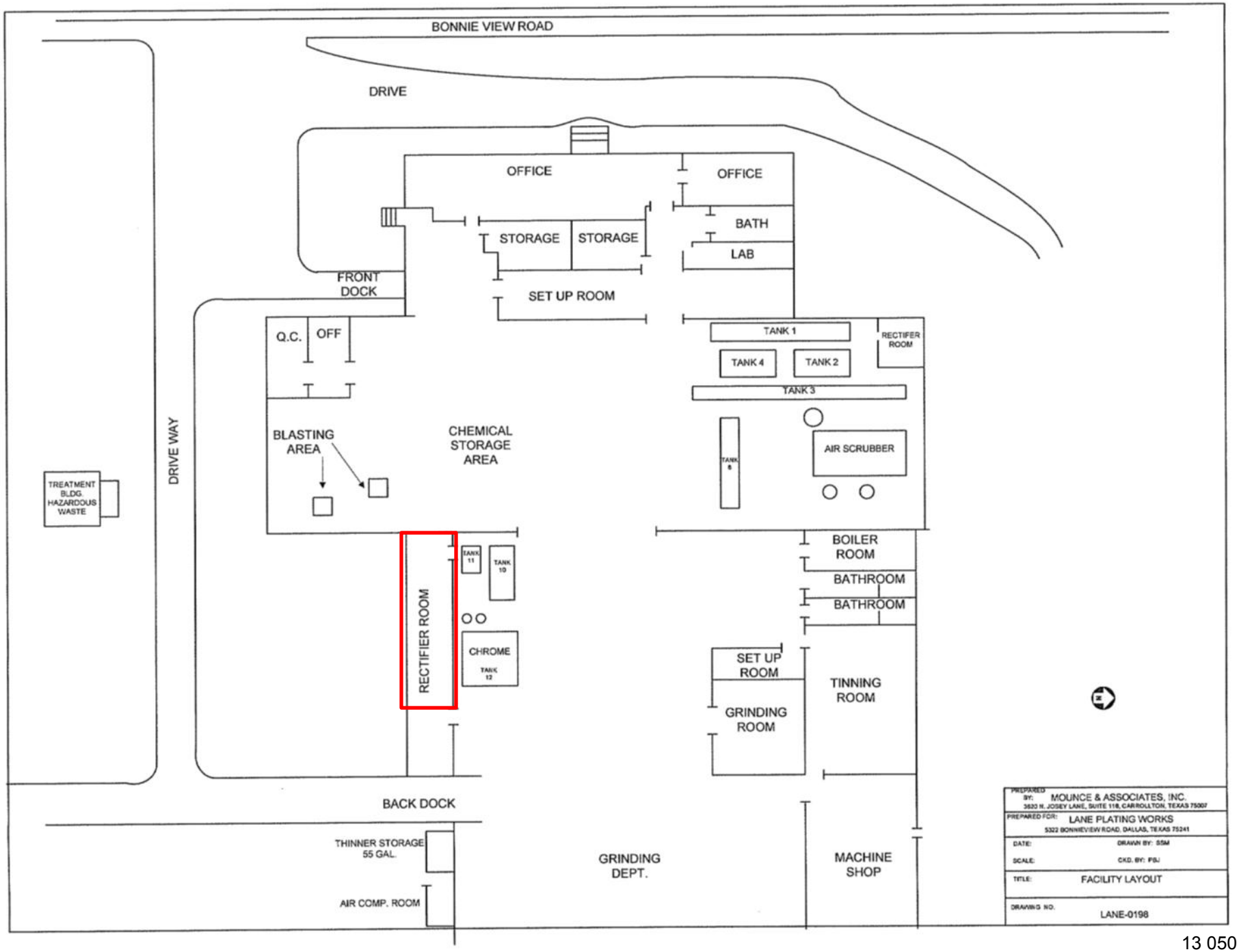
13 047

Machine Shop

- One 55-gallon drum of cadmium solids labeled hazardous waste
- One 5-gallon container of oil
- One 55-gallon drum of nickel strip
- More waste are located in the rear left (northeast) corner of this area. See next slide.

Northeast Corner of Machine Shop

- More waste storage
- (35) 55-gallon drums were observed here about half of which were near empty or empty
- These drums largely contained caustic cyanide based solutions (cadmium cyanide and sodium cyanide).
- One drum of nickel strip


BONNIE VIEW ROAD
DRIVE
OFFICE
OFFICE
BATH
LAB
STORAGE
STORAGE
SET UP ROOM
FRONT DOCK
Q.C.
OFF
TANK 1
RECTIFER ROOM
TANK 4
TANK 2
TANK 3
DRIVE WAY
BLASTING AREA
CHEMICAL STORAGE AREA
TANK 5
AIR SCRUBBER
TREATMENT BLDG. HAZARDOUS WASTE
BOILER ROOM
BATHROOM
BATHROOM
TANK 11
TANK 10
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CHROME TANK 12
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GRINDING ROOM
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DATE:
DRAWN BY: SSM
SCALE:
CKD. BY: PSJ
TITLE: FACILITY LAYOUT
DRAWING NO. LANE-0198

Rectifier Room (Power Room)

- The large chrome plating tank with the sump containment share this wall.
- The yellow stains are thought to be chromium.
- The sump/trench system were noted in a past report as overflowing into this area.

Rectifier Room

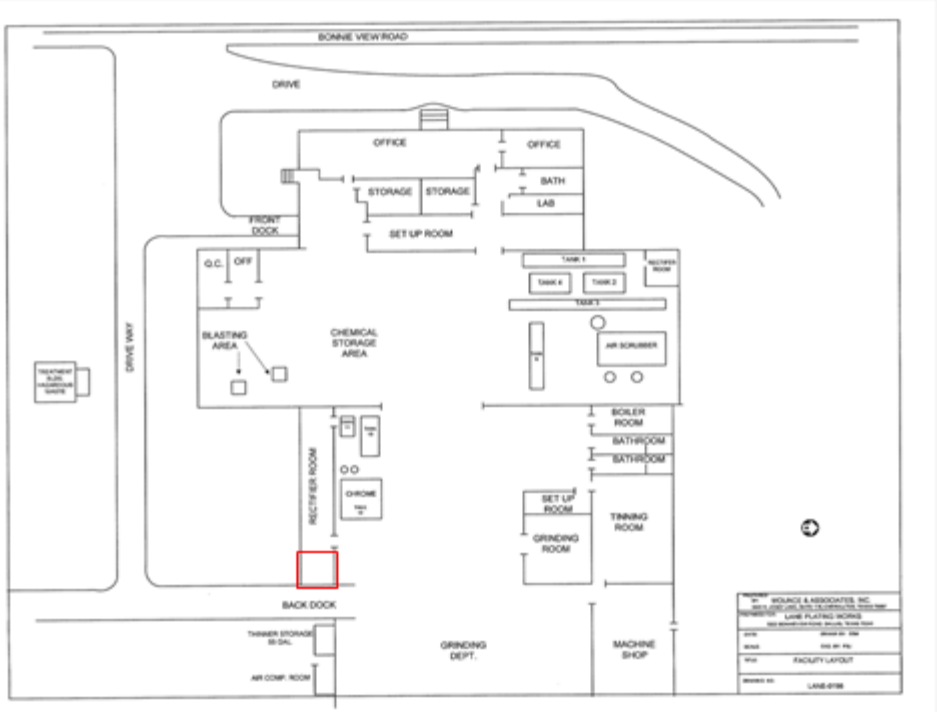
- Another opening in the wall
- More yellow stainage believed to be a result of chromium leaks from chrome tank or the sump/trench system.

Rectifier Room

- More yellow stainage from third opening in the wall behind the sump/trench system.

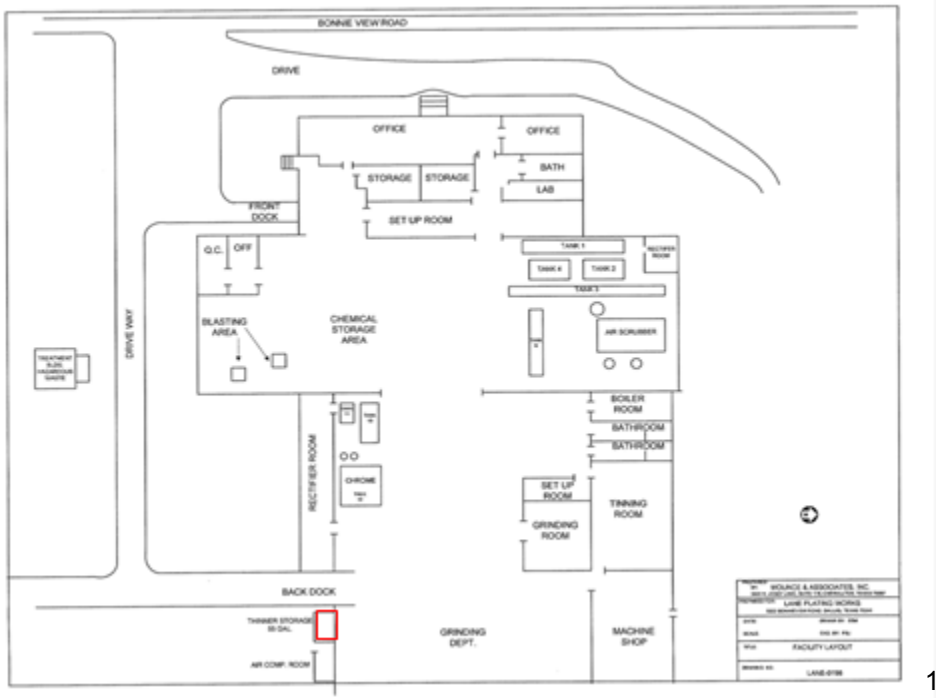
Black Oxide Room

- Located outside in a shed-like structure immediately adjacent to the facility.
- Black oxide is a blend of caustic, oxidizers, additives that is used to blacken ferrous metals.
- One 55-gallon drum of black oxide solution
- One black oxide tank (empty)



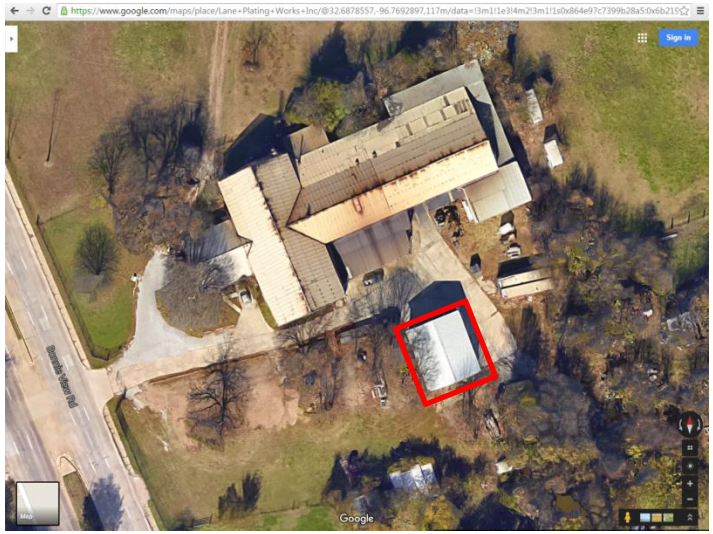
Thinner Area

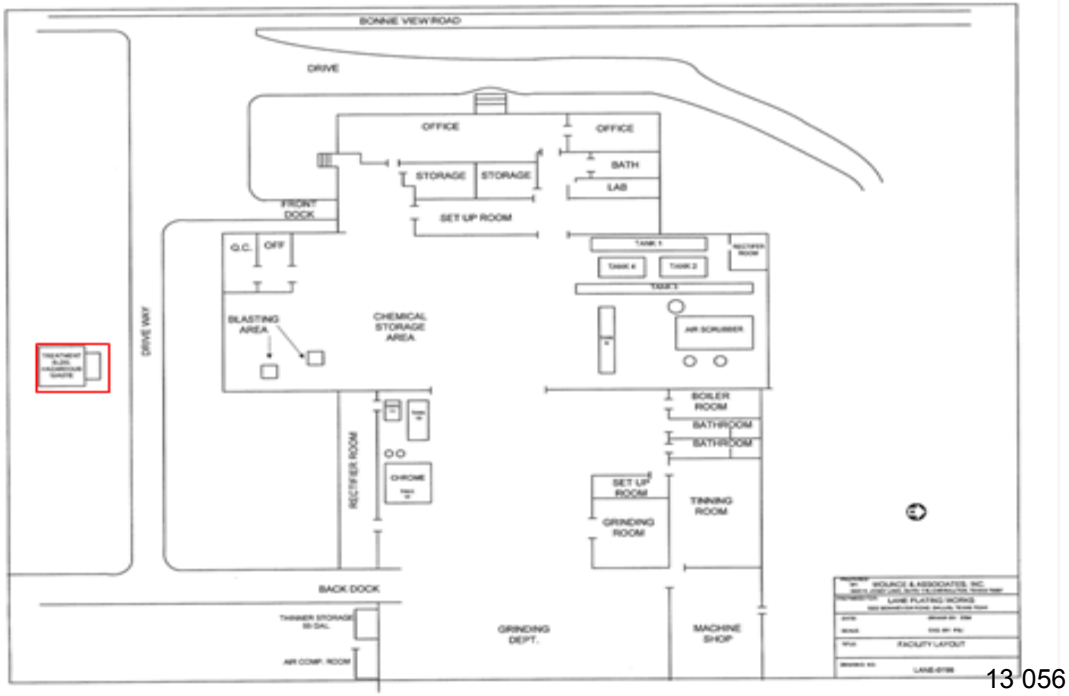
- One 55-gallon drum of paint thinner (full)
- Three 55-gallon drums of oil (full)
- One 55-gallon drum of kerosene (full)
- One 55-gallon drum of oil filters about 1/3 full
- One 5-gallon container of oil



Hazardous Waste Treatment Building

- 12 supersacs (white bags) containing soil that was excavated south east of the facility. This soil contained elevated concentrations of lead.
- One 250 gallon tote of used oil
- Several old plating tanks (empty); one liner observed.





Area where grinding grit was observed

Former Grinding Grit Disposal Area

- Lane Plating disposed of some of this soil off-site and the rest of it is in the supersacs in the shed.
- There was still grinding grit observed in this area.

Grinding Grit

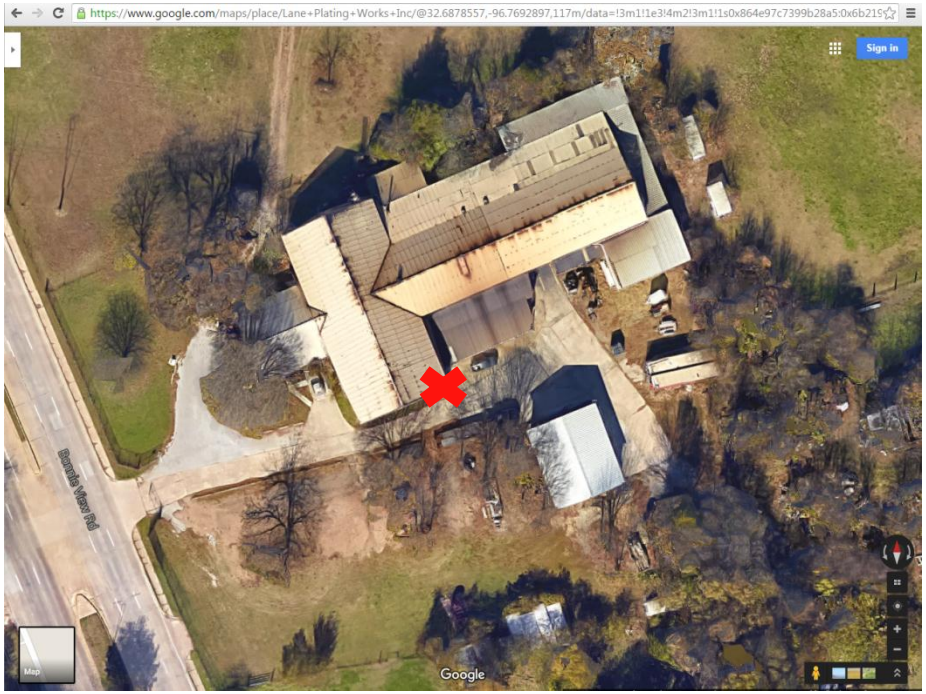
- There are still pieces of grinding grit in this area embedded in the soil.
- The total area where grinding grit was observed on the surface is approximately 1,800 square feet.

Grinding Grit

- Area behind (south side) the shed with pieces of grinding grit containing elevated concentrations of lead.

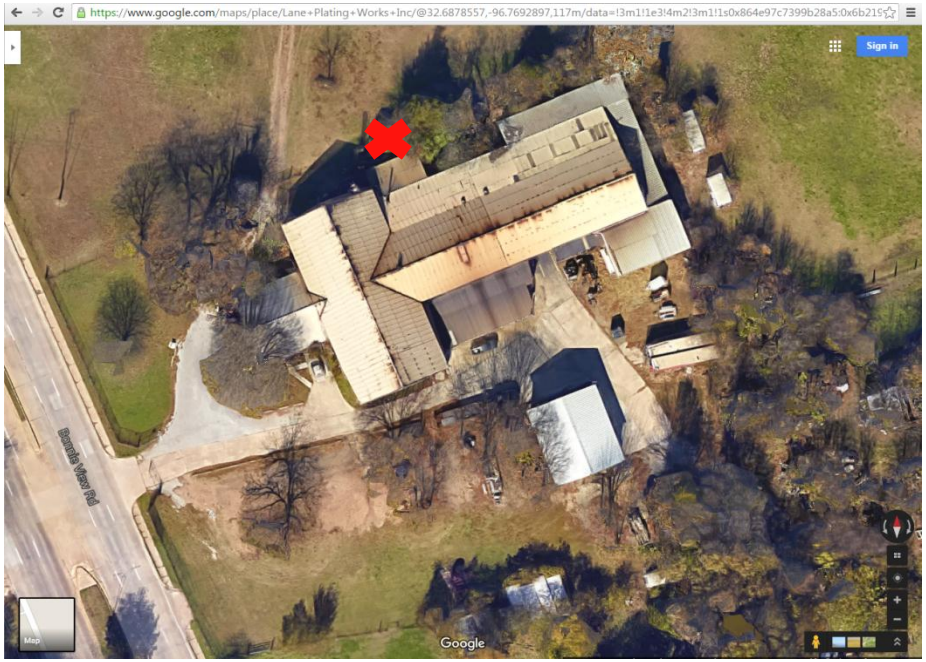
Yellow staining

- Observed outside of the building.
- TCEQ sample results from this area had elevated concentrations of chromium.



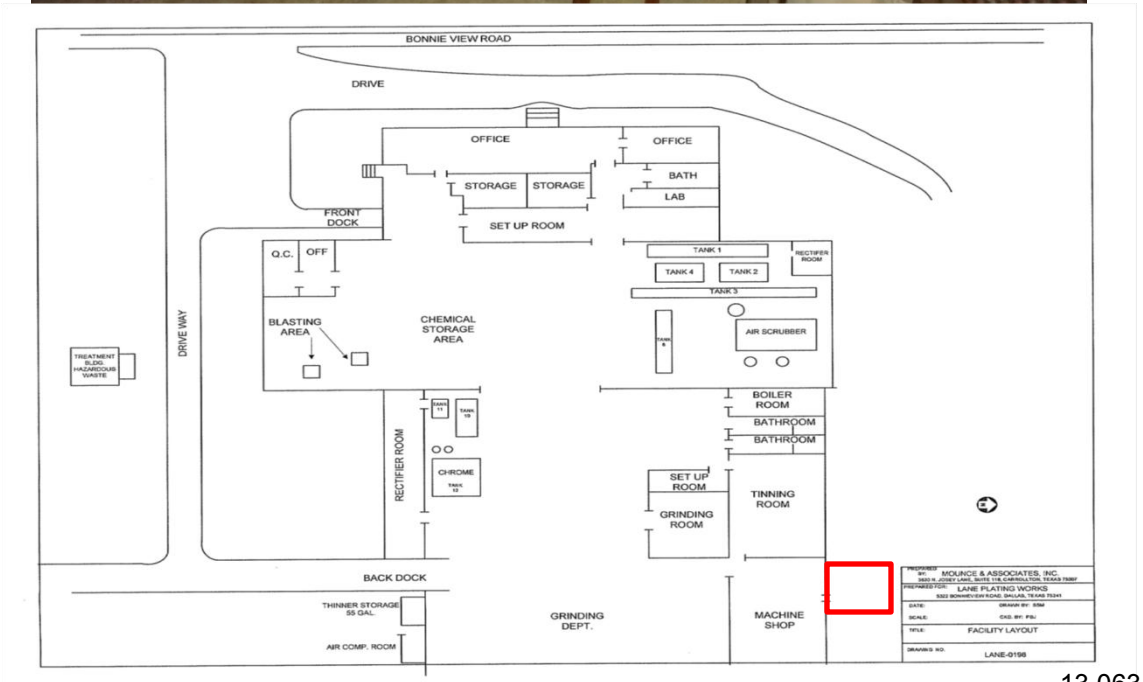
Outside Storage of Equipment

- More facility equipment including anodes



Lead Dip Tank for Anodes

- One lead dip tank
- Two 5-gallon containers of kerosene
- Table of newly dipped anodes

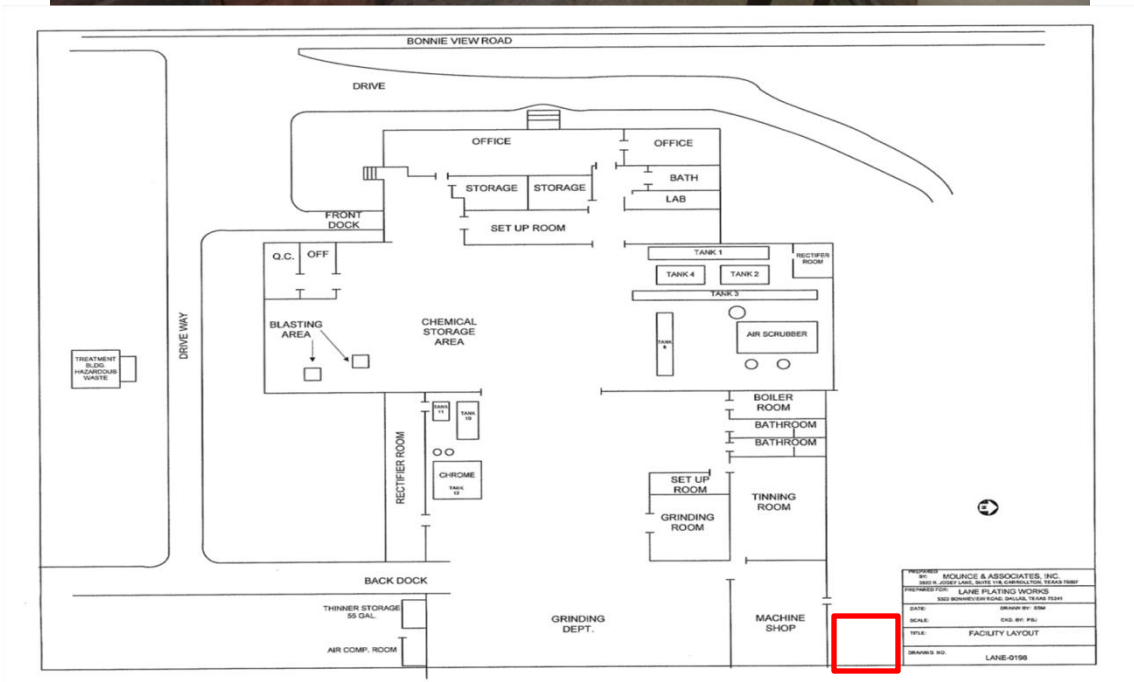


Lead Dip Tank for Anodes

- Used to coat lead onto the anodes
- Still contained lead that was solidified
- Unable to estimate how many inches of lead it contained

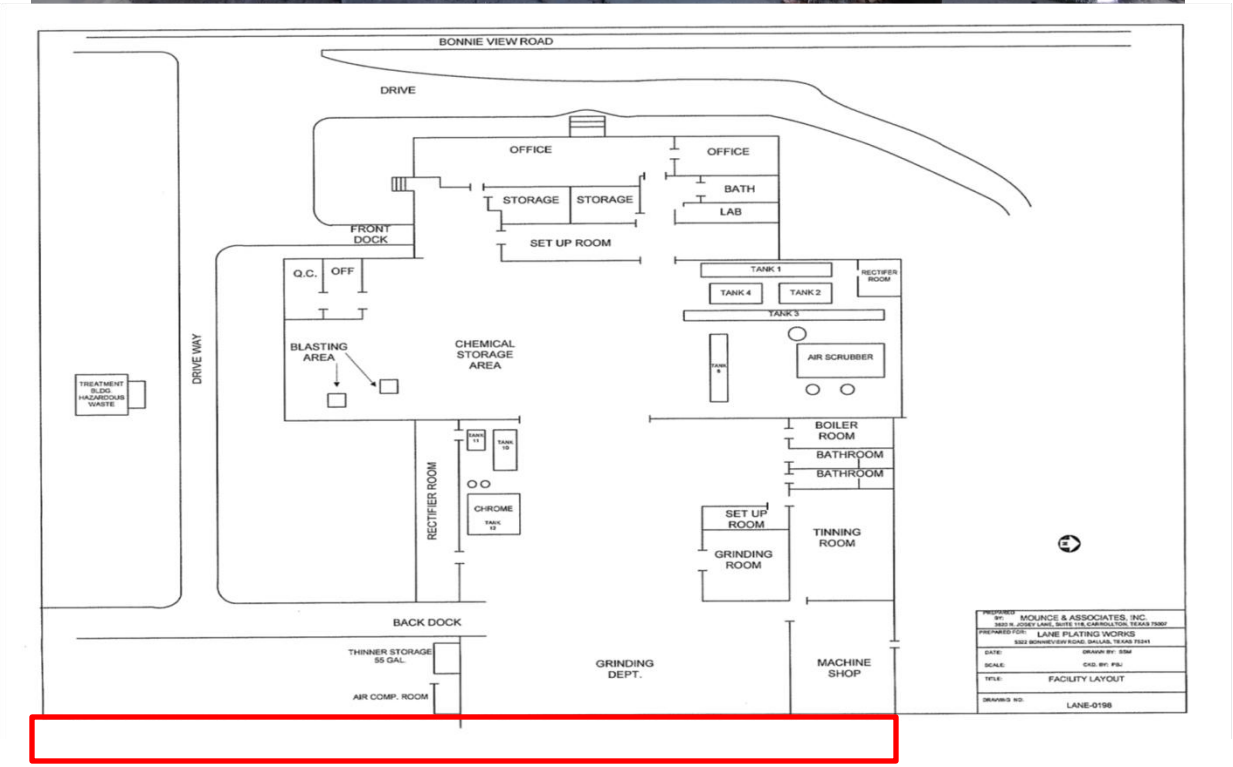
Equipment Storage Area

- More misc. equipment



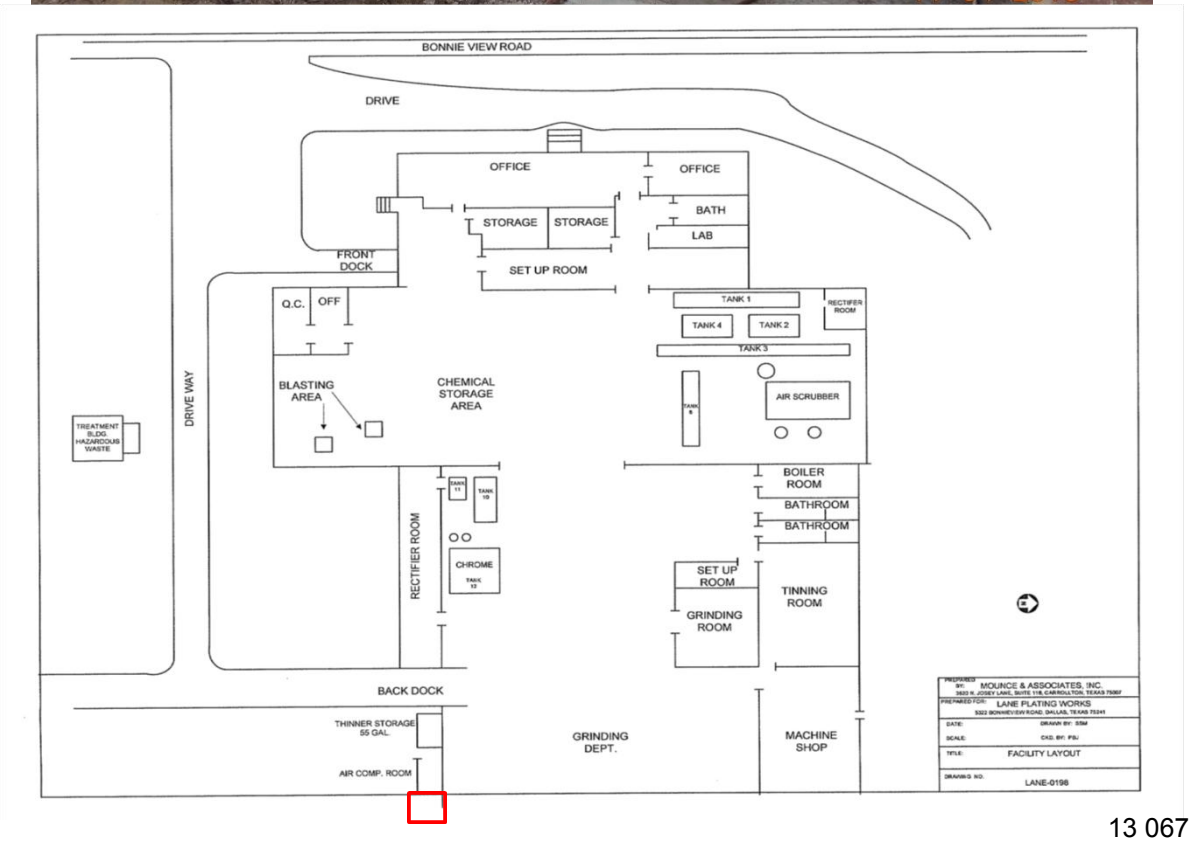
Storage Area

- Equipment storage area



Equipment Storage Area

- 10-12 old plating tanks (empty)
- Other process equipment



Reference 14

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

TELEPHONE MEMO TO THE FILE

Please complete with typewriter or black pen.

Call to: Dorothy Lewis, R4

Call from: Superfund Section Rebecca Comeaux & Omar Valdez

Date of call: 2/11/2016

File no.: Lane Plating, PAS-I

Phone no.: (817) 588-5824 p.1/2

Subject: Lane Plating Site Conditions for upcoming Removals + PAS-I Site Visits

Information for file: TCEQ spoke to Dorothy Lewis of Region 4, investigator at Lane Plating since 2011, regarding current site conditions. Omar Valdez indicated concern of airborne; metal laden dust and how we would monitor for this with level D PPE. Ms. Lewis indicated there is dust inside on surfaces that could get on your hands, etc., which is why latex gloves are required PPE. If the wind blows outside, could pick up soil contamination / grinding dust. Grinding dust observed near grinding areas + hazardous waste treatment bldg. Staining was observed near rectifier room. Ms. Lewis indicated could shut the door to everything except: black oxide room, outside equipment, lead melting pot, hazardous waste treatment building, + tunnel area. Region 4 has never conducted air monitoring. Other required PPE: rubber boot covers, hard hat. Can leave used PPE inside drum in office area. - Dorothy has keys to site. The process/grinding areas have not changed + site footprint has not change since Region 4 has investigated site. R4 is not aware of any waste burial. In 2011 a waste pile was observed. In 2014, the pile was gone + had been placed into supersacs. A sample came back as hot/

Signed

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

TELEPHONE MEMO TO THE FILE

Please complete with typewriter or black pen.

Call to: Dorothy Lewis, RPM

Call from: Superfund, Rebecca Cemecay + Omar Valdez

Date of call: 2/11/2016

File no.: Lane Plating, PASI

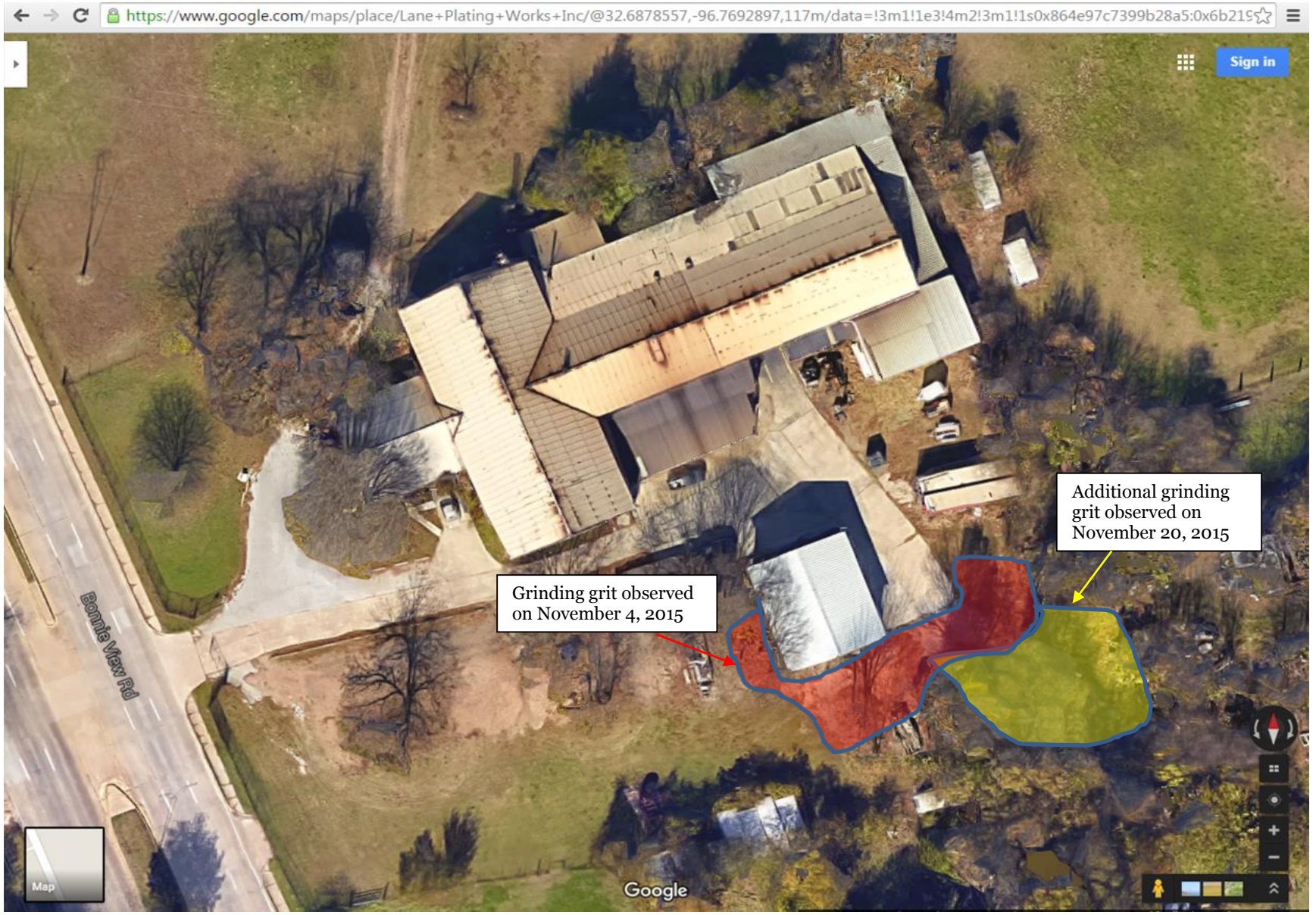
Phone no.: (817) 588-5824 p.2/2

Subject: Lane Plating Site Conditions, cont'd.

Information for file: hazardous, The supersacs of contaminated soil are still inside stored in the hazardous waste treatment building. RPM is not sure if there are waste manifests or if the NOR is accurate. According to Ms. Lewis, Lane Plating copied + passed the same Annual Waste Summaries for the last 3 years (under self-reporting and do not appear to be accurate). Ms. Lewis indicated the limited emergency response performed by the Region (hired contractor) removed cyanide product grade waste, but there are more drums of cyanide waste (more dilute) stored with 1 drum of acid in the same room in the machine shop (IDLH). Open baths containing liquid plating wastes are still in the facility (center dip line). There is leakage from the overhead duct that condenses into puddles on the facility floor. This may be condesate from the air pollution control device over the tank (scrubber) + may be caustic. Grinding grit observed outside looks like rock fragments (fine + larger pieces). Violations occurred in 2011 - RPM wanted Lane to clean-up discharges. Lane did not - RPM sampled to confirm.

Signed

Reference 15



Grinding grit areas are approximate (annotated by R.Comeaux 5/17/16).

Reference 16

Dallas Central Appraisal District

NAVIGATION LINKS

- DCAD Videos
- Annual Report
- About DCAD
- Search Appraisals
  - By Owner
  - By Account
  - By Address
  - By Business
- Find Property on Map
- Online BPP Rendition
- Online TaxRep Website
- Forms
- Data Products
- GIS Data Products
- Exemptions
- Property Valuation Process
- Protest Process
- Paying Taxes
- Local Tax Offices
- Taxing Unit Rates
- F.A.Q.
- Calendar
- Certified Value Summaries
- Certified Comparisons
- Certification Reports
- Preliminary Comparisons
- Average SFR Values
- Reappraisal Plan
- Water & Electricity Usage
- Administration
- Human Resources
- Links
- Contact Us
- On-line Help
- DCAD Mobile Site

Find Property By Street Address

Search By: Owner Name | Account Number | Street Address | Business Name | Map

Address Number	Direction	Street Name (required)
5322		BONNIE VIEW

Building	Suite	City
		[ALL]

Account Type

- [x] RESIDENTIAL
- [x] COMMERCIAL
- [x] BPP

Address Number Range Search

From To Search

Hints:

- Do not enter the street type such as Street, Drive or Lane.
- To find a single address, fill in one Address Number field. To find a range of addresses, fill in both.
- If no results are found, try entering less information.
- Use % as a wildcard. For example, %oak in the street name to find all streets with "oak" somewhere in the name.
- If searching for a one letter street name, such as X,Y or Z street, you must add the wildcard after the letter. For Example, X%.

The Residence Homestead Exemption Application form is available from the details page of your account. You may search for your account by owner, by account or by address. Click the BLUE property address link to view the details of your account. Select the link "Print Homestead Exemption Form".

< PREV matches 1 - 2 of 2 properties. NEXT >					Page 1 of 1
#	Property Address	City	Owner Name / Business Name	Total Value	Type
1	5322 BONNIE VIEW RD	DALLAS	STAG MANAGEMENT INC	$270,410	COMMERCIAL
2	5322 BONNIE VIEW RD	DALLAS	LANE PLATING WORKS INC DBA: LANE PLATING WORKS INC	$248,390	BPP
< PREV matches 1 - 2 of 2 properties. NEXT >					Page 1 of 1

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Commercial Account #00000636400000000

Location Owner Legal Desc Value Improvements Land Exemptions Estimated Taxes Building Footprint History

Location (Current 2016)

Address: 5322 BONNIE VIEW RD
Market Area: 0
Mapsco: 66-K (DALLAS)

DCAD Property Map

View Photo

2015 Appraisal Notice

Electronic Documents (ENS)

Print Homestead Exemption Form

Owner (Current 2016)

STAG MANAGEMENT INC
ATTN JOHN R LANE PRES
5322 BONNIE VIEW RD
DALLAS, TEXAS 752413201

Multi-Owner (Current 2016)

Owner Name	Ownership %
STAG MANAGEMENT INC	100%

Legal Desc (Current 2016)

1: BONNIE VIEW ROAD
2: BLK 6859 PT TR 12 ACS 4.655
3:
4: VOL97241/1699 DD110196 CO-DALLAS
5: 6859 000 012 2006859 000
Deed Transfer Date: 12/12/1997

Value

2015 Certified Values	
Improvement:	$233,170
Land:	+ $37,240
Market Value:	=$270,410
Revaluation Year:	2015
Previous Revaluation Year:	2012

Improvements (Current 2016)

#	Desc:	Total Area:	Year Built:
1	LIGHT INDUSTRIAL	13,688 sqft	1950

Construction		Depreciation		Appraisal Method
Construction:	S-PRE-ENGINEERED STEEL BLDGS	**Physical:**	80%	INCOME
Foundation (Area):	CONCRETE BEAM (13,688 sqft)	**Functional:** +	0%	
Net Lease Area :	15,452 sqft	**External:** +	0%	
		Total: =	80%	
		Quality:	AVERAGE	

	# Stories: 1 **# Units:** 0 **Basement (Area):** UNASSIGNED **Heat:** UNASSIGNED **A/C:** UNASSIGNED	**Condition:** AVERAGE

#	**Desc:** OFFICE BUILDING	**Total Area:** 1,764 sqft	**Year Built:** 1950

	Construction	Depreciation	Appraisal Method
2	**Construction:** D-WOOD FRAME **Foundation (Area):** CONCRETE BEAM (1,764 sqft) **Net Lease Area :** 0 sqft **# Stories:** 1 **# Units:** 0 **Basement (Area):** UNASSIGNED **Heat:** UNASSIGNED **A/C:** FORCED AIR	**Physical:** 80% **Functional:** + 0% **External:** + 0% **Total:** = 80% **Quality:** AVERAGE **Condition:** AVERAGE	INCOME

Land (2015 Certified Values)

#	State Code	Zoning	Frontage (ft)	Depth (ft)	Area	Pricing Method	Unit Price	Market Adjustment	Adjusted Price	Ag Land
1	INDUSTRIAL IMPROVEMENTS	COMMERCIAL SERVICE DISTRICT	0	0	4.6550 ACRE	STANDARD	$8,000.00	0%	$37,240	N

*** All Exemption information reflects 2015 Certified Values. ***

Exemptions (2015 Certified Values)

No Exemptions

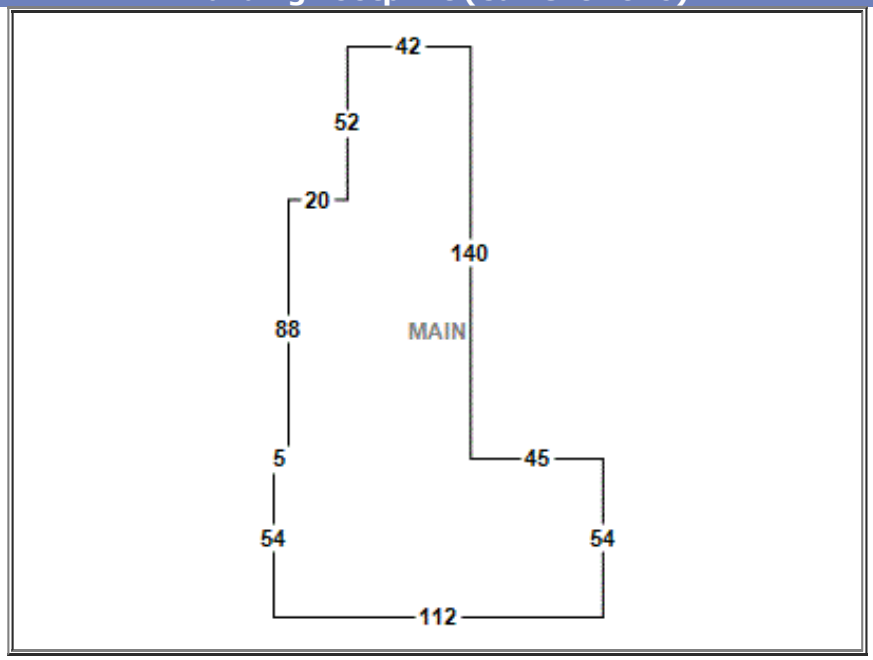
Estimated Taxes (2015 Certified Values)

	City	School	County and School Equalization	College	Hospital	Special District
Taxing Jurisdiction	DALLAS	DALLAS ISD	DALLAS COUNTY	DALLAS CO COMMUNITY COLLEGE	PARKLAND HOSPITAL	UNASSIGNED
Tax Rate per $100	$0.797	$1.282085	$0.2531	$0.12365	$0.286	N/A
Taxable Value	$270,410	$270,410	$270,410	$270,410	$270,410	$0
Estimated Taxes	$2,155.17	$3,466.89	$684.41	$334.36	$773.37	N/A
Tax Ceiling					N/A	N/A
					Total Estimated Taxes:	**$7,414.20**

DO NOT PAY TAXES BASED ON THESE ESTIMATED TAXES. You will receive an **official tax bill** from the appropriate agency when they are prepared. Taxes are collected by the agency sending you the **official** tax bill. To see a listing of agencies that collect taxes for your property. Click Here

The estimated taxes are provided as a courtesy and should not be relied upon in making financial or other decisions. The Dallas Central Appraisal District (DCAD) does not control the tax rate nor the amount of the taxes, as that is the responsibility of each Taxing Jurisdiction. Questions about your taxes should be directed to the appropriate taxing jurisdiction. We cannot assist you in these matters. These tax estimates are calculated by using the most current certified taxable value multiplied by the most current tax rate. **It does not take into account other special or unique tax scenarios**. If you wish to calculate taxes yourself, you may use the TaxEstimator to assist you.

Building Footprint (Current 2016)



History

History

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This website is for informational purposes only. Title research should be performed at the appropriate County Clerks office. This is not deemed a legal document.

Account History #00000636400000000

Owner Legal Desc Market Value Taxable Value Exemptions

Owner / Legal Description

Year	Owner	Legal Description
2015	STAG MANAGEMENT INC ATTN JOHN R LANE PRES 5322 BONNIE VIEW RD DALLAS, TEXAS 752412401	**1:** BONNIE VIEW ROAD **2:** BLK 6859 PT TR 12 ACS 4.655 **3:** **4:** VOL97241/1699 DD110196 CO-DALLAS **5:** 6859 000 012 2006859 000 Deed Transfer Date: 12/12/1997
2014	STAG MANAGEMENT INC ATTN JOHN R LANE PRES 5322 BONNIE VIEW RD DALLAS, TEXAS 752412401	**1:** BONNIE VIEW ROAD **2:** BLK 6859 PT TR 12 ACS 4.655 **3:** **4:** VOL97241/1699 DD110196 CO-DALLAS **5:** 6859 000 012 2006859 000 Deed Transfer Date: 12/12/1997
2013	STAG MANAGEMENT INC ATTN JOHN R LANE PRES 5322 BONNIE VIEW RD DALLAS, TEXAS 752412401	**1:** BONNIE VIEW ROAD **2:** BLK 6859 PT TR 12 ACS 4.655 **3:** **4:** VOL97241/1699 DD110196 CO-DALLAS **5:** 6859 000 012 2006859 000 Deed Transfer Date: 12/12/1997
2012	STAG MANAGEMENT INC ATTN JOHN R LANE PRES 5322 BONNIE VIEW RD DALLAS, TEXAS 752412401	**1:** BONNIE VIEW ROAD **2:** BLK 6859 PT TR 12 ACS 4.655 **3:** **4:** VOL97241/1699 DD110196 CO-DALLAS **5:** 6859 000 012 2006859 000 Deed Transfer Date: 12/12/1997
2011	STAG MANAGEMENT INC ATTN JOHN R LANE PRES 5322 BONNIE VIEW RD DALLAS, TEXAS 752412401	**1:** BONNIE VIEW ROAD **2:** BLK 6859 PT TR 12 ACS 4.655 **3:** **4:** VOL97241/1699 DD110196 CO-DALLAS **5:** 6859 000 012 2006859 000 Deed Transfer Date: 12/12/1997
2010	STAG MANAGEMENT INC ATTN JOHN R LANE PRES 5322 BONNIE VIEW RD DALLAS, TEXAS 752412401	**1:** BONNIE VIEW ROAD **2:** BLK 6859 PT TR 12 ACS 4.655 **3:** **4:** VOL97241/1699 DD110196 CO-DALLAS **5:** 6859 000 012 2006859 000 Deed Transfer Date: 12/12/1997
	STAG MANAGEMENT INC ATTN JOHN R LANE PRES	**1:** BONNIE VIEW ROAD **2:** BLK 6859 PT TR 12 ACS 4.655 **3:**

2009	5322 BONNIE VIEW RD DALLAS, TEXAS 752412401	**4:** VOL97241/1699 DD110196 CO-DALLAS **5:** 6859 000 012 2006859 000 Deed Transfer Date: 12/12/1997
2008	STAG MANAGEMENT INC ATTN JOHN R LANE PRES 5322 BONNIE VIEW RD DALLAS, TEXAS 752412401	**1:** BONNIE VIEW ROAD **2:** BLK 6859 PT TR 12 ACS 4.655 **3:** **4:** VOL97241/1699 DD110196 CO-DALLAS **5:** 6859 000 012 2006859 000 Deed Transfer Date: 12/12/1997
2007	STAG MANAGEMENT INC ATTN JOHN R LANE PRES 5322 BONNIE VIEW RD DALLAS, TEXAS 752412401	**1:** BONNIE VIEW ROAD **2:** BLK 6859 PT TR 12 ACS 4.655 **3:** **4:** VOL97241/1699 DD110196 CO-DALLAS **5:** 6859 000 012 2006859 000 Deed Transfer Date: 12/12/1997
2006	STAG MANAGEMENT INC ATTN JOHN R LANE PRES 5322 BONNIE VIEW RD DALLAS, TEXAS 752412401	**1:** BONNIE VIEW ROAD **2:** BLK 6859 PT TR 12 ACS 4.655 **3:** **4:** VOL97241/1699 DD110196 CO-DALLAS **5:** 6859 000 012 2006859 000 Deed Transfer Date: 12/12/1997
2005	STAG MANAGEMENT INC ATTN JOHN R LANE PRES 5322 BONNIE VIEW RD DALLAS, TEXAS 752412401	**1:** BONNIE VIEW ROAD **2:** BLK 6859 PT TR 12 ACS 4.655 **3:** **4:** VOL97241/1699 DD110196 CO-DALLAS **5:** 6859 000 012 2006859 000 Deed Transfer Date: 12/12/1997
2004	STAG MANAGEMENT INC ATTN JOHN R LANE PRES 5322 BONNIE VIEW RD DALLAS, TEXAS 752412401	**1:** BONNIE VIEW ROAD **2:** BLK 6859 PT TR 12 ACS 4.655 **3:** **4:** VOL97241/1699 DD110196 CO-DALLAS **5:** 6859 000 012 2006859 000 Deed Transfer Date: 12/12/1997
2003	STAG MANAGEMENT INC ATTN JOHN R LANE PRES 5322 BONNIE VIEW RD DALLAS, TEXAS 752412401	**1:** BONNIE VIEW ROAD **2:** BLK 6859 PT TR 12 ACS 4.655 **3:** **4:** VOL97241/1699 DD110196 CO-DALLAS **5:** 6859 000 012 2006859 000 Deed Transfer Date: 12/12/1997
2002	STAG MANAGEMENT INC ATTN JOHN R LANE PRES 5322 BONNIE VIEW RD DALLAS, TEXAS 752412401 UNASSIGNED	**1:** BONNIE VIEW ROAD **2:** BLK 6859 PT TR 12 ACS 4.655 **3:** **4:** VOL97241/1699 DD110196 CO-DALLAS **5:** 6859 000 012 2006859 000 Deed Transfer Date: 1/1/1900
2001	STAG MANAGEMENT INC ATTN JOHN R LANE PRES 5322 BONNIE VIEW RD DALLAS, TEXAS 752412401 UNASSIGNED	**1:** BONNIE VIEW ROAD **2:** BLK 6859 PT TR 12 ACS 4.655 **3:** **4:** VOL97241/1699 DD110196 CO-DALLAS **5:** 6859 000 012 2006859 000 Deed Transfer Date: 1/1/1900

2000	STAG MANAGEMENT INC ATTN JOHN R LANE PRES 5322 BONNIE VIEW RD DALLAS, TEXAS 752412401 UNASSIGNED	**1:** BONNIE VIEW ROAD **2:** BLK 6859 PT TR 12 ACS 4.655 **3:** **4:** VOL97241/1699 DD110196 CO-DALLAS **5:** 6859 000 012 2006859 000 Deed Transfer Date: 1/1/1900
1999	STAG MANAGEMENT INC ATTN JOHN R LANE PRES 5322 BONNIE VIEW RD DALLAS, TEXAS 752412401 UNASSIGNED	**1:** BONNIE VIEW ROAD **2:** BLK 6859 PT TR 12 ACS 4.655 **3:** **4:** VOL97241/1699 DD110196 CO-DALLAS **5:** 6859 000 012 2006859 000 Deed Transfer Date: 1/1/1900

Market Value

Year	Improvement	Land	Total Market	Homestead Capped
2015	$233,170	$37,240	$270,410	N/A
2014	$233,170	$37,240	$270,410	N/A
2013	$233,170	$37,240	$270,410	N/A
2012	$233,170	$37,240	$270,410	N/A
2011	$233,170	$37,240	$270,410	N/A
2010	$233,170	$37,240	$270,410	N/A
2009	$233,170	$37,240	$270,410	N/A
2008	$233,170	$37,240	$270,410	N/A
2007	$206,130	$37,240	$243,370	N/A
2006	$161,880	$37,240	$199,120	N/A
2005	$145,080	$51,200	$196,280	N/A
2004	$145,080	$51,200	$196,280	N/A
2003	$145,080	$51,200	$196,280	N/A
2002	$145,080	$51,200	$196,280	N/A
2001	$145,080	$51,200	$196,280	N/A
2000	$145,080	$51,200	$196,280	N/A
1999	$145,080	$51,200	$196,280	N/A

Taxable Value

Year	City	ISD	County	College	Hospital	Special District
2015	$270,410	$270,410	$270,410	$270,410	$270,410	$0
2014	$270,410	$270,410	$270,410	$270,410	$270,410	$0
2013	$270,410	$270,410	$270,410	$270,410	$270,410	$0
2012	$270,410	$270,410	$270,410	$270,410	$270,410	$0
2011	$270,410	$270,410	$270,410	$270,410	$270,410	$0
2010	$270,410	$270,410	$270,410	$270,410	$270,410	$0
2009	$270,410	$270,410	$270,410	$270,410	$270,410	$0
2008	$270,410	$270,410	$270,410	$270,410	$270,410	$0
2007	$243,370	$243,370	$243,370	$243,370	$243,370	$0
2006	$199,120	$199,120	$199,120	$199,120	$199,120	$0
2005	$196,280	$196,280	$196,280	$196,280	$196,280	$0
2004	$196,280	$196,280	$196,280	$196,280	$196,280	$0
2003	$196,280	$196,280	$196,280	$196,280	$196,280	$0
2002	$196,280	$196,280	$196,280	$196,280	$196,280	$0
2001	$196,280	$196,280	$196,280	$196,280	$196,280	$0
2000	$196,280	$196,280	$196,280	$196,280	$196,280	$0
1999	$196,280	$196,280	$196,280	$196,280	$196,280	$0

Exemptions

2015	No Exemptions
2014	No Exemptions
2013	No Exemptions
2012	No Exemptions
2011	No Exemptions
2010	No Exemptions
2009	No Exemptions
2008	No Exemptions
2007	No Exemptions
2006	No Exemptions
2005	No Exemptions
2004	No Exemptions
2003	No Exemptions
2002	No Exemptions
2001	No Exemptions
2000	No Exemptions
1999	No Exemptions

Exemption Details History

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- Forms
- Data Products
- GIS Data Products
- Exemptions
- Property Valuation Process
- Protest Process
- Paying Taxes
- Local Tax Offices
- Taxing Unit Rates
- F.A.Q.
- Calendar
- Certified Value Summaries
- Certified Comparisons
- Certification Reports
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Find Property By Account Number

Search By: Owner Name Account Number Street Address Business Name Map

Enter your 17 character account number:

Account Number: 00685900000120600 Search

< PREV matches 1 - 1 of 1 properties. NEXT >					Page 1 of 1
#	Property Address	City	Owner Name / Business Name	Total Value	Type
1	5156 BONNIE VIEW RD	DALLAS	STAG MANAGEMENT INC	$79,200	COMMERCIAL
< PREV matches 1 - 1 of 1 properties. NEXT >					Page 1 of 1

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Commercial Account #00685900000120600

Location Owner Legal Desc Value Improvements Land Exemptions Estimated Taxes Building Footprint History

Location (Current 2016)

Address: 5156 BONNIE VIEW RD
Market Area: 0
Mapsco: 66-F (DALLAS)

DCAD Property Map

View Photo

2015 Appraisal Notice

Electronic Documents (ENS)

Print Homestead Exemption Form

Owner (Current 2016)

STAG MANAGEMENT INC
ATTN JOHN LANE PRES
5322 BONNIE VIEW RD
DALLAS, TEXAS 752413201

Multi-Owner (Current 2016)

Owner Name	Ownership %
STAG MANAGEMENT INC	100%

Legal Desc (Current 2016)

1: BLK 6859 TR 12.6
2: TR 12.6 ACS 9.904
3:
4: VOL97241/1695 DD120197 CO-DALLAS
5: 6859 000 01206 2006859 000
Deed Transfer Date: 8/5/1998

Value

2015 Certified Values	
Improvement:	$0
Land:	+ $79,200
Market Value:	=$79,200
Ag Use Value: $792	
Revaluation Year:	2015
Previous Revaluation Year:	2012

Improvements (Current 2016)

No Improvements.

Land (2015 Certified Values)

#	State Code	Zoning	Frontage (ft)	Depth (ft)	Area	Pricing Method	Unit Price	Market Adjustment	Adjusted Price	Ag Land
1	QUALIFIED OPEN SPACE LAND	SINGLE FAMILY DISTRICT 7,500 S	0	0	9.9000 ACRE	STANDARD	$10,000.00	-20%	$79,200	Y

*** All Exemption information reflects 2015 Certified Values. ***

Exemptions (2015 Certified Values)

	City	School	County and School Equalization	College	Hospital	Special District
Taxing Jurisdiction	DALLAS	DALLAS ISD	DALLAS COUNTY	DALLAS CO COMMUNITY COLLEGE	PARKLAND HOSPITAL	UNASSIGNED
AG EXEMPTION	$78,408	$78,408	$78,408	$78,408	$78,408	$0
Taxable Value	$792	$792	$792	$792	$792	$0

Exemption Details

Estimated Taxes (2015 Certified Values)

	City	School	County and School Equalization	College	Hospital	Special District
Taxing Jurisdiction	DALLAS	DALLAS ISD	DALLAS COUNTY	DALLAS CO COMMUNITY COLLEGE	PARKLAND HOSPITAL	UNASSIGNED
Tax Rate per $100	$0.797	$1.282085	$0.2531	$0.12365	$0.286	N/A
Taxable Value	$792	$792	$792	$792	$792	$0
Estimated Taxes	$6.31	$10.15	$2.00	$0.98	$2.27	N/A
Tax Ceiling					N/A	N/A
					Total Estimated Taxes:	**$21.72**

DO NOT PAY TAXES BASED ON THESE ESTIMATED TAXES. You will receive an **official tax bill** from the appropriate agency when they are prepared. Taxes are collected by the agency sending you the **official** tax bill. To see a listing of agencies that collect taxes for your property. Click Here

The estimated taxes are provided as a courtesy and should not be relied upon in making financial or other decisions. The Dallas Central Appraisal District (DCAD) does not control the tax rate nor the amount of the taxes, as that is the responsibility of each Taxing Jurisdiction. Questions about your taxes should be directed to the appropriate taxing jurisdiction. We cannot assist you in these matters. These tax estimates are calculated by using the most current certified taxable value multiplied by the most current tax rate. **It does not take into account other special or unique tax scenarios**. If you wish to calculate taxes yourself, you may use the TaxEstimator to assist you.

Building Footprint (Current 2016)

Building Footprint Not Available

History

History

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Account History #00685900000120600

Owner Legal Desc Market Value Taxable Value Exemptions

Owner / Legal Description

Year	Owner	Legal Description
2015	STAG MANAGEMENT INC ATTN JOHN LANE PRES 5322 BONNIE VIEW RD DALLAS, TEXAS 752412401	**1:** BLK 6859 TR 12.6 **2:** TR 12.6 ACS 9.904 **3:** **4:** VOL97241/1695 DD120197 CO-DALLAS **5:** 6859 000 01206 2006859 000 Deed Transfer Date: 8/5/1998
2014	STAG MANAGEMENT INC ATTN JOHN LANE PRES 5322 BONNIE VIEW RD DALLAS, TEXAS 752412401	**1:** BLK 6859 TR 12.6 **2:** TR 12.6 ACS 9.904 **3:** **4:** VOL97241/1695 DD120197 CO-DALLAS **5:** 6859 000 01206 2006859 000 Deed Transfer Date: 8/5/1998
2013	STAG MANAGEMENT INC ATTN JOHN LANE PRES 5322 BONNIE VIEW RD DALLAS, TEXAS 752412401	**1:** BLK 6859 TR 12.6 **2:** TR 12.6 ACS 9.904 **3:** **4:** VOL97241/1695 DD120197 CO-DALLAS **5:** 6859 000 01206 2006859 000 Deed Transfer Date: 8/5/1998
2012	STAG MANAGEMENT INC ATTN JOHN LANE PRES 5322 BONNIE VIEW RD DALLAS, TEXAS 752412401	**1:** BLK 6859 TR 12.6 **2:** TR 12.6 ACS 9.904 **3:** **4:** VOL97241/1695 DD120197 CO-DALLAS **5:** 6859 000 01206 2006859 000 Deed Transfer Date: 8/5/1998
2011	STAG MANAGEMENT INC ATTN JOHN LANE PRES 5322 BONNIE VIEW RD DALLAS, TEXAS 752412401	**1:** BLK 6859 TR 12.6 **2:** TR 12.6 ACS 9.904 **3:** **4:** VOL97241/1695 DD120197 CO-DALLAS **5:** 6859 000 01206 2006859 000 Deed Transfer Date: 8/5/1998
2010	STAG MANAGEMENT INC ATTN JOHN LANE PRES 5322 BONNIE VIEW RD DALLAS, TEXAS 752412401	**1:** BLK 6859 TR 12.6 **2:** TR 12.6 ACS 9.904 **3:** **4:** VOL97241/1695 DD120197 CO-DALLAS **5:** 6859 000 01206 2006859 000 Deed Transfer Date: 8/5/1998
2009	STAG MANAGEMENT INC ATTN JOHN LANE PRES 5322 BONNIE VIEW RD DALLAS, TEXAS 752412401	**1:** BLK 6859 TR 12.6 **2:** TR 12.6 ACS 9.904 **3:** **4:** VOL97241/1695 DD120197 CO-DALLAS **5:** 6859 000 01206 2006859 000 Deed Transfer Date: 8/5/1998
	STAG MANAGEMENT INC	**1:** BLK 6859 TR 12.6 **2:** TR 12.6 ACS 9.904

2008	ATTN JOHN LANE PRES 5322 BONNIE VIEW RD DALLAS, TEXAS 752412401	**3:** **4:** VOL97241/1695 DD120197 CO-DALLAS **5:** 6859 000 01206 2006859 000 Deed Transfer Date: 8/5/1998
2007	STAG MANAGEMENT INC ATTN JOHN LANE PRES 5322 BONNIE VIEW RD DALLAS, TEXAS 752412401	**1:** BLK 6859 TR 12.6 **2:** TR 12.6 ACS 9.904 **3:** **4:** VOL97241/1695 DD120197 CO-DALLAS **5:** 6859 000 01206 2006859 000 Deed Transfer Date: 8/5/1998
2006	STAG MANAGEMENT INC ATTN JOHN LANE PRES 5322 BONNIE VIEW RD DALLAS, TEXAS 752412401	**1:** BLK 6859 TR 12.6 **2:** TR 12.6 ACS 9.904 **3:** **4:** VOL97241/1695 DD120197 CO-DALLAS **5:** 6859 000 01206 2006859 000 Deed Transfer Date: 8/5/1998
2005	STAG MANAGEMENT INC ATTN JOHN LANE PRES 5322 BONNIE VIEW RD DALLAS, TEXAS 752412401	**1:** BLK 6859 TR 12.6 **2:** TR 12.6 ACS 9.904 **3:** **4:** VOL97241/1695 DD120197 CO-DALLAS **5:** 6859 000 01206 2006859 000 Deed Transfer Date: 8/5/1998
2004	STAG MANAGEMENT INC ATTN JOHN LANE PRES 5322 BONNIE VIEW RD DALLAS, TEXAS 752412401	**1:** BLK 6859 TR 12.6 **2:** TR 12.6 ACS 9.904 **3:** **4:** VOL97241/1695 DD120197 CO-DALLAS **5:** 6859 000 01206 2006859 000 Deed Transfer Date: 8/5/1998
2003	STAG MANAGEMENT INC ATTN JOHN LANE PRES 5322 BONNIE VIEW RD DALLAS, TEXAS 752412401	**1:** BLK 6859 TR 12.6 **2:** TR 12.6 ACS 9.904 **3:** **4:** VOL97241/1695 DD120197 CO-DALLAS **5:** 6859 000 01206 2006859 000 Deed Transfer Date: 8/5/1998
2002	STAG MANAGEMENT INC ATTN JOHN LANE PRES 5322 BONNIE VIEW RD DALLAS, TEXAS 752412401 UNASSIGNED	**1:** BLK 6859 TR 12.6 **2:** TR 12.6 ACS 9.904 **3:** **4:** VOL97241/1695 DD120197 CO-DALLAS **5:** 6859 000 01206 2006859 000 Deed Transfer Date: 1/1/1900
2001	STAG MANAGEMENT INC ATTN JOHN LANE PRES 5322 BONNIE VIEW RD DALLAS, TEXAS 752412401 UNASSIGNED	**1:** BLK 6859 TR 12.6 **2:** TR 12.6 ACS 9.904 **3:** **4:** VOL97241/1695 DD120197 CO-DALLAS **5:** 6859 000 01206 2006859 000 Deed Transfer Date: 1/1/1900
2000	STAG MANAGEMENT INC ATTN JOHN LANE PRES 5322 BONNIE VIEW RD DALLAS, TEXAS 752412401 UNASSIGNED	**1:** BLK 6859 TR 12.6 **2:** TR 12.6 ACS 9.904 **3:** **4:** VOL97241/1695 DD120197 CO-DALLAS **5:** 6859 000 01206 2006859 000 Deed Transfer Date: 1/1/1900
1999	STAG MANAGEMENT INC ATTN JOHN LANE PRES 5322 BONNIE VIEW RD DALLAS, TEXAS 752412401 UNASSIGNED	**1:** BLK 6859 TR 12.6 **2:** TR 12.6 ACS 9.904 **3:** **4:** VOL97241/1695 DD120197 CO-DALLAS **5:** 6859 000 01206 2006859 000

		Deed Transfer Date: 1/1/1900

Market Value

Year	Improvement	Land	Total Market	Homestead Capped
2015	$0	$79,200	$79,200	N/A
2014	$0	$79,200	$79,200	N/A
2013	$0	$79,200	$79,200	N/A
2012	$0	$79,200	$79,200	N/A
2011	$0	$79,200	$79,200	N/A
2010	$0	$79,200	$79,200	N/A
2009	$0	$79,200	$79,200	N/A
2008	$0	$79,200	$79,200	N/A
2007	$0	$79,200	$79,200	N/A
2006	$0	$79,200	$79,200	N/A
2005	$0	$79,200	$79,200	N/A
2004	$0	$79,200	$79,200	N/A
2003	$0	$79,200	$79,200	N/A
2002	$0	$79,200	$79,200	N/A
2001	$0	$79,200	$79,200	N/A
2000	$0	$79,200	$79,200	N/A
1999	$0	$79,200	$79,200	N/A

Taxable Value

Year	City	ISD	County	College	Hospital	Special District
2015	$792	$792	$792	$792	$792	$0
2014	$792	$792	$792	$792	$792	$0
2013	$792	$792	$792	$792	$792	$0
2012	$891	$891	$891	$891	$891	$0
2011	$792	$792	$792	$792	$792	$0
2010	$792	$792	$792	$792	$792	$0
2009	$792	$792	$792	$792	$792	$0
2008	$792	$792	$792	$792	$792	$0
2007	$792	$792	$792	$792	$792	$0
2006	$792	$792	$792	$792	$792	$0
2005	$792	$792	$792	$792	$792	$0
2004	$792	$792	$792	$792	$792	$0
2003	$792	$792	$792	$792	$792	$0
2002	$792	$792	$792	$792	$792	$0
2001	$742	$742	$742	$742	$742	$0
2000	$742	$742	$742	$742	$742	$0
1999	$742	$742	$742	$742	$742	$0

Exemptions

2015

	City	School	County and School Equalization	College	Hospital	Special District
Taxing Jurisdiction	DALLAS	DALLAS ISD	DALLAS COUNTY	DALLAS CO COMMUNITY COLLEGE	PARKLAND HOSPITAL	UNASSIGNED
AG EXEMPTION	$78,408	$78,408	$78,408	$78,408	$78,408	$0
Taxable Value	$792	$792	$792	$792	$792	$0

2014

	City	School	County and School Equalization	College	Hospital	Special District
Taxing Jurisdiction	DALLAS	DALLAS ISD	DALLAS COUNTY	DALLAS CO COMMUNITY COLLEGE	PARKLAND HOSPITAL	UNASSIGNED
AG EXEMPTION	$78,408	$78,408	$78,408	$78,408	$78,408	$0
Taxable Value	$792	$792	$792	$792	$792	$0

2013

	City	School	County and School Equalization	College	Hospital	Special District
Taxing Jurisdiction	DALLAS	DALLAS ISD	DALLAS COUNTY	DALLAS CO COMMUNITY COLLEGE	PARKLAND HOSPITAL	UNASSIGNED
AG EXEMPTION	$78,408	$78,408	$78,408	$78,408	$78,408	$0
Taxable Value	$792	$792	$792	$792	$792	$0

2012

	City	School	County and School Equalization	College	Hospital	Special District
Taxing Jurisdiction	DALLAS	DALLAS ISD	DALLAS COUNTY	DALLAS CO COMMUNITY COLLEGE	PARKLAND HOSPITAL	UNASSIGNED
AG EXEMPTION	$78,309	$78,309	$78,309	$78,309	$78,309	$0
Taxable Value	$891	$891	$891	$891	$891	$0

2011

	City	School	County and School Equalization	College	Hospital	Special District
Taxing Jurisdiction	DALLAS	DALLAS ISD	DALLAS COUNTY	DALLAS CO COMMUNITY COLLEGE	PARKLAND HOSPITAL	UNASSIGNED
AG EXEMPTION	$78,408	$78,408	$78,408	$78,408	$78,408	$0
Taxable Value	$792	$792	$792	$792	$792	$0

	City	School	County and School Equalization	College	Hospital	Special District
Taxing	DALLAS	DALLAS	DALLAS	DALLAS CO COMMUNITY	PARKLAND	UNASSIGNED

2010	**Jurisdiction**		ISD	COUNTY	COLLEGE	HOSPITAL	
	AG EXEMPTION	$78,408	$78,408	$78,408	$78,408	$78,408	$0
	Taxable Value	$792	$792	$792	$792	$792	$0

		City	School	County and School Equalization	College	Hospital	Special District
2009	**Taxing Jurisdiction**	DALLAS	DALLAS ISD	DALLAS COUNTY	DALLAS CO COMMUNITY COLLEGE	PARKLAND HOSPITAL	UNASSIGNED
	AG EXEMPTION	$78,408	$78,408	$78,408	$78,408	$78,408	$0
	Taxable Value	$792	$792	$792	$792	$792	$0

		City	School	County and School Equalization	College	Hospital	Special District
2008	**Taxing Jurisdiction**	DALLAS	DALLAS ISD	DALLAS COUNTY	DALLAS CO COMMUNITY COLLEGE	PARKLAND HOSPITAL	UNASSIGNED
	AG EXEMPTION	$78,408	$78,408	$78,408	$78,408	$78,408	$0
	Taxable Value	$792	$792	$792	$792	$792	$0

		City	School	County and School Equalization	College	Hospital	Special District
2007	**Taxing Jurisdiction**	DALLAS	DALLAS ISD	DALLAS COUNTY	DALLAS CO COMMUNITY COLLEGE	PARKLAND HOSPITAL	UNASSIGNED
	AG EXEMPTION	$78,408	$78,408	$78,408	$78,408	$78,408	$0
	Taxable Value	$792	$792	$792	$792	$792	$0

		City	School	County and School Equalization	College	Hospital	Special District
2006	**Taxing Jurisdiction**	DALLAS	DALLAS ISD	DALLAS COUNTY	DALLAS CO COMMUNITY COLLEGE	PARKLAND HOSPITAL	UNASSIGNED
	AG EXEMPTION	$78,408	$78,408	$78,408	$78,408	$78,408	$0
	Taxable Value	$792	$792	$792	$792	$792	$0

2005	No Exemptions
2004	No Exemptions
2003	No Exemptions
2002	No Exemptions
2001	No Exemptions
2000	No Exemptions

1999	No Exemptions

Exemption Details History

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Commercial Account #00685900000120400

Location Owner Legal Desc Value Improvements Land Exemptions Estimated Taxes Building Footprint History

Location (Current 2016)

Address: 5156 BONNIE VIEW RD
Market Area: 0
Mapsco: 66-F (DALLAS)

DCAD Property Map

View Photo

2015 Appraisal Notice

Electronic Documents (ENS)

Print Homestead Exemption Form

Owner (Current 2016)

LANE JEFFREY T & LETICIA
5156 BONNIE VIEW RD
DALLAS, TEXAS 752411605

Multi-Owner (Current 2016)

Owner Name	Ownership %
LANE JEFFREY T & LETICIA	100%

Legal Desc (Current 2016)

1: BLK 6859
2: TR 12.4 ACS 6.06
3: SEE 006859000001204HS FOR REM ACS
4: VOL83073/2532 CO-DC
5: 6859 000 01204 2006859 000
Deed Transfer Date: 11/11/1900

Value

2015 Certified Values	
Improvement:	$0
Land:	+ $60,600
Market Value:	=$60,600
Ag Use Value: $484	
Revaluation Year:	2015
Previous Revaluation Year:	2012

Improvements (Current 2016)

No Improvements.

Land (2015 Certified Values)

#	State Code	Zoning	Frontage (ft)	Depth (ft)	Area	Pricing Method	Unit Price	Market Adjustment	Adjusted Price	Ag Land
1	QUALIFIED OPEN SPACE LAND	AGRICULTURE DISTRICT	0	0	6.0600 ACRE	STANDARD	$10,000.00	0%	$60,600	Y

*** All Exemption information reflects 2015 Certified Values. ***

Exemptions (2015 Certified Values)

	City	School	County and School Equalization	College	Hospital	Special District
Taxing Jurisdiction	DALLAS	DALLAS ISD	DALLAS COUNTY	DALLAS CO COMMUNITY COLLEGE	PARKLAND HOSPITAL	UNASSIGNED
AG EXEMPTION	$60,116	$60,116	$60,116	$60,116	$60,116	$0
Taxable Value	$484	$484	$484	$484	$484	$0

Exemption Details

Estimated Taxes (2015 Certified Values)

	City	School	County and School Equalization	College	Hospital	Special District
Taxing Jurisdiction	DALLAS	DALLAS ISD	DALLAS COUNTY	DALLAS CO COMMUNITY COLLEGE	PARKLAND HOSPITAL	UNASSIGNED
Tax Rate per $100	$0.797	$1.282085	$0.2531	$0.12365	$0.286	N/A
Taxable Value	$484	$484	$484	$484	$484	$0
Estimated Taxes	$3.86	$6.21	$1.23	$0.60	$1.38	N/A
Tax Ceiling					N/A	N/A
					Total Estimated Taxes:	**$13.27**

DO NOT PAY TAXES BASED ON THESE ESTIMATED TAXES. You will receive an **official tax bill** from the appropriate agency when they are prepared. Taxes are collected by the agency sending you the **official** tax bill. To see a listing of agencies that collect taxes for your property. Click Here

The estimated taxes are provided as a courtesy and should not be relied upon in making financial or other decisions. The Dallas Central Appraisal District (DCAD) does not control the tax rate nor the amount of the taxes, as that is the responsibility of each Taxing Jurisdiction. Questions about your taxes should be directed to the appropriate taxing jurisdiction. We cannot assist you in these matters. These tax estimates are calculated by using the most current certified taxable value multiplied by the most current tax rate. **It does not take into account other special or unique tax scenarios**. If you wish to calculate taxes yourself, you may use the TaxEstimator to assist you.

Building Footprint (Current 2016)

Building Footprint Not Available

History

History

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Commercial Account #00000636394000000

Location Owner Legal Desc Value Improvements Land Exemptions Estimated Taxes Building Footprint History

Location (Current 2016)

Address: 2944 STAG RD
Market Area: 0
Mapsco: 66-F (DALLAS)

DCAD Property Map

View Photo

2015 Appraisal Notice

Electronic Documents (ENS)

Print Homestead Exemption Form

Owner (Current 2016)

LANE J R & C E
%LANE PLATING WORKS
PO BOX 41098
DALLAS, TEXAS 752410098

Multi-Owner (Current 2016)

Owner Name	Ownership %
LANE J R & C E	100%

Legal Desc (Current 2016)

1: BLK 6859
2: LOT 11 ACS 22.581
3:
4: VOL80011 PG2076 CO-DALLAS
5: 6859 000 011 2006859 000
Deed Transfer Date: 8/6/1998

Value

2015 Certified Values	
Improvement:	$0
Land:	+ $293,540
Market Value:	=$293,540
Ag Use Value: $1,806	
Revaluation Year:	2015
Previous Revaluation Year:	2012

Improvements (Current 2016)

No Improvements.

Land (2015 Certified Values)

#	State Code	Zoning	Frontage (ft)	Depth (ft)	Area	Pricing Method	Unit Price	Market Adjustment	Adjusted Price	Ag Land
1	QUALIFIED OPEN SPACE LAND	MULTIFAMILY DISTRICT 2	0	0	22.5800 ACRE	STANDARD	$13,000.00	0%	$293,540	Y

*** All Exemption information reflects 2015 Certified Values. ***

Exemptions (2015 Certified Values)

	City	School	County and School Equalization	College	Hospital	Special District
Taxing Jurisdiction	DALLAS	DALLAS ISD	DALLAS COUNTY	DALLAS CO COMMUNITY COLLEGE	PARKLAND HOSPITAL	UNASSIGNED
AG EXEMPTION	$291,734	$291,734	$291,734	$291,734	$291,734	$0
Taxable Value	$1,806	$1,806	$1,806	$1,806	$1,806	$0

Exemption Details

Estimated Taxes (2015 Certified Values)

	City	School	County and School Equalization	College	Hospital	Special District
Taxing Jurisdiction	DALLAS	DALLAS ISD	DALLAS COUNTY	DALLAS CO COMMUNITY COLLEGE	PARKLAND HOSPITAL	UNASSIGNED
Tax Rate per $100	$0.797	$1.282085	$0.2531	$0.12365	$0.286	N/A
Taxable Value	$1,806	$1,806	$1,806	$1,806	$1,806	$0
Estimated Taxes	$14.39	$23.15	$4.57	$2.23	$5.17	N/A
Tax Ceiling					N/A	N/A
					Total Estimated Taxes:	**$49.52**

DO NOT PAY TAXES BASED ON THESE ESTIMATED TAXES. You will receive an **official tax bill** from the appropriate agency when they are prepared. Taxes are collected by the agency sending you the **official** tax bill. To see a listing of agencies that collect taxes for your property. Click Here

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Building Footprint (Current 2016)

Building Footprint Not Available

History

History

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Commercial Account #00000635944000000

Location Owner Legal Desc Value Improvements Land Exemptions Estimated Taxes Building Footprint History

Location (Current 2016)

Address: 5257 BONNIE VIEW RD
Market Area: 0
Mapsco: 66-J (DALLAS)

DCAD Property Map

View Photo

2015 Appraisal Notice

Electronic Documents (ENS)

Print Homestead Exemption Form

Owner (Current 2016)

LANE CHARLES EDWARD & JOHN REIB
% LANE PLATING WORKS
PO BOX 41098
DALLAS, TEXAS 752410098

Multi-Owner (Current 2016)

Owner Name	Ownership %
LANE CHARLES EDWARD & JOHN REIB	100%

Legal Desc (Current 2016)

1: BLK 6858
2: TR 16 ACS 19.272
3:
4: VOL 80041/2084 DD12151972 CO-DC
5: 6858 000 01600 2DA6858 000
Deed Transfer Date: 12/15/1972

Value

2015 Certified Values	
Improvement:	$0
Land:	+ $58,590
Market Value:	=$58,590
Ag Use Value: $1,541	
Revaluation Year:	2015
Previous Revaluation Year:	2012

Improvements (Current 2016)

No Improvements.

Land (2015 Certified Values)

#	State Code	Zoning	Frontage (ft)	Depth (ft)	Area	Pricing Method	Unit Price	Market Adjustment	Adjusted Price	Ag Land
1	QUALIFIED OPEN SPACE LAND	SINGLE FAMILY DISTRICT 5,000 S	0	0	19.5300 ACRE	STANDARD	$6,000.00	-50%	$58,590	Y

*** All Exemption information reflects 2015 Certified Values. ***

Exemptions (2015 Certified Values)

	City	School	County and School Equalization	College	Hospital	Special District
Taxing Jurisdiction	DALLAS	DALLAS ISD	DALLAS COUNTY	DALLAS CO COMMUNITY COLLEGE	PARKLAND HOSPITAL	UNASSIGNED
AG EXEMPTION	$57,028	$57,028	$57,028	$57,028	$57,028	$0
Taxable Value	$1,562	$1,562	$1,562	$1,562	$1,562	$0

Exemption Details

Estimated Taxes (2015 Certified Values)

	City	School	County and School Equalization	College	Hospital	Special District
Taxing Jurisdiction	DALLAS	DALLAS ISD	DALLAS COUNTY	DALLAS CO COMMUNITY COLLEGE	PARKLAND HOSPITAL	UNASSIGNED
Tax Rate per $100	$0.797	$1.282085	$0.2531	$0.12365	$0.286	N/A
Taxable Value	$1,562	$1,562	$1,562	$1,562	$1,562	$0
Estimated Taxes	$12.45	$20.03	$3.95	$1.93	$4.47	N/A
Tax Ceiling					N/A	N/A
					Total Estimated Taxes:	**$42.83**

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Building Footprint (Current 2016)

Building Footprint Not Available

History

History

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Residential Account #00000636403000000

Location Owner Legal Desc Value Main Improvement Additional Improvements Land
Exemptions Estimated Taxes History

Property Location (Current 2016)

Address: 2940 STAG RD
Neighborhood: 4DSD43
Mapsco: 66-F (DALLAS)

DCAD Property Map

2015 Appraisal Notice

Electronic Documents (ENS)

File Homestead Exemption Online

Print Homestead Exemption Form

Owner (Current 2016)

LANE JOHN REIB
643 SW COUNTY ROAD 1000
CORSICANA, TEXAS 751108608

Multi-Owner (Current 2016)

Owner Name	Ownership %
LANE JOHN REIB	100%

Legal Desc (Current 2016)

1: BLK 6859
2: PT LOT 12 0.836 AC
3: STAG RD 385FR BONNIE VIEW RD
4: CO-DALLAS
5: 6859 000 012 2006859 000
Deed Transfer Date: 11/11/1900

Value

2015 Certified Values	
Improvement:	$56,640
Land:	+ $8,360
Market Value:	=$65,000
Revaluation Year:	2015
Previous Revaluation Year:	2012

Main Improvement (Current 2016)

Building Class	13	**Construction Type**	FRAME	**# Baths (Full/Half)**	1/ 0
Year Built	1963	**Foundation**	PIER AND BEAM	**# Kitchens**	1
Effective Year Built	1963	**Roof Type**	HIP	**# Bedrooms**	3

Actual Age	53 years	**Roof Material**	COMP SHINGLES	**# Wet Bars**	0
Desirability	FAIR	**Fence Type**	CHAIN	**# Fireplaces**	1
Living Area	2,306 sqft	**Ext. Wall Material**	BRICK VENEER	**Sprinkler (Y/N)**	N
Total Area	2,306 sqft	**Basement**	PARTIAL	**Deck (Y/N)**	N
% Complete	100%	**Heating**	CENTRAL FULL	**Spa (Y/N)**	N
# Stories	ONE STORY	**Air Condition**	CENTRAL FULL	**Pool (Y/N)**	N
Depreciation	60%			**Sauna (Y/N)**	N

Additional Improvements (Current 2016)

#	Improvement Type	Construction	Floor	Exterior Wall	Area (sqft)
1	BASEMENT		UNASSIGNED	BRICK VENEER	250
2	ATTACHED GARAGE	FR-FRAME	CONCRETE	UNASSIGNED	484
3	DETACHED GARAGE		UNASSIGNED	CONCRETE BRICK	600

Land (2015 Certified Values)

#	State Code	Zoning	Frontage (ft)	Depth (ft)	Area	Pricing Method	Unit Price	Market Adjustment	Adjusted Price	Ag Land
1	SINGLE FAMILY RESIDENCES	SINGLE FAMILY DISTRICT 7,500 S	0	0	0.8360 ACRE	STANDARD	$10,000.00	0%	$8,360	N

*** All Exemption information reflects 2015 Certified Values. ***

Exemptions (2015 Certified Values)

No Exemptions

Estimated Taxes (2015 Certified Values)

	City	School	County and School Equalization	College	Hospital	Special District
Taxing Jurisdiction	DALLAS	DALLAS ISD	DALLAS COUNTY	DALLAS CO COMMUNITY COLLEGE	PARKLAND HOSPITAL	UNASSIGNED
Tax Rate per $100	$0.797	$1.282085	$0.2531	$0.12365	$0.286	N/A
Taxable Value	$65,000	$65,000	$65,000	$65,000	$65,000	$0
Estimated Taxes	$518.05	$833.36	$164.52	$80.37	$185.90	N/A
Tax Ceiling					N/A	N/A
					Total Estimated Taxes:	**$1,782.19**

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History

History

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Commercial Account #00000636406000000

Location Owner Legal Desc Value Improvements Land Exemptions Estimated Taxes Building Footprint History

Location (Current 2016)

Address: 5118 BONNIE VIEW RD
Market Area: 0
Mapsco: 66-E (DALLAS)

DCAD Property Map

View Photo

2015 Appraisal Notice

Electronic Documents (ENS)

Print Homestead Exemption Form

Owner (Current 2016)

LANE JOHN R
643 SW COUNTY ROAD 1000
CORSICANA, TEXAS 751108608

Multi-Owner (Current 2016)

Owner Name	Ownership %
LANE JOHN R	100%

Legal Desc (Current 2016)

1: BLK 6859
2: TR 12.1 0.869 ACS
3: BONNIE VIEW RD & THIGPEN RD
4: VOL2000114/1681 DD05312000 CO-DC
5: 6859 000 012 2006859 000
Deed Transfer Date: 6/9/2000

Value

2015 Certified Values	
Improvement: **Land:** **Market Value:**	$0 + $4,900 =$4,900
Revaluation Year:	2015
Previous Revaluation Year:	2012

Improvements (Current 2016)

No Improvements.

Land (2015 Certified Values)

#	State Code	Zoning	Frontage (ft)	Depth (ft)	Area	Pricing Method	Unit Price	Market Adjustment	Adjusted Price	Ag Land
1	COMMERCIAL - VACANT PLOTTED LOTS/TRACTS	SINGLE FAMILY DISTRICT 7,500 S	0	0	37,679.0000 SQUARE FEET	STANDARD	$0.30	-57%	$4,898	N

*** All Exemption information reflects 2015 Certified Values. ***

Exemptions (2015 Certified Values)

No Exemptions

Estimated Taxes (2015 Certified Values)

	City	School	County and School Equalization	College	Hospital	Special District
Taxing Jurisdiction	DALLAS	DALLAS ISD	DALLAS COUNTY	DALLAS CO COMMUNITY COLLEGE	PARKLAND HOSPITAL	UNASSIGNED
Tax Rate per $100	$0.797	$1.282085	$0.2531	$0.12365	$0.286	N/A
Taxable Value	$4,900	$4,900	$4,900	$4,900	$4,900	$0
Estimated Taxes	$39.05	$62.82	$12.40	$6.06	$14.01	N/A
Tax Ceiling					N/A	N/A
					Total Estimated Taxes:	**$134.35**

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Building Footprint (Current 2016)

Building Footprint Not Available

History

History

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Reference 17

Texas Commission on Environmental Quality
Investigation Report

The TCEQ is committed to accessibility. If you need assistance in accessing this document, please contact oce@tceq.texas.gov

Customer: STAG MANAGEMENT INCORPORATED
Customer Number: CN603834292

Regulated Entity Name: LANE PLATING
Regulated Entity Number: RN100597707

Investigation # 1330051
Investigator: DOROTHY LEWIS

Incident Numbers

Site Classification CONTAINER STORAGE AREA
SUMP
TANK
ORDER
LARGE QUANTITY GENERATOR

Conducted: 04/29/2016 -- 04/29/2016

NAIC Code: 332813
SIC Code: 3471

Program(s): INDUSTRIAL AND HAZARDOUS WASTE

Investigation Type: Compliance Invest File Review

Location: 5322 Bonnieview Rd, Dallas, TX

Additional ID(s): TXD007336571
31215

Address: 5322 BONNIE VIEW RD, DALLAS, TX , 75241

Local Unit: REGION 04 - DFW METROPLEX

Activity Type(s): IHWCDI - Case development investigation
IHWSPL - Sampling Investigation

Principal(s):

Role	Name
RESPONDENT	STAG MANAGEMENT INCORPORATED

Contact(s):

Role	Title	Name	Phone

Other Staff Member(s):

Role	Name
Supervisor	SAMUEL BARRETT

Associated Check List

Checklist Name	Unit Name
IHW SAMPLE ANALYSES RESULTS	Lane Plating

Investigation Comments:

INTRODUCTION

On April 29, 2016, Ms. Dorothy Lewis, Texas Commission on Environmental Quality (TCEQ) DFW Region Environmental Investigator, conducted an Industrial and Hazardous Waste (IHW) Reporting of Sample Results

Investigation. On December 7, 2016, soil samples from Lane Plating located at 5322 Bonnie View Road, Dallas (Dallas County), Texas (the facility) were collected and analyzed. The sample results documented constituents of concern exceeding the Texas Risk Reduction Program (TRRP) Protective Concentration Limits (PCLs) listed in Title 30 Texas Administrative Code (TAC) Chapter 350. The results of this sampling event were transmitted to the TCEQ Remediation Section, the TCEQ Litigation Division, and the EPA On-Scene Coordinator for the Emergency Removal Program for review. No letters were transmitted to Lane Plating Works.

On November 20, 2015, Ms. Lewis conducted an IHW Sampling Investigation at Lane Plating Works. Ms. Lewis was accompanied by Mr. Andrew Townsend, TCEQ DFW Region Environmental Investigator. The purpose of this investigation was to determine if any of the grinding grit, a hazardous waste (lead and chromium) disposed on-site, had generated any metal laden dust that may have spread off-site due to wind and precipitation exposure. See Investigation No. 1301528 for additional details regarding this sampling event.

BACKGROUND

Lane Plating had been operating for approximately 90 years at the current site and employed fewer than 10 people. The facility property is currently leased by Lane Plating Works Inc. from the property owner, Stag Management Inc. Mr. Joe Lane is also the owner of Stag Management Incorporated. Review of the TCEQ DFW Regional file indicates that Lane Plating has been investigated by several state and federal regulatory agencies over the past forty years.

On February 22, 2010, TCEQ DFW Region Solid Waste staff conducted an unannounced IHW Focused Compliance Evaluation Investigation (CEI) at Lane Plating (Consolidated Compliance and Enforcement Data System (CCEDS) Investigation No. 793100). This investigation was conducted during an initiative by the DFW Region Waste Program to review a listing of known electroplating facilities that had not been recently investigated by the TCEQ DFW Region Waste Section. The purpose of the initiative was to identify facilities storing incompatible wastes together, creating a potential risk to human life. Focused Container Storage Area Investigations were conducted at these facilities to determine if wastes were being properly managed and to obtain information to be used in a risk-based inspection strategy. At the time of the focused investigation at Lane Plating, a violation for the failure to clearly mark accumulation start dates on containers storing hazardous waste was observed and noted, and a follow-up investigation was deemed necessary. A Notice of Violation (NOV) letter detailing the investigation findings was submitted to Lane Plating on February 24, 2010. The alleged violations were subsequently resolved during a Record Review Investigation conducted by DFW Region staff on March 29, 2010 (CCEDS Investigation No. 797546).

On January 19, 2011, TCEQ DFW Region staff, accompanied by TCEQ Small Business and Local Government Assistance (SBLGA) staff, traveled to Lane Plating and conducted an IHW CEI of a LQG (CCEDS Investigation No. 900994). Based on observations made during the CEI, it was determined that soil sampling was necessary. On January 20, 2011, TCEQ DFW Region Solid Waste staff returned to the facility to collect the samples. As a result of the CEI, five alleged violations and one additional issue regarding the rules for IHW were noted and formal enforcement action requested. The violations observed were: (1) the failure to obtain a permit prior to the disposal of hazardous waste; (2) the failure to transport hazardous waste off-site within the allotted accumulation time limit; (3) the failure to submit Annual Waste Summaries (AWSs) for calendar years 2008 and 2009; (4) the failure to prevent the unauthorized discharge of industrial solid waste; and (5) the failure to maintain records of all hazardous and industrial solid waste activities. A Notice of Enforcement (NOE) letter was transmitted to the facility on April 20, 2011.

On July 5, 2011, a proposed Agreed Order was transmitted to the facility. On June 15, 2012, Mr. Joe Lane signed Agreed Order Docket No. 2011-0662-IHW-E. Agreed Order Docket No. 2011-0662-IHW-E was approved during a TCEQ Agenda meeting on August 22, 2012 (See agency files).

On September 16, 2014, the TCEQ Enforcement Division requested the TCEQ DFW Region conduct an on-site investigation at Lane Plating to determine if the facility had complied with Agreed Order Docket No. 2011-0662-IHW-E.

On October 21, 2014, TCEQ DFW Region staff conducted an IHW CEI of an LQG and an Agreed Order Follow-up Investigation at Lane Plating. During the investigation, several additional issues and alleged violations of the rules for the management of industrial and hazardous waste were observed and noted. One alleged violation for the

failure to install a secondary containment unit for a hazardous waste tank containing liquids resulted in the initiation of the formal enforcement process. Additionally, the failure to comply with Agreed Order (Docket No. 2011-0662-IHW-E) Provisions 2.a, 2.b.i, 2.b.ii, 3.b.iii, 2.b.iv, and 2.c. warranted a formal enforcement action. The TCEQ DFW Region Office transmitted an NOE letter to Lane Plating in March 2015.

On November 4, 2015, the TCEQ conducted an investigation at the site at the request of the TCEQ Bankruptcy Program and the TCEQ Critical Infrastructure Program (See Investigation No. 1300861 for additional information). The purpose of this investigation was to assess the site and provide information to the TCEQ CID, TCEQ Bankruptcy Program, and the TCEQ DFW ER Team so that they could determine if anything at the site posed an immediate threat to the health of the neighboring residents. The information obtained during this investigation was transmitted to the TCEQ programs on November 6, 2015, for review and it was determined that personnel representing these programs would travel to the site on November 19, 2015, to further assess the site and determine a course of action for the cyanide waste.

On November 19, 2015, members of the TCEQ DFW Region Office, TCEQ Critical Infrastructure Division, TCEQ Bankruptcy Program, TCEQ Emergency Response, SWS Environmental Service, Mr. Lane, and Mr. Daniel Sherman (bankruptcy trustee) met at the site to determine if any of the waste inside the facility and on the property posed an immediate threat to the health of the neighboring community. As a result of the investigation, it was determined that the facility and the property needed to be secured and all product-grade cyanide waste needed to be removed and properly disposed due to the potential health threat to the community. It was also determined that the spent chromic acid from the tank and the sump needed to be removed from these units and containerized. All these tasks were assigned to SWS Environmental for completion and SWS began working on the site the following day. Based upon the investigation findings, a TCEQ Demand Letter was transmitted to Mr. Lane on December 9, 2015, after the bankruptcy case was dismissed. See Investigation No. 1301517 for additional details regarding this investigation.

On November 20, 2016, TCEQ DFW Region staff conducted an IHW Sampling Investigation at the site (Investigation No. 1301528). The TCEQ collected 18 surface soil samples (0-3 inches deep) from the south perimeter of the site. The TCEQ requested that these samples be analyzed for total metals (nickel, beryllium, antimony, lead, cadmium, silver, selenium, chromium, mercury, barium, and arsenic). The results of these samples are reported in this body of work.

GENERAL FACILITY INFORMATION

Lane Plating was an electroplating facility, conducting primarily hard chromium plating and cadmium plating. Current processes performed at the facility include: chromate dips, chromic acid anodize, hard chrome plating, cadmium plating, black oxide coating, electroless nickel, passivation, and machining and grinding. In addition, the facility operated a lead melting pot used to repair anodes used in the plating baths. Electroplating at the facility was all done manually; no automated machinery was used in any of the processes. There are two inactive chrome tanks; and according to TCEQ Air Compliance Section reports, the emissions from these tanks were controlled by a mesh-pad scrubber and a mist eliminator fume hood system.

Lane Plating is registered as an LQG of hazardous wastes that operated under EPA ID No. TXD007336571 and TCEQ Solid Waste Registration (SWR) No. 31215.

Surrounding Land Use
Lane Plating is located approximately 5 miles south of downtown Dallas, Texas in River Segment 0805 (Atlas of Texas Surface Waters, 2004). The immediate surrounding area on all sides is open/wooded. Single family residences are located approximately 100 yards west of the facility along Bonnie View Road. A school and additional single family residences are located approximately 600 yards due east of the facility to the north and south. Five Mile Creek is located approximately 0.3 miles to the south of the facility and discharges into the Trinity River.

Sample Results Review Investigation
Ms. Lewis reviewed the results of the sample analysis which indicated elevated levels of lead, antimony, mercury, selenium, silver, chromium, and cadmium (Attachment 1: Sampling Information and Results).

Lead

Lead was detected in sixteen soil samples (duplicates included) as exceeding both the background concentration (15mg/kg) and the Soil-Groundwater-Ingestion (SGI) PCL (3 mg/kg). Of the sixteen samples, five exceeded the Total Soil Combined (TSC) PCL (500 mg/kg). Lead was also detected in the grinding grit sample (52391-05) at 1,420 mg/kg.

Chromium
Chromium was detected in sixteen soil samples (duplicates included) as exceeding the background concentration (30 mg/kg). Of the sixteen samples, three exceeded the SGI PCL (2,400 mg/kg). Chromium was also detected in the grinding grit sample at 7,580 mg/kg.

Mercury
Mercury was detected in sixteen soil samples (duplicates included) as exceeding the background concentration (0.081 mg/kg). Of the sixteen samples, two exceeded the SGI PCL (2.1 mg/kg) and seven exceeded the TSC PCL (3.6 mg/kg). Mercury was also detected in the grinding grit sample at 1.4 mg/kg.

Selenium
Selenium was detected in twelve soil samples (duplicates included) as exceeding the background concentration (0.3 mg/kg). Of the twelve samples, none exceeded the SGI PCL (23 mg/kg) or the TSC PCL (310 mg/kg). Selenium was also detected in the grinding grit sample at 6.5 mg/kg.

Cadmium
Mercury was detected in thirteen soil samples (duplicates included) as exceeding the background concentration (non-detect). Of the thirteen samples, seven exceeded the SGI PCL (1.5 mg/kg) and three exceeded the TSC PCL (52.4 mg/kg). Cadmium was also detected in the grinding grit sample at 56.9 mg/kg.

Silver
Silver was detected in five soil samples (duplicates included) as exceeding the background concentration (non-detect). Of the five samples, three exceeded the SGI PCL (0.48 mg/kg) and none exceeded the TSC PCL (97mg/kg). Silver was not detected in the grinding grit sample.

Nickel
Nickel was detected in fifteen soil samples (duplicates included) as exceeding the background concentration (14.7 mg/kg). Of the fifteen samples, eleven exceeded the SGI PCL (160 mg/kg) and none exceeded the TSC PCL (840 mg/kg). Nickel was also detected in the grinding grit sample at 507 mg/kg.

Antimony
Antimony was detected in seven soil samples (duplicates included) as exceeding the background concentration (1.0 mg/kg). Of the seven samples, five exceeded both the SGI PCL (5.4 mg/kg) and the TSC PCL (15.0 mg/kg). Antimony was also detected in the grinding grit sample at 40.6 mg/kg.

The unauthorized release of hazardous waste at this site is already being addressed by both the TCEQ and the Environmental Protection Agency (EPA); therefore, no additional violation are being alleged. The sample results were provided to the TCEQ Remediation Section, the TCEQ Litigation Division, and the EPA On-Scene Coordinators for the Emergency Removal Program for review.

Summary of Exit Interview
Not Applicable

CONCLUSION

On April 29, 2015, Ms. Lewis conducted an IHW Reporting of Sample Results Investigation. Due to the nature of the investigation and the bankruptcy, no additional violations are being alleged at this time. Copies of the sample results were provided to the TCEQ Remediation Section, the TCEQ Litigation Division, and the EPA On-Scene Coordinator for the Emergency Removal Program for review. No letter was transmitted to Lane Plating Works.

ATTACHMENTS

1. Sampling Information and Results

No Violations Associated to this Investigation

Signed _____ **Date** 5/2/16
Environmental Investigator

Signed _____ **Date** 5/3/16
Supervisor

Attachments: (in order of final report submittal)

___Enforcement Action Request (EAR)
___Letter to Facility (specify type) : _____
Investigation Report
✓ Sample Analysis Results
___Manifests
___Notice of Registration
✓ Maps, Plans, Sketches
___Photographs
___Correspondence from the facility
___Other (specify) :

Pace Analytical Services, Inc.
400 West Bethany Drive - Suite 190
Allen, TX 75013
(972)727-1123

December 07, 2015

Dorothy Lewis
Texas Commision on Environmental Quality
2309 Gravel Dr.
Fort Worth, TX 76118

RE: Project: 52390/52391
Pace Project No.: 7534892

Dear Dorothy Lewis:
Enclosed are the analytical results for sample(s) received by the laboratory on November 24, 2015. The results relate only to the samples included in this report. Results reported herein conform to the most current TNI standards and the laboratory's Quality Assurance Manual, where applicable, unless otherwise noted in the body of the report.

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Leslie Underwood
leslie.underwood@pacelabs.com
Project Manager

Enclosures

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Pace Analytical Services, Inc.
400 West Bethany Drive - Suite 190
Allen, TX 75013
(972)727-1123

CERTIFICATIONS

Project: 52390/52391
Pace Project No.: 7534892

Dallas Certification IDs:
400 West Bethany Dr Suite 190, Allen, TX 75013
EPA# TX00074
Texas Certification #: T104704232-15-12
Texas Certification #: T104704232-14-8
Kansas Certification #: E-10388
Arkansas Certification #: 88-0647
Oklahoma Certification #: 2014-055
Louisiana Certification #: 02007

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Pace Analytical Services, Inc.
400 West Bethany Drive - Suite 190
Allen, TX 75013
(972)727-1123

SAMPLE SUMMARY

Project: 52390/52391
Pace Project No.: 7534892

Lab ID	Sample ID	Matrix	Date Collected	Date Received
7534892001	**52390-01**	Solid	11/20/15 14:05	11/24/15 10:40
7534892002	**52390-02**	Solid	11/20/15 14:22	11/24/15 10:40
7534892003	**52390-03**	Solid	11/20/15 14:26	11/24/15 10:40
7534892004	**52390-04**	Solid	11/20/15 14:30	11/24/15 10:40
7534892005	**52390-05**	Solid	11/20/15 14:36	11/24/15 10:40
7534892006	**52390-06**	Solid	11/20/15 14:40	11/24/15 10:40
7534892007	**52390-07**	Solid	11/20/15 14:44	11/24/15 10:40
7534892008	**52390-08**	Solid	11/20/15 14:52	11/24/15 10:40
7534892009	**52390-09**	Solid	11/20/15 14:52	11/24/15 10:40
7534892010	**52390-10**	Solid	11/20/15 15:01	11/24/15 10:40
7534892011	**52391-01**	Solid	11/20/15 15:05	11/24/15 10:40
7534892012	**52391-02**	Solid	11/20/15 15:12	11/24/15 10:40
7534892013	**52391-03**	Solid	11/20/15 15:12	11/24/15 10:40
7534892014	**52391-04**	Solid	11/20/15 15:34	11/24/15 10:40
7534892015	**52391-05**	Solid	11/20/15 15:52	11/24/15 10:40
7534892016	**52391-06**	Solid	11/20/15 16:00	11/24/15 10:40
7534892017	**52391-07**	Solid	11/20/15 16:04	11/24/15 10:40
7534892018	**52391-08**	Solid	11/20/15 16:15	11/24/15 10:40

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SAMPLE ANALYTE COUNT

Project: 52390/52391
Pace Project No.: 7534892

Lab ID	Sample ID	Method	Analysts	Analytes Reported
7534892001	**52390-01**	EPA 6010	SPS	10
		EPA 7471	SSL	1
		ASTM D2974-87	NT	1
7534892002	**52390-02**	EPA 6010	SPS	10
		EPA 7471	SSL	1
		ASTM D2974-87	NT	1
7534892003	**52390-03**	EPA 6010	SPS	10
		EPA 7471	SSL	1
		ASTM D2974-87	NT	1
7534892004	**52390-04**	EPA 6010	SPS	10
		EPA 7471	SSL	1
		ASTM D2974-87	NT	1
7534892005	**52390-05**	EPA 6010	SPS	10
		EPA 7471	SSL	1
		ASTM D2974-87	NT	1
7534892006	**52390-06**	EPA 6010	SPS	10
		EPA 7471	SSL	1
		ASTM D2974-87	NT	1
7534892007	**52390-07**	EPA 6010	SPS	10
		EPA 7471	SSL	1
		ASTM D2974-87	NT	1
7534892008	**52390-08**	EPA 6010	SPS	10
		EPA 7471	SSL	1
		ASTM D2974-87	NT	1
7534892009	**52390-09**	EPA 6010	SPS	10
		EPA 7471	SSL	1
		ASTM D2974-87	NT	1
7534892010	**52390-10**	EPA 6010	SPS	10
		EPA 7471	SSL	1
		ASTM D2974-87	NT	1
7534892011	**52391-01**	EPA 6010	SPS	10
		EPA 7471	SSL	1
		ASTM D2974-87	NT	1
7534892012	**52391-02**	EPA 6010	SPS	10
		EPA 7471	SSL	1
		ASTM D2974-87	NT	1
7534892013	**52391-03**	EPA 6010	SPS	10

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SAMPLE ANALYTE COUNT

Project: 52390/52391
Pace Project No.: 7534892

Lab ID	Sample ID	Method	Analysts	Analytes Reported
		EPA 7471	SSL	1
		ASTM D2974-87	NT	1
7534892014	**52391-04**	EPA 6010	SPS	10
		EPA 7471	SSL	1
		ASTM D2974-87	NT	1
7534892015	**52391-05**	EPA 6010	SPS	10
		EPA 7471	SSL	1
		ASTM D2974-87	NT	1
7534892016	**52391-06**	EPA 6010	SPS	10
		EPA 7471	SSL	1
		ASTM D2974-87	NT	1
7534892017	**52391-07**	EPA 6010	SPS	10
		EPA 7471	SSL	1
		ASTM D2974-87	NT	1
7534892018	**52391-08**	EPA 6010	SPS	10
		EPA 7471	SSL	1
		ASTM D2974-87	NT	1

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ANALYTICAL RESULTS

Project: 52390/52391
Pace Project No.: 7534892

Sample: 52390-01 **Lab ID: 7534892001** Collected: 11/20/15 14:05 Received: 11/24/15 10:40 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
6010 Metals, Total	Analytical Method: EPA 6010 Preparation Method: EPA 3050							
Antimony	ND	mg/kg	1.4	1	11/30/15 16:00	12/02/15 03:54	7440-36-0	M1
Arsenic	**24.0**	mg/kg	1.8	5	11/30/15 16:00	12/02/15 01:14	7440-38-2	M1
Barium	**98.8**	mg/kg	3.5	5	11/30/15 16:00	12/04/15 14:16	7440-39-3	
Beryllium	**0.42**	mg/kg	0.070	1	11/30/15 16:00	12/02/15 03:54	7440-41-7	M1
Cadmium	ND	mg/kg	0.14	1	11/30/15 16:00	12/02/15 03:54	7440-43-9	M1
Chromium	**17.7**	mg/kg	1.8	5	11/30/15 16:00	12/02/15 01:14	7440-47-3	M1
Lead	**12.3**	mg/kg	1.4	5	11/30/15 16:00	12/02/15 01:14	7439-92-1	M1
Nickel	**14.7**	mg/kg	1.4	5	11/30/15 16:00	12/02/15 01:14	7440-02-0	M1
Selenium	ND	mg/kg	0.25	1	11/30/15 16:00	12/02/15 03:54	7782-49-2	M1
Silver	ND	mg/kg	0.14	1	11/30/15 16:00	12/02/15 03:54	7440-22-4	M1
7471 Mercury	Analytical Method: EPA 7471 Preparation Method: EPA 7471							
Mercury	**0.081**	mg/kg	0.051	1	12/01/15 11:20	12/01/15 16:17	7439-97-6	
Percent Moisture	Analytical Method: ASTM D2974-87							
Percent Moisture	**30.8**	%		1		11/30/15 11:05		

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ANALYTICAL RESULTS

Project: 52390/52391
Pace Project No.: 7534892

Sample: 52390-02 **Lab ID: 7534892002** Collected: 11/20/15 14:22 Received: 11/24/15 10:40 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
6010 Metals, Total	Analytical Method: EPA 6010 Preparation Method: EPA 3050							
Antimony	ND	mg/kg	1.4	1	11/30/15 16:00	12/02/15 04:02	7440-36-0	
Arsenic	**7.5**	mg/kg	1.7	5	11/30/15 16:00	12/02/15 01:20	7440-38-2	
Barium	**85.2**	mg/kg	3.4	5	11/30/15 16:00	12/04/15 14:28	7440-39-3	
Beryllium	**0.52**	mg/kg	0.34	5	11/30/15 16:00	12/02/15 01:20	7440-41-7	
Cadmium	**0.78**	mg/kg	0.68	5	11/30/15 16:00	12/02/15 01:20	7440-43-9	
Chromium	**99.2**	mg/kg	1.7	5	11/30/15 16:00	12/02/15 01:20	7440-47-3	
Lead	**171**	mg/kg	1.4	5	11/30/15 16:00	12/02/15 01:20	7439-92-1	
Nickel	**23.8**	mg/kg	1.4	5	11/30/15 16:00	12/02/15 01:20	7440-02-0	
Selenium	**0.49**	mg/kg	0.24	1	11/30/15 16:00	12/02/15 04:02	7782-49-2	
Silver	ND	mg/kg	0.14	1	11/30/15 16:00	12/02/15 04:02	7440-22-4	
7471 Mercury	Analytical Method: EPA 7471 Preparation Method: EPA 7471							
Mercury	**0.36**	mg/kg	0.094	2	12/01/15 11:20	12/01/15 18:29	7439-97-6	
Percent Moisture	Analytical Method: ASTM D2974-87							
Percent Moisture	**29.5**	%		1		11/30/15 11:06		

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ANALYTICAL RESULTS

Project: 52390/52391
Pace Project No.: 7534892

Sample: 52390-03 **Lab ID: 7534892003** Collected: 11/20/15 14:26 Received: 11/24/15 10:40 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
6010 Metals, Total	Analytical Method: EPA 6010 Preparation Method: EPA 3050							
Antimony	ND	mg/kg	1.4	1	11/30/15 16:00	12/02/15 04:09	7440-36-0	
Arsenic	**6.5**	mg/kg	1.8	5	11/30/15 16:00	12/02/15 01:28	7440-38-2	
Barium	**97.1**	mg/kg	3.6	5	11/30/15 16:00	12/04/15 14:34	7440-39-3	
Beryllium	**0.54**	mg/kg	0.36	5	11/30/15 16:00	12/02/15 01:28	7440-41-7	
Cadmium	**0.24**	mg/kg	0.14	1	11/30/15 16:00	12/02/15 04:09	7440-43-9	
Chromium	**58.1**	mg/kg	1.8	5	11/30/15 16:00	12/02/15 01:28	7440-47-3	
Lead	**117**	mg/kg	1.4	5	11/30/15 16:00	12/02/15 01:28	7439-92-1	
Nickel	**18.1**	mg/kg	1.4	5	11/30/15 16:00	12/02/15 01:28	7440-02-0	
Selenium	**0.42**	mg/kg	0.26	1	11/30/15 16:00	12/02/15 04:09	7782-49-2	
Silver	ND	mg/kg	0.14	1	11/30/15 16:00	12/02/15 04:09	7440-22-4	
7471 Mercury	Analytical Method: EPA 7471 Preparation Method: EPA 7471							
Mercury	**0.15**	mg/kg	0.048	1	12/01/15 11:20	12/01/15 16:22	7439-97-6	
Percent Moisture	Analytical Method: ASTM D2974-87							
Percent Moisture	**31.0**	%		1		11/30/15 11:06		

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ANALYTICAL RESULTS

Project: 52390/52391
Pace Project No.: 7534892

Sample: 52390-04 **Lab ID: 7534892004** Collected: 11/20/15 14:30 Received: 11/24/15 10:40 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
6010 Metals, Total	Analytical Method: EPA 6010 Preparation Method: EPA 3050							
Antimony	ND	mg/kg	1.6	1	11/30/15 16:00	12/02/15 04:17	7440-36-0	
Arsenic	**7.2**	mg/kg	1.9	5	11/30/15 16:00	12/02/15 01:34	7440-38-2	
Barium	**109**	mg/kg	3.9	5	11/30/15 16:00	12/04/15 14:40	7440-39-3	
Beryllium	**0.66**	mg/kg	0.39	5	11/30/15 16:00	12/02/15 01:34	7440-41-7	
Cadmium	ND	mg/kg	0.16	1	11/30/15 16:00	12/02/15 04:17	7440-43-9	
Chromium	**50.8**	mg/kg	1.9	5	11/30/15 16:00	12/02/15 01:34	7440-47-3	
Lead	**60.0**	mg/kg	1.6	5	11/30/15 16:00	12/02/15 01:34	7439-92-1	
Nickel	**20.3**	mg/kg	1.6	5	11/30/15 16:00	12/02/15 01:34	7440-02-0	
Selenium	**0.47**	mg/kg	0.28	1	11/30/15 16:00	12/02/15 04:17	7782-49-2	
Silver	ND	mg/kg	0.16	1	11/30/15 16:00	12/02/15 04:17	7440-22-4	
7471 Mercury	Analytical Method: EPA 7471 Preparation Method: EPA 7471							
Mercury	**0.15**	mg/kg	0.054	1	12/01/15 11:20	12/01/15 16:24	7439-97-6	
Percent Moisture	Analytical Method: ASTM D2974-87							
Percent Moisture	**36.8**	%		1		11/30/15 11:07		

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ANALYTICAL RESULTS

Project: 52390/52391
Pace Project No.: 7534892

Sample: 52390-05 **Lab ID: 7534892005** Collected: 11/20/15 14:36 Received: 11/24/15 10:40 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
6010 Metals, Total	Analytical Method: EPA 6010 Preparation Method: EPA 3050							
Antimony	ND	mg/kg	1.7	1	11/30/15 16:00	12/02/15 04:24	7440-36-0	
Arsenic	**5.9**	mg/kg	2.2	5	11/30/15 16:00	12/02/15 01:40	7440-38-2	
Barium	**86.5**	mg/kg	4.4	5	11/30/15 16:00	12/04/15 14:46	7440-39-3	
Beryllium	**0.51**	mg/kg	0.44	5	11/30/15 16:00	12/02/15 01:40	7440-41-7	
Cadmium	ND	mg/kg	0.87	5	11/30/15 16:00	12/02/15 01:40	7440-43-9	
Chromium	**147**	mg/kg	2.2	5	11/30/15 16:00	12/02/15 01:40	7440-47-3	
Lead	**111**	mg/kg	1.7	5	11/30/15 16:00	12/02/15 01:40	7439-92-1	
Nickel	**21.9**	mg/kg	1.7	5	11/30/15 16:00	12/02/15 01:40	7440-02-0	
Selenium	**0.49**	mg/kg	0.31	1	11/30/15 16:00	12/02/15 04:24	7782-49-2	
Silver	ND	mg/kg	0.17	1	11/30/15 16:00	12/02/15 04:24	7440-22-4	
7471 Mercury	Analytical Method: EPA 7471 Preparation Method: EPA 7471							
Mercury	**0.26**	mg/kg	0.063	1	12/01/15 11:20	12/01/15 16:27	7439-97-6	
Percent Moisture	Analytical Method: ASTM D2974-87							
Percent Moisture	**44.5**	%		1		11/30/15 11:07		

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ANALYTICAL RESULTS

Project: 52390/52391
Pace Project No.: 7534892

Sample: 52390-06 **Lab ID: 7534892006** Collected: 11/20/15 14:40 Received: 11/24/15 10:40 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
6010 Metals, Total	Analytical Method: EPA 6010 Preparation Method: EPA 3050							
Antimony	ND	mg/kg	2.0	1	11/30/15 16:00	12/02/15 04:32	7440-36-0	
Arsenic	**5.2**	mg/kg	2.5	5	11/30/15 16:00	12/02/15 01:46	7440-38-2	
Barium	**77.0**	mg/kg	5.0	5	11/30/15 16:00	12/04/15 15:04	7440-39-3	
Beryllium	**0.51**	mg/kg	0.50	5	11/30/15 16:00	12/02/15 01:46	7440-41-7	
Cadmium	**2.3**	mg/kg	1.0	5	11/30/15 16:00	12/02/15 01:46	7440-43-9	
Chromium	**177**	mg/kg	2.5	5	11/30/15 16:00	12/02/15 01:46	7440-47-3	
Lead	**110**	mg/kg	2.0	5	11/30/15 16:00	12/02/15 01:46	7439-92-1	
Nickel	**22.2**	mg/kg	2.0	5	11/30/15 16:00	12/02/15 01:46	7440-02-0	
Selenium	**0.64**	mg/kg	0.36	1	11/30/15 16:00	12/02/15 04:32	7782-49-2	
Silver	ND	mg/kg	0.20	1	11/30/15 16:00	12/02/15 04:32	7440-22-4	
7471 Mercury	Analytical Method: EPA 7471 Preparation Method: EPA 7471							
Mercury	**0.69**	mg/kg	0.13	2	12/01/15 11:20	12/01/15 18:32	7439-97-6	
Percent Moisture	Analytical Method: ASTM D2974-87							
Percent Moisture	**49.6**	%		1		11/30/15 11:08		

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ANALYTICAL RESULTS

Project: 52390/52391
Pace Project No.: 7534892

Sample: 52390-07 **Lab ID: 7534892007** Collected: 11/20/15 14:44 Received: 11/24/15 10:40 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
6010 Metals, Total	Analytical Method: EPA 6010 Preparation Method: EPA 3050							
Antimony	ND	mg/kg	1.8	1	11/30/15 16:00	12/02/15 04:39	7440-36-0	
Arsenic	**5.5**	mg/kg	2.3	5	11/30/15 16:00	12/02/15 01:52	7440-38-2	
Barium	**93.9**	mg/kg	4.6	5	11/30/15 16:00	12/04/15 15:10	7440-39-3	
Beryllium	**0.62**	mg/kg	0.46	5	11/30/15 16:00	12/02/15 01:52	7440-41-7	
Cadmium	**1.5**	mg/kg	0.92	5	11/30/15 16:00	12/02/15 01:52	7440-43-9	
Chromium	**245**	mg/kg	2.3	5	11/30/15 16:00	12/02/15 01:52	7440-47-3	
Lead	**55.0**	mg/kg	1.8	5	11/30/15 16:00	12/02/15 01:52	7439-92-1	
Nickel	**21.0**	mg/kg	1.8	5	11/30/15 16:00	12/02/15 01:52	7440-02-0	
Selenium	**0.58**	mg/kg	0.33	1	11/30/15 16:00	12/02/15 04:39	7782-49-2	
Silver	ND	mg/kg	0.18	1	11/30/15 16:00	12/02/15 04:39	7440-22-4	
7471 Mercury	Analytical Method: EPA 7471 Preparation Method: EPA 7471							
Mercury	**0.60**	mg/kg	0.13	2	12/01/15 11:20	12/01/15 18:34	7439-97-6	
Percent Moisture	Analytical Method: ASTM D2974-87							
Percent Moisture	**47.4**	%		1		11/30/15 11:49		

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ANALYTICAL RESULTS

Project: 52390/52391
Pace Project No.: 7534892

Sample: 52390-08 **Lab ID: 7534892008** Collected: 11/20/15 14:52 Received: 11/24/15 10:40 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
6010 Metals, Total	Analytical Method: EPA 6010 Preparation Method: EPA 3050							
Antimony	ND	mg/kg	2.1	1	11/30/15 16:00	12/02/15 04:47	7440-36-0	
Arsenic	**6.3**	mg/kg	2.7	5	11/30/15 16:00	12/02/15 01:58	7440-38-2	
Barium	**116**	mg/kg	5.4	5	11/30/15 16:00	12/04/15 15:16	7440-39-3	
Beryllium	**0.81**	mg/kg	0.54	5	11/30/15 16:00	12/02/15 01:58	7440-41-7	
Cadmium	**6.5**	mg/kg	1.1	5	11/30/15 16:00	12/02/15 01:58	7440-43-9	
Chromium	**349**	mg/kg	2.7	5	11/30/15 16:00	12/02/15 01:58	7440-47-3	
Lead	**158**	mg/kg	2.1	5	11/30/15 16:00	12/02/15 01:58	7439-92-1	
Nickel	**32.1**	mg/kg	2.1	5	11/30/15 16:00	12/02/15 01:58	7440-02-0	
Selenium	**0.77**	mg/kg	0.39	1	11/30/15 16:00	12/02/15 04:47	7782-49-2	
Silver	ND	mg/kg	0.21	1	11/30/15 16:00	12/02/15 04:47	7440-22-4	
7471 Mercury	Analytical Method: EPA 7471 Preparation Method: EPA 7471							
Mercury	**2.3**	mg/kg	0.73	10	12/01/15 11:20	12/01/15 18:37	7439-97-6	
Percent Moisture	Analytical Method: ASTM D2974-87							
Percent Moisture	**55.6**	%		1		11/30/15 11:50		

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ANALYTICAL RESULTS

Project: 52390/52391
Pace Project No.: 7534892

Sample: 52390-09 **Lab ID: 7534892009** Collected: 11/20/15 14:52 Received: 11/24/15 10:40 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
6010 Metals, Total	Analytical Method: EPA 6010 Preparation Method: EPA 3050							
Antimony	ND	mg/kg	2.2	1	11/30/15 16:00	12/02/15 05:06	7440-36-0	
Arsenic	**6.4**	mg/kg	2.7	5	11/30/15 16:00	12/07/15 14:23	7440-38-2	
Barium	**107**	mg/kg	5.4	5	11/30/15 16:00	12/04/15 15:22	7440-39-3	
Beryllium	**0.73**	mg/kg	0.54	5	11/30/15 16:00	12/04/15 15:22	7440-41-7	
Cadmium	**6.6**	mg/kg	1.1	5	11/30/15 16:00	12/04/15 15:22	7440-43-9	
Chromium	**380**	mg/kg	2.7	5	11/30/15 16:00	12/04/15 15:22	7440-47-3	
Lead	**139**	mg/kg	2.2	5	11/30/15 16:00	12/04/15 15:22	7439-92-1	
Nickel	**31.8**	mg/kg	2.2	5	11/30/15 16:00	12/04/15 15:22	7440-02-0	
Selenium	**0.76**	mg/kg	0.39	1	11/30/15 16:00	12/02/15 05:06	7782-49-2	
Silver	ND	mg/kg	0.22	1	11/30/15 16:00	12/02/15 05:06	7440-22-4	
7471 Mercury	Analytical Method: EPA 7471 Preparation Method: EPA 7471							
Mercury	**1.9**	mg/kg	0.68	10	12/01/15 11:20	12/01/15 18:39	7439-97-6	
Percent Moisture	Analytical Method: ASTM D2974-87							
Percent Moisture	**52.3**	%		1		11/30/15 11:53		

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ANALYTICAL RESULTS

Project: 52390/52391
Pace Project No.: 7534892

Sample: 52390-10 **Lab ID: 7534892010** Collected: 11/20/15 15:01 Received: 11/24/15 10:40 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
6010 Metals, Total	Analytical Method: EPA 6010 Preparation Method: EPA 3050							
Antimony	**18.8**	mg/kg	12.5	5	11/30/15 16:00	12/02/15 02:30	7440-36-0	
Arsenic	**0.78**	mg/kg	0.63	1	11/30/15 16:00	12/02/15 05:14	7440-38-2	
Barium	**139**	mg/kg	6.3	5	11/30/15 16:00	12/04/15 15:27	7440-39-3	
Beryllium	**0.45**	mg/kg	0.13	1	11/30/15 16:00	12/02/15 05:14	7440-41-7	
Cadmium	**20.6**	mg/kg	1.3	5	11/30/15 16:00	12/02/15 02:30	7440-43-9	
Chromium	**1940**	mg/kg	3.1	5	11/30/15 16:00	12/02/15 02:30	7440-47-3	
Lead	**713**	mg/kg	2.5	5	11/30/15 16:00	12/02/15 02:30	7439-92-1	
Nickel	**138**	mg/kg	2.5	5	11/30/15 16:00	12/02/15 02:30	7440-02-0	
Selenium	**0.75**	mg/kg	0.45	1	11/30/15 16:00	12/02/15 05:14	7782-49-2	
Silver	**0.90**	mg/kg	0.25	1	11/30/15 16:00	12/02/15 05:14	7440-22-4	
7471 Mercury	Analytical Method: EPA 7471 Preparation Method: EPA 7471							
Mercury	**17.5**	mg/kg	9.2	100	12/01/15 11:20	12/01/15 18:42	7439-97-6	
Percent Moisture	Analytical Method: ASTM D2974-87							
Percent Moisture	**62.0**	%		1		11/30/15 11:55		

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ANALYTICAL RESULTS

Project: 52390/52391
Pace Project No.: 7534892

Sample: 52391-01 **Lab ID: 7534892011** Collected: 11/20/15 15:05 Received: 11/24/15 10:40 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
6010 Metals, Total	Analytical Method: EPA 6010 Preparation Method: EPA 3050							
Antimony	ND	mg/kg	7.6	5	11/30/15 16:00	12/02/15 02:37	7440-36-0	
Arsenic	**6.3**	mg/kg	1.9	5	11/30/15 16:00	12/02/15 02:37	7440-38-2	
Barium	**136**	mg/kg	7.6	10	11/30/15 16:00	12/04/15 15:33	7440-39-3	
Beryllium	**0.77**	mg/kg	0.38	5	11/30/15 16:00	12/02/15 02:37	7440-41-7	
Cadmium	**7.8**	mg/kg	0.76	5	11/30/15 16:00	12/02/15 02:37	7440-43-9	
Chromium	**520**	mg/kg	1.9	5	11/30/15 16:00	12/02/15 02:37	7440-47-3	
Lead	**163**	mg/kg	1.5	5	11/30/15 16:00	12/02/15 02:37	7439-92-1	
Nickel	**57.1**	mg/kg	1.5	5	11/30/15 16:00	12/02/15 02:37	7440-02-0	
Selenium	ND	mg/kg	1.4	5	11/30/15 16:00	12/02/15 02:37	7782-49-2	
Silver	ND	mg/kg	0.76	5	11/30/15 16:00	12/02/15 02:37	7440-22-4	
7471 Mercury	Analytical Method: EPA 7471 Preparation Method: EPA 7471							
Mercury	**4.6**	mg/kg	2.5	50	12/01/15 11:20	12/01/15 18:44	7439-97-6	
Percent Moisture	Analytical Method: ASTM D2974-87							
Percent Moisture	**35.7**	%		1		11/30/15 11:56		

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ANALYTICAL RESULTS

Project: 52390/52391
Pace Project No.: 7534892

Sample: 52391-02 **Lab ID: 7534892012** Collected: 11/20/15 15:12 Received: 11/24/15 10:40 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
6010 Metals, Total	Analytical Method: EPA 6010 Preparation Method: EPA 3050							
Antimony	**37.5**	mg/kg	6.1	5	11/30/15 16:00	12/02/15 02:43	7440-36-0	
Arsenic	ND	mg/kg	1.5	5	11/30/15 16:00	12/02/15 02:43	7440-38-2	
Barium	**124**	mg/kg	6.1	10	11/30/15 16:00	12/04/15 15:39	7440-39-3	
Beryllium	ND	mg/kg	0.31	5	11/30/15 16:00	12/02/15 02:43	7440-41-7	
Cadmium	**58.5**	mg/kg	0.61	5	11/30/15 16:00	12/02/15 02:43	7440-43-9	
Chromium	**2970**	mg/kg	1.5	5	11/30/15 16:00	12/02/15 02:43	7440-47-3	
Lead	**2000**	mg/kg	1.2	5	11/30/15 16:00	12/02/15 02:43	7439-92-1	
Nickel	**388**	mg/kg	1.2	5	11/30/15 16:00	12/02/15 02:43	7440-02-0	
Selenium	ND	mg/kg	1.1	5	11/30/15 16:00	12/02/15 02:43	7782-49-2	
Silver	**3.3**	mg/kg	0.61	5	11/30/15 16:00	12/02/15 02:43	7440-22-4	
7471 Mercury	Analytical Method: EPA 7471 Preparation Method: EPA 7471							
Mercury	**46.4**	mg/kg	8.4	200	12/01/15 11:20	12/01/15 19:16	7439-97-6	
Percent Moisture	Analytical Method: ASTM D2974-87							
Percent Moisture	**18.5**	%		1		11/30/15 11:56		

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ANALYTICAL RESULTS

Project: 52390/52391
Pace Project No.: 7534892

Sample: 52391-03 **Lab ID: 7534892013** Collected: 11/20/15 15:12 Received: 11/24/15 10:40 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
6010 Metals, Total	Analytical Method: EPA 6010 Preparation Method: EPA 3050							
Antimony	**33.7**	mg/kg	7.9	5	11/30/15 16:00	12/02/15 02:49	7440-36-0	
Arsenic	ND	mg/kg	2.0	5	11/30/15 16:00	12/02/15 02:49	7440-38-2	
Barium	**97.7**	mg/kg	7.9	10	11/30/15 16:00	12/04/15 15:45	7440-39-3	
Beryllium	ND	mg/kg	0.39	5	11/30/15 16:00	12/02/15 02:49	7440-41-7	
Cadmium	**57.0**	mg/kg	0.79	5	11/30/15 16:00	12/02/15 02:49	7440-43-9	
Chromium	**2780**	mg/kg	2.0	5	11/30/15 16:00	12/02/15 02:49	7440-47-3	
Lead	**1510**	mg/kg	1.6	5	11/30/15 16:00	12/02/15 02:49	7439-92-1	
Nickel	**380**	mg/kg	1.6	5	11/30/15 16:00	12/02/15 02:49	7440-02-0	
Selenium	ND	mg/kg	1.4	5	11/30/15 16:00	12/02/15 02:49	7782-49-2	
Silver	ND	mg/kg	0.79	5	11/30/15 16:00	12/02/15 02:49	7440-22-4	
7471 Mercury	Analytical Method: EPA 7471 Preparation Method: EPA 7471							
Mercury	**16.2**	mg/kg	5.0	100	12/01/15 11:20	12/01/15 20:00	7439-97-6	M6,R1
Percent Moisture	Analytical Method: ASTM D2974-87							
Percent Moisture	**36.6**	%		1		11/30/15 11:56		

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ANALYTICAL RESULTS

Project: 52390/52391
Pace Project No.: 7534892

Sample: 52391-04 **Lab ID: 7534892014** Collected: 11/20/15 15:34 Received: 11/24/15 10:40 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
6010 Metals, Total	Analytical Method: EPA 6010 Preparation Method: EPA 3050							
Antimony	**21.7**	mg/kg	7.4	5	11/30/15 16:00	12/02/15 02:55	7440-36-0	
Arsenic	**2.0**	mg/kg	1.9	5	11/30/15 16:00	12/02/15 02:55	7440-38-2	
Barium	**127**	mg/kg	3.7	5	11/30/15 16:00	12/04/15 15:51	7440-39-3	
Beryllium	**0.65**	mg/kg	0.37	5	11/30/15 16:00	12/02/15 02:55	7440-41-7	
Cadmium	**205**	mg/kg	0.74	5	11/30/15 16:00	12/02/15 02:55	7440-43-9	
Chromium	**2690**	mg/kg	1.9	5	11/30/15 16:00	12/02/15 02:55	7440-47-3	
Lead	**1060**	mg/kg	1.5	5	11/30/15 16:00	12/02/15 02:55	7439-92-1	
Nickel	**208**	mg/kg	1.5	5	11/30/15 16:00	12/02/15 02:55	7440-02-0	
Selenium	**0.27**	mg/kg	0.27	1	11/30/15 16:00	12/02/15 05:44	7782-49-2	
Silver	**0.52**	mg/kg	0.15	1	11/30/15 16:00	12/02/15 05:44	7440-22-4	
7471 Mercury	Analytical Method: EPA 7471 Preparation Method: EPA 7471							
Mercury	**24.6**	mg/kg	5.1	100	12/01/15 11:20	12/01/15 18:58	7439-97-6	
Percent Moisture	Analytical Method: ASTM D2974-87							
Percent Moisture	**35.1**	%		1		11/30/15 11:57		

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ANALYTICAL RESULTS

Project: 52390/52391
Pace Project No.: 7534892

Sample: 52391-05 **Lab ID: 7534892015** Collected: 11/20/15 15:52 Received: 11/24/15 10:40 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
6010 Metals, Total	Analytical Method: EPA 6010 Preparation Method: EPA 3050							
Antimony	**40.6**	mg/kg	5.8	5	11/30/15 16:00	12/02/15 03:01	7440-36-0	
Arsenic	**5.6**	mg/kg	1.5	5	11/30/15 16:00	12/02/15 03:01	7440-38-2	
Barium	**59.6**	mg/kg	5.8	10	11/30/15 16:00	12/04/15 15:57	7440-39-3	
Beryllium	ND	mg/kg	0.29	5	11/30/15 16:00	12/02/15 03:01	7440-41-7	
Cadmium	**56.9**	mg/kg	0.58	5	11/30/15 16:00	12/02/15 03:01	7440-43-9	
Chromium	**7580**	mg/kg	2.9	10	11/30/15 16:00	12/02/15 02:04	7440-47-3	
Lead	**1420**	mg/kg	1.2	5	11/30/15 16:00	12/02/15 03:01	7439-92-1	
Nickel	**507**	mg/kg	1.2	5	11/30/15 16:00	12/02/15 03:01	7440-02-0	
Selenium	**6.5**	mg/kg	1.1	5	11/30/15 16:00	12/02/15 03:01	7782-49-2	
Silver	ND	mg/kg	0.58	5	11/30/15 16:00	12/02/15 03:01	7440-22-4	
7471 Mercury	Analytical Method: EPA 7471 Preparation Method: EPA 7471							
Mercury	**1.7**	mg/kg	0.40	10	12/01/15 11:20	12/01/15 19:01	7439-97-6	
Percent Moisture	Analytical Method: ASTM D2974-87							
Percent Moisture	**16.1**	%		1		11/30/15 11:57		

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ANALYTICAL RESULTS

Project: 52390/52391
Pace Project No.: 7534892

Sample: 52391-06 **Lab ID: 7534892016** Collected: 11/20/15 16:00 Received: 11/24/15 10:40 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
6010 Metals, Total	Analytical Method: EPA 6010 Preparation Method: EPA 3050							
Antimony	**18.6**	mg/kg	6.5	5	11/30/15 16:00	12/02/15 03:09	7440-36-0	
Arsenic	**3.4**	mg/kg	1.6	5	11/30/15 16:00	12/02/15 03:09	7440-38-2	
Barium	**46.7**	mg/kg	3.3	5	11/30/15 16:00	12/04/15 16:15	7440-39-3	
Beryllium	**0.22**	mg/kg	0.065	1	11/30/15 16:00	12/02/15 05:59	7440-41-7	
Cadmium	**8.8**	mg/kg	0.65	5	11/30/15 16:00	12/02/15 03:09	7440-43-9	
Chromium	**740**	mg/kg	1.6	5	11/30/15 16:00	12/02/15 03:09	7440-47-3	
Lead	**735**	mg/kg	1.3	5	11/30/15 16:00	12/02/15 03:09	7439-92-1	
Nickel	**132**	mg/kg	1.3	5	11/30/15 16:00	12/02/15 03:09	7440-02-0	
Selenium	ND	mg/kg	0.24	1	11/30/15 16:00	12/02/15 05:59	7782-49-2	
Silver	**0.33**	mg/kg	0.13	1	11/30/15 16:00	12/02/15 05:59	7440-22-4	
7471 Mercury	Analytical Method: EPA 7471 Preparation Method: EPA 7471							
Mercury	**13.8**	mg/kg	4.3	100	12/01/15 11:20	12/01/15 17:46	7439-97-6	
Percent Moisture	Analytical Method: ASTM D2974-87							
Percent Moisture	**25.8**	%		1		11/30/15 11:58		

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ANALYTICAL RESULTS

Project: 52390/52391
Pace Project No.: 7534892

Sample: 52391-07 **Lab ID: 7534892017** Collected: 11/20/15 16:04 Received: 11/24/15 10:40 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
6010 Metals, Total	Analytical Method: EPA 6010 Preparation Method: EPA 3050							
Antimony	**2.5**	mg/kg	1.3	1	11/30/15 16:00	12/02/15 06:07	7440-36-0	
Arsenic	**7.2**	mg/kg	1.6	5	11/30/15 16:00	12/02/15 03:15	7440-38-2	
Barium	**53.1**	mg/kg	3.2	5	11/30/15 16:00	12/04/15 16:21	7440-39-3	
Beryllium	**0.50**	mg/kg	0.32	5	11/30/15 16:00	12/02/15 03:15	7440-41-7	
Cadmium	**4.7**	mg/kg	0.64	5	11/30/15 16:00	12/02/15 03:15	7440-43-9	
Chromium	**257**	mg/kg	1.6	5	11/30/15 16:00	12/02/15 03:15	7440-47-3	
Lead	**145**	mg/kg	1.3	5	11/30/15 16:00	12/02/15 03:15	7439-92-1	
Nickel	**48.4**	mg/kg	1.3	5	11/30/15 16:00	12/02/15 03:15	7440-02-0	
Selenium	**0.49**	mg/kg	0.23	1	11/30/15 16:00	12/02/15 06:07	7782-49-2	
Silver	ND	mg/kg	0.13	1	11/30/15 16:00	12/02/15 06:07	7440-22-4	
7471 Mercury	Analytical Method: EPA 7471 Preparation Method: EPA 7471							
Mercury	**4.1**	mg/kg	0.88	20	12/01/15 11:20	12/01/15 19:03	7439-97-6	
Percent Moisture	Analytical Method: ASTM D2974-87							
Percent Moisture	**21.7**	%		1		11/30/15 11:58		

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ANALYTICAL RESULTS

Project: 52390/52391
Pace Project No.: 7534892

Sample: 52391-08 **Lab ID: 7534892018** Collected: 11/20/15 16:15 Received: 11/24/15 10:40 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
6010 Metals, Total	Analytical Method: EPA 6010 Preparation Method: EPA 3050							
Antimony	**3.4**	mg/kg	1.1	1	11/30/15 16:00	12/02/15 06:14	7440-36-0	
Arsenic	**2.2**	mg/kg	1.4	5	11/30/15 16:00	12/02/15 03:21	7440-38-2	
Barium	**39.9**	mg/kg	2.8	5	11/30/15 16:00	12/04/15 16:27	7440-39-3	
Beryllium	**0.18**	mg/kg	0.057	1	11/30/15 16:00	12/02/15 06:14	7440-41-7	
Cadmium	ND	mg/kg	0.11	1	11/30/15 16:00	12/02/15 06:14	7440-43-9	
Chromium	**241**	mg/kg	1.4	5	11/30/15 16:00	12/02/15 03:21	7440-47-3	
Lead	**27.4**	mg/kg	1.1	5	11/30/15 16:00	12/02/15 03:21	7439-92-1	
Nickel	**12.7**	mg/kg	1.1	5	11/30/15 16:00	12/02/15 03:21	7440-02-0	
Selenium	**0.70**	mg/kg	0.20	1	11/30/15 16:00	12/02/15 06:14	7782-49-2	
Silver	**0.17**	mg/kg	0.11	1	11/30/15 16:00	12/02/15 06:14	7440-22-4	
7471 Mercury	Analytical Method: EPA 7471 Preparation Method: EPA 7471							
Mercury	**0.093**	mg/kg	0.038	1	12/01/15 11:20	12/01/15 19:06	7439-97-6	
Percent Moisture	Analytical Method: ASTM D2974-87							
Percent Moisture	**12.0**	%		1		11/30/15 11:58		

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QUALITY CONTROL DATA

Project: 52390/52391
Pace Project No.: 7534892

QC Batch: MERP/2421 Analysis Method: EPA 7471
QC Batch Method: EPA 7471 Analysis Description: 7471 Mercury
Associated Lab Samples: 7534892001, 7534892002, 7534892003, 7534892004, 7534892005, 7534892006, 7534892007, 7534892008, 7534892009, 7534892010, 7534892011, 7534892012

METHOD BLANK: 183470 Matrix: Solid
Associated Lab Samples: 7534892001, 7534892002, 7534892003, 7534892004, 7534892005, 7534892006, 7534892007, 7534892008, 7534892009, 7534892010, 7534892011, 7534892012

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Mercury	mg/kg	ND	0.035	12/01/15 15:44	

LABORATORY CONTROL SAMPLE: 183471

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Mercury	mg/kg	.05	0.057	114	85-115	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 183472 183473

Parameter	Units	7534725002 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Mercury	mg/kg	ND	.055	.056	0.087	0.087	129	127	70-130	0	20	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

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QUALITY CONTROL DATA

Project: 52390/52391
Pace Project No.: 7534892

QC Batch: MERP/2422 Analysis Method: EPA 7471
QC Batch Method: EPA 7471 Analysis Description: 7471 Mercury
Associated Lab Samples: 7534892013, 7534892014, 7534892015, 7534892016, 7534892017, 7534892018

METHOD BLANK: 183480 Matrix: Solid
Associated Lab Samples: 7534892013, 7534892014, 7534892015, 7534892016, 7534892017, 7534892018

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Mercury	mg/kg	ND	0.035	12/01/15 17:04	

LABORATORY CONTROL SAMPLE: 183481

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Mercury	mg/kg	.05	0.053	106	85-115	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 183482 183483

Parameter	Units	7534892013 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Mercury	mg/kg	16.2	.073	.079	21.0	13.6	6610	-3350	70-130	43	20	M6,R1

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REPORT OF LABORATORY ANALYSIS

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400 West Bethany Drive - Suite 190
Allen, TX 75013
(972)727-1123

QUALITY CONTROL DATA

Project: 52390/52391
Pace Project No.: 7534892

QC Batch: MPRP/3882 Analysis Method: EPA 6010
QC Batch Method: EPA 3050 Analysis Description: 6010 MET
Associated Lab Samples: 7534892001, 7534892002, 7534892003, 7534892004, 7534892005, 7534892006, 7534892007, 7534892008, 7534892009, 7534892010, 7534892011, 7534892012, 7534892013, 7534892014, 7534892015, 7534892016, 7534892017, 7534892018

METHOD BLANK: 183460 Matrix: Solid
Associated Lab Samples: 7534892001, 7534892002, 7534892003, 7534892004, 7534892005, 7534892006, 7534892007, 7534892008, 7534892009, 7534892010, 7534892011, 7534892012, 7534892013, 7534892014, 7534892015, 7534892016, 7534892017, 7534892018

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Antimony	mg/kg	ND	1.0	12/02/15 00:32	
Arsenic	mg/kg	ND	0.25	12/02/15 00:32	
Barium	mg/kg	ND	0.50	12/02/15 00:32	CU
Beryllium	mg/kg	ND	0.050	12/02/15 00:32	
Cadmium	mg/kg	ND	0.10	12/02/15 00:32	
Chromium	mg/kg	ND	0.25	12/02/15 00:32	
Lead	mg/kg	ND	0.20	12/02/15 00:32	
Nickel	mg/kg	ND	0.20	12/02/15 00:32	
Selenium	mg/kg	ND	0.18	12/02/15 00:32	
Silver	mg/kg	ND	0.10	12/02/15 00:32	

LABORATORY CONTROL SAMPLE: 183461

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Antimony	mg/kg	50	52.0	104	80-120	
Arsenic	mg/kg	50	49.2	98	80-120	
Barium	mg/kg	50	49.9	100	80-120	
Beryllium	mg/kg	50	51.8	104	80-120	
Cadmium	mg/kg	50	50.8	102	80-120	
Chromium	mg/kg	50	53.8	108	80-120	
Lead	mg/kg	50	52.2	104	80-120	
Nickel	mg/kg	50	53.0	106	80-120	
Selenium	mg/kg	50	50.6	101	80-120	
Silver	mg/kg	25	24.9	99	80-120	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 183462 183463

Parameter	Units	7534892001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Antimony	mg/kg	ND	68.8	70.1	23.6	26.9	34	38	75-125	13	20	M1
Arsenic	mg/kg	24.0	68.8	70.1	73.9	85.5	72	88	75-125	15	20	M1
Barium	mg/kg	98.8	68.8	70.1	174	174	109	108	75-125	0	20	
Beryllium	mg/kg	0.42	68.8	70.1	42.5	47.6	61	67	75-125	11	20	M1
Cadmium	mg/kg	ND	68.8	70.1	44.0	49.9	64	71	75-125	13	20	M1
Chromium	mg/kg	17.7	68.8	70.1	69.0	78.5	74	87	75-125	13	20	M1

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QUALITY CONTROL DATA

Project: 52390/52391
Pace Project No.: 7534892

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 183462 183463

Parameter	Units	7534892001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Lead	mg/kg	12.3	68.8	70.1	60.8	69.5	70	82	75-125	13	20	M1
Nickel	mg/kg	14.7	68.8	70.1	64.2	72.6	72	82	75-125	12	20	M1
Selenium	mg/kg	ND	68.8	70.1	44.1	49.7	64	71	75-125	12	20	M1
Silver	mg/kg	ND	34.4	35.1	23.1	26.4	67	75	75-125	13	20	M1

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QUALITY CONTROL DATA

Project: 52390/52391
Pace Project No.: 7534892

QC Batch: PMST/2033 Analysis Method: ASTM D2974-87
QC Batch Method: ASTM D2974-87 Analysis Description: Dry Weight/Percent Moisture
Associated Lab Samples: 7534892001, 7534892002, 7534892003, 7534892004, 7534892005, 7534892006

SAMPLE DUPLICATE: 183416

Parameter	Units	7534897001 Result	Dup Result	RPD	Max RPD	Qualifiers
Percent Moisture	%	20.8	19.9	5	20	

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QUALITY CONTROL DATA

Project: 52390/52391
Pace Project No.: 7534892

QC Batch: PMST/2034 Analysis Method: ASTM D2974-87
QC Batch Method: ASTM D2974-87 Analysis Description: Dry Weight/Percent Moisture
Associated Lab Samples: 7534892007, 7534892008, 7534892009, 7534892010, 7534892011, 7534892012, 7534892013, 7534892014, 7534892015, 7534892016, 7534892017, 7534892018

SAMPLE DUPLICATE: 183417

Parameter	Units	7534892007 Result	Dup Result	RPD	Max RPD	Qualifiers
Percent Moisture	%	47.4	45.7	4	20	

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QUALIFIERS

Project: 52390/52391
Pace Project No.: 7534892

DEFINITIONS

DF - Dilution Factor, if reported, represents the factor applied to the reported data due to dilution of the sample aliquot.

ND - Not Detected at or above adjusted reporting limit.

J - Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

MDL - Adjusted Method Detection Limit.

PQL - Practical Quantitation Limit.

RL - Reporting Limit.

S - Surrogate

1,2-Diphenylhydrazine decomposes to and cannot be separated from Azobenzene using Method 8270. The result for each analyte is a combined concentration.

Consistent with EPA guidelines, unrounded data are displayed and have been used to calculate % recovery and RPD values.

LCS(D) - Laboratory Control Sample (Duplicate)

MS(D) - Matrix Spike (Duplicate)

DUP - Sample Duplicate

RPD - Relative Percent Difference

NC - Not Calculable.

SG - Silica Gel - Clean-Up

U - Indicates the compound was analyzed for, but not detected.

N-Nitrosodiphenylamine decomposes and cannot be separated from Diphenylamine using Method 8270. The result reported for each analyte is a combined concentration.

Pace Analytical is TNI accredited. Contact your Pace PM for the current list of accredited analytes.

TNI - The Nelac Institute

ANALYTE QUALIFIERS

CU	The continuing calibration for this compound is outside of Pace Analytical acceptance limits. Analyte presence below reporting limits in associated samples. Results unaffected by high bias.
M1	Matrix spike recovery exceeded QC limits. Batch accepted based on laboratory control sample (LCS) recovery.
M6	Matrix spike and Matrix spike duplicate recovery not evaluated against control limits due to sample dilution.
R1	RPD value was outside control limits.

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QUALITY CONTROL DATA CROSS REFERENCE TABLE

Project: 52390/52391
Pace Project No.: 7534892

Lab ID	Sample ID	QC Batch Method	QC Batch	Analytical Method	Analytical Batch
7534892001	52390-01	EPA 3050	MPRP/3882	EPA 6010	ICP/3179
7534892002	52390-02	EPA 3050	MPRP/3882	EPA 6010	ICP/3179
7534892003	52390-03	EPA 3050	MPRP/3882	EPA 6010	ICP/3179
7534892004	52390-04	EPA 3050	MPRP/3882	EPA 6010	ICP/3179
7534892005	52390-05	EPA 3050	MPRP/3882	EPA 6010	ICP/3179
7534892006	52390-06	EPA 3050	MPRP/3882	EPA 6010	ICP/3179
7534892007	52390-07	EPA 3050	MPRP/3882	EPA 6010	ICP/3179
7534892008	52390-08	EPA 3050	MPRP/3882	EPA 6010	ICP/3179
7534892009	52390-09	EPA 3050	MPRP/3882	EPA 6010	ICP/3179
7534892010	52390-10	EPA 3050	MPRP/3882	EPA 6010	ICP/3179
7534892011	52391-01	EPA 3050	MPRP/3882	EPA 6010	ICP/3179
7534892012	52391-02	EPA 3050	MPRP/3882	EPA 6010	ICP/3179
7534892013	52391-03	EPA 3050	MPRP/3882	EPA 6010	ICP/3179
7534892014	52391-04	EPA 3050	MPRP/3882	EPA 6010	ICP/3179
7534892015	52391-05	EPA 3050	MPRP/3882	EPA 6010	ICP/3179
7534892016	52391-06	EPA 3050	MPRP/3882	EPA 6010	ICP/3179
7534892017	52391-07	EPA 3050	MPRP/3882	EPA 6010	ICP/3179
7534892018	52391-08	EPA 3050	MPRP/3882	EPA 6010	ICP/3179
7534892001	52390-01	EPA 7471	MERP/2421	EPA 7471	MERC/2394
7534892002	52390-02	EPA 7471	MERP/2421	EPA 7471	MERC/2394
7534892003	52390-03	EPA 7471	MERP/2421	EPA 7471	MERC/2394
7534892004	52390-04	EPA 7471	MERP/2421	EPA 7471	MERC/2394
7534892005	52390-05	EPA 7471	MERP/2421	EPA 7471	MERC/2394
7534892006	52390-06	EPA 7471	MERP/2421	EPA 7471	MERC/2394
7534892007	52390-07	EPA 7471	MERP/2421	EPA 7471	MERC/2394
7534892008	52390-08	EPA 7471	MERP/2421	EPA 7471	MERC/2394
7534892009	52390-09	EPA 7471	MERP/2421	EPA 7471	MERC/2394
7534892010	52390-10	EPA 7471	MERP/2421	EPA 7471	MERC/2394
7534892011	52391-01	EPA 7471	MERP/2421	EPA 7471	MERC/2394
7534892012	52391-02	EPA 7471	MERP/2421	EPA 7471	MERC/2394
7534892013	52391-03	EPA 7471	MERP/2422	EPA 7471	MERC/2395
7534892014	52391-04	EPA 7471	MERP/2422	EPA 7471	MERC/2395
7534892015	52391-05	EPA 7471	MERP/2422	EPA 7471	MERC/2395
7534892016	52391-06	EPA 7471	MERP/2422	EPA 7471	MERC/2395
7534892017	52391-07	EPA 7471	MERP/2422	EPA 7471	MERC/2395
7534892018	52391-08	EPA 7471	MERP/2422	EPA 7471	MERC/2395
7534892001	52390-01	ASTM D2974-87	PMST/2033		
7534892002	52390-02	ASTM D2974-87	PMST/2033		
7534892003	52390-03	ASTM D2974-87	PMST/2033		
7534892004	52390-04	ASTM D2974-87	PMST/2033		
7534892005	52390-05	ASTM D2974-87	PMST/2033		
7534892006	52390-06	ASTM D2974-87	PMST/2033		
7534892007	52390-07	ASTM D2974-87	PMST/2034		
7534892008	52390-08	ASTM D2974-87	PMST/2034		
7534892009	52390-09	ASTM D2974-87	PMST/2034		
7534892010	52390-10	ASTM D2974-87	PMST/2034		
7534892011	52391-01	ASTM D2974-87	PMST/2034		

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QUALITY CONTROL DATA CROSS REFERENCE TABLE

Project: 52390/52391
Pace Project No.: 7534892

Lab ID	Sample ID	QC Batch Method	QC Batch	Analytical Method	Analytical Batch
7534892012	**52391-02**	ASTM D2974-87	PMST/2034		
7534892013	**52391-03**	ASTM D2974-87	PMST/2034		
7534892014	**52391-04**	ASTM D2974-87	PMST/2034		
7534892015	**52391-05**	ASTM D2974-87	PMST/2034		
7534892016	**52391-06**	ASTM D2974-87	PMST/2034		
7534892017	**52391-07**	ASTM D2974-87	PMST/2034		
7534892018	**52391-08**	ASTM D2974-87	PMST/2034		

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TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Chain of Custody Record

52390

Location:

(Do not fill in this shaded area if the facility information must be confidential)

Permit #:

Region:	Organization #:	PCA Code:	Program:	Sampler telephone number:
DCW	~~6120~~ 6102		Solid Waste	8175885824

E-Mail ID: Dorothy.Lewis@tag.texas.gov

Sampler: (signature)

Sampler: (please print clearly) Dorothy Lewis

Lab ID Number	Sample ID	Date	Time	# of Bottles	Grab/ Comp.	Matrix L,S,M,O,T	CL2	pH	Cond.	Analyses Requested	REMARKS
	-01	11/20/15	14:05	1	G	S				RCRA 8 + Ni, Sb, Be Totals	SW-846
	-02 *	11/20/15	14:22	1	G	S					
	-03 *	11/20/15	14:26	1	G	S					
	-04 *	11/20/15	14:30	1	G	S					
	-05 *	11/20/15	14:36	1	G	S					
	-06 *	11/20/15	14:40	1	G	S					
	-07 *	11/20/15	14:44	1	G	S					
	-08 *	11/20/15	14:52	1	G	S					
	-09 *	11/20/15	14:52	1	G	S					
	-10 *	11/20/15	15:01	1	G	S					* Collection Date is 11/20/15 per Dorothy 11/24/15 LCR

WO# : 7534892

7534892

Relinquished by:	Date	Time	Received by:
	11/23/15	12:05	
Relinquished by:	Date	Time	Received by:
	11-24-15	0848	Fed EX
Relinquished by:	Date	Time	Received by:
Fed EX	11-24-15	1040	Melissa M. Allday PACE
Relinquished by:	Date	Time	Received by: 11-24-15 1040 Temp 2.0°C IR01
Shipper name:	Shipper Number:		

For Laboratory Use:

Received on ice:	Y ✓	N	8.4 deg. C
Preservatives:	Y	N ✓	CS#4 FWSC
COC Seal:	Y	N ✓	
Seals Intact:	Y	N ✓	

17 038

Page 33 of 37

TCEQ-10065 (11/02) White (Original) -Lab Yellow-Lab Pink-Contract Lab Manager Goldenrod-Collector Copy

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Chain of Custody Record

52391

Location:

(Do not fill in this shaded area if the facility information must be confidential)

Permit #:

Region:	Organization #:	PCA Code:	Program:	Sampler telephone number:
DFW	L107		solid waste	817 588 5824

E-Mail ID: Dorothy.Lewis@tceq.texas.gov

Sampler: (signature)

Sampler: (please print clearly) Dorothy Lewis

Lab ID Number	Sample ID	Date	Time	# of Bottles	Grab/ Comp.	Matrix L,S,M,O,T	CL2	pH	Cond.	Analyses Requested	REMARKS
	-01	11/20/15	15:05	1	G	S				TOTALS RCRA 8 + Be, Sb, Ni	SW-846
	-02	11/20/15	15:13	1	G	S					
	-03	11/20/15	15:12	1	G	S					
	-04	11/20/15	15:34	1	G	S					
	-05	11/20/15	15:42	1	G	S					
	-06	11/20/15	16:00	1	G	S					
	-07	11/20/15	16:04	1	G	S					
	-08	11/20/15	16:15	1	G	S					
	-09										
	-10										

Relinquished by:	Date: 11/23/15	Time: 12:05	Received by: Kalen Stout
Relinquished by: Kalen Stout	Date: 11-24-15	Time: 0848	Received by: Fed EX
Relinquished by: Fed EX	Date: 11-24-15	Time: 1040	Received by: Melissa M. Culley
Relinquished by:	Date:	Time:	Received by: Temp 3.0 C IR#1
Shipper name:	Shipper Number:		

For Laboratory Use:

Received on ice:	Y ✓	N	3.4 deg. C
Preservatives:	Y	N ✓	CS#1 FWSC
COC Seal:	Y ✓	N	
Seals Intact:	Y ✓	N	

TCEQ-10065 (11/02) White (Original) -Lab Yellow-Lab Pink-Contract Lab Manager Goldenrod-Collector Copy

17 039

Page 24 of 27

Pace Analytical

Sample Condition Upon Receipt

☑Dallas ☐Ft Worth ☐San Angelo

Client Name: TCEQ Project Work order: 7534892

Courier: FedEX ☑ UPS ☐ USPS ☐ Client ☐ Courier ☐ LSO ☐ PACE ☐ Other:

Tracking#: 1645 1 0330 1925

Custody Seal on Cooler/Box: Yes ☑ No ☐ **Seals Intact:** Yes ☑ No ☐ NA ☐

Packing Material: Bubble Wrap ☐ Bubble Bags ☐ Foam ☐ None ☑ Other ☐

Thermometer Used: IR-01 Type of Ice: Wet ☑ Blue ☐ None ☐ Sample Received on ice, cooling process has begun ☑

Cooler Temp: 2.0°C (Temp should be above freezing to 6°C)

Chain of Custody Present	Yes ☑ No ☐ NA ☐	1
Chain of Custody filled out	Yes ☑ No ☐ NA ☐	2
Chain of Custody relinquished	Yes ☑ No ☐ NA ☐	3
Sampler name & signature on COC	Yes ☑ No ☐ NA ☐	4
Sample received within HT	Yes ☑ No ☐ NA ☐	5
Short HT analyses (<72 hrs)	Yes ☐ No ☑ NA ☐	6
Rush TAT requested	Yes ☐ No ☑ NA ☐	7
Sufficient Volume received	Yes ☑ No ☐ NA ☐	8
Correct Container used Pace Container used	Yes ☑ No ☐ NA ☐ Yes ☐ No ☑ NA ☐	9
Container Intact	Yes ☑ No ☐ NA ☐	10
Unpreserved 5035A soil frozen within 48 hrs	Yes ☐ No ☐ NA ☑	11
Filtered volume received for Dissolved tests	Yes ☐ No ☐ NA ☑	12
Sample labels match COC Include date/time/ID/analyses Matrix: SOIL	Yes ☑ No ☐ NA ☐	13
All containers needing preservation have been checked	Yes ☐ No ☐ NA ☑	14a. Lot# of pH strip: pH checked Yes ☐ No ☐ pH<2 ☐ pH>9 ☐ pH>12 ☐ Lot# of Iodine strip: Lot# of Lead Acetate strip:
Do containers require preservation at the lab	Yes ☐ No ☐ NA ☑	14b. Preservation: / Lot#:
All containers needing preservation are found to be in Compliance with EPA recommendation **Exception:** VOA, coliform, O&G	Yes ☐ No ☐ NA ☑ Yes ☐ No ☑	14c.
Are soil samples (volatiles) received in	Bulk ☐ Terracore ☐ EnCore ☐ NA ☑	15.
Trip Blank present Trip Blank Custody Seals Intact Pace Trip Blank Lot# (if purchased):	Yes ☐ No ☐ NA ☑ Yes ☐ No ☐ NA ☑	16.
Headspace in VOA (>6mm)	Yes ☐ No ☐ NA ☑	17.
Project sampled in USDA Regulated Area:	Yes ☐ No ☐ NA ☑	18. List State

Client Notification/Resolution/Comments:

Person Contacted: Date:

Comments/Resolution:

Person Examining Contents: Date: 11/24/15

F-DAL-C001rev.05 090215

17 040

Pace Analytical Services - Dallas

Sample Container Count-

COC PAGE 1 of 2

COC ID# _____

Pace Project # 7534892

Sample Line Item	AG1S	AG1U	AG3S	BG1S	BP1U	BP2N	BP2S	BP2U	BP20	SP5T	VG9H	DG9M	VG9U	VG9W	WGFU	WGKU	BP3C	GN	WG2U	BP3S				
1															1									
2															1									
3															1									
4															1									
5															1									
6															1									
7															1									
8															1									
9															1									
10															1									
11															1									
12															1									

Container Codes

AF	Air Filter	BP1A	1 liter NaOH, Asc Acid plastic	BP3S	250mL H2SO4 plastic	R	terra core kit
AG1H	1L HCL Amber Glass	BP1N	1 liter HNO3 plastic	BP3U	250mL unpreserved plastic	SP5T	120mL Coliform Na Thiosulfate
AG1S	1L H2SO4 Amber Glass	BP1S	1 liter H2SO4 plastic	BP3Z	250mL NaOH, Zn Ac plastic	SP5U	120mL Coliform unpreserved
AG1T	1L Sodium Thiosulfate Amber	BP1U	1 liter unpreserved plastic	C	Air Cassettes	VG9H	40mL HCL clear vial
AG1U	1L Unpreserved Amber Glass	BP1Z	1 liter NaOH, Zn, Ac	DG9B	40mL Na Bisulfate amber vial	VG9T	40mL Na Thio. clear vial
AG2N	500mL HNO3 amber glass	BP2A	500mL NaOH, Asc Acid plasti	DG9H	40mL HCL amber voa vial	VG9U	40mL unpreserved clear vial
AG2S	500mL H2SO4 amber glass	BP2N	500mL HNO3 plastic	DG9M	40mL MeOH clear vial	VG9W	40mL Unpreserved Tared
AG2U	500mL unpreserved amber glas	BP2O	500mL NaOH plastic	DG9P	40mL TSP amber vial	VSG	Headspace septa vial & HCL
AG3S	250mL H2SO4 glass amber	BP2S	500mL H2SO4 plastic	DG9S	40mL H2SO4 amber vial	WGFU	4oz clear soil jar
AG3U	250mL unpreserved amber glas	BP2U	500mL unpreserved plastic	DG9T	40mL Na Thio amber vial	WGFX	4oz wide jar w/hexane wipe
BG1H	1 liter HCL clear glass	BP2Z	500mL NaOH, Zn Ac	DG9U	40mL unpreserved amber vial	WGKU	8oz wide jar upreserved
BG1S	1 liter H2SO4 clear glass	BP3A	250mL NaOh, Asc Acid plastic	GN	General unpreserved	WG2U	2oz clear jar
BG1T	1 liter Na Thiosulfate clear gla	BP3C	250mL NaOH plastic	I	Wipe/Swab	ZPLC	Ziploc Bag
BG1U	1 liter unpreserved glass	BP3N	250mL HNO3 plastic	JGFU	4oz unpreserved amber wide	Other	Other

17 041

Pace Analytical Services - Dallas

Sample Container Count-

COC PAGE 2 of 2

COC ID# _____

Pace Project # 7534892

Sample Line Item	AG1S	AG1U	AG3S	BG1S	BP1U	BP2N	BP2S	BP2U	BP20	SP5T	VG9H	DG9M	VG9U	VG9W	WGFU	WGKU	BP3C	GN	WG2U	BP3S				
1															1									
2															1									
3															1									
4															1									
5															1									
6															1									
7																								
8																								
9																								
10																								
11																								
12																								

Container Codes

AF	Air Filter	BP1A	1 liter NaOH, Asc Acid plastic	BP3S	250mL H2SO4 plastic	R	terra core kit
AG1H	1L HCL Amber Glass	BP1N	1 liter HNO3 plastic	BP3U	250mL unpreserved plastic	SP5T	120mL Coliform Na Thiosulfate
AG1S	1L H2SO4 Amber Glass	BP1S	1 liter H2SO4 plastic	BP3Z	250mL NaOH, Zn Ac plastic	SP5U	120mL Coliform unpreserved
AG1T	1L Sodium Thiosulfate Amber	BP1U	1 liter unpreserved plastic	C	Air Cassettes	VG9H	40mL HCL clear vial
AG1U	1L Unpreserved Amber Glass	BP1Z	1 liter NaOH, Zn, Ac	DG9B	40mL Na Bisulfate amber vial	VG9T	40mL Na Thio. clear vial
AG2N	500mL HNO3 amber glass	BP2A	500mL NaOH, Asc Acid plasti	DG9H	40mL HCL amber voa vial	VG9U	40mL unpreserved clear vial
AG2S	500mL H2SO4 amber glass	BP2N	500mL HNO3 plastic	DG9M	40mL MeOH clear vial	VG9W	40mL Unpreserved Tared
AG2U	500mL unpreserved amber glas	BP2O	500mL NaOH plastic	DG9P	40mL TSP amber vial	VSG	Headspace septa vial & HCL
AG3S	250mL H2SO4 glass amber	BP2S	500mL H2SO4 plastic	DG9S	40mL H2SO4 amber vial	WGFU	4oz clear soil jar
AG3U	250mL unpreserved amber glas	BP2U	500mL unpreserved plastic	DG9T	40mL Na Thio amber vial	WGFX	4oz wide jar w/hexane wipe
BG1H	1 liter HCL clear glass	BP2Z	500mL NaOH, Zn Ac	DG9U	40mL unpreserved amber vial	WGKU	8oz wide jar upreserved
BG1S	1 liter H2SO4 clear glass	BP3A	250mL NaOh, Asc Acid plasti	GN	General unpreserved	WG2U	2oz clear jar
BG1T	1 liter Na Thiosulfate clear gla	BP3C	250mL NaOH plastic	I	Wipe/Swab	ZPLC	Ziploc Bag
BG1U	1 liter unpreserved glass	BP3N	250mL HNO3 plastic	JGFU	4oz unpreserved amber wide	Other	Other

17 042

November 20, 2015 Sample Locations

November 20, 2015 Sample Locations

November 20, 2015 Sample Locations

Map ID	COC No.	Lab ID No.	Sample
1	52390-01	7534892001	Background (soil)
2	53290-02	7534892002	Surface soil
3	52390-03	7534892003	Surface soil
4	52390-04	7534892004	Surface soil
5	52390-05	7534892005	Surface soil
6	52390-06	7534892006	Surface soil
7	52390-07	7534892007	Surface soil
8	52390-08	7534892008	Surface soil
9 (duplicate of 8)	52390-09	7534892009	Surface soil
10	52390-10	7534892010	Surface soil
11	52391-01	7534892011	Surface soil
12	52391-02	7534892012	Surface soil
13 (duplicate of 12)	52391-03	7534892013	Surface soil
14	52391-04	7534892014	Surface soil
15	52391-05	7534892015	Grinding grit fragment
16	52391-06	7534892016	Surface soil
17	52391-07	7534892017	Surface soil
18	52391-08	7534892018	Surface soil

Sampling Results Table

Sample ID	Lab ID	Results (mg/kg)	Parameter	Background	TotSoilComb (mg/kg)	Tier 1 Table 1 Res GWSoilIng (mg/kg)
52390-02	7534892002	**0.36**	Mercury	**0.081**	3.6	2.1
52390-02	7534892002	**0.49**	Selenium	**0.3 (TSBC)**	310	23
52390-02	7534892002	0.52	Beryllium	**1.5 (TSBC)**	38	1.8
52390-02	7534892002	**0.78**	Cadmium	**ND**	52.4	1.5
52390-02	7534892002	**171**	Lead	**15 (TSBC)**	500	3
52390-02	7534892002	**23.8**	Nickel	**14.7**	840	160
52390-02	7534892002	7.5	Arsenic	**24**	24	5
52390-02	7534892002	85.2	Barium	**300 (TSBC)**	8100	440
52390-02	7534892002	**99.2**	Chromium	**30 (TSBC)**	33000	2400
52390-03	7534892003	**0.15**	Mercury	**0.081**	3.6	2.1
52390-03	7534892003	**0.24**	Cadmium	**ND**	52.4	1.5
52390-03	7534892003	**0.42**	Selenium	**0.3 (TSBC)**	310	23
52390-03	7534892003	0.54	Beryllium	**1.5 (TSBC)**	38	1.8
52390-03	7534892003	**117**	Lead	**15 (TSBC)**	500	3
52390-03	7534892003	**18.1**	Nickel	**14.7**	840	160
52390-03	7534892003	**58.1**	Chromium	**30 (TSBC)**	33000	2400
52390-03	7534892003	6.5	Arsenic	**24.0**	24	5
52390-03	7534892003	97.1	Barium	**300 (TSBC)**	8100	440
52390-04	7534892004	**0.15**	Mercury	**0.081**	3.6	2.1
52390-04	7534892004	**0.47**	Selenium	**0.3 (TSBC)**	310	23
52390-04	7534892004	0.66	Beryllium	**1.5 (TSBC)**	38	1.8
52390-04	7534892004	109	Barium	**300 (TSBC)**	8100	440
52390-04	7534892004	**20.3**	Nickel	**14.7**	840	160
52390-04	7534892004	**50.8**	Chromium	**30 (TSBC)**	33000	2400
52390-04	7534892004	**60.0**	Lead	**15 (TSBC)**	500	3
52390-04	7534892004	7.2	Arsenic	**24**	24	5
52390-05	7534892005	**0.26**	Mercury	**0.081**	3.6	2.1
52390-05	7534892005	**0.49**	Selenium	**0.3 (TSBC)**	310	23
52390-05	7534892005	0.51	Beryllium	**1.5 (TSBC)**	38	1.8
52390-05	7534892005	**111**	Lead	**15 (TSBC)**	500	3
52390-05	7534892005	**147**	Chromium	**30 (TSBC)**	33000	2400
52390-05	7534892005	**21.9**	Nickel	**14.7**	840	160
52390-05	7534892005	5.9	Arsenic	**24**	24	5
52390-05	7534892005	86.5	Barium	**300 (TSBC)**	8100	440
52390-06	7534892006	0.51	Beryllium	**1.5 (TSBC)**	38	1.8
52390-06	7534892006	**0.64**	Selenium	**0.3 (TSBC)**	310	23
52390-06	7534892006	**0.69**	Mercury	**0.081**	3.6	2.1
52390-06	7534892006	**110**	Lead	**15 (TSBC)**	500	3
52390-06	7534892006	**177**	Chromium	**30 (TSBC)**	33000	2400
52390-06	7534892006	**2.3**	Cadmium	**ND**	52.4	1.5
52390-06	7534892006	**22.2**	Nickel	**14.7**	840	160
52390-06	7534892006	5.2	Arsenic	**24**	24	5
52390-06	7534892006	77.0	Barium	**300 (TSBC)**	8100	440
52390-07	7534892007	**0.58**	Selenium	**0.3 (TSBC)**	310	23
52390-07	7534892007	**0.60**	Mercury	**0.081**	3.6	2.1
52390-07	7534892007	0.62	Beryllium	**1.5 (TSBC)**	38	1.8
52390-07	7534892007	**1.5**	Cadmium	**ND**	52.4	1.5
52390-07	7534892007	21.0	Nickel	**14.7**	840	160
52390-07	7534892007	**245**	Chromium	**30 (TSBC)**	33000	2400
52390-07	7534892007	5.5	Arsenic	**24**	24	5
52390-07	7534892007	**55.0**	Lead	**15 (TSBC)**	500	3

Sampling Results Table

Sample ID	Lab ID	Results (mg/kg)	Parameter	Background	TotSoilComb (mg/kg)	Tier 1 Table 1 Res GWSoilIng (mg/kg)
52390-07	7534892007	93.9	Barium	**300 (TSBC)**	8100	440
52390-08	7534892008	**0.77**	Selenium	**0.3 (TSBC)**	310	23
52390-08	7534892008	0.81	Beryllium	**1.5 (TSBC)**	38	1.8
52390-08	7534892008	116	Barium	**300 (TSBC)**	8100	440
52390-08	7534892008	**158**	Lead	**15 (TSBC)**	500	3
52390-08	7534892008	**2.3**	Mercury	**0.081**	3.6	2.1
52390-08	7534892008	**32.1**	Nickel	**14.7**	840	160
52390-08	7534892008	**349**	Chromium	**30 (TSBC)**	33000	2400
52390-08	7534892008	6.3	Arsenic	**24**	24	5
52390-08	7534892008	**6.5**	Cadmium	**ND**	52.4	1.5
52390-09	7534892009	0.73	Beryllium	**1.5 (TSBC)**	38	1.8
52390-09	7534892009	**0.76**	Selenium	**0.3 (TSBC)**	310	23
52390-09	7534892009	**1.9**	Mercury	**0.081**	3.6	2.1
52390-09	7534892009	107	Barium	**300 (TSBC)**	8100	440
52390-09	7534892009	**139**	Lead	**15 (TSBC)**	500	3
52390-09	7534892009	**31.8**	Nickel	**14.7**	840	160
52390-09	7534892009	**380**	Chromium	**30 (TSBC)**	33000	2400
52390-09	7534892009	6.4	Arsenic	**24**	24	5
52390-09	7534892009	**6.6**	Cadmium	**ND**	52.4	1.5
52390-10	7534892010	0.45	Beryllium	**1.5 (TSBC)**	38	1.8
52390-10	7534892010	**0.75**	Selenium	**0.3 (TSBC)**	310	23
52390-10	7534892010	0.78	Arsenic	**24**	24	5
52390-10	7534892010	**0.90**	Silver	**ND**	97	0.48
52390-10	7534892010	**138**	Nickel	**14.7**	840	160
52390-10	7534892010	139	Barium	**300 (TSBC)**	8100	440
52390-10	7534892010	**17.5**	Mercury	**0.081**	**3.6**	2.1
52390-10	7534892010	**18.8**	Antimony	**1.0 (TSBC)**	**15**	5.4
52390-10	7534892010	**1940**	Chromium	**30 (TSBC)**	33000	2400
52390-10	7534892010	**20.6**	Cadmium	**ND**	52.4	1.5
52390-10	7534892010	**713**	Lead	**15 (TSBC)**	**500**	3
52391-01	7534892011	0.77	Beryllium	**1.5 (TSBC)**	38	1.8
52391-01	7534892011	136	Barium	**300 (TSBC)**	8100	440
52391-01	7534892011	**163**	Lead	**15 (TSBC)**	500	3
52391-01	7534892011	**4.6**	Mercury	**0.081**	**3.6**	2.1
52391-01	7534892011	**520**	Chromium	**30 (TSBC)**	33000	2400
52391-01	7534892011	**57.1**	Nickel	**14.7**	840	160
52391-01	7534892011	6.3	Arsenic	**24**	24	5
52391-01	7534892011	**7.8**	Cadmium	**ND**	52.4	1.5
52391-02	7534892012	124	Barium	**300 (TSBC)**	8100	440
52391-02	7534892012	**2000**	Lead	**15 (TSBC)**	**500**	3
52391-02	7534892012	**2970**	Chromium	**30 (TSBC)**	33000	2400
52391-02	7534892012	**3.3**	Silver	**ND**	97	0.48
52391-02	7534892012	**37.5**	Antimony	**1.0 (TSBC)**	**15**	5.4
52391-02	7534892012	**388**	Nickel	**14.7**	840	160
52391-02	7534892012	**46.4**	Mercury	**0.081**	**3.6**	2.1
52391-02	7534892012	**58.5**	Cadmium	**ND**	**52.4**	1.5
52391-03	7534892013	**1510**	Lead	**15 (TSBC)**	**500**	3
52391-03	7534892013	**16.2**	Mercury	**0.081**	**3.6**	2.1
52391-03	7534892013	**2780**	Chromium	**30 (TSBC)**	33000	2400
52391-03	7534892013	**33.7**	Antimony	**1.0 (TSBC)**	**15**	5.4
52391-03	7534892013	**380**	Nickel	**14.7**	840	160

Sampling Results Table

Sample ID	Lab ID	Results (mg/kg)	Parameter	Background	TotSoilComb (mg/kg)	Tier 1 Table 1 Res GWSoilIng (mg/kg)
52391-03	7534892013	**57.0**	Cadmium	**ND**	**52.4**	1.5
52391-03	7534892013	97.7	Barium	**300 (TSBC)**	8100	440
52391-04	7534892014	0.27	Selenium	**0.3 (TSBC)**	310	23
52391-04	7534892014	**0.52**	Silver	**ND**	97	0.48
52391-04	7534892014	0.65	Beryllium	**1.5 (TSBC)**	38	1.8
52391-04	7534892014	**1060**	Lead	**15 (TSBC)**	**500**	3
52391-04	7534892014	127	Barium	**300 (TSBC)**	8100	440
52391-04	7534892014	2.0	Arsenic	**24**	24	5
52391-04	7534892014	**205**	Cadmium	**ND**	**52.4**	1.5
52391-04	7534892014	**208**	Nickel	**14.7**	840	160
52391-04	7534892014	**21.7**	Antimony	**1.0 (TSBC)**	**15**	5.4
52391-04	7534892014	**24.6**	Mercury	**0.081**	**3.6**	2.1
52391-04	7534892014	**2690**	Chromium	**30 (TSBC)**	33000	2400
52391-06	7534892016	0.22	Beryllium	**1.5 (TSBC)**	38	1.8
52391-06	7534892016	**0.33**	Silver	**ND**	97	0.48
52391-06	7534892016	**13.8**	Mercury	**0.081**	**3.6**	2.1
52391-06	7534892016	**132**	Nickel	**14.7**	840	160
52391-06	7534892016	**18.6**	Antimony	**1.0 (TSBC)**	**15**	5.4
52391-06	7534892016	3.4	Arsenic	**24**	24	5
52391-06	7534892016	46.7	Barium	**300 (TSBC)**	8100	440
52391-06	7534892016	**735**	Lead	**15 (TSBC)**	**500**	3
52391-06	7534892016	**740**	Chromium	**30 (TSBC)**	33000	2400
52391-06	7534892016	**8.8**	Cadmium	**ND**	52.4	1.5
52391-07	7534892017	**0.49**	Selenium	**0.3 (TSBC)**	310	23
52391-07	7534892017	0.50	Beryllium	**1.5 (TSBC)**	38	1.8
52391-07	7534892017	**145**	Lead	**15 (TSBC)**	500	3
52391-07	7534892017	**2.5**	Antimony	**1.0 (TSBC)**	15	5.4
52391-07	7534892017	**257**	Chromium	**30 (TSBC)**	33000	2400
52391-07	7534892017	**4.1**	Mercury	**0.081**	**3.6**	2.1
52391-07	7534892017	**4.7**	Cadmium	**ND**	52.4	1.5
52391-07	7534892017	**48.4**	Nickel	**14.7**	840	160
52391-07	7534892017	53.1	Barium	**300 (TSBC)**	8100	440
52391-07	7534892017	7.2	Arsenic	**24**	24	5
52391-08	7534892018	**0.093**	Mercury	**0.081**	3.6	2.1
52391-08	7534892018	**0.17**	Silver	**ND**	97	0.48
52391-08	7534892018	0.18	Beryllium	**1.5 (TSBC)**	38	1.8
52391-08	7534892018	**0.70**	Selenium	**0.3 (TSBC)**	310	23
52391-08	7534892018	12.7	Nickel	**14.7**	840	160
52391-08	7534892018	2.2	Arsenic	**24**	24	5
52391-08	7534892018	**241**	Chromium	**30 (TSBC)**	33000	2400
52391-08	7534892018	**27.4**	Lead	**15 (TSBC)**	500	3
52391-08	7534892018	**3.4**	Antimony	**1.0 (TSBC)**	15	5.4
52391-08	7534892018	39.9	Barium	**300 (TSBC)**	8100	440

TSBC-Texas Specific Background Concentration

Exceedance of Tier 1 Table 1 Res GWSoilIng Protective Concentration Levels (PCL)

Exceedance of Tier 1 Table 1 Res TotSoilComb Protective Concentration Levels (PCL)

BOLD Exceedance of Background

Sampling Results Table						
Sample ID	Lab ID	Results (mg/kg)	Parameter	**Background**	TotSoilComb (mg/kg)	Tier 1 Table 1 Res GWSoilIng (mg/kg)
Grinding Grit Fragment						
52391-05	7534892015	1.7	Mercury	**NA**	NA	NA
52391-05	7534892015	1420	Lead	**NA**	NA	NA
52391-05	7534892015	40.6	Antimony	**NA**	NA	NA
52391-05	7534892015	5.6	Arsenic	**NA**	NA	NA
52391-05	7534892015	507	Nickel	**NA**	NA	NA
52391-05	7534892015	56.9	Cadmium	**NA**	NA	NA
52391-05	7534892015	59.6	Barium	**NA**	NA	NA
52391-05	7534892015	6.5	Selenium	**NA**	NA	NA
52391-05	7534892015	7580	Chromium	**NA**	NA	NA

Reference 18

TEXAS SECRETARY of STATE
CARLOS H. CASCOS

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Filing Number:	141814500	**Entity Type:**	Domestic For-Profit Corporation
Original Date of Filing:	October 7, 1996	**Entity Status:**	In existence
Formation Date:	N/A		
Tax ID:	30118990487	**FEIN:**	
Duration:	Perpetual		

Name: STAG MANAGEMENT INCORPORATED

Address: PO BOX 41098
DALLAS, TX 75241 USA

REGISTERED AGENT | FILING HISTORY | NAMES | MANAGEMENT | ASSUMED NAMES | ASSOCIATED ENTITIES

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View Image	Document Number	Filing Type	Filing Date	Effective Date	Eff. Cond	Page Count
	6759125	Articles Of Incorporation	October 7, 1996	October 7, 1996	No	10
	6759126	Statement Of Operation As A Close Corporation	December 15, 1997	December 15, 1997	No	1
	26472160001	Public Information Report (PIR)	December 31, 2002	February 10, 2003	No	1
	38703130001	Public Information Report (PIR)	December 31, 2003	July 29, 2003	No	1
	61349630001	Public Information Report (PIR)	December 31, 2004	June 1, 2004	No	1
	111274780001	Public Information Report (PIR)	December 31, 2005	December 10, 2005	No	1
	134689640001	Public Information Report (PIR)	December 31, 2006	June 27, 2006	No	1
	176858510001	Public Information Report (PIR)	December 31, 2007	July 4, 2007	No	1
	270545520001	Public Information Report (PIR)	December 31, 2008	August 4, 2009	No	1
	270802970001	Public Information Report (PIR)	December 31, 2008	August 5, 2009	No	1
	327891690001	Public Information Report (PIR)	December 31, 2009	September 16, 2010	No	1
	340251280001	Public Information Report (PIR)	December 31, 2010	November 12, 2010	No	1
	376144470001	Public Information Report (PIR)	December 31, 2011	July 8, 2011	No	1
	433480200001	Public Information Report (PIR)	December 31, 2012	July 28, 2012	No	1
	498317010001	Public Information Report (PIR)	December 31, 2013	August 27, 2013	No	1
	561852500001	Public Information Report (PIR)	December 31, 2014	August 18, 2014	No	1
	620254390001	Public Information Report (PIR)	December 31, 2015	August 2, 2015	No	1

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Formation Date:	N/A		
Tax ID:	30118990487	**FEIN:**	
Duration:	Perpetual		

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Address: PO BOX 41098
DALLAS, TX 75241 USA

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Original Date of Filing:	October 7, 1996	**Entity Status:**	In existence
Formation Date:	N/A		
Tax ID:	30118990487	**FEIN:**	
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Last Update	Name	Title	Address
August 2, 2015	JOE D LANE	SECRETARY	PO BOX 41098 DALLAS, TX 75241 USA
August 2, 2015	JOE D LANE	DIRECTOR	PO BOX 41098 DALLAS, TX 75241 USA
August 2, 2015	J R LANE	PRESIDENT	PO BOX 41098 DALLAS, TX 75241 USA
August 2, 2015	J R LANE	DIRECTOR	PO BOX 41098 DALLAS, TX 75241 USA

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Name	Entity Type	Document Description	Filing Date	Entity Filing Number	Jurisdiction	Capacity
There are no documents listed for this entity which match your inquiry.						

Order | Return to Search

Instructions:

- To place an order for additional information about a filing press the 'Order' button.

Reference 19

TEXAS SECRETARY of STATE
CARLOS H. CASCOS

BUSINESS ORGANIZATIONS INQUIRY - VIEW ENTITY

Filing Number:	116799800	**Entity Type:**	Domestic For-Profit Corporation
Original Date of Filing:	September 27, 1990	**Entity Status:**	In existence
Formation Date:	N/A		
Tax ID:	17523454373	**FEIN:**	
Duration:	Perpetual		

Name: LANE PLATING WORKS, INC.

Address: 5322 BONNIE VIEW RD
DALLAS, TX 75241 USA

REGISTERED AGENT | FILING HISTORY | NAMES | MANAGEMENT | ASSUMED NAMES | ASSOCIATED ENTITIES

Name	Address	Inactive Date
William F Pyne	8150 North Central Expressway, Suite 1800 Dallas, TX 75206 USA	

Order | Return to Search

Instructions:

- To place an order for additional information about a filing press the 'Order' button.

TEXAS SECRETARY of STATE
CARLOS H. CASCOS

BUSINESS ORGANIZATIONS INQUIRY - VIEW ENTITY

Filing Number:	116799800	**Entity Type:**	Domestic For-Profit Corporation
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Address: 5322 BONNIE VIEW RD
DALLAS, TX 75241 USA

REGISTERED AGENT | FILING HISTORY | NAMES | MANAGEMENT | ASSUMED NAMES | ASSOCIATED ENTITIES

View Image	Document Number	Filing Type	Filing Date	Effective Date	Eff. Cond	Page Count
	6156549	Articles Of Incorporation	September 27, 1990	September 27, 1990	No	11
	6156550	Articles Of Amendment	September 6, 1996	September 6, 1996	No	4
	16216410002	Change of Registered Agent/Office	August 29, 2002	August 29, 2002	No	1
	26165660001	Public Information Report (PIR)	December 31, 2002	February 7, 2003	No	1
	39802350001	Public Information Report (PIR)	December 31, 2003	August 11, 2003	No	1
	61344940001	Public Information Report (PIR)	December 31, 2004	June 1, 2004	No	1
	107480050002	Articles of Merger	October 28, 2005	October 31, 2005	No	2
	118925840001	Public Information Report (PIR)	December 31, 2005	February 27, 2006	No	1
	140772980001	Public Information Report (PIR)	December 31, 2006	August 17, 2006	No	1
	178658640001	Public Information Report (PIR)	December 31, 2007	July 19, 2007	No	1
	267494760001	Public Information Report (PIR)	December 31, 2008	July 18, 2009	No	1
	326671380001	Public Information Report (PIR)	December 31, 2009	September 13, 2010	No	1
	340247820001	Public Information Report (PIR)	December 31, 2010	November 12, 2010	No	1
	433478260001	Public Information Report (PIR)	December 31, 2012	July 28, 2012	No	1
	498314830001	Public Information Report (PIR)	December 31, 2013	August 27, 2013	No	1
	561850580001	Public Information Report (PIR)	December 31, 2014	August 18, 2014	No	1
	620253640001	Public Information Report (PIR)	December 31, 2015	August 2, 2015	No	1

Order | Return to Search

Instructions:

- To place an order for additional information about a filing press the 'Order' button.

TEXAS SECRETARY of STATE
CARLOS H. CASCOS

BUSINESS ORGANIZATIONS INQUIRY - VIEW ENTITY

Filing Number:	116799800	**Entity Type:**	Domestic For-Profit Corporation
Original Date of Filing:	September 27, 1990	**Entity Status:**	In existence
Formation Date:	N/A		
Tax ID:	17523454373	**FEIN:**	
Duration:	Perpetual		

Name: LANE PLATING WORKS, INC.

Address: 5322 BONNIE VIEW RD
DALLAS, TX 75241 USA

REGISTERED AGENT | FILING HISTORY | NAMES | MANAGEMENT | ASSUMED NAMES | ASSOCIATED ENTITIES

Name	Name Status	Name Type	Name Inactive Date	Consent Filing #
LANE PLATING WORKS, INC.	In use	Legal		

Order | Return to Search

Instructions:

- To place an order for additional information about a filing press the 'Order' button.

TEXAS SECRETARY of STATE
CARLOS H. CASCOS

BUSINESS ORGANIZATIONS INQUIRY - VIEW ENTITY

Filing Number:	116799800	**Entity Type:**	Domestic For-Profit Corporation
Original Date of Filing:	September 27, 1990	**Entity Status:**	In existence
Formation Date:	N/A		
Tax ID:	17523454373	**FEIN:**	
Duration:	Perpetual		

Name: LANE PLATING WORKS, INC.

Address: 5322 BONNIE VIEW RD
DALLAS, TX 75241 USA

REGISTERED AGENT | FILING HISTORY | NAMES | MANAGEMENT | ASSUMED NAMES | ASSOCIATED ENTITIES

Last Update	Name	Title	Address
August 2, 2015	JOE LANE	PRESIDENT	1220 GLEN COVE RICHARDSON, TX 75080 USA
August 2, 2015	JOE LANE	DIRECTOR	1220 GLEN COVE RICHARDSON, TX 75080 USA
August 2, 2015	JEFFERY LANE	VICE PRESIDENT	5322 BONNIE VIEW RD DALLAS, TX 75241 USA
August 2, 2015	JEFFERY LANE	DIRECTOR	5322 BONNIE VIEW RD DALLAS, TX 75241 USA

Order | Return to Search

Instructions:

- To place an order for additional information about a filing press the 'Order' button.

TEXAS SECRETARY of STATE
CARLOS H. CASCOS

BUSINESS ORGANIZATIONS INQUIRY - VIEW ENTITY

Filing Number:	116799800	**Entity Type:**	Domestic For-Profit Corporation
Original Date of Filing:	September 27, 1990	**Entity Status:**	In existence
Formation Date:	N/A		
Tax ID:	17523454373	**FEIN:**	
Duration:	Perpetual		

Name: LANE PLATING WORKS, INC.

Address: 5322 BONNIE VIEW RD
DALLAS, TX 75241 USA

REGISTERED AGENT | FILING HISTORY | NAMES | MANAGEMENT | ASSUMED NAMES | ASSOCIATED ENTITIES

Name	Entity Type	Document Description	Filing Date	Entity Filing Number	Jurisdiction	Capacity
XL AIR, INC.	Domestic For-Profit Corporation		October 28, 2005	800399674		Non-Survivor

Order | Return to Search

Instructions:

- To place an order for additional information about a filing press the 'Order' button.

19 005

Reference 20

31215 LANE PLATING

Solid Waste Registration #: 31215 EPA ID:TXD007336571 CN: CN600307508 RN: RN100597707

Company Name: LANE PLATING WORKS, INC. Region: 4 Initial Registration Date: 02/02/1978
Site Name: LANE PLATING County: 113 DALLAS Last Amendment Date: 01/18/2011
Site Location: 5322 BONNIE VIEW RD, DALLAS, TX Land Type: PRIVATE Last Update Date: 01/26/2011

Primary Contact: LANE, JOE Title: MANAGER

Mailing Address: 5322 BONNIE VIEW RD Phone:214-371-1351
DALLAS, TX, 75241-3201

Registration Status: ACTIVE HW Permit: IW Permit: MW Permit:

Registration Type: GENERATOR

Generator Type: Industrial

Hazardous Waste Generation Type: LARGE QUANTITY GENERATOR

Receiver Type: null

Universal Waste Activity:

Large Quantity Handler of Universal Waste (you accumulate 5,000 kg or more):

Destination Facility for Universal Waste:

NAICS Code: 332813 Plating

Tax ID: 17523454373

31215 LANE PLATING

Owner Information

Name: LANE PLATING WORKS INC,
Phone: 214-371-1351
Address: 5322 BONNIE VIEW RD
DALLAS, TX, 75241-3201

Operator Information

Name: LANE PLATING WORKS INC,
Phone: 214-371-1351
Address: 5322 BONNIE VIEW RD
DALLAS, TX, 75241-3201

Billing Contact: LANE PLATING WORKS,
Billing Address: 5322 BONNIE VIEW RD
DALLAS, TX, 75241-3201

Title:
Phone: - -

Other Contact: MOUNCE, STEVEN K
Mailing Address: 3492 E ROSEMEADE PKWY
CARROLLTON, TX, 75007-2068

Role: STEERS CONTACT
Phone:972-862-3911

As of 01/18/2011 - The next unassigned sequence number for WASTES is 0015.

The next unassigned sequence number for UNITS is 004.

31215 LANE PLATING

**** WASTE INFORMATION ****

Texas Waste Code	Waste Class	Status	Waste Status Code Change Date	Mixed Radioactive	TCEQ Audit Complete	Waste Update Date	Inactive Reason
****** Active Wastes ******							
0001103H	H	Active		N	No	1/1/03	

Waste Description: Spent chromic acid solution from chromium electroplating. Initial generation began March 1995.
Date of Generation: 2/4/97
Texas Form Code: 103 - Spent acid with metals
EPA Form Code: W103 Spent concentrated acid
EPA Hazardous Waste Numbers: D002 D007
Current Management Units: 22 - Miscellaneous Storage Containers: 002, OFF-SITE
Origin Codes: 1 - Generated on-site from a product process or service activity
Source Codes: G03 - Plating and phosphating
NAICS Code: 332813 Plating
New Chemical Substance: N

0002110H	H	Active		N	No	1/1/03	

Waste Description: Spent alkaline solution from cleaning of steel parts Initial generation - December 1996.
Date of Generation: 2/4/97
Texas Form Code: 110 - Caustic aqueous waste
EPA Form Code: W110 Caustic aqueous waste without cyanides
EPA Hazardous Waste Numbers: D002
Current Management Units: 22 - Miscellaneous Storage Containers: 002, OFF-SITE
Origin Codes: 1 - Generated on-site from a product process or service activity
Source Codes: G02 - Stripping and acid or caustic cleaning

31215 LANE PLATING

Texas Waste Code	Waste Class	Status	Waste Status Code Change Date	Mixed Radioactive	TCEQ Audit Complete	Waste Update Date	Inactive Reason
****** Active Wastes ******							

NAICS Code: 332813 Plating

New Chemical Substance: N

0003505H H Active N No 1/1/03

Waste Description: Sludge formed in bottom of alkaline cleaner bath. Initial generation - December1996.

Date of Generation: 2/4/97

Texas Form Code: 505 - Untreated plating sludge without cyanides

EPA Form Code: W505 Metal bearing sludges (including plating sludge) not containing cyanides

EPA Hazardous Waste Numbers: D002

Current Management Units: 22 - Miscellaneous Storage Containers: 002, OFF-SITE

Origin Codes: 1 - Generated on-site from a product process or service activity

Source Codes: G02 - Stripping and acid or caustic cleaning

NAICS Code: 332813 Plating

New Chemical Substance: N

0004505H H Active N No 1/1/03

Waste Description: Sludge from bottom of chromic acid plating bath. This sludge contains chromic acid, lead chromate, and fullers clay absorbent. Initial generation - November 1996.

Date of Generation: 2/4/97

Texas Form Code: 505 - Untreated plating sludge without cyanides

EPA Form Code: W505 Metal bearing sludges (including plating sludge) not containing cyanides

EPA Hazardous Waste Numbers: D002 D007 D008

Current Management Units: 22 - Miscellaneous Storage Containers: 002, OFF-SITE

Origin Codes: 1 - Generated on-site from a product process or service activity

31215 LANE PLATING

Texas Waste Code	Waste Class	Status	Waste Status Code Change Date	Mixed Radioactive	TCEQ Audit Complete	Waste Update Date	Inactive Reason
****** Active Wastes ******							
	Source Codes: G03 - Plating and phosphating						
	NAICS Code: 332813 Plating						
	New Chemical Substance: N						
0006103H	H	Active		N	No	1/1/03	
	Waste Description: Description of Waste: Spent Muriatic acid. Used to clean rusted food bowls prior to retinning.Initial Generation Date: January 1990						
	Date of Generation: 9/16/97						
	Texas Form Code: 103 - Spent acid with metals						
	EPA Form Code: W103 Spent concentrated acid						
	EPA Hazardous Waste Numbers: D002						
	Current Management Units: 22 - Miscellaneous Storage Containers: 002, OFF-SITE						
	Origin Codes: 1 - Generated on-site from a product process or service activity						
	Source Codes: G02 - Stripping and acid or caustic cleaning						
	NAICS Code: 332813 Plating						
	New Chemical Substance: N						
00073192	2	Active		N	Yes	9/8/11	
	Waste Description: Description of Waste: Metal turnings, filings, and dust.Generating Process : Produced from the surface finishing of metal parts by machining.InitialGenerating Date: January 1990						
	Date of Generation: 9/16/97						
	Texas Form Code: 319 - Other waste inorganic solids						
	EPA Form Code: null null						

31215 LANE PLATING

Texas Waste Code	Waste Class	Status	Waste Status Code Change Date	Mixed Radioactive	TCEQ Audit Complete	Waste Update Date	Inactive Reason

****** Active Wastes ******

EPA Hazardous Waste Numbers: None
Current Management Units: 22 - Miscellaneous Storage Containers: 002,003, OFF-SITE
Origin Codes: 1 - Generated on-site from a product process or service activity
NAICS Code:
New Chemical Substance: N

00083892	2	Active		N	Yes	9/8/11

Waste Description: Description of Waste: Spent glass beads.Generating Process: Generatedfrom dry blast (Sand blasting) and dry boning of rusted metal parts.InitialGeneration Date: Initially generated January 1990.
Date of Generation: 9/16/97
Texas Form Code: 389 - Nonhazardous sandblasting waste
EPA Form Code: null null
EPA Hazardous Waste Numbers: None
Current Management Units: 22 - Miscellaneous Storage Containers: 002,003, OFF-SITE
Origin Codes: 1 - Generated on-site from a product process or service activity
NAICS Code:
New Chemical Substance: N

00099992	2	Active		N	Yes	9/8/11

Waste Description: Description of Waste: Plant and office trash.Generating Process: (Pap er, Cardboard, Packaging, Plastics, Equipment belts).Date of Initial Generati on: January 1990
Date of Generation: 9/16/97
Texas Form Code: 999 - Class 2 plant trash
EPA Form Code: null null

31215 LANE PLATING

Texas Waste Code	Waste Class	Status	Waste Status Code Change Date	Mixed Radioactive	TCEQ Audit Complete	Waste Update Date	Inactive Reason

****** Active Wastes ******

EPA Hazardous Waste Numbers: None
Current Management Units: 22 - Miscellaneous Storage Containers: 003, OFF-SITE
Origin Codes: 1 - Generated on-site from a product process or service activity
NAICS Code:
New Chemical Substance: N

0010310H	H	Active		N	No	9/8/11

Waste Description: Misc plating shop debris and absorbent
Date of Generation: 8/29/03
Texas Form Code: 310 - Spent solid filters or adsorbents
EPA Form Code: W310 Filters, solid adsorbents, ion exchange resins and spent carbon
EPA Hazardous Waste Numbers: D007
Current Management Units: 22 - Miscellaneous Storage Containers: 002, OFF-SITE
Origin Codes: 1 - Generated on-site from a product process or service activity
Source Codes: G13 - Cleaning out process equipment
NAICS Code: 332813 Plating
Company's Waste ID: PLATING SHOP DEBRIS
New Chemical Substance: N

0011107H	H	Active		N	No	9/8/11

Waste Description: Cyanide bearing material
Date of Generation: 3/3/06
Texas Form Code: 107 - Caustic solution with metals and cyanides
EPA Form Code: W107 Aqueous waste containing cyanides

31215 LANE PLATING

Texas Waste Code	Waste Class	Status	Waste Status Code Change Date	Mixed Radioactive	TCEQ Audit Complete	Waste Update Date	Inactive Reason

****** Active Wastes ******

EPA Hazardous Waste Numbers: D003 D006
Current Management Units: 22 - Miscellaneous Storage Containers: 002, OFF-SITE
Origin Codes: 1 - Generated on-site from a product process or service activity
Source Codes: G03 - Plating and phosphating
NAICS Code: 332813 Plating
Company's Waste ID: CYANIDE WASTE
New Chemical Substance: N

0012110H	H	Active		N	No	9/8/11

Waste Description: Tank Bottoms
Date of Generation: 3/3/06
Texas Form Code: 110 - Caustic aqueous waste
EPA Form Code: W110 Caustic aqueous waste without cyanides
EPA Hazardous Waste Numbers: D007
Current Management Units: 22 - Miscellaneous Storage Containers: 002
Origin Codes: 1 - Generated on-site from a product process or service activity
Source Codes: G13 - Cleaning out process equipment
NAICS Code: 332813 Plating
Company's Waste ID: CAUSTIC SODA SOLID
New Chemical Substance: N

0013104H	H	Active		N	No	9/8/11

Waste Description: Spent acid solution from cleaning
Date of Generation: 8/22/06

31215 LANE PLATING

Texas Waste Code	Waste Class	Status	Waste Status Code Change Date	Mixed Radioactive	TCEQ Audit Complete	Waste Update Date	Inactive Reason

****** Active Wastes ******

Texas Form Code: 104 - Spent acid without metals

EPA Form Code: W103 Spent concentrated acid

EPA Hazardous Waste Numbers: D002

Current Management Units: 22 - Miscellaneous Storage Containers: 002, OFF-SITE

Origin Codes: 1 - Generated on-site from a product process or service activity

Source Codes: G02 - Stripping and acid or caustic cleaning

NAICS Code: 332813 Plating

Company's Waste ID: SPENT ACID SOLUTION

New Chemical Substance: N

0014312H	H	Active		N	No	9/8/11

Waste Description: Non pumpable solids from cadmium tank and blast media with cadmium.

Date of Generation: 10/2/07

Texas Form Code: 312 - Metal-cyanide salts/chemicals

EPA Form Code: W312 Cyanide or metal cyanide bearing solids, salts or chemicals

EPA Hazardous Waste Numbers: D003 D006

Current Management Units: 22 - Miscellaneous Storage Containers: 002, OFF-SITE

Origin Codes: 1 - Generated on-site from a product process or service activity

Source Codes: G03 - Plating and phosphating

NAICS Code: 332813 Plating

Company's Waste ID: CADMIUM SOLIDS

New Chemical Substance: N

31215 LANE PLATING

Texas Waste Code	Waste Class	Status	Waste Status Code Change Date	Mixed Radioactive	TCEQ Audit Complete	Waste Update Date	Inactive Reason
** No Longer Generated Wastes **							
0005504H	H	Inactive		N	No	1/18/11	

Waste Description: Sludge generated from treatment of wastewater from chromium plating operations.Initial generation - prior to 1990.; Due to waste minimization, ingredient changes or process changes this waste is no longer generated.

Date of Generation: 2/4/97

Texas Form Code: 504 - Other wastewater treatment sludge

EPA Form Code: Other sludges from wastewater treatment or air pollution control

EPA Hazardous Waste Numbers: F006

Current Management Units: OFF-SITE

Origin Codes: 1 - Generated on-site from a product process or service activity

Source Codes: G03 - Plating and phosphating

NAICS Code: 332813 Plating

New Chemical Substance: N

31215 LANE PLATING

**** UNITS AT THIS SITE MANAGING WASTE ****

WMU Sequence Number	Unit Capacity	Capacity UOM	Unit Status	Date of Unit Regis	Class of Waste from Offsite	UIC Permit Number	Unit Number on Permit	Unit Update Date	Deed Record Date
** 'Active', 'Closure Pending' & 'Closure Request' Units **									
001			ACTIVE						
002			ACTIVE	2/4/97				9/14/11	

001
Unit Type: Container Storage Area
Unit Regulatory Status:
Unit Description:
Billing Class:
System Type Cd:
Unit Notes: Usage: Storage for Less Than 90 Days
Wastes Currently Managed in Unit: None
Wastes Previously Managed in Unit: 0005504H

002
Unit Type: Miscellaneous Storage Containers
Unit Regulatory Status: 13 RCRA Permit Exempt - Accumulation Time
Unit Description: Container storage area in middle of plating plant building. These are containers of wastes.
Billing Class:
System Type Cd: 129 Other treatment

Wastes Currently Managed in Unit: 0001103H Spent chromic acid s***0002110H Spent alkaline solut***0003505H Sludge formed in bot***0004505H Sludge from bottom o***0006103H Description of Waste***00073192 Description of Waste***00083892 Description of Waste***0010310H Misc plating shop de***0011107H Cyanide bearing mate***0012110H Tank Bottoms***0013104H Spent acid solution ***0014312H Non pumpable solids

31215 LANE PLATING

WMU Sequence Number	Unit Capacity	Capacity UOM	Unit Status	Date of Unit Regis	Class of Waste from Offsite	UIC Permit Number	Unit Number on Permit	Unit Update Date	Deed Record Date
** 'Active', 'Closure Pending' & 'Closure Request' Units **									
Wastes Previously Managed in Unit: None									
003			ACTIVE	9/16/97				9/14/11	

Unit Type: Miscellaneous Storage Containers

Unit Regulatory Status: 05 Non-Hazardous Regulated

Unit Description: Unit Description: 6 Cubic yard metal trash bin located on South side of main building.

Billing Class:

System Type Cd: 132 Landfill

Wastes Currently Managed in Unit: 00073192 Description of Waste***00083892 Description of Waste***00099992 Description of Waste

Wastes Previously Managed in Unit: None

WMU Sequence Number	Unit Capacity	Capacity UOM	Unit Status	Date of Unit Regis	Class of Waste from Offsite	UIC Permit Number	Unit Number on Permit	Unit Update Date	Deed Record Date
** 'Inactive', 'Closed', 'Post Closure Care', 'Never Built' & 'Not Required' Units **									

WMU Sequence Number	Unit Capacity	Capacity UOM	Unit Status	Date of Unit Regis	Class of Waste from Offsite	UIC Permit Number	Unit Number on Permit	Unit Update Date	Deed Record Date
** 'Not Yet Built' & 'Under Construction' Units **									

Reference 21

Bankruptcy Overview for Lane Plating Works, Inc. and Stag Management, Inc.

Case Number	Company	Judge	Trustee	Debtors' Counsel	Date of Filing	Status
15-34289	Lane Plating Works, Inc.	Judge Houser	Daniel Sherman	Paul Keiffer	10/28/2015	Dismissed 11/17/2015
15-34291	Stag Management, Inc.	Judge Houser	Daniel Sherman	Paul Keiffer	10/28/2015	Dismissed 11/17/2015
15-35048	Lane Plating Works, Inc.	Judge Hale	Daniel Sherman	Paul Keiffer	12/21/2015	Active
15-35047	Stag Management, Inc.	Judge Hale	Daniel Sherman	Paul Keiffer	12/21/2015	Active

There are two active chapter 7 bankruptcies on file in the Northern District of Texas Bankruptcy Court, Dallas Division in front of Judge Hale: Lane Plating Works, Inc. ("Lane"), case number 15-35048 and Stag Management, Inc. ("Stag"), case number 15-35047. These are not jointly administered cases. As reflected in the chart above, both Lane and Stag originally filed chapter 7 petitions on 10/28/2015, but both original petitions were dismissed on 11/17/2015 due to a technical failure on behalf of the Debtors' counsel. Thereafter, Lane and Stag each filed a second petition on 12/21/2015 originating the case numbers cited above. Both the original cases and these current cases have the same Chapter 7 Trustee appointed and the same Debtors' counsel, but different Judges assigned. The original cases were in front of Judge Houser, and the current cases are in front of Judge Hale.

The respective bankruptcy schedules show that Stag management owns the real property upon which the Lane operations are located. In turn, Lane leases the real property from Stag. As reflected in Lane's schedules, Lane's assets are mainly held in equipment and accounts receivables.

On 12/22/2016, the Texas Attorney General, on behalf of TCEQ, filed a motion to dismiss both cases. In short, the State argued that the Trustee did not have the assets necessary to cover the cost of the necessary removal and remediation and to comply with the State's laws protecting human health and safety. On 1-21-2016, the Court held a hearing on the Texas Attorney General's motion, and, after the hearing, the Judge took the matter under advisement pending further briefing from the State and Debtors' counsel. After submission of the briefing, on 2-18-2016, the Court held a hearing and denied the State's Motion.

On 2/5/2016, the bankruptcy Trustee for both cases, Daniel Sherman, signed Consent to Access agreements to allow the TCEQ and the EPA to enter the property. Likewise, on or about 2/9/2016, Joe Lane also signed a Consent to Access agreement to be used in the event that the bankruptcy was dismissed.

The last filing in the Stag case occurred on 2-23-2016, when the Court uploaded the Order denying the State's Motion to Dismiss. The last filing in the Lane case occurred on 3-30-2016. This was an order by the Court allowing the Trustee to hire counsel.

Reference 22

Central Registry Query - Regulated Entity Information

Regulated Entity Information

RN Number: RN100597707
Name: LANE PLATING View Prior Names
Primary Business: No primary business description on file.
Street Address: 5322 BONNIE VIEW RD, DALLAS TX 75241 3201
County: DALLAS
Nearest City: DALLAS
State: TX
Near ZIP Code: 75241
Physical Location: 5322 Bonnieview Rd, Dallas, TX

Affiliated Customers - Current

Your Search Returned **3** Current Affiliation Records (View Affiliation History)

1-3 of 3 Records

CN Number	Customer Name	Customer Role	Details
CN600307508	LANE PLATING WORKS INC	OWNER OPERATOR	
CN602284473	LANE PLATING COMPANY	OWNER OPERATOR	
CN603834292	STAG MANAGEMENT INCORPORATED	OWNER	

Industry Type Codes

Code	Classification	Name
332813	NAICS	Electroplating
3471	SIC	Electroplating

Permits, Registrations, or Other Authorizations

There are a total of **12** programs and IDs for this regulated entity. Click on a column name to change the sort order.

1-12 of 12 Records

Program ▲	ID Type	ID Number	ID Status
AIR EMISSIONS INVENTORY	ACCOUNT NUMBER	DB0528A	ACTIVE
AIR NEW SOURCE PERMITS	ACCOUNT NUMBER	DB0528A	ACTIVE
AIR NEW SOURCE PERMITS	AFS NUM	4811300848	ACTIVE
AIR NEW SOURCE PERMITS	REGISTRATION	40123	ACTIVE
AIR NEW SOURCE PERMITS	REGISTRATION	82475	ACTIVE
AIR OPERATING PERMITS	ACCOUNT NUMBER	DB0528A	INACTIVE
AIR OPERATING PERMITS	PERMIT	1100	CANCELLED
INDUSTRIAL AND HAZARDOUS WASTE	EPA ID	TXD007336571	ACTIVE
INDUSTRIAL AND HAZARDOUS WASTE	SOLID WASTE REGISTRATION # (SWR)	31215	ACTIVE
POLLUTION PREVENTION PLANNING	ID NUMBER	P03202	ACTIVE
STORMWATER	PERMIT	TXR05K471	EXPIRED
STORMWATER	PERMIT	TXRNEU256	ACTIVE

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Central Registry

Detail of: **Air Emissions Inventory Account Number DB0528A**

For: **LANE PLATING (RN100597707)**

5322 BONNIE VIEW RD, DALLAS

Account Number Status: **ACTIVE**

AIR EMISSIONS INVENTORY

Account	Company Name	Site Name	County	Last EI Date	Latitude	Longitude
DB0528A	LANE PLATING WORKS INC	HARD CHROME PLATING FACILITY	DALLAS	12/31/2004	32.83333333	-96.66666111

Available Reports

No emissions data exists since 2004

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Go To: Title V Federal Operating Permits

03/18/2016 ----------AirPermits IMS - PROJECT RECORD ----------

Customer Name: **LANE PLATING INC**
Legal Name: **Lane Plating Works, Inc.**
CN Number : **CN600307508**

Region: **DFW METROPLEX** Account: **DB0528A** Central Registry Id: **RN100597707**
County Name: **DALLAS** City: **DALLAS**
Location : **5322 Bonnieview Rd, Dallas, TX**

PROJECT INFORMATION

Project Administrative Name: **FACILITY MODIFICATIONS**
Project Technical Name: **FACILITY MODIFICATIONS**

Project Number: **63737** Permit Number: **40123**
Project Received Date: **01/20/1999** Renewal Date: Issued Date: **02/22/1999**

Project Type: **INITIAL** Permit Type: **PERMIT BY RULE**
Project Status: **COMPLETE**

Assigned Staff:
REVIEW ENG: REAGAN , STEPHANIE
Staff Group:
APD MANAGEMENT MACC SECTION

FEE

Reference	Fee Receipt Number	Amount	Fee Receipt Date	Fee Payment Type

TRACKING ELEMENTS

TE Name	Start Date	Complete Date
PROJECT DECLARED ADMIN COMPLETE (DATE)	**02/04/1999**	
APIRT RECEIVED PROJECT (DATE)	**01/20/1999**	

PROJECT RULES:

Unit Desc	Rule Desc	On Application	Approve
FACILITIES (EMISSION AND DISTANCE LIMITATIONS)	106.262	N	Y

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The list below is not sorted.

Site Associated with This Customer						Compliance History for Customer at this Site (If no Site appears in thesame row, this is the Customer's overall compliance history.)			
Customer	Name	City or Nearest City	County	TCEQ Region	Related Numbers	Rating	Classification	Date Rated	Date Posted
LANE PLATING WORKS INC	LANE PLATING	DALLAS	DALLAS	REGION 04 - DFW METROPLEX	▪ TXRNEU256 ▪ 4811300848 ▪ 82475 ▪ 1100 ▪ 31215 ▪ TXD007336571 ▪ 82475 ▪ TXR05K471	82.88	UNSATISFACTORY	09/01/2008	11/15/2015
LANE PLATING COMPANY	LANE PLATING	DALLAS	DALLAS	REGION 04 - DFW METROPLEX	▪ 4811300848 ▪ P03202 ▪ DB0528A ▪ TXRNEU256 ▪ 4811300848 ▪ 1100 ▪ TXD007336571 ▪ TXRNEU256 ▪ TXR05K471 ▪ P03202	0	UNCLASSIFIED	09/01/2009	11/15/2015
STAG MANAGEMENT INCORPORATED	LANE PLATING	DALLAS	DALLAS	REGION 04 - DFW METROPLEX	▪ 31215 ▪ TXRNEU256 ▪ 40123 ▪ TXRNEU256 ▪ 1100	0	UNCLASSIFIED	09/01/2010	11/15/2015
LANE PLATING WORKS INC	LANE PLATING	DALLAS	DALLAS	REGION 04 - DFW METROPLEX	▪ TXD007336571 ▪ P03202 ▪ TXD007336571 ▪ TXR05K471 ▪ TXD007336571 ▪ 4811300848 ▪ 4811300848 ▪ P03202 ▪ 1100 ▪ 31215 ▪ 4811300848 ▪ TXRNEU256	82.88	UNSATISFACTORY	09/01/2008	11/15/2015
LANE PLATING COMPANY	LANE PLATING	DALLAS	DALLAS	REGION 04 - DFW METROPLEX	▪ DB0528A ▪ 82475 ▪ 1100 ▪ TXD007336571 ▪ 31215 ▪ DB0528A ▪ 82475 ▪ 1100 ▪ DB0528A ▪ 4811300848 ▪ TXR05K471	0	UNCLASSIFIED	09/01/2008	11/15/2015

STAG MANAGEMENT INCORPORATED	LANE PLATING	DALLAS	DALLAS	REGION 04 - DFW METROPLEX	▪ TXR05K471 ▪ 40123 ▪ DB0528A ▪ 82475 ▪ TXR05K471 ▪ 1100 ▪ TXR05K471	0	UNCLASSIFIED	09/01/2011	11/15/2015
LANE PLATING WORKS INC	LANE PLATING	DALLAS	DALLAS	REGION 04 - DFW METROPLEX	▪ 1100 ▪ 31215 ▪ 31215 ▪ TXR05K471 ▪ 4811300848 ▪ 82475 ▪ TXRNEU256 ▪ DB0528A	82.88	UNSATISFACTORY	09/01/2008	11/15/2015
LANE PLATING COMPANY	LANE PLATING	DALLAS	DALLAS	REGION 04 - DFW METROPLEX	▪ 31215 ▪ TXRNEU256 ▪ TXD007336571 ▪ 31215 ▪ 4811300848 ▪ 82475 ▪ 82475 ▪ TXRNEU256 ▪ P03202 ▪ 40123 ▪ 4811300848 ▪ DB0528A ▪ 82475 ▪ 40123 ▪ 31215 ▪ 82475	0	UNCLASSIFIED	09/01/2009	11/15/2015
STAG MANAGEMENT INCORPORATED	LANE PLATING	DALLAS	DALLAS	REGION 04 - DFW METROPLEX	▪ DB0528A ▪ TXR05K471 ▪ 40123 ▪ 4811300848 ▪ TXR05K471 ▪ P03202	0	UNCLASSIFIED	09/01/2010	11/15/2015
LANE PLATING WORKS INC	LANE PLATING	DALLAS	DALLAS	REGION 04 - DFW METROPLEX	▪ 40123 ▪ TXD007336571 ▪ TXRNEU256 ▪ TXRNEU256 ▪ P03202 ▪ DB0528A ▪ 31215 ▪ 1100 ▪ 31215 ▪ 4811300848 ▪ TXR05K471 ▪ P03202	82.88	UNSATISFACTORY	09/01/2011	11/15/2015
LANE PLATING COMPANY	LANE PLATING	DALLAS	DALLAS	REGION 04 - DFW METROPLEX	▪ DB0528A ▪ 40123 ▪ 31215 ▪ 4811300848 ▪ 1100 ▪ 31215 ▪ TXRNEU256	0	UNCLASSIFIED	09/01/2008	11/15/2015
	LANE PLATING	DALLAS	DALLAS		▪ 1100	0	UNCLASSIFIED	09/01/2010	11/15/2015

STAG MANAGEMENT INCORPORATED				REGION 04 - DFW METROPLEX	▪ P03202 ▪ 40123 ▪ TXRNEU256				
LANE PLATING WORKS INC	LANE PLATING	DALLAS	DALLAS	REGION 04 - DFW METROPLEX	▪ P03202 ▪ DB0528A ▪ 1100 ▪ TXR05K471 ▪ 82475 ▪ DB0528A ▪ TXD007336571 ▪ 82475 ▪ DB0528A ▪ 82475 ▪ P03202	82.88	UNSATISFACTORY	09/01/2008	11/15/2015
LANE PLATING COMPANY	LANE PLATING	DALLAS	DALLAS	REGION 04 - DFW METROPLEX	▪ 1100 ▪ 40123 ▪ TXR05K471 ▪ 40123 ▪ 31215 ▪ 4811300848 ▪ TXR05K471 ▪ TXR05K471 ▪ 1100 ▪ TXR05K471 ▪ TXRNEU256 ▪ P03202 ▪ TXD007336571 ▪ 4811300848 ▪ P03202	0	UNCLASSIFIED	09/01/2008	11/15/2015
STAG MANAGEMENT INCORPORATED	LANE PLATING	DALLAS	DALLAS	REGION 04 - DFW METROPLEX	▪ 40123 ▪ P03202 ▪ TXD007336571 ▪ 31215 ▪ P03202 ▪ TXD007336571 ▪ 31215 ▪ 4811300848 ▪ TXRNEU256 ▪ TXD007336571 ▪ 4811300848 ▪ 82475	0	UNCLASSIFIED	09/01/2010	11/15/2015
LANE PLATING WORKS INC	LANE PLATING	DALLAS	DALLAS	REGION 04 - DFW METROPLEX	▪ DB0528A ▪ 40123 ▪ 4811300848 ▪ 82475 ▪ P03202 ▪ 40123 ▪ 31215 ▪ TXR05K471 ▪ TXRNEU256	82.88	UNSATISFACTORY	09/01/2010	11/15/2015
LANE PLATING COMPANY	LANE PLATING	DALLAS	DALLAS	REGION 04 - DFW METROPLEX	▪ P03202 ▪ 1100 ▪ TXD007336571 ▪ DB0528A ▪ 1100 ▪ TXD007336571 ▪ 40123 ▪ TXD007336571	0	UNCLASSIFIED	09/01/2008	11/15/2015
		DALLAS	DALLAS			0	UNCLASSIFIED	09/01/2010	11/15/2015

STAG MANAGEMENT INCORPORATED	LANE PLATING			REGION 04 - DFW METROPLEX	▪ TXD007336571 ▪ 82475 ▪ P03202 ▪ DB0528A ▪ 1100 ▪ 31215 ▪ 31215				
LANE PLATING WORKS INC	LANE PLATING	DALLAS	DALLAS	REGION 04 - DFW METROPLEX	▪ DB0528A ▪ 4811300848 ▪ 82475 ▪ 40123 ▪ 1100 ▪ 40123 ▪ TXD007336571 ▪ DB0528A ▪ 1100 ▪ TXD007336571 ▪ 40123	82.88	UNSATISFACTORY	09/01/2008	11/15/2015
LANE PLATING COMPANY	LANE PLATING	DALLAS	DALLAS	REGION 04 - DFW METROPLEX	▪ TXD007336571 ▪ TXRNEU256 ▪ 82475 ▪ P03202 ▪ P03202 ▪ DB0528A ▪ TXRNEU256 ▪ 40123 ▪ 82475	0	UNCLASSIFIED	09/01/2008	11/15/2015
STAG MANAGEMENT INCORPORATED	LANE PLATING	DALLAS	DALLAS	REGION 04 - DFW METROPLEX	▪ 4811300848 ▪ 1100 ▪ TXD007336571 ▪ 82475 ▪ TXR05K471 ▪ TXRNEU256 ▪ TXD007336571 ▪ 40123 ▪ 82475 ▪ DB0528A	0	UNCLASSIFIED	09/01/2010	11/15/2015
LANE PLATING WORKS INC	LANE PLATING	DALLAS	DALLAS	REGION 04 - DFW METROPLEX	▪ TXR05K471 ▪ 31215 ▪ TXRNEU256 ▪ TXRNEU256 ▪ 1100 ▪ 40123 ▪ 40123 ▪ TXR05K471 ▪ P03202	82.88	UNSATISFACTORY	09/01/2009	11/15/2015
LANE PLATING COMPANY	LANE PLATING	DALLAS	DALLAS	REGION 04 - DFW METROPLEX	▪ TXR05K471 ▪ 40123 ▪ 31215 ▪ TXR05K471	0	UNCLASSIFIED	09/01/2010	11/15/2015
STAG MANAGEMENT INCORPORATED	LANE PLATING	DALLAS	DALLAS	REGION 04 - DFW METROPLEX	▪ DB0528A ▪ 1100 ▪ 31215 ▪ TXRNEU256 ▪ 4811300848 ▪ 4811300848 ▪ DB0528A ▪ 82475	0	UNCLASSIFIED	09/01/2011	11/15/2015

					▪ P03202				

What's a "site"?
A "site" (sometimes called a "regulated entity") is any person or thing that is of environmental interest to the TCEQ. At a "site", one or more regulatory activities of interest to us occur or have occurred in the past. Some examples of sites are:

- Industrial plants, such as the Exxon Baytown Facility
- Small businesses, such as Texaco Gas Station #200 or Elroy's Dry Cleaning & Laundry
- Public facilities, such as the City of Austin's Hornsby Bend Wastewater Treatment Plant

What's a "customer"?
A "customer" owns, operates, is responsible for, or is affiliated with a regulated entity. Examples include:

- Major industrial corporations, such as Exxon USA, Exxon Inc, or Texaco Inc
- Small businesses, such as Karl Redmond dba Karl's Kleaners, which owns several dry-cleaner locations
- Governmental bodies, such as the City of Austin, the United States Air Force, or a municipal utility district
- Individuals, such as Karl A. Redmond, owner of Karl Redmond dba Karl's Kleaners

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Go To: Title V Federal Operating Permits

03/18/2016 ----------AirPermits IMS - PROJECT RECORD ----------

Customer Name: **LANE PLATING WORKS INC**
Legal Name: **Lane Plating Works, Inc.**
CN Number : **CN600307508**

Region: **DFW METROPLEX** Account: **DB0528A** Central Registry Id: **RN100597707**
County Name: **DALLAS** City: **DALLAS**
Location : **5322 Bonnieview Rd, Dallas, TX**

PROJECT INFORMATION

Project Administrative Name: **CHROME FACILITY**
Project Technical Name: **CHROME FACILITY**

Project Number: **131281** Permit Number: **82475**
Project Received Date: **07/25/2007** Renewal Date: Issued Date: **08/15/2007**

Project Type: **INITIAL** Permit Type: **PERMIT BY RULE**
Project Status: **COMPLETE**

Assigned Staff:
REVIEWER1: BOWERS , JOHNNY **REVIEW ENG: EVRIDGE , BONNIE**
PEERREVIEW: MARTIN , PATRICIA **REVIEWER2: MONROE , SHEILA**

Staff Group:
AP INITIAL REVIEW **MAC TEAM**
MACC SECTION **PERM SUPP SECTION**

FEE

Reference	Fee Receipt Number	Amount	Fee Receipt Date	Fee Payment Type

TRACKING ELEMENTS

TE Name	Start Date	Complete Date
PROJECT FORWARDED TO ADMIN (DATE)	**08/15/2007**	
FINAL PACKAGE TO TEAM LEADER OR SUPERVISOR FOR REVIEW (DATE)	**08/15/2007**	
PEER / MANAGER REVIEW PERIOD	**08/14/2007**	**08/14/2007**
PEER / MANAGER REVIEW PERIOD	**08/14/2007**	**08/14/2007**
ENGINEER INITIAL REVIEW COMPLETED (DATE)	**08/10/2007**	
PROJECT RECEIVED BY ENGINEER (DATE)	**07/30/2007**	
APIRT TRANSFERRED PROJECT TO TECHNICAL STAFF (DATE)	**07/27/2007**	
CENTRAL REGISTRY UPDATED	**07/26/2007**	
APIRT RECEIVED PROJECT (DATE)	**07/25/2007**	

PROJECT RULES:

Unit Desc	Rule Desc	On Application	Approve
FACILITIES (EMISSION AND DISTANCE LIMITATIONS)	106.262	N	Y

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Central Registry

Detail of: **Air New Source Registration 82475**
For: **LANE PLATING (RN100597707)**
5322 BONNIE VIEW RD, DALLAS
Registration Status: **ACTIVE**
Held by: **LANE PLATING WORKS INC (CN600307508)**
OWNER OPERATOR View Compliance History
Mailing Address: PO BOX 41098 DALLAS, TX 75241-0098

Investigations

Investigation Date	Investigation Type
05/11/2012	Compliance Investigation
11/06/2013	Compliance Investigation
11/12/2014	Compliance Investigation

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Central Registry

Detail of: **Industrial and Hazardous Waste Solid Waste Registration 31215**

For: **LANE PLATING (RN100597707)**
5322 BONNIE VIEW RD, DALLAS

Solid Waste Registration Status: **ACTIVE**

Held by: **LANE PLATING WORKS INC (CN600307508)**
OWNER OPERATOR View Compliance History

Mailing Address: 5322 BONNIE VIEW RD DALLAS, TX 75241-3201

Facility Information

Annual Waste Summary For: 2014

Registration Number: 31215
Site Name: LANE PLATING
Company Name: LANE PLATING WORKS INC
EPA Number: TXD007336571

Texas Waste Code	EPA Hazardous Waste No.	Total Quantity Generated	Description		
0001103H	D002, D007	1835 lbs	Spent chromic acid solution from chromium electroplating. Initial generation began March 1995.		
Quantity Handled	**Management**	**Fee Exemption**	**Facility Number**	**Receiver's EPA ID**	**Comment**
1835 lbs	141 (Storage, bulking, and/or transfer off site - no treatment/recovery, fuel blending or disposal at this site.)	n/a	002		

Texas Waste Code	EPA Hazardous Waste No.	Total Quantity Generated	Description		
0002110H	D002	917 lbs	Spent alkaline solution from cleaning of steel parts Initial generation - December 1996.		
Quantity Handled	**Management**	**Fee Exemption**	**Facility Number**	**Receiver's EPA ID**	**Comment**
917 lbs	141 (Storage, bulking, and/or transfer off site - no treatment/recovery, fuel blending or disposal at this site.)	n/a	002		

Texas Waste Code	EPA Hazardous Waste No.	Total Quantity Generated	Description		
0006103H	D002	1376 lbs	Description of Waste: Spent Muriatic acid. Used to clean rusted food bowls prior to retinning.Initial Generation Date: January 1990		
Quantity Handled	**Management**	**Fee Exemption**	**Facility Number**	**Receiver's EPA ID**	**Comment**
1376 lbs	141 (Storage, bulking, and/or transfer off site - no treatment/recovery, fuel blending or disposal at this site.)	n/a	002		

Texas Waste Code	EPA Hazardous Waste No.	Total Quantity Generated	Description		
0010310H	D007	917 lbs	Misc plating shop debris and absorbent		
Quantity Handled	**Management**	**Fee Exemption**	**Facility Number**	**Receiver's EPA ID**	**Comment**
917 lbs	141 (Storage, bulking, and/or transfer off site - no treatment/recovery, fuel blending or disposal at this site.)	n/a	002		

Texas Waste Code	EPA Hazardous Waste No.	Total Quantity Generated	Description		
0011107H	D003, D005	459 lbs	Cyanide bearing material		
Quantity Handled	**Management**	**Fee Exemption**	**Facility Number**	**Receiver's EPA ID**	**Comment**
459 lbs	141 (Storage, bulking, and/or transfer off site - no treatment/recovery, fuel blending or disposal at this site.)	n/a	002		

Texas Waste Code	EPA Hazardous Waste No.	Total Quantity Generated	Description		
0012110H	D007	459 lbs	Tank Bottoms		
Quantity Handled	**Management**	**Fee Exemption**	**Facility Number**	**Receiver's EPA ID**	**Comment**
459 lbs	141 (Storage, bulking, and/or transfer off site - no treatment/recovery, fuel blending or disposal at this site.)	n/a	002		

Texas Waste Code	EPA Hazardous Waste No.	Total Quantity Generated	Description		
0014312H	D003, D006	917 lbs	Non pumpable solids from cadmium tank and blast media with cadmium.		
Quantity Handled	**Management**	**Fee Exemption**	**Facility Number**	**Receiver's EPA ID**	**Comment**
917 lbs	141 (Storage, bulking, and/or transfer off site - no treatment/recovery, fuel blending or disposal at this site.)	n/a	002		

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Detail of: **Industrial and Hazardous Waste Solid Waste Registration 31215**
For: **LANE PLATING (RN100597707)**
5322 BONNIE VIEW RD, DALLAS
Solid Waste Registration Status: **ACTIVE**
Held by: **LANE PLATING WORKS INC (CN600307508)**
OWNER OPERATOR View Compliance History
Mailing Address: 5322 BONNIE VIEW RD DALLAS, TX 75241-3201

BACK TO: **Facility Information**

Annual Waste Summary For: 2013

Registration Number: 31215
Site Name: LANE PLATING
Company Name: LANE PLATING WORKS INC
EPA Number: TXD007336571

Texas Waste Code	EPA Hazardous Waste No.	Total Quantity Generated	Description		
0001103H	D002, D007	1835 lbs	Spent chromic acid solution from chromium electroplating. Initial generation began March 1995.		
Quantity Handled	**Management**	**Fee Exemption**	**Facility Number**	**Receiver's EPA ID**	**Comment**
1835 lbs	141 (Storage, bulking, and/or transfer off site - no treatment/recovery, fuel blending or disposal at this site.)	n/a	002		

Texas Waste Code	EPA Hazardous Waste No.	Total Quantity Generated	Description		
0002110H	D002	917 lbs	Spent alkaline solution from cleaning of steel parts Initial generation - December 1996.		
Quantity Handled	**Management**	**Fee Exemption**	**Facility Number**	**Receiver's EPA ID**	**Comment**
917 lbs	141 (Storage, bulking, and/or transfer off site - no treatment/recovery, fuel blending or disposal at this site.)	n/a	002		

Texas Waste Code	EPA Hazardous Waste No.	Total Quantity Generated	Description		
0006103H	D002	1376 lbs	Description of Waste: Spent Muriatic acid. Used to clean rusted food bowls prior to retinning.Initial Generation Date: January 1990		
Quantity Handled	**Management**	**Fee Exemption**	**Facility Number**	**Receiver's EPA ID**	**Comment**
1376 lbs	141 (Storage, bulking, and/or transfer off site - no treatment/recovery, fuel blending or disposal at this site.)	n/a	002		

Texas Waste Code	EPA Hazardous Waste No.	Total Quantity Generated	Description		
0010310H	D007	917 lbs	Misc plating shop debris and absorbent		
Quantity Handled	**Management**	**Fee Exemption**	**Facility Number**	**Receiver's EPA ID**	**Comment**
917 lbs	141 (Storage, bulking, and/or transfer off site - no treatment/recovery, fuel blending or disposal at this site.)	n/a	002		

Texas Waste Code	EPA Hazardous Waste No.	Total Quantity Generated	Description		
0011107H	D003, D005	459 lbs	Cyanide bearing material		
Quantity Handled	**Management**	**Fee Exemption**	**Facility Number**	**Receiver's EPA ID**	**Comment**
459 lbs	141 (Storage, bulking, and/or transfer off site - no treatment/recovery, fuel blending or disposal at this site.)	n/a	002		

Texas Waste Code	EPA Hazardous Waste No.	Total Quantity Generated	Description		
0012110H	D007	459 lbs	Tank Bottoms		
Quantity Handled	**Management**	**Fee Exemption**	**Facility Number**	**Receiver's EPA ID**	**Comment**
459 lbs	141 (Storage, bulking, and/or transfer off site - no treatment/recovery, fuel blending or disposal at this site.)	n/a	002		

Texas Waste Code	EPA Hazardous Waste No.	Total Quantity Generated	Description		
0013104H	D002, D006, D007	4250 lbs	Spent acid solution from cleaning		
Quantity Handled	**Management**	**Fee Exemption**	**Facility Number**	**Receiver's EPA ID**	**Comment**
4250 lbs	141 (Storage, bulking, and/or transfer off site - no treatment/recovery, fuel blending or disposal at this site.)	n/a	Indiana	IND000646943	TRADEBE

Texas Waste Code	EPA Hazardous Waste No.	Total Quantity Generated	Description		
0014312H	D003, D006	917 lbs	Non pumpable solids from cadmium tank and blast media with cadmium.		
Quantity Handled	**Management**	**Fee Exemption**	**Facility Number**	**Receiver's EPA ID**	**Comment**
917 lbs	141 (Storage, bulking, and/or transfer off site - no treatment/recovery, fuel blending or disposal at this site.)	n/a	002		

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Detail of: **Industrial and Hazardous Waste Solid Waste Registration 31215**

For: **LANE PLATING (RN100597707)**
5322 BONNIE VIEW RD, DALLAS

Solid Waste Registration Status: **ACTIVE**

Held by: **LANE PLATING WORKS INC (CN600307508)**
OWNER OPERATOR View Compliance History

Mailing Address: 5322 BONNIE VIEW RD DALLAS, TX 75241-3201

Investigations

Investigation Date	Investigation Type
01/19/2011	Compliance Invest File Review
01/19/2011	Compliance Invest File Review
10/21/2014	Compliance Investigation
11/04/2015	Compliance Investigation
11/19/2015	Compliance Investigation
11/20/2015	Compliance Investigation
02/18/2016	Compliance Investigation

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Detail of: **Industrial and Hazardous Waste Solid Waste Registration 31215**

For: **LANE PLATING (RN100597707)**
5322 BONNIE VIEW RD, DALLAS

Solid Waste Registration Status: **ACTIVE**

Held by: **LANE PLATING WORKS INC (CN600307508)**
OWNER OPERATOR View Compliance History

Mailing Address: 5322 BONNIE VIEW RD DALLAS, TX 75241-3201

Effective Enforcement Orders Current TCEQ Rules

Type	Effective Date	Docket Number	Citation/Requirement Provision	Violation Allegation	Classification
ADMINISTRATIVE ORDER	09/29/2012	2011-0663-IHW-E	30 TAC Chapter 335, SubChapter A 335.4 (Not applicable to CH)	Failed to prevent the unauthorized discharge of an industrial solid or municipal hazardous waste.	MODERATE
ADMINISTRATIVE ORDER	09/29/2012	2011-0663-IHW-E	30 TAC Chapter 335, SubChapter A 335.2(a) (Not applicable to CH)	Failed to obtain a permit prior to the disposal of hazardous waste. Specifically, the investigator observed five cubic yards of hazardous waste on the southeast corner of the property.	MAJOR
ADMINISTRATIVE ORDER	08/27/2012	2011-0662-IHW-E	30 TAC Chapter 335, SubChapter A 335.9(a)(2) (Not applicable to CH)	Failed to submit annual waste summaries for the calendar years 2008 and 2009.	MINOR
ADMINISTRATIVE ORDER	08/27/2012	2011-0662-IHW-E	30 TAC Chapter 335, SubChapter A 335.9(a)(1) (Not applicable to CH)	Failed to maintain records of all hazardous and industrial solid waste activities.	MINOR
ADMINISTRATIVE ORDER	08/27/2012	2011-0662-IHW-E	30 TAC Chapter 335, SubChapter A 335.4 (Not applicable to CH)	Failed to prevent the unauthorized discharge of an industrial solid waste.	MAJOR
ADMINISTRATIVE ORDER	08/27/2012	2011-0662-IHW-E	40 CFR Chapter 262, SubChapter I, PT 262, SubPT C 262.34(a) ; 30 TAC Chapter 335, SubChapter C 335.69(a) (Not applicable to CH)	Failed to transfer hazardous waste off-site within the allotted accumulation time limit for small quantity generators.	MODERATE
ADMINISTRATIVE ORDER	08/27/2012	2011-0662-IHW-E	30 TAC Chapter 335, SubChapter A 335.2(a) (Not applicable to CH)	Failed to obtain a permit prior to the disposal of hazardous waste.	MAJOR

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Detail of: **Industrial and Hazardous Waste Solid Waste Registration 31215**
For: **LANE PLATING (RN100597707)**
5322 BONNIE VIEW RD, DALLAS
Solid Waste Registration Status: **ACTIVE**
Held by: **LANE PLATING WORKS INC (CN600307508)**
OWNER OPERATOR View Compliance History
Mailing Address: 5322 BONNIE VIEW RD DALLAS, TX 75241-3201

Commissioners' Actions

Item Number	Item Type	Document Type	Status	TCEQ Docket Number	SOAH Docket Number
96881	NO, ENFORCEMENT	ORDER	CLOSED	2015-0423-IHW-E	582-15-5607

Item 96881

Activity Actions

Action Date	Document Type	Action
09/17/2015	Record for SOAH	ROUTED
08/31/2015	Notice of SOAH Hearing	MAILED
10/01/2015	SOAH Hearing	SCHEDULED
08/21/2015	SOAH Referral	RECEIVED
03/18/2015	TCEQ Docket Number	ISSUED
03/17/2015	TCEQ Docket Number	REQUESTED

Protestant Information

Request Type	Count
No Protestant information exist for this item	

Filings

Date Received	Title
02/17/2016 8:36 AM	ORDER NO. 2 - DISMISSING CASE
02/12/2016 4:02 PM	NOTICE OF NON-SUIT
01/15/2016 9:40 AM	NOTICE OF SUBSTITUTION OF LEAD COUNSEL
10/08/2015 4:03 PM	ED'S REQUEST FOR DISCLOSURES TO STAG MANAGEMENT INCORPORATED
10/08/2015 4:01 PM	ED'S REQUEST FOR DISCLOSURES TO LANE PLATING WORKS, INC.
09/30/2015 1:20 PM	ORDER NO. 1
09/30/2015 9:27 AM	ED'S AGREED MOTION TO WAIVE PRELIMINARY HEARING
08/21/2015 10:54 AM	SOAH REFERRAL
07/20/2015 9:14 AM	ANSWER
06/18/2015 10:37 AM	EDPRP

Public Meeting

Meeting Type	Meeting Date	Meeting Time	Location	Total Attendance
No Public Meeting exist for this Item.				

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Reference 23

EPA United States Environmental Protection Agency

Envirofacts

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<< Return

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- Overview
- Search
- Model
- RCRAInfo Search User Guide
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Report an Error

LANE PLATING
Handler ID: TXD007336571
5322 BONNIEVIEW RD
DALLAS, TX 752412401

County Name: DALLAS

Latitude: 32.68725
Longitude: -96.76915

Hazardous Waste Generator: Large Quantity Generator

Owner Name: LANE PLATING WORKS INC,

You can navigate within the map with your mouse.

BIENNIAL REPORT SUMMARY

REPORT YEAR	GENERATION (Tons)	MANAGEMENT (Tons)	WASTE RECEIVED (Tons)	WASTE SHIPPED (Tons)	INCINERATION (Tons)	DISPOSAL (Tons)	ACUTE GENERATION (Tons)
2001	15.5			15.5			

LIST OF FACILITY CONTACTS

NAME	STREET	CITY	STATE	ZIP CODE	PHONE	TYPE OF CONTACT
JOE LANE	5322 BONNIEVIEW RD	DALLAS	TX	752412401	214-371-1351	Public
JOE LANE	PO BOX 41098	DALLAS	TX	75241	2143711351	Permit
JOE LANE					2143711351	Permit
JOE LANE	5322 BONNIEVIEW RD	DALLAS	TX	752412401	214-371-1351	Permit
JOE LANE	BONNIEVIEW RD	DALLAS	TX	75241	214-371-1351	Permit

HANDLER / FACILITY CLASSIFICATION

Unspecified Universe for the facility listed above.

HANDLER TYPE
Large Quantity Generator

No PROCESS INFORMATION is available for the facility listed above.

LIST OF NAICS CODES AND DESCRIPTIONS

NAICS CODE	NAICS DESCRIPTION
332813	ELECTROPLATING, PLATING, POLISHING, ANODIZING, AND COLORING

LIST OF WASTE CODES AND DESCRIPTIONS

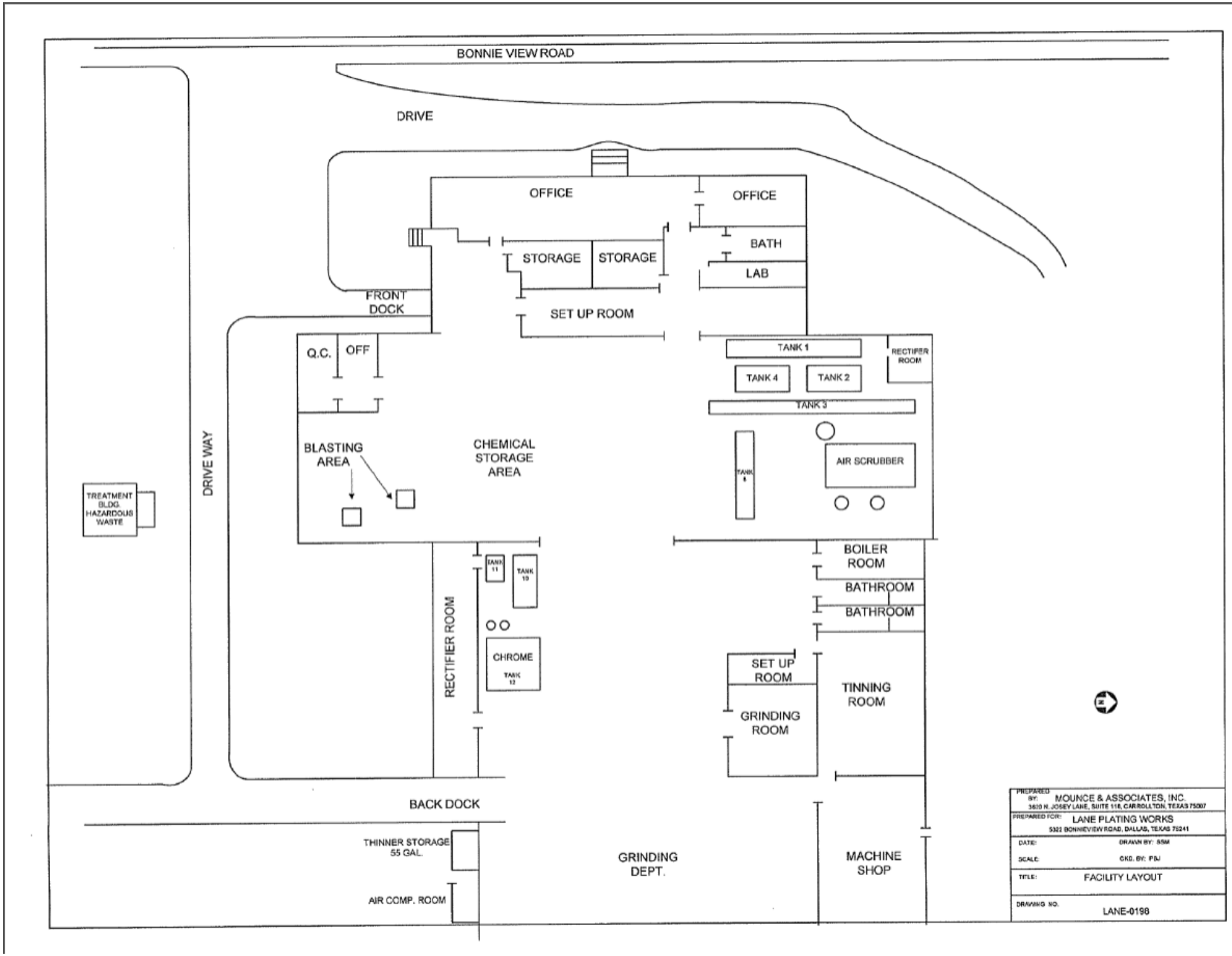
WASTE CODE	WASTE DESCRIPTION
D002	CORROSIVE WASTE
D003	REACTIVE WASTE
D006	CADMIUM
D007	CHROMIUM
D008	LEAD
F006	WASTEWATER TREATMENT SLUDGES FROM ELECTROPLATING OPERATIONS, EXCEPT FROM THE FOLLOWING PROCESSES: (1) SULFURIC ACID ANODIZING OF ALUMINUM; (2) TIN PLATING ON CARBON STEEL; (3) ZINC PLATING (SEGREGATED BASIS) ON CARBON STEEL; (4) ALUMINUM OR ZINC-ALUMINUM PLATING ON CARBON STEEL; (5) CLEANING/STRIPPING ASSOCIATED WITH TIN, ZINC, AND ALUMINUM PLATING ON CARBON STEEL; AND (6) CHEMICAL ETCHING AND MILLING OF ALUMINUM.

Go To Top Of The Page

Total Number of Facilities Retrieved: 1

Last updated on 2/10/2016

Reference 24


BONNIE VIEW ROAD
DRIVE
OFFICE
OFFICE
BATH
LAB
STORAGE
STORAGE
FRONT DOCK
SET UP ROOM
Q.C.
OFF
TANK 1
RECTIFIER ROOM
TANK 4
TANK 2
TANK 3
BLASTING AREA
CHEMICAL STORAGE AREA
AIR SCRUBBER
TREATMENT BLDG. HAZARDOUS WASTE
DRIVE WAY
BOILER ROOM
BATHROOM
BATHROOM
TANK 11
TANK 10
RECTIFIER ROOM
CHROME TANK 12
SET UP ROOM
GRINDING ROOM
TINNING ROOM
BACK DOCK
THINNER STORAGE 55 GAL.
AIR COMP. ROOM
GRINDING DEPT.
MACHINE SHOP
PREPARED BY: MOUNCE & ASSOCIATES, INC.
3620 N. JOSEY LANE, SUITE 118, CARROLLTON, TEXAS 75007
PREPARED FOR: LANE PLATING WORKS
5322 BONNIEVIEW ROAD, DALLAS, TEXAS 75241
DATE:
DRAWN BY: SSM
SCALE:
CKD. BY: PBJ
TITLE: FACILITY LAYOUT
DRAWING NO. LANE-0196

Reference 25

Executive Summary – Enforcement Matter – Case No. 41583
LANE PLATING WORKS, INC.
RN100597707
Docket No. 2011-0662-IHW-E

Order Type:
1660 Agreed Order
Findings Order Justification:
N/A
Media:
IHW
Small Business:
Yes
Location(s) Where Violation(s) Occurred:
Lane Plating, 5322 Bonnie View Road, Dallas, Dallas County
Type of Operation:
Electroplating processing facility
Other Significant Matters:
Additional Pending Enforcement Actions: Yes. Docket No. 2011-0663-IHW-E
Past-Due Penalties: No
Other: N/A
Interested Third-Parties: None
Texas Register Publication Date: May 4, 2012
Comments Received: No

Penalty Information

Total Penalty Assessed: $28,350
Amount Deferred for Expedited Settlement: $0
Amount Deferred for Financial Inability to Pay: $21,372
Total Paid to General Revenue: $328
Total Due to General Revenue: $6,650
Payment Plan: 35 payments of $190 each
SEP Conditional Offset: $0
Name of SEP: N/A
Compliance History Classifications:
Person/CN - Average
Site/RN - Average
Major Source: No
Statutory Limit Adjustment: N/A
Applicable Penalty Policy: September 2002

Executive Summary – Enforcement Matter – Case No. 41583
LANE PLATING WORKS, INC.
RN100597707
Docket No. 2011-0662-IHW-E

Investigation Information

Complaint Date(s): N/A
Complaint Information: N/A
Date(s) of Investigation: January 19, 2011
Date(s) of NOE(s): April 15, 2011

Violation Information

1. Failed to prevent the unauthorized disposal of hazardous waste. Specifically, the investigator observed five cubic yards of hazardous waste on the southeast corner of the property. Analyses of soil samples from the area indicated leachable lead concentrations of 8.4 parts per million ("ppm") and 15.2 ppm, exceeding the Toxicity Characteristic Leaching Procedure ("TCLP") values of 5 ppm [30 TEX. ADMIN. CODE § 335.2(a)].

2. Failed to transfer hazardous waste off-site within the allotted accumulation time limit for small quantity generators. Specifically, seven drums that were observed at the Facility during the March 2010 investigation were again observed at the January 2011 investigation, exceeding the 180 day allotted time frame [30 TEX. ADMIN. CODE § 335.69(a) and 40 CODE OF FEDERAL REGULATIONS § 262.34(a)].

3. Failed to submit annual waste summaries for the calendar years 2008 and 2009 [30 TEX. ADMIN. CODE § 335.9(a)(2)].

4. Failed to prevent the unauthorized discharge of an industrial solid waste. Specifically, analytical results from soil samples collected around the foundation of the Facility building indicated elevated levels of chromium at 168.8 ppm, exceeding the TCLP regulatory limit of 5 ppm, cadmium at 3.5 ppm and 1.1 ppm, exceeding TCLP regulatory limit of 1 ppm, and mercury concentrations ranging from 1.98 to 12.6 ppm, exceeding the Texas specific protective concentration levels of .04 ppm [30 TEX. ADMIN. CODE § 335.4].

5. Failed to maintain records of all hazardous and industrial solid waste activities. Specifically, records of waste generation quantity, descriptions of individual waste stream characterizations, and waste determinations for class II waste streams were not available for review [30 TEX. ADMIN. CODE § 335.9(a)(1)].

Corrective Actions/Technical Requirements

Corrective Action(s) Completed:

N/A

Technical Requirements:

The Order will require Respondent to:

a. Immediately, cease additional unauthorized discharges.

b. Within 30 days:

i. Remove all discharged industrial solid waste, visibly impacted soils, and waste containers from the Facility and properly dispose of it at an authorized facility;

ii. Develop and implement procedures to ensure that all containers storing hazardous waste are removed within the allotted accumulation time limit and transported to a facility authorized to accept the waste;

iii. Submit annual waste summaries for calendar years 2008 and 2009;

iv. Begin maintaining all records of all hazardous and industrial solid waste activities to the TCEQ; and

c. Within 45 days, submit an Affected Property Assessment Report, pursuant to 30 TEX. ADMIN. CODE § 350.91, to the Executive Director for approval. If response actions are necessary, comply with all applicable requirements of the Texas Risk Reduction Program found in 30 TEX. ADMIN. CODE ch. 350 which may include: plans, reports, and notices under Subchapter E (30 TEX. ADMIN. CODE §§ 350.92 to 350.96); financial assurance [30 TEX. ADMIN. CODE § 350.33(l)]; and Institutional Controls under Subchapter F.

d. Within 60 days, submit written certification demonstrating compliance.

Litigation Information

Date Petition(s) Filed: N/A
Date Answer(s) Filed: N/A
SOAH Referral Date: N/A
Hearing Date(s): N/A
Settlement Date: N/A

Contact Information

TCEQ Attorney: N/A
TCEQ Enforcement Coordinator: Judy Kluge, Enforcement Division, Enforcement Team 6, MC R-04, (817) 588-5825; Debra Barber, Enforcement Division, MC 219, (512) 239-0412

Executive Summary – Enforcement Matter – Case No. 41583
LANE PLATING WORKS, INC.
RN100597707
Docket No. 2011-0662-IHW-E

TCEQ SEP Coordinator: N/A
Respondent: Jeff Lane, Vice President, LANE PLATING WORKS, INC., 5322 Bonnie View Road, Dallas, Texas 75241
Respondent's Attorney: N/A

Penalty Calculation Worksheet (PCW)

Policy Revision 2 (September 2002) — *PCW Revision October 30, 2008*

TCEQ

DATES **Assigned** 25-Apr-2011 **PCW** 6-May-2011 **Screening** 2-May-2011 **EPA Due** 16-Sep-2011

RESPONDENT/FACILITY INFORMATION

Respondent	LANE PLATING WORKS, INC.
Reg. Ent. Ref. No.	RN100597707
Facility/Site Region	4-Dallas/Fort Worth
Major/Minor Source	Minor

CASE INFORMATION

Enf./Case ID No.	41583	**No. of Violations**	5
Docket No.	2011-0662-IHW-E	**Order Type**	1660
Media Program(s)	Industrial and Hazardous Waste	**Government/Non-Profit**	No
Multi-Media		**Enf. Coordinator**	Judy Kluge
		EC's Team	Enforcement Team 6

Admin. Penalty $ Limit Minimum $0 **Maximum** $10,000

Penalty Calculation Section

TOTAL BASE PENALTY (Sum of violation base penalties) — *Subtotal 1* **$27,000**

ADJUSTMENTS (+/-) TO SUBTOTAL 1

Subtotals 2-7 are obtained by multiplying the Total Base Penalty (Subtotal 1) by the indicated percentage.

Compliance History **5.0%** Enhancement — *Subtotals 2, 3, & 7* **$1,350**

Notes: Enhancement for one prior NOV for same or similar violations.

Culpability No **0.0%** Enhancement — *Subtotal 4* **$0**

Notes: The Respondent does not meet the culpability criteria.

Good Faith Effort to Comply Total Adjustments — *Subtotal 5* **$0**

Economic Benefit **0.0%** Enhancement* — *Subtotal 6* **$0**

Total EB Amounts $1,178
Approx. Cost of Compliance $23,500
**Capped at the Total EB $ Amount*

SUM OF SUBTOTALS 1-7 — *Final Subtotal* **$28,350**

OTHER FACTORS AS JUSTICE MAY REQUIRE **0.0%** — *Adjustment* **$0**

Reduces or enhances the Final Subtotal by the indicated percentage.

Notes:

Final Penalty Amount **$28,350**

STATUTORY LIMIT ADJUSTMENT — *Final Assessed Penalty* **$28,350**

DEFERRAL **20.0%** Reduction — *Adjustment* **-$5,670**

Reduces the Final Assessed Penalty by the indicted percentage. *(Enter number only; e.g. 20 for 20% reduction.)*

Notes: Deferral offered for expedited settlement.

PAYABLE PENALTY **$22,680**

Screening Date 2-May-2011 **Docket No.** 2011-0662-IHW-E **PCW**

Respondent LANE PLATING WORKS, INC.

Policy Revision 2 (September 2002)

Case ID No. 41583

PCW Revision October 30, 2008

Reg. Ent. Reference No. RN100597707

Media [Statute] Industrial and Hazardous Waste

Enf. Coordinator Judy Kluge

Compliance History Worksheet

>> Compliance History *Site* Enhancement (Subtotal 2)

Component	Number of...	Enter Number Here	Adjust.
NOVs	Written notices of violation ("NOVs") with same or similar violations as those in the current enforcement action (*number of NOVs meeting criteria*)	1	5%
	Other written NOVs	0	0%
Orders	Any agreed final enforcement orders containing a denial of liability (*number of orders meeting criteria*)	0	0%
	Any adjudicated final enforcement orders, agreed final enforcement orders without a denial of liability, or default orders of this state or the federal government, or any final prohibitory emergency orders issued by the commission	0	0%
Judgments and Consent Decrees	Any non-adjudicated final court judgments or consent decrees containing a denial of liability of this state or the federal government (*number of judgements or consent decrees meeting criteria*)	0	0%
	Any adjudicated final court judgments and default judgments, or non-adjudicated final court judgments or consent decrees without a denial of liability, of this state or the federal government	0	0%
Convictions	Any criminal convictions of this state or the federal government (*number of counts*)	0	0%
Emissions	Chronic excessive emissions events (*number of events*)	0	0%
Audits	Letters notifying the executive director of an intended audit conducted under the Texas Environmental, Health, and Safety Audit Privilege Act, 74th Legislature, 1995 *(number of audits for which notices were submitted)*	0	0%
	Disclosures of violations under the Texas Environmental, Health, and Safety Audit Privilege Act, 74th Legislature, 1995 (*number of audits for which violations were disclosed*)	0	0%

		Please Enter Yes or No	
Other	Environmental management systems in place for one year or more	No	0%
	Voluntary on-site compliance assessments conducted by the executive director under a special assistance program	No	0%
	Participation in a voluntary pollution reduction program	No	0%
	Early compliance with, or offer of a product that meets future state or federal government environmental requirements	No	0%

Adjustment Percentage (Subtotal 2) 5%

>> Repeat Violator (Subtotal 3)

No

Adjustment Percentage (Subtotal 3) 0%

>> Compliance History Person Classification (Subtotal 7)

Average Performer

Adjustment Percentage (Subtotal 7) 0%

>> Compliance History Summary

Compliance History Notes

Enhancement for one prior NOV for same or similar violations.

Total Adjustment Percentage (Subtotals 2, 3, & 7) 5%

Screening Date 2-May-2011 **Docket No.** 2011-0662-IHW-E **PCW**

Policy Revision 2 (September 2002)

PCW Revision October 30, 2008

Respondent LANE PLATING WORKS, INC.

Case ID No. 41583

Reg. Ent. Reference No. RN100597707

Media [Statute] Industrial and Hazardous Waste

Enf. Coordinator Judy Kluge

Violation Number 1

Rule Cite(s) 30 Tex. Admin. Code § 335.2(a)

Violation Description Failed to obtain a permit prior to the disposal of hazardous waste. Specifically, the investigator observed 5 cubic yards of hazardous waste on the southeast corner of the property. Analyses of soil samples from the area indicated leachable lead concentrations of 8.4 parts per million ("ppm") and 15.2 ppm, exceeding the Toxicity Characteristic Leaching Procedure ("TCLP") values of 5 ppm.

Base Penalty $10,000

>> Environmental, Property and Human Health Matrix

OR

Release	Harm: Major	Moderate	Minor
Actual			
Potential			

Percent 0%

>>Programmatic Matrix

Falsification	Major	Moderate	Minor
	x		

Percent 10%

Matrix Notes: 100% of the rule requirement was not met.

Adjustment $9,000

$1,000

Violation Events

Number of Violation Events: 4

103 Number of violation days

mark only one with an x

daily	
weekly	
monthly	x
quarterly	
semiannual	
annual	
single event	

Violation Base Penalty $4,000

Four monthly events are recommended from the January 19, 2011 investigation to the May 2, 2011 screening date.

Good Faith Efforts to Comply

0.0% Reduction $0

	Before NOV	NOV to EDPRP/Settlement Offer
Extraordinary		
Ordinary		
N/A	x	(mark with x)

Notes: The Respondent does not meet the good faith criteria for this violation.

Violation Subtotal $4,000

Economic Benefit (EB) for this violation

Estimated EB Amount $251

Statutory Limit Test

Violation Final Penalty Total $4,200

This violation Final Assessed Penalty (adjusted for limits) $4,200

Economic Benefit Worksheet

Respondent LANE PLATING WORKS, INC.
Case ID No. 41583
Reg. Ent. Reference No. RN100597707
Media Industrial and Hazardous Waste
Violation No. 1

Percent Interest	Years of Depreciation
5.0	15

Item Description (No commas or $)	Item Cost	Date Required	Final Date	Yrs	Interest Saved	Onetime Costs	EB Amount
Delayed Costs							
Equipment				0.00	$0	$0	$0
Buildings				0.00	$0	$0	$0
Other (as needed)				0.00	$0	$0	$0
Engineering/construction				0.00	$0	$0	$0
Land				0.00	$0	n/a	$0
Record Keeping System				0.00	$0	n/a	$0
Training/Sampling				0.00	$0	n/a	$0
Remediation/Disposal				0.00	$0	n/a	$0
Permit Costs	$5,000	19-Jan-2011	20-Jan-2012	1.00	$251	n/a	$251
Other (as needed)				0.00	$0	n/a	$0
Notes for DELAYED costs	Estimated cost to remove 5 cubic yards of hazardous waste and properly dispose of the waste and contaminated soil at an authorized facility. The date required is the investigation date and the final date is the expected date of compliance.						
Avoided Costs	**ANNUALIZE [1] avoided costs before entering item (except for one-time avoided costs)**						
Disposal				0.00	$0	$0	$0
Personnel				0.00	$0	$0	$0
Inspection/Reporting/Sampling				0.00	$0	$0	$0
Supplies/equipment				0.00	$0	$0	$0
Financial Assurance [2]				0.00	$0	$0	$0
ONE-TIME avoided costs [3]				0.00	$0	$0	$0
Other (as needed)				0.00	$0	$0	$0
Notes for AVOIDED costs							

Approx. Cost of Compliance $5,000

TOTAL $251

Screening Date 2-May-2011 **Docket No.** 2011-0662-IHW-E **PCW**

Respondent LANE PLATING WORKS, INC.

Policy Revision 2 (September 2002)

Case ID No. 41583

PCW Revision October 30, 2008

Reg. Ent. Reference No. RN100597707

Media [Statute] Industrial and Hazardous Waste

Enf. Coordinator Judy Kluge

Violation Number 2

Rule Cite(s) 30 Tex. Admin. Code § 335.69(a) and 40 Code of Federal Regulations § 262.34(a)

Violation Description Failed to transfer hazardous waste off-site within the allotted accumulation time limit for small quantity generators. Specifically, seven drums that were observed at the Facility during the March 2010 investigation were again observed at the January 2011 investigation, exceeding the 180 day allotted time frame.

Base Penalty $10,000

>> Environmental, Property and Human Health Matrix

OR

Release	Harm: Major	Moderate	Minor
Actual			
Potential	x		

Percent 25%

>>Programmatic Matrix

Falsification	Major	Moderate	Minor

Percent 0%

Matrix Notes: Human health or the environment will or could be exposed to pollutants which would exceed levels that are protective of human health or environmental receptors as a result of the violation.

Adjustment $7,500

$2,500

Violation Events

Number of Violation Events: 4 — 103 Number of violation days

mark only one with an x

daily	
weekly	
monthly	x
quarterly	
semiannual	
annual	
single event	

Violation Base Penalty $10,000

Four monthly events are recommended from the January 19, 2011 investigation to the screening date of May 2, 2011.

Good Faith Efforts to Comply

0.0% Reduction — $0

	Before NOV	NOV to EDPRP/Settlement Offer
Extraordinary		
Ordinary		
N/A	x	(mark with x)

Notes: The Respondent does not meet the good faith criteria for this violation.

Violation Subtotal $10,000

Economic Benefit (EB) for this violation

Estimated EB Amount $376

Statutory Limit Test

Violation Final Penalty Total $10,500

This violation Final Assessed Penalty (adjusted for limits) $10,500

Economic Benefit Worksheet

Respondent LANE PLATING WORKS, INC.
Case ID No. 41583
Reg. Ent. Reference No. RN100597707
Media Industrial and Hazardous Waste
Violation No. 2

Percent Interest	Years of Depreciation
5.0	15

	Item Cost	Date Required	Final Date	Yrs	Interest Saved	Onetime Costs	EB Amount
Item Description	No commas or $						
Delayed Costs							
Equipment				0.00	$0	$0	$0
Buildings				0.00	$0	$0	$0
Other (as needed)				0.00	$0	$0	$0
Engineering/construction				0.00	$0	$0	$0
Land				0.00	$0	n/a	$0
Record Keeping System				0.00	$0	n/a	$0
Training/Sampling				0.00	$0	n/a	$0
Remediation/Disposal	$7,000	19-Jan-2011	20-Jan-2012	1.00	$351	n/a	$351
Permit Costs				0.00	$0	n/a	$0
Other (as needed)	$500	19-Jan-2011	20-Jan-2012	1.00	$25	n/a	$25
Notes for DELAYED costs	Estimated cost to properly dispose of seven hazardous waste drums and to develop and implement procedures to ensure that all containers storing hazardous waste are removed within the allotted accumulation time limit and transported to a facility authorized to accept the waste. The date required is the investigation date and the final date is the expected date of compliance.						
Avoided Costs	ANNUALIZE [1] avoided costs before entering item (except for one-time avoided costs)						
Disposal				0.00	$0	$0	$0
Personnel				0.00	$0	$0	$0
Inspection/Reporting/Sampling				0.00	$0	$0	$0
Supplies/equipment				0.00	$0	$0	$0
Financial Assurance [2]				0.00	$0	$0	$0
ONE-TIME avoided costs [3]				0.00	$0	$0	$0
Other (as needed)				0.00	$0	$0	$0
Notes for AVOIDED costs							

Approx. Cost of Compliance $7,500

TOTAL $376

Screening Date 2-May-2011 **Docket No.** 2011-0662-IHW-E **PCW**

Respondent LANE PLATING WORKS, INC.

Policy Revision 2 (September 2002)

Case ID No. 41583

PCW Revision October 30, 2008

Reg. Ent. Reference No. RN100597707

Media [Statute] Industrial and Hazardous Waste

Enf. Coordinator Judy Kluge

Violation Number 3

Rule Cite(s) 30 Tex. Admin. Code § 335.9(a)(2)

Violation Description Failed to submit annual waste summaries for the calendar years 2008 and 2009.

Base Penalty $10,000

>> Environmental, Property and Human Health Matrix

OR

Release	Harm: Major	Moderate	Minor
Actual			
Potential			

Percent 0%

>>Programmatic Matrix

Falsification	Major	Moderate	Minor
	x		

Percent 10%

Matrix Notes: 100% of the rule requirement was not met.

Adjustment $9,000

$1,000

Violation Events

Number of Violation Events: 2 — 730 Number of violation days

mark only one with an x

daily	
weekly	
monthly	
quarterly	
semiannual	
annual	x
single event	

Violation Base Penalty $2,000

Two annual events (one per calendar year) are recommended.

Good Faith Efforts to Comply

0.0% Reduction — $0

	Before NOV	NOV to EDPRP/Settlement Offer
Extraordinary		
Ordinary		
N/A	x	(mark with x)

Notes: The Respondent does not meet the good faith criteria for this violation.

Violation Subtotal $2,000

Economic Benefit (EB) for this violation

Estimated EB Amount $25

Statutory Limit Test

Violation Final Penalty Total $2,100

This violation Final Assessed Penalty (adjusted for limits) $2,100

Economic Benefit Worksheet

Respondent LANE PLATING WORKS, INC.
Case ID No. 41583
Reg. Ent. Reference No. RN100597707
Media Industrial and Hazardous Waste
Violation No. 3

Percent Interest	Years of Depreciation
5.0	15

	Item Cost	Date Required	Final Date	Yrs	Interest Saved	Onetime Costs	EB Amount
Item Description	No commas or $						
Delayed Costs							
Equipment				0.00	$0	$0	$0
Buildings				0.00	$0	$0	$0
Other (as needed)				0.00	$0	$0	$0
Engineering/construction				0.00	$0	$0	$0
Land				0.00	$0	n/a	$0
Record Keeping System				0.00	$0	n/a	$0
Training/Sampling				0.00	$0	n/a	$0
Remediation/Disposal				0.00	$0	n/a	$0
Permit Costs				0.00	$0	n/a	$0
Other (as needed)	$500	19-Jan-2011	20-Jan-2012	1.00	$25	n/a	$25
Notes for DELAYED costs	Estimated cost to submit complete and correct annual waste summaries for calendar years 2008 and 2009. The date required is the investigation date and the final date is the expected date of compliance.						
Avoided Costs	ANNUALIZE [1] avoided costs before entering item (except for one-time avoided costs)						
Disposal				0.00	$0	$0	$0
Personnel				0.00	$0	$0	$0
Inspection/Reporting/Sampling				0.00	$0	$0	$0
Supplies/equipment				0.00	$0	$0	$0
Financial Assurance [2]				0.00	$0	$0	$0
ONE-TIME avoided costs [3]				0.00	$0	$0	$0
Other (as needed)				0.00	$0	$0	$0
Notes for AVOIDED costs							

Approx. Cost of Compliance $500

TOTAL $25

Screening Date 2-May-2011 **Docket No.** 2011-0662-IHW-E **PCW**

Respondent LANE PLATING WORKS, INC. *Policy Revision 2 (September 2002)*

Case ID No. 41583 *PCW Revision October 30, 2008*

Reg. Ent. Reference No. RN100597707

Media [Statute] Industrial and Hazardous Waste

Enf. Coordinator Judy Kluge

Violation Number 4

Rule Cite(s) 30 Tex. Admin. Code § 335.4

Violation Description Failed to prevent the unauthorized discharge of an industrial solid waste. Specifically, analytical results from soil samples collected around the foundation of the Facility building indicated elevated levels of chromium at 168.8 ppm, exceeding the TCLP regulatory limit of 5 ppm, cadmium at 3.5 ppm and 1.1 ppm, exceeding TCLP regulatory limit of 1 ppm, and mercury concentrations ranging from 1.98 to 12.6 ppm, exceeding the Texas specific protective concentration levels of .04 ppm

Base Penalty $10,000

>> Environmental, Property and Human Health Matrix

OR	Harm: Release	Major	Moderate	Minor
	Actual		x	
	Potential			

Percent 25%

>>Programmatic Matrix

Falsification	Major	Moderate	Minor

Percent 0%

Matrix Notes: Human health or the environment has been exposed to significant amounts of pollutants which do not exceed levels that are protective of human health or environmental receptors as a result of the violation.

Adjustment $7,500

$2,500

Violation Events

Number of Violation Events: 4 — 103 Number of violation days

mark only one with an x

daily	
weekly	
monthly	x
quarterly	
semiannual	
annual	
single event	

Violation Base Penalty $10,000

Four monthly events are recommended from the January 19, 2011 investigation to the screening date of May 2, 2011.

Good Faith Efforts to Comply

0.0% Reduction $0

	Before NOV	NOV to EDPRP/Settlement Offer
Extraordinary		
Ordinary		
N/A	x	(mark with x)

Notes: The Respondent does not meet the good faith criteria for this violation.

Violation Subtotal $10,000

Economic Benefit (EB) for this violation

Estimated EB Amount $501

Statutory Limit Test

Violation Final Penalty Total $10,500

This violation Final Assessed Penalty (adjusted for limits) $10,500

Economic Benefit Worksheet

Respondent LANE PLATING WORKS, INC.
Case ID No. 41583
Reg. Ent. Reference No. RN100597707
Media Industrial and Hazardous Waste
Violation No. 4

Percent Interest	Years of Depreciation
5.0	15

	Item Cost	Date Required	Final Date	Yrs	Interest Saved	Onetime Costs	EB Amount
Item Description	No commas or $						
Delayed Costs							
Equipment				0.00	$0	$0	$0
Buildings				0.00	$0	$0	$0
Other (as needed)				0.00	$0	$0	$0
Engineering/construction				0.00	$0	$0	$0
Land				0.00	$0	n/a	$0
Record Keeping System				0.00	$0	n/a	$0
Training/Sampling				0.00	$0	n/a	$0
Remediation/Disposal	$10,000	19-Jan-2011	20-Jan-2012	1.00	$501	n/a	$501
Permit Costs				0.00	$0	n/a	$0
Other (as needed)				0.00	$0	n/a	$0
Notes for DELAYED costs	The estimated cost to remove and dispose of contaminated soil at an authorized facility, and conduct an environmental assessment and submit an Affected Property Assessment Report. The date required is the investigation date and the final date is the estimated date of compliance.						
Avoided Costs	ANNUALIZE [1] avoided costs before entering item (except for one-time avoided costs)						
Disposal				0.00	$0	$0	$0
Personnel				0.00	$0	$0	$0
Inspection/Reporting/Sampling				0.00	$0	$0	$0
Supplies/equipment				0.00	$0	$0	$0
Financial Assurance [2]				0.00	$0	$0	$0
ONE-TIME avoided costs [3]				0.00	$0	$0	$0
Other (as needed)				0.00	$0	$0	$0
Notes for AVOIDED costs							

Approx. Cost of Compliance $10,000

TOTAL $501

Screening Date 2-May-2011 **Docket No.** 2011-0662-IHW-E **PCW**

Policy Revision 2 (September 2002)

PCW Revision October 30, 2008

Respondent LANE PLATING WORKS, INC.

Case ID No. 41583

Reg. Ent. Reference No. RN100597707

Media [Statute] Industrial and Hazardous Waste

Enf. Coordinator Judy Kluge

Violation Number 5

Rule Cite(s) 30 Tex. Admin. Code § 335.9(a)(1)

Violation Description Failed to maintain records of all hazardous and industrial solid waste activities. Specifically, records of waste generation quantity, descriptions of individual waste stream characterizations, and waste determinations for class II waste streams were not available for review.

Base Penalty $10,000

>> Environmental, Property and Human Health Matrix

OR

Release	Harm: Major	Moderate	Minor
Actual			
Potential			

Percent 0%

>>Programmatic Matrix

Falsification	Major	Moderate	Minor
	x		

Percent 10%

Matrix Notes: 100% of the rule requirement was not met.

Adjustment $9,000

$1,000

Violation Events

Number of Violation Events: 1 — 103 Number of violation days

mark only one with an x

daily	
weekly	
monthly	
quarterly	
semiannual	
annual	
single event	x

Violation Base Penalty $1,000

One single event is recommended.

Good Faith Efforts to Comply

0.0% Reduction — $0

	Before NOV	NOV to EDPRP/Settlement Offer
Extraordinary		
Ordinary		
N/A	x	(mark with x)

Notes: The Respondent does not meet the good faith criteria for this violation.

Violation Subtotal $1,000

Economic Benefit (EB) for this violation

Estimated EB Amount $25

Statutory Limit Test

Violation Final Penalty Total $1,050

This violation Final Assessed Penalty (adjusted for limits) $1,050

Economic Benefit Worksheet

Respondent LANE PLATING WORKS, INC.
Case ID No. 41583
Reg. Ent. Reference No. RN100597707
Media Industrial and Hazardous Waste
Violation No. 5

Percent Interest	Years of Depreciation
5.0	15

	Item Cost	Date Required	dmin. Code § 3	Yrs	Interest Saved	Onetime Costs	EB Amount
Item Description	No commas or $						
Delayed Costs							
Equipment				0.00	$0	$0	$0
Buildings				0.00	$0	$0	$0
Other (as needed)				0.00	$0	$0	$0
Engineering/construction				0.00	$0	$0	$0
Land				0.00	$0	n/a	$0
Record Keeping System	$500	19-Jan-2011	20-Jan-2012	1.00	$25	n/a	$25
Training/Sampling				0.00	$0	n/a	$0
Remediation/Disposal				0.00	$0	n/a	$0
Permit Costs				0.00	$0	n/a	$0
Other (as needed)				0.00	$0	n/a	$0
Notes for DELAYED costs	Estimated cost to maintain all hazardous waste records. The date required is the investigation date and the final date is the expected date of compliance.						
Avoided Costs	ANNUALIZE [1] avoided costs before entering item (except for one-time avoided costs)						
Disposal				0.00	$0	$0	$0
Personnel				0.00	$0	$0	$0
Inspection/Reporting/Sampling				0.00	$0	$0	$0
Supplies/equipment				0.00	$0	$0	$0
Financial Assurance [2]				0.00	$0	$0	$0
ONE-TIME avoided costs [3]				0.00	$0	$0	$0
Other (as needed)				0.00	$0	$0	$0
Notes for AVOIDED costs							

Approx. Cost of Compliance $500

TOTAL $25

Compliance History

Customer/Respondent/Owner-Operator:	CN600307508	LANE PLATING WORKS, INC.	Classification: AVERAGE	Rating: 1.00
Regulated Entity:	RN100597707	LANE PLATING	Classification: AVERAGE	Site Rating: 1.00

ID Number(s):

INDUSTRIAL AND HAZARDOUS WASTE	EPA ID	TXD007336571
INDUSTRIAL AND HAZARDOUS WASTE	SOLID WASTE REGISTRATION #	31215
AIR NEW SOURCE PERMITS	ACCOUNT NUMBER	DB0528A
AIR NEW SOURCE PERMITS	REGISTRATION	40123
AIR NEW SOURCE PERMITS	AFS NUM	4811300848
AIR NEW SOURCE PERMITS	REGISTRATION	82475
STORMWATER	PERMIT	TXRNEU256
POLLUTION PREVENTION PLANNING	ID NUMBER	P03202
AIR EMISSIONS INVENTORY	ACCOUNT NUMBER	DB0528A

Location: 5322 BONNIE VIEW RD, DALLAS, TX, 75241

TCEQ Region: REGION 04 - DFW METROPLEX

Date Compliance History Prepared: April 27, 2011

Agency Decision Requiring Compliance History: Enforcement

Compliance Period: April 27, 2006 to April 27, 2011

TCEQ Staff Member to Contact for Additional Information Regarding this Compliance History

Name: Judy Kluge Phone: (817) 588-5825

Site Compliance History Components

1. Has the site been in existence and/or operation for the full five year compliance period? Yes
2. Has there been a (known) change in ownership/operator of the site during the compliance period? No
3. If Yes, who is the current owner/operator? N/A
4. If Yes, who was/were the prior owner(s)/operator(s)? N/A
5. When did the change(s) in owner or operator occur? N/A
6. Rating Date: 9/1/2010 Repeat Violator: NO

Components (Multimedia) for the Site :

A. Final Enforcement Orders, court judgments, and consent decrees of the State of Texas and the federal government.
N/A

B. Any criminal convictions of the state of Texas and the federal government.
N/A

C. Chronic excessive emissions events.
N/A

D. The approval dates of investigations. (CCEDS Inv. Track. No.)

1 08/23/2006 (509247)
2 05/15/2007 (560253)
3 08/28/2008 (700478)
4 02/24/2010 (793100)
5 03/30/2010 (797546)
6 12/14/2010 (872989)
7 04/20/2011 (900994)
8 04/20/2011 (912445)

E. Written notices of violations (NOV). (CCEDS Inv. Track. No.)

Date: 02/24/2010 (793100)CN600307508

Self Report? NO Classification: Moderate
Citation: 30 TAC Chapter 335, SubChapter C 335.69(a)(3)
30 TAC Chapter 335, SubChapter C 335.69(f)(4)(A)
Description: Failure to properly label drums containing hazardous waste with the words

"Hazardous Waste".

Self Report? NO Classification: Moderate

Citation: 30 TAC Chapter 335, SubChapter C 335.69(a)(2)
30 TAC Chapter 335, SubChapter C 335.69(f)(4)(A)

Description: Failure to clearly mark the accumulation date on containers of hazardous waste

F. Environmental audits.

N/A

G. Type of environmental management systems (EMSs).

N/A

H. Voluntary on-site compliance assessment dates.

N/A

I. Participation in a voluntary pollution reduction program.

N/A

J. Early compliance.

N/A

Sites Outside of Texas

N/A

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

IN THE MATTER OF AN ENFORCEMENT ACTION CONCERNING LANE PLATING WORKS, INC. RN100597707	§	**BEFORE THE**
	§	
	§	**TEXAS COMMISSION ON**
	§	
	§	
	§	**ENVIRONMENTAL QUALITY**

AGREED ORDER
DOCKET NO. 2011-0662-IHW-E

I. JURISDICTION AND STIPULATIONS

At its _____ agenda, the Texas Commission on Environmental Quality ("the Commission" or "TCEQ") considered this agreement of the parties, resolving an enforcement action regarding LANE PLATING WORKS, INC. ("the Respondent") under the authority of TEX. HEALTH & SAFETY CODE ch. 361 and TEX. WATER CODE ch. 7. The Executive Director of the TCEQ, through the Enforcement Division, and the Respondent appear before the Commission and together stipulate that:

1. The Respondent operates a electroplating processing facility at 5322 Bonnie View Road in Dallas, Dallas County, Texas (the "Facility").

2. The Facility involves or involved the management of industrial waste and hazardous waste as defined in TEX. HEALTH & SAFETY CODE ch. 361.

3. The Commission and the Respondent agree that the Commission has jurisdiction to enter this Agreed Order, and that the Respondent is subject to the Commission's jurisdiction.

4. The Respondent received notice of the violations alleged in Section II ("Allegations") on or about April 20, 2011.

5. The occurrence of any violation is in dispute and the entry of this Agreed Order shall not constitute an admission by the Respondent of any violation alleged in Section II ("Allegations"), nor of any statute or rule.

6. An administrative penalty in the amount of Twenty-Eight Thousand Three Hundred Fifty Dollars ($28,350) is assessed by the Commission in settlement of the violations alleged in Section II ("Allegations"). The Financial Assurance Section of the Commission's

Financial Administration Division reviewed financial documentation submitted by the Respondent and determined that the Respondent is unable to pay part of the administrative penalty. Therefore, Twenty-One Thousand Three Hundred Seventy-Two Dollars ($21,372) of the penalty is deferred contingent upon the Respondent's timely and satisfactory compliance with all the terms of this Agreed Order. The deferred amount will be waived upon full compliance with the terms of this Agreed Order. If the Respondent fails to timely and satisfactorily comply with all requirements of this Agreed Order, including the payment schedule, the Executive Director may require the Respondent to pay all or part of the deferred penalty.

The Respondent has paid Three Hundred Twenty-Eight Dollars ($328) of the undeferred administrative penalty. The remaining amount of Six Thousand Six Hundred Fifty Dollars ($6,650) of the administrative penalty shall be payable in 35 monthly payments of One Hundred Ninety Dollars ($190) each. The next monthly payment shall be paid within 30 days after the effective date of this Agreed Order. The subsequent payments shall each be paid not later than 30 days following the due date of the previous payment. If the Respondent fails to timely and satisfactorily comply with the payment requirements of this Agreed Order, the Executive Director may, at the Executive Director's option, accelerate the maturity of the remaining installments, in which event the unpaid balance shall become immediately due and payable without demand or notice. In addition, the failure of the Respondent to meet the payment schedule of this Agreed Order constitutes the failure by the Respondent to timely and satisfactorily comply with all the terms of this Agreed Order.

7. Any notice and procedures, which might otherwise be authorized or required in this action, are waived in the interest of a more timely resolution of the matter.

8. The Executive Director of the TCEQ and the Respondent have agreed on a settlement of the matters alleged in this enforcement action, subject to the approval of the Commission.

9. The Executive Director may, without further notice or hearing, refer this matter to the Office of the Attorney General of the State of Texas ("OAG") for further enforcement proceedings if the Executive Director determines that the Respondent has not complied with one or more of the terms or conditions in this Agreed Order.

10. This Agreed Order shall terminate five years from its effective date or upon compliance with all the terms and conditions set forth in this Agreed Order, whichever is later.

11. The provisions of this Agreed Order are deemed severable and, if a court of competent jurisdiction or other appropriate authority deems any provision of this Agreed Order unenforceable, the remaining provisions shall be valid and enforceable.

II. ALLEGATIONS

As operator of the Facility, the Respondent is alleged to have:

1. Failed to obtain a permit prior to the disposal of hazardous waste, in violation of 30 TEX. ADMIN. CODE § 335.2(a), as documented during an investigation conducted on January

19, 2011. Specifically, the investigator observed five cubic yards of hazardous waste on the southeast corner of the property. Analyses of soil samples from the area indicated leachable lead concentrations of 8.4 parts per million ("ppm") and 15.2 ppm, exceeding the Toxicity Characteristic Leaching Procedure ("TCLP") values of 5 ppm.

2. Failed to transfer hazardous waste off-site within the allotted accumulation time limit for small quantity generators, in violation of 30 TEX. ADMIN. CODE § 335.69(a) and 40 CODE OF FEDERAL REGULATIONS § 262.34(a), as documented during an investigation conducted on January 19, 2011. Specifically, seven drums that were observed at the Facility during the March 2010 investigation were again observed at the January 2011 investigation, exceeding the 180 day allotted time frame.

3. Failed to submit annual waste summaries for the calendar years 2008 and 2009, in violation of 30 TEX. ADMIN. CODE § 335.9(a)(2), as documented during an investigation conducted on January 19, 2011.

4. Failed to prevent the unauthorized discharge of an industrial solid waste, in violation of 30 TEX. ADMIN. CODE § 335.4, as documented during an investigation conducted on January 19, 2011. Specifically, analytical results from soil samples collected around the foundation of the Facility building indicated elevated levels of chromium at 168.8 ppm, exceeding the TCLP regulatory limit of 5 ppm, cadmium at 3.5 ppm and 1.1 ppm, exceeding TCLP regulatory limit of 1 ppm, and mercury concentrations ranging from 1.98 to 12.6 ppm, exceeding the Texas specific protective concentration levels of .04 ppm.

5. Failed to maintain records of all hazardous and industrial solid waste activities, in violation of 30 TEX. ADMIN. CODE § 335.9(a)(1), as documented during an investigation conducted on January 19, 2011. Specifically, records of waste generation quantity, descriptions of individual waste stream characterizations, and waste determinations for class II waste streams were not available for review.

III. DENIALS

The Respondent generally denies each allegation in Section II ("Allegations").

IV. ORDERING PROVISIONS

1. It is, therefore, ordered by the TCEQ that the Respondent pay an administrative penalty as set forth in Section I, Paragraph 6 above. The payment of this administrative penalty and the Respondent's compliance with all the terms and conditions set forth in this Agreed Order resolve only the allegations in Section II. The Commission shall not be constrained in any manner from requiring corrective action or penalties for violations which are not raised here. Administrative penalty payments shall be made payable to "TCEQ" and shall be sent with the notation "Re: LANE PLATING WORKS, INC., Docket No. 2011-0662-IHW-E" to:

Financial Administration Division, Revenues Section
Attention: Cashier's Office, MC 214

Texas Commission on Environmental Quality
P.O. Box 13088
Austin, Texas 78711-3088

2. It is further ordered that the Respondent shall undertake the following technical requirements:

a. Immediately upon the effective date of this Agreed Order, cease additional unauthorized discharges.

b. Within 30 days after the effective date of this Agreed Order:

i. Remove all discharged industrial solid waste, visibly impacted soils, and waste containers from the Facility and properly dispose of them at an authorized facility;

ii. Develop and implement procedures to ensure that all containers storing hazardous waste are removed within the allotted accumulation time limit and transported to a facility authorized to accept the waste; in accordance with 30 TEX. ADMIN. CODE § 335.69;

iii. Submit annual waste summaries for calendar years 2008 and 2009, in accordance with 30 TEX. ADMIN. CODE § 335.9; and

iv. Begin maintaining all records of all hazardous and industrial solid waste activities to the TCEQ, in accordance with 30 TEX. ADMIN. CODE § 335.9.

c. Within 45 days after the effective date of this Agreed Order, submit an Affected Property Assessment Report, pursuant to 30 TEX. ADMIN. CODE § 350.91, to the Executive Director for approval. If response actions are necessary, comply with all applicable requirements of the Texas Risk Reduction Program found in 30 TEX. ADMIN. CODE ch. 350 which may include: plans, reports, and notices under Subchapter E (30 TEX. ADMIN. CODE §§ 350.92 to 350.96); financial assurance [30 TEX. ADMIN. CODE § 350.33(l)]; and Institutional Controls under Subchapter F.

d. Within 60 days after the effective date of this Agreed Order, submit written certification as described below, and include detailed supporting documentation including photographs, receipts, and/or other records to demonstrate compliance with Ordering Provision Nos. 2.a. through 2.c. The certification shall be notarized by a State of Texas Notary Public and include the following certification language:

"I certify under penalty of law that I have personally examined and am familiar with the information submitted and all attached documents, and that based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the submitted information is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fines and imprisonment for knowing violations."

The certification shall be submitted to:

Order Compliance Team
Enforcement Division, MC 149A
Texas Commission on Environmental Quality
P.O. Box 13087
Austin, Texas 78711-3087

with a copy to:

Waste Section Manager
Dallas/Fort Worth Regional Office
Texas Commission on Environmental Quality
2309 Gravel Drive
Fort Worth, Texas 76118-6951

3. The provisions of this Agreed Order shall apply to and be binding upon the Respondent. The Respondent is ordered to give notice of the Agreed Order to personnel who maintain day-to-day control over the Facility operations referenced in this Agreed Order.

4. If the Respondent fails to comply with any of the Ordering Provisions in this Agreed Order within the prescribed schedules, and that failure is caused solely by an act of God, war, strike, riot, or other catastrophe, the Respondent's failure to comply is not a violation of this Agreed Order. The Respondent shall have the burden of establishing to the Executive Director's satisfaction that such an event has occurred. The Respondent shall notify the Executive Director within seven days after the Respondent becomes aware of a delaying event and shall take all reasonable measures to mitigate and minimize any delay.

5. The Executive Director may grant an extension of any deadline in this Agreed Order or in any plan, report, or other document submitted pursuant to this Agreed Order, upon a written and substantiated showing of good cause. All requests for extensions by the Respondent shall be made in writing to the Executive Director. Extensions are not effective until the Respondent receives written approval from the Executive Director. The determination of what constitutes good cause rests solely with the Executive Director.

6. This Agreed Order, issued by the Commission, shall not be admissible against the Respondent in a civil proceeding, unless the proceeding is brought by the OAG to: (1) enforce the terms of this Agreed Order; or (2) pursue violations of a statute within the Commission's jurisdiction, or of a rule adopted or an order or permit issued by the Commission under such a statute.

7. This Agreed Order may be executed in separate and multiple counterparts, which together shall constitute a single instrument. Any page of this Agreed Order may be copied, scanned, digitized, converted to electronic portable document format ("pdf"), or otherwise reproduced and may be transmitted by digital or electronic transmission, including but not limited to facsimile transmission and electronic mail. Any signature affixed to this Agreed Order shall constitute an original signature for all purposes and may be used, filed, substituted, or issued for any purpose for which an original signature

could be used. The term "signature" shall include manual signatures and true and accurate reproductions of manual signatures created, executed, endorsed, adopted, or authorized by the person or persons to whom the signatures are attributable. Signatures may be copied or reproduced digitally, electronically, by photocopying, engraving, imprinting, lithographing, electronic mail, facsimile transmission, stamping, or any other means or process which the Executive Director deems acceptable. In this paragraph exclusively, the terms "electronic transmission", "owner", "person", "writing", and "written" shall have the meanings assigned to them under TEX. BUS. ORG. CODE § 1.002.

8. Under 30 TEX. ADMIN. CODE § 70.10(b), the effective date is the date of hand-delivery of the Order to the Respondent, or three days after the date on which the Commission mails notice of the Order to the Respondent, whichever is earlier. The Chief Clerk shall provide a copy of this Agreed Order to each of the parties.

SIGNATURE PAGE

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

_____
For the Commission

Pam Dorsey Jr. 7/6/12
For the Executive Director Date

I, the undersigned, have read and understand the attached Agreed Order. I am authorized to agree to the attached Agreed Order on behalf of the entity indicated below my signature, and I do agree to the terms and conditions specified therein. I further acknowledge that the TCEQ, in accepting payment for the penalty amount, is materially relying on such representation.

I also understand that failure to comply with the Ordering Provisions, if any, in this order and/or failure to timely pay the penalty amount, may result in:

- A negative impact on compliance history;
- Greater scrutiny of any permit applications submitted;
- Referral of this case to the Attorney General's Office for contempt, injunctive relief, additional penalties, and/or attorney fees, or to a collection agency;
- Increased penalties in any future enforcement actions;
- Automatic referral to the Attorney General's Office of any future enforcement actions; and
- TCEQ seeking other relief as authorized by law.

In addition, any falsification of any compliance documents may result in criminal prosecution.

Jeff Lane June 15, 2012
Signature Date

JEFF LANE V. Pres.
Name (Printed or typed) Title
Authorized Representative of
LANE PLATING WORKS, INC.

Instructions: Send the original, signed Agreed Order with penalty payment to the Financial Administration Division, Revenues Section at the address in Section IV, Paragraph 1 of this Agreed Order.

Reference 26

GUIDELINES

FOR THE

CLASSIFICATION

AND

CODING

OF

INDUSTRIAL

AND

HAZARDOUS WASTES

TEXAS COMMISSION ON
ENVIRONMENTAL QUALITY

WASTE PERMITS DIVISION

RG-022 Revised 11/14

GUIDELINES FOR THE CLASSIFICATION AND CODING OF INDUSTRIAL AND HAZARDOUS WASTES

THIS IS A GUIDANCE DOCUMENT AND SHOULD NOT BE INTERPRETED AS A REPLACEMENT TO THE RULES.
The rules for classifying and coding industrial wastes and hazardous wastes may be found in 30 Texas Administrative Code (TAC) Sections (§§) 335.501-.521 (Subchapter R).

Prepared by:

I&HW Permits Section, MC 130
Waste Permits Division
Texas Commission on Environmental Quality
P.O. Box 13087
Austin, Texas 78711-3087

RG-022
Texas Commission on Environmental Quality

Bryan W. Shaw, Ph.D., P.E., *Chairman*
Toby Baker, *Commissioner*
Zak Covar, *Commissioner*

Richard A. Hyde, P.E., *Executive Director*

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Contents

Chapter 1
1 **INTRODUCTION**

Chapter 2
3 **"WASTE STREAMS"—A KEY CONCEPT**

Chapter 3
4 **WASTE CLASSIFICATION CHECKLIST**

Chapter 4
12 **PROCESS KNOWLEDGE, ANALYTICAL TESTING, AND DOCUMENTATION REQUIREMENTS**

Chapter 5
14 **TEXAS WASTE CODE FORMULA**

Chapter 6
16 **NOTIFICATION REQUIREMENTS AND FORMS**

Chapter 7
18 **MANAGEMENT OF MECHANICAL SHREDDING WASTES**

Chapter 8
19 **DEFINITIONS OF TERMS**

Appendices, Tables and Figures listed on page iv.

Contents Continued

APPENDICES

Appendix A
24 **Hazardous Substances**

Appendix B
31 **Ignitable Solids**

Appendix C
33 **Class 1 Toxic Constituents' Maximum Leachable Concentrations**

Appendix D
35 **7-Day Distilled Water Leachate Test's Maximum Contaminant Levels**

Appendix E
36 **Class 1 Toxic Constituents**

Appendix F
38 **7-Day Distilled Water Leachate Test Procedure**

Appendix G
39 **Form Codes**

Appendix H
46 **Codes for Out-of-State Waste Generators and Receivers**

FIGURES

Figure 1-1
1 **Hazardous and Nonhazardous Wastes**

Figure 5-1
15 **Components of a Texas Waste Code**

TABLES

Table 2-1
3 **An Operation's Overall Waste Flow Can Produce Multiple "Waste Streams"**

Table 3-1
6 **TCLP Regulatory Levels**

Table 5-1
15 **Questions to Ask about Some Combinations of Coding and Classification**

Chapter 3

Waste Classification Checklist

This chapter provides a checklist to help you classify your hazardous waste and your nonhazardous industrial waste. For an overview of these types of waste, refer back to Figure 1-1 in Chapter 1; for more details, refer to 30 TAC Chapter 335 Subchapter R Sections 335.501–508. (You can obtain your own copy of state rules from the TCEQ publications unit; ways to contact this unit are listed under the heading "TCEQ and EPA Forms" in Chapter 6.)

Process Knowledge vs. Analytical Testing

In determining a waste stream's classification, a generator may use *process knowledge* and/or *analytical testing*. Process knowledge is the owner or operator's knowledge about how the facility operates, how a waste was produced and handled, and other information based on operating experience. Analytical testing is information about a waste from laboratory analysis.

In the checklist, the nonhazardous classification criteria that could involve analytical testing have been marked with an *. This marking **does not** mean that analytical testing is the only way to evaluate these criteria. If sufficient process knowledge is available, little or no analysis may need to be performed. You should evaluate whether you have enough process knowledge about the waste to classify it or whether analytical testing is needed.

Documentation

Regardless of whether you rely on process knowledge or opt for analytical testing, you must fully document the information used in making your waste classification. **A completed checklist does not qualify as full documentation**. Documentation should be in a written and/or electronically stored format that is reasonably accessible and easily reproducible. For details on documentation requirements, see Chapter 4.

Part I. Hazardous Waste Determination

All waste generators should work through Part I of this checklist. In this part you will determine whether your waste is hazardous because (a) it is listed as hazardous by EPA or (b) it displays characteristics that EPA says make it hazardous.

In federal regulatory language, the first step in classifying your waste is called "making a *hazardous waste determination*." The definition of hazardous waste, based upon the Resource Conservation and Recovery Act (RCRA), is found in Title 40 of the Code of Federal Regulations (CFR), Part 261.

This TCEQ guidance document reflects the hazardous waste definition in the *Federal Register* as of July 1, 2004. If that definition changes, the generator is still responsible for making an accurate hazardous waste determination in accordance with the latest regulations—instead of with what is printed in this guidance document.

IF the answer to any of the questions in Part I is "Yes,"
THEN the waste is hazardous.

Possible *Exclusions* from Hazardous Classification

Under certain conditions, some types of wastes are excluded from being considered hazardous (40 CFR Sections 261.3–4). Generators may wish to review these exclusions before working through Part I of this checklist.

Part I-A. *Listed* Hazardous Waste Determination

The EPA lists some 400 hazardous wastes.

Information to Help You Make This Determination

Descriptions of listed waste are found in 40 CFR Part 261, Subpart D, Sections 261.31–33. These wastes are often referred to as follows:

- "F" listed waste (waste from nonspecific sources, Section 261.31);
- "K" listed waste (wastes from specific sources, Section 261.32);
- "P" listed waste (unused acutely hazardous off-specification materials as well as container residues and spill residues of these materials, Section 261.33);
- "U" listed waste (unused toxic hazardous off-specification materials as well as container residues and spill residues of these materials, Section 261.33).

QUESTION: Is the waste a listed hazardous waste, or is it mixed with or derived from one? ☐ Yes ☐ No

Part I-B. *Characteristic* Hazardous Waste Determination

Wastes may be hazardous if they display any of four characteristics: ignitability, corrosiveness, reactivity, or toxicity.

Information to Help You Make This Determination

Ignitability

Wastes that are hazardous because they may ignite include the following:

- Liquid wastes (other than those aqueous waste containing less than 24 percent alcohol by volume) that have a flash point less than 60°C (140°F). (The test method is the Pensky-Martens closed cup tester, using the test method specified in ASTM Standard D-93-79 or D-93-80, or a Setaflash closed cup tester, using the test method specified in ASTM Standard D-3278-78.)
- Nonliquid wastes that, under standard temperature and pressure, are capable of causing fire through friction, absorption of moisture, or spontaneous chemical changes and, when ignited, burn so vigorously and persistently that they create a hazard.
- Wastes that meet the definition of an ignitable compressed gas (see 49 CFR Section 173.300).
- Wastes that meet the definition of an oxidizer (see 49 CFR Section 173.151).

QUESTION: Is the waste ignitable according to 40 CFR Section 261.21? ☐ Yes ☐ No

Corrosiveness

Wastes that are hazardous because they are corrosive include the following:

- aqueous wastes with a pH of 2 units or below or of 12.5 units or above;
- liquid wastes that corrode steel at a rate greater than 6.35 mm (0.250 inches) per year.

QUESTION: Is the waste corrosive according to 40 CFR Section 261.22? ☐ Yes ☐ No

Reactivity

A waste is considered reactive if it meets any of the following conditions:

- It is capable of detonation or explosive decomposition or reaction
  - at standard temperature and pressure,
  - if subjected to a strong ignition source, or
  - if heated under confinement.
- When mixed with water, it is
  - potentially explosive,
  - reacts violently, or
  - generates toxic gases or vapors.
- If a cyanide or sulfide-bearing waste is exposed to pH conditions between 2 and 12.5, it can generate enough toxic gases, vapors, or fumes to present a danger to human health or the environment. Generally, if a waste generates **250** ppm or more of reactive cyanides or **500** ppm or more of reactive sulfides, it is considered a reactive waste. (It should be noted that these levels of reactive compounds are just guidance. Each waste must be evaluated for reactivity on a case-by-case basis).
- It is normally unstable and readily undergoes violent change without detonating.
- It is a forbidden explosive (as defined in 49 CFR 173.51, or a Class A explosive as defined in 49 CFR 173.53).
- It is a Class B explosive (see 49 CFR Section 173.88).

QUESTION: Is the waste reactive according to 40 CFR Section 261.23? ☐ Yes ☐ No

Toxicity

A waste is toxic if the toxicity characteristic leaching procedure (TCLP) shows that a representative sample from the waste contains one or more constituents at or above the levels listed in Table 3-1. The TCLP is described in EPA Method 1311 (SW-846).

QUESTION: Is the waste toxic according to 40 CFR Section 261.24? ☐ Yes ☐ No

Table 3-1. TCLP Regulatory Levels

arsenic —5.0 mg/l	1,4-dichlorobenzene — 7.5 mg/l	nitrobenzene — 2.0 mg/l
barium — 100.0 mg/l	1,2-dichloroethane — 0.5 mg/l	pentachlorophenol — 100.0 mg/l
benzene — 0.5 mg/l	1,1-dichloroethylene — 0.7 mg/l	pyridine — 5.0 mg/l
cadmium — 1.0 mg/l	2,4-dinitrotoluene — 0.13 mg/l	selenium — 1.0 mg/l
carbon tetrachloride — 0.5 mg/l	endrin — 0.02 mg/l	silver — 5.0 mg/l
chlordane — 0.03 mg/l	heptachlor (and its epoxide) — 0.008 mg/l	tetrachloroethylene — 0.7 mg/l
chlorobenzene — 100.0 mg/l	hexachlorobenzene — 0.13 mg/l	toxaphene — 0.5 mg/l
chloroform — 6.0 mg/l	hexachlorobutadiene — 0.5 mg/l	trichloroethylene — 0.5 mg/l
chromium — 5.0 mg/l	hexachloroethane — 3.0 mg/l	2,4,5-trichlorophenol — 400.0 mg/l
o-cresol — 200.0 mg/l	lead — 5.0 mg/l	2,4,6-trichlorophenol — 2.0 mg/l
m-cresol — 200.0 mg/l	lindane — 0.4 mg/l	2,4,5-TP (Silvex) — 1.0 mg/l
p-cresol — 200.0 mg/l	mercury — 0.2 mg/l	vinyl chloride — 0.2 mg/l
cresol — 200.0 mg/l	methoxychlor — 10.0 mg/l	
2,4-D — 10.0 mg/l	methyl ethyl ketone — 200.0 mg/l	

Review of Checklist Part I: Hazardous Waste

IF the answer to any of the preceding questions in Part I is "Yes,"
THEN the waste is HAZARDOUS; PROCEED to Chapter 4.

IF the answers are "No" to all the preceding questions,
AND the waste is NONINDUSTRIAL,
THEN STOP here.

IF the answers are "No" to all of the preceding questions,
AND the waste is INDUSTRIAL,
THEN PROCEED to Part II.

Part II: Nonhazardous Industrial Waste Classes 1 & 2

The determination in this part of the checklist applies only to nonhazardous industrial waste—see Figure 1-1 in Chapter 1. (This part of the checklist is based on regulations found in 30 TAC Sections 335.505–06 and 335.508).

IF the answer to any of the **un-numbered** questions in this part of the checklist is "Yes,"
THEN the nonhazardous industrial waste is a Class 1 waste.

IF all the answers to the **un-numbered** questions in this part are "No,"
THEN the industrial waste is a Class 2 waste.

Generator's Self-Classification

QUESTION: Has the generator chosen to classify its nonhazardous waste as Class 1? ☐ Yes ☐ No

Container Waste

IF the waste is a container, greater than 5 gallons in holding capacity, which has held

- a hazardous substance (as defined in 40 CFR Part 302 and listed in Appendix A of this guidance document),
- a hazardous waste (including acutely hazardous wastes),
- a Class 1 waste, and/or
- a material that would be classified as a hazardous or Class 1 waste if disposed of,

THEN answer questions 1 and 2. *(Please note that containers that have held acutely hazardous wastes must be triple-rinsed before they can be classified as empty).*

IF these conditions are not present in your situation,
THEN proceed to the next un-numbered question.

1. Has the container had all its residues removed? ☐ Yes ☐ No
2. Has the container been rendered unusable? ☐ Yes ☐ No

QUESTION: Are ***any*** of the answers to questions (1) or (2) above "NO"? ☐ Yes ☐ No

Regulated Asbestos-Containing Material (RACM)

(See Chapter 8, Definition of Terms, for information on RACM.)

QUESTION: Does the waste contain asbestos material identified as RACM, as defined in 40 CFR Part 61? * ☐ Yes ☐ No

Polychlorinated Biphenyls (PCBs)

QUESTION: Is the waste contaminated by a material that originally contained 50 or more parts per million (ppm) total PCBs? * ☐ Yes ☐ No

QUESTION: Does the waste contain 50 or more ppm PCBs?* ☐ Yes ☐ No

Petroleum Substance Waste

1. Is your waste specifically identified as a *petroleum substance* (see Chapter 8, Definitions of Terms) or contaminated with a material identified as a petroleum substance waste? ☐ Yes ☐ No
2. Does the waste contain more than 1,500 ppm total petroleum hydrocarbons (TPH)? ☐ Yes ☐ No

QUESTION: Are the answers to **both** of the numbered questions above "Yes"? (If one or both of the answers are "No," enter "No" for this question.) ☐ Yes ☐ No

"New Chemical Substance"

See "new chemical substances wastes" in Chapter 8, Definitions and Terms, for a description of how this particular type of waste may be classified as Class 2 or 3.

QUESTION: Is the waste from the production of a "new chemical substance," as defined by the federal Toxic Substances Control Act, 15 U.S.C.A. Section 2602(9)? ☐ Yes ☐ No

Out-of-State Origin

See "wastes generated out-of-state" in Chapter 8, Definitions of Terms, for details on how this particular type of waste may be classified as Class 2 or 3.

QUESTION: Is the waste generated outside Texas? ☐ Yes ☐ No

Constituent Levels and Specified Properties for Nonhazardous Industrial Class 1 Wastes

QUESTION: If the waste is a liquid, does it have a flash point of less than 65.6^{O}C (150^{O}F)? * ☐ Yes ☐ No

QUESTION: Is the waste a solid or semi-solid that—under conditions normally encountered in storage, transportation, and disposal—

- is liable to cause fires through friction or through retained heat from manufacturing or processing; or
- can be ignited readily, and when ignited burns so vigorously and persistently as to create a serious hazard? ☐ Yes ☐ No

QUESTION: Is the waste a semi-solid or solid that, when mixed with an equivalent weight of ASTM Type II laboratory distilled or deionized water, produces a solution with a pH of 2 or less or 12.5 or more? ☐ Yes ☐ No
(***Exception:*** for solidified, stabilized, encapsulated, or otherwise chemically bound wastes, an exception is provided in 30 TAC Section 335.505(3)) *

QUESTION: Does the waste leach Class 1 toxic constituents at or above the levels listed in Table 1, Appendix 1 of 30 TAC Chapter 335 Subchapter R when submitted to the toxicity characteristic leaching procedure (TCLP)? * ☐ Yes ☐ No
(For a copy of Table 1, Appendix 1, see Appendix C of this guidance document.)

(Where matrix interferences of the waste cause the Practical Quantitation Limit (PQL) of the specific analysis to be greater than the Maximum Concentration listed in Table 1, Appendix 1 of 30 TAC Chapter 335 Subchapter R, then the achievable PQL becomes the Maximum Concentration, provided that the generator maintains documentation that satisfactorily demonstrates to the TCEQ that lower levels of quantitation of a sample are not possible.)

A satisfactory demonstration includes the results from the analysis of the waste for that specific constituent by a laboratory using an appropriate method found in *Test Methods for the Evaluation of Solid Waste, Physical/Chemical Methods* (EPA SW-846); *Methods or Chemical Analysis of Water and Wastes* (EPA-600 series); *Standard Methods for the Examination of Water and Wastewater*; *American Society for Testing and Materials (ASTM) Standard Methods*; or an equivalent method approved by the TCEQ.

Lack of Class 2 or 3 Information

QUESTION: Is information lacking that demonstrates the waste belongs in Class 2 or 3? ☐ Yes ☐ No

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Review of Checklist Part II: Class 1 or 2 Nonhazardous Industrial Waste

IF	the answer to any of the preceding **un-numbered** questions in Part II is "Yes,"
THEN	the nonhazardous industrial waste is a Class 1 waste.
PROCEED	to Chapter 4.

IF	the answers are "No" to all the preceding **un-numbered** questions in Part II,
THEN	the industrial waste is a Class 2 waste.
PROCEED	to Chapter 4.

IF	the answers are "No" to all of the preceding **un-numbered** questions in Part II,
AND	the industrial generator wishes to evaluate the waste for a possible Class 3 status,
THEN PROCEED	to Part III.

Part III: Nonhazardous Industrial Class 3 Waste

This part of the checklist applies only to nonhazardous, industrial waste that does not meet the definition of a Class 1 waste and is not specifically identified as a Class 2 waste. (The corresponding regulations for this part of the checklist can be found in 30 TAC Sections 335.507 and 335.508.)

Part III-A. Initial Determinations for Class 3 Status

IF the answer to any of the following questions in Part III-A is "Yes,"
THEN the nonhazardous, industrial waste ***cannot*** be considered a Class 3 waste.

Containers

QUESTION: Is the waste an empty container? ☐ Yes ☐ No

Medical Waste

(For a definition, see "medical wastes" in Chapter 8.)

QUESTION: Is the waste a medical waste regulated under 30 TAC Chapter 330, Subchapter Y? ☐ Yes ☐ No

Distilled Water Leaching Test

QUESTION: When subjected to the 7-day distilled water leaching test, does the waste leach constituents at or above the maximum contaminant levels listed in Table 3, Appendix 1 of 30 TAC Chapter 335, Subchapter R? * ☐ Yes ☐ No
(Table 3 is reproduced in Appendix D of this guidance document.)

Toxicity Characteristic Leaching Procedure

QUESTION: When submitted to the toxicity characteristic leaching procedure (TCLP), does the waste leach Class 1 toxic constituents listed in Table 1, Appendix 1 of 30 TAC Chapter 335 Subchapter R at or above their detection levels? * ☐ Yes ☐ No
(The list of Class 1 toxic constituents is reproduced in Appendix E of this guidance document.)

Exclusion: Excluded from this list of Class 1 toxic constituents are those addressed in the previous question (that is, constituents identified in Table 3, Appendix 1 of 30 TAC Chapter 335 Subchapter R).

Petroleum Hydrocarbons

QUESTION: Does the waste contain detectable levels of petroleum hydrocarbons (Method 1005)? * ☐ Yes ☐ No

Polychlorinated Biphenyls (PCBs)

QUESTION: Does the waste contain detectable levels of PCBs? * ☐ Yes ☐ No

Decomposition

QUESTION: Is the waste readily decomposable? ☐ Yes ☐ No

Review of Checklist Part III-A: Class 3 Nonhazardous Industrial Waste

IF the answer to any of the preceding questions in Part III-A is "Yes,"
THEN the nonhazardous, industrial waste ***cannot*** be considered a Class 3 waste.

IF all the answers to the preceding questions in Part III-A are "No,"
THEN proceed to Part III-B to continue the waste's evaluation for possible Class 3 status.

Part III-B: Final Determinations for Class 3 Status

Inertness

QUESTION: Is the waste inert? (Inertness refers to chemical inactivity of an element, a compound, or a waste.) ☐ Yes ☐ No

Insolubility

QUESTION: Is the waste essentially insoluble? ☐ Yes ☐ No
(***Note***: wastes that contain liquids are *NOT* considered insoluble.)

Review of Checklist Part III

IF the answer to any question under Part III-B is "No,"
THEN the nonhazardous, industrial waste ***cannot*** be considered a Class 3 waste.

IF all the answers to the questions in Part III-A are "No,"
AND all the answers to the questions in Part III-B are "YES,"
THEN the nonhazardous industrial waste is a Class 3 waste.

Part IV. Variance from Waste Classification

The TCEQ may determine, on a case-by-case basis, the merits of a variance request for a specific nonhazardous classification. The burden of justifying the need for a variance is on the requestor. The requestor must submit information sufficient to clearly indicate the issues involved, the reason(s) for the request, and both the positive and negative impacts that may result from the granting of the variance. (The regulations corresponding to these types of variance requests can be found in 30 TAC Section 335.514, Variance from Waste Classification Provisions.)

* **As a reminder**, these characteristics need not necessarily be addressed by analytical testing. A generator may be able to address them through process knowledge. For more information on process knowledge, please see Chapter 4 of this guidance document.

Appendix C

Class 1 Toxic Constituents' Maximum Leachable Concentrations

(30 TAC Chapter 335 Subchapter R Appendix 1 Table 1)

Applicability: **Class 1, 2, and 3 Waste Evaluations**

Values are based on information contained in Federal Registers Vol. 55 / Friday, July 27, 1990; Vol. 56 / June 7, 1991; and Integrated Risk Information Systems, Environmental Protection Agency, and 40 CFR 264 Appendix 9.

Compound	CAS No.	Concentration (mg/l)
Acenaphthene	83-32-9	210
Acetone	67-64-1	400
Acetonitrile	75-05-8	20
Acetophenone	98-86-2	400
Acrylamide	79-06-1	0.08
Acrylonitrile	107-13-1	0.6
Aniline	62-53-3	60
Anthracene	120-12-7	1050
Antimony	7440-36-0	1
Arsenic	7440-38-2	1.8
Barium	7440-39-3	100.0
Benzene	71-43-2	0.50
Benzidine	92-87-5	0.002
Beryllium	7440-41-7	0.08
Bis(2-chloroethyl) ether	111-44-4	0.3
Bis(2-ethylhexyl) phthalate	117-81-7	30
Bromodichloromethane	75-27-4	0.3
Bromomethane	74-83-9	5
Butylbenzyl phthalate	85-68-7	700
Cadmium	7440-43-9	0.5
Carbon disulfide	75-15-0	400
Carbon tetrachloride	56-23-5	0.50
Chlordane	57-74-9	0.03
Chlorobenzene	108-90-7	70
Chloroform	67-66-3	6.0
Chloro-m-cresol, p	59-50-7	7000
2-Chlorophenol	95-57-8	20
Chromium	7440-47-3	5.0
m-Cresol	108-39-4	200.0*
o-Cresol	95-48-7	200.0*
p-Cresol	106-44-5	200.0*
DDD	72-54-8	1
DDE	72-55-9	1
DDT	50-29-3	1
Dibutyl phthalate	84-74-2	400
1,4-Dichlorobenzene	106-46-7	7.5
3,3-Dichlorobenzidine	91-94-1	0.8
1,2-Dichloroethane	107-06-2	0.50
Dichlorodifluoromethane	75-71-8	700
1,1-Dichloroethylene	75-35-4	0.6
1,3-Dichloropropene	542-75-6	1
2,4-Dichlorophenol	120-83-2	10
2,4-Dichlorophenoxy-acetic acid (2,4-D)	94-75-7	10.0
Dieldrin	60-57-1	0.02
Diethyl phthalate	84-66-2	3000
Dimethoate	60-51-5	70
2,4-Dimethyphenol	105-67-9	70
2,6-Dimethyphenol	576-26-1	21
m-Dinitrobenzene	99-65-0	0.4
2,4-Dinitrophenol	51-28-5	7
2,4-Dinitrotoluene (and 2,6-, mixture)	602-01-7	0.13
Dinoseb	88-85-7	3.5
1,4-Dioxane	123-91-1	30
Dioxins (Polychlorinated dibenzo-p-dioxins)		
2,3,7,8-TCDD	1746-01-6	0.005
1,2,3,7,8-PeCDD	40321-76-4	0.010
1,2,3,4,7,8-HxCDD	57653-85-7	0.050
1,2,3,6,7,8-HxCDD	34465-46-8	0.050
1,2,3,7,8,9-HxCDD		0.050
Diphenylamine	122-39-4	90
1,2-Diphenylhydrazine	122-66-7	0.4
Disulfoton	298-04-4	0.1
Endosulfan	959-98-8	0.2
Endrin	72-20-8	.02
2-Ethoxyethanol	10-80-5	1400
Ethylbenzene	100-41-4	400
Ethylene dibromide	106-93-4	0.004
Ethylene glycol	107-21-1	7000
Fluoranthene	206-44-0	140
Fluorene	86-73-7	140
Furans (Polychlorinated dibenzofurans)		
2,3,7,8-TCDF	51207-31-9	0.050
1,2,3,7,8-PeCDF		0.100
2,3,4,7,8-PeCDF		0.010
1,2,3,4,7,8-HxCDF		0.050
1,2,3,6,7,8-HxCDF		0.050
1,2,3,7,8,9-HxCDF		0.050
Heptachlor	76-44-8	0.008
Heptachlor epoxide	1024-57-3	0.04
Hexachlorobenzene	118-74-1	0.13
Hexachloro-1,3-butadiene	87-68-3	0.4
Hexachlorocyclopentadiene	77-47-4	20
Hexachloroethane	67-72-1	3.0
Hexachlorophene	70-30-4	1
Isobutyl alcohol	78-83-1	1000
Isophorone	78-59-1	90

Appendix C — Class 1 Toxic Constituents' Maximum Leachable Concentrations (MCLs)

Compound	CAS No.	Concentration (mg/l)	Compound	CAS No.	Concentration (mg/l)
Lead	7439-92-1	1.5	Pyridine	110-86-1	4
Lindane	58-89-9	0.3	Selenium	7782-49-2	1.0
Mercury	7439-97-6	0.2	Silver	7440-22-4	5.0
Methacrylonitrile	126-98-7	0.4	Styrene	100-42-5	700
Methomyl	16752-77-5	90	1,1,1,2-Tetrachloroethane	630-20-6	10
Methoxychlor	72-43-5	10.0	1,1,2,2-Tetrachloroethane	79-34-5	2
2-Methoxyethanol	109-86-4	14.0	Tetrachloroethylene	127-18-4	0.7
Methyl ethyl ketone	78-93-3	200.0	2,3,4,6-Tetrachlorophenol	58-90-2	100
Methyl isobutyl ketone	108-10-1	200	Toluene	108-88-3	1000
Methylene chloride	75-09-2	50	Toxaphene	8001-35-2	0.3
Methyl parathion	298-00-0	0.9	trans-1,3-Dichloropropene	542-75-6	1
Mirex	2385-85-5	0.7	Tribromomethane (Bromoform)	75-25-2	70
Nickel	7440-02-0	70			
Nitrobenzene	98-95-3	2.0	1,2,4-Trichlorobenzene	120-82-1	70
N-Nitroso-di-n-butylamine	924-16-3	0.06	1,1,1-Trichloroethane	71-55-6	300
N-Nitrosodiphenylamine	86-30-6	70	Trichloroethylene	79-01-6	0.5
N-Nitrosomethylethylamine	10595-95-6	0.02	1,1,2-Trichloroethane	79-00-5	6
N-Nitroso-n-propylamine	621-64-7	0.05	Trichlorofluoromethane	75-69-4	1000
N-Nitrosopyrrolidine	930-55-2	0.2	2,4,5-Trichlorophenoxy-propionic acid (2,4,5-TP or Silvex)	93-72-1	1.0
p-Phenylenediamine	106-50-3	20			
Parathion	56-38-2	20			
Pentachlorobenzene	608-93-5	3	1,2,3-Trichloropropane	96-18-4	20
Pentachloronitrobenzene	82-68-8	10	2,4,5-Trichlorophenol	95-95-4	400.0
Pentachlorophenol	87-86-5	100.0	2,4,6-Trichlorophenol	88-06-2	2
Phenol	108-95-2	2000	Vanadium pentoxide	1314-62-1	30
Pronamide	23950-58-5	300	Vinyl chloride	75-01-4	0.2
Pyrene	129-00-0	5.9	Xylenes (all isomers)	1330-82-1	7000

* If o-, m-, and p-cresol concentrations cannot be differentiated, the total cresol concentration is used. The Maximum Concentration for total cresol is 200.0 mg/l.

Appendix G

Form Codes

(30 TAC Chapter 335 Subchapter R Appendix 3)

Applicability: **All Waste**

In determining a waste stream's form code, it is recommended that the generator first determine into which major category the waste stream fits (e.g. inorganic liquids). The generator should then review all the form code descriptors in that category to determine which code or codes best describe the generator's waste stream. The generator should then choose, from the narrowed-down list, a form code for the waste stream.

Form codes are fairly generic in their descriptions. It is possible that more than one form code may be applicable to a particular waste stream. Generators should assign the form code which best describes the waste stream. If more than one form code can "best describe" the waste stream, then the generator should choose one of those several codes.

Code	Waste Description
	— Lab Packs —
	Lab Packs *— Lab packs of mixed wastes, chemicals, lab wastes*
001	Lab packs of old chemicals only
002	Lab packs of debris only
003	Mixed lab packs
004	Lab packs containing acute hazardous wastes
009	Other lab packs (Specify in Comments)
	— Liquids —
	Inorganic Liquids *— Waste that is primarily inorganic and highly fluid (e.g., aqueous), with low suspended inorganic solids and low organic content*
101	Aqueous waste with low solvents
102	Aqueous waste with low other toxic organics
103	Spent acid with metals
104	Spent acid without metals
105	Acidic aqueous waste
106	Caustic solution with metals but no cyanides
107	Caustic solution with metals and cyanides
108	Caustic solution with cyanides but no metals
109	Spent caustic
110	Caustic aqueous waste
111	Aqueous waste with reactive sulfides
112	Aqueous waste with other reactives (e.g., explosives)
113	Other aqueous waste with high dissolved solids
114	Other aqueous waste with low dissolved solids
115	Scrubber water
116	Leachate
117	Waste liquid mercury
119	Other inorganic liquids (Specify in Comments)
198	Nonhazardous photographic chemical wastes (inorganic)
199	Brine solution that could also bear the form code 113
	Organic Liquids *— Waste that is primarily organic and is highly fluid, with low inorganic solids content and low-to-moderate water content*
201	Concentrated solvent-water solution
202	Halogenated (e.g., chlorinated) solvent
203	Non-halogenated solvent
204	Halogenated/non-halogenated solvent mixture
205	Oil-water emulsion or mixture
206	Waste oil
207	Concentrated aqueous solution of other organics
208	Concentrated phenolics
209	Organic paint, ink, lacquer, or vanish
210	Adhesives or epoxies
211	Paint thinner or petroleum distillates
212	Reactive or polymerizable organic liquids
219	Other organic liquids (Specify in Comments)
296	Ethylene glycol based antifreeze

Code	Waste Description
297	Nonhazardous liquids containing greater than or equal to (>) 50 and less than (<) 500 ppm PCBs
298	Nonhazardous liquids containing greater than or equal to (>) 500 ppm PCBs
299	Nonhazardous photographic chemical waste (organic)

— Solids —

*(These codes **do not** apply to pumpable waste.)*

Inorganic Solids** — Waste that is primarily inorganic and solid, with low organic content and low-to-moderate water content; **not pumpable

301	Soil contaminated with organics
302	Soil contaminated with inorganics only
303	Ash, slag, or other residue from incineration of wastes
304	Other "dry" ash, slag, or thermal residue
305	"Dry" lime or metal hydroxide solids chemically "fixed"
306	"Dry" lime or metal hydroxide solids not "fixed"
307	Metal scale, filings, or scrap
308	Empty or crushed metal drums or containers
309	Batteries or battery parts, casings, cores
310	Spent solid filters or adsorbents
311	Asbestos solids and debris
312	Metal-cyanide salts/chemicals
313	Reactive cyanide salts/chemicals
314	Reactive sulfide salts/chemicals
315	Other reactive salts/chemicals
316	Other metal salts/chemicals
319	Other waste inorganic solids (Specify in Comments)
388	Empty or crushed glass containers
389	Nonhazardous sandblasting waste
390	Nonhazardous concrete/cement/ construction debris
391	Nonhazardous dewatered wastewater treatment sludge
392	Nonhazardous dewatered air pollution control device sludge
393	Catalyst waste
394	Nonhazardous solids containing greater than or equal to (>) 50 ppm and less than (<) 500 ppm PCBs
395	Nonhazardous solids containing greater than or equal to (>) 500 ppm PCBs
396	Nonhazardous electrical equipment/devices containing greater than or equal to (>) 50ppm and less than (<) 500 ppm PCBs
397	Nonhazardous electrical equipment/devices containing greater than or equal to (>) 500 ppm PCBs
398	Nonhazardous soils containing greater than or equal to (>) 50 ppm and less than (<) 500 ppm PCBs
399	Nonhazardous soils containing greater than or equal to (>) 500 ppm PCBs

Organic Solids** — Waste that is primarily organic and solid, with low-to-moderate inorganic content and water content; **not pumpable

401	Halogenated pesticide solid
402	Non-halogenated pesticide solid
403	Solids resins or polymerized organics
404	Spent carbon
405	Reactive organic solid
406	Empty fiber or plastic containers
407	Other halogenated organic solids (Specify in Comments)
409	Other non-halogenated organic solids (Specify in Comments)
488	Wood debris
489	Petroleum contaminated solids
490	Sand blasting waste
491	Dewatered biological treatment sludge
492	Dewatered sewage or other untreated biological sludge
493	Catalyst waste
494	Solids containing greater than or equal to (>) 50 ppm and less than (<) 500 ppm PCBs
495	Solids containing greater than or equal to (>) 500 ppm PCBs
496	Electrical equipment/devices containing greater than or equal to (>) 50 ppm and less than (<) 500 ppm PCBs
497	Electrical equipment/devices containing greater than or equal to (>) 500 ppm PCBs
498	Soil containing greater than or equal to (>) 50 ppm and less than (<) 500 ppm PCBs
499	Soils containing greater than or equal to (>) 500 ppm PCBs

— Sludges —

(These codes only apply to pumpable waste.)

Inorganic Sludges** — Waste that is primarily inorganic, with moderate-to-high water content and low organic content, and **pumpable

501	Lime sludge without metals
502	Lime sludge with metals/metal hydroxide sludge

Code	Waste Description
503	Wastewater treatment sludge with toxic organics
504	Other wastewater treatment sludge
505	Untreated plating sludge without cyanides
506	Untreated plating sludge with cyanides
507	Other sludge with cyanides
508	Sludge with reactive sulfides
509	Sludge with other reactives
510	Degreasing sludge with metal scale or filings
511	Air pollution control device sludge (e.g., fly ash, wet scrubber sludge)
512	Sediment or lagoon dragout contaminated with organics
513	Sediment or lagoon dragout contaminated with inorganics only
514	Drilling mud
515	Asbestos slurry or sludge
516	Chloride or other brine sludge
519	Other inorganic sludges (Specify in Comments)
597	Catalyst waste
598	Nonhazardous sludges containing greater than or equal to (>) 50 ppm and less than (<) 500 ppm PCBs
599	Nonhazardous sludges containing greater than or equal to (>) 500 ppm PCBs

Organic Sludges *— Waste that is primarily organic with low-to-moderate inorganic solids content and water content, and* ***pumpable***

601	Still bottoms of halogenated (e.g., chlorinated) solvents or other organic liquids
602	Still bottoms on non-halogenated solvents or other organic liquids
603	Oily sludge
604	Organic paint or ink sludge
605	Reactive or polymerizable organics
606	Resins, tars, or tarry sludge
607	Biological treatment sludge
608	Sewage or other untreated biological sludge
609	Other organic sludges (Specify in Comments)
695	Petroleum contaminated sludges other than still bottoms and oily sludges
696	Grease
697	Catalyst waste
698	Nonhazardous sludges containing greater than or equal to (>) 50 ppm and less than (<) 500 ppm PCBs
699	Nonhazardous sludges containing greater than or equal to (>) 500 ppm PCBs

— Gases —

Inorganic Gases *— Waste that is primarily inorganic with a low organic content and is a gas at atmospheric pressure*

701	Inorganic gases

Organic Gases *— Waste that is primarily organic with low-to-moderate inorganic content and is a gas at atmospheric pressure*

801	Organic gases

— Plant Trash —

(In order to be considered for one of the two plant refuse designations, a waste must first meet the following two criteria.

First*, the waste* ***must*** *be a Class 2 waste. This means that a proper classification determination must be performed for each item which a facility is considering as one of the plant refuse designations. A waste is not a Class 2 solely because it has been designated as a plant refuse waste.* ***Hazardous*** *and* ***Class 1 wastes*** *are* ***not eligible*** *for designation as one of the plant refuses.*

Second*, the waste must meet the particular definition of the plant refuse term. For more information on these terms, please refer to the terms listed in this table as well as the "Definitions" section which follows this table.)*

902 **Supplemental plant production refuse** – any Class 2 waste from production, manufacturing, or laboratory operations as long as the total amount of the supplemental plant production refuse does not exceed twenty percent of the total plant trash (form code 999) volume or weight, whichever is less – this could include, but is not limited to, such things as metal parts, floor sweepings, and off-specification materials

999 **Plant Trash** – any Class 2 waste originating in the facility offices, laboratory, plant production area or food services/cafeteria operations that is composed of paper, cardboard, linings, wrappings, paper and/or wooden packaging materials, uncontaminated food wastes and/or packaging, cafeteria wastes, glass, aluminum foil, aluminum cans, aluminum scrap, stainless steel, steel, iron scrap, plastics, styrofoam, rope, twine, uncontaminated rubber, uncontaminated wooden materials, equipment belts, wirings, uncontaminated cloth, metal bindings, empty containers with a holding capacity of less than five gallons, uncontaminated floor sweepings, and personal cosmetics generated by facility personnel (does not include cosmetics generated as a result of manufacturing or plant production operations).

Form Code Definitions

The following are definitions of terms utilized in form codes:

Acidic – A material having a pH less than 7.0.

Alkaline – A material having a pH greater than 7.0.

Aqueous – A water solution containing organic and/or inorganic constituents dissolved in solution.

Caustic – A material which is corrosive or irritating to living tissue and has a pH greater than 7.

Inorganic – Chemicals that are not organic (i.e., water, carbon dioxide, carbon disulfide, iron, zinc, steel). Generally, if a waste is composed of more than 50% inorganic materials, it is considered an inorganic waste.

Organic – Chemicals composed primarily of carbon and hydrogen and their derivatives. (i.e. methylene chloride, benzene, petroleum products). In general, if a waste is composed of 50% or more organic materials, it is considered an organic waste.

Plant Trash – Includes the following Class 2 wastes which are produced as a result of plant production, manufacturing, laboratory, general office, cafeteria or food service operations; paper, cardboard, linings, wrappings, paper or wood packaging materials, food wastes, cafeteria wastes, glass, aluminum foil, aluminum cans, aluminum scrap, stainless steel, steel, iron scrap, plastics, styrofoam, rope, twine, uncontaminated rubber, uncontaminated wooden materials, equipment belts, wirings, uncontaminated cloth, metal bindings, empty containers with a holding capacity of less than five gallons, uncontaminated floor sweepings, and personal cosmetics generated by facility personnel (does not include cosmetics generated as a result of manufacturing or plant production operations). **Please note that hazardous waste and Class 1 waste can not be designated as "plant office refuse".** Plant trash shall not include oils, lubricants of any type, oil filters, contaminated soils, sludges, or wastewaters.

Examples of "plant trash" include Class 2 soda cans, lunch sacks, food scraps, envelopes, plastic binders, empty boxes, pallets, styrofoam shipping boxes, chemical container liners, shrink wrap, and broken glassware.

As another example, used typing paper from the secretarial area could be considered "plant trash" because it resulted from general office operations. (Please note that typing paper would normally be considered a Class 2 waste unless it were contaminated with something to cause it to be considered a hazardous or Class 1 waste. For example, if typing paper were used to clean up a spill of a F003 waste, it would be considered a hazardous waste.)

As another example, a Class 2 off-specification production chemical could not be considered "plant trash" because it does not meet the definition of a "plant trash". However, the Class 2 off-specification production chemical might be considered a "supplemental plant production refuse" as long as the weight/volume limits established for "supplemental plant production refuse" were not exceeded. (For more information on "supplemental plant production refuse" and weight/volume limits, please see "Supplemental Plant Production Refuse" in these definitions.

Reactive – A material is reactive if it is capable of detonation or explosive decomposition:
1. at standard temperature and pressure, or
2. if subjected to a strong ignition source, or
3. heated under confinement.

A material is also considered reactive if, when mixed with water it is:
1. potentially explosive, or
2. reacts violently, or
3. generates toxic gases or vapors (i.e. hydrogencyanide or hydrogensulfide).

A material is also considered reactive if it is:
1. normally unstable and readily undergoes violent changes, or
2. a forbidden explosive (see 49 CFR §173.53), or
3. a Class B explosive (see 49 CFR §173.88).

Solvent – A liquid used to dissolve another material.

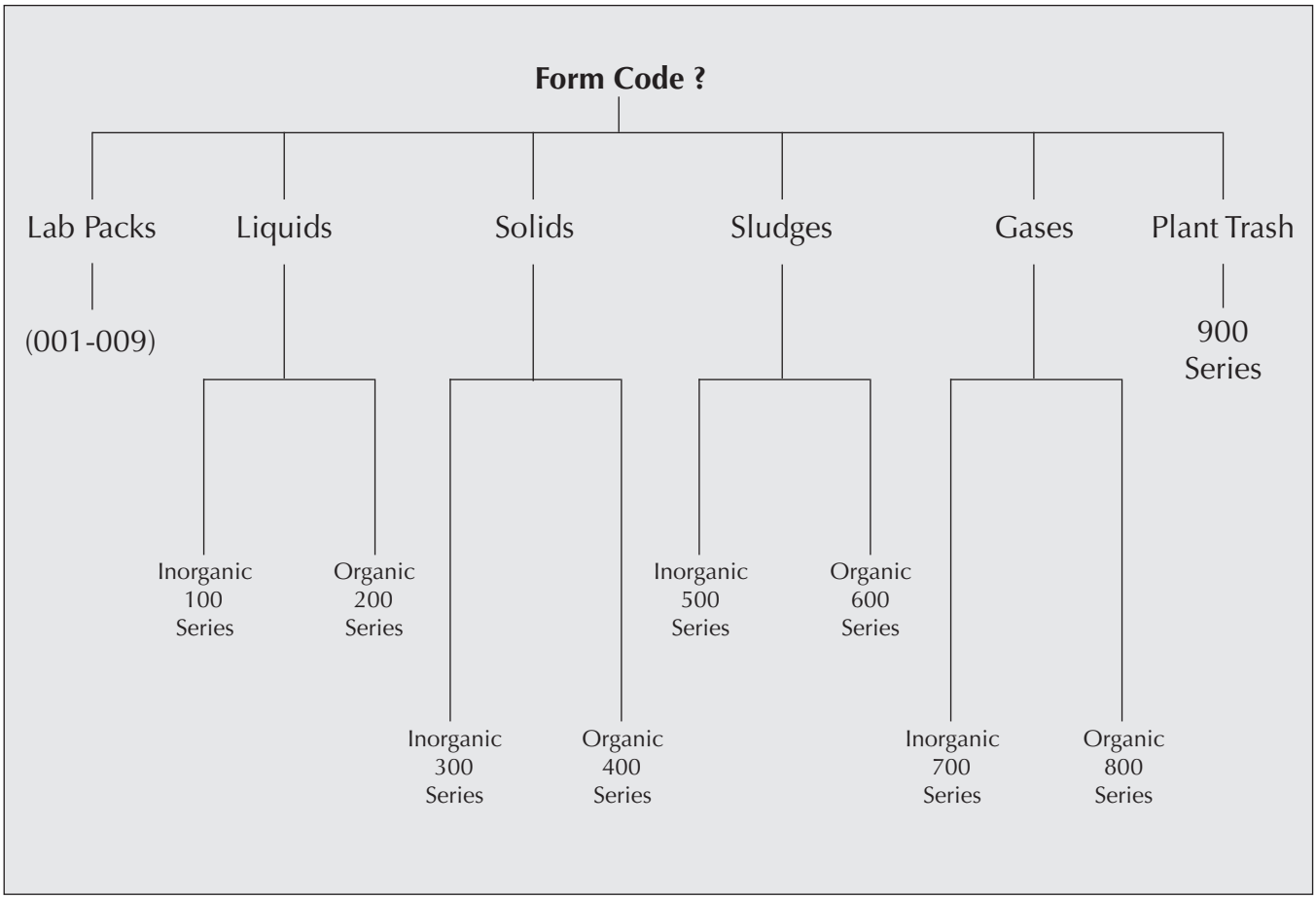
Supplemental Plant Production Refuse – Any **Class 2 Waste from production, manufacturing, or laboratory operations** can be designated as **"supplemental plant production refuse"** (form code 999) as long as the total amount of the supplemental plant production refuse **does not exceed twenty percent of the total plant production refuse volume or weight, whichever is less.**

Individual wastes which have been designated "supplemental plant production refuse" may be designated by the generator at a later time as a separate waste in order to maintain the "supplemental plant production refuse" at a level below 20% of the "plant trash" amount. For any waste stream so redesignated, the generator must provide the initial notification information required pursuant to 30 TAC Chapter 335.

Please note that hazardous waste and Class 1 waste can not be designated as "supplemental plant production refuse".

Examples of "supplemental plant production refuse" include Class 2 steel shavings, empty metal containers, aerosol cans, old chemicals, safety equipment, and machine parts.

Please note that when a site notifies the Commission that it generates "supplemental plant production refuse", it must include a list of those wastes which are expected to be included in the "supplemental plant production refuse" designation. If that list increases, the generator must notify the Commission of the additions to that list; otherwise, the Commission will not view the additions as "supplemental plant production refuse".



Lab Packs – 001-009 series

Examples:

1. Lab pack containing debris — **002**
2. Lab pack containing old unused or partially used chemicals — **001**

Plant Trash – 900 series

Examples:

1. Office debris (i.e., paper, plastic, aluminum cans and fax paper) — **999**
2. Scrap plastic from molds of toys and souvenirs — **902**
3. Packing debris from unpacking of raw materials — **999**

Liquids

Inorganic – 100 series

(Waste that is primarily inorganic and highly fluid, (e.g., aqueous), with low suspended solids and low organic content.)

Examples:

1. 99% water with 1% methanol — **101**
2. 98% water with 2% methyl ethyl ketone MEK — **102**
3. Waste sulfuric acid from plastics cleaning — **104**
4. Water with 0.73% potassium permanganate — **114**
5. Leachate from landfills — **116**
6. Waste photographic fixer — **198**

Organic – 200 series

(Waste that is primarily organic and is highly fluid, with low inorganic solids and low-to-moderate water content.)

Examples:

1. Solvent mixture 65% methylene chloride, 30% phenol, 5% cresol — **204**
2. 95% motor oil, 5% water emulsion — **205**
3. Used hydraulic oil — **206**
4. Unused varnish and organic paint — **209**
5. Waste ethylene glycol antifreeze — **296**

Solids

Inorganic – 300 series

*(Waste that is primarily inorganic and solid, with low organic content and low-to-moderate water content; **not pumpable**.)*

Examples:

1. Soil contaminated with naptha — **301**
2. Incinerator ash — **303**
3. Crushed RCRA empty metal drums — **308**
4. Lead acid batteries, chips and cores — **309**
5. Concrete, plaster and other construction debris — **390**
6. Metalic catalyst waste — **393**

Organic – 400 series

*(Waste that is primarily organic and solid, with low-to-moderate inorganic and water content; **not pumpable**.)*

Examples:

1. Unused malathion pellets — **402**
2. Spent carbon from filters — **404**
3. Wooden house exterior debris — **488**
4. Paper contaminated with oil — **489**
5. Sand blasting waste from petroleum tanks — **490**
6. Dewatered sewage sludge — **492**

Sludges

Inorganic – 500 series

*(Waste that is primarily inorganic, with moderate-to-high water content, and low organic content, and **pumpable**.)*

Examples:

1. Wastewater treatment sludge containing phenolics — **503**
2. Zinc plating wastewater sludge containing cyanide — **506**
3. Sludge from pollution removal scrubber — **511**
4. Sediment pond dragout contaminated with lead — **513**
5. Water based drilling mud with brine — **514**
6. Waste metal catalyst with 0.89% organics — **597**

Organic – 600 series

*(Waste that is primarily organic, with moderate-to-high water content, and low inorganic content, and **pumpable**.)*

Examples:

1. Still bottoms from naptha recovery — **602**
2. Ink and paint sludge from printing billboards — **604**
3. Bioremediation sludge from oil spill cleanup — **607**
4. Motor repair facility sludge with grease — **603**
5. Refinery wastewater sludge with petroleum compounds — **695**
6. Waste lubricating grease — **696**

Gases

Inorganic – 701

(Waste that is primarily inorganic with a low organic content and is a gas at atmospheric pressure.)

Organic – 801

(Waste that is primarily organic with low-to-moderate inorganic content and is a gas at atmospheric pressure.)

Reference 27

TCEQ

Region 4 - DFW Office

Attachment 9

Sampling Plan

Investigation No. 1197542

Lane Plating Works, Inc.

Dallas, TX (Dallas County)

Date of Investigation: 10/21/2014

TCEQ/R4 Waste Section
Sampling and Analysis Plan
Lane Plating, Inc.
5233 Bonnie View Road
Dallas, Texas, 75241 (Dallas County)
SWR No. 31215

Date Inspection: 10/21/2014
Date Sampling: 10/21/2014

Collection of Samples

1. Collect grab and/or composite samples from selected areas on-site that could be areas of concern.
2. Maintain a written record of action throughout the day.

Blanks and duplicate samples will be collected in accordance to the current version of FOD "QUALITY CONTROL GUIDELINES FOR SAMPLING BY TCEQ FIELD INVESTIGATORS IN THE WASTE PROGRAM."

Sample Preservation

1. No chemical preservatives will be used in the soil samples.

   All samples will be kept on ice to help achieve and maintain an optimum temperature of 4 degrees Celsius between the time of collection and delivery to Xenco Labs located at 9701 Harry Hines Blvd Dallas, TX 75220 for analysis.

Sample Shipment Chain of Custody

Each sample will be affixed with a label that lists the sampler's name, sample identification number, date, time of sample collection, and analysis to be performed. Samples will be kept in a secure location during transportation to Xenco Labs.

Containers:

8-oz. glass jars

Equipment

Soil sample collections will be made with a disposable plastic scoop. The sample collector will be wearing disposal latex gloves that will be discarded after the collection of the sample at each site.

Records

Field notes may be used to record any pertinent details of the sampling event, particularly any deviation from this Sampling and Analysis Plan. Investigators may take photographs during the sampling event. An investigation report for TCEQ will be generated and filed. It is expected that correspondence concerning the results of the investigation will be directed to the entity.

TCEQ

Region 4 - DFW Office

Attachment 10

TCEQ Sample Results and Chain of Custody

Investigation No. 1197542

Lane Plating Works, Inc.

Dallas, TX (Dallas County)

Date of Investigation: 10/21/2014

Sample Results – Lane Plating

Samples Collected: 10/21/2014

Sample ID Nos.	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium - totals	Chrome 6	Lead	Nickel	Selenium	Silver	Mercury
Sample 52317 - 1	0.086	4.42	49.3	0.593	2.67	890	561	23.4	15.8	<.442	<.177	0.642
Sample 52317 - 3	10.6	5.56	80.7	0.431	52.3	2,550	32.5	1370	1,330	<.435	2.28	31.1
Sample 52317 - 4	8.29	5.47	66	0.289	76.4	1,440	<.100	500	298	<.500	0.521	12
Sample 52317 - 5	672	<4.76	90	<1.90	97.7	19,700	49.8	41,200	583	<4.76	9.4	136
Sample 52317 - 6	271	<4.81	75	<1.92	70.4	10,200	73.2	26,400	486	<4.81	4.46	124
Sample 52317 - 7	21.7	0.549	17.1	<.198	266	758	240	1,380	147	<.498	1.29	0.889

	C8-C10 Aliphatic	C10-C12 Aliphatic	C12-C16 Aliphatic	C16-C21 Aliphatic	C21-C35 Aliphatic	C7-C8 Aromatic	C8-C10 Aromatic	C10-C12 Aromatic	C12-C16 Aromatic	C16-C21 Aromatic	C21-C36 Aromatic
Sample 52317 - 2	<50.0	<50.0	188	2,730	361,000	<100	<50.0	<50.0	2,190	208	23,600

- Results in red exceed the Tier 1 Residential Protective Concentration Levels (PCLs) as determined by 30 TAC Chapter 350 – Texas Risk Reduction Program (TRRP), November 2014 Revision
- All sample results are reported in mg/kg

TCLP Sample Results – Lane Plating

Samples Collected: 10/21/2014

Sample ID Nos.	Antimony - TCLP	Chromium - TCLP	Lead - TCLP	Nickel - TCLP
Sample 52317 - 5	<.0500	3.06	9.37	0.173
Sample 52317 - 6	<.0500	2.54	4.16	0.196

- Results in red exceed the Tier 1 Residential Protective Concentration Levels (PCLs) as determined by 30 TAC Chapter 350 – Texas Risk Reduction Program (TRRP), November 2014 Revision
- All sample results are reported in mg/kg

Analytical Report 495675

for

TCEQ-Region 04

Project Manager: Hannah Bent

52317

52317

30-OCT-14

Collected By: Client

9701 Harry Hines Blvd, Dallas, TX 75220

Xenco-Houston (EPA Lab code: TX00122):
Texas (T104704215-14-18), Arizona (AZ0765), Florida (E871002), Louisiana (03054)
New Jersey (TX007), North Carolina(681), Oklahoma (9218), Pennsylvania (68-03610)

Xenco-Atlanta (EPA Lab Code: GA00046):
Florida (E87429), North Carolina (483), South Carolina (98015), Kentucky (85), DoD (L10-135)
Texas (T104704477), Louisiana (04176), USDA (P330-07-00105)

Xenco-Lakeland: Florida (E84098)
Xenco-Odessa (EPA Lab code: TX00158): Texas (T104704400-TX)
Xenco-Dallas (EPA Lab code: TX01468): Texas (T104704295-TX)
Xenco Phoenix (EPA Lab Code: AZ00901): Arizona(AZ0757)
Xenco-Phoenix Mobile (EPA Lab code: AZ00901): Arizona (AZM757)
Xenco Tucson (EPA Lab code:AZ000989): Arizona (AZ0758)

Table of Contents

Cover Page 1
Cover Letter 3
Sample ID Cross Reference 4
Case Narrative 5
Certificate of Analysis (Detailed Report) 6
Summary of Quality control 13
Explanation of Qualifiers (Flags) 15
Chain of Custody 16
Sample Receipt Conformance Report 17

30-OCT-14

Project Manager: **Hannah Bent**
TCEQ-Region 04
2309 Gravel Drive
Fort Worth, TX 76118

Reference: XENCO Report No(s): **495675**
52317
Project Address: 52317

Hannah Bent:

We are reporting to you the results of the analyses performed on the samples received under the project name referenced above and identified with the XENCO Report Number(s) 495675. All results being reported under this Report Number apply to the samples analyzed and properly identified with a Laboratory ID number. Subcontracted analyses are identified in this report with either the NELAC certification number of the subcontract lab in the analyst ID field, or the complete subcontracted report attached to this report.

Unless otherwise noted in a Case Narrative, all data reported in this Analytical Report are in compliance with NELAC standards. The uncertainty of measurement associated with the results of analysis reported is available upon request. Should insufficient sample be provided to the laboratory to meet the method and NELAC Matrix Duplicate and Matrix Spike requirements, then the data will be analyzed, evaluated and reported using all other available quality control measures.

The validity and integrity of this report will remain intact as long as it is accompanied by this letter and reproduced in full, unless written approval is granted by XENCO Laboratories. This report will be filed for at least 5 years in our archives after which time it will be destroyed without further notice, unless otherwise arranged with you. The samples received, and described as recorded in Report No. 495675 will be filed for 60 days, and after that time they will be properly disposed without further notice, unless otherwise arranged with you. We reserve the right to return to you any unused samples, extracts or solutions related to them if we consider so necessary (e.g., samples identified as hazardous waste, sample sizes exceeding analytical standard practices, controlled substances under regulated protocols, etc).

We thank you for selecting XENCO Laboratories to serve your analytical needs. If you have any questions concerning this report, please feel free to contact us at any time.

Respectfully,

Monica Tobar
Project Manager

Recipient of the Prestigious Small Business Administration Award of Excellence in 1994.
Certified and approved by numerous States and Agencies.
A Small Business and Minority Status Company that delivers SERVICE and QUALITY

Houston - Dallas - Odessa - San Antonio - Tampa - Lakeland - Atlanta - Phoenix - Oklahoma - Latin America

Sample Cross Reference 495675

TCEQ-Region 04, Fort Worth, TX

52317

Sample Id	Matrix	Date Collected	Sample Depth	Lab Sample Id
52317-01	S	10-21-14 15:09		495675-001
52317-02	S	10-21-14 15:16		495675-002
52317-03	S	10-21-14 15:21		495675-003
52317-04	S	10-21-14 15:24		495675-004
52317-05	S	10-21-14 15:29		495675-005
52317-06	S	10-21-14 15:32		495675-006
52317-07	S	10-21-14 15:38		495675-007

Certificate of Analytical Results 495675

TCEQ-Region 04, Fort Worth, TX

52317

Sample Id: 52317-01
Lab Sample Id: 495675-001

Matrix: Solid
Date Collected: 10.21.14 15.09

Date Received:10.22.14 11.24

Analytical Method: Mercury by SW7471A
Tech: DAT
Analyst: DAT
Seq Number: 954216

Date Prep: 10.28.14 11.00

Prep Method: SW7471P
% Moisture:
Basis: Wet Weight

Parameter	Cas Number	Result	RL	Units	Analysis Date	Flag	Dil
Mercury	7439-97-6	0.642	0.0265	mg/kg	10.30.14 08.57		10

Analytical Method: Metals per ICP by SW846 6010B
Tech: DAT
Analyst: DAT
Seq Number: 954197

Date Prep: 10.27.14 09.00

Prep Method: SW3050B
% Moisture:
Basis: Wet Weight

Parameter	Cas Number	Result	RL	Units	Analysis Date	Flag	Dil
Antimony	7440-36-0	0.865	0.442	mg/kg	10.30.14 07.59		1
Arsenic	7440-38-2	4.42	0.442	mg/kg	10.30.14 07.59		1
Barium	7440-39-3	49.3	0.442	mg/kg	10.30.14 07.59		1
Beryllium	7440-41-7	0.593	0.177	mg/kg	10.30.14 07.59		1
Cadmium	7440-43-9	2.67	0.221	mg/kg	10.30.14 07.59		1
Chromium	7440-47-3	890	0.221	mg/kg	10.30.14 07.59		1
Lead	7439-92-1	23.4	0.531	mg/kg	10.30.14 07.59		1
Nickel	7440-02-0	15.8	0.442	mg/kg	10.30.14 07.59		1
Selenium	7782-49-2	<0.442	0.442	mg/kg	10.30.14 07.59	U	1
Silver	7440-22-4	<0.177	0.177	mg/kg	10.30.14 07.59	U	1

CASE NARRATIVE

Client Name: TCEQ-Region 04
Project Name: 52317

Project ID: *52317*
Work Order Number(s): *495675*

Report Date: *30-OCT-14*
Date Received: *10/22/2014*

Sample receipt non conformances and comments:

Sample receipt non conformances and comments per sample:

None

Analytical non conformances and comments:
Batch: LBA-954149 TPH Speciation by Texas 1006 - Aliphatics
Surrogate 1-Chlorooctane recovered above QC limits. Matrix interferences is suspected; data confirmed by re-analysis Samples affected are: 495675-002.

Batch: LBA-954197 Metals per ICP by SW846 6010B
Antimony, Lead, Selenium recovered below QC limits in the Matrix Spike and Matrix Spike Duplicate. Chromium, Nickel recovered below QC limits in the Matrix Spike Duplicate. Samples affected are: 495675-004, -005, -006, -007, -001, -003.
The Laboratory Control Sample for Chromium, Antimony, Nickel, Selenium, Lead is within laboratory Control Limits

Certificate of Analytical Results 495675

TCEQ-Region 04, Fort Worth, TX

52317

Sample Id: 52317-02 Matrix: Solid Date Received:10.22.14 11.24
Lab Sample Id: 495675-002 Date Collected: 10.21.14 15.16

Analytical Method: TPH Speciation by Texas 1006 - Aliphatics Prep Method: TX1006P
Tech: MAA % Moisture:
Analyst: MAA Date Prep: 10.27.14 09.00 Basis: Wet Weight
Seq Number: 954149

Parameter	Cas Number	Result	RL	Units	Analysis Date	Flag	Dil
C8 to C10 Aliphatic Hydrocarbons	ALHYDRC8C1(	<50.0	50.0	mg/kg	10.27.14 14.35	U	10
C10 to C12 Aliphatic Hydrocarbons	ALHYDRC10C:	<50.0	50.0	mg/kg	10.27.14 14.35	U	10
C12 to C16 Aliphatic Hydrocarbons	ALHYDRC12C:	**188**	50.0	mg/kg	10.27.14 14.35		10
C16 to C21 Aliphatic Hydrocarbons	ALHYDRC16C:	**2730**	50.0	mg/kg	10.27.14 14.35		10
C21 to C35 Aliphatic Hydrocarbons	ALHYDRC21C:	**361000**	4000	mg/kg	10.27.14 15.14	D	200

Surrogate	Cas Number	% Recovery	Units	Limits	Analysis Date	Flag
1-Chlorooctane	111-85-3	204	%	52-126	10.27.14 14.35	**

Analytical Method: TPH Speciation by Texas 1006 - Aromatics Prep Method: TX1006P
Tech: MAA % Moisture:
Analyst: MAA Date Prep: 10.27.14 09.00 Basis: Wet Weight
Seq Number: 953980

Parameter	Cas Number	Result	RL	Units	Analysis Date	Flag	Dil
C7 to C8 Aromatic Hydrocarbons		<100	100	mg/kg	10.27.14 14.55	U	10
C8 to C10 Aromatic Hydrocarbons		<50.0	50.0	mg/kg	10.27.14 14.55	U	10
C10 to C12 Aromatic Hydrocarbons		<50.0	50.0	mg/kg	10.27.14 14.55	U	10
C12 to C16 Aromatic Hydrocarbons		**2190**	50.0	mg/kg	10.27.14 14.55		10
C16 to C21 Aromatic Hydrocarbons		**208**	50.0	mg/kg	10.27.14 14.55		10
C21 to C36 Aromatic Hydrocarbons		**23600**	200	mg/kg	10.27.14 14.55		10

Surrogate	Cas Number	% Recovery	Units	Limits	Analysis Date	Flag
o-Terphenyl	84-15-1	115	%	61-131	10.27.14 14.55	

Certificate of Analytical Results 495675

TCEQ-Region 04, Fort Worth, TX

52317

Sample Id: 52317-03
Lab Sample Id: 495675-003

Matrix: Solid
Date Collected: 10.21.14 15.21

Date Received: 10.22.14 11.24

Analytical Method: Mercury by SW7471A
Tech: DAT
Analyst: DAT
Seq Number: 954216

Date Prep: 10.28.14 11.00

Prep Method: SW7471P
% Moisture:
Basis: Wet Weight

Parameter	Cas Number	Result	RL	Units	Analysis Date	Flag	Dil
Mercury	7439-97-6	31.1	1.52	mg/kg	10.30.14 09.08		500

Analytical Method: Metals per ICP by SW846 6010B
Tech: DAT
Analyst: DAT
Seq Number: 954197

Date Prep: 10.27.14 09.00

Prep Method: SW3050B
% Moisture:
Basis: Wet Weight

Parameter	Cas Number	Result	RL	Units	Analysis Date	Flag	Dil
Antimony	7440-36-0	10.6	0.435	mg/kg	10.30.14 08.08		1
Arsenic	7440-38-2	5.56	0.435	mg/kg	10.30.14 08.08		1
Barium	7440-39-3	80.7	0.435	mg/kg	10.30.14 08.08		1
Beryllium	7440-41-7	0.431	0.174	mg/kg	10.30.14 08.08		1
Cadmium	7440-43-9	52.3	0.217	mg/kg	10.30.14 08.08		1
Chromium	7440-47-3	2550	0.217	mg/kg	10.30.14 08.08		1
Lead	7439-92-1	1370	0.522	mg/kg	10.30.14 08.08		1
Nickel	7440-02-0	1330	0.435	mg/kg	10.30.14 08.08		1
Selenium	7782-49-2	<0.435	0.435	mg/kg	10.30.14 08.08	U	1
Silver	7440-22-4	2.28	0.174	mg/kg	10.30.14 08.08		1

Certificate of Analytical Results 495675

TCEQ-Region 04, Fort Worth, TX

52317

Sample Id: 52317-04 | Matrix: Solid | Date Received: 10.22.14 11.24
Lab Sample Id: 495675-004 | Date Collected: 10.21.14 15.24

Analytical Method: Mercury by SW7471A | Prep Method: SW7471P
Tech: DAT | % Moisture:
Analyst: DAT | Date Prep: 10.28.14 11.00 | Basis: Wet Weight
Seq Number: 954216

Parameter	Cas Number	Result	RL	Units	Analysis Date	Flag	Dil
Mercury	7439-97-6	12.0	0.164	mg/kg	10.30.14 09.10		50

Analytical Method: Metals per ICP by SW846 6010B | Prep Method: SW3050B
Tech: DAT | % Moisture:
Analyst: DAT | Date Prep: 10.27.14 09.00 | Basis: Wet Weight
Seq Number: 954197

Parameter	Cas Number	Result	RL	Units	Analysis Date	Flag	Dil
Antimony	7440-36-0	8.29	0.500	mg/kg	10.30.14 08.23		1
Arsenic	7440-38-2	5.47	0.500	mg/kg	10.30.14 08.23		1
Barium	7440-39-3	66.0	0.500	mg/kg	10.30.14 08.23		1
Beryllium	7440-41-7	0.289	0.200	mg/kg	10.30.14 08.23		1
Cadmium	7440-43-9	76.4	0.250	mg/kg	10.30.14 08.23		1
Chromium	7440-47-3	1440	0.250	mg/kg	10.30.14 08.23		1
Lead	7439-92-1	500	0.600	mg/kg	10.30.14 08.23		1
Nickel	7440-02-0	298	0.500	mg/kg	10.30.14 08.23		1
Selenium	7782-49-2	<0.500	0.500	mg/kg	10.30.14 08.23	U	1
Silver	7440-22-4	0.521	0.200	mg/kg	10.30.14 08.23		1

Certificate of Analytical Results 495675

TCEQ-Region 04, Fort Worth, TX

52317

Sample Id: 52317-05
Lab Sample Id: 495675-005

Matrix: Solid
Date Collected: 10.21.14 15.29

Date Received: 10.22.14 11.24

Analytical Method: Mercury by SW7471A
Tech: DAT
Analyst: DAT
Seq Number: 954216

Date Prep: 10.28.14 11.00

Prep Method: SW7471P
% Moisture:
Basis: Wet Weight

Parameter	Cas Number	Result	RL	Units	Analysis Date	Flag	Dil
Mercury	7439-97-6	136	1.46	mg/kg	10.30.14 09.12		500

Analytical Method: Metals per ICP by SW846 6010B
Tech: DAT
Analyst: DAT
Seq Number: 954197

Date Prep: 10.27.14 09.00

Prep Method: SW3050B
% Moisture:
Basis: Wet Weight

Parameter	Cas Number	Result	RL	Units	Analysis Date	Flag	Dil
Antimony	7440-36-0	672	4.76	mg/kg	10.30.14 08.26		10
Arsenic	7440-38-2	<4.76	4.76	mg/kg	10.30.14 08.26	U	10
Barium	7440-39-3	90.0	4.76	mg/kg	10.30.14 08.26		10
Beryllium	7440-41-7	<1.90	1.90	mg/kg	10.30.14 08.26	U	10
Cadmium	7440-43-9	97.7	2.38	mg/kg	10.30.14 08.26		10
Chromium	7440-47-3	19700	2.38	mg/kg	10.30.14 08.26		10
Lead	7439-92-1	41200	5.71	mg/kg	10.30.14 08.26		10
Nickel	7440-02-0	583	4.76	mg/kg	10.30.14 08.26		10
Selenium	7782-49-2	<4.76	4.76	mg/kg	10.30.14 08.26	U	10
Silver	7440-22-4	9.40	1.90	mg/kg	10.30.14 08.26		10

Certificate of Analytical Results 495675

TCEQ-Region 04, Fort Worth, TX

52317

Sample Id: 52317-06
Lab Sample Id: 495675-006
Matrix: Solid
Date Collected: 10.21.14 15.32
Date Received: 10.22.14 11.24

Analytical Method: Mercury by SW7471A
Tech: DAT
Analyst: DAT
Seq Number: 954216
Date Prep: 10.28.14 11.00
Prep Method: SW7471P
% Moisture:
Basis: Wet Weight

Parameter	Cas Number	Result	RL	Units	Analysis Date	Flag	Dil
Mercury	7439-97-6	124	1.56	mg/kg	10.30.14 09.14		500

Analytical Method: Metals per ICP by SW846 6010B
Tech: DAT
Analyst: DAT
Seq Number: 954197
Date Prep: 10.27.14 09.00
Prep Method: SW3050B
% Moisture:
Basis: Wet Weight

Parameter	Cas Number	Result	RL	Units	Analysis Date	Flag	Dil
Antimony	7440-36-0	271	4.81	mg/kg	10.30.14 08.28		10
Arsenic	7440-38-2	<4.81	4.81	mg/kg	10.30.14 08.28	U	10
Barium	7440-39-3	75.0	4.81	mg/kg	10.30.14 08.28		10
Beryllium	7440-41-7	<1.92	1.92	mg/kg	10.30.14 08.28	U	10
Cadmium	7440-43-9	70.4	2.40	mg/kg	10.30.14 08.28		10
Chromium	7440-47-3	10200	2.40	mg/kg	10.30.14 08.28		10
Lead	7439-92-1	26400	5.77	mg/kg	10.30.14 08.28		10
Nickel	7440-02-0	486	4.81	mg/kg	10.30.14 08.28		10
Selenium	7782-49-2	<4.81	4.81	mg/kg	10.30.14 08.28	U	10
Silver	7440-22-4	4.46	1.92	mg/kg	10.30.14 08.28		10

Certificate of Analytical Results 495675

TCEQ-Region 04, Fort Worth, TX

52317

Sample Id: 52317-07
Lab Sample Id: 495675-007

Matrix: Solid
Date Collected: 10.21.14 15.38

Date Received:10.22.14 11.24

Analytical Method: Mercury by SW7471A
Tech: DAT
Analyst: DAT
Seq Number: 954216

Date Prep: 10.28.14 11.00

Prep Method: SW7471P
% Moisture:
Basis: Wet Weight

Parameter	Cas Number	Result	RL	Units	Analysis Date	Flag	Dil
Mercury	7439-97-6	0.889	0.0323	mg/kg	10.30.14 09.16		10

Analytical Method: Metals per ICP by SW846 6010B
Tech: DAT
Analyst: DAT
Seq Number: 954197

Date Prep: 10.27.14 09.00

Prep Method: SW3050B
% Moisture:
Basis: Wet Weight

Parameter	Cas Number	Result	RL	Units	Analysis Date	Flag	Dil
Antimony	7440-36-0	21.7	0.495	mg/kg	10.30.14 08.37		1
Arsenic	7440-38-2	0.549	0.495	mg/kg	10.30.14 08.37		1
Barium	7440-39-3	17.1	0.495	mg/kg	10.30.14 08.37		1
Beryllium	7440-41-7	<0.198	0.198	mg/kg	10.30.14 08.37	U	1
Cadmium	7440-43-9	266	0.248	mg/kg	10.30.14 08.37		1
Chromium	7440-47-3	758	0.248	mg/kg	10.30.14 08.37		1
Lead	7439-92-1	1380	0.594	mg/kg	10.30.14 08.37		1
Nickel	7440-02-0	147	0.495	mg/kg	10.30.14 08.37		1
Selenium	7782-49-2	<0.495	0.495	mg/kg	10.30.14 08.37	U	1
Silver	7440-22-4	1.29	0.198	mg/kg	10.30.14 08.37		1

QC Summary 495675

TCEQ-Region 04
52317

Analytical Method: Mercury by SW7471A — Prep Method: SW7471P
Seq Number: 954216 — Matrix: Solid — Date Prep: 10.28.14
MB Sample Id: 663621-1-BLK — LCS Sample Id: 663621-1-BKS — LCSD Sample Id: 663621-1-BSD

Parameter	MB Result	Spike Amount	LCS Result	LCS %Rec	LCSD Result	LCSD %Rec	Limits	%RPD	RPD Limit	Units	Analysis Date	Flag
Mercury	<0.00333	0.167	0.179	107	0.182	109	85-115	2	20	mg/kg	10.30.14 08:39	

Analytical Method: Mercury by SW7471A — Prep Method: SW7471P
Seq Number: 954216 — Matrix: Solid — Date Prep: 10.28.14
Parent Sample Id: 495906-003 — MS Sample Id: 495906-003 S — MSD Sample Id: 495906-003 SD

Parameter	Parent Result	Spike Amount	MS Result	MS %Rec	MSD Result	MSD %Rec	Limits	%RPD	RPD Limit	Units	Analysis Date	Flag
Mercury	0.0177	0.164	0.176	97	0.179	98	75-125	2	20	mg/kg	10.30.14 09:35	

Analytical Method: Metals per ICP by SW846 6010B — Prep Method: SW3050B
Seq Number: 954197 — Matrix: Solid — Date Prep: 10.27.14
MB Sample Id: 663519-1-BLK — LCS Sample Id: 663519-1-BKS — LCSD Sample Id: 663519-1-BSD

Parameter	MB Result	Spike Amount	LCS Result	LCS %Rec	LCSD Result	LCSD %Rec	Limits	%RPD	RPD Limit	Units	Analysis Date	Flag
Antimony	<0.500	100	104	104	105	105	85-115	1	20	mg/kg	10.30.14 07:31	
Arsenic	<0.500	100	102	102	103	103	85-115	1	20	mg/kg	10.30.14 07:31	
Barium	<0.500	100	103	103	103	103	85-115	0	20	mg/kg	10.30.14 07:31	
Beryllium	<0.200	100	104	104	104	104	85-115	0	20	mg/kg	10.30.14 07:31	
Cadmium	<0.250	100	105	105	105	105	85-115	0	20	mg/kg	10.30.14 07:31	
Chromium	<0.250	100	104	104	104	104	85-115	0	20	mg/kg	10.30.14 07:31	
Lead	<0.600	100	104	104	104	104	85-115	0	20	mg/kg	10.30.14 07:31	
Nickel	<0.500	100	104	104	104	104	85-115	0	20	mg/kg	10.30.14 07:31	
Selenium	<0.500	100	104	104	106	106	85-115	2	20	mg/kg	10.30.14 07:31	
Silver	<0.200	100	105	105	104	104	85-115	1	20	mg/kg	10.30.14 07:31	

Analytical Method: Metals per ICP by SW846 6010B — Prep Method: SW3050B
Seq Number: 954197 — Matrix: Solid — Date Prep: 10.27.14
Parent Sample Id: 495675-003 — MS Sample Id: 495675-003 S — MSD Sample Id: 495675-003 SD

Parameter	Parent Result	Spike Amount	MS Result	MS %Rec	MSD Result	MSD %Rec	Limits	%RPD	RPD Limit	Units	Analysis Date	Flag
Antimony	10.6	93.5	44.8	37	42.5	35	75-125	5	20	mg/kg	10.30.14 08:11	X
Arsenic	5.56	93.5	87.3	87	82.7	85	75-125	5	20	mg/kg	10.30.14 08:11	
Barium	80.7	93.5	158	83	152	78	75-125	4	20	mg/kg	10.30.14 08:11	
Beryllium	0.431	93.5	86.0	92	82.0	90	75-125	5	20	mg/kg	10.30.14 08:11	
Cadmium	52.3	93.5	136	90	134	90	75-125	1	20	mg/kg	10.30.14 08:11	
Chromium	2550	93.5	2700	160	2590	44	75-125	4	20	mg/kg	10.30.14 08:11	X
Lead	1370	93.5	1400	32	1360	0	75-125	3	20	mg/kg	10.30.14 08:11	X
Nickel	1330	93.5	1400	75	1330	0	75-125	5	20	mg/kg	10.30.14 08:11	X
Selenium	<0.467	93.5	57.6	62	59.3	65	75-125	3	20	mg/kg	10.30.14 08:11	X
Silver	2.28	93.5	91.8	96	86.0	92	75-125	7	20	mg/kg	10.30.14 08:11	

TCEQ-Region 04

52317

Analytical Method: TPH Speciation by Texas 1006 - Aliphatics
Seq Number: 954149
Matrix: Solid
MB Sample Id: 663566-1-BLK

Prep Method: TX1006P
Date Prep: 10.27.14

Parameter	MB Result	Units	Analysis Date	Flag
C8 to C10 Aliphatic Hydrocarbons	<5.00	mg/kg	10.27.14 14:16	
C12 to C16 Aliphatic Hydrocarbons	<5.00	mg/kg	10.27.14 14:16	
C16 to C21 Aliphatic Hydrocarbons	<5.00	mg/kg	10.27.14 14:16	
C21 to C35 Aliphatic Hydrocarbons	<20.0	mg/kg	10.27.14 14:16	

Analytical Method: TPH Speciation by Texas 1006 - Aromatics
Seq Number: 953980
Matrix: Solid
MB Sample Id: 663567-1-BLK

Prep Method: TX1006P
Date Prep: 10.27.14

Parameter	MB Result	Units	Analysis Date	Flag
C10 to C12 Aromatic Hydrocarbons	<5.00	mg/kg	10.27.14 13:57	
C12 to C16 Aromatic Hydrocarbons	<5.00	mg/kg	10.27.14 13:57	
C16 to C21 Aromatic Hydrocarbons	<5.00	mg/kg	10.27.14 13:57	
C21 to C36 Aromatic Hydrocarbons	<20.0	mg/kg	10.27.14 13:57	

XENCO Laboratories

Prelogin/Nonconformance Report- Sample Log-In

Client: TCEQ-Region 04

Date/ Time Received: 10/22/2014 11:24:00 AM

Work Order #: 495675

Acceptable Temperature Range: 0 - 6 degC
Air and Metal samples Acceptable Range: Ambient

Temperature Measuring device used : XDA

Sample Receipt Checklist		Comments
#1 *Temperature of cooler(s)?	2.5	
#2 *Shipping container in good condition?	Yes	
#3 *Samples received on ice?	Yes	
#4 *Custody Seals intact on shipping container/ cooler?	N/A	
#5 Custody Seals intact on sample bottles?	Yes	
#6 *Custody Seals Signed and dated?	Yes	
#7 *Chain of Custody present?	Yes	
#8 Sample Instructions complete on Chain of Custody?	Yes	
#9 Any missing/extra samples?	No	
#10 Chain of Custody signed when relinquished/ received?	Yes	
#11 Chain of Custody agrees with sample label(s)?	Yes	
#12 Container label(s) legible and intact?	Yes	
#13 Sample matrix/ properties agree with Chain of Custody?	Yes	
#14 Samples in proper container/ bottle?	Yes	
#15 Samples properly preserved?	Yes	
#16 Sample container(s) intact?	Yes	
#17 Sufficient sample amount for indicated test(s)?	Yes	
#18 All samples received within hold time?	Yes	
#19 Subcontract of sample(s)?	No	
#20 VOC samples have zero headspace (less than 1/4 inch bubble)?	N/A	
#21 <2 for all samples preserved with HNO3,HCL, H2SO4? Except for samples for the analysis of HEM or HEM-SGT which are verified by the analysts.	N/A	
#22 >10 for all samples preserved with NaAsO2+NaOH, ZnAc+NaOH?	N/A	

*** Must be completed for after-hours delivery of samples prior to placing in the refrigerator**

Analyst: PH Device/Lot#:

Checklist completed by: M. Watkins Date: 10/22/2014
Mandy Watkins

Checklist reviewed by: Angelica Martinez Date: 10/23/2014
Angelica Martinez

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Chain of Custody Record

495675-0

52317

Location:

(Do not fill in this shaded area if the facility information must be confidential)

Permit #:

Region:	Organization #:	PCA Code:	Program:	Sampler telephone number:
	6104	04171	Solid Waste	(817) 588-5908

E-Mail ID: HANNAH.BENT@TCEQ.texas.gov

Sampler: (signature) Hannah Bent

Sampler: (please print clearly) Hannah Bent

Lab ID Number	Sample ID	Date	Time	# of Bottles	Grab/ Comp.	Matrix L,S,M,O,T	Cl2	pH	Cond.	Analyses Requested	REMARKS
	-01	10/21/14	1509	1	G	S				RCRA 8 Nickel, Be, Sb	SW-846
	-02	10/21/14	1516 TSQ	1	G	S				TX 1006	
	-03	10/21/14	1521	1	GC	S				RCRA 8 Ni, Be, Sb	
	-04	10/21/14	1524	1	G	S				RCRA 8 Ni, Be, Sb	
	-05	10/21/14	1529	1	C	S				RCRA 8 Ni, Be, Sb	
	-06	10/21/14	1532	1	C	S				RCRA 8 Ni, Be, Sb	
	-07	10/21/14	1538	1	GC	S				RCRA 8 Ni, Be, Sb	
	-08	↓	↓	↓	↓	↓				↓	↓
	-09										
	-10										

Relinquished by:	Date	Time	Received by:
Hannah Bent	10/22/14	9:33	M. Watkins
Relinquished by:	Date	Time	Received by:
Relinquished by:	Date	Time	Received by:
Relinquished by: M. Watkins	Date 10/22/14	Time 11:24	Received by: 10/22/14 11:24

Shipper name: Shipper Number:

For Laboratory Use:

Received on ice: (Y) N

Temp Device: XDA
As Read: 1.2 C (+0.8)
Corrected: ____ C

Preservatives: Y N

COC Seal: Y N

Seals Intact: Y N

TCEQ-10065 (11/02) White (Original) -Lab Yellow-Lab Pink-Contract Lab Manager Goldenrod-Collector

Flagging Criteria

X In our quality control review of the data a QC deficiency was observed and flagged as noted. MS/MSD recoveries were found to be outside of the laboratory control limits due to possible matrix /chemical interference, or a concentration of target analyte high enough to affect the recovery of the spike concentration. This condition could also affect the relative percent difference in the MS/MSD.

B A target analyte or common laboratory contaminant was identified in the method blank. Its presence indicates possible field or laboratory contamination.

D The sample(s) were diluted due to targets detected over the highest point of the calibration curve, or due to matrix interference. Dilution factors are included in the final results. The result is from a diluted sample.

E The data exceeds the upper calibration limit; therefore, the concentration is reported as estimated.

F RPD exceeded lab control limits.

J The target analyte was positively identified below the quantitation limit and above the detection limit.

U Analyte was not detected.

L The LCS data for this analytical batch was reported below the laboratory control limits for this analyte. The department supervisor and QA Director reviewed data. The samples were either reanalyzed or flagged as estimated concentrations.

H The LCS data for this analytical batch was reported above the laboratory control limits. Supporting QC Data were reviewed by the Department Supervisor and QA Director. Data were determined to be valid for reporting.

K Sample analyzed outside of recommended hold time.

JN A combination of the "N" and the "J" qualifier. The analysis indicates that the analyte is "tentatively identified" and the associated numerical value may not be consistent with the amount actually present in the environmental sample.

** Surrogate recovered outside laboratory control limit.

BRL Below Reporting Limit.

RL Reporting Limit

MDL Method Detection Limit SDL Sample Detection Limit LOD Limit of Detection

PQL Practical Quantitation Limit MQL Method Quantitation Limit LOQ Limit of Quantitation

DL Method Detection Limit

NC Non-Calculable

\+ NELAC certification not offered for this compound.

* (Next to analyte name or method description) = Outside XENCO's scope of NELAC accreditation

Reference 28

EPA

EPA
OSWER Directive #9355.4-12
August 1994

MEMORANDUM:
OSWER DIRECTIVE:
REVISED INTERIM SOIL LEAD GUIDANCE FOR CERCLA SITES AND RCRA CORRECTIVE ACTION FACILITIES

Office of Solid Waste and Emergency Response
U.S. Environmental Protection Agency
Washington, DC 20460

NOTICE

This document provides guidance to EPA staff. It also provides guidance to the public and to the regulated community on how EPA intends to exercise its discretion in implementing the National Contingency Plan. The guidance is designed to implement national policy on these issues. The document does not, however, substitute for EPA's statutes or regulations, nor is it a regulation itself. Thus, it cannot impose legally-binding requirements on EPA, States, or the regulated community, and may not apply to a particular situation based upon the circumstances. EPA may change this guidance in the future, as appropriate.

MEMORANDUM

SUBJECT: Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities

FROM: Elliott P. Laws
Assistant Administrator

TO: Regional Administrators I-X

PURPOSE

As part of the Superfund Administrative Improvements Initiative, this interim directive establishes a streamlined approach for determining protective levels for lead in soil at CERCLA sites and RCRA facilities that are subject to corrective action under RCRA section 3004 (u) or 3008 (h) as follows:

- It recommends screening levels for lead in soil for residential land use 400 (ppm);[1]
- It describes how to develop site-specific preliminary remediation goals (PRGs) at CERCLA sites and media cleanup standards (MCSs) at RCRA Corrective Action facilities for residential land use; and,
- It describes a plan for soil lead cleanup at CERCLA sites and RCRA Corrective Action Facilities that have multiple sources of lead.

This interim directive replaces all previous directives on soil lead cleanup for CERCLA and RCRA programs (see the Background section, 1989-1991).

KEY MESSAGES

Screening levels are not cleanup goals. Rather, these screening levels may be used as a tool to determine which sites or portions of sites do not require further study and to encourage voluntary cleanup. Screening levels are defined as a level of contamination above which there may be enough concern to warrant site-specific study of risks. Levels of contamination above the screening level would NOT automatically require a removal action, nor designate a site as "contaminated."

The residential screening level for lead described in this directive has been calculated with the Agency's new Integrated Exposure Uptake Biokinetic Model (IEUBK) model (Pub. # 9285.7-15-2, PB93-963511), using default parameters. As outlined in the Guidance Manual for the IEUBK Model for Lead in Children (Pub. # 9285.7-15-1, PB93-963510, February 1994), this model was developed to: recognize the multimedia nature of lead exposure; incorporate important absorption and pharmacokinetic information; and allow the risk manager to consider the potential distributions of exposure and risk likely to occur at a site (the model goes beyond providing a single point estimate output). For these reasons, this approach is judged to be superior to the more common method for assessing risks of non-cancer health effects which utilizes the reference dose (RfD) methodology. Both the Guidance Manual and the model are available to Superfund staff through the Superfund Document Center (703-603-8917) and to the public through the National Technical Information Service (703-487-4650).

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[1] The residential screening level is the same concept as the action level proposed in the RCRA Corrective Action Subpart S rule (July 27, 1990, 55 *Federal Register* 30798).

Residential preliminary remediation goals (PRGs) for CERCLA remediations and media cleanup standards (MCSs) for RCRA corrective actions can be developed using the IEUBK model on a site-specific basis, where site data support modification of model default parameters. At some Superfund sites, using the IEUBK model with site-specific soil and dust characteristics, PRGs of more than twice the screening level have been identified. However, it is important to note that the model alone does not determine the cleanup levels required at a site. After considering other factors such as costs of remedial options, reliability of institutional controls, technical feasibility, and/or community acceptance, still higher cleanup levels may be selected.

The implementation of this guidance is expected to provide for more consistent decisions across the country and improve the use of site-specific information for RCRA and CERCLA sites contaminated with lead. The implementation of this guidance will aid in determining when evaluation with the IEUBK model is appropriate in assessing the likelihood that environmental lead poses a threat to the public. Use of the IEUBK model in the context of this guidance will allow risk managers to assess the contribution of different environmental sources of lead to overall blood lead levels (e.g., consideration of the importance of soil lead levels relative to lead from drinking water, paint and household dust). It offers a flexible approach to considering risk reduction options (referred to as the "bubble" concept) that allows for remediation of lead sources that contribute significantly to elevated blood lead. This guidance encourages the risk manager to select, on a site-specific basis, the most appropriate combination of remedial measures needed to address site-specific lead exposure threats. These remedial measures may range widely from intervention to abatement. However, RCRA and CERCLA have very limited authority to address interior exposures from interior paint. For detailed discussion of the decision logic for addressing lead-contaminated sites, see the Implementation section and Appendix A.

Relationship to lead paint guidance. In addition, this interim directive clarifies the relationship between guidance on Superfund and RCRA Corrective Action cleanups, and EPA's guidance on lead-based paint hazards (discussed further in Appendix C). The paint hazard guidance will be issued to provide information until the Agency issues regulations identifying lead-based paint hazards as directed by Section 403 of the Toxic Substances Control Act (TSCA).[2] Lead-based paint hazards are those lead levels and conditions of paint, and residential soil and dust that would result in adverse health effects.

The two guidance documents have different purposes and are intended to serve very different audiences. As a result the approaches taken differ to some degree. The lead-based paint hazard guidance is intended for use by any person who may be involved in addressing residential lead exposures (from paint, dust or soil). It thus relates to a potentially huge number of sites, and serves a very broad potential audience, including private property owners or residents in addition to federal or state regulators. Much residential lead abatement may take place outside any governmental program, and may not involve extensive site-specific study.

This OSWER guidance, on the other hand, deals with a much smaller number of sites, being addressed under close federal regulatory scrutiny, at which extensive site characterization will have been performed before cleanup decisions are made. Thus, the RCRA and CERCLA programs will often have the benefit of much site-specific exposure information. This guidance is intended for use by the relatively small number of agency officials who oversee and direct these cleanups.

Both the TSCA Section 403 and OSWER programs use a flexible, tiered approach. The OSWER guidance sets a residential screening level at 400 ppm. As noted above, this is not intended to be a "cleanup level" for CERCLA and RCRA facilities, but only to serve as an indicator that further study is appropriate. The Section 403 guidance indicates that physical exposure-reduction activities may be appropriate at 400 ppm, depending upon site-specific conditions such as use patterns, populations at risk and other factors. Although worded somewhat differently, the guidances are intended to be similar in effect. For neither guidance is 400 ppm to automatically be considered a "cleanup level"; instead, it indicates a need for considering further action, but not necessarily for taking action. Neither is meant to indicate that cleanup is necessarily appropriate at 400 ppm. The greater emphasis in this OSWER guidance on determining the scope of further study reflects the fact that both CERCLA and RCRA cleanups proceed in stages with detailed site characterization preceding response actions in every case.

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[2]Title IV of TSCA (including section 403) was added by the Residential Lead-Based Paint Hazard Reduction Act of 1992 (Title X of the Housing and Community Development Act of 1992).

Above the 400 ppm level, the Section 403 guidance identifies ranges over which various types of responses are appropriate, commensurate with the level of potential risk reduction, and cost incurred to achieve such risk reduction. For example, in the range of 400 to 5000 ppm, limited interim controls are recommended depending, as noted above, on conditions at the site, while above 5000 ppm, soil abatement is recommended. This OSWER guidance does not include comparable numbers above 400 ppm; instead, as discussed above, it recommends the site-specific use of the IEUBK model to set PRGs and MCSs, when necessary. The remedy selection process specified in the National Contingency Plan (NCP) should then be used to decide what type of action is appropriate to achieve those goals.

In general, because the Section 403 guidance was developed for a different purpose and audience, OSWER does not recommend that it be used as a reference in setting PRGs and MCSs or in determining whether action at a particular site is warranted. (To put it another way, it generally should not be treated as a "to be considered" document or "TBC" under CERCLA.) The section 403 guidance is meant to provide generic levels that can be used at thousands of widely varying sites across the nation. The detailed study that goes on at CERCLA or RCRA sites will allow levels to be developed that are more narrowly tailored to the individual site. Nothing in the section 403 guidance discourages setting more site-specific levels for certain situations; in fact, it specifically identifies factors such as bioavailability that may significantly affect the evaluation of risk at some sites.

The IEUBK model. The Agency is further studying both the IEUBK model and analyses of epidemiologic studies in order to better develop the technical basis for rulemaking under TSCA Section 403. The Agency intends to promulgate regulations under Section 403 setting health-based standards for lead in soil and dust. OSWER intends to issue a final soil lead directive once the TSCA Section 403 regulations are finalized. For additional information on TSCA Section 403 developments, call (202) 260-1866.

However, the Agency believes that risk managers (risk assessors, on-scene coordinators, remedial project managers, and other decision-makers at Superfund and RCRA sites) are currently in need of the best guidance available today. The Agency believes that the IEUBK model is the best available tool currently available for assessing blood lead levels in children. Furthermore, use of the IEUBK provides allows the risk manager to consider site-specific information that can be very important in evaluating remediation options. Therefore, using the latest developments in the IEUBK model and the collective experience of the Superfund, RCRA Corrective Action, and TSCA Section 403 programs, the Agency is offering this guidance and is recommending a residential screening level for Superfund and RCRA sites of 400 ppm.

BACKGROUND

Early OSWER guidance (1989-1991). Four guidance documents on the soil lead cleanup were issued by OSWER during the period of 1989 to 1991:

1. September 1989, OSWER Directive #9355.4-02. This guidance recommended a soil lead cleanup level of 500 - 1000 ppm for protection of human health at residential CERCLA sites.

2. May 9, 1990. RCRA Corrective Action program guidance on soil lead cleanup. This guidance described three alternative methods for setting "cleanup levels" (not action levels) for lead in soil at RCRA facilities. One approach was to use levels derived from preliminary results of IEUBK model runs. The other two approaches were to use the range of 500 to 100 provided in the 1989 directive on CERCLA sites, or to use "background" levels at the facility in question.

3. June 1990, OSWER Directive #9355.4-02A. Supplement to Interim Guidance on Establishing Soil Land Cleanup Levels at Superfund Sites. This memorandum reiterated that the September 1989 directive was guidance and should not be interpreted as regulation.

4. August 29, 1991. This supplemental guidance discussed EPA's efforts to develop a new directive that would accomplish two objectives: (1) account for the contribution from multiple media to total lead exposure; and, (2) provide a stronger scientific basis for determining a soil lead cleanup level at a specific site.

Development of the IEUBK Model for OSWER use. During the 1989-91 time period, use of EPA IEUBK model was identified as the best available approach for accomplishing the objectives outlined in the August 1991 guidance. The model integrates exposure from lead in air, water, soil, dust, diet, and paint with pharmacokinetic modeling to predict blood lead levels in children (i.e., Children 6 to 84 months old), a particularly sensitive population.

In the spring of 1991, OSWER organized the Lead Technical Review Workgroup to assist Regional risk assessors and site managers in both using the model and making data collection decisions at CERCLA and RCRA sites. The workgroup was composed of scientists and risk assessors from the Regions and Headquarters, including the Office of Research and Development (ORD), and the Office of Pollution Prevention and Toxic Substances (OPPTS).

In November 1991, the EPA Science Advisory Board (SAB) reviewed the scientific merits of using the IEUBK model for assessing total lead exposure and developing soil lead cleanup levels at CERCLA and RCRA sites. In general, the SAB found the model to be an important advance in assessing potential health risks from environmental contaminants. However, the SAB also recommended additional guidance on the proper use of the model.

In response to SAB concern over the potential for incorrect use of the model and selection of inappropriate input values both for default and site-specific applications, OSWER developed a comprehensive "Guidance Manual for the Integrated Exposure Uptake Biokinetic Model for Lead in Children" (referred to in this interim directive as the "Guidance Manual"). This Guidance Manual assists the user in providing inputs to the model to estimate risks from exposures to lead. It discusses the use of model default values or alternative values, and the application of the model to characterize site risks. Use of the Guidance Manual should facilitate consistent use of the IEUBK model and allow the risk assessor to obtain valid and reliable predictions of lead exposure. The Lead Technical Review Workgroup has been collecting data to further validate the model and to update the Guidance Manual as needed.

Relationship to RCRA Corrective Action "Action" Levels. The approach for calculating a screening level for lead (including exposure assumptions), set forth in this Revised Interim Soil Lead Directive, supersedes the guidance provided for calculating "action" levels set forth in Appendix D of the proposed Subpart S Corrective Action rule. In the July 27, 1990 RCRA proposal (55 *Federal Register* 30798), EPA introduced the concept of "action levels" as trigger levels for further study and subsequent remediation at RCRA facilities. In this respect, the current directive's "screening levels" are analogous to the proposed rule's "action levels." In the proposal, where data were available, action levels were developed for three pathways of human exposure to contaminants: soil ingestion, water ingestion and inhalation of contaminated air. Exposure assumptions used in the calculations were set out in Appendix D of the proposal. For the soil pathway, action levels were calculated two different ways depending on whether the contaminant in the soil was a carcinogen or systemic toxicant. Although lead was listed in Appendix A of the preamble to the rule as a class B2 carcinogen, no action level had been calculated because neither a carcinogenic slope factor (SF) nor a reference dose (RfD) had been developed by the Agency. Although the guidance in Appendix D of the proposed Corrective Action rule remains in effect with respect to other hazardous constituents, this directive now allows for the development of the lead screening ("action") level using the IEUBK model.

Recent developments (1992-Present). Following discussions among senior Regional and OSWER management, the OSWER Soil Lead Directive Workgroup (composed of Headquarters, Regional and other Federal agency representatives) recommended in the spring of 1992 that a "two step" decision framework be developed for establishing cleanup levels at sites with lead-contaminated soils. This framework would identify a single level of

lead in soils that could be used as either the PRG for CERCLA site cleanups or the action level for RCRA Corrective Action sites, but would allow site managers to establish site-specific cleanup levels (where appropriate) based on site-specific circumstances. The IEUBK model would be an integral part of this framework. OSWER then developed a draft of this directive which it circulated for review on June 4, 1992. The draft set 500 ppm as a PRG and an action level for RCRA facilities in residential settings.

Following development of this draft, OSWER held a meeting on July 31, 1992 to solicit a broad range of views and expertise. A wide range of interests, including environmental groups, citizens and representatives from the lead industry attended. This meeting encouraged OSWER to think more broadly about how the directive would affect urban areas, how lead paint and dust contribute to overall risk, and blood lead data could be used to assess risk. In subsequent meetings with the Agency for Toxic Substances and Disease Registry (ATSDR) and Centers for Disease Control (CDC), options were discussed on how to use blood lead data and the need to evaluate the contribution of paint. In addition, during these meetings, a "decision tree" approach was suggested that proposed different threshold levels (primary and secondary) for screening decisions, action decisions and land use patterns.

Findings from the three cities (Baltimore, Boston, and Cincinnati) of the Urban Soil Lead Abatement Demonstration Project (peer review scheduled for completion in late 1994) indicate that dust and paint are major contributors to elevated blood lead levels in children. Furthermore, preliminary findings suggest that any strategy to reduce overall lead risk at a site needs to consider not only soil, but these other sources and their potential exposure pathways. (For further information on this demonstration project, contact Dr. Rob Elias, USEPA/ORD, Environmental Criteria And Assessment Office (ECAO), RTP, (919) 541-4167.)

Finally, in its efforts to develop this interim directive, the OSWER Soil Lead Workgroup has met with other EPA workgroups including the TSCA Section 403, Large Area Land Sites, and Urban Lead workgroups, as well as other Federal agencies including the Agency for Toxic Substances and Disease Registry, the Centers for Disease Control, and Department of Housing and Urban Development.

Derivation of Lead Screening Levels. Development of the residential screening level in this interim directive required two important OSWER decisions. 1) OSWER determined that it would seek to achieve a specific level of protectiveness in site cleanups; generally, OSWER will attempt to limit exposure to soil lead levels such that a typical (or hypothetical) child or group of similarly exposed children would have an estimated risk of no more than 5% exceeding the 10 μg lead/dl blood lead level. This 10 μg/dl blood lead level is based upon analyses conducted by the Centers for Disease Control and EPA that associate blood lead levels of 10 μg/dl and higher with health effects in children; however, this blood lead level is below a level that would trigger medical intervention. 2) In developing the residential screening level, OSWER has decided to apply the EPA's IEUBK model on a site-specific basis. This model has been designed specifically to evaluate exposures for children in a residential setting. Current research indicates that young children are particularly sensitive to the effects of lead and require specific attention in the development of a soil screening level for lead. A screening level that is protective for young children is expected to be protective for older population subgroups.

In general, the model generates a probability distribution of blood lead levels for a typical child, or group of children, exposed to a particular soil lead concentration and concurrent lead exposures from other sources. The spread of the distribution reflects the observed variability of blood lead levels in several communities. This variability arises from several sources including behavioral and cultural factors.

The identification of lead exposures from other sources (due to air, water, diet, paint, etc.) is an essential part of characterizing the appropriate blood lead distribution for a specific neighborhood or site. For the purpose of deriving a residential screening level, the background lead exposure inputs to the IEUBK model were determined using national averages, where suitable, or typical values. Thus, the estimated screening level of 400 ppm is associated with an expected "typical" response to these exposures, and should not be taken to indicate that a certain level of risk (e.g., exactly 5% of children exceeding 10 μg/dl blood) will be observed in specific community, e.g., in a blood lead survey.

Because a child's exposure to lead involves a complex array of variables, because there is population sampling variability, and because there is variability in environmental lead measurements and background levels of

lead in food and drinking water, results from the model may differ from results of blood lead screening of children in a community. Extensive field validation is in progress. The model will be evaluated further once these efforts are completed.

OBJECTIVE

With this interim directive, OSWER recommends using 400 ppm soil lead (based on application of the IEUBK model) as a screening level for lead in soil for residential scenarios at CERCLA sites and at RCRA Corrective Action sites. Residential areas with soil lead below 400 ppm generally require no further action. However, in some special situations, further study is warranted below the screening level. For example, agricultural areas, wetlands, areas with ecological risk, and areas of higher than expected human exposure are all situations that could require further study. For further guidance on ecological risks, Superfund risk managers are encouraged to consult their Regional Biological Technical Assistance Groups (BTAGs; see Appendix D).

Generally, the ground water pathway will not pose a significant risk since many lead compounds are generally not highly mobile. However, there are situations where, because of the form of lead, hydrogeology, or the presence of other contaminants at the site, lead may pose a threat to the ground water. In these situations, additional analysis is warranted, Superfund Regional Toxics Integration Coordinators (RTICs; seeAppendix B) or RCRA hydrogeologists should be consulted.

While recognizing that urban lead is a significant problem, this interim directive is not designed to be applied in addressing the potential threat of lead in urban areas other than at CERCLA or RCRA Corrective Action sites. Guidance and regulations to be developed under TSCA Section 403 will provide an appropriate tool for addressing urban sites of potential concern.

Generally, where the screening level is exceeded, OSWER recommends using the IEUBK model during the Remedial Investigation or the RCRA Facility Investigation for evaluating potential risks to humans from environmental exposures to lead under residential scenarios. Site-specific data need to be collected to determine PRGs or MCSs. At a minimum, this may involve collecting soil and dust samples in appropriate areas of the site. Further guidance on data collection or modification of the non-residential equation can be obtained by contacting the RTICs or RCRA Regional risk assesors, who in turn may consult the Lead Technical Review Workgroup.

The type of site-specific data that should be collected will obviously depend on a number of factors, including the proximity of residences to the contaminated soil, the presence of site access controls, and other factors that would influence the probability of actual human exposure to the soils. At a minimum, when residences are at or near the site, it is expected that using the model will generally involve taking soil and dust samples from appropriate areas of the site. In many cases, it may not be necessary to gather certain types of data for input into the model. For example, when there are no residences nearby, or where there is otherwise no exposure or very limited exposure to lead contamination, it may not be necessary to collect site-specific data (e.g., dust, water, paint, blood-lead, etc.)

In developing a PRG for CERCLA sites or a MCS for RCRA facilities, EPA recommends that a soil lead concentration be determined so that a typical child or group of children exposed to lead at this level would have an estimated risk of no more than 5% of exceeding a blood lead of 10 μg/dl. In applying the IEUBK model for this purpose, appropriate site-specific data on model input parameters, including background exposures to lead, would be identified.

When the PRG or MCS is exceeded, remedial action is generally recommended. Such action does not, however, necessarily involve excavating soil. A range of possible actions may be considered, as discussed in greater detail under the Implementation section of this directive: Issues for Both Programs.

IMPLEMENTATION
Superfund

This interim directive applies to all future CERCLA Remedial Investigation/Feasibility Study (RI/FS) work; this interim directive should generally not be applied at sites for which risk assessments have been completed. For

removal sites, this interim directive recommends that decisions regarding removal actions be considered first by the Regional Decision Team (RDT). The RDT will then refer sites to the removal program for early action, as appropriate.

The approach in this interim directive helps meet the goals set by the Superfund Accelerated Cleanup Model (SACM) for streamlining remedial decision-making. (This streamlined approach is described in Appendix A, Suggested Decision Logic for CERCLA and RCRA Corrective Action.) This interim directive also recognizes that other methods (e.g., slope studies and others) for evaluating risks at lead sites may also be appropriate and may be used in lieu of, or in conjunction with, the IEUBK model. If an alternate approach to lead risk assessment is to be applied, an EPA scientific review should be obtained. For example, expert statisticians would need to review slope factor calculations for statistical biases before their use could be supported. Recognizing that all assessment methods involve some uncertainties, the Agency, at this time, believes the IEUBK model is the most appropriate and widely applicable tool for Superfund and RCRA sites. Alternatively, EPA may require setting cleanup levels below the screening level if site-specific circumstances warrant (e.g., ecological risk). For further information on the use of the IEUBK model at CERCLA sites, contact the Regional Toxics Integration Coordinators identified in Appendix B.

RCRA Corrective Action

It is expected that the RCRA corrective action program will generally follow an approach similar to CERCLA's (as described above) in using the IEUBK model. In the case of RCRA facilities at which lead contaminated soils are of concern, collection and evaluation of data for the purpose of using the model will be primarily the responsibility of the owner/operator.

Issues for Both Programs

Cleanup of soils vs. other lead sources: OSWER's approach to assessing and managing risks from lead is intended to address the multi-media/multi-source nature of environmental lead exposures because it is expected that people at or near CERCLA and RCRA Corrective Action sites will experience lead exposures from sources in addition to contaminated soil. In some instances, these other exposures may be large (e.g., where there are children living in houses with high levels of lead dust form deteriorated paint). The presence of various sources of lead exposure may be very important in both the development of site-specific risk assessments and in the consideration of alternative risk management options.

From an assessment perspective, estimating blood lead levels, that might result from exposures at a site, depends on appropriately integrating exposures from all relevant media. Specifically, it is important to consider direct soil exposures and indoor dust exposures (which can include contributions from both soil and lead-based paint) on a site-specific basis, as well as any contributions from drinking water or other local sources of lead exposure. In using the IEUBK model to estimate blood lead levels, it is important to note that the risk attributable to soil lead exposures is dependent upon the existing level of exposures from other sources. That is, the amount by which the total risk would be lowered if all exposures to lead in soil were removed is not a constant, but varies with the level of existing non-soil exposures. This is because the model derives "distribution" (rather than a simple point estimate) as an output whose shape and size is quite dependent on the predicted variability of exposures from each lead source. As a result, other factors being equal, the risks attributable to soil will generally be higher in the presence of elevated lead exposures from other sources. Therefore, in applying the IEUBK model, the risk attributable to soil lead can be predicted as the difference between the risk estimated when all sources of lead exposure are assessed, and the risk estimated considering only non-soil related exposures. This concept is especially important when evaluating different options for risk reduction at a given site.

From a risk management perspective, achieving a safe environment for populations at CERCLA and RCRA Corrective Action sites may require attention to multiple sources of lead, not all of which may be related to contamination from the source that was the initial concern at the site. Generally, the goal of the Agency, while acting within the constraints of CERCLA and RCRA legal authorities, is to reduce, to the maximum extent feasible, the risk of having significantly elevated blood lead levels. On a site-specific basis this can include remediation approaches that would lead to reduction of exposure from other sources, such as lead-based paint, in conjunction with appropriate soil remediation. Following from the risk assessment discussion in the previous

paragraphs, exposures from lead in soils may have a lesser impact in producing high blood lead level if existing exposures from lead in soils may have a lesser impact in producing high blood lead levels if existing exposures from lead-based paint are reduced.

Abatement vs. Intervention: Remedial measures can be divided into those that remove the source of contamination (abatement) and those that leave the contamination in place but block the exposure pathway (intervention). These combinations of measures might include but not be limited to:

Abatement - Soil removal or interior and exterior lead paint abatement.

Intervention - Institutional controls, education/public outreach, gardening restrictions, indoor cleaning and dust removal, or additional cover.

Generally, the most appropriate CERCLA or RCRA response action or combination of actions will be based, in part, on the estimated level of threat posed at a given site. However, as mentioned earlier, key decision criteria also include the overall protectiveness of response options, attainment of Applicable or Relevant and Appropriate Requirements (for CERCLA), a preference for permanent remedies, implementability, cost-effectiveness, and public acceptance. Intervention measures may be more appropriate than abatement (e.g., soil excavation) at many sites, especially in areas where soil lead levels fall at or near the site-specific PRG or MCS.

Addressing exposure from other sources of lead may reduce risk to a greater extent and yet be less expensive than directly remediating soil. In some cases, cleaning up the soil to low levels may, by itself, provide limited risk reduction because other significant lead sources are present (e.g., contaminated drinking water or lead-based paint in residential housing). If it is possible to address the other sources, the most cost-effective approach may be to remediate the other sources as well as, or (if exposures to lead in soil are relatively low) instead of full soil lead abatement.

Lead-based paint can be a significant source of lead exposure and needs to be considered when determining the most appropriate response action. Interior paint can contribute to elevated indoor dust lead levels. In addition, exterior paint can be a significant source of recontamination of soil. Appendix A-3 of this document contains more information on how to evaluate and address the contribution of paint.

Certain legal considerations arise in considering remediation of sources other than soil. In particular, interior exposures from interior paint generally are not within the jurisdiction of RCRA or CERCLA. In addition, where other sources are addressed, issues may arise regarding the recoverability of costs expended by the Agency, or the possibility of claims being asserted against the Fund where other parties are ordered to do the work.

As discussed above, in considering whether to address sources other than soil, it is necessary to consider the risk that would remain from the lead in the soil. In some cases, after risks from other sources have been addressed, unrestricted exposure to soil could be allowed while still being protective (e.g., where the IEUBK model result was heavily affected by the other sources). In other cases, soil risks may still be high enough to require abatement, containment or institutional controls to prevent high levels of exposure. In such cases, before a conclusion is made that the overall remedy will be protective, institutional controls should be carefully studied to make sure that they will be implementable, effective in both the long-term and short-term, and likely to achieve community acceptance.

A potentially useful approach that can be considered in conjunction with other, more active measures in reducing blood lead levels is to develop and promote public education and awareness programs that focus on the causes and prevention of lead poisoning in children. EPA's Office of Pollution Prevention and Toxics (OPPT) provides information on abatement of lead-based paint by the homeowner as well as inexpensive preventive measures the public can take to reduce their exposure to lead. Additional research to evaluate the effectiveness of educational efforts in reducing lead exposures are needed to allow better evaluation of the usefulness of this option. Further, OPPT is assessing the effectiveness of various lead paint abatement options emphasizing low-cost methods. For additional information, contact the National Lead Information Center at 1-800-424-LEAD.

Mining-related sites: Both risk assessors and site managers should be aware that there are a number of factors that affect the relationship between soil lead concentrations and blood lead levels. These factors include the

variability in soil lead contribution to house dust levels, or differences in the bioavailability of lead. See discussion in next section, Use of blood lead data, for assessing differences between measured and predicted blood lead levels.

Thus, for mining-related sites without significant past smelting/mill activity, this interim directive encourages further research for characterizing the potential impact of particle size and speciation on soil bioavailability.

Site managers and risk assessors are cautioned that most areas impacted by mining activities are also associated with present or historical smelting or milling operations. Generalizations regarding distinct differences between mining and smelting or milling sites should be avoided until adequate site history and characterization are complete.

Use of blood lead data: In conducting Remedial Investigations (RIs) for CERCLA or RCRA Facility Investigations (RFIs) for RCRA Corrective Action, the interim directive recommends evaluating available blood lead data. In some cases, it may be appropriate to collect new or additional blood lead samples. In general, data from well-conducted blood lead studies of children on or near a site can provide useful information to both the risk assessor and site manager. However, the design and conduct of such studies, as well as the interpretation of results, are often difficult because of confounding factors such as a small population sample size. Therefore, any available blood lead data should be carefully evaluated by EPA Regional risk assessors to determine their usefulness. The Guidance Manual discusses how to evaluate observed blood lead survey data and blood lead data predicted by the IEUBK model.

The Guidance Manual recommends that blood lead data not be used alone either to assess risk from lead exposure or to develop soil lead cleanup levels. During its review of the IEUBK model, the SAB supported this position by asserting that site residents may temporarily modify their behavior (e.g., wash their children's hands more frequently) whenever public attention is drawn to a site. In such cases, this behavior could mask the true magnitude of potential risk at a site and lead to only temporary reductions in the blood lead levels of children. Thus, blood lead levels below 10 μg/dl are not necessarily evidence that a potential for significant lead exposure does not exist, or that such potential could not occur in the future.

Non-residential (adult) screening level. EPA also believes there is a strong need to develop a non-residential (adult) screening level. The IEUBK model is, however, not appropriate for calculating this screening level since it is designed specifically for evaluating lead exposures in children. At this time, EPA is considering a few options for developing this screening level. Several adult models have recently become available. Developing a screening level by using any of them is likely to require significant additional work by the Agency. This work might include testing, validation, and selection of one of the existing models or development of its own model, both of which would require a considerable amount of time. Consequently this would probably be a long-term option. A short-term option would be to develop a screening level based on a simple approach that approximates the more complicated biokinetics in humans. This can serve in the interim while more sophisticated adult lead exposure assessment tools can be identified or developed.

NOTICE: Users of this directive should bear in mind that the recommendations in this document are intended solely as guidance, and that EPA risk managers may act at variance with any of these recommendations where site-specific conditions warrant, as has been noted above. These recommendations are not intended, and cannot be relied upon, to create any rights, substantive or procedural, enforceable by any party in litigation with the United States, and may change at any time without public notice.

Because this document and the related Guidance Manual are not legally binding either upon EPA or other parties, Agency personnel should keep in mind if they are questioned or challenged in comments on a proposed remedial plan, such comments must be considered and a substantive explanation must be provided for whatever approach is ultimately selected. For example, while the IEUBK model is recommended here, its use is not a regulatory requirement and comments on the model or its use should be fully considered.

APPENDICES

A Suggested Decision Logic for CERCLA and RCRA Corrective Action

A-1 Suggested Decision Logic for Residential Scenarios for CERCLA and RCRA Corrective Action

A-2 Suggested Decision Logic for Lead-based Paint for CERCLA and RCRA Corrective Action

B Regional Toxics Integration Coordinators (RTICS)

C Relationship between the OSWER Soil Lead Directive and TSCA Section 403 Guidance

D Biological Technical Assistance Group Coordinators (BTAGS)

Appendix A-1

Suggested Decision Logic for Residential Scenarios for CERCLA and RCRA Corrective Action

Step 1: Determine soil lead concentration at the site.

If soil lead is less than 400 ppm:
STOP, no further action is required, UNLESS special circumstances (such as the presence of wetlands, other areas of ecological risk, agricultural areas, shallow aquifers, or other areas of potentially high exposure) warrant further study.

If soil lead is greater than 400 ppm:
PROCEED to Step 2, UNLESS 400 ppm is selected as a cleanup goal based on consideration of all relevant risk management factors.

Step 2: Evaluate probable land use and develop exposure scenarios.

Step 3: Collect appropriate site-specific data based on selected scenarios.

For example, sampling data may include:

- Soil and dust (at a minimum), paint, water, and air,
- For unique site situations, data on speciation and particle size, and behavioral activities may be required.

Available blood lead data:

- If blood lead data are available, consult the Guidance Manual and Regional Risk Assessor.
- If blood lead data are not available, Regional Risk Assessors and site managers should consider the appropriateness of consulting a blood lead study to supplement available data.

Step 4: Run the IEUBK model with site-specific data to estimate risk and evaluate key exposure pathways at the site.

- If blood lead data are available, compare the data to the model results.

Step 5: Where risks are significant, evaluate remedial options.

If lead-based exterior or interior paint is the only major contributor to exposure, no Superfund action or RCRA corrective action is warranted.

If soil is the only major contributor to elevated blood lead, a response to soil contamination is warranted, but paint abatement is not.

If both exterior lead-based paint and soil are major contributors to exposure, consider remediating both sources, using alternative options as described in Appendix A-2.

If indoor dust levels are greater than soil levels, consider evaluating the contribution of interior lead-based paint to the dust levels. If interior lead-based paint is a major contributor, consider remediating indoor paint to achieve a greater overall risk reduction at a lower cost. (See Appendix A-2.)

NOTE: Available authority to remediate lead-based paint under CERCLA and RCRA is extremely limited.)

Step 6: If the IEUBK model predicts elevated blood leads, rerun the model using the site-specific parameters selected to reflect remedial options in Step 5 to determine site-specific PRGs or MCSs for soil.

Appendix A-2

Suggested Decision Logic for Lead-based Paint for CERCLA and RCRA Corrective Action

(If soil lead levels are below screening levels, lead-based paint could be addressed by authorities other than RCRA or CERCLA.)

If soil lead levels are above screening levels:

Step 1: Examine condition of exterior paint and determine its lead content, if any.

- If the paint is deteriorated, assess contribution or potential contribution of paint to elevated soil lead levels through speciation studies, structural equation modeling, or other statistical methods.

Step 2: Evaluate potential for recontamination of soil by exterior paint.

Step 3: Remediate exterior paint only in conjunction with soil.

- Determine appropriate remediation based on risk management factors (e.g., applying the nine criteria), remediating the major contributor first.

Step 4: Examine condition of indoor paint and determine its lead content, if any.

- If indoor dust lead concentration is greater than outdoor soil lead concentration (because of contamination from both interior paint and outdoor soil), remediate indoor dust (e.g., through a removal action, or making HEPA-VACS available to community).

Step 5: Once the risk from indoor paint has been assessed, examine options to abate indoor paint (e.g., PRP, State, local, HUD) and consult TSCA Section 403 program for additional information and/or guidance.

Step 6: While RCRA and CERCLA have very limited authority regarding the cleanup of interior paint, the remedy may take into account the reduction of total risk that may occur if interior paint is addressed by other means. Thus, for example, a Record of Decision (ROD) or Statement of Basis (SB) may recognize that interior lead-based paint is being addressed by other means, and narrow the response accordingly (possibly making this contingent on completion of the interior lead-based paint abatement effort).

Appendix B

Superfund Regional Toxics Integration Coordinators (RTICs)

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Appendix C

Relationship between the OSWER Soil Lead Directive and TSCA Section 403 Guidance

Since lead exposures occur through all media, a variety of Agency programs address lead under a number of statutes. Lead in soil is addressed under TSCA Section 403, the RCRA Corrective Action program, and CERCLA, each of which differs somewhat in the types of sites that apply and the types of standards that are used. These differences are primarily due to differences in the purposes of the programs and the authority granted by the statutes under which they are developed. Section 403 soil standards will apply only to residential soil and the current TSCA guidance is generic in nature, with the same standards applying on a nationwide basis. Given the wide applicability of Section 403, generic standards are used in the current guidance in order to reduce resource requirements, as compared to site-specific decisions which can involve expensive and time-consuming analyses. Required RCRA and CERCLA activities are determined on a site-specific basis. The agency's recommendations for evaluating RCRA Corrective Action and CERCLA sites are contained in the OSWER Interim Soil Lead Directive.

In all three of these programs, the Agency's approach is to consider soil lead in the context of other lead sources that may be present and contribute to the total risk. For example, TSCA Section 403 specifically requires the Agency to consider the hazards posed by lead-based paint and lead-contaminated interior dust, as well as lead-contaminated soil. Likewise, the OSWER Soil Directive includes evaluation of other lead sources at a site as part of site assessment / investigation procedures. In addition, the primary focus of the three programs is primary prevention -- the prevention of future exposures from the source(s) being remediated.

The fundamental difference between the relatively new TSCA Section 403 program and the RCRA Corrective Action and CERCLA cleanup programs is that, under current guidance the Section 403 program seeks to establish national standards to prioritize responses to lead hazards whereas the other two programs usually develop site-specific cleanup requirements. This is because TSCA Section 403 deals with a potentially huge number of sites, and resources for the investigation needed to accurately identify their risks are typically very limited. Therefore most decisions under Section 403 will be made with little or no regulatory oversight and clear generic guidelines will be more effective. The more established RCRA and CERCLA programs, on the other hand, deal with a much smaller number of sites, at which extensive site characterization will have been performed before cleanup decisions are made. In addition, these programs have well-established funding mechanisms.

Appendix D

Superfund Biological Technical Assistance Group Coordinators (BTAGs)

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Reference 29

U.S. DEPARTMENT OF LABOR
Occupational Safety and Health Administration
1100 East Campbell Road, Suite 250
Richardson, TX 75081
Phone: 972-952-1330 / Fax: 972-952-1338

Citation and Notification of Penalty

To:
Lane Plating Works, Inc.
P.O. Box 41098
Dallas, TX 75241

Inspection Number: 989172
Inspection Date(s): 08/05/2014 - 11/13/2014
Issuance Date: 01/28/2015

Inspection Site:
5322 Bonnie View Road
Dallas, TX 75241

The violation(s) described in this Citation and Notification of Penalty is (are) alleged to have occurred on or about the day(s) the inspection was made unless otherwise indicated within the description given below.

This Citation and Notification of Penalty (this Citation) describes violations of the Occupational Safety and Health Act of 1970. The penalty(s) listed herein is (are) based on these violations. You must abate the violations referred to in this Citation by the dates listed and pay the penalties proposed, unless within 15 working days (excluding weekends and Federal holidays) from your receipt of this Citation and Notification of Penalty **you either call to schedule an informal conference (see paragraph below) or** you mail a notice of contest to the U.S. Department of Labor Area Office at the address shown above. Please refer to the enclosed booklet (OSHA 3000) which outlines your rights and responsibilities and which should be read in conjunction with this form. Issuance of this Citation does not constitute a finding that a violation of the Act has occurred unless there is a failure to contest as provided for in the Act or, if contested, unless this Citation is affirmed by the Review Commission or a court.

Posting - The law requires that a copy of this Citation and Notification of Penalty be posted immediately in a prominent place at or near the location of the violation(s) cited herein, or, if it is not practicable because of the nature of the employer's operations, where it will be readily observable by all affected employees. This Citation must remain posted until the violation(s) cited herein has (have) been abated, or for 3 working days (excluding weekends and Federal holidays), whichever is longer.

Informal Conference - An informal conference is not required. However, if you wish to have such a conference you may request one with the Area Director during the 15 working day contest period. During such an informal conference you may present any evidence or views which you believe would support an adjustment to the citation(s) and/or penalty(s).

If you are considering a request for an informal conference to discuss any issues related to this Citation and Notification of Penalty, you must take care to schedule it early enough to allow time to contest after the informal conference, should you decide to do so. Please keep in mind that a written letter of intent to contest must be submitted to the Area Director within 15 working days of your receipt of this Citation. The running of this contest period is not interrupted by an informal conference.

If you decide to request an informal conference, please complete, remove and post the Notice to Employees next to this Citation and Notification of Penalty as soon as the time, date, and place of the informal conference have been determined. Be sure to bring to the conference any and all supporting documentation of existing conditions as well as any abatement steps taken thus far. If conditions warrant, we can enter into an informal settlement agreement which amicably resolves this matter without litigation or contest.

Right to Contest – You have the right to contest this Citation and Notification of Penalty. You may contest all citation items or only individual items. You may also contest proposed penalties and/or abatement dates without contesting the underlying violations. **Unless you inform the Area Director in writing that you intend to contest the citation(s) and/or proposed penalty(ies) within 15 working days after receipt, the citation(s) and the proposed penalty(ies) will become a final order of the Occupational Safety and Health Review Commission and may not be reviewed by any court or agency.**

Penalty Payment – Penalties are due within 15 working days of receipt of this notification unless contested (See the enclosed booklet and the additional information provided related to the Debt Collection Act of 1982.) Make your check or money order payable to "DOL-OSHA". Please indicate the Inspection Number on the remittance. You can also make your payment electronically on www.pay.gov. On the left side of the pay.gov homepage, you will see an option to Search Public Forms. Type "**OSHA**" and click Go. From the results, click on **OSHA Penalty Payment Form**. The direct link is:

https://www.pay.gov/paygov/forms/formInstance.html?agencyFormId=53090334.

You will be required to enter your inspection number when making the payment. Payments can be made by credit card or Automated Clearing House (ACH) using your banking information. Payments of $50,000 or more require a Transaction ID, and also must be paid using ACH. If you require a Transaction ID, please contact the OSHA Debt Collection Team at (202) 693-2170.

OSHA does not agree to any restrictions or conditions or endorsements put on any check, money order, or electronic payment for less than the full amount due, and will process the payments as if these restrictions or conditions do not exist.

Notification of Corrective Action – For each violation which you do not contest, you must provide ***abatement certification*** to the Area Director of the OSHA office issuing the citation and identified above. This abatement certification is to be provided by letter within 10 calendar days after each abatement date. Abatement certification includes the date and method of abatement. If the citation indicates that the violation was corrected during the inspection, no abatement certification is required for that item. The abatement certification letter must be posted at the location where the violation appeared and the corrective action took place or employees must otherwise be effectively informed about abatement activities. A sample abatement certification letter is enclosed with this Citation. In addition, where the citation indicates that ***abatement documentation*** is necessary, evidence of the purchase or repair of equipment, photographs or video, receipts, training records, etc., verifying that abatement has occurred is required to be provided to the Area Director.

Employer Discrimination Unlawful – The law prohibits discrimination by an employer against an employee for filing a complaint or for exercising any rights under this Act. An employee who believes that he/she has been discriminated against may file a complaint no later than 30 days after the discrimination occurred with the U.S. Department of Labor Area Office at the address shown above.

Employer Rights and Responsibilities – The enclosed booklet (OSHA 3000) outlines additional employer rights and responsibilities and should be read in conjunction with this notification.

Notice to Employees – The law gives an employee or his/her representative the opportunity to object to any abatement date set for a violation if he/she believes the date to be unreasonable. The contest must be mailed to the U.S. Department of Labor Area Office at the address shown above and postmarked within 15 working days (excluding weekends and Federal holidays) of the receipt by the employer of this Citation and Notification of Penalty.

Inspection Activity Data – You should be aware that OSHA publishes information on its inspection and citation activity on the Internet under the provisions of the Electronic Freedom of Information Act. The information related to these alleged violations will be posted when our system indicates that you have received this citation. You are encouraged to review the information concerning your establishment at www.osha.gov. If you have any dispute with the accuracy of the information displayed, please contact this office.

NOTICE TO EMPLOYEES OF INFORMAL CONFERENCE

An informal conference has been scheduled with OSHA to discuss the citation(s) issued on 01/28/2015. The conference will be held by telephone or at the OSHA office located at 1100 East Campbell Road, Suite 250, Richardson, TX 75081 on _____ at _____. Employees and/or representatives of employees have a right to attend an informal conference.

CERTIFICATION OF CORRECTIVE ACTION WORKSHEET

Inspection Number: 989172

Company Name: Lane Plating Works, Inc.
Inspection Site: 5322 Bonnie View Road, Dallas, TX 75241
Issuance Date: 01/28/2015

List the specific method of correction for each item on this citation in this package that does not read "Corrected During Inspection" and return to: **U.S. Department of Labor – Occupational Safety and Health Administration, 1100 East Campbell Road, Suite 250, Richardson, TX 75081**

Citation Number _____ and Item Number _____ was corrected on _____
By (Method of Abatement): _____
_____

Citation Number _____ and Item Number _____ was corrected on _____
By (Method of Abatement): _____
_____

Citation Number _____ and Item Number _____ was corrected on _____
By (Method of Abatement): _____
_____

Citation Number _____ and Item Number _____ was corrected on _____
By (Method of Abatement): _____
_____

Citation Number _____ and Item Number _____ was corrected on _____
By (Method of Abatement): _____
_____

Citation Number _____ and Item Number _____ was corrected on _____
By (Method of Abatement): _____
_____

I certify that the information contained in this document is accurate and that the affected employees and their representatives have been informed of the abatement.

_____	_____
Signature	Date
_____	_____
Typed or Printed Name	Title

NOTE: 29 USC 666(g) whoever knowingly makes any false statements, representation or certification in any application, record, plan or other documents filed or required to be maintained pursuant to the Act shall, upon conviction, be punished by a fine of not more than $10,000 or by imprisonment of not more than 6 months or both.

POSTING: A copy of completed Corrective Action Worksheet should be posted for employee review

Citation and Notification of Penalty

Company Name: Lane Plating Works, Inc.
Inspection Site: 5322 Bonnie View Road, Dallas, TX 75241

Citation 1 Item 1 Type of Violation: **Serious**

Section 5(a)(1) of the Occupational Safety and Health Act of 1970: The employer does not furnish to each of his employees employment and a place of employment which are free from recognized fire and/or explosion hazards that are causing or likely to cause death or serious physical harm to his employees:

This violation occurred on or about August 5, 2014, and at times prior thereto, in the chrome plating area where; the employer by storing a 225 pound barrel of 96%-100% sodium hydroxide together with a 225 pound barrel of 77%-100% sulfuric acid, exposed employees to fire and/or explosion hazards.

Among other methods, one feasible and acceptable method to correct this hazard includes, but is not limited to the following: Separate incompatible chemicals for storage in accordance with NFPA 1, 2012, 60.5.1.12.1, 60.5.1.12.2, and 60.5.1.12.3.

Pursuant to 29 CFR 1903.19, within ten (10) calendar days of the abatement date, the employer must submit documentation showing that it is in compliance with the standard, including describing the steps that it is taking to ensure that incompatible chemicals are not being stored together.

ABATEMENT DOCUMENTATION REQUIRED FOR THIS ITEM

Date By Which Violation Must be Abated:	02/05/2015
Proposed Penalty:	$2800.00

Citation and Notification of Penalty

Company Name: Lane Plating Works, Inc.
Inspection Site: 5322 Bonnie View Road, Dallas, TX 75241

Citation 1 Item 2 Type of Violation: **Serious**

OSH ACT of 1970 Section (5)(a)(1): The employer does not furnish to each of his employees employment and a place of employment which are free from recognized struck-by and/or crushed-by hazards that are causing or likely to cause death or serious physical harm to his employees:

This violation occurred on or about August 5, 2014, and at times prior thereto; where employees who operated overhead, unhung electric hoists were exposed to struck-by and/or crushed by hazards:

a) In the chrome plating area by the back loading dock, the employer by not ensuring that each actuator on the pendant control box was clearly marked or identified with its function, exposed employees to struck-by and/or crushed-by hazards.

b) In the chrome plating area in the chemical storage area, the employer by not ensuring that each actuator on the pendant control box was clearly marked or identified with its function, exposed employees to stuck-by and/or crushed-by hazards.

c) In the grinding area, the employer by not ensuring that the self-closing safe latch of a hook attached to an overhead hoist was functional, exposed employees to struck-by and/or crushed by hazards.

Among other methods, feasible and acceptable means to correct these hazards include but are not limited to: a) and b) complying with paragraph 16-1.1.2 of ANSI B30.16 - 2012 which requires each actuator on the pendent control boxes to electrical hoist to be labeled with its function; and c) complying with paragraph 10-1.10.5 of ANSI B30.10 - 2009 which requires hooks that have an inoperative latch be removed from service.

Pursuant to 29 CFR 1903.19, within ten (10) calendar days of the abatement date, the employer must submit documentation showing that it is in compliance with the standard, including describing the steps that it is taking to ensure that pendant control boxes are clearly marked for identification and function.

ABATEMENT DOCUMENTATION REQUIRED FOR THIS ITEM

Citation and Notification of Penalty

Company Name: Lane Plating Works, Inc.
Inspection Site: 5322 Bonnie View Road, Dallas, TX 75241

Date By Which Violation Must be Abated:	02/09/2015
Proposed Penalty:	$2800.00

See pages 1 through 4 of this Citation and Notification of Penalty for information on employer and employee rights and responsibilities.

Citation and Notification of Penalty

Company Name: Lane Plating Works, Inc.
Inspection Site: 5322 Bonnie View Road, Dallas, TX 75241

Citation 1 Item 3 Type of Violation: **Serious**

29 CFR 1910.23(a)(5): Every pit and trapdoor floor opening, infrequently used, shall be guarded by a floor opening cover of standard strength and construction. While the cover is not in place, the pit or trap opening shall be constantly attended by someone or shall be protected on all exposed sides by removable standard railings:

The employer does not assure that employees are protected from falling through floor openings. This violation occurred on or about August 5, 2014 and at times prior thereto, in the chrome plating area; where the floor grating used to cover the secondary containment areas for the chromium dip tanks and strip tanks were removed and employees were exposed to a fall hazard of approximately 8-feet.

Pursuant to 29 CFR 1903.19, within ten (10) calendar days of the abatement date, the employer must submit documentation showing that it is in compliance with the standard, including describing the steps that it is taking to protect pit openings on all sides.

ABATEMENT DOCUMENTATION REQUIRED FOR THIS ITEM

Date By Which Violation Must be Abated:	02/09/2015
Proposed Penalty:	$2800.00

See pages 1 through 4 of this Citation and Notification of Penalty for information on employer and employee rights and responsibilities.

Citation and Notification of Penalty

Company Name: Lane Plating Works, Inc.
Inspection Site: 5322 Bonnie View Road, Dallas, TX 75241

Citation 1 Item 4 Type of Violation: **Serious**

29 CFR 1910.23(c)(1): Open-sided floors and/or platforms four feet or more above adjacent floor or ground level were not guarded with standard railings (or equivalent) and toeboards:

The employer does not ensure that open-sided floors, four feet or more above a lower level, are guarded with standard railings. This violation occurred on or about August 5, 2014 and at times prior thereto, in the chrome plating area; where employees working near the back loading dock were not protected from falling to the lower level.

Pursuant to 29 CFR 1903.19, within ten (10) calendar days of the abatement date, the employer must submit documentation showing that it is in compliance with the standard, including describing the steps that it is taking to guard open-sided floors and/or platforms four feet or move above adjacent floors or ground level.

ABATEMENT DOCUMENTATION REQUIRED FOR THIS ITEM

Date By Which Violation Must be Abated:	02/09/2015
Proposed Penalty:	$2800.00

Citation and Notification of Penalty

Company Name: Lane Plating Works, Inc.
Inspection Site: 5322 Bonnie View Road, Dallas, TX 75241

Citation 1 Item 5 Type of Violation: **Serious**

29 CFR 1910.106(e)(6)(i): Adequate precautions were not taken to prevent the ignition of flammable vapors:

The employer does not ensure that precautions are taken to prevent flammable vapors from igniting. This violation occurred on or about August 28, 2014, and at times prior thereto, at the front loading dock where; employees smoking near a storage cabinet containing gasoline and other flammable chemicals created a fire and explosion hazard.

Pursuant to 29 CFR 1903.19, within ten (10) calendar days of the abatement date, the employer must submit documentation showing that it is in compliance with the standard, including describing the steps that it is taking to ensure that employees do not smoke near flammable storage areas.

ABATEMENT DOCUMENTATION REQUIRED FOR THIS ITEM

Date By Which Violation Must be Abated:	02/05/2015
Proposed Penalty:	$2000.00

Citation and Notification of Penalty

Company Name: Lane Plating Works, Inc.
Inspection Site: 5322 Bonnie View Road, Dallas, TX 75241

The alleged violations below have been grouped because they involve similar or related hazards that may increase the potential for injury or illness.

Citation 1 Item 6 a Type of Violation: **Serious**

29 CFR 1910.134(c)(2)(i): Respirator users were not provided with the information contained in Appendix D to 29 CFR 1910.134 when the employer determined that any voluntary respirator use was permissible:

The employer did not provide employees voluntarily using respirators with the information contained in Appendix D of 29 CFR 1910.134.This violation occurred on or about August 28, 2014 and at times prior thereto when employees in the chromium plating area voluntarily used MSA half-face respirators were not provided with the information contained in Appendix D of 29 CFR 1910.134.

Pursuant to 29 CFR 1903.19, within ten (10) calendar days of the abatement date, the employer must submit documentation showing that it is in compliance with the standard, including describing the steps that it is taking to provide employees voluntarily using respirations with the information contained in Appendix D of 29 CFR 1910.134.

ABATEMENT DOCUMENTATION REQUIRED FOR THIS ITEM

Date By Which Violation Must be Abated:	02/09/2015
Proposed Penalty:	$2000.00

Citation and Notification of Penalty

Company Name: Lane Plating Works, Inc.
Inspection Site: 5322 Bonnie View Road, Dallas, TX 75241

Citation 1 Item 6 b Type of Violation: **Serious**

29 CFR 1910.134(c)(2)(ii): The employer did not establish and implement those elements of a written program necessary to ensure that any employee using a respirator voluntarily was medically able to use that respirator, and that the respirator was cleaned, stored, and maintained so that its use does not present a health hazard to the user:

The employer does not establish and implement the elements of a written program necessary to ensure that employees using a respirator voluntarily are medically able to do so, and that the respirator is cleaned, stored, and maintained so that its use does not present a health hazard to the user. This violation occurred on or about August 28, 2014, and at times prior thereto, in the chrome plating area; where employees voluntarily used MSA half-face respirators without being medically evaluated and without being trained on how to properly clean, store, and maintain respirators.

Pursuant to 29 CFR 1903.19, within ten (10) calendar days of the abatement date, the employer must submit documentation showing that it is in compliance with the standard, including describing the steps that it is taking to establish and implement those elements of a written program necessary to ensure that any employee using a respirator voluntarily is medically able to use that respirator, and that the respirator is cleaned, stored, and maintained so that its use does not present a health hazard to the user.

ABATEMENT DOCUMENTATION REQUIRED FOR THIS ITEM

Date By Which Violation Must be Abated: 02/09/2015

Citation and Notification of Penalty

Company Name: Lane Plating Works, Inc.
Inspection Site: 5322 Bonnie View Road, Dallas, TX 75241

Citation 1 Item 7 Type of Violation: **Serious**

29 CFR 1910.151(c): Where employees were exposed to injurious corrosive materials, suitable facilities for quick drenching or flushing of the eyes and body were not provided within the work area for immediate emergency use:

The employer does not provide suitable facilities for quick drenching or flushing of the eyes and body for employees exposed to injurious corrosive materials. This violation occurred on or about August 5, 2014, at times prior thereto and at times thereafter; when the employer did not provide eye wash stations or safety showers to employees working with chromic acid.

Pursuant to 29 CFR 1903.19, within ten (10) calendar days of the abatement date, the employer must submit documentation showing that it is in compliance with the standard, including describing the steps that the employer is taking to provide suitable facilities for quick drenching of the eyes and body to employees working with injurious corrosive materials.

ABATEMENT DOCUMENTATION REQUIRED FOR THIS ITEM

Date By Which Violation Must be Abated:	02/24/2015
Proposed Penalty:	$2800.00

Citation and Notification of Penalty

Company Name: Lane Plating Works, Inc.
Inspection Site: 5322 Bonnie View Road, Dallas, TX 75241

The alleged violations below have been grouped because they involve similar or related hazards that may increase the potential for injury or illness.

Citation 1 Item 8 a Type of Violation: **Serious**

29 CFR 1910.219(d)(1): Pulleys, with any part seven (7) feet or less from the floor or working platform, were not guarded in accordance with the standards specified in 29 CFR 1910.219 paragraphs (m) and (o):

The employer does not ensure that pulleys with parts seven feet or less above floors or platforms are guarded. This violation occurred on or about August 5, 2014, and at times prior thereto; where:

a) In the grinding area, the pulleys to a homemade fan were not guarded and exposed employees to in-going nip points.

b) In the chemical storage area, the bottom pulley of a Storm-Vulcan polisher was not guarded and exposed employees to in-going nip-points.

Pursuant to 29 CFR 1903.19, within ten (10) calendar days of the abatement date, the employer must submit documentation showing that it is in compliance with the standard, including describing the steps that it is taking to ensure that pulleys are guarded.

ABATEMENT DOCUMENTATION REQUIRED FOR THIS ITEM

Date By Which Violation Must be Abated:	02/09/2015
Proposed Penalty:	$2000.00

Citation and Notification of Penalty

Company Name: Lane Plating Works, Inc.
Inspection Site: 5322 Bonnie View Road, Dallas, TX 75241

Citation 1 Item 8 b Type of Violation: **Serious**

29 CFR 1910.219(e)(3)(i): Vertical and inclined belts were not enclosed by a guard conforming to standards in 29 CFR 1910.219 paragraphs (m) and (o):

The employer does not ensure that vertical and inclined belts are guarded. This violation occurred on or about August 5, 2014, and at times prior thereto; where:

a) In the grinding area, the vertical belt to a homemade fan was not guarded and exposed employees to in-going nip points.

b) In the chemical storage area, the inclined belt to a Storm-Vulcan polisher was not guarded and exposed employees to in-going nip-points.

Pursuant to 29 CFR 1903.19, within ten (10) calendar days of the abatement date, the employer must submit documentation showing that it is in compliance with the standard, including describing the steps that it is taking to ensure that vertical and inclined belts are guarded.

ABATEMENT DOCUMENTATION REQUIRED FOR THIS ITEM

Date By Which Violation Must be Abated: 02/09/2015

Citation and Notification of Penalty

Company Name: Lane Plating Works, Inc.
Inspection Site: 5322 Bonnie View Road, Dallas, TX 75241

Citation 1 Item 9 Type of Violation: **Serious**

29 CFR 1910.303(b)(1): Electrical equipment was not free from recognized hazards that were likely to cause death or serious physical harm to employees:

The employer does not assure that electrical equipment is free from recognized hazards that are likely to cause death or serious physical harm to employees. This violation occurred on or about August 5, 2014 and at times prior thereto in the grinding area; where employees were exposed to electrical hazards from an improperly spliced power cord to a homemade fan.

Pursuant to 29 CFR 1903.19, within ten (10) calendar days of the abatement date, the employer must submit documentation showing that it is in compliance with the standard, including describing the steps that it is taking to ensure that electrical equipment is free from recognized hazarders likely to cause death or serious physical harm to employees.

ABATEMENT DOCUMENTATION REQUIRED FOR THIS ITEM

Date By Which Violation Must be Abated:	02/09/2015
Proposed Penalty:	$2800.00

See pages 1 through 4 of this Citation and Notification of Penalty for information on employer and employee rights and responsibilities.

Citation and Notification of Penalty

Company Name: Lane Plating Works, Inc.
Inspection Site: 5322 Bonnie View Road, Dallas, TX 75241

Citation 1 Item 10 Type of Violation: **Serious**

29 CFR 1910.1026(c): Employees were exposed to an airborne concentration of chromium (VI) which exceeded 5 micrograms per cubic meter of air, as an 8-hour time-weighted average:

The employer does not ensure that an employee's exposure to hexavalent chromium does not exceed 5 $\mu g/m^3$ of air, as an 8-hour time-weighted average. This violation occurred on or about August 28, 2014, at times prior thereto and at times thereafter in the chrome plating area; where a chrome plater was exposed to hexavalent chromium at an eight-hour time-weighted average of 6.8 µg/m3 of air, approximately 1.36 times the OSHA PEL of 5.0 $\mu g/m^3$ of air.

Pursuant to 29 CFR 1903.19, within ten (10) calendar days of the abatement date, the employer must submit documentation showing that it is in compliance with the standard, including describing the steps that it is taking to ensure that employee's exposure to hexavalent chromium do not exceed 5 micrograms per cubic meter of air, as an 8-hour time-weighted average.

ABATEMENT DOCUMENTATION REQUIRED FOR THIS ITEM

Date By Which Violation Must be Abated:	02/24/2015
Proposed Penalty:	$2800.00

See pages 1 through 4 of this Citation and Notification of Penalty for information on employer and employee rights and responsibilities.

Citation and Notification of Penalty

Company Name: Lane Plating Works, Inc.
Inspection Site: 5322 Bonnie View Road, Dallas, TX 75241

Citation 1 Item 11 Type of Violation: **Serious**

29 CFR 1910.1026(e)(1): The employer did not establish a regulated area wherever an employee's exposure to airborne concentrations of chromium (VI) was, or could reasonably be expected to be, in excess of the permissible exposure limit:

The employer does not ensure that regulated work areas are established for employees who are, or could reasonably be exposed to airborne concentrations of hexavalent chromium in excess of the permissible exposure limit. This violation occurred on or about August 28, 2014 and at times prior thereto, in the chromium plating area; where the employer did not establish regulated work areas for employees working with hexavalent chromium. The facility contains two areas where chromium plating is done:

a) The first set of dip tanks are found in the chemical storage area near a work room where employees prepare parts for chromium plating. All employees entering the building through the front entrance must pass through this plating area to access any other part of the facility;

b) The second set of dip tanks are found in the back loading dock. Employees working in the grinding area must pass through this plating area to access the grinding area, mens restrooms, and break room.

Pursuant to 29 CFR 1903.19, within ten (10) calendar days of the abatement date, the employer must submit documentation showing that it is in compliance with the standard, including describing the steps that it is taking to ensure that regulated areas were established where employee's exposure to airborne concentrations of chromium (VI) was, or could reasonably be expected to be, in excess of the permissible exposure limit.

ABATEMENT DOCUMENTATION REQUIRED FOR THIS ITEM

Date By Which Violation Must be Abated:	02/24/2015
Proposed Penalty:	$2000.00

See pages 1 through 4 of this Citation and Notification of Penalty for information on employer and employee rights and responsibilities.

Citation and Notification of Penalty

Company Name: Lane Plating Works, Inc.
Inspection Site: 5322 Bonnie View Road, Dallas, TX 75241

Citation 1 Item 12 Type of Violation: **Serious**

1910.1026(g)(2) Where respirator use was required by 29 CFR 1910.1026, the employer did not institute a respiratory protection program in accordance with 29 CFR 1910.134, which covers each employee required to use a respirator:

The employer did not institute a respirators protection program in accordance with 29 CFR 1910.134. This violation occurred on or about August 28, 2014 and at times prior thereto when employees in the chromium plating area used MSA half-face respirators without having a written respiratory protection program consisting on the elements described in 29 CFR 1910.134(c)-(c)(1)(ix).

Pursuant to 29 CFR 1903.19, within ten (10) calendar days of the abatement date, the employer must submit documentation showing that it is in compliance with the standard, including describing the steps that it is taking to establish and implement those elements of a written program necessary to ensure that any employee using a respirator is in compliance with the elements described in 29 CFR 1910.134(c)-(c)(1)(ix).

ABATEMENT DOCUMENTATION REQUIRED FOR THIS ITEM

Date By Which Violation Must be Abated:	02/24/2015
Proposed Penalty:	$2800.00

See pages 1 through 4 of this Citation and Notification of Penalty for information on employer and employee rights and responsibilities.

Citation and Notification of Penalty

Company Name: Lane Plating Works, Inc.
Inspection Site: 5322 Bonnie View Road, Dallas, TX 75241

The alleged violations below have been grouped because they involve similar or related hazards that may increase the potential for injury or illness.

Citation 1 Item 13 a Type of Violation: **Serious**

29 CFR 1910.1026(h)(1): A hazard was present or was likely to be present from skin or eye contact with chromium (VI); however, the employer did not provide appropriate personal protective clothing and equipment at no cost to employees, and/or did not ensure that employees used such clothing and equipment:

The employer does not require employees to wear appropriate personal protective clothing, including, but not limited to, chemical resistant aprons, chemical resistant gloves, and safety glasses. This violation occurred on or about August 28, 2014, at times prior thereto and at times thereafter, in the chrome plating area; where the employer did not require employees to wear chemical resistant gloves, chemical resistant aprons, or safety glasses when handling parts being placed in or being taken out of the chromium dip tanks.

Pursuant to 29 CFR 1903.19, within ten (10) calendar days of the abatement date, the employer must submit documentation showing that it is in compliance with the standard, including describing the steps that it is taking to ensure that employees use appropriate personal protective clothing and equipment, including chemical resistant aprons, chemical resistant gloves, and safety glasses when performing plating operations.

ABATEMENT DOCUMENTATION REQUIRED FOR THIS ITEM

Date By Which Violation Must be Abated:	02/09/2015
Proposed Penalty:	$2800.00

Citation and Notification of Penalty

Company Name: Lane Plating Works, Inc.
Inspection Site: 5322 Bonnie View Road, Dallas, TX 75241

Citation 1 Item 13 b Type of Violation: **Serious**

29 CFR 1910.133(a)(1): The employer did not ensure that each affected employee uses appropriate eye or face protection when exposed to eye or face hazards from flying particles, molten metal, liquid chemicals, acids or caustic liquids, chemical gases or vapors, or potentially injurious light radiation:

The employer does not ensure that employees using hazardous chemicals use appropriate eye or face protection. This violation occurred on or about August 28, 2014, at times prior thereto and at times thereafter; when employees were exposed to splash hazards from the following hazardous chemicals:

a) Employees in the chromium plating area are exposed to splash hazards from chromic acid while rinsing parts removed from the chromium plating baths;

b) Employees cleaning parts in the chromium plating prep room were using Stop-off lacquer without wearing proper eye protection. Stop-off lacquer contains MEK, Vinyl chloride, xylene, and butyl acetate;

c) Employees in the chromium plating area used methyl ethyl ketone (MEK) and WF Thinner without wearing eye protection. WF Thinner is a solvent containing methanol, 2-butoxethanol, toluene, and acetone.

Pursuant to 29 CFR 1903.19, within ten (10) calendar days of the abatement date, the employer must submit documentation showing that it is in compliance with the standard, including describing the steps that it is taking to ensure that employees use appropriate eye and face protection when using hazardous chemicals.

ABATEMENT DOCUMENTATION REQUIRED FOR THIS ITEM

Date By Which Violation Must be Abated: 02/09/2015

Citation and Notification of Penalty

Company Name: Lane Plating Works, Inc.
Inspection Site: 5322 Bonnie View Road, Dallas, TX 75241

Citation 1 Item 13 c Type of Violation: **Serious**

29 CFR 1910.138(a): The employer did not select and require employee(s) to use appropriate hand protection when employees' hands were exposed to hazards such as those from skin absorption of harmful substances; severe cuts or lacerations; severe abrasion; punctures; chemical burns; thermal burns; and harmful temperature extremes

The employer does not require employees to use appropriate hand protection when working with hazardous chemicals. This violation occurred on or about August 28, 2014, at times prior thereto and at times thereafter in the chromium plating area when the employer did not require employees to use appropriate hand protection while performing the following actions:

a) Employees in the chromium plating area are exposed to chromic acid and were not required to wear chemical resistant gloves when handling wet parts being removed from the chromium dip tanks;

b) Employees in the chromium plating area were not required to wear hand protection while applying Methyl Ethyl Ketone (MEK) and WF Thinner to clean parts before placing them in the chromium dip tanks;

c) Employees in the chromium plating prep area were not required to wear hand protection while applying Stop-off Lacquer while preparing parts to be placed in the chromium dip tanks.

Pursuant to 29 CFR 1903.19, within ten (10) calendar days of the abatement date, the employer must submit documentation showing that it is in compliance with the standard, including describing the steps that it is taking to ensure that employees use appropriate hand protection when working with hazardous chemicals.

ABATEMENT DOCUMENTATION REQUIRED FOR THIS ITEM

Date By Which Violation Must be Abated: 02/09/2015

See pages 1 through 4 of this Citation and Notification of Penalty for information on employer and employee rights and responsibilities.

Citation and Notification of Penalty

Company Name: Lane Plating Works, Inc.
Inspection Site: 5322 Bonnie View Road, Dallas, TX 75241

The alleged violations below have been grouped because they involve similar or related hazards that may increase the potential for injury or illness.

Citation 1 Item 14 a Type of Violation: **Serious**

29 CFR 1910.1026(h)(2)(i): The employer did not ensure that employees removed all protective clothing and equipment contaminated with chromium (VI) at the end of the work shift or at the completion of their tasks involving chromium (VI) exposure, whichever came first:

The employer did not ensure that employees remove all protective clothing and equipment contaminated with hexavalent chromium at the end of the work shift. This violation occurred on or about August 28, 2014, at times prior thereto and at times thereafter when employees exposed to hexavalent chromium did not remove clothing with hexavalent chromium at the end of the work shift. Full-shift air monitoring showed that employees working in the chromium plating area were exposed to levels of hexavalent chromium above OSHAs permissible exposure limit (PEL).

Pursuant to 29 CFR 1903.19, within ten (10) calendar days of the abatement date, the employer must submit documentation showing that it is in compliance with the standard, including describing the steps that it is taking to ensure that employees remove clothing contaminated with hexavalent chromium is removed at the end of the work shift.

ABATEMENT DOCUMENTATION REQUIRED FOR THIS ITEM

Date By Which Violation Must be Abated:	02/09/2015
Proposed Penalty:	$2800.00

Citation and Notification of Penalty

Company Name: Lane Plating Works, Inc.
Inspection Site: 5322 Bonnie View Road, Dallas, TX 75241

Citation 1 Item 14 b Type of Violation: **Serious**

29 CFR 1910.1026(h)(2)(iii): Chromium (VI)-contaminated protective clothing or equipment was removed for laundering, cleaning, maintenance, or disposal; however, the employer did not ensure that it was stored and transported in sealed, impermeable bags or other closed, impermeable containers:

The employer does not ensure that protective clothing or equipment contaminated with hexavalent chromium is removed for laundering, cleaning, or disposal and does not ensure that protective clothing or equipment is stored in sealed, impermeable bags or other closed, impermeable containers that are labeled with product identifiers, signal words, and hazard statements. This violation occurred on or about August 28, 2014, at times prior thereto and at times thereafter; when N-95 respirators and disposable gloves contaminated with hexavalent chromium were removed for disposal and placed in the trash.

Pursuant to 29 CFR 1903.19, within ten (10) calendar days of the abatement date, the employer must submit documentation showing that it is in compliance with the standard, including describing the steps that it is taking to ensure that protective clothing or equipment contaminated with hexavalent chromium was removed for disposal and was stored and transported in sealed, impermeable bags or other closed, impermeable containers that were labeled with product identifiers, signal words, and hazard statements.

ABATEMENT DOCUMENTATION REQUIRED FOR THIS ITEM

Date By Which Violation Must be Abated: 02/09/2015

Citation and Notification of Penalty

Company Name: Lane Plating Works, Inc.
Inspection Site: 5322 Bonnie View Road, Dallas, TX 75241

Citation 1 Item 15 Type of Violation: **Serious**

29 CFR 1910.1026(h)(3)(i): The employer did not clean, launder, repair and replace all protective clothing and equipment for chromium (VI) exposures, as needed to maintain effectiveness:

The employer does not clean or launder protective clothing and equipment contaminated with hexavalent chromium. This violation occurred on or about August 28, 2014, at times prior thereto and at times thereafter; when the employer did not launder and/or provide a laundry service to wash clothing contaminated with hexavalent chromium.

Pursuant to 29 CFR 1903.19, within ten (10) calendar days of the abatement date, the employer must submit documentation showing that it is in compliance with the standard, including describing the steps that the employer is taking to clean or launder clothing contaminated with hexavalent chromium.

ABATEMENT DOCUMENTATION REQUIRED FOR THIS ITEM

Date By Which Violation Must be Abated:	02/09/2015
Proposed Penalty:	$2800.00

Citation and Notification of Penalty

Company Name: Lane Plating Works, Inc.
Inspection Site: 5322 Bonnie View Road, Dallas, TX 75241

Citation 1 Item 16 Type of Violation: **Serious**

29 CFR 1910.1026(i)(3)(ii): The employer did not ensure that employees who had skin contact with chromium (VI) wash their hands and faces at the end of the work shift and/or prior to eating, drinking, smoking, chewing tobacco or gum, applying cosmetics, or using the toilet:

The employer does not ensure that employees who have skin contact with hexavalent chromium wash their hands prior to eating, drinking, smoking, chewing tobacco or gum, applying cosmetics, or using the toilet. This violation occurred on or about August 28, 2014, at times prior thereto and at times thereafter; when the employer did not implement a hand washing policy and did not ensure that employees who had skin contact with hexavalent chromium wash their hands at the end of the work shift and/or prior to eating, drinking, smoking, or using the toilet.

Pursuant to 29 CFR 1903.19, within ten (10) calendar days of the abatement date, the employer must submit documentation showing that it is in compliance with the standard, including describing the steps that it is taking to establish a hand washing policy and to ensure that employees who had skin contact with hexavalent chromium wash their hands at the end of the work shift and/or prior to eating, drinking, smoking, or using the toilet.

ABATEMENT DOCUMENTATION REQUIRED FOR THIS ITEM

Date By Which Violation Must be Abated:	02/24/2015
Proposed Penalty:	$2800.00

See pages 1 through 4 of this Citation and Notification of Penalty for information on employer and employee rights and responsibilities.

Citation and Notification of Penalty

Company Name: Lane Plating Works, Inc.
Inspection Site: 5322 Bonnie View Road, Dallas, TX 75241

The alleged violations below have been grouped because they involve similar or related hazards that may increase the potential for injury or illness.

Citation 1 Item 17 a Type of Violation: **Serious**

29 CFR 1910.1026(i)(4)(i): Employees were allowed to consume food or beverages at a worksite where chromium (VI) was present; however, the employer did not ensure that the eating and drinking areas were maintained as free as practicable of chromium (VI):

The employer allows employees to consume food or beverage at a worksite where hexavalent chromium is present and does not ensure that the eating and drinking areas are maintained as free as practicable of hexavalent chromium. This violation occurred on or about September 11, 2014, at times prior thereto and at times thereafter; where the employer did not ensure that the break room and other areas where employees eat and drink were maintained as free as practicable of hexavalent chromium. The following areas where employees eat and drink were found to be contaminated with hexavalent chromium:

a) Two tables and the sink in the break room were found to be contaminated with 2.4029 µg, 0.9616 µg, and 1.8208 µg of hexavalent chromium;

b) The secretary's desk in the front office was found to be contaminated with 5.5382 µg of hexavalent chromium;

c) The table on the front loading dock where employees smoke was found to be contaminated with 32.3731 µg of hexavalent chromium.

Pursuant to 29 CFR 1903.19, within ten (10) calendar days of the abatement date, the employer must submit documentation showing that it is in compliance with the standard, including describing the steps that it is taking to ensure that eating and drinking areas are maintained as free as practicable from hexavalent chromium.

Citation and Notification of Penalty

Company Name: Lane Plating Works, Inc.
Inspection Site: 5322 Bonnie View Road, Dallas, TX 75241

ABATEMENT DOCUMENTATION REQUIRED FOR THIS ITEM

Date By Which Violation Must be Abated:	02/09/2015
Proposed Penalty:	$7000.00

See pages 1 through 4 of this Citation and Notification of Penalty for information on employer and employee rights and responsibilities.

Citation and Notification of Penalty

Company Name: Lane Plating Works, Inc.
Inspection Site: 5322 Bonnie View Road, Dallas, TX 75241

Citation 1 Item 17 b Type of Violation: **Serious**

29 CFR 1910.1026(j)(1)(i): The employer did not ensure that all surfaces were maintained as free as practicable of accumulations of chromium (VI):

The employer does not ensure that all surfaces are maintained as free as practicable of accumulations of hexavalent chromium. This violation occurred on or about August 28, 2014, at times prior thereto and at times thereafter; where employees were exposed to the following surfaces contaminated with hexavalent chromium:

a) The table in the break room across from the stove was found to be contaminated with 2.4029 µg of hexavalent chromium;

b) The table in corner of the break room was found to be contaminated with 0.9616 µg of hexavalent chromium;

c) The sink in the break room was found to be contaminated with 1.8208 µg of hexavalent chromium;

d) The sink in the men's bathroom was found to be contaminated with 5.4218 µg of hexavalent chromium;

e) The sink in the women's bathroom was found to be contaminated with 5.6905 µg of hexavalent chromium;

f) The work bench in the chrome plating preparation room was found to be contaminated with 66.8952 µg of hexavalent chromium;

g) The phone at the secretary's desk in the front office was found to be contaminated with 2.1715 µg of hexavalent chromium;

h) The surface of the secretary's desk in the front office was found to be contaminated with 5.5382 µg of hexavalent chromium;

Citation and Notification of Penalty

Company Name: Lane Plating Works, Inc.
Inspection Site: 5322 Bonnie View Road, Dallas, TX 75241

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i) The table in the front loading dock was found to be contaminated with 32.3731 µg of hexavalent chromium.

Pursuant to 29 CFR 1903.19, within ten (10) calendar days of the abatement date, the employer must submit documentation showing that it is in compliance with the standard, including describing the steps that it is taking to ensure that all surfaces are maintained as free as practicable of accumulations of hexavalent chromium.

ABATEMENT DOCUMENTATION REQUIRED FOR THIS ITEM

Date By Which Violation Must be Abated: 02/09/2015

Citation and Notification of Penalty

Company Name: Lane Plating Works, Inc.
Inspection Site: 5322 Bonnie View Road, Dallas, TX 75241

Citation 1 Item 18 Type of Violation: **Serious**

29 CFR 1910.1026(k)(1)(i)(A): The employer did not make medical surveillance available for all employees who were or could be occupationally exposed to chromium (VI) at or above the action level for 30 or more days a year:

The employer does not make medical surveillance available for all employees who are or could be occupationally exposed to hexavalent chromium at or above the action level for 30 or more days a year. This violation occurred on or about August 28, 2014, at times prior thereto and at times thereafter, in the chrome plating area; where employees, who were occupationally exposed to hexavalent chromium, did not receive medical surveillance. A chromium plater was exposed to hexavalent chromium at an 8-hour time-weighted average of 6.8 $\mu g / m^3$ of air, approximately 1.36 times the OSHA PEL of 5.0 $\mu g/m^3$.

Pursuant to 29 CFR 1903.19, within ten (10) calendar days of the abatement date, the employer must submit documentation showing that it is in compliance with the standard, including describing the steps that it is taking to ensure that employees who were or could be occupationally exposed to hexavalent chromium at or above the action level for 30 or more days a year have medical surveillance made available.

ABATEMENT DOCUMENTATION REQUIRED FOR THIS ITEM

Date By Which Violation Must be Abated:	02/09/2015
Proposed Penalty:	$2800.00

See pages 1 through 4 of this Citation and Notification of Penalty for information on employer and employee rights and responsibilities.

Citation and Notification of Penalty

Company Name: Lane Plating Works, Inc.
Inspection Site: 5322 Bonnie View Road, Dallas, TX 75241

The alleged violations below have been grouped because they involve similar or related hazards that may increase the potential for injury or illness.

Citation 1 Item 19 a Type of Violation: **Serious**

29 CFR 1910.1026(l)(1): The employer did not ensure that all employees who were assigned to workplaces where there was exposure to chromium (VI) were provided with information and training as required by the Hazard Communication Standard 29 CFR 1910.1200:

The employer does not ensure that all employees who are exposed to hexavalent chromium are provided with information and training as required by the Hazard Communication Standard, 29 CFR 1910.1200. This violation occurred on or about August 28, 2014 and at times prior thereto and at times thereafter; when employees exposed to hexavalent chromium had not been provided information and training on the hazards associated with hexavalent chromium exposure; the purpose, selection, and use of respiratory protection and protective clothing, and measures employees can take to protect themselves.

Pursuant to 29 CFR 1903.19, within ten (10) calendar days of the abatement date, the employer must submit documentation showing that it is in compliance with the standard, including describing the steps that it is taking to ensure that employees who are assigned to a workplace where there is an exposure to hexavalent chromium are provided with information and training as required by the Hazard Communication Standard 29 CFR 1910.1200.

ABATEMENT DOCUMENTATION REQUIRED FOR THIS ITEM

Date By Which Violation Must be Abated:	02/09/2015
Proposed Penalty:	$2800.00

Citation and Notification of Penalty

Company Name: Lane Plating Works, Inc.
Inspection Site: 5322 Bonnie View Road, Dallas, TX 75241

Citation 1 Item 19 b Type of Violation: **Serious**

29 CFR 1910.1200(e)(1): The employer did not develop, implement, and/or maintain at the workplace a written hazard communication program which describes how the criteria specified in 29 CFR 1910.1200 (f), (g), and (h) will be met:

The employer does not ensure that a written hazard communication program is developed, implemented, and/or maintained. This violation occurred on or about August 28, 2014 and at times prior thereto and at times thereafter when the employer did not develop, implement, and/or maintain a written hazard communication program describing how the criteria specified in 29 CFR 1910.1200 (f), (g), and (h) will be met.

a) Employees in the chromium plating area near the back loading dock poured WF Thinner from an improperly labeled container;

b) Employees in the chromium prep area applied Stop-off Lacquer from an unlabeled bottle;

c) Employees using chromic acid in the chromium plating area were not provided with safety material data sheets (MSDS) for chromic acid, sulfuric acid, and sodium hydroxide;

d) Employees using chromic acid, methyl ethyl ketone (MEK), WF Thinner, sulfuric acid, sodium hydroxide, Stop-off Lacquer and other hazardous chemicals were not provided with effective information and training.

Pursuant to 29 CFR 1903.19, within ten (10) calendar days of the abatement date, the employer must submit documentation showing that it is in compliance with the standard, including describing the steps that it is taking to develop, implement, and/or maintain at the workplace a written hazard communication program which describes how the criteria specified in 29 CFR 1910.1200 (f), (g), and (h) will be met.

ABATEMENT DOCUMENTATION REQUIRED FOR THIS ITEM

Date By Which Violation Must be Abated: 02/09/2015

See pages 1 through 4 of this Citation and Notification of Penalty for information on employer and employee rights and responsibilities.

Citation and Notification of Penalty

Company Name: Lane Plating Works, Inc.
Inspection Site: 5322 Bonnie View Road, Dallas, TX 75241

Citation 2 Item 1 Type of Violation: **Willful**

29 CFR 1910.1026(f)(1)(i): Feasible engineering controls and work practices were not instituted to reduce and maintain employee exposures to chromium (VI) at or below the permissible exposure limit:

The employer does not determine and implement administrative and engineering controls to achieve compliance with the limits prescribed in 29 CFR 1910.1026(c). This violation occurred on or about August 5, 2014, at times prior thereto and at times thereafter, in the chromium plating area; where the employer had not implemented feasible administrative or engineering controls to achieve compliance with the permissible exposure limit for hexavalent chromium. A chromium plater was exposed to hexavalent chromium at an eight-hour time-weighted average of 6.8 $\mu g/m^3$ of air, approximately 1.36 times the OSHA PEL of 5.0 $\mu g/m^3$.

Pursuant to 29 CFR 1903.19, within ten (10) calendar days of the abatement date, the employer must submit documentation showing that it is in compliance with the standard, including describing the steps that it is taking to ensure that feasible administrative or engineering controls and work practices are implemented to reduce and maintain employee exposures to hexavalent chromium at or below the permissible exposure limit.

ABATEMENT DOCUMENTATION REQUIRED FOR THIS ITEM

Date By Which Violation Must be Abated:	02/24/2015
Proposed Penalty:	$28000.00

See pages 1 through 4 of this Citation and Notification of Penalty for information on employer and employee rights and responsibilities.

Citation and Notification of Penalty

Company Name: Lane Plating Works, Inc.
Inspection Site: 5322 Bonnie View Road, Dallas, TX 75241

Citation 2 Item 2 Type of Violation: **Willful**

29 CFR 1910.1026(d)(2)(iv): The employer used the scheduled monitoring option, and monitoring revealed employee exposures to chromium (VI) to be above the permissible exposure limit; however, the employer did not perform periodic monitoring at least every three months:

The employer does not perform periodic monitoring, at least every three months, for employees exposed to hexavalent chromium above the permissible exposure limit. This violation occurred on or about August 28, 2014, at times prior thereto and at times thereafter in the chrome plating area; where a chrome plater was exposed to hexavalent chromium at an eight-hour time-weighted average of 6.8 $\mu g/m^3$ of air, approximately 1.26 times the OSHA PEL of 5.0 $\mu g/m^3$.

Pursuant to 29 CFR 1903.19, within ten (10) calendar days of the abatement date, the employer must submit documentation showing that it is in compliance with the standard, including describing the steps that it is taking to ensure that periodic monitoring is performed, at least every three months, for employees exposed to hexavalent chromium above the permissible exposure limit.

ABATEMENT DOCUMENTATION REQUIRED FOR THIS ITEM

Date By Which Violation Must be Abated:	02/24/2015
Proposed Penalty:	$28000.00

STEPHEN BOYD
Area Director

U.S. DEPARTMENT OF LABOR
Occupational Safety and Health Administration
1100 East Campbell Road, Suite 250
Richardson, TX 75081
Phone: 972-952-1330 / Fax: 972-952-1338

INVOICE / DEBT COLLECTION NOTICE

Company Name: **Lane Plating Works, Inc.**
Inspection Site: **5322 Bonnie View Road, Dallas, TX 75241**
Issuance Date: **01/28/2015**

Summary of Penalties for Inspection Number	**989172**
Citation 1, Serious	**$54200.00**
Citation 2, Willful	**$56000.00**
TOTAL PROPOSED PENALTIES	**$110200.00**

To avoid additional charges, please remit payment promptly to this Area Office for the total amount of the uncontested penalties summarized above. Make your check or money order payable to: "DOL-OSHA". Please indicate OSHA's Inspection Number (indicated above) on the remittance. You can also make your payment electronically on www.pay.gov. On the left side of the pay.gov homepage, you will see an option to Search Public Forms. Type "**OSHA**" and click Go. From the results, click on **OSHA Penalty Payment Form**. The direct link is https://www.pay.gov/paygov/forms/formInstance.html?agencyFormId=53090334. You will be required to enter your inspection number when making the payment. Payments can be made by credit card or Automated Clearing House (ACH) using your banking information. Payments of $50,000 or more require a Transaction ID, and also must be paid using ACH. If you require a Transaction ID, please contact the OSHA Debt Collection Team at (202) 693-2170.

OSHA does not agree to any restrictions or conditions or endorsements put on any check, money order, or electronic payment for less than the full amount due, and will cash the check or money order as if these restrictions or conditions do not exist.

If a personal check is issued, it will be converted into an electronic fund transfer (EFT). This means that our bank will copy your check and use the account information on it to electronically debit your account for the amount of the check. The debit from your account will then usually occur within 24 hours and will be shown on your regular account statement. You will not receive your original check back. The bank will destroy your original check, but will keep a copy of it. If the EFT cannot be completed because of insufficient funds or closed account, the bank will attempt to make the transfer up to 2 times.

Pursuant to the Debt Collection Act of 1982 (Public Law 97-365) and regulations of the U.S. Department of Labor (29 CFR Part 20), the Occupational Safety and Health Administration is required to assess interest, delinquent charges, and administrative costs for the collection of delinquent penalty debts for violations of the Occupational Safety and Health Act.

Interest: Interest charges will be assessed at an annual rate determined by the Secretary of the Treasury on all penalty debt amounts not paid within one month (30 calendar days) of the date on which the debt amount becomes due and payable (penalty due date). The current interest rate is one percent (1%). Interest will accrue from the date on which the penalty amounts (as proposed or adjusted) become a final order of the Occupational Safety and Health Review Commission (that is, 15 working days from your receipt of the Citation and Notification of Penalty), unless you file a notice of contest. Interest charges will be waived if the full amount owed is paid within 30 calendar days of the final order.

Delinquent Charges: A debt is considered delinquent if it has not been paid within one month (30 calendar days) of the penalty due date or if a satisfactory payment arrangement has not been made. If the debt remains delinquent for more than 90 calendar days, a delinquent charge of six percent (6%) per annum will be assessed accruing from the date that the debt became delinquent.

Administrative Costs: Agencies of the Department of Labor are required to assess additional charges for the recovery of delinquent debts. These additional charges are administrative costs incurred by the Agency in its attempt to collect an unpaid debt. Administrative costs will be assessed for demand letters sent in an attempt to collect the unpaid debt.

STEPHEN BOYD
Area Director

January 28, 2015
Date

Reference 30

Bryan W. Shaw, Ph.D., P.E., *Chairman*
Toby Baker, *Commissioner*
Richard A. Hyde, P.E., *Executive Director*

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Protecting Texas by Reducing and Preventing Pollution

June 18, 2015

Via Certified Mail, Return Receipt Requested, Article Number 7013 3020 0000 8380 5514
William F. Pyne, Registered Agent
LANE PLATING WORKS, INC.
8150 North Central Expressway, Suite 1800
Dallas, Texas 75206

Via Certified Mail, Return Receipt Requested, Article Number 7013 3020 0000 8380 5507
Joe Lane, President
LANE PLATING WORKS, INC.
1220 Glen Cove
Richardson, Texas 75080

Via Certified Mail, Return Receipt Requested, Article Number 7013 3020 0000 8380 5491
Jeffery Lane, Vice President
LANE PLATING WORKS, INC.
5322 Bonnie View Road
Dallas, Texas 75241

Via Certified Mail, Return Receipt Requested, Article Number 7013 3020 0000 8380 5484
William F. Pyne, Registered Agent
STAG MANAGEMENT INCORPORATED
1700 Pacific Avenue, Suite 3300
Dallas, Texas 75201

Via Certified Mail, Return Receipt Requested, Article Number 7013 3020 0000 8380 5477
J.R. Lane, President and Director
STAG MANAGEMENT INCORPORATED
P. O. Box 41098
Dallas, Texas 75241

Via Certified Mail, Return Receipt Requested, Article Number 7013 3020 0000 8380 5460
Joe D. Lane, Director
STAG MANAGEMENT INCORPORATED
P. O. Box 41098
Dallas, Texas 75241

Re: LANE PLATING WORKS, INC.; RN100597707;
TCEQ Docket No. 2015-0423-IHW-E

Dear Messrs. Pyne and Lane:

The Executive Director of the Texas Commission on Environmental Quality ("Commission" or "TCEQ") is pursuing an enforcement action against you for violations of state statutes and

Commission Rules. Enclosed is a copy of the "Executive Director's Preliminary Report and Petition Recommending that the Texas Commission on Environmental Quality Enter an Enforcement Order Assessing an Administrative Penalty Against and Requiring Certain Actions of LANE PLATING WORKS, INC." (the "EDPRP"), which was filed today with the Chief Clerk of the TCEQ.

You may employ an attorney. If you or your attorney do not file a written answer with the Chief Clerk of the TCEQ within twenty days after you receive this notice and petition, and/or fail to settle this matter by entering into an Agreed Order, the Commission may issue a default order against you. If a default order is issued, you will be required to pay the assessed penalty and complete any corrective actions recommended by the Executive Director.

YOUR FAILURE TO ACCEPT OR PICK UP CERTIFIED MAIL WILL NOT RELIEVE YOU OF YOUR RESPONSIBILITY IN THIS MATTER.

To request a hearing, send a written hearing request referencing TCEQ Docket No. 2015-0423-IHW-E to the persons listed below via e-mail, regular mail, fax, or e-filing:

Bridget Bohac, Chief Clerk
Office of the Chief Clerk
Texas Commission on Environmental Quality
P.O. Box 13087, MC 105
Austin, Texas 78711-3087
(512) 239-3311 (fax)
http://www14.tceq.texas.gov/epic/eFiling/

and:

Jennifer Cook, Staff Attorney
Office of Legal Services, Litigation Division
Texas Commission on Environmental Quality
P.O. Box 13087, MC 175
Austin, Texas 78711-3087
(512) 239-3434 (fax)
jennifer.cook@tceq.texas.gov

and:

Rudy Calderon, Staff Attorney
Office of Public Interest Counsel
Texas Commission on Environmental Quality
P.O. Box 13087, MC 103
Austin, Texas 78711-3087
(512) 239-6377 (fax)
rudy.calderon@tceq.texas.gov

To e-file your hearing request, go to http://www14.tceq.texas.gov/epic/eFiling/ and follow the on-screen instructions. Hearing requests are due to the Chief Clerk by 5:00 p.m. CST on or before the 20-day deadline date referenced above. Hearing requests filed via e-filing must be in either Microsoft Word or Adobe Acrobat (pdf) format.

All or a portion of the recommended administrative penalty may be offset through the completion of or payment to a Supplemental Environmental Project ("SEP"), which directs all or a portion of your administrative penalty toward projects aimed at improving the

environment. For further information on contributing to a SEP, please visit our website at http://www.tceq.texas.gov/legal/sep.

For further information concerning the enforcement process, contact the TCEQ Office of Public Interest Counsel at (512) 239-6363. For information concerning compliance assistance, contact the TCEQ Environmental Assistance Division at (800) 447-2827.

If you have any questions or would like to schedule a meeting to discuss settlement, payment plan options, or contribution to a SEP, please contact me at (512) 239-3400 or at my e-mail address listed below. I look forward to cooperatively resolving this matter with you.

Sincerely,

Jennifer Cook, Staff Attorney
Office of Legal Services, Litigation Division
Texas Commission on Environmental Quality
jennifer.cook@tceq.texas.gov

Enclosure

cc: TCEQ Office of the Chief Clerk
Rudy Calderon, TCEQ Office of Public Interest Counsel
Mike Pace, Enforcement Division
Sam Barrett, Dallas/Fort Worth Regional Office

TCEQ DOCKET NO. 2015-0423-IHW-E

IN THE MATTER OF	**§**	**BEFORE THE**
AN ENFORCEMENT ACTION	**§**	
AGAINST	**§**	**TEXAS COMMISSION ON**
LANE PLATING WORKS, INC. AND	**§**	
STAG MANAGEMENT INCORPORATED;	**§**	
RN100597707 AND RN100597707	**§**	**ENVIRONMENTAL QUALITY**

EXECUTIVE DIRECTOR'S PRELIMINARY REPORT AND PETITION RECOMMENDING THAT THE TEXAS COMMISSION ON ENVIRONMENTAL QUALITY ENTER AN ENFORCEMENT ORDER ASSESSING AN ADMINISTRATIVE PENALTY AGAINST AND REQUIRING CERTAIN ACTIONS OF LANE PLATING WORKS, INC. AND STAG MANAGEMENT INCORPORATED

INTRODUCTION

1. The Executive Director of the Texas Commission on Environmental Quality ("Commission" or "TCEQ"), by and through a representative of the Litigation Division, hereby issues this Preliminary Report and Petition pursuant to TEX. WATER CODE § 7.054 and TEX. WATER CODE ch. 7, TEX. HEALTH & SAFETY CODE ch. 361, and 30 TEX. ADMIN. CODE chs. 70 and 335. Discovery related to this matter is intended to be conducted under Level 3 pursuant to TEX. R. CIV. P. 190.

2. LANE PLATING WORKS, INC. and STAG MANAGEMENT INCORPORATED (collectively "Respondents") are subject to the enforcement authority of the Commission pursuant to TEX. WATER CODE § 7.002 because the violations alleged herein are within the Commission's general jurisdiction, pursuant to TEX. WATER CODE § 5.013, as they involve violations of the state's industrial and hazardous waste program.

3. The Executive Director has come to the conclusion that Respondents violated Texas Water Code § 26.121; 30 TEX. ADMIN. CODE §§ 335.4, 335.6(c), 335.9(a)(1) and (a)(1)(G), 350.3(1), 335.62, 335.69(a), (d)(1), and (d)(2), 335.112(a)(8) and (a)(9), 335.122(a)(1), 335.503, and 335.504; 40 C.F.R. §§ 262.11, 262.34(a), (c)(1)(i) and (c)(1)(ii), 265.16(d)(2) and (d)(4), 265.174, 265.193(a)(1), and 265.195(b)(2); and Agreed Order Docket No. 2011-0662-IHW-E, Ordering Provisions Nos. 2.a., 2.b.i., 2.b.ii and 2.b.iv. The Executive Director recommends that the Commission enter an order assessing an administrative penalty against each Respondent in the amount of six hundred ninety-five thousand nine hundred twenty-five dollars ($695,925.00). Further, the Executive Director recommends that the Commission order Respondents to undertake such actions as are necessary to bring operations into compliance with the Texas Health and Safety Code and TCEQ rules.

4. Effective September 1, 2006, the TCEQ does not issue, amend, or renew permits, registrations, certifications, or licenses to an entity or person if any delinquent penalties or delinquent fees are associated with that entity's/person's 9-digit TCEQ Customer Number (CN), regardless of media and/or facility location.

FACTS SUPPORTING VIOLATIONS

5. Respondents own and operate an electroplating facility located at 5322 Bonnie View Road in Dallas, Dallas County, Texas (the "Facility"). The Facility contains and/or involves the management of industrial hazardous waste ("IHW"), as defined in TEX. HEALTH & SAFETY CODE ch. 361.

6. During an investigation conducted on October 21, 2014, an investigator documented that Respondents:

   a. Failed to update the Facility's Notice of Registration ("NOR") for any changes or additional information within 90 days of the occurrence of such change or of becoming aware of additional information, in violation of 30 TEX. ADMIN. CODE § 335.6(c). Specifically, the NOR was not updated for eight waste streams;

   b. Failed to clearly label all hazardous waste containers with the words "Hazardous Waste" and mark each container with the date on which the accumulation period began, in violation of 30 TEX. ADMIN. CODE § 335.69(a)(2), (a)(3) and (d)(2) and 40 C.F.R. § 262.34(a)(2), (a)(3) and (c)(1)(ii). Specifically, 17 containers were not labeled;

   c. Failed to keep containers in a Satellite Accumulation Area ("SAA") holding hazardous waste closed during storage, except when adding or removing waste, in violation of 30 TEX. ADMIN. CODE § 335.69(d)(1) and 40 C.F.R. §§ 262.34(c)(1)(i) and 265.173(a). Specifically, one container storing contaminated absorbent and two containers storing hazardous filters were open;

   d. Failed to conduct hazardous waste determinations and classifications, in violation of 30 TEX. ADMIN. CODE §§ 335.62, 335.503, and 335.504 and 40 C.F.R. § 262.11. Specifically, waste determinations and classifications were not conducted on the following four waste streams: 1) TWC 0011107H (cyanide-bearing material), 2) TWC 00083892 (spent glass beads), 3) unlabeled container storing an unidentified waste, and 4) spent tape covered with chromic acid;

   e. Failed to provide adequate secondary containment for hazardous waste tanks, in violation of 30 TEX. ADMIN. CODE §§ 335.69(a)(1)(B) and 335.112(a)(9) and 40 C.F.R. §§ 262.34(a)(1)(i) and 265.193(a)(1). Specifically, two tanks storing hazardous waste and the Facility's sump were not equipped with secondary containment;

   f. Failed to conduct weekly inspections of Container Storage Areas ("CSAs"), in violation of 30 TEX. ADMIN. CODE §§ 335.69(a)(1)(A) and 335.112(a)(8) and 40 C.F.R. §§ 262.34(a)(1)(i) and 265.174. Specifically, inspection logs were missing for the weeks of January 26, 2014 and April 28, 2014;

   g. Failed to conduct daily inspections of hazardous waste storage tanks, in violation of 30 TEX. ADMIN. CODE § 335.69(a)(1)(B) and 40 C.F.R. §§ 262.34(a)(1)(ii) and 265.195(b)(2). Specifically, the investigator noted that daily inspections were not being conducted on one hazardous waste storage tank;

   h. Failed to maintain hazardous waste records, in violation of 30 TEX. ADMIN. CODE §§ 335.122(a)(1) and 335.69(a)(4)(A), and 40 C.F.R. §§ 262.34(a)(4), 265.16(d)(2) and (d)(4). Specifically, job descriptions and training records for personnel who handle hazardous waste were not available for review;

i. Failed to maintain records of all hazardous and industrial solid waste activities, in violation of 30 TEX. ADMIN. CODE § 335.9(a)(1) and (a)(1)(G) and Agreed Order Docket No. 2011-0662-IHW-E, Ordering Provision No. 2.b.iv. Specifically, records of waste generation quantities, descriptions of individual waste stream characterizations, and waste determinations for class II waste streams were not available for review. Also, a record of the location of each SAA was not maintained;

j. Failed to transfer hazardous waste off-site within the allotted accumulation time limit, in violation of 30 TEX. ADMIN. CODE § 335.69(a), 40 C.F.R. § 262.34(a) and Agreed Order Docket No. 2011-0662-IHW-E, Ordering Provision No. 2.b.ii. Specifically, 12 super sacks of contaminated soil, one drum of waste silver chromate, and two drums of chrome-contaminated soil were noted to have been stored on site longer than 90 days; and

k. Caused, suffered, allowed, or permitted the unauthorized discharge of industrial hazardous waste, in violation of Texas Water Code 26.121, 30 TEX. ADMIN. CODE §§ 335.4 and 350.3(1), and Agreed Order Docket No. 2011-0662-IHW-E, Ordering Provisions Nos. 2.a., b.i. and c. Specifically, analytical results from soil samples collected around the foundation of the Facility building indicated elevated levels of chromium at 168.8 ppm, exceeding the Toxicity Characteristic Leachate Procedure ("TCLP") regulatory limit of 5 ppm; cadmium at 3.5 ppm and 1.1 ppm, exceeding TCLP regulatory limit of 1 ppm; and mercury concentrations ranging from 1.98 to 12.6 ppm, exceeding the Texas specific protective concentration levels of .04 ppm.

IMPOSITION OF PENALTY

7. Based on the facts supporting the violations, the Executive Director recommends that an administrative penalty be imposed pursuant to TEX. WATER CODE § 7.051. The Commission has the authority to assess an administrative penalty of up to $25,000 for each day of each violation under TEX. WATER CODE § 7.052.

AMOUNT OF PENALTY

8. In determining the amount of the penalty, the Commission is required by TEX. WATER CODE § 7.053 to consider:

a. The nature, circumstances, extent, duration, and gravity of the prohibited act, with special emphasis on the impairment of existing water rights or the hazard or potential hazard created to the health or safety of the public;

b. The impact of the violation on:

i. air quality in the region;

ii. a receiving stream or underground water reservoir;

iii. instream uses, water quality, aquatic and wildlife habitat, or beneficial freshwater inflows to bays and estuaries; or

iv. affected persons;

c. With respect to the alleged violator:

i. the history and extent of previous violations;

ii. the degree of culpability, including whether the violation was attributable to mechanical or electrical failures and whether the violation could have been reasonably anticipated and avoided;

iii. the demonstrated good faith, including actions taken by the alleged violator to rectify the cause of the violation and to compensate affected persons;

iv. economic benefit gained through the violation; and

v. the amount necessary to deter future violations; and

d. Any other matters that justice may require.

9. Based on the facts supporting the violations, and having considered the above-described factors, the Executive Director recommends that each Respondent be required to pay an administrative penalty in the amount of six hundred ninety-five thousand nine hundred twenty-five dollars ($695,925.00).

10. The penalty calculation worksheet ("PCW") for the recommended administrative penalty is attached hereto and incorporated herein by reference ("Attachment A"). The PCW sets forth each alleged violation and the statutory factors the Executive Director considered in determining the recommended administrative penalty.

11. The Executive Director followed an established Penalty Policy approved by the Commission in calculating the penalty in this enforcement action. *See* Texas Commission on Environmental Quality Penalty Policy (April 2014 Penalty Policy).

CORRECTIVE ACTION ORDERING PROVISIONS

12. Pursuant to TEX. WATER CODE § 7.073, if a person violates any statute or rule within the Commission's jurisdiction, the Commission may order the person to take corrective action.

13. The Executive Director recommends that Respondents be required to implement the following corrective measures:

a. Immediately upon the effective date of the Commission Order, cease additional unauthorized discharges;

b. Within 30 days after the effective date of the Commission Order:

i. Remove all discharged industrial solid waste, visibly impacted soils, and waste containers from the Facility and properly dispose of them at an authorized facility;

ii. Develop and implement procedures to ensure that all containers storing hazardous waste are removed within the allotted accumulation time limit and transported to a facility authorized to accept the waste, in accordance with 30 TEX. ADMIN. CODE § 335.69(a) and 40 C.F.R. § 262.34(a);

iii. Begin maintaining records of all hazardous and industrial solid waste activities, in accordance with, 30 TEX. ADMIN. CODE § 335.9(a)(1) and (a)(1)(G);

iv. Update the Facility's NOR to accurately reflect all waste streams, in accordance with 30 TEX. ADMIN. CODE § 335.6;

v. Properly label all containers storing hazardous waste with the words "hazardous waste" and a beginning accumulation date, in accordance with 30 TEX. ADMIN. CODE § 335.69(a)(2), (a)(3) and (d)(2) and 40 C.F.R. § 262.34(a)(2), (a)(3), and (c)(1)(ii);

vi. Properly close all hazardous waste containers except when adding or removing waste, in accordance with 30 TEX. ADMIN. CODE § 335.69(d)(1) and 40 C.F.R. §§ 262.34(c)(1)(i) and 265.173(a);

vii. Conduct waste determinations and classifications on all waste streams generated at the Facility, in accordance with 30 TEX. ADMIN. CODE §§ 335.62, 335.503, and 335.504 and 40 C.F.R. § 262.11;

viii. Provide secondary containment for the two hazardous waste tanks and the Facility's sump, in accordance with 30 TEX. ADMIN. CODE §§ 335.69(a)(1)(B) and 335.112(a)(9) and 40 C.F.R. §§ 262.34(a)(1)(i) and 265.193(a)(1);

ix. Develop and implement procedures to ensure that weekly inspections are conducted on container storage areas, in accordance with 30 TEX. ADMIN. CODE §§ 335.69(a)(1)(A) and 335.112(a)(8) and 40 C.F.R. §§ 262.34(a)(1)(i) and 265.174;

x. Begin conducting the daily inspections of the hazardous waste storage tanks, in accordance with 30 TEX. ADMIN. CODE § 335.69(a)(1)(B) and 40 C.F.R. §§ 262.34(a)(1)(ii) and 265.195(b)(2); and

xi. Begin to maintain job description and training records for personnel who handle hazardous waste, in accordance with 30 TEX. ADMIN. CODE §§ 335.122(a)(1), 335.69(a)(4)(A), and 40 C.F.R. §§ 262.34(a)(4), 265.16(d)(2) and (d)(4).

c. Within 45 days after the effective date of the Commission Order:

i. Conduct an Affected Property Assessment pursuant to 30 TEX. ADMIN. CODE § 330.51; and

ii. Submit an Affected Property Assessment Report ("APAR"), pursuant to 30 TEX. ADMIN. CODE § 350.91, to the Executive Director at the following addresses:

Order Compliance Team
Enforcement Division, MC 149A
Texas Commission on Environmental Quality
P.O. Box 13087
Austin, Texas 78711-3087

and:

Environmental Cleanup Section
Remediation Division, MC 221
Texas Commission on Environmental Quality
P.O. Box 13087
Austin, Texas 78711-3087

d. Respond completely and adequately, as determined by the TCEQ, to all requests for information concerning the APAR 15 days after the date of such requests or by any other deadline specified in writing by the TCEQ.

e. If the Executive Director determines that the APAR indicates that response actions are necessary:

i. Comply with all applicable requirements of the Texas Risk Reduction Program ("TRRP"), which may include: plans, reports, and notices under Subchapter E (30 TEX. ADMIN. CODE §§ 350.92 to 350.96); financial assurance (30 TEX. ADMIN. CODE § 350.33(1)); and Institutional Controls under Subchapter F;

ii. Perform the necessary response actions in accordance with all approved plans and/or schedules as directed by the Executive Director; and

iii. Respond, completely and adequately, as determined by the TCEQ, to all requests for information concerning any response actions within 15 days after the date of such requests, or by any other deadline specified by the TCEQ in writing.

f. Within 60 days after the effective date of the Commission Order, submit written certification, in accordance with Paragraph 2.h., below, to demonstrate compliance with Corrective Action Ordering Provisions Nos. 2.a. through 2.d.

g. Within 15 days after all response actions and all TRRP requirements have been met, submit written certification, in accordance with Paragraph 2.h., below, to demonstrate compliance with Corrective Action Ordering Provisions Nos. 2.e.i. through 2.e.iii.

h. The certifications required by these Corrective Action Ordering Provisions shall be accompanied by detailed supporting documentation, including photographs, receipts, and/or other records, shall be signed by Respondent, and shall include the following certification language:

> "I certify under penalty of law that I have personally examined and am familiar with the information submitted and all attached documents, and that based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the submitted information is true, accurate and complete. I am aware that there are

significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

Respondents shall submit the written certifications and copies of documentation necessary to demonstrate compliance with these Ordering Provisions to:

Order Compliance Team
Enforcement Division, MC 149A
Texas Commission on Environmental Quality
P.O. Box 13087
Austin, Texas 78711-3087

and:

Sam Barrett, Waste Section Manager
Texas Commission on Environmental Quality
Dallas/Fort Worth Regional Office
2309 Gravel Drive
Fort Worth, Texas 76118-6951

and:

Environmental Cleanup Section
Remediation Division, MC 221
Texas Commission on Environmental Quality
P.O. Box 13087
Austin, Texas 78711-3087

RESPONDENT'S RIGHTS AND RESPONSIBILITIES

14. According to TEX. WATER CODE § 7.056 and the TCEQ's procedural rules, Respondents have a right to a hearing on the occurrence of the violations, the amount of the proposed penalty, or both. To preserve this right to a hearing, within 20 days after the day each Respondent receives this Preliminary Report and Petition, each Respondent must submit a written response to the Executive Director in accordance with TEX. WATER CODE § 7.056 and 30 TEX. ADMIN. CODE § 70.105(a).

PRAYER

15. ACCORDINGLY, the Executive Director respectfully requests that the Commission enter an order, pursuant to TEX. HEALTH & SAFETY CODE ch. 361, assessing a penalty and granting other relief as requested above, together with any other relief the Commission finds appropriate.

Respectfully submitted,

Texas Commission on Environmental Quality

Richard A. Hyde, P.E.
Executive Director

Caroline M. Sweeney, Deputy Director
Office of Legal Services

Kathleen C. Decker, Division Director
Litigation Division

by _____
Jennifer Cook
State Bar of Texas No. 789233
TCEQ Office of Legal Services
Litigation Division, MC 175
P.O. Box 13087
Austin, Texas 78711-3087
(512) 239-3400
(512) 239-3434 (FAX)
jennifer.cook@tceq.texas.gov

CERTIFICATE OF SERVICE

I hereby certify that on this 18th day of June, 2015, the original of the foregoing "Executive Director's Preliminary Report and Petition Recommending that the Texas Commission on Environmental Quality Enter an Enforcement Order Assessing an Administrative Penalty Against and Requiring Certain Actions of LANE PLATING WORKS, INC. and STAG MANAGEMENT INCORPORATED" ("EDPRP") was filed with the Chief Clerk, Texas Commission on Environmental Quality, Austin, Texas.

I further certify that on this day a true and correct copy of the foregoing EDPRP was mailed via Certified Mail, postage prepaid, to:

William F. Pyne, Registered Agent
LANE PLATING WORKS, INC.
8150 North Central Expressway, Suite 1800
Dallas, Texas 75206
Return Receipt Requested Article No.
7013 3020 0000 8380 5514

William F. Pyne, Registered Agent
STAG MANAGEMENT INCORPORATED
1700 Pacific Avenue, Suite 3300
Dallas, Texas 75201
Return Receipt Requested Article No.
7013 3020 0000 8380 5484

Joe Lane, President
LANE PLATING WORKS, INC.
1220 Glen Cove
Richardson, Texas 75080
Return Receipt Requested Article No.
7013 3020 0000 8380 5507

J.R. Lane, President and Director
STAG MANAGEMENT INCORPORATED
P. O. Box 41098
Dallas, Texas 75241
Return Receipt Requested Article No.
7013 3020 0000 8380 5477

Jeffery Lane, Vice President
LANE PLATING WORKS, INC.
5322 Bonnie View Road
Dallas, Texas 75241
Return Receipt Requested Article No.
7013 3020 0000 8380 5491

Joe D. Lane, Director
STAG MANAGEMENT INCORPORATED
P. O. Box 41098
Dallas, Texas 75241
Return Receipt Requested Article No.
7013 3020 0000 8380 5460

I further certify that on this day a true and correct copy of the foregoing EDPRP was electronically delivered to Rudy Calderon, TCEQ Office of Public Interest Counsel, at rudy.calderon@tceq.texas.gov.

Jennifer Cook, Staff Attorney
Office of Legal Services
Litigation Division
Texas Commission on Environmental Quality

Bryan W. Shaw, Ph.D., P.E., *Chairman*
Toby Baker, *Commissioner*
Richard A. Hyde, P.E., *Executive Director*

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Protecting Texas by Reducing and Preventing Pollution

July 20, 2015

Bridget C. Bohac, Chief Clerk
Texas Commission on Environmental Quality
Attention: Docket Clerk, MC 105
P.O. Box 13087
Austin, Texas 78711-3087

Re: Answer of LANE PLATING WORKS, INC. and STAG MANAGEMENT INCORPORATED to Executive Director's Preliminary Report and Petition
LANE PLATING WORKS, INC. and STAG MANAGEMENT INCORPORATED; RN100597707 and RN100597707; TCEQ Docket No. 2015-0423-IHW-E

Dear Ms. Bohac:

Enclosed for filing is the answer of LANE PLATING WORKS, INC. and STAG MANAGEMENT INCORPORATED to the Executive Director's Preliminary Report and Petition, which I received on July 16, 2015. If you have questions or comments, please call me at (512) 239-1873.

Sincerely,

Jennifer Cook, Staff Attorney
Office of Legal Services, Litigation Division

Enclosure

cc: Rudy Calderon, Office of Public Interest Counsel **Via electronic mail**
Joe Lane, LANE PLATING WORKS, INC. and STAG MANAGEMENT INCORPORATED **Via electronic mail**

From:	Joe Lane
To:	Jennifer Cook
Subject:	File Answer for Lane plating and Stag managment
Date:	Thursday, July 16, 2015 2:47:26 PM
Attachments:	joe lane.vcf

July 16, 2015

Jennifer Cook
Attorney for TCEQ

Please let this serve as notice to Answer in the Matter of An Enforcement Action Against
Lane Plating Works, Inc.
and Stag Management Inc.
RN100597707 and RN100597707.
We respectfully request that you file this Answer with the Chief Clerk or proper Authority.

Thank You,
Joe Lane for,
Lane Plating Works, Inc.
Stag Management Inc.

Bryan W. Shaw, Ph.D., P.E., *Chairman*
Toby Baker, *Commissioner*
Richard A. Hyde, P.E., *Executive Director*

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Protecting Texas by Reducing and Preventing Pollution

August 21, 2015

via e-filing http://www10.tceq.state.tx.us/epic/efilings

Bridget C. Bohac, Chief Clerk
Texas Commission on Environmental Quality
Attention: Docket Clerk, MC 105
P.O. Box 13087
Austin, Texas 78711-3087

Re: TCEQ Enforcement Action
LANE PLATING WORKS, INC. and STAG MANAGEMENT INCORPORATED
Docket No. 2015-0423-IHW-E; RN100597707

Dear Ms. Bohac:

On behalf of the Executive Director, and pursuant to 30 TEX. ADMIN. CODE § 70.109, please consider this letter a request for referral of the above-referenced enforcement action to the State Office of Administrative Hearings ("SOAH"). Accordingly, the Executive Director requests that you file a Request to Docket Case form so that SOAH may acquire jurisdiction to preside over this contested enforcement action.

On June 18, 2015, the "Executive Director's Preliminary Report and Petition Recommending that the Texas Commission on Environmental Quality Enter an Enforcement Order Assessing an Administrative Penalty Against and Requiring Certain Actions of LANE PLATING WORKS, INC. and STAG MANAGEMENT INCORPORATED" (the "EDPRP") was filed with the Office of the Chief Clerk. On July 20, 2015, LANE PLATING WORKS, INC. and STAG MANAGEMENT INCORPORATED filed an Answer with the Office of the Chief Clerk requesting a hearing. Thus, more than 30 days have passed since an Answer was filed in this matter. The EDPRP serves as the list of issues or areas that must be addressed in the contested case hearing. As such, please file the EDPRP with SOAH and issue to all parties notice of the public hearing pursuant to TEX. GOV'T CODE § 2001.052 and 1 TEX. ADMIN. CODE § 155.401.

Please contact me at (512) 239-3400 with any questions you may have. Thank you for your prompt attention to this matter.

Sincerely,

Jennifer Cook, Staff Attorney
Litigation Division
jennifer.cook@tceq.texas.gov

Enclosures

cc: Mike Pace, Enforcement Division
Sam Barrett, Dallas/Fort Worth Regional Office

CERTIFICATE OF SERVICE

I hereby certify that on this 21st day of August, 2015, the original of this letter was filed with the Chief Clerk of the Texas Commission on Environmental Quality, and that a true and correct copy of the foregoing was sent to the following persons by the method of service indicated:

William F. Pyne, Registered Agent
LANE PLATING WORKS, INC.
8150 North Central Expressway, Suite 1800
Dallas, Texas 75206
Via Certified Mail, Article Number 7013 3020 0001 1906 7008

Joe Lane, President
LANE PLATING WORKS, INC.
1220 Glen Cove
Richardson, Texas 75080
Via Certified Mail, Article Number 7013 3020 0001 1906 6995

Jeffery Lane, Vice President
LANE PLATING WORKS, INC.
5322 Bonnie View Road
Dallas, Texas 75241
Via Certified Mail, Article Number 7013 3020 0001 1906 6988

William F. Pyne, Registered Agent
STAG MANAGEMENT INCORPORATED
1700 Pacific Avenue, Suite 3300
Dallas, Texas 75201
Via Certified Mail, Article Number 7015 0920 0001 4345 4964

J.R. Lane, President and Director
STAG MANAGEMENT INCORPORATED
P. O. Box 41098
Dallas, Texas 75241
Via Certified Mail, Article Number 7015 0920 0001 4345 4971

Joe D. Lane, Director
STAG MANAGEMENT INCORPORATED
P. O. Box 41098
Dallas, Texas 75241
Via Certified Mail, Article Number 7015 0920 0001 4345 4988 and Electronic Mail (pdf version) to joe@laneplating.com

Rudy Calderon
Office of Public Interest Counsel, MC 103
Texas Commission on Environmental Quality
P.O. Box 13087
Austin, Texas 78711-3087
Via Electronic Mail (pdf version) to rudy.calderon@tceq.texas.gov

Jennifer Cook, Staff Attorney
Litigation Division

SERVICE LIST
LANE PLATING WORKS, INC.
TCEQ Docket No. 2015-0423-IHW-E

William F. Pyne, Registered Agent
LANE PLATING WORKS, INC.
8150 North Central Expressway, Suite 1800
Dallas, Texas 75206

Joe Lane, President
LANE PLATING WORKS, INC.
1220 Glen Cove
Richardson, Texas 75080

Jeffery Lane, Vice President
LANE PLATING WORKS, INC.
5322 Bonnie View Road
Dallas, Texas 75241

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STAG MANAGEMENT INCORPORATED
1700 Pacific Avenue, Suite 3300
Dallas, Texas 75201

J.R. Lane, President and Director
STAG MANAGEMENT INCORPORATED
P. O. Box 41098
Dallas, Texas 75241

Joe D. Lane, Director
STAG MANAGEMENT INCORPORATED
P. O. Box 41098
Dallas, Texas 75241
Email joe@laneplating.com

Rudy Calderon
Office of Public Interest Counsel, MC 103
Texas Commission on Environmental Quality
P.O. Box 13087
Austin, Texas 78711-3087
E-Mail rudy.calderon@tceq.texas.gov

SOAH DOCKET NO. 582-15-5607
TCEQ DOCKET NO. 2015-0423-IHW-E

EXECUTIVE DIRECTOR OF THE TEXAS COMMISSION ON ENVIRONMENTAL QUALITY, PETITIONER	§	**BEFORE THE**
VS.	§	**STATE OFFICE OF**
LANE PLATING WORKS, INC. AND STAG MANAGEMENT INCORPORATED, RESPONDENTS	§	**ADMINISTRATIVE HEARINGS**

THE EXECUTIVE DIRECTOR'S
AGREED MOTION TO WAIVE THE PRELIMINARY HEARING
AND REQUEST TO SUBMIT PROPOSED PROCEDURAL SCHEDULE

TO THE HONORABLE ADMINISTRATIVE LAW JUDGE WILLIAM G. NEWCHURCH (ALJ):

The Executive Director (ED) of the Texas Commission on Environmental Quality files this motion to waive the preliminary hearing because the parties have agreed to jurisdiction and a proposed schedule. I have conferred with the attorney for LANE PLATING WORKS, INC. and STAG MANAGEMENT INCORPORATED (Respondents), who is in agreement with this motion. I have also conferred with the Office of Public Interest Counsel, who is also in agreement with this motion.

I. Background

On or about June 18, 2015, the ED filed the Executive Director's Preliminary Report and Petition (Petition). On or about July 20, 2015, Respondents filed an answer. On or about August 21, 2015, the matter was referred to the State Office of Administrative Hearings (SOAH). The case is currently scheduled for a preliminary hearing on October 1, 2015.

II. Jurisdiction

The attorneys for the ED, Respondents and OPIC have consulted and agree to waive the preliminary hearing, and to admit, without objection, the ED's attached Exhibits Nos. ED-A through ED-D into the record to establish jurisdiction. The parties also agree that SOAH has jurisdiction of this case. The exhibits are as follows:

- Exhibit ED-A is a certified copy of the Petition;
- Exhibit ED-B is a certified copy of Respondents answer to the Petition;
- Exhibit ED-C is a certified copy of the request to refer the matter to SOAH; and

- Exhibit ED-D is a certified copy of the notice of the preliminary hearing.

III. Procedural Schedule

The parties have agreed to the following proposed procedural schedule.

Date	Event
March 18, 2016	Deadline to complete all discovery, including depositions, and deadline for Respondents to submit information for consideration of financial inability to pay the penalty, in accordance with 30 TEX. ADMIN. CODE § 70.8.
April 19, 21 or 22, 2016	Evidentiary hearing at 9:00 am (three alternative dates are provided for the ALJ's consideration).

IV. Prayer

Therefore, the ED respectfully requests that:

a. The preliminary hearing be canceled as waived,

b. The ED's Exhibits Nos. ED-A through ED-D be admitted into evidence for the purposes of establishing jurisdiction,

c. Jurisdiction be established, and

d. The agreed procedural schedule be adopted.

Respectfully submitted,

Texas Commission on Environmental Quality

Richard A. Hyde, P.E.
Executive Director

Caroline M. Sweeney, Deputy Director
Office of Legal Services

Kathleen C. Decker, Division Director
Litigation Division

by _____
Jennifer Cook
State Bar of Texas No. 789233
Amanda Patel
State Bar of Texas No. 24083627
Litigation Division, MC 175
P.O. Box 13087
Austin, Texas 78711-3087
(512) 239-3400
(512) 239-3434 (Fax)
jennifer.cook@tceq.texas.gov
amanda.patel@tceq.texas.gov

CERTIFICATE OF CONFERENCE

I hereby certify that I have conferred with Respondents attorney and the Office of Public Interest Counsel, who are in agreement with this motion.

_____
Jennifer Cook

CERTIFICATE OF SERVICE

I hereby certify that on September 30, 2015, the foregoing document was filed with the Chief Clerk, Texas Commission on Environmental Quality, Austin, Texas.

I further certify that on this day the foregoing document was served as indicated:

The Honorable Administrative Law Judge William G. Newchurch
State Office of Administrative Hearings
300 W. 15th Street, Suite 504
Austin, Texas 78701-1649
(512) 322-2061 Fax
Via Electronic Filing

Paul Keiffer
Wright Ginsberg Brusilow P.C.
325 N. St. Paul Street
Dallas, Texas 75201
(214) 744-2615 Fax
pkeiffer@wgblawfirm.com
Attorney for Respondents
Via Facsimile Without Attachments
Via Electronic Mail with Attachments

Rudy Calderon
Office of Public Interest Counsel, MC 103
Texas Commission on Environmental Quality
P.O. Box 13087
Austin, Texas 78711-3087
rudy.calderon@tceq.texas.gov
Via Electronic Mail

_____
Jennifer Cook

STATE OFFICE OF ADMINISTRATIVE HEARINGS

AUSTIN OFFICE
300 West 15th Street Suite 502
Austin, Texas 78701
Phone: (512) 475-4993
Fax: (512) 322-2061

DATE: **9/30/2015**

NUMBER OF PAGES INCLUDING THIS COVER SHEET: **4**

REGARDING: **ORDER NO. 1 - GRANTING MOTION TO WAIVE PRELIMINARY HEARING & APPROVE SCHEDULE**

DOCKET NUMBER: **582-15-5607**

JUDGE WILLIAM G NEWCHURCH

FAX TO:	**FAX TO:**
JENNIFER N. COOK (TEXAS COMMISSION ON ENVIRONMENTAL QUALITY)	VIA EMAIL
RUDY CALDERON (TEXAS COMMISSION ON ENVIRONMENTAL QUALITY)	(512) 239-6377
PAUL KEIFFER	(214) 744-2615

xc: Docket Clerk, State Office of Administrative Hearings
NOTE: IF ALL PAGES ARE NOT RECEIVED, PLEASE CONTACT LIZ SLICK(lsl) (512) 475-4993

The information contained in this facsimile message is privileged and confidential information intended only for the use of the above-named recipient(s) or the individual or agent responsible to deliver it to the intended recipient. You are hereby notified that any dissemination, distribution or copying of this communication is strictly prohibited. If you have received this communication in error, please immediately notify us by telephone, and return the original message to us at the address via the U.S. Postal Service. Thank you.

SOAH DOCKET NO. 582-15-5607
TCEQ DOCKET NO. 2015-0423-IHW-E

EXECUTIVE DIRECTOR OF THE TEXAS COMMISSION ON ENVIRONMENTAL QUALITY, Petitioner	§	**BEFORE THE STATE OFFICE**
	§	
	§	**OF**
	§	
	§	**ADMINISTRATIVE HEARINGS**
V.	§	
	§	
LANE PLATING WORKS, INC. AND STAG MANAGEMENT INCORPORATED, Respondents	§	
	§	
	§	
	§	

ORDER NO. 1
GRANTING MOTION TO WAIVE PRELIMINARY HEARING AND APPROVE SCHEDULE

On September 30, 2015, the Executive Director (ED) of the Texas Commission on Environmental Quality (TCEQ) filed an agreed motion to waive the preliminary hearing, scheduled for October 1, 2015; admit ED Exhibits A through D to show jurisdiction; and set a case schedule on which the parties have agreed. The motion is granted. The preliminary hearing will not be held, ED Exs. A through D are admitted solely to show jurisdiction, and the following schedule is adopted for this case:

DATE	EVENT
March 18, 2016	Deadline to complete all discovery, including depositions, and deadline for Respondents to submit information for consideration of financial inability to pay penalty, in accordance with 30 Texas Administrative Code § 70.8.
April 19, 2016	Evidentiary hearing.

The evidentiary hearing will begin at 9:00 a.m., April 19, 2016, at the William P. Clements Office Building, Fourth Floor, 300 West 15th Street, Austin, Texas. If necessary, it will continue each workday thereafter until concluded. If the parties anticipate that the hearing will last more than one day, the ED shall notify the Judge in writing not later than ten days before the hearing and shall arrange and pay for a court reporter to transcribe the hearing and prepare a transcript.

If the Respondent fails to appear for hearing, the hearing may proceed in the Respondent's absence on a default basis; the factual allegations listed in the previously issued notice of hearing, including any documents incorporated by reference, may be deemed admitted as true; and the relief sought in the notice of hearing, including any documents incorporated by reference, may be granted by default.

SIGNED September 30, 2015.

WILLIAM G. NEWCHURCH
ADMINISTRATIVE LAW JUDGE
STATE OFFICE OF ADMINISTRATIVE HEARINGS

STATE OFFICE OF ADMINISTRATIVE HEARINGS

AUSTIN OFFICE
300 West 15th Street Suite 502
Austin, Texas 78701
Phone: (512) 475-4993
Fax: (512) 322-2061

SERVICE LIST

AGENCY:	**Environmental Quality, Texas Commission on (TCEQ)**
STYLE/CASE:	**LANE PLATING WORKS INC AND STAG MANAGEMENT INCORPORATED**
SOAH DOCKET NUMBER:	**582-15-5607**
REFERRING AGENCY CASE:	**2015-0423-IHW-E**

STATE OFFICE OF ADMINISTRATIVE HEARINGS	**ADMINISTRATIVE LAW JUDGE** **ALJ WILLIAM G. NEWCHURCH**
REPRESENTATIVE / ADDRESS	**PARTIES**
JENNIFER N. COOK ATTORNEY TEXAS COMMISSION ON ENVIRONMENTAL QUALITY MC-175 P.O. BOX 13087 AUSTIN, TX 78711-3087 (512) 239-1873 (PH) (512) 239-3434 (FAX) jennifer.cook@tceq.texas.gov	TCEQ EXECUTIVE DIRECTOR
RUDY CALDERON TEXAS COMMISSION ON ENVIRONMENTAL QUALITY OFFICE OF PUBLIC INTEREST COUNSEL MC-103 P.O. BOX 13087 AUSTIN, TX 78711-3087 (512) 239-3144 (PH) (512) 239-6377 (FAX) rudy.calderon@tceq.texas.gov	TCEQ PUBLIC INTEREST COUNSEL
PAUL KEIFFER WRIGHT GINSBERG BRUSILOW P.C. 325 N. PAUL ST. DALLAS, TX 75201 (214) 651-6517 (PH) (214) 744-2615 (FAX) pkeiffer@wgblawfirm.com	LANE PLATING WORKS, INC.

Liz Slick

From: XMediusFAX@soah.state.tx.us
Sent: Wednesday, September 30, 2015 1:18 PM
To: Liz Slick
Subject: Broadcast Completed: ORDER NO. 1 - DKT. #582-15-5607
Attachments: 6351A4A9-06F7-4CDC-B461-A230A897B3BC-1733-BR.pdf

Time Submitted : Wednesday, September 30, 2015 1:15:54 PM Central Daylight Time
Time Completed : Wednesday, September 30, 2015 1:17:42 PM Central Daylight Time
Nb of Success Items : 2
Nb of Failed Items : 0

Status	Time Sent	Pages Sent	Duration	Remote CSID	Destination	Error Code
Success	Wednesday, September 30, 2015 1:16:45 PM Centr	4	49		12147442615	0
Success	Wednesday, September 30, 2015 1:17:32 PM Centr	4	96		5122396377	0

SOAH DOCKET NO. 582-15-5607
TCEQ DOCKET NO. 2015-0423-IHW-E

EXECUTIVE DIRECTOR OF THE TEXAS COMMISSION ON ENVIRONMENTAL QUALITY, PETITIONER	§	**BEFORE THE**
VS.	§	**STATE OFFICE OF**
LANE PLATING WORKS, INC. AND STAG MANAGEMENT INCORPORATED, RESPONDENTS	§	**ADMINISTRATIVE HEARINGS**

THE EXECUTIVE DIRECTOR'S
REQUEST FOR DISCLOSURES TO RESPONDENT LANE PLATING WORKS, INC.

To: LANE PLATING WORKS, INC. (Respondent), by and through its attorney of record:

Paul Keiffer
Wright Ginsberg Brusilow P.C.
325 North St. Paul Street
Dallas, Texas 75201
(214) 744-2615 Fax
pkeiffer@wgblawfirm.com
Via Facsimile and Electronic Mail

The Executive Director (ED) serves this request for disclosures on Respondent pursuant to 30 TEX. ADMIN. CODE § 80.151 and the Texas Rules of Civil Procedure.

REQUEST FOR DISCLOSURES

Under Texas Rule of Civil Procedure 194, Respondent is requested to disclose, within 30 days of service of this request, the information or materials described in Texas Rule of Civil Procedure 194.2(a), (b), (c), (e), (f), (g), (h), (i), and (l).

Respectfully submitted,

Texas Commission on Environmental Quality

Richard A. Hyde, P.E.
Executive Director

Caroline M. Sweeney, Deputy Director
Office of Legal Services

Kathleen C. Decker, Division Director
Litigation Division

by _____
Jennifer Cook
State Bar of Texas No. 789233
Amanda Patel
State Bar of Texas No. 24083627
Litigation Division, MC 175
P.O. Box 13087
Austin, Texas 78711-3087
(512) 239-3400
(512) 239-3434 (Fax)
jennifer.cook@tceq.texas.gov
amanda.patel@tceq.texas.gov

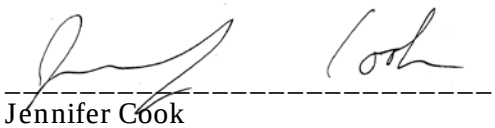
CERTIFICATE OF SERVICE

I hereby certify that on October 8, 2015, the foregoing document was filed with the Chief Clerk, Texas Commission on Environmental Quality, Austin, Texas.

I further certify that on this day the foregoing document was served as indicated:

Paul Keiffer
Wright Ginsberg Brusilow P.C.
325 North St. Paul Street
Dallas, Texas 75201
(214) 744-2615 Fax
pkeiffer@wgblawfirm.com
Attorney for Respondents
Via Facsimile and Electronic Mail

Rudy Calderon
Office of Public Interest Counsel, MC 103
Texas Commission on Environmental Quality
P.O. Box 13087
Austin, Texas 78711-3087
rudy.calderon@tceq.texas.gov
Via Electronic Mail



Jennifer Cook

SOAH DOCKET NO. 582-15-5607
TCEQ DOCKET NO. 2015-0423-IHW-E

EXECUTIVE DIRECTOR OF THE TEXAS COMMISSION ON ENVIRONMENTAL QUALITY, PETITIONER	§	**BEFORE THE**
VS.	§	**STATE OFFICE OF**
LANE PLATING WORKS, INC. AND STAG MANAGEMENT INCORPORATED, RESPONDENTS	§	**ADMINISTRATIVE HEARINGS**

THE EXECUTIVE DIRECTOR'S REQUEST FOR DISCLOSURES TO RESPONDENT STAG MANAGEMENT INCORPORATED

To: STAG MANAGEMENT INCORPORATED (Respondent), by and through its attorney of record:

Paul Keiffer
Wright Ginsberg Brusilow P.C.
325 North St. Paul Street
Dallas, Texas 75201
(214) 744-2615 Fax
pkeiffer@wgblawfirm.com
Via Facsimile and Electronic Mail

The Executive Director (ED) serves this request for disclosures on Respondent pursuant to 30 TEX. ADMIN. CODE § 80.151 and the Texas Rules of Civil Procedure.

REQUEST FOR DISCLOSURES

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Respectfully submitted,

Texas Commission on Environmental Quality

Richard A. Hyde, P.E.
Executive Director

Caroline M. Sweeney, Deputy Director
Office of Legal Services

Kathleen C. Decker, Division Director
Litigation Division

by _____
Jennifer Cook
State Bar of Texas No. 789233
Amanda Patel
State Bar of Texas No. 24083627
Litigation Division, MC 175
P.O. Box 13087
Austin, Texas 78711-3087
(512) 239-3400
(512) 239-3434 (Fax)
jennifer.cook@tceq.texas.gov
amanda.patel@tceq.texas.gov

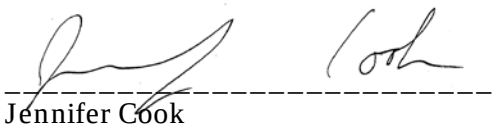
CERTIFICATE OF SERVICE

I hereby certify that on October 8, 2015, the foregoing document was filed with the Chief Clerk, Texas Commission on Environmental Quality, Austin, Texas.

I further certify that on this day the foregoing document was served as indicated:

Paul Keiffer
Wright Ginsberg Brusilow P.C.
325 N. St. Paul Street
Dallas, Texas 75201
(214) 744-2615 Fax
pkeiffer@wgblawfirm.com
Attorney for Respondents
Via Facsimile and Electronic Mail

Rudy Calderon
Office of Public Interest Counsel, MC 103
Texas Commission on Environmental Quality
P.O. Box 13087
Austin, Texas 78711-3087
rudy.calderon@tceq.texas.gov
Via Electronic Mail



Jennifer Cook

Bryan W. Shaw, Ph.D., *Chairman*
Toby Baker, *Commissioner*
Jon Niermann, *Commissioner*
Richard A. Hyde, P.E., *Executive Director*

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Protecting Texas by Reducing and Preventing Pollution

January 15, 2016

Via Electronic Filing

Honorable William G. Newchurch
State Office of Administrative Hearings
300 West 15th Street, Suite 502
Austin, Texas 78701

Re: Texas Commission on Environmental Quality ("TCEQ") Enforcement Proceeding Against LANE PLATING WORKS, INC. and STAG MANAGEMENT INCORPORATED; TCEQ Docket No. 2015-0423-IHW-E; SOAH Docket No. 582-15-5607

Dear Honorable Administrative Law Judge William G. Newchurch:

Enclosed please find the Executive Director's Notice of Substitution of Lead Counsel for the above-referenced matter. If you have any questions, please do not hesitate to call me at (512) 239-0629. Thank you for your attention to this matter.

Sincerely,

Tracy Chandler, Staff Attorney
Office of Legal Services, Litigation Division
Texas Commission on Environmental Quality
tracy.chandler@tceq.texas.gov

Enclosure

cc: TCEQ Chief Clerk, Via Electronic Filing
Rudy Calderon, Office of Public Interest Counsel, Via Electronic Mail
Paul Keiffer, Coats Rose, P.C., Republic Center, Suite 4150, 325 N. St. Paul Street, Dallas, Texas 75201, pkeiffer@coatsrose.com, Via CM/RRR and Electronic Mail
Daniel J. "Corky" Sherman, Sherman & Yaquinto, LLP, 509 N. Montclair Ave., Dallas, Texas 75208, corky@syllp.com, Via CM/RRR and Electronic Mail
Abigail Lindsey, Enforcement Division, Via Electronic Mail
Sam Barrett, Dallas/Fort Worth Regional Office, Via Electronic Mail
Christopher S. Murphy, Assistant Attorney General | Bankruptcy Regulatory Section, christopher.murphy@texasattorneygeneral.gov, Via Electronic Mail
Abigail Ryan, TCEQ Bankruptcy Program, Via Electronic Mail

SOAH DOCKET NO. 582-15-5607
TCEQ DOCKET NO. 2015-0423-IHW-E

EXECUTIVE DIRECTOR OF THE TEXAS COMMISSION ON ENVIRONMENTAL QUALITY, PETITIONER	§	**BEFORE THE**
VS.	§	**STATE OFFICE OF**
LANE PLATING WORKS, INC. AND STAG MANAGEMENT INCORPORATED RESPONDENTS	§	**ADMINISTRATIVE HEARINGS**

NOTICE OF SUBSTITUTION OF LEAD COUNSEL

TO THE HONORABLE WILLIAM G. NEWCHURCH:

COMES NOW, the Executive Director of the Texas Commission on Environmental Quality ("TCEQ"), by and through his attorney, and files this Notice of Substitution of Lead Counsel. The Executive Director of the TCEQ respectfully requests the Administrative Law Judge take notice that Ms. Tracy Chandler will be lead counsel representing the Executive Director of the TCEQ in the above styled and numbered case and Ms. Jennifer Cook will no longer be attorney of record for the Executive Director. Ms. Chandler is licensed to practice law in the State of Texas and is in good standing with the Texas State Bar. All future communications should be directed to Ms. Chandler.

Respectfully submitted,

Texas Commission on Environmental Quality

Richard A. Hyde, P.E.
Executive Director

Caroline M. Sweeney, Deputy Director
Office of Legal Services

Kathleen C. Decker, Director
Litigation Division

by _____
Tracy Chandler
State Bar of Texas No. 24031929
Litigation Division, MC 175
P.O. Box 13087
Austin, Texas 78711-3087
(512) 239-3400
(512) 239-3434 (FAX)
tracy.chandler@tceq.texas.gov

CERTIFICATE OF SERVICE

I hereby certify on this 15th day of January, 2016, the original of the foregoing "Notice of Substitution of Lead Counsel" ("Notice") was filed with the Chief Clerk, Texas Commission on Environmental Quality, Austin, Texas.

I further certify that on this day a true and correct copy of the foregoing Notice were sent to the following persons by the methods indicated:

Via Electronic Filing
The Honorable William G. Newchurch
State Office of Administrative Hearings
300 W. 15th Street, Suite 502
Austin, Texas 78701-1649

Via Certified Mail, Return Receipt Requested
Article No. 7013 0600 0001 8045 6267 and
Via E-Mail to: pkeiffer@coatsrose.com
Paul Keiffer
Coat Rose, P.C.
Republic Center, Suite 4150
325 North St. Paul Street
Dallas, Texas 75201

Via Certified Mail, Return Receipt Requested
Article No. 7013 0600 0001 8045 6274
Via E-Mail to: corky@syllp.com
Daniel J. "Corky" Sherman
Sherman & Yaquinto, LLP
509 N. Montclair Ave.
Dallas, Texas 75208

I further certify that on this day a true and correct copy of the foregoing Notice was sent via electronic mail to Mr. Rudy Calderon, TCEQ Office of Public Interest Counsel, Texas Commission on Environmental Quality, Austin, Texas.

_____
Tracy Chandler
Attorney, Litigation Division
Texas Commission on Environmental Quality

Bryan W. Shaw, Ph.D., *Chairman*
Toby Baker, *Commissioner*
Jon Niermann, *Commissioner*
Richard A. Hyde, P.E., *Executive Director*

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Protecting Texas by Reducing and Preventing Pollution

February 12, 2016

The Honorable William G. Newchurch
State Office of Administrative Hearings
300 West 15th Street, Suite 502
P.O. Box 13025
Austin, Texas 78711-3025

Re: Notice of Non-Suit and Withdrawal of the Executive Director's Preliminary Report and Petition; SOAH Docket No. 582-15-5607; TCEQ Docket No. 2015-0423-IHW-E

Dear Honorable Administrative Law Judge Newchurch:

Enclosed please find the Executive Director's "Notice of Non-Suit and Withdrawal of the Executive Director's Preliminary Report and Petition" ("Non-Suit") regarding the above-referenced matter. If you have any questions, please do not hesitate to contact me at (512) 239-0629 or at my email address listed below.

Sincerely,

Tracy Chandler, Staff Attorney
Office of Legal Services, Litigation Division
Texas Commission on Environmental Quality
tracy.chandler@tceq.texas.gov

Enclosure

cc: TCEQ Chief Clerk, Via Electronic Filing
Rudy Calderon, Office of Public Interest Counsel, Via Electronic Mail
Paul Keiffer, Coats Rose, P.C., Republic Center, Suite 4150, 325 North St. Paul Street, Dallas, Texas 75201, pkeiffer@coatsrose.com, Via CM/RRR and Electronic Mail
Daniel J. "Corky" Sherman, Sherman & Yaquinto, LLP, 509 North Montclair Avenue, Dallas, Texas 75208, corky@syllp.com, Via CM/RRR and Electronic Mail
Abigail Lindsey, Enforcement Division, Via Electronic Mail
Sam Barrett, Dallas/Fort Worth Regional Office, Via Electronic Mail
Christopher S. Murphy, Assistant Attorney General | Bankruptcy Regulatory Section, christopher.murphy@texasattorneygeneral.gov, Via Electronic Mail
Abigail Ryan, TCEQ Bankruptcy Program, Via Electronic Mail

SOAH DOCKET NO. 582-15-5607
TCEQ DOCKET NO. 2015-0423-IHW-E

EXECUTIVE DIRECTOR OF THE TEXAS COMMISSION ON ENVIRONMENTAL QUALITY, PETITIONER	§	**BEFORE THE**
VS.	§	**STATE OFFICE OF**
LANE PLATING WORKS, INC. AND STAG MANAGEMENT INCORPORATED, RESPONDENTS	§	**ADMINISTRATIVE HEARINGS**

EXECUTIVE DIRECTOR'S NOTICE OF NON-SUIT AND WITHDRAWAL OF THE EXECUTIVE DIRECTOR'S PRELIMINARY REPORT AND PETITION

The Executive Director of the Texas Commission on Environmental Quality ("Commission" or "TCEQ"), by and through a representative of the Litigation Division, files this "Notice of Non-Suit and Withdrawal of the Executive Director's Preliminary Report and Petition" ("Non-Suit") in the enforcement matter against LANE PLATING WORKS, INC. and STAG MANAGEMENT INCORPORATED ("Respondents").

The Executive Director's Preliminary Report and Petition ("EDPRP") in this matter was filed with the Chief Clerk of the Commission on June 18, 2015. On the same date, a true and correct copy of the EDPRP was mailed to Respondents via certified mail, return receipt requested, postage prepaid. The Respondents' Answer was filed on July 20, 2015, and the matter was referred to the State Office of Administrative Hearings on August 21, 2015. The Preliminary Hearing was set for October 1, 2015, and waived by mutual agreement of the parties. The Evidentiary Hearing was set for April 19, 2016.

An evidentiary hearing has not been held, nor has evidence been heard on this matter. Since this matter has not been heard on the merits, such dismissal is without prejudice to the Executive Director to re-file his claims or otherwise pursue legal remedies against Respondents at any future time. All parties are placed on notice that this Non-Suit is effective upon filing.

The Executive Director hereby gives notice to the Texas Commission on Environmental Quality, Respondents, and TCEQ Public Interest Counsel that the Executive Director is taking a Non-Suit and hereby withdraws the EDPRP.

Respectfully submitted,

Texas Commission on Environmental Quality

Richard A. Hyde, P.E.
Executive Director

Caroline M. Sweeney, Deputy Director
Office of Legal Services

Kathleen C. Decker, Division Director
Litigation Division

by _____
Tracy Chandler
State Bar of Texas No. 24031929
TCEQ Office of Legal Services
Litigation Division, MC 175
P.O. Box 13087
Austin, Texas 78711-3087
(512) 239-3400 / (512) 239-3434 (FAX)
Tracy.Chandler@tceq.texas.gov

CERTIFICATE OF SERVICE

I hereby certify that on this 12th day of February, 2016, the original of the foregoing "Executive Director's Notice of Non-Suit and Withdrawal of the Executive Director's Preliminary Report and Petition" ("Non-Suit") was filed with the Chief Clerk, Texas Commission on Environmental Quality, Austin, Texas.

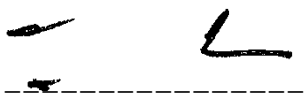
I further certify that on this day a true and correct copy of the foregoing Non-Suit was sent to the following persons by the method indicated:

Via Electronic Filing
The Honorable William G. Newchurch
State Office of Administrative Hearings
300 West 15th Street, Suite 502
P.O. Box 13025
Austin, Texas 78711-3025

Via Certified Mail, Return Receipt Requested
Article No. 7013 3020 0000 8380 6689 and
Via Electronic Mail to: pkeiffer@coatsrose.com
Paul Keiffer
Coats Rose, P.C.
Republic Center, Suite 4150
325 North Saint Paul Street
Dallas, Texas 75201

Via Certified Mail, Return Receipt Requested
Article No. 7013 3020 0000 8380 6696
Via Electronic Mail to: corky@syllp.com
Daniel J. "Corky" Sherman
Sherman & Yaquinto, LLP
509 North Montclair Avenue
Dallas, Texas 75208

I further certify that on this day a true and correct copy of the foregoing Notice was sent via electronic mail to Mr. Rudy Calderon, TCEQ Office of Public Interest Counsel, Texas Commission on Environmental Quality, Austin, Texas.



Tracy Chandler, Staff Attorney
Office of Legal Services
Litigation Division
Texas Commission on Environmental Quality

SOAH DOCKET NO. 582-15-5607
TCEQ DOCKET NO. 2015-0423-IHW-E

EXECUTIVE DIRECTOR OF THE TEXAS COMMISSION ON ENVIRONMENTAL QUALITY, Petitioner	§	**BEFORE THE STATE OFFICE**
v.	§	**OF**
LANE PLATING WORKS, INC. AND STAG MANAGEMENT INCORPORATED, Respondents	§	**ADMINISTRATIVE HEARINGS**

ORDER NO. 2
DISMISSING CASE

On February 12, 2016, the Executive Director (ED) of the Texas Commission on Environmental Quality filed a notice of non-suit and withdrew his preliminary report and petition. This case is dismissed from the docket of the State Office of Administrative Hearings without prejudice to refiling.

SIGNED February 17, 2016.

WILLIAM G. NEWCHURCH
ADMINISTRATIVE LAW JUDGE
STATE OFFICE OF ADMINISTRATIVE HEARINGS

STATE OFFICE OF ADMINISTRATIVE HEARINGS

AUSTIN OFFICE
300 West 15th Street Suite 502
Austin, Texas 78701
Phone: (512) 475-4993
Fax: (512) 322-2061

SERVICE LIST

AGENCY: **Environmental Quality, Texas Commission on (TCEQ)**

STYLE/CASE: **LANE PLATING WORKS INC AND STAG MANAGEMENT INCORPORATED**

SOAH DOCKET NUMBER: **582-15-5607**

REFERRING AGENCY CASE: **2015-0423-IHW-E**

STATE OFFICE OF ADMINISTRATIVE HEARINGS	**ADMINISTRATIVE LAW JUDGE** **ALJ WILLIAM G. NEWCHURCH**
REPRESENTATIVE / ADDRESS	**PARTIES**
TRACY CHANDLER ATTORNEY TEXAS COMMISSION ON ENVIRONMENTAL QUALITY LITIGATION DIVISION MC 175 PO BOX 13087 AUSTIN, TX 78711-3087 (512) 239-0629 (PH) (512) 239-3434 (FAX) tracy.chandler@tceq.texas.gov	TEXAS COMMISSION ON ENVIRONMENTAL QUALITY
RUDY CALDERON TEXAS COMMISSION ON ENVIRONMENTAL QUALITY OFFICE OF PUBLIC INTEREST COUNSEL MC-103 P.O. BOX 13087 AUSTIN, TX 78711-3087 (512) 239-3144 (PH) (512) 239-6377 (FAX) rudy.calderon@tceq.texas.gov	TCEQ PUBLIC INTEREST COUNSEL
PAUL KEIFFER COATS ROSE, P.C. REPUBLIC CENTER 325 NORTH PAUL STREET, SUITE 4150 DALLAS, TX 75201 (214) 651-6517 (PH) (214) 744-2615 (FAX) pkeiffer@coatsrose.com	LANE PLATING WORKS, INC. STAG MANAGEMENT INCORPORATED

Reference 31

SUMMARY REPORT FOR RESPONSE TO PROVIDE SITE SECURITY AND CHEMICAL CHARACTERIZATION, LAB-PACKING, AND CHEMICAL REMOVAL
LANE PLATING FACILITY

5322 Bonnie View Road
Dallas, Texas

Prepared for:

Texas Commission on Environmental Quality
Office of Compliance and Enforcement
P.O. Box 13087, MC-137
Austin, TX 78711-3087

Prepared by:

SWS Environmental Services
9204 Hwy 287 NW
Fort Worth, Texas 76131

SWS Project No. FW1-511-1482
TCEQ Project No. 2015-004

RECEIVED
JAN 19 2016
DFW REGION-4

SWS ENVIRONMENTAL SERVICES

SWS ENVIRONMENTAL SERVICES

Emergency Response
Remediation
Field Services
Waste Services

600 Grand Panama Blvd, Suite 200
Panama City Beach, FL 32407
Phone: 850.234.8428
Fax: 850.234.2451
www.swsenvironmental.com

January 15, 2016

Anthony Buck
Emergency Management Coordinator
Critical Infrastructure Division
Texas Commission on Environmental Quality
12100 Park 35 Circle
Austin, Texas 78711-3087

RE: Summary Report for Providing Site Security, Chemical Characterization and Lab-packing, Removal and Re-packaging of Chemicals and Offsite Disposal of Cyanide Waste, Lane Plating Company Facility, 5322 Bonnie View Road, Dallas, Texas, TCEQ Work Order 2015-004

Dear Mr. Buck:

Pursuant to your request, SWS Environmental Services (SWSES) has prepared this summary of the work conducted by SWS following the recent field work completed at the Lane Plating Facility located at the above referenced address (See Figure 1.0). SWS personnel met with TCEQ representatives at the site on November 19, 2015 to develop a scope of work/workplan to 1)provide site security to prevent unauthorized access to the building, 2) provide haz-cat analysis and chemical characterization of chemicals in the onsite lab and to provide lab pack and re-packaging of select chemicals and 3) remove chromic acid sludge from two sumps at the facility and secure the liquid chromic acid waste in poly totes delivered to the site. At the request of TCEQ, SWSES developed a cost estimate for the work, and prepared a Site Specific Health and Safety Plan prior to mobilizing to the site under TCEQ Work Order No. 2015-004.

Response Summary

On November 19, 2015 following the notice to proceed, SWSES personnel mobilized to the Lane Plating facility and met with TCEQ personnel from the Region 4 office and representatives from the Attorney Generals Office as well as the owner of the facility (Mr. Joe Lane). The purpose of the site inspection walk through was to evaluate the necessary measures to secure the building and to develop a plan to provide haz–cat analysis of unlabeled chemical containers in the onsite laboratory (See Figure 3.0, attached), and evaluate and prioritize which chemicals in the facility posed the highest risk for releases to the environment or to public health and safety. SWSES personnel included Mr. Damon Waresback - Project Manager, Mr. Gary Smith - Response Foreman and Ms. Cindy Bruce - Director of Waste Services. During the site walk, SWSES evaluated the requirements to secure the site from unauthorized access and the personnel and equipment necessary to identify and subsequently secure specific chemicals at the facility. A cost estimate for the work was submitted for review and subsequently SWES was directed to proceed with the workplan.

600 Grand Panama Blvd, Suite 200
Panama City Beach, FL 32407
Phone: 850.234.8428
Fax: 850.234.2451
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Site Security

On November 20, 2015, SWES personnel mobilized to the site and began securing all the doors at the site (walk-through and garage style roll-up doors) by installing bolts and nuts through the guide tracks for the garage style roll-up doors and by welding dead bolts, hasps and padlocks for the walk through doors. All the outside opening doors were secured on this date. On November 23, 2015, SWES personnel returned to the site and began installing metal cattle panels over the first floor windows of the facility. The cattle panels were measured and cut to fit each window and the panels were secured by welding the panels to the metal window frames. The work for securing the site was completed on November 25, 2015.

Haz-Cat Analysis Lab - Pack and Removal/Repackaging of Chemicals

On December 1, 2015, SWES personnel mobilized to the site to stage poly totes for storing chromic acid waste to be removed from the two main sump areas located at the facility. The main sump is located beneath the chrome tank and around the chrome tank in the central part of the facility (See figures 3 & 4). On December 3, 2015, SWSES personnel mobilized to the site to initiate the removal of chromic acid from the two sumps and to conduct the haz-cat identification, lab-pack and over - packing of select chemicals at the site. A Site Entry/Exit Log with all personnel present at this debriefing/Health and Safety Meeting are included with the Site Specific Health and Safety Plan (See Attachment B of this report). Following the safety meeting, SWSES personnel began setting up the poly pump in secondary containment to begin removing the chromic acid liquid from the main large sump area in the central part of the building (see Figure 3.0 and 4.0 attached). The waste was pumped into 300 gallon totes staged adjacent to the sump/chrome tank and at the east loading dock (See site photographs, Attachment A). While the SWSES crew worked at removing the chromic acid liquids, a SWSES chemist began the haz - cat identification of the chemical containers in the lab. Four containers of cyanide materials were identified in the lab including silver cyanide, copper cyanide, sodium cyanide and potassium cyanide. These containers were subsequently lab - packed in 5 gallon buckets and secured and labeled for chemical profiling and off-site disposal (see discussion below). All of the chemical contents in the containers in the lab were identified and labeled for future disposal proceedings. In addition to the lab chemicals, two small drums containing potassium cyanide and sodium cyanide were overpacked in DOT-approved, open-head 55 gallon drums, labeled and secured in a lockable flammables cabinet for subsequent profiling and disposal. The removal of the chromic acid from the main sump and the sump beneath the tank labeled Tank 5 on Figure 3.0 and 4.0 was continued and was completed on December 7, 2016.

SWS ENVIRONMENTAL SERVICES

Emergency Response
Remediation
Field Services
Waste Services

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Panama City Beach, FL 32407
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Waste Management

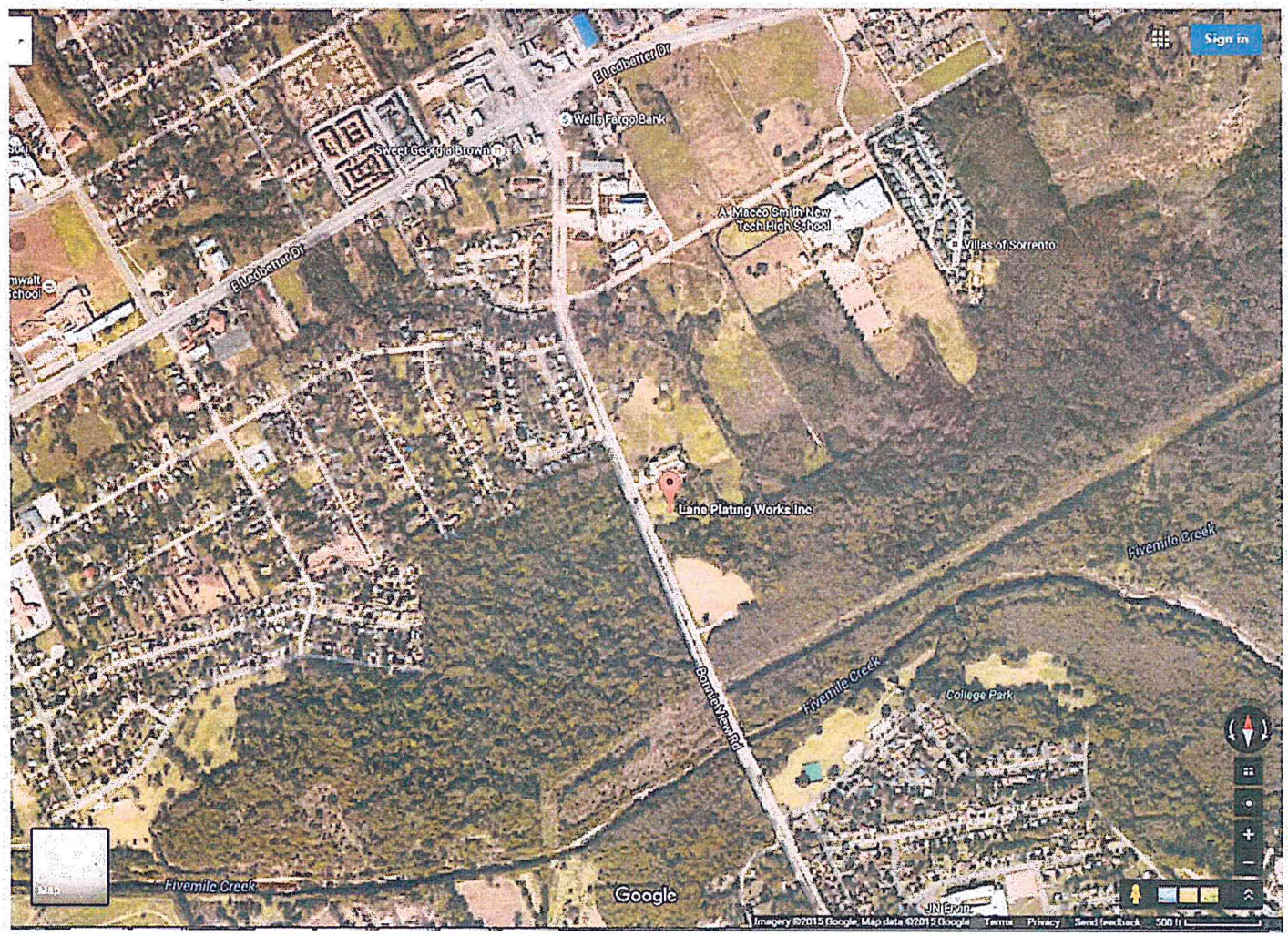
The four containers of cyanide materials lab - packed from the onsite lab were secured along with the two 55 gallon overpacks in the lockable cabinet to await further profiling and disposal proceedings. On December 10, 2015, SWSES personnel met with the facility owner at the site to obtain signatures on the land disposal restriction (LDR) forms, waste profiles and waste manifests. The six (6) containers were profiled and approved for disposal at the Chemical Reclamation Services Facility in Avalon, Texas. On December 18, 2015 SWS transported the six containers of cyanide for disposal at the Chemical Reclamation Services Facility (land disposal restriction (LDR) forms, waste profiles and waste manifests are included in Attachment C of this report).

Should you have any questions regarding this report, please do not hesitate to call me at 817-847-1333.

Sincerely,

Damon Waresback, P.G.
Remedial Services Manager
SWS Environmental Services

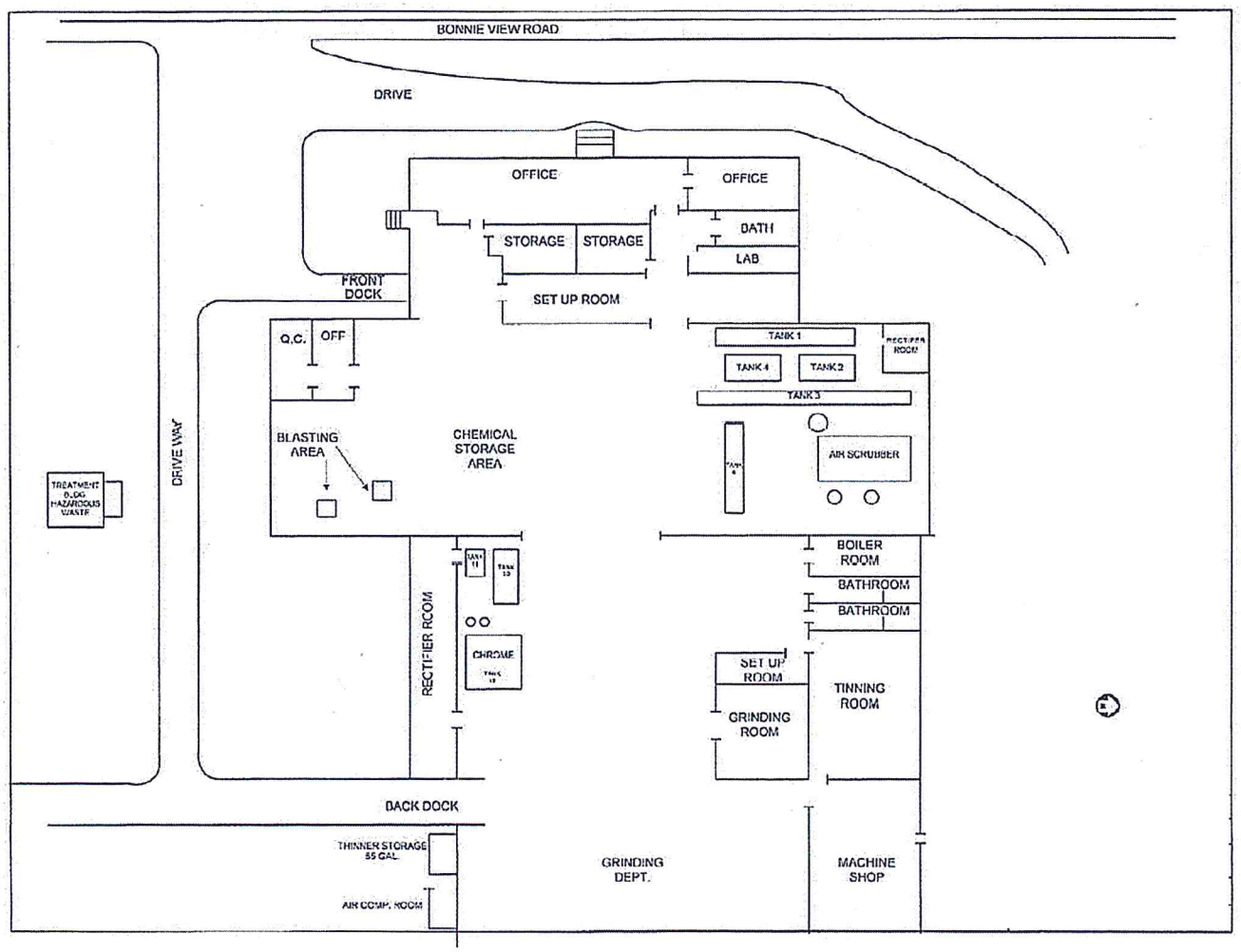
Attachments: Figure 1.0 - Staging Area, Figure 2.0 - Site Map, Figure 3.0 - Building Identification and Locations, Site Photographs; Work Plan; Site Specific Health and Safety Plan with Site Login Sheet; Sampling Plan; Copy of Waste Manifest



SWS ENVIRONMENTAL SERVICES 9204 Hwy 287 NW Fort Worth, TX 76131	Date: 1/15/2016 Project No. FW1-511-1482	Figure 1 Vicinity Map Lane Plating, Works Inc. 5322 Bonnie View Road Dallas, TX	N

SWS ENVIRONMENTAL SERVICES 9204 Hwy 287 NW Fort Worth, TX 76131	Date: 1/15/2016 Project No. FW1-511-1482	Figure 2 Aerial Site Map Lane Plating, Works Inc. 5322 Bonnie View Road Dallas, TX	N

31 006



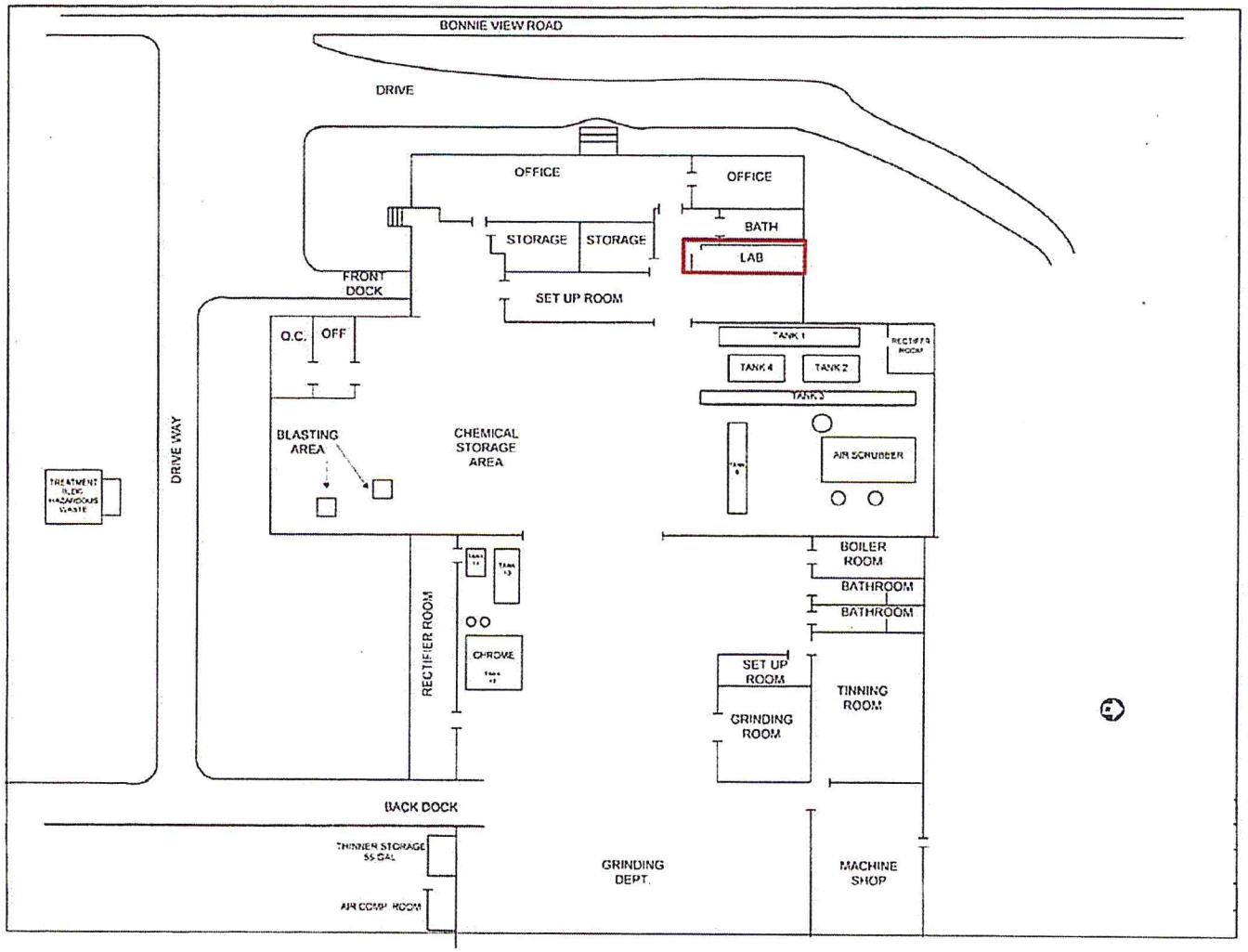
SWS ENVIRONMENTAL SERVICES
9204 Hwy 287 NW
Fort Worth, TX 76131

Date: 1/15/2016

Project No. FW1-511-1482

Figure 3
Facility Layout Map
Lane Plating, Works Inc.
5322 Bonnie View Road
Dallas, TX

31 007



SWS ENVIRONMENTAL SERVICES
9204 Hwy 287 NW
Fort Worth, TX 76131

Date: 1/15/2016

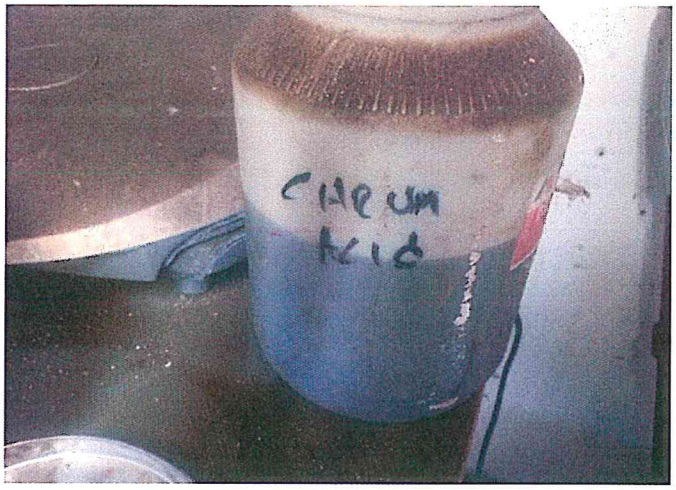
Project No. FW1-511-1482

Figure 4
Site Map – Lab Location
Lane Plating, Works Inc.
5322 Bonnie View Road
Dallas, TX

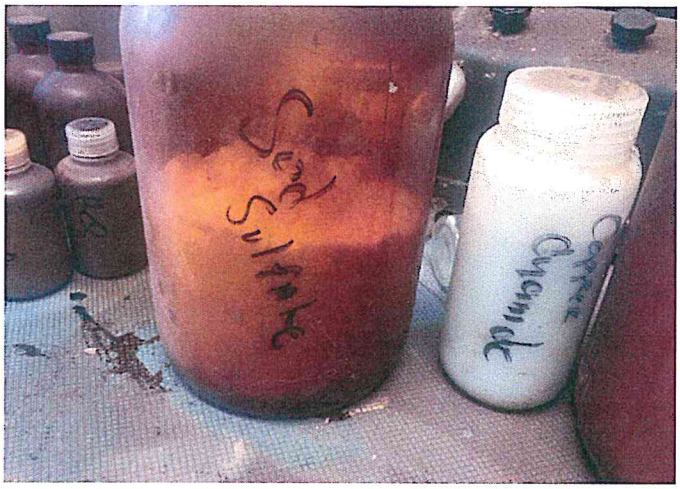
31 008

ATTACHMENT A
PHOTOGRAPHIC DOCUMENTATION

1. View of Lane Plating Facility Lab and chemicals prior to Haz-Cat Identification and Labeling.



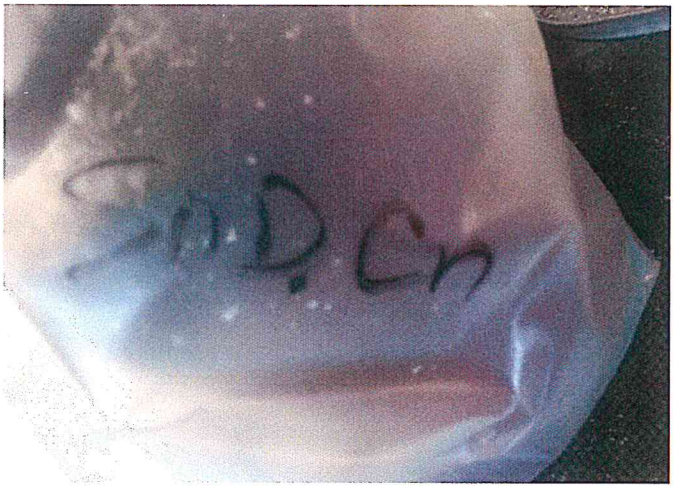
2. View of container of chromic acid labeled after identification.



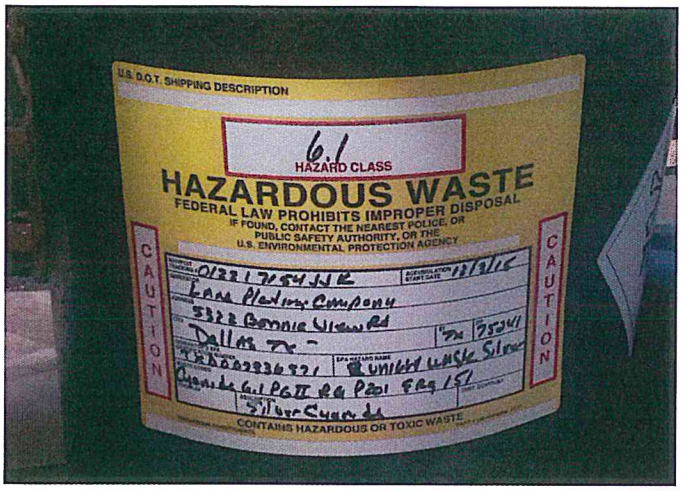
3. View of containers following identification/labeling in Lane Plating Lab.

4. View of containers following identification/labeling in Lane Plating Lab.

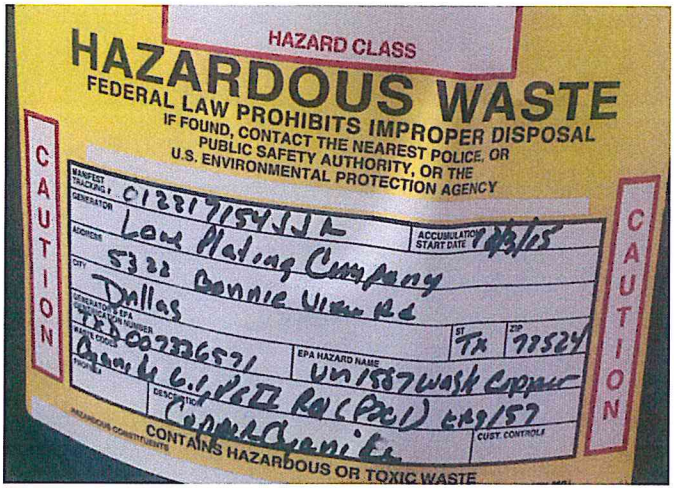
5. View of containers following identification/labeling in Lane Plating Lab.



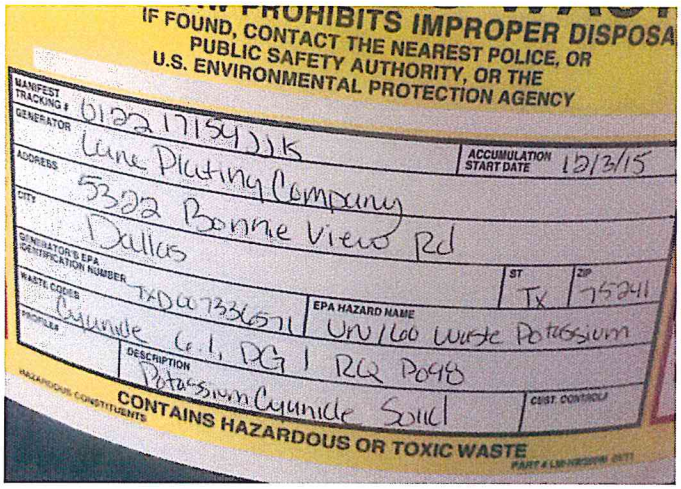
6. Container of sodium cyanide following identification and prior to lab-packing.



7. View of label on lab-pack of silver cyanide from Lane Plating Facility Lab.



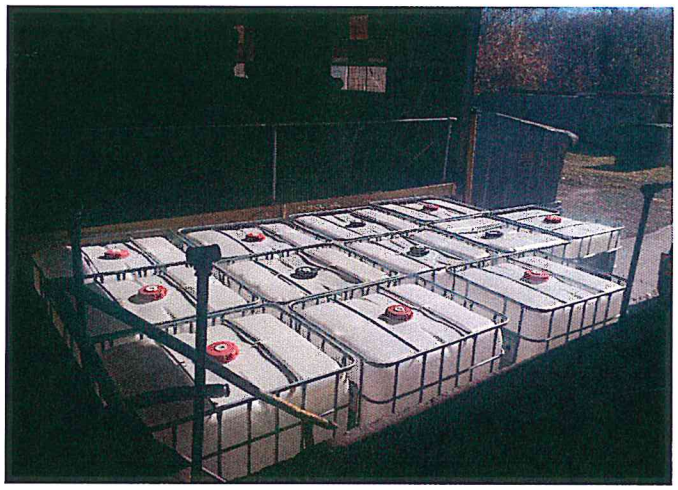
8. View of label on lab-pack of copper cyanide from Lane Plating Facility Lab.



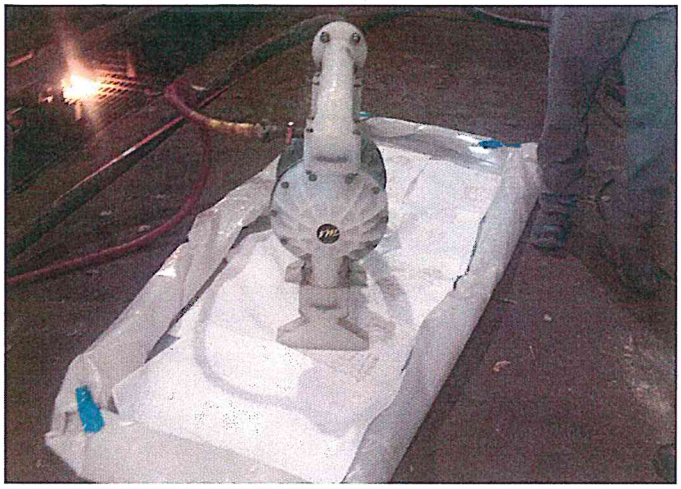
9. View of label on lab-pack of potassium cyanide from Lane Plating Facility Lab.

10. View of lab-packed cyanide waste prior to securing in lockable cabinet.

11. View of lab-packed and overpacked containers of cyanide waste secured in cabinet of Lane Plating Facility.

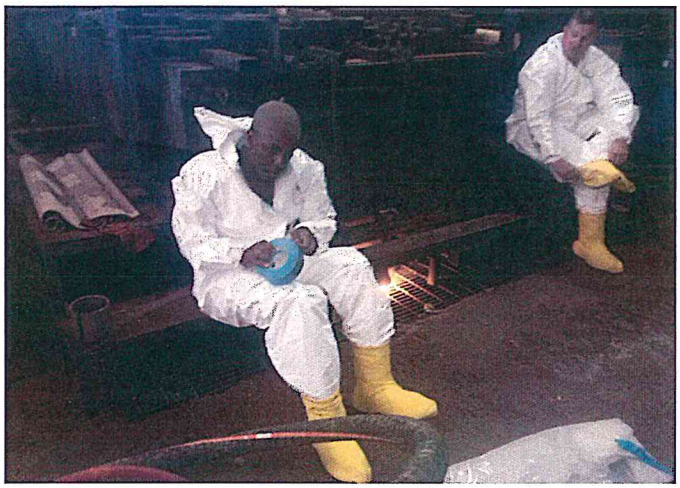


12. View of totes used to store chromic acid waste pumped from sumps at Lane Plating Facility.



13. View of poly-pump and secondary containment prior to pumping chromic acid waste from sumps.

14. Close-up of poly pump used to remove chromic acid waste from sumps.



15. View of SWS personnel donning PPE for removal of chromic acid sludge.

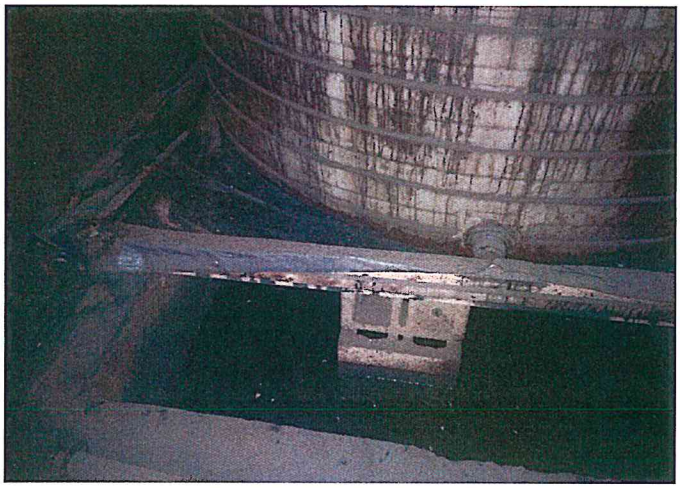
16. View of SWS personnel removing chromic acid waste from main sump.

17. View of totes and SWS personnel during chromic acid waste removal activities.

18. View of totes and SWS personnel during chromic acid waste removal activities.

19. View of partially filled tote during chromic acid waste removal from sumps.

20. View of chromic acid waste in area of sump beneath poly tanks.



21. View of poly tank and sump during chromic acid tank removal activities.

ATTACHMENT B
SITE SPECIFIC HEALTH AND SAFETY PLAN

SWS
Health and Safety/ Site Security Plan
Emergency Response for: Lane Plating Works Cleanup

Job Information	Date: 12/03/2015 Job Number: FW1-511-1482
Client:	TCEQ
Contact:	Anthony Buck
Phone/Pager Numbers:	(512) 563-3935
Location:	5322 Bonnie View Rd, Dallas, TX

Product Involved: Chromic Acid, Sodium Cyanide, Potassium Cyanide, Unknowns

Site Activities: Site cleanup, specifically pumping chromic acid into totes, over packing two (2) cyanide drums, and packing three (3) unknowns to prepare for sampling and disposal.

Anticipated Duration: 1 Day

SWS Chain of Command:

	Print	*Signature*
Project Manager:	Damon Waresback	
Supervisor:	Taboo Washington	
Safety Specialist:	Ashley Gill	
Decon Supervisor:	Taboo Washington	
	Slade Hinrichs	
(Use attachment		
if necessary)		

All personnel have received the appropriate safety training in accordance with 29 CFR 1910.120 section Q and are currently under medical surveillance in accordance with 29 CFR 1910.120 section (f).

Tailgate Safety Meeting

By signing the above chain of command, I acknowledge that, I have been instructed in the information that will be covered in the Tailgate safety meeting with all personnel that will be involved with the site sampling activities. The Project Manager (Damon Waresback) will conduct the Tailgate Meeting and cover the topics outlined in this Health and Safety Plan and the work order/work plan. Ashley Gill will keep all Agency, HUB's, all outside Organization, and SWS apprised as to ongoing updates and changes to the Health and Safety plan when they come about.

Outside Organizations:

Name	Agency/Company	Phone Number	Pager Number

Site Security and Control
Site Security and control of the Exclusion Zone will be the responsibility of the SWS Onsite Foreman/Supervisor: Taboo Washington.

No unauthorized persons will be permitted within this area. All activities and arriving/departing personnel will coordinate with the site Supervisor. Initially the entire site will be considered the Exclusion Zone. Upon completion of air monitoring and chemical identification, a support zone and contamination reduction zone will be designated.

Decontamination
All materials leaving the exclusion zone will be thoroughly decontaminated using a Hudson sprayer for decontamination. An eye wash station will be set up at the outfall. The PPE will be collected and drummed for later disposal.

Personal Protective Equipment will consist of the following items:

Task: Site Cleanup

Protective Suit	Glove(s)	Respiratory Protection	Standard Equipment
Tychem SL	Nitrile Gloves	Full Face Respirator	
		w/ Organic-Acid	
		Cartridge/MultiGas	

Task: Decontamination

Protective Suit	Glove(s)	Respiratory Protection	Standard Equipment
	Nitrile Gloves		Eyewash Station
			Hudson Sprayer

The failure to use mandatory PPE will result in the immediate removal from job site and a write up in your employee file.

Monitoring Equipment to be used:
- 5-Gas Monitor

Emergency Alerting:
In addition to visual and verbal communication, air-horn signaling will be utilized as follows:

Air-horn Signaling	**Meaning**
One Long Blast	Break
Two Short Blasts	In Need of Supervisor
Multiple Short Blasts	Emergency Evacuation
Visual Signaling	**Meaning**
Hands on top of Head	Need assistance
Hands on Chest	Respiratory Problems
Hands Pointing to Side of Head	Return to Decon for Consultation
Thumbs Up	O.K., I'm all right, I understand
Thumbs Down	No, Negative

Site Safety Concerns: Check appropriate site specific concerns:

Weather concerns:

Temperature	Winds	Conditions
Cool	Light	Wet & Rainy

Acid Concerns: All employees must wear appropriate PPE while on the job site. Several concerns could be encountered when sampling acid or acid impacted media including acid splashing and inhalation hazards. Minimum requirements will be Level D. Acid sampling will require Level C which will include splash resistant coated Tyvek, respirator with acid cartridges, nitrile gloves and chemical boots.

Environmental Concerns: Several biological concerns are often encountered while in the field. Arachnid, insect, mammal and reptile injuries (bites and stings) can all become medical problems while in the field.

Medical Emergency: The following procedure is to be followed in the event of a medical Emergency. Employees will be provided medical attention at no personal cost.
Hospital: Baylor University Medical Center at Dallas
Hospital Address: 3500 Gaston Ave, Dallas, TX 75246

Immediately contact the Site Safety Specialist Ashley Gill about Injuries and Illnesses reported. Please have injured prepare a statement and the Supervisor will complete an Incident Analysis Report within 8 hours. These documents must be turned in the following day. **Report Near Miss Incidents** to Safety Specialist for analysis and correction.

Emergency Meeting Point: Identify an emergency meeting location and/or a facility emergency evacuation plan and meeting point prior to commencement.

Site Map: (please include wind direction, CRZ, exclusion zone, support zone, decon area, and significant landmarks (roads, mile markers, etc.)

2) General Work	- Chemical Exposures - Eye Injuries - Lacerations/Punctures - Fire	- Wear ANSI approved Safety Glasses, Face Shields, or Goggles. - Beware of jagged and damaged structures. Wear proper PPE. - Be aware of nearest fire extinguisher location. Practice good housekeeping procedures.
3) Chemical Cleanup - Acid - Cyanide - Unknowns	- Chemical Splash - Inhalation	- Wear appropriate Level C PPE which will include Tychem SL sealed seam CPC, full face APR with Multi-gas Cartridge, nitrile gloves and chemical boots. All seams will be taped with chemical tape. - Ensure decontamination station is setup prior to starting work - Beware of jagged and damaged structures.

SWS ENVIRONMENTAL SERVICES

31 020

JOB SAFETY ANALYSIS

Work Activity:	Date:	Revision Date:	Job Number:
Acid/Cyanide/Unknown Cleanup	12/02/2015		FW1-511-1482

PPE: ☒ Hard Hat ☒ Safety Shoes ☒ Chem Boots ☒ Traffic Vest ☒ Safety Glasses ☐ Hearing Protection ☐ Safety Goggles ☐ Face Shield

☒ Respiratory Protection (Full Face Respirator w/ MultiGas Cartridge) ☒ Chemical Protective Clothing (Tychem SL Suit) ☒ Gloves (Nitrile)

Basic Job Steps	Hazard Identification	Safe Work Practices
1) General Activities	- Slips, Trips and Falls	- Follow good housekeeping procedures. - Keep designated walkway clear of debris. - Maintain level pathways and use extreme caution on uneven ground. - Watch for suspended and slippery working surfaces. - Use proper lifting techniques. - Do not swing or throw items into containers.
	- Strains/Sprains	- Maintain level pathways and use extreme caution on uneven ground.
	- Eye Injuries	- Wear ANSI approved Safety Glasses. - Beware of jagged and damaged structures.
	- Lacerations/Punctures	- Wear proper PPE. - Follow plan and procedures for associated tasks. - Use correct tools for the associated tasks.
	- Heat/Dehydration/Sunburn	- Drink plenty of bottled water only. - Use sun protection lotions as necessary. - Wear appropriate sun protective PPE. - Take adequate number of breaks.
	- Weather	- Adhere to warning signals as indicated in the HASP - Observe changes in weather conditions. - Suspend work as applicable with serious weather conditions.
	- Arachnid, Insect, Mammal, and Reptile injuries (bites and stings)	- Maintain safe distance from known location of vermin. - Use appropriates deterrent sprays, lotions, or other, as applicable. - Acknowledge and adhere to warning signs (visual or auditory). - Use appropriate tools and measures to remove vermin from operating area. - Do not place hands or other parts of body into areas not previously investigated of Inhabitants.

SWS ENVIRONMENTAL SERVICES

31 021

JOB SAFETY ANALYSIS

Work Activity: Loading/Unloading Trailers	Date: ~~3/27/11~~	Revision Date: ~~4/7/11~~	Job Number

PPE: ☐ Hard Hat ☒ Safety Shoes ☒ Traffic Vest ☒ Safety Glasses ☐ Hearing Protection ☐ Fall protection ☐ Safety Goggles ☐ Face Shield ☐ Respiratory Protection ☐ Chemical Protective Clothing ☒ Gloves ☐ PFD ☐ Nomex ☐ Thermal Protection ☒ Leather gloves ☐ Chaps

Basic Job Steps	Hazard Identification	Safe Work Practices
1) Chock wheels, secure trailer	- Pinch points - Muscle strains - Slips, trips , falls - Movement of trailer	- Wear work gloves and be aware of body position - Use proper lifting techniques - Only work on level trailers and ensure work area is clear of debris - Chock wheels
2) Inspect trailer	- Slip, trip, fall - Muscle strain	- Inspect trailer for structurally integrity, including checking ramps for clean/clear walking surface, ensure metal webbing on the ramp is not detached for the frame - Ensure employee inspecting the trailer are knowledgeable regarding trailers, tie downs, and securing loads
3) Loading/Unloading the trailer	- Slips, trips, falls - Muscle strains - Cargo control - Vehicle control - Removing and Replacing portable ramps	- Watch where you are walking and use good housekeeping practices - Use proper lift techniques - Properly secure cargo, all equipment must have 2 heavy duty racket straps, if porta-johns can be bolted to the trailer frame/floor it must be done - Place loads over the axels to ensure that the trailer is stable - Check loads often throughout the day - Removing and Replacing portable ramps is a 2 person lift, use proper lifting techniques and work gloves are required (A 1 person lift is permitted if that person has received proper training to perform that task and can do so safely)
4) Post trip inspections	- Pinch points - Muscle strains - Slips, trips , falls - Movement of trailer	- Wear work gloves and be aware of body position - Use proper lifting techniques - Only work on level trailers and ensure work area is clear of debris - Chock wheels - Inspect trailer for structurally integrity, including checking ramps for clean/clear walking surface, ensure metal webbing on the ramp is not detached for the frame

ATTACHMENT C
LAND DISPOSAL RESTRICTION (LDR) FORMS, WASTE PROJILES, WASTE MANIFESTS

PSC, LLC

Land Disposal Restriction Form

Generator: Lane Plating Company

U.S. EPA I.D. TXD007336571

Manifest #: 004/5954 5WK

Profile #: 7368819-00, 7364101-00

CHECK THE APPROPRIATE BOX AND COMPLETE ALL REQUIRED SECTIONS AND TABLES.

☐ The wastes identified on this form do not currently meet the definition of a hazardous solid waste as set forth in 40 CFR Part 261 and is therefore not subject to 40 CFR Part 268 restrictions. Complete Section 4 on page 5.

☐ The wastes identified on this form are lab packs. Complete Section 3 and 4 on page 5 and attach inventory packing sheets for all drums identified.

☒ The wastes identified on this form are subject to the land disposal restrictions of 40 CFR Part 268. The wastes do not meet the treatment standards specified in Part 268, Subpart D or do not meet the applicable prohibition levels specified in 268.32. Pursuant to 40 CFR 268.7(a), Complete Sections 1, 2 and 4 and any required TABLES.

SECTION (1) Treatability Group (check the appropriate box): ☐ Wastewater ■ Non-wastewater
(Wastewaters contain less than 1% filterable solids and less than 1% Total Organic Carbon)

SECTION (2) EPA Waste Codes (check all boxes that apply):

☐ D001 Ignitable except for High TOC *(If this box is checked, TABLE 3 on pages 3,4, and 5 must be completed and attached* with *this shipment).*
☐ D001 High TOC Ignitable (greater than 10% total organic carbon)
☐ D002 Corrosive characteristic waste *(If this box is checked, TABLE 3 on pages 3,4, and 5 must be completed and attached* with *this shipment).*
☒ D003 Reactive Sulfides based on 261.23(a)(5)
☒ D003 Reactive Cyanides based on 261.23(a)(5)
☐ D003 Water Reactives based on 261.23(a)(2),(3) and (4) *(If this box is checked, TABLE 3 on pages 3,4, and 5 must be completed and attached* with *this shipment).*
☐ D003 Other Reactives based on 261.23(a)(1)

If D004 - D043 or F039 boxes are checked, TABLE 3 on pages 3,4, and 5 must be completed and attached with *this shipment.*

☐ D004 Arsenic	☐ D005 Barium	☐ D006 Cadmium
☐ D006 Cadmium-containing batteries		
☐ D007 Chromium	☐ D008 Lead	☐ D008 Lead acid batteries
☐ D009 High mercury inorganic (>260 mg/kg total), including incinerator residue and residues from RMERC		
☐ D009 High-mercury organic (>260 mg/kg total), not including incinerator residue		
☐ D009 Low-mercury (<260 mg/kg total)		☐ D009 All D009 wastewaters
☐ D010 Selenium	☐ D011 Silver	
☐ D012 Endrin	☐ D023 *o*-Cresol	☐ D034 Hexachloroethane
☐ D013 Lindane	☐ D024 *m*-Cresol	☐ D035 Methyl ethyl ketone
☐ D014 Methoxychlor	☐ D025 *p*-Cresol	☐ D036 Nitrobenzene
☐ D015 Toxaphene	☐ D026 Cresols (Total)	☐ D037 Pentachlorophenol
☐ D016 2,4-D	☐ D027 *p*-Dichlorobenzene	☐ D038 Pyridine
☐ D017 2,4,5-TP (Silvex)	☐ D028 1,2-Dichloroethane	☐ D039 Tetrachloroethylene
☐ D018 Benzene	☐ D029 1,1-Dichloroethylene	☐ D040 Trichloroethylene
☐ D019 Carbon tetrachloride	☐ D030 2,4-Dinitrotoluene	☐ D041 2,4,5-Trichlorophenol
☐ D020 Chlordane	☐ D031 Heptachlor	☐ D042 2,4,6-Trichlorophenol
☐ D021 Chlorobenzene	☐ D032 Hexachlorobenzene	☐ D043 Vinyl chloride
☐ D022 Chloroform	☐ D033 Hexachlorobutadiene	☐ F039 Multi-source leachate

PSC, LLC
Land Disposal Restriction Form

☐ F001-F005 spent solvents. *(If this box is checked TABLE 2 on page 2 must be completed and attached with this shipment.)*
☒ This shipment carries additional EPA waste codes that are not addressed above. *(If this box is checked TABLE 1 on page 2 must be completed and attached with this shipment.)*

TABLE 1: ADDITONAL EPA WASTE CODES

This table must be completed for all EPA waste codes that are not addressed on the preceeding page. List each all applicable waste codes and corresponding subcategories.

EPA Waste Code (one per line)	Subcategory (if applicable)	EPA Waste Code (one per line)	Subcategory (if applicable)
P106			
P098			

TABLE 2: SOLVENT WASTE TREATMENT STANDARDS

This table must be completed for all F001-F005 Spent Solvent waste. Each underlying hazardous constituent present in the waste at the point of generation and at a level above the UST constituents listed treatment standard must be checked and this page must accompany the shipment.

F001 Through F005 spent solvent constituents and their associated USEPA hazardous waste code(s)	Wastewater treatment standard	Non-Wastewater treatment standard	F001 through F005 spent solvent constituents and their associated USEPA hazardous waste code(s)	Wastewater treatment standard	Non-Wastewater treatment standard
☐ Acetone (F003)	0.28	160	☐ Methanol (F003)	5.6	0.75 TCLP
☐ Benzene (F005)	0.14	10	☐ Methylene Chloride (F001 F002)	0.089	30
☐ n-Butyl alcohol (F003)	5.6	2.6	☐ Methyl ethyl ketone (F005)	0.28	36
☐ Carbon disulfide (F005)	3.8	4.8 TCLP	☐ Methyl isobutyl ketone (F003)	0.14	33
☐ Carbon Tetrachloride (F001)	0.057	6.0	☐ Nitrobenzene (F004)	0.068	14
☐ Chlorobenzene (F002)	0.057	6.0	☐ 2-Nitropropane (F005)	WETOX or CHOXD, followed by CARBN or INCIN	INCIN
☐ O-Cresol (F004)	0.11	5.6	☐ Pyridine (F005)	0.014	16
☐ Cresols (m- and p- isomers) (F004)	0.77	5.6	☐ Tetrachloroethylene (F001, F002)	0.056	6.0
☐ Cyclohexanone (F003)	0.36	0.75 TCLP	☐ Toluene (F005)	0.08	10
☐ o-Dichlorobenzene (F002)	0.088	6.0	☐ 1,1,1 Trichloroethane (F001 F002)	0.054	6.0
☐ 2-Ethoxyethanol (F005)	INCIN or BIODG	INCIN	☐ 1,1,2 Trichloroethane (F002)	0.054	6.0
Ethyl acetate (F003)	0.34	33	☐ 1,1,2 Trichloro 1,2,2 trifluoroethane (F002)	0.057	30
☐ Ethyl benzene (F003)	0.057	10	☐ Trichloroethylene (F001, F002)	0.0.54	6.0

☐ Ethyl Ether (F003)	0.12	180	☐ Trichloromonofluoromethane (F002)	0.02	30
☐ Isobutanol (F005)	5.6	170	☐ Xylene (F003) sum of o-, p- and m-isomers)	0.32	30

All spent solvent treatment standards are measured through a total waste analysis (TCA) unless otherwise noted. Wastewater units are mg/L, non wastewater are mg/Kg.

TABLE 3: UNDERLYING HAZARDOUS CONSTITUENTS

This table must be completed for all F039, or D001(other than High TOC ignitable liquids), D002, D003 or D004-D043 waste which requires treatment to 268.40 Standards. Each underlying hazardous constituent present in the waste at the point of generation and at a level above the UST constituents listed treatment standard must be checked and this page must accompany the shipment.

Regulated Constituent (check all that apply)	UTS WW[1]	UTS NWW[1]	Regulated Constituent (check all that apply)	UTS WW[1]	UTS NWW[1]
☐A2213	0.042	1.4	☐bis-(2-Chloroisopropyl) ether	0.055	7.2
☐Acenaphthene	0.059	3.4	☐p-Chloro-m-cresol	0.018	14
☐Acenaphthylene	0.059	3.4	☐Chloromethane (Methyl chloride)	0.19	30
☐Acetone	0.28	160	☐2-Chloronaphthalene	0.055	5.6
☐Acetonitrile	5.6	38	☐2-Chlorophenol	0.044	5.7
☐Acetophenone	0.010	9.7	☐3-Chloropropylene	0.036	30
☐2-Acetylaminofluorene	0.059	140	☐Chrysene	0.059	3.4
☐Acrolein	0.29	N/A	☐o-Creseol	0.11	5.6
☐Acrylamide	19	23	☐Cresol (m-or p-isomers)	0.77	5.6
☐Acrylonitrile	0.24	84	☐m-Cumenyl methylcarbamate	0.056	1.4
☐Aldicarb sulfone	0.056	0.28	☐Cyclohexanone	0.36	0.75*
☐Aldrin	0.021	0.066	☐o,p'-DDD	0.023	0.087
☐4-Aminobiphenyl	0.13	N/A	☐p,p'-DDD	0.023	0.087
☐Aniline	0.81	14	☐o,p'-DDE	0.031	0.087
☐Anthracene	0.059	3.4	☐p,p'-DDE	0.031	0.087
☐Aramite	0.36	N/A	☐o,p'-DDT	0.0039	0.087
☐Barban	0.056	1.4	☐p,p'-DDT	0.0039	0.087
☐Bendiocarb	0.056	1.4	☐Dibenz (a,h) anthracene	0.055	8.2
☐Bendiocarb phenol	0.056	1.4	☐Dibenz (a,e) pyrene	0.061	N/A
☐Benomyl	0.056	1.4	☐1,2-Dibromo-3-chloropropane	0.11	15
☐Benz (a) anthracene	0.059	3.4	☐1,2-Dibromoethane (Ethylene dibromide)	0.028	15
☐Benzal Chloride	0.055	6	☐Dibromomethane	0.11	15
☐Benzene	0.14	10	☐m-Dichlorobenzene	0.036	6.0
☐Benzo (b) fluoranthene	0.11	6.8	☐o-Dichlorobenzene	0.088	6.0
☐Benzo (k) fluoranthene	0.11	6.8	☐p-Dichlorobenzene	0.09	6.0
☐Benzo (g,h,i) perylene	0.0055	1.8	☐Dichlorodifluoromethane	0.23	7.2
☐Benzo (a) pyrene	0.061	3.4	☐1,1-Dichloroethane	0.059	6.0
☐alpha-BHC	0.00014	0.066	☐1,2-Dichloroethane	0.21	6.0
☐beta-BHC	0.00014	0.066	☐1,1-Dichloroethylene	0.025	6.0
☐delta-BHC	0.023	0.066	☐trans-1,2-Dichloroethylene	0.054	30
☐gamma-BHC (Lindane)	0.0017	0.066	☐2,4-Dichlorophenol	0.044	14
☐Bromodichloromethane	0.35	15	☐2,6-Dichlorophenol	0.044	14
☐BromoMethane (Methyl Bromide)	0.11	15	☐2,4-Dichorophenoxyacetic acid (2,4,-D)	0.72	10
☐4-Bromophenyl phenyl ether	0.055	15	☐1,2-Dichloropropane	0.85	18
☐n-Butyl alcohol	5.6	2.6	☐cis-1,3-Dichloropropylene	0.036	18
☐Butyl benzyl phthalate	0.017	28	☐trans-1,3-Dichloropropylene	0.036	18
☐Butylate	0.042	1.4	☐Dieldrin	0.017	0.13
☐2-sec-Butyl 4,6 dinitrophenol (Dinoseb)	0.066	2.5	☐Diethyl phthalate	0.2	28
☐Carbaryl	0.006	0.14	☐Diethylene glycol,dicarbamate	0.056	1.4
☐Carbenzadim	0.056	1.4	☐p-Dimethylaminoazobenzene	0.13	N/A
☐Carbofuran	0.006	0.14	☐2,4-Dimethyl phenol	0.036	14
☐Carbofuran phenol	0.056	1.4	☐Dimethyl phthalate	0.047	28
☐Carbon disulfide	3.8	4.8*	☐Dimetilan	0.056	1.4
☐Carbon tetrachloride	0.057	6.0	☐Di-n-butyl phthalate	0.057	28
☐Carbosulfan	0.028	1.4	☐1,4-Dinitrobenzene	0.32	2.3
☐Chlordane (alpha & gamma)	0.0033	0.26	☐4,6 Dinitro-o-cresol	0.28	160
☐p-Chloroaniline	0.46	16	☐2,4-Dinitropheneol	0.12	160
☐Chlorobenzene	0.057	6.0	☐2,4-Dinitrotoluene	0.32	140
☐Chlorobenzilate	0.10	N/A	☐2,6-Dinitrotoluene	0.55	28
☐2-Chloro-1,3-butadiene	0.057	0.28	☐Di-n-octyl phthalate	0.017	28
☐Chlorodibromomethane	0.057	15	☐Di-n-propylnitrosamine	0.40	14

☐Chloroethane	0.27	6.0	☐1,4-Dioxane	12.0	170
☐bis-(2-Chloroethoxy) methane	0.036	7.2	☐Diphenylamine	0.92	13
☐bis-(2-Chloroethyl) ether	0.033	6.0	☐Diphenylnitrosamine	0.92	13
☐2-Chlorethyl vinyl ether	0.062	N/A	☐1,2-Diphenylhydrazine	0.087	N/A
☐Chloroform	0.046	6.0	☐Disulfoton	0.017	6.2

TABLE 3: UNDERLYING HAZARDOUS CONSTITUENTS (CONTINUED)

Regulated Constituent (check all that apply)	UTS WW[1]	UTS NWW[1]	Regulated Constituent (check all that apply)	UTS WW[1]	UTS NWW[1]
☐Dithiocarbamates (total)	0.028	28	☐N-Nitrosodimethylamine	0.4	2.3
☐Endosulfan I	0.023	0.066	☐N-Nitroso-di-n-butylamine	0.4	17
☐Endosulfan II	0.029	0.13	☐Nitrosomethylethylamine	0.4	2.3
☐Endosulfan sulfate	0.029	0.13	☐N-Nitrosomorpholine	0.4	2.3
☐Endrin	0.0028	0.13	☐N-Nitrosopiperidine	0.013	35
☐Endrin aldehyde	0.025	0.13	☐N-Nitrosopyrrolidine	0.013	35
☐EPTC	0.042	1.4	☐Oxamyl	0.056	0.28
Ethyl acetate	0.34	33	☐Parathion	0.014	4.6
☐Ethyl benzene	0.057	10	☐Total PCB's	0.10	10
☐Ethyl cyanide (Propanenitrile)	0.24	360	☐Pebulate	0.042	1.4
☐Ethyl ether	0.12	160	☐Pentachlorobenzene	0.055	10
☐Ethyl methacrylate	0.14	160	☐PeCDD's (All Pentachlorodibenzo-p-dioxins)	0.000063	0.001
☐Ethylene oxide	0.12	N/A	☐PeCDF's (All Pentchlorodibenzofurans)	0.000035	0.001
☐bis- (2-Ethylhexyl) phthalate	0.28	28	☐Pentachloroethane	0.055	6
☐Famphur	0.017	15	☐Pentachloronitrobenzene	0.055	4.8
☐Fluoranthene	0.068	3.4	☐Pentachlorophenol	0.089	7.4
☐Fluorene	0.059	3.4	☐Phenacetin	0.081	16
☐Formetanate hydrochloride	0.056	1.4	☐Phenanthrene	0.059	5.6
☐Formparanate	0.056	1.4	☐Phenol	0.039	6.2
☐Heptachlor	0.0012	0.066	☐o-Phenylenediamine	0.056	5.6
☐Heptachlor epoxide	0.016	0.066	☐Phorate	0.021	4.6
☐Hexachlorobenzene	0.055	10	☐Phthalic Acid	0.055	28
☐Hexachlorobutadiene	0.055	5.6	☐Phthalic anhydride	0.055	28
☐Hexachlorocyclopentadiene	0.057	2.4	☐Physostigmine	0.056	1.4
☐Hexachloroethane	0.055	30	☐Physostigmine salicylate	0.056	1.4
☐Hexachloropropylene	0.035	30	☐Promecarb	0.056	1.4
☐HxCDD's (All Hexachlorodibenzo-p-dioxins)	0.000063	0.001	☐Pronamide	0.093	1.5
☐HxCDF's (All Hexachlorodibenzofurans)	0.000063	0.001	☐Propham	0.056	1.4
☐Indeno (1,2,3-c,d) pyrene	0.0055	3.4	☐Propoxur	0.056	1.4
☐Iodomethane	0.19	65	☐Prosulfocarb	0.042	1.4
☐Isobutyl alcohol	5.6	170	☐Pyrene	0.067	8.2
☐Isodrin	0.021	0.066	☐Pyridine	0.014	16
☐Isolan	0.056	1.4	☐Safrole	0.081	22
☐Isosafrole	0.081	2.6	☐Silvex (2,4,5-TP)	0.72	7.9
☐Kepone	0.0011	0.13	☐1,2,4,5-Tetrachlorobenzene	0.055	14
☐Methacrylonitrite	0.24	84	☐TCDDs (All Tetrachlorodibenzo-p-dioxins)	0.000063	0.001
☐Methanol	5.6	0.75*	☐TCDFs (All Tetrachlordibenzofurans)	0.000063	0.001
☐Methapyrilene	0.081	1.5	☐1,1,1,2-Tetrachloroethane	0.057	6.0
☐Methiocarb	0.056	1.4	☐1,1,2,2-Tetrachloroethane	0.057	6.0
☐Methyomyl	0.028	0.14	☐Tetrachloroethylene	0.056	6.0
☐Methyoxychlor	0.25	0.18	☐2,3,4,6-Tetrachlorophenol	0.030	7.4
☐Methyl ethyl ketone	0.28	36	☐Thiodicarb @	0.019	1.4
☐Methyl isobutyl ketone	0.14	33	☐Thiophanate-methyl	0.056	1.4
☐Methyl methacrylate	0.14	160	☐Tirpate	0.056	0.28
☐Methyl methansulfonate	0.018	N/A	☐Toluene	0.080	10
☐Methyl parathion	0.014	4.6	☐Toxaphene	0.0095	2.6
☐3-Methylcholanthrene	0.0055	15	☐Triallate	0.042	1.4
☐4,4-Methylene bis (2-chloroaniline)	0.50	30	☐Tribromomethane (Bromoform)	0.63	15
☐Methylene chloride	0.089	30	☐1,2,4-Trichlorobenzene	0.055	19
☐Metolcarb	0.056	1.4	☐1,1,1-Trichloroethane	0.054	6.0
☐Mexacarbate	0.056	1.4	☐1,1,2-Trichloroethane	0.054	6.0
☐Molinate	0.042	1.4	☐Trichloroethylene	0.054	6.0
☐Napthalene	0.059	5.6	☐Trichloromonofluoromethane	0.020	30
☐2-Naphthylamine	0.52	N/A	☐2,4,5-Trichlorophenol	0.18	7.4
☐o-Nitroaniline	0.27	14	☐2,4,6-Trichlorophenol	0.035	7.4

☐p-Nitroaniline	0.028	28	☐2,4,5-Trichlorophenoxyacetic acid (2,4,5-T)	0.72	7.9
☐Nitrobenzene	0.068	14	☐1,2,3-Trichloropropane	0.85	30
☐5-Nitro-o-toluidine	0.32	28	☐1,1,2-Trichloro-1,2,2-trifluoroethane	0.057	30
☐o-Nitrophenol	0.028	13	☐Triethylamine	0.081	1.5
☐p-Nitrophenol	0.12	29	☐tris-(2,3-Dibromopropyl) phosphate	0.11	0.10
☐N-Nitrosodiethylamine	0.40	28	☐Vernolate	0.042	1.4

TABLE 3: UNDERLYING HAZARDOUS CONSTITUENTS (CONTINUED)

Regulated Constituent (check all that apply)	UTS WW[1]	UTS NWW[1]	Regulated Constituent (check all that apply)	UTS WW[1]	UTS NWW[1]
☐Vinyl chloride	0.27	6.0	☐Lead	0.69	0.75*
☐Xylene (s)	0.32	30	☐Mercury (Non-wastewater from Retort)	N/A	0.2*
☐Cyanides (Total)	1.2	590	☐Mercury (All others)	0.15	0.025*
☐Cyanides (Amenable)	0.86	30	☐Nickel	3.98	11*
☐Antimony	1.9	1.15*	☐Selenium	0.82	5.7*
☐Arsenic	1.4	5*	☐Silver	0.43	0.14*
☐Barium	1.2	21*	☐Thallium	1.4	0.20*
☐Beryllium	0.82	1.22*	☐Vanadium[2]	4.3	1.6*
☐Cadmium	0.69	0.11*	☐Zinc[2]	2.61	4.3*
☐Chromium (Total)	2.77	0.60*	☐Fluoride	35	N/A

Notes:
[1] Wastewater concentration in mg/l, Non-wastewater concentration in mg/kg measured through total waste analysis unless otherwise noted.
[2] These constituents are not "underlying hazardous constituents" in characteristic wastes, according to the definition at 268.2(i).
* These concentrations measured through TCLP analysis and are expressed in mg/l.

SECTION (4) CERTIFICATION:

"I hereby certify under penalty of law that I have personally examined and am familiar with the waste through analysis and testing, or through knowledge of the waste to support this certification. I certify that as an authorized representative of the generator named previously, all the information submitted in this certification and all attached pages is true and correct to the best of my knowledge. I am aware that there are significant penalties for submitting a false certification, including the possibility of fine or imprisonment.

Authorized Representative Signature _____

Print or Type Name Joe Lane

Date 12-10-2015

PSC, LLC

Land Disposal Restriction Form

Generator: Lane Plating Company

U.S. EPA I.D. TXD007336571

Manifest #: 012217454JJK

Profile #: 736899-00, 736901-00, 737377-00, 737376-00

CHECK THE APPROPRIATE BOX AND COMPLETE ALL REQUIRED SECTIONS AND TABLES.

☐ The wastes identified on this form do not currently meet the definition of a hazardous solid waste as set forth in 40 CFR Part 261 and is therefore not subject to 40 CFR Part 268 restrictions. Complete Section 4 on page 5.

☐ The wastes identified on this form are lab packs. Complete Section 3 and 4 on page 5 and attach inventory packing sheets for all drums identified.

☒ The wastes identified on this form are subject to the land disposal restrictions of 40 CFR Part 268. The wastes do not meet the treatment standards specified in Part 268, Subpart D or do not meet the applicable prohibition levels specified in 268.32. Pursuant to 40 CFR 268.7(a), Complete Sections 1, 2 and 4 and any required TABLES.

SECTION (1) Treatability Group (check the appropriate box): ☐ Wastewater ■ Non-wastewater
(Wastewaters contain less than 1% filterable solids and less than 1% Total Organic Carbon)

SECTION (2) EPA Waste Codes (check all boxes that apply):

☐ D001 Ignitable except for High TOC *(If this box is checked, TABLE 3 on pages 3,4, and 5 must be completed and attached* with *this shipment).*
☐ D001 High TOC Ignitable (greater than 10% total organic carbon)
☐ D002 Corrosive characteristic waste *(If this box is checked, TABLE 3 on pages 3,4, and 5 must be completed and attached* with *this shipment).*
☐ D003 Reactive Sulfides based on 261.23(a)(5)
☒ D003 Reactive Cyanides based on 261.23(a)(5)
☐ D003 Water Reactives based on 261.23(a)(2),(3) and (4) *(If this box is checked, TABLE 3 on pages 3,4, and 5 must be completed and attached* with *this shipment).*
☐ D003 Other Reactives based on 261.23(a)(1)

If D004 - D043 or F039 boxes are checked, TABLE 3 on pages 3,4, and 5 must be completed and attached with *this shipment.*

☐ D004 Arsenic	☐ D005 Barium	☐ D006 Cadmium
☐ D006 Cadmium-containing batteries		
☐ D007 Chromium	☐ D008 Lead	☐ D008 Lead acid batteries
☐ D009 High mercury inorganic (>260 mg/kg total), including incinerator residue and residues from RMERC		
☐ D009 High-mercury organic (>260 mg/kg total), not including incinerator residue		
☐ D009 Low-mercury (<260 mg/kg total)		☐ D009 All D009 wastewaters
☐ D010 Selenium	☒ D011 Silver	
☐ D012 Endrin	☐ D023 *o*-Cresol	☐ D034 Hexachloroethane
☐ D013 Lindane	☐ D024 *m*-Cresol	☐ D035 Methyl ethyl ketone
☐ D014 Methoxychlor	☐ D025 *p*-Cresol	☐ D036 Nitrobenzene
☐ D015 Toxaphene	☐ D026 Cresols (Total)	☐ D037 Pentachlorophenol
☐ D016 2,4-D	☐ D027 *p*-Dichlorobenzene	☐ D038 Pyridine
☐ D017 2,4,5-TP (Silvex)	☐ D028 1,2-Dichloroethane	☐ D039 Tetrachloroethylene
☐ D018 Benzene	☐ D029 1,1-Dichloroethylene	☐ D040 Trichloroethylene
☐ D019 Carbon tetrachloride	☐ D030 2,4-Dinitrotoluene	☐ D041 2,4,5-Trichlorophenol
☐ D020 Chlordane	☐ D031 Heptachlor	☐ D042 2,4,6-Trichlorophenol
☐ D021 Chlorobenzene	☐ D032 Hexachlorobenzene	☐ D043 Vinyl chloride
☐ D022 Chloroform	☐ D033 Hexachlorobutadiene	☐ F039 Multi-source leachate

PSC, LLC
Land Disposal Restriction Form

☐ F001-F005 spent solvents. *(If this box is checked TABLE 2 on page 2 must be completed and attached with this shipment.)*
☒ This shipment carries additional EPA waste codes that are not addressed above. *(If this box is checked TABLE 1 on page 2 must be completed and attached with this shipment.)*

TABLE 1: ADDITONAL EPA WASTE CODES

This table must be completed for all EPA waste codes that are not addressed on the preceeding page. List each all applicable waste codes and corresponding subcategories.

EPA Waste Code (one per line)	Subcategory (if applicable)	EPA Waste Code (one per line)	Subcategory (if applicable)
P106			
P098			
~~P204~~ P104			
~~P205~~ P029			

TABLE 2: SOLVENT WASTE TREATMENT STANDARDS

This table must be completed for all F001-F005 Spent Solvent waste. Each underlying hazardous constituent present in the waste at the point of generation and at a level above the UST constituents listed treatment standard must be checked and this page must accompany the shipment.

F001 Through F005 spent solvent constituents and their associated USEPA hazardous waste code(s)	Wastewater treatment standard	Non-Wastewater treatment standard	F001 through F005 spent solvent constituents and their associated USEPA hazardous waste code(s)	Wastewater treatment standard	Non-Wastewater treatment standard
☐ Acetone (F003)	0.28	160	☐ Methanol (F003)	5.6	0.75 TCLP
☐ Benzene (F005)	0.14	10	☐ Methylene Chloride (F001 F002)	0.089	30
☐ n-Butyl alcohol (F003)	5.6	2.6	☐ Methyl ethyl ketone (F005)	0.28	36
☐ Carbon disulfide (F005)	3.8	4.8 TCLP	☐ Methyl isobutyl ketone (F003)	0.14	33
☐ Carbon Tetrachloride (F001)	0.057	6.0	☐ Nitrobenzene (F004)	0.068	14
☐ Chlorobenzene (F002)	0.057	6.0	☐ 2-Nitropropane (F005)	WETOX or CHOXD, followed by CARBN or INCIN	INCIN
☐ O-Cresol (F004)	0.11	5.6	☐ Pyridine (F005)	0.014	16
☐ Cresols (m- and p- isomers) (F004)	0.77	5.6	☐ Tetrachloroethylene (F001, F002)	0.056	6.0
☐ Cyclohexanone (F003)	0.36	0.75 TCLP	☐ Toluene (F005)	0.08	10
☐ o-Dichlorobenzene (F002)	0.088	6.0	☐ 1,1,1 Trichloroethane (F001 F002)	0.054	6.0
☐ 2-Ethoxyethanol (F005)	INCIN or BIODG	INCIN	☐ 1,1,2 Trichloroethane (F002)	0.054	6.0
Ethyl acetate (F003)	0.34	33	☐ 1,1,2 Trichloro 1,2,2 trifluoroethane (F002)	0.057	30
☐ Ethyl benzene (F003)	0.057	10	☐ Trichloroethylene (F001, F002)	0.0.54	6.0

☐ Ethyl Ether (F003)	0.12	180	☐ Trichloromonofluoromethane (F002)	0.02	30
☐ Isobutanol (F005)	5.6	170	☐ Xylene (F003) sum of o-, p- and m-isomers)	0.32	30

All spent solvent treatment standards are measured through a total waste analysis (TCA) unless otherwise noted. Wastewater units are mg/L, non wastewater are mg/Kg.

TABLE 3: UNDERLYING HAZARDOUS CONSTITUENTS

This table must be completed for all F039, or D001(other than High TOC ignitable liquids), D002, D003 or D004-D043 waste which requires treatment to 268.40 Standards. Each underlying hazardous constituent present in the waste at the point of generation and at a level above the UST constituents listed treatment standard must be checked and this page must accompany the shipment.

Regulated Constituent (check all that apply)	UTS WW[1]	UTS NWW[1]	Regulated Constituent (check all that apply)	UTS WW[1]	UTS NWW[1]
☐A2213	0.042	1.4	☐bis-(2-Chloroisopropyl) ether	0.055	7.2
☐Acenaphthene	0.059	3.4	☐p-Chloro-m-cresol	0.018	14
☐Acenaphthylene	0.059	3.4	☐Chloromethane (Methyl chloride)	0.19	30
☐Acetone	0.28	160	☐2-Chloronaphthalene	0.055	5.6
☐Acetonitrile	5.6	38	☐2-Chlorophenol	0.044	5.7
☐Acetophenone	0.010	9.7	☐3-Chloropropylene	0.036	30
☐2-Acetylaminofluorene	0.059	140	☐Chrysene	0.059	3.4
☐Acrolein	0.29	N/A	☐o-Creseol	0.11	5.6
☐Acrylamide	19	23	☐Cresol (m-or p-isomers)	0.77	5.6
☐Acrylonitrile	0.24	84	☐m-Cumenyl methylcarbamate	0.056	1.4
☐Aldicarb sulfone	0.056	0.28	☐Cyclohexanone	0.36	0.75*
☐Aldrin	0.021	0.066	☐o,p'-DDD	0.023	0.087
☐4-Aminobiphenyl	0.13	N/A	☐p,p'-DDD	0.023	0.087
☐Aniline	0.81	14	☐o,p'-DDE	0.031	0.087
☐Anthracene	0.059	3.4	☐p,p'-DDE	0.031	0.087
☐Aramite	0.36	N/A	☐o,p'-DDT	0.0039	0.087
☐Barban	0.056	1.4	☐p,p'-DDT	0.0039	0.087
☐Bendiocarb	0.056	1.4	☐Dibenz (a,h) anthracene	0.055	8.2
☐Bendiocarb phenol	0.056	1.4	☐Dibenz (a,e) pyrene	0.061	N/A
☐Benomyl	0.056	1.4	☐1,2-Dibromo-3-chloropropane	0.11	15
☐Benz (a) anthracene	0.059	3.4	☐1,2-Dibromoethane (Ethylene dibromide)	0.028	15
☐Benzal Chloride	0.055	6	☐Dibromomethane	0.11	15
☐Benzene	0.14	10	☐m-Dichlorobenzene	0.036	6.0
☐Benzo (b) fluoranthene	0.11	6.8	☐o-Dichlorobenzene	0.088	6.0
☐Benzo (k) fluoranthene	0.11	6.8	☐p-Dichlorobenzene	0.09	6.0
☐Benzo (g,h,i) perylene	0.0055	1.8	☐Dichlorodifluoromethane	0.23	7.2
☐Benzo (a) pyrene	0.061	3.4	☐1,1-Dichloroethane	0.059	6.0
☐alpha-BHC	0.00014	0.066	☐1,2-Dichloroethane	0.21	6.0
☐beta-BHC	0.00014	0.066	☐1,1-Dichloroethylene	0.025	6.0
☐delta-BHC	0.023	0.066	☐trans-1,2-Dichloroethylene	0.054	30
☐gamma-BHC (Lindane)	0.0017	0.066	☐2,4-Dichlorophenol	0.044	14
☐Bromodichloromethane	0.35	15	☐2,6-Dichlorophenol	0.044	14
☐BromoMethane (Methyl Bromide)	0.11	15	☐2,4-Dichorophenoxyacetic acid (2,4,-D)	0.72	10
☐4-Bromophenyl phenyl ether	0.055	15	☐1,2-Dichloropropane	0.85	18
☐n-Butyl alcohol	5.6	2.6	☐cis-1,3-Dichloropropylene	0.036	18
☐Butyl benzyl phthalate	0.017	28	☐trans-1,3-Dichloropropylene	0.036	18
☐Butylate	0.042	1.4	☐Dieldrin	0.017	0.13
☐2-sec-Butyl 4,6 dinitrophenol (Dinoseb)	0.066	2.5	☐Diethyl phthalate	0.2	28
☐Carbaryl	0.006	0.14	☐Diethylene glycol,dicarbamate	0.056	1.4
☐Carbenzadim	0.056	1.4	☐p-Dimethylaminoazobenzene	0.13	N/A
☐Carbofuran	0.006	0.14	☐2,4-Dimethyl phenol	0.036	14
☐Carbofuran phenol	0.056	1.4	☐Dimethyl phthalate	0.047	28
☐Carbon disulfide	3.8	4.8*	☐Dimetilan	0.056	1.4
☐Carbon tetrachloride	0.057	6.0	☐Di-n-butyl phthalate	0.057	28
☐Carbosulfan	0.028	1.4	☐1,4-Dinitrobenzene	0.32	2.3
☐Chlordane (alpha & gamma)	0.0033	0.26	☐4,6 Dinitro-o-cresol	0.28	160
☐p-Chloroaniline	0.46	16	☐2,4-Dinitropheneol	0.12	160
☐Chlorobenzene	0.057	6.0	☐2,4-Dinitrotoluene	0.32	140
☐Chlorobenzilate	0.10	N/A	☐2,6-Dinitrotoluene	0.55	28
☐2-Chloro-1,3-butadiene	0.057	0.28	☐Di-n-octyl phthalate	0.017	28
☐Chlorodibromomethane	0.057	15	☐Di-n-propylnitrosamine	0.40	14

☐Chloroethane	0.27	6.0	☐1,4-Dioxane	12.0	170
☐bis-(2-Chloroethoxy) methane	0.036	7.2	☐Diphenylamine	0.92	13
☐bis-(2-Chloroethyl) ether	0.033	6.0	☐Diphenylnitrosamine	0.92	13
☐2-Chlorethyl vinyl ether	0.062	N/A	☐1,2-Diphenylhydrazine	0.087	N/A
☐Chloroform	0.046	6.0	☐Disulfoton	0.017	6.2

TABLE 3: UNDERLYING HAZARDOUS CONSTITUENTS (CONTINUED)

Regulated Constituent (check all that apply)	UTS WW[1]	UTS NWW[1]	Regulated Constituent (check all that apply)	UTS WW[1]	UTS NWW[1]
☐Dithiocarbamates (total)	0.028	28	☐N-Nitrosodimethylamine	0.4	2.3
☐Endosulfan I	0.023	0.066	☐N-Nitroso-di-n-butylamine	0.4	17
☐Endosulfan II	0.029	0.13	☐Nitrosomethylethylamine	0.4	2.3
☐Endosulfan sulfate	0.029	0.13	☐N-Nitrosomorpholine	0.4	2.3
☐Endrin	0.0028	0.13	☐N-Nitrosopiperidine	0.013	35
☐Endrin aldehyde	0.025	0.13	☐N-Nitrosopyrrolidine	0.013	35
☐EPTC	0.042	1.4	☐Oxamyl	0.056	0.28
Ethyl acetate	0.34	33	☐Parathion	0.014	4.6
☐Ethyl benzene	0.057	10	☐Total PCB's	0.10	10
☐Ethyl cyanide (Propanenitrile)	0.24	360	☐Pebulate	0.042	1.4
☐Ethyl ether	0.12	160	☐Pentachlorobenzene	0.055	10
☐Ethyl methacrylate	0.14	160	☐PeCDD's (All Pentachlorodibenzo-p-dioxins)	0.000063	0.001
☐Ethylene oxide	0.12	N/A	☐PeCDF's (All Pentchlorodibenzofurans)	0.000035	0.001
☐bis- (2-Ethylhexyl) phthalate	0.28	28	☐Pentachloroethane	0.055	6
☐Famphur	0.017	15	☐Pentachloronitrobenzene	0.055	4.8
☐Fluoranthene	0.068	3.4	☐Pentachlorophenol	0.089	7.4
☐Fluorene	0.059	3.4	☐Phenacetin	0.081	16
☐Formetanate hydrochloride	0.056	1.4	☐Phenanthrene	0.059	5.6
☐Formparanate	0.056	1.4	☐Phenol	0.039	6.2
☐Heptachlor	0.0012	0.066	☐o-Phenylenediamine	0.056	5.6
☐Heptachlor epoxide	0.016	0.066	☐Phorate	0.021	4.6
☐Hexachlorobenzene	0.055	10	☐Phthalic Acid	0.055	28
☐Hexachlorobutadiene	0.055	5.6	☐Phthalic anhydride	0.055	28
☐Hexachlorocyclopentadiene	0.057	2.4	☐Physostigmine	0.056	1.4
☐Hexachloroethane	0.055	30	☐Physostigmine salicylate	0.056	1.4
☐Hexachloropropylene	0.035	30	☐Promecarb	0.056	1.4
☐HxCDD's (All Hexachlorodibenzo-p-dioxins)	0.000063	0.001	☐Pronamide	0.093	1.5
☐HxCDF's (All Hexachlorodibenzofurans)	0.000063	0.001	☐Propham	0.056	1.4
☐Indeno (1,2,3-c,d) pyrene	0.0055	3.4	☐Propoxur	0.056	1.4
☐Iodomethane	0.19	65	☐Prosulfocarb	0.042	1.4
☐Isobutyl alcohol	5.6	170	☐Pyrene	0.067	8.2
☐Isodrin	0.021	0.066	☐Pyridine	0.014	16
☐Isolan	0.056	1.4	☐Safrole	0.081	22
☐Isosafrole	0.081	2.6	☐Silvex (2,4,5-TP)	0.72	7.9
☐Kepone	0.0011	0.13	☐1,2,4,5-Tetrachlorobenzene	0.055	14
☐Methacrylonitrile	0.24	84	☐TCDDs (All Tetrachlorodibenzo-p-dioxins)	0.000063	0.001
☐Methanol	5.6	0.75*	☐TCDFs (All Tetrachlordibenzofurans)	0.000063	0.001
☐Methapyrilene	0.081	1.5	☐1,1,1,2-Tetrachloroethane	0.057	6.0
☐Methiocarb	0.056	1.4	☐1,1,2,2-Tetrachloroethane	0.057	6.0
☐Methyomyl	0.028	0.14	☐Tetrachloroethylene	0.056	6.0
☐Methyoxychlor	0.25	0.18	☐2,3,4,6-Tetrachlorophenol	0.030	7.4
☐Methyl ethyl ketone	0.28	36	☐Thiodicarb @	0.019	1.4
☐Methyl isobutyl ketone	0.14	33	☐Thiophanate-methyl	0.056	1.4
☐Methyl methacrylate	0.14	160	☐Tirpate	0.056	0.28
☐Methyl methansulfonate	0.018	N/A	☐Toluene	0.080	10
☐Methyl parathion	0.014	4.6	☐Toxaphene	0.0095	2.6
☐3-Methylcholanthrene	0.0055	15	☐Triallate	0.042	1.4
☐4,4-Methylene bis (2-chloroaniline)	0.50	30	☐Tribromomethane (Bromoform)	0.63	15
☐Methylene chloride	0.089	30	☐1,2,4-Trichlorobenzene	0.055	19
☐Metolcarb	0.056	1.4	☐1,1,1-Trichloroethane	0.054	6.0
☐Mexacarbate	0.056	1.4	☐1,1,2-Trichloroethane	0.054	6.0
☐Molinate	0.042	1.4	☐Trichloroethylene	0.054	6.0
☐Napthalene	0.059	5.6	☐Trichloromonofluoromethane	0.020	30
☐2-Naphthylamine	0.52	N/A	☐2,4,5-Trichlorophenol	0.18	7.4
☐o-Nitroaniline	0.27	14	☐2,4,6-Trichlorophenol	0.035	7.4

☐p-Nitroaniline	0.028	28	☐2,4,5-Trichlorophenoxyacetic acid (2,4,5-T)	0.72	7.9
☐Nitrobenzene	0.068	14	☐1,2,3-Trichloropropane	0.85	30
☐5-Nitro-o-toluidine	0.32	28	☐1,1,2-Trichloro-1,2,2-trifluoroethane	0.057	30
☐o-Nitrophenol	0.028	13	☐Triethylamine	0.081	1.5
☐p-Nitrophenol	0.12	29	☐tris-(2,3-Dibromopropyl) phosphate	0.11	0.10
☐N-Nitrosodiethylamine	0.40	28	☐Vernolate	0.042	1.4

TABLE 3: UNDERLYING HAZARDOUS CONSTITUENTS (CONTINUED)

Regulated Constituent (check all that apply)	UTS WW[1]	UTS NWW[1]	Regulated Constituent (check all that apply)	UTS WW[1]	UTS NWW[1]
☐Vinyl chloride	0.27	6.0	☐Lead	0.69	0.75*
☐Xylene (s)	0.32	30	☐Mercury (Non-wastewater from Retort)	N/A	0.2*
☐Cyanides (Total)	1.2	590	☐Mercury (All others)	0.15	0.025*
☐Cyanides (Amenable)	0.86	30	☐Nickel	3.98	11*
☐Antimony	1.9	1.15*	☐Selenium	0.82	5.7*
☐Arsenic	1.4	5*	☐Silver	0.43	0.14*
☐Barium	1.2	21*	☐Thallium	1.4	0.20*
☐Beryllium	0.82	1.22*	☐Vanadium[2]	4.3	1.6*
☐Cadmium	0.69	0.11*	☐Zinc[2]	2.61	4.3*
☐Chromium (Total)	2.77	0.60*	☐Fluoride	35	N/A

Notes:
[1] Wastewater concentration in mg/l, Non-wastewater concentration in mg/kg measured through total waste analysis unless otherwise noted.
[2] These constituents are not "underlying hazardous constituents" in characteristic wastes, according to the definition at 268.2(i).
* These concentrations measured through TCLP analysis and are expressed in mg/l.

SECTION (4) CERTIFICATION:

"I hereby certify under penalty of law that I have personally examined and am familiar with the waste through analysis and testing, or through knowledge of the waste to support this certification. I certify that as an authorized representative of the generator named previously, all the information submitted in this certification and all attached pages is true and correct to the best of my knowledge. I am aware that there are significant penalties for submitting a false certification, including the possibility of fine or imprisonment.

Authorized Representative Signature _____

Print or Type Name Joe Lane

Date 12-10-2015

Printed: 02 DEC 2015

Generator's Waste Profile 736899-00

Status : PENDING

Starts : 02 DEC 2015
Expires: 01 DEC 2016

Sales Rep 7512 Deandra Shrum
Acct Mngr 5210 Brett Robinson

A: GENERATOR (531584) SITE INFORMATION

Lane Plating Company
5322 Bonnie View Road
DALLAS, TX 75241
> Contact Joe Lane
TSDF Approval List No

EPA TXD007336571
NAICS 332813 Neshap N
Phone (214) 535-4314

B: CUSTOMER (46708) INFORMATION

SWS ENVIRONMENTAL SERVICE, INC
PO Box 18619
PANAMA CITY BEACH, FL 32417

C: WASTE INFORMATION

On File > MSDS Yes Analysis No Sample No

Waste Name SODIUM CYANIDE
Process UNUSED VIRGIN PRODUCT FOR DISPOSAL
Unused Commercial Product No Spill Residue No

D: PHYSICAL CHARACTERISTICS OF WASTE

Phys States	S-Sol	Top Color	White	Odor	Mild	Almond-like	PH Range N/A
		Mid Color		Layers	Single Phased		Free Liq % 0
		Bot Color		Spec Grav	1.595		Flash Test MSDS
		% Ash	0	BTU/Lbs	800		Flash Rnge NO FLASH
		% Water	0	% Halogens	0		Viscosity High
							Pumpable No

E: CHEMICAL COMPOSITION OF WASTE

Sodium Cyanide (100 %)

PCB's 0 Cyanides 0 Phenolics 0 Sulfides 0 Dioxins 0
TOC 0 VOC 0 Information Provided By Generator

F: METALS METHOD Total

Arsenic	<5	Cadmium	<1	Chromium	<5	Silver <5	Zinc 0
Barium	<100	Merc TCLP	<0.2	Selenium	<1	Nickel 0	Copper 0
		Lead	<5	Merc Tot	<260	Thallium 0	Chrome-6

G: OTHER CHARACTERISTICS OF WASTE

Ign. Solid	No	Oxidizer	No	Explosive	No	Shock Sensitive	No	Cyanide Reactive	No	Sulfide Reactive	No
Explosive		Asbestos				Radioactive	No	Water Reactive	No	Reactive (Other)	No
Herbicides	0	Pesticides	0			Ammonia	0	Infectious	No	Medical	No

H: EPA / STATE WASTE IDENTIFICATION

EPA Waste Yes State Waste Yes TSCA No Waste Water No Universal Waste No
Form W319 Source G11 Origin SubPart CC No NESHAPS No CERCLA No Debris No Reg. Organics No

EPA Codes P106
State Codes CESQ319H 0001319H 0015319H
UHC
Categorical Discharge Standards No CTW Category N/A DW/EHW: DW

I: SHIPPING INFORMATION

Marine Poltutant No

Containers DM Metal Drum Qty to Ship Now 1 Projected Volume 1/Onetime
DOT Descrip UN1689 WASTE SODIUM CYANIDE 6 1 PGI RQ(P106) ERG(157)

J: SPECIAL DISPOSAL INSTRUCTIONS

Generator's Waste Profile 736899-00

Status : PENDING

Starts : 02 DEC 2015
Expires: 01 DEC 2016

Sales Rep 7512 Deandra Shrum
Acct Mngr 5210 Brett Robinson

GENERATOR CERTIFICATION

I hereby certify, as an authorized representative of the Generator named above, that Allworth, LLC has been fully informed of all information known about this waste, including but not limited to, the waste's generation process, composition, and physical characteristics, necessary to identify proper treatment and disposal of waste and this information is true and accurate.If this is an existing profile which is being renewed, I hereby certify that there have been no changes in this waste, chemical, physical, or regulatory designation since full characterization by sample testing.

Signature	Printed Name	Title	Date
	Joe Lane	RMS	12-10-2015

In accordance with 40 CFR 264.12(b), Allworth, LLC has the appropriate permits for, and will accept the waste the generator is shipping as described in this profile.

Printed: 02 DEC 2015

Generator's Waste Profile 736901-00

Status : PENDING

Starts : 02 DEC 2015
Expires: 01 DEC 2016

Sales Rep 7512 Deandra Shrum
Acct Mngr 5210 Brett Robinson

A: GENERATOR (531584) SITE INFORMATION

Lane Plating Company
5322 Bonnie View Road
DALLAS, TX 75241
> Contact Joe Lane
TSDF Approval List No

EPA TXD007336571
NAICS 332813 Neshap N
Phone (214) 535-4314

B: CUSTOMER (46708) INFORMATION

SWS ENVIRONMENTAL SERVICE, INC
PO Box 18619
PANAMA CITY BEACH, FL 32417

C: WASTE INFORMATION

On File > MSDS Yes Analysis No Sample No

Waste Name POTASSIUM CYANIDE
Process UNUSED VIRGIN PRODUCT
Unused Commercial Product No Spill Residue No

D: PHYSICAL CHARACTERISTICS OF WASTE

Phys States S-Sol
Top Color White
Mid Color
Bot Color
% Ash 0
% Water 0

Odor Mild Bitter almon
Layers Single Phased
Spec Grav 1.553
BTU/Lbs 500
% Halogens 0

PH Range N/A
Free Liq % 0
Flash Test MSDS
Flash Rnge NO FLASH
Viscosity High
Pumpable No

E: CHEMICAL COMPOSITION OF WASTE

Potassium Cyanide (100 %)

PCB's 0 Cyanides 0 Phenolics 0 Sulfides 0 Dioxins 0
TOC 0 VOC 0
Information Provided By Generator

F: METALS METHOD Total

Arsenic	<5	Cadmium	<1	Chromium	<5	Silver	<5	Zinc	0
Barium	<100	Merc TCLP	<0 2	Selenium	<1	Nickel	0	Copper	0
		Lead	<5	Merc Tot	<260	Thallium	0	Chrome-6	

G: OTHER CHARACTERISTICS OF WASTE

Ign. Solid	No	Oxidizer	No	Explosive	No	Shock Sensitive	No	Cyanide Reactive	Yes	Sulfide Reactive	No
Explosive		Asbestos				Radioactive	No	Water Reactive	No	Reactive (Other)	No
Herbicides	0	Pesticides	0			Ammonia	0	Infectious	No	Medical	No

H: EPA / STATE WASTE IDENTIFICATION

EPA Waste Yes State Waste Yes TSCA No Waste Water No Universal Waste No

Form W319 Source G11 Origin SubPart CC No NESHAPS No CERCLA No Debris No Reg. Organics No

EPA Codes P098
State Codes CESQ319H 0001319H
UHC

0016319H

Categorical Discharge Standards No CTW Category N/A DW/EHW: DW

I: SHIPPING INFORMATION

Marine Pollutant No

Containers DM Metal Drum Qty to Ship Now 1 Projected Volume 1/Onetime

DOT Descrip UN1680 WASTE POTASSIUM CYANIDE 6 1 PGI RQ(P098 = 10 LBS) ERG(157)

J: SPECIAL DISPOSAL INSTRUCTIONS

Generator's Waste Profile 736901-00

Status : PENDING

Starts : 02 DEC 2015

Expires: 01 DEC 2016

Sales Rep 7512 Deandra Shrum

Acct Mngr 5210 Brett Robinson

GENERATOR CERTIFICATION

I hereby certify, as an authorized representative of the Generator named above, that Allworth, LLC has been fully informed of all information known about this waste, including but not limited to, the waste's generation process, composition, and physical characteristics, necessary to identify proper treatment and disposal of waste and this information is true and accurate.If this is an existing profile which is being renewed, I hereby certify that there have been no changes in this waste, chemical, physical, or regulatory designation since full characterization by sample testing.

Signature	Printed Name	Title	Date
	Joe Lane	Pres.	12-10-2015

In accordance with 40 CFR 264.12(b), Allworth, LLC has the appropriate permits for, and will accept the waste the generator is shipping as described in this profile.

Printed: 04 DEC 2015

Generator's Waste Profile 737377-00

Status : PENDING

Starts : 04 DEC 2015
Expires: 03 DEC 2016

Sales Rep 7512 Deandra Shrum
Acct Mngr 5210 Brett Robinson

A: GENERATOR (531584) SITE INFORMATION

Lane Plating Company
5322 Bonnie View Road
DALLAS, TX 75241
> Contact Joe Lane
TSDF Approval List No

EPA TXD007336571
NAICS 332813 Neshap N
Phone (214) 535-4314

B: CUSTOMER (46708) INFORMATION

SWS ENVIRONMENTAL SERVICE, INC
PO Box 18619
PANAMA CITY BEACH, FL 32417

C: WASTE INFORMATION

On File > MSDS Yes Analysis No Sample No

Waste Name SILVER CYANIDE
Process UNUSED VIRGIN PRODUCT BEING DISCARDED
Unused Commercial Product Yes Spill Residue No

D: PHYSICAL CHARACTERISTICS OF WASTE

Phys States	S-Sol	Top Color	Grayish white	Odor	None	PH Range	N/A
		Mid Color		Layers	Single Phased	Free Liq %	0
		Bot Color		Spec Grav	3.95	Flash Test	NT
		% Ash	0	BTU/Lbs	500	Flash Rnge	NO FLASH
		% Water	0	% Halogens	0	Viscosity	High
						Pumpable	No

E: CHEMICAL COMPOSITION OF WASTE

Silver cyanide - solid (100 %)

PCB's	0	Cyanides	5000	Phenolics	0	Sulfides	0
TOC	0	VOC	0				

Dioxins 0
Information Provided By Generator

F: METALS METHOD Total

Arsenic	<5	Cadmium	<1	Chromium	<5	Silver	600	Zinc	0
Barium	<100	Merc TCLP	<0.2	Selenium	<1	Nickel	0	Copper	0
		Lead	<5	Merc Tot	<260	Thallium	0	Chrome-6	

G: OTHER CHARACTERISTICS OF WASTE

Ign. Solid	No	Oxidizer	No	Explosive	No	Shock Sensitive	No	Cyanide Reactive	Yes	Sulfide Reactive	No
Explosive		Asbestos				Radioactive	No	Water Reactive	No	Reactive (Other)	No
Herbicides	0	Pesticides	0			Ammonia	0	Infectious	No	Medical	No

H: EPA / STATE WASTE IDENTIFICATION

EPA Waste Yes State Waste Yes TSCA No Waste Water No Universal Waste No

Form W319 Source G03 Origin SubPart CC No NESHAPS No CERCLA No Debris No Reg. Organics No

EPA Codes D011 P104
State Codes 0017319H 0017319H
UHC
Categorical Discharge Standards No CTW Category N/A DW/EHW: DW

I: SHIPPING INFORMATION

Marine Pollutant No

Containers DM Metal Drum Qty to Ship Now 1 Projected Volume 1/Onetime
DOT Descrip UN1684 WASTE SILVER CYANIDE 6.1 PGII RQ(D011 = 1 LBS) ERG(151)
Add Descrip "MARINE POLLUTANT"

J: SPECIAL DISPOSAL INSTRUCTIONS

Generator's Waste Profile 737377-00

Status : PENDING

Starts : 04 DEC 2015
Expires: 03 DEC 2016

Sales Rep 7512 Deandra Shrum
Acct Mngr 5210 Brett Robinson

GENERATOR CERTIFICATION

I hereby certify, as an authorized representative of the Generator named above, that CRS (Chemical Reclamation Services, LLC) has been fully informed of all information known about this waste, including but not limited to, the waste's generation process, composition, and physical characteristics, necessary to identify proper treatment and disposal of waste and this information is true and accurate.If this is an existing profile which is being renewed, I hereby certify that there have been no changes in this waste, chemical, physical, or regulatory designation since full characterization by sample testing.

Signature	Joe Lane	Pres	12-10-2015
	Printed Name	Title	Date

In accordance with 40 CFR 264 12(b), Chemical Reclamation Services, LLC has the appropriate permits for, and will accept the waste the generator is shipping as described in this profile.

Printed: 04 DEC 2015

Generator's Waste Profile 737376-00

Status : PENDING

Starts : 04 DEC 2015
Expires: 03 DEC 2016

Sales Rep 7512 Deandra Shrum
Acct Mngr 5210 Brett Robinson

A: GENERATOR (531584) SITE INFORMATION

Lane Plating Company
5322 Bonnie View Road
DALLAS, TX 75241
> Contact Joe Lane
TSDF Approval List No

EPA TXD007336571
NAICS 332813 Neshap N
Phone (214) 535-4314

B: CUSTOMER (46708) INFORMATION

SWS ENVIRONMENTAL SERVICE, INC
PO Box 18619
PANAMA CITY BEACH, FL 32417

C: WASTE INFORMATION

On File > MSDS Yes Analysis No Sample No

Waste Name COPPER CYANIDE - SOLID
Process UNUSED VIRGIN PRODUCT BEING DISCARDED
Unused Commercial Product Yes Spill Residue No

D: PHYSICAL CHARACTERISTICS OF WASTE

Phys States	S-Sol	Top Color	White	Odor	None	PH Range	N/A
		Mid Color		Layers	Single Phased	Free Liq %	0
		Bot Color		Spec Grav	3.0	Flash Test	NT
		% Ash	0	BTU/Lbs	500	Flash Rnge	NO FLASH
		% Water	0	% Halogens	0	Viscosity	High
						Pumpable	No

E: CHEMICAL COMPOSITION OF WASTE

Copper Cyanide - Solid (100 %)

PCB's	0	Cyanides	5000	Phenolics	0	Sulfides	0
TOC	0	VOC	0				

Dioxins 0
Information Provided By Generator

F: METALS METHOD Total

Arsenic	<5	Cadmium	<1	Chromium	<5	Silver	<5	Zinc	0
Barium	<100	Merc TCLP	<0.2	Selenium	<1	Nickel	0	Copper	2000
		Lead	<5	Merc Tot	<260	Thallium	0	Chrome-6	

G: OTHER CHARACTERISTICS OF WASTE

Ign. Solid	No	Oxidizer	No	Explosive	No	Shock Sensitive	No	Cyanide Reactive	Yes	Sulfide Reactive	No
Explosive		Asbestos				Radioactive	No	Water Reactive	No	Reactive (Other)	No
Herbicides	0	Pesticides	0			Ammonia	0	Infectious	No	Medical	No

H: EPA / STATE WASTE IDENTIFICATION

EPA Waste Yes State Waste Yes TSCA No Waste Water No Universal Waste No

Form W319 Source G03 Origin SubPart CC No NESHAPS No CERCLA No Debris No Reg. Organics No

EPA Codes P029
State Codes 0018319H
UHC
Categorical Discharge Standards No CTW Category N/A DW/EHW: DW

I: SHIPPING INFORMATION

Marine Pollutant No

Containers DM Metal Drum Qty to Ship Now 1 Projected Volume 1/Onetime
DOT Descrip UN1587 WASTE COPPER CYANIDE 6.1 PGII RQ(P029 = 10 LBS) ERG(151)
Add Descrip "MARINE POLLUTANT"

J: SPECIAL DISPOSAL INSTRUCTIONS

Generator's Waste Profile 737376-00

Status : PENDING

Starts : 04 DEC 2015

Expires: 03 DEC 2016

Sales Rep 7512 Deandra Shrum

Acct Mngr 5210 Brett Robinson

GENERATOR CERTIFICATION

I hereby certify, as an authorized representative of the Generator named above, that CRS (Chemical Reclamation Services, LLC) has been fully informed of all information known about this waste, including but not limited to, the waste's generation process, composition, and physical characteristics, necessary to identify proper treatment and disposal of waste and this information is true and accurate.If this is an existing profile which is being renewed, I hereby certify that there have been no changes in this waste, chemical, physical, or regulatory designation since full characterization by sample testing.

Signature	Printed Name	Title	Date
	Joe Lane	Pres	12-10-2015

In accordance with 40 CFR 264 12(b), Chemical Reclamation Services, LLC has the appropriate permits for, and will accept the waste the generator is shipping as described in this profile.

Please print or type. (Form designed for use on elite (12-pitch) typewriter.)

Form Approved. OMB No. 2050-0039

UNIFORM HAZARDOUS WASTE MANIFEST

1. Generator ID Number	2. Page 1 of	3. Emergency Response Phone	4. Manifest Tracking Number
TX D007336571	1	8008528878	004159545 JJK

GENERATOR

5. Generator's Name and Mailing Address: Lane Plating Company, 5322 Bonnie View Rd, DALLAS TX 75241
Generator's Site Address (if different than mailing address)
Generator's Phone: 214-535-4314

6. Transporter 1 Company Name: SWS Environmental Services — U.S. EPA ID Number: FLO 000936831

7. Transporter 2 Company Name — U.S. EPA ID Number:

8. Designated Facility Name and Site Address: Chemical Reclamation Services, 405 Powell St, Avalon TX 76623 — U.S. EPA ID Number: TXD046844700
Facility's Phone: 972-697-3224

9a. HM	9b. U.S. DOT Description (including Proper Shipping Name, Hazard Class, ID Number, and Packing Group (if any))	10. Containers No.	10. Containers Type	11. Total Quantity	12. Unit Wt./Vol.	13. Waste Codes		
X	1. UN1689 waste Sodium Cyanide 6.1, PG I RQ (P106) ERG 157	1	DF	3	P	2016 319H	D003	
						P106		
X	2. UN1680 waste Potassium Cyanide 6.1 PG I (RQ (P098) ERG 157	1	DF	3	P	2016 319H	D003	
						P098		
	3.							
	4.							

14. Special Handling Instructions and Additional Information
961) Profile 136899-00 1x5 DF
962) Profile 136901-00 1x5 DF

15. GENERATOR'S/OFFEROR'S CERTIFICATION: I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name, and are classified, packaged, marked and labeled/placarded, and are in all respects in proper condition for transport according to applicable international and national governmental regulations. If export shipment and I am the Primary Exporter, I certify that the contents of this consignment conform to the terms of the attached EPA Acknowledgment of Consent.
I certify that the waste minimization statement identified in 40 CFR 262.27(a) (if I am a large quantity generator) or (b) (if I am a small quantity generator) is true.

Generator's/Offeror's Printed/Typed Name: Joe Lane — Signature — Month 12 Day 10 Year 15

INT'L

16. International Shipments ☐ Import to U.S. ☐ Export from U.S. Port of entry/exit:
Transporter signature (for exports only): Date leaving U.S.:

TRANSPORTER

17. Transporter Acknowledgment of Receipt of Materials

Transporter 1 Printed/Typed Name: IGNACIO GONZALEZ — Signature — Month Day Year

Transporter 2 Printed/Typed Name — Signature — Month Day Year 12 18 15

DESIGNATED FACILITY

18. Discrepancy

18a. Discrepancy Indication Space ☐ Quantity ☐ Type ☐ Residue ☐ Partial Rejection ☐ Full Rejection
Manifest Reference Number:

18b. Alternate Facility (or Generator) — U.S. EPA ID Number
Facility's Phone:

18c. Signature of Alternate Facility (or Generator) — Month Day Year

19. Hazardous Waste Report Management Method Codes (i.e., codes for hazardous waste treatment, disposal, and recycling systems)
1. H141 2. H141 3. 4.

20. Designated Facility Owner or Operator: Certification of receipt of hazardous materials covered by the manifest except as noted in Item 18a
Printed/Typed Name: Dankun Knight — Signature — Month 12 Day 18 Year 15

DESIGNATED FACILITY TO DESTINATION STATE (IF REQUIRED)

Please print or type. (Form designed for use on elite (12-pitch) typewriter.)

Form Approved. OMB No. 2050-0039

UNIFORM HAZARDOUS WASTE MANIFEST	1. Generator ID Number	2. Page 1 of	3. Emergency Response Phone	4. Manifest Tracking Number
	TXD007336571	1	8008528878	012217154 JJK

GENERATOR

5. Generator's Name and Mailing Address: Lane Plating Company, 5322 Bonnieview Rd, Dallas TX 75241
Generator's Site Address (if different than mailing address):
Generator's Phone: 214-535-4314

6. Transporter 1 Company Name: EWS Environmental Services — U.S. EPA ID Number: FLD000936831

7. Transporter 2 Company Name — U.S. EPA ID Number:

8. Designated Facility Name and Site Address: Chemical Reclamation Services, 405 Powell St., Avalon TX 76623 — U.S. EPA ID Number: TXD046844700
Facility's Phone: 972-627-3224

9a. HM	9b. U.S. DOT Description (including Proper Shipping Name, Hazard Class, ID Number, and Packing Group (if any))	10. Containers No.	10. Containers Type	11. Total Quantity	12. Unit Wt./Vol.	13. Waste Codes
X	1. UN1689 Waste Sodium Cyanide 6.1, PGI RQ(P106) ERG 157	1	DM	50	P	P106 0015 319H D003
X	2. UN1680 Waste Potassium Cyanide 6.1, PGI RQ(P098) ERG 157	1	DM	100	P	P098 0016 319H D003
X	3. UN1684 Waste Silver Cyanide 6.1, PGII RQ(P201) ERG 151	1	DF	3	P	~~P201~~ 0017 319H D003; D011 P104
X	4. UN1587 Waste Copper Cyanide 6.1, PGII (RQ P029) ERG 157	1	DF	3	P	~~P029~~ 0018 319H D003; P029

14. Special Handling Instructions and Additional Information
9b1) Profile 736899-00 1x55 DM — 9b3) 1x55 DF/Profile # 737377-00
9b2) Profile 736901-00 1x55 DM — 9b4) 1x55 DF/Profile # 737316-00

15. GENERATOR'S/OFFEROR'S CERTIFICATION: I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name, and are classified, packaged, marked and labeled/placarded, and are in all respects in proper condition for transport according to applicable international and national governmental regulations. If export shipment and I am the Primary Exporter, I certify that the contents of this consignment conform to the terms of the attached EPA Acknowledgment of Consent.
I certify that the waste minimization statement identified in 40 CFR 262.27(a) (if I am a large quantity generator) or (b) (if I am a small quantity generator) is true.

Generator's/Offeror's Printed/Typed Name: Joe Lane — Signature: [signature] — Month/Day/Year: 12/10/15

INT'L

16. International Shipments ☐ Import to U.S. ☐ Export from U.S. — Port of entry/exit: — Date leaving U.S.:
Transporter signature (for exports only):

TRANSPORTER

17. Transporter Acknowledgment of Receipt of Materials
Transporter 1 Printed/Typed Name: IGNACIO GONZALEZ — Signature: [signature] — Month/Day/Year: 12/18/15
Transporter 2 Printed/Typed Name — Signature — Month/Day/Year:

DESIGNATED FACILITY

18. Discrepancy
18a. Discrepancy Indication Space ☐ Quantity ☐ Type ☐ Residue ☐ Partial Rejection ☐ Full Rejection
Manifest Reference Number:
18b. Alternate Facility (or Generator) — U.S. EPA ID Number:
Facility's Phone:
18c. Signature of Alternate Facility (or Generator) — Month/Day/Year:

19. Hazardous Waste Report Management Method Codes (i.e., codes for hazardous waste treatment, disposal, and recycling systems)
1. H141 2. H141 3. H141 4. H141

20. Designated Facility Owner or Operator: Certification of receipt of hazardous materials covered by the manifest except as noted in Item 18a
Printed/Typed Name: Connun Knight, C. — Signature: [signature] — Month/Day/Year: 12/18/15

EPA Form 8700-22 (Rev. 3-05) Previous editions are obsolete.

DESIGNATED FACILITY TO DESTINATION STATE (IF REQUIRED)

Reference 32

Rebecca Comeaux

From: Dorothy Lewis
Sent: Tuesday, March 08, 2016 12:21 PM
To: Rebecca Comeaux; Omar Valdez; Rhotenberry, William
Cc: Sam Barrett; Erin Gorman; Tony Walker; Alyssa Taylor; Jerrell Cooper; Abigail Ryan
Subject: FW: final report for 525767
Attachments: Rpt_WO_525767_ver_1_000.pdf

Follow Up Flag: Follow up
Flag Status: Flagged

Hello All,
You requested that I send these to you. They are the groundwater results from the two wells. I'm not sure if one of them is an actual well though. All samples were collected with a baler (one for each well) and they were just a quick grab. Sample 1 came from the west well near the front door. Sample 2 is a duplicate of Sample 1. Sample 3 was collected from the well on the north side of the facility near the gas meter. It's about 15 feet from the other well. The hold time for chromium VI was busted by a day. The EPA Interim Primary Drinking Water Standards for chromium is 0.05 mg/L and barium is 1.0 mg/L (40 CFR 265 Appendix III).

Abby, could you please forward this to Tracy.

TCEQ
Dorothy Lewis
Solid Waste Section
TCEQ DFW Region
2309 Gravel Dr.
Fort Worth, TX 76118
Phone: (817) 588-5824
Fax: (817) 588-5706

From: Gale Denman [mailto:gale.denman@xenco.com]
Sent: Wednesday, March 02, 2016 2:11 PM
To: Dorothy Lewis <dorothy.lewis@tceq.texas.gov>
Subject: final report for 525767

thank you Ms Lewis.. have a good day gale

--
Gale Denman
Project Manager
XENCO Laboratories
9701 Harry Hines Blvd, Dallas TX 75220
214-902-0300(office) 972-800-9578 (cell)
gale.denman@xenco.com

"Setting the Standard since 1990"

Analytical Report 525767

for

TCEQ-Region 04

Project Manager: Dorothy Lewis

52398

52398

02-MAR-16

Collected By: Client

9701 Harry Hines Blvd
Dallas, TX 75220

Xenco-Houston (EPA Lab code: TX00122):
Texas (T104704215-15-19), Arizona (AZ0765), Florida (E871002), Louisiana (03054)
Oklahoma (9218)

Xenco-Dallas (EPA Lab code: TX01468): Texas (T104704295)
Xenco-Odessa (EPA Lab code: TX00158): Texas (T104704400)
Xenco-San Antonio: Texas (T104704534-15-1)
Xenco Phoenix (EPA Lab Code: AZ00901): Arizona(AZ0757)
Xenco-Phoenix Mobile (EPA Lab code: AZ00901): Arizona (AZM757)
Xenco-Atlanta (EPA Lab Code: GA00046):
Florida (E87429), North Carolina (483), South Carolina (98015), Kentucky (85), DoD (L10-135)
Texas (T104704477), Louisiana (04176), USDA (P330-07-00105)

Xenco-Lakeland: Florida (E84098)

02-MAR-16

Project Manager: **Dorothy Lewis**
TCEQ-Region 04
2309 Gravel Drive
Fort Worth, TX 76118

Reference: XENCO Report No(s): **525767**
52398
Project Address: 52398

Dorothy Lewis:

We are reporting to you the results of the analyses performed on the samples received under the project name referenced above and identified with the XENCO Report Number(s) 525767. All results being reported under this Report Number apply to the samples analyzed and properly identified with a Laboratory ID number. Subcontracted analyses are identified in this report with either the NELAC certification number of the subcontract lab in the analyst ID field, or the complete subcontracted report attached to this report.

Unless otherwise noted in a Case Narrative, all data reported in this Analytical Report are in compliance with NELAC standards. The uncertainty of measurement associated with the results of analysis reported is available upon request. Should insufficient sample be provided to the laboratory to meet the method and NELAC Matrix Duplicate and Matrix Spike requirements, then the data will be analyzed, evaluated and reported using all other available quality control measures.

The validity and integrity of this report will remain intact as long as it is accompanied by this letter and reproduced in full, unless written approval is granted by XENCO Laboratories. This report will be filed for at least 5 years in our archives after which time it will be destroyed without further notice, unless otherwise arranged with you. The samples received, and described as recorded in Report No. 525767 will be filed for 60 days, and after that time they will be properly disposed without further notice, unless otherwise arranged with you. We reserve the right to return to you any unused samples, extracts or solutions related to them if we consider so necessary (e.g., samples identified as hazardous waste, sample sizes exceeding analytical standard practices, controlled substances under regulated protocols, etc).

We thank you for selecting XENCO Laboratories to serve your analytical needs. If you have any questions concerning this report, please feel free to contact us at any time.

Respectfully,

Gale Denman

Gale Denman
Project Manager

Recipient of the Prestigious Small Business Administration Award of Excellence in 1994.
Certified and approved by numerous States and Agencies.
A Small Business and Minority Status Company that delivers SERVICE and QUALITY

Houston - Dallas - Odessa - San Antonio - Tampa - Lakeland - Atlanta - Phoenix - Oklahoma - Latin America

Sample Cross Reference 525767

TCEQ-Region 04, Fort Worth, TX

52398

Sample Id	Matrix	Date Collected	Sample Depth	Lab Sample Id
52398-01	W	02-24-16 13:57		525767-001
52398-02	W	02-24-16 13:57		525767-002
52398-03	W	02-24-16 14:12		525767-003

Sample receipt non conformances and comments:

Sample receipt non conformances and comments per sample:

None

Analytical non conformances and comments:

Batch: LBA-989165 Chromium, Hexavalent by SW 7196A
Samples were analyzed out of holding time. DHE 02/29/16

TCEQ-Region 04, Fort Worth, TX

52398

Sample Id: **52398-01** Matrix: Water Date Received:02.26.16 13.30
Lab Sample Id: 525767-001 Date Collected: 02.24.16 13.57

Analytical Method: Metals per ICP by EPA 200.7 Prep Method: E200.7P
Tech: DAT % Moisture:
Analyst: DAT Date Prep: 03.01.16 05.15
Seq Number: 989181

Parameter	Cas Number	Result	RL	Units	Analysis Date	Flag	Dil
Antimony	7440-36-0	<0.0100	0.0100	mg/L	03.01.16 11.28	U	1
Arsenic	7440-38-2	<0.0100	0.0100	mg/L	03.01.16 11.28	U	1
Barium	7440-39-3	**0.126**	0.0100	mg/L	03.01.16 11.28		1
Beryllium	7440-41-7	<0.00400	0.00400	mg/L	03.01.16 11.28	U	1
Cadmium	7440-43-9	<0.00500	0.00500	mg/L	03.01.16 11.28	U	1
Chromium	7440-47-3	**0.219**	0.00500	mg/L	03.01.16 11.28		1
Lead	7439-92-1	<0.0120	0.0120	mg/L	03.01.16 11.28	U	1
Nickel	7440-02-0	<0.0100	0.0100	mg/L	03.01.16 11.28	U	1
Selenium	7782-49-2	<0.0100	0.0100	mg/L	03.01.16 11.28	U	1
Silver	7440-22-4	<0.00400	0.00400	mg/L	03.01.16 11.28	U	1

Analytical Method: Chromium, Hexavalent (Colorimetric)
Tech: DHE % Moisture:
Analyst: DHE
Seq Number: 989165 SUB: TX104704215

Parameter	Cas Number	Result	RL	Units	Analysis Date	Flag	Dil
Chromium, Hexavalent	18540-29-9	**0.212**	0.0100	mg/L	02.29.16 16.00	K	1

Analytical Method: Mercury by EPA 245.1 Prep Method: E245.1P
Tech: DAT % Moisture:
Analyst: DAT Date Prep: 03.02.16 08.15
Seq Number: 989307

Parameter	Cas Number	Result	RL	Units	Analysis Date	Flag	Dil
Mercury, Total	7439-97-6	<0.000100	0.000100	mg/L	03.02.16 12.15	U	1

TCEQ-Region 04, Fort Worth, TX

52398

Sample Id: **52398-02** Matrix: Water Date Received:02.26.16 13.30
Lab Sample Id: 525767-002 Date Collected: 02.24.16 13.57

Analytical Method: Metals per ICP by EPA 200.7 Prep Method: E200.7P
Tech: DAT % Moisture:
Analyst: DAT Date Prep: 03.01.16 05.15
Seq Number: 989181

Parameter	Cas Number	Result	RL	Units	Analysis Date	Flag	Dil
Antimony	7440-36-0	<0.0100	0.0100	mg/L	03.01.16 11.31	U	1
Arsenic	7440-38-2	<0.0100	0.0100	mg/L	03.01.16 11.31	U	1
Barium	7440-39-3	**0.128**	0.0100	mg/L	03.01.16 11.31		1
Beryllium	7440-41-7	<0.00400	0.00400	mg/L	03.01.16 11.31	U	1
Cadmium	7440-43-9	<0.00500	0.00500	mg/L	03.01.16 11.31	U	1
Chromium	7440-47-3	**0.229**	0.00500	mg/L	03.01.16 11.31		1
Lead	7439-92-1	<0.0120	0.0120	mg/L	03.01.16 11.31	U	1
Nickel	7440-02-0	<0.0100	0.0100	mg/L	03.01.16 11.31	U	1
Selenium	7782-49-2	<0.0100	0.0100	mg/L	03.01.16 11.31	U	1
Silver	7440-22-4	<0.00400	0.00400	mg/L	03.01.16 11.31	U	1

Analytical Method: Chromium, Hexavalent (Colorimetric)
Tech: DHE % Moisture:
Analyst: DHE
Seq Number: 989165 SUB: TX104704215

Parameter	Cas Number	Result	RL	Units	Analysis Date	Flag	Dil
Chromium, Hexavalent	18540-29-9	**0.212**	0.0100	mg/L	02.29.16 16.00	K	1

Analytical Method: Mercury by EPA 245.1 Prep Method: E245.1P
Tech: DAT % Moisture:
Analyst: DAT Date Prep: 03.02.16 08.15
Seq Number: 989307

Parameter	Cas Number	Result	RL	Units	Analysis Date	Flag	Dil
Mercury, Total	7439-97-6	<0.000100	0.000100	mg/L	03.02.16 12.25	U	1

TCEQ-Region 04, Fort Worth, TX

52398

Sample Id: **52398-03** Matrix: Water Date Received:02.26.16 13.30

Lab Sample Id: 525767-003 Date Collected: 02.24.16 14.12

Analytical Method: Metals per ICP by EPA 200.7 Prep Method: E200.7P

Tech: DAT % Moisture:

Analyst: DAT Date Prep: 03.01.16 05.15

Seq Number: 989181

Parameter	Cas Number	Result	RL	Units	Analysis Date	Flag	Dil
Antimony	7440-36-0	<0.0100	0.0100	mg/L	03.01.16 11.34	U	1
Arsenic	7440-38-2	<0.0100	0.0100	mg/L	03.01.16 11.34	U	1
Barium	7440-39-3	**0.131**	0.0100	mg/L	03.01.16 11.34		1
Beryllium	7440-41-7	<0.00400	0.00400	mg/L	03.01.16 11.34	U	1
Cadmium	7440-43-9	<0.00500	0.00500	mg/L	03.01.16 11.34	U	1
Chromium	7440-47-3	**0.0275**	0.00500	mg/L	03.01.16 11.34		1
Lead	7439-92-1	<0.0120	0.0120	mg/L	03.01.16 11.34	U	1
Nickel	7440-02-0	<0.0100	0.0100	mg/L	03.01.16 11.34	U	1
Selenium	7782-49-2	<0.0100	0.0100	mg/L	03.01.16 11.34	U	1
Silver	7440-22-4	<0.00400	0.00400	mg/L	03.01.16 11.34	U	1

Analytical Method: Chromium, Hexavalent (Colorimetric)

Tech: DHE % Moisture:

Analyst: DHE

Seq Number: 989165 SUB: TX104704215

Parameter	Cas Number	Result	RL	Units	Analysis Date	Flag	Dil
Chromium, Hexavalent	18540-29-9	**0.0170**	0.0100	mg/L	02.29.16 16.00	K	1

Analytical Method: Mercury by EPA 245.1 Prep Method: E245.1P

Tech: DAT % Moisture:

Analyst: DAT Date Prep: 03.02.16 08.15

Seq Number: 989307

Parameter	Cas Number	Result	RL	Units	Analysis Date	Flag	Dil
Mercury, Total	7439-97-6	<0.000100	0.000100	mg/L	03.02.16 12.28	U	1

TCEQ-Region 04

52398

Analytical Method: **Metals per ICP by EPA 200.7** Prep Method: E200.7P

Seq Number: 989181 Matrix: Water Date Prep: 03.01.16

MB Sample Id: 705664-1-BLK LCS Sample Id: 705664-1-BKS LCSD Sample Id: 705664-1-BSD

Parameter	MB Result	Spike Amount	LCS Result	LCS %Rec	LCSD Result	LCSD %Rec	Limits	%RPD	RPD Limit	Units	Analysis Date	Flag
Antimony	<0.0100	1.00	1.04	104	1.05	105	75-125	1	20	mg/L	03.01.16 10:34	
Arsenic	<0.0100	1.00	1.04	104	1.05	105	75-125	1	20	mg/L	03.01.16 10:34	
Barium	<0.0100	1.00	1.06	106	1.06	106	75-125	0	20	mg/L	03.01.16 10:34	
Beryllium	<0.00400	1.00	1.03	103	1.03	103	75-125	0	20	mg/L	03.01.16 10:34	
Cadmium	<0.00500	1.00	1.06	106	1.07	107	75-125	1	20	mg/L	03.01.16 10:34	
Chromium	<0.00500	1.00	1.00	100	1.01	101	75-125	1	20	mg/L	03.01.16 10:34	
Lead	<0.0120	1.00	1.07	107	1.08	108	75-125	1	20	mg/L	03.01.16 10:34	
Nickel	<0.0100	1.00	1.07	107	1.07	107	75-125	0	20	mg/L	03.01.16 10:34	
Selenium	<0.0100	1.00	1.03	103	1.04	104	75-125	1	20	mg/L	03.01.16 10:34	
Silver	<0.00400	1.00	0.991	99	1.00	100	75-125	1	20	mg/L	03.01.16 10:34	

Analytical Method: **Metals per ICP by EPA 200.7** Prep Method: E200.7P

Seq Number: 989181 Matrix: Water Date Prep: 03.01.16

Parent Sample Id: 525718-001 MS Sample Id: 525718-001 S MSD Sample Id: 525718-001 SD

Parameter	Parent Result	Spike Amount	MS Result	MS %Rec	MSD Result	MSD %Rec	Limits	%RPD	RPD Limit	Units	Analysis Date	Flag
Antimony	<0.0100	1.00	1.03	103	1.03	103	75-125	0	20	mg/L	03.01.16 10:50	
Arsenic	<0.0100	1.00	1.05	105	1.06	106	75-125	1	20	mg/L	03.01.16 10:50	
Barium	0.0502	1.00	1.05	100	1.05	100	75-125	0	20	mg/L	03.01.16 10:50	
Beryllium	<0.00400	1.00	1.02	102	1.01	101	75-125	1	20	mg/L	03.01.16 10:50	
Cadmium	<0.00500	1.00	1.01	101	1.01	101	75-125	0	20	mg/L	03.01.16 10:50	
Chromium	<0.00500	1.00	1.00	100	0.991	99	75-125	1	20	mg/L	03.01.16 10:50	
Lead	<0.0120	1.00	1.01	101	1.00	100	75-125	1	20	mg/L	03.01.16 10:50	
Nickel	<0.0100	1.00	1.00	100	1.00	100	75-125	0	20	mg/L	03.01.16 10:50	
Selenium	<0.0100	1.00	1.04	104	1.05	105	75-125	1	20	mg/L	03.01.16 10:50	
Silver	<0.00400	1.00	0.974	97	0.974	97	75-125	0	20	mg/L	03.01.16 10:50	

Analytical Method: **Metals per ICP by EPA 200.7** Prep Method: E200.7P

Seq Number: 989181 Matrix: Water Date Prep: 03.01.16

Parent Sample Id: 525767-003 MS Sample Id: 525767-003 S MSD Sample Id: 525767-003 SD

Parameter	Parent Result	Spike Amount	MS Result	MS %Rec	MSD Result	MSD %Rec	Limits	%RPD	RPD Limit	Units	Analysis Date	Flag
Antimony	<0.0100	1.00	1.03	103	1.01	101	75-125	2	20	mg/L	03.01.16 11:36	
Arsenic	<0.0100	1.00	1.04	104	1.03	103	75-125	1	20	mg/L	03.01.16 11:36	
Barium	0.131	1.00	1.12	99	1.09	96	75-125	3	20	mg/L	03.01.16 11:36	
Beryllium	<0.00400	1.00	1.02	102	1.01	101	75-125	1	20	mg/L	03.01.16 11:36	
Cadmium	<0.00500	1.00	0.979	98	0.971	97	75-125	1	20	mg/L	03.01.16 11:36	
Chromium	0.0275	1.00	1.01	98	0.999	97	75-125	1	20	mg/L	03.01.16 11:36	
Lead	<0.0120	1.00	0.975	98	0.968	97	75-125	1	20	mg/L	03.01.16 11:36	
Nickel	<0.0100	1.00	0.973	97	0.963	96	75-125	1	20	mg/L	03.01.16 11:36	
Selenium	<0.0100	1.00	1.03	103	1.02	102	75-125	1	20	mg/L	03.01.16 11:36	
Silver	<0.00400	1.00	0.994	99	0.966	97	75-125	3	20	mg/L	03.01.16 11:36	

TCEQ-Region 04

52398

Analytical Method: **Chromium, Hexavalent (Colorimetric)**

Seq Number: 989165 Matrix: Water

MB Sample Id: 989165-1-BLK LCS Sample Id: 989165-1-BKS LCSD Sample Id: 989165-1-BSD

Parameter	MB Result	Spike Amount	LCS Result	LCS %Rec	LCSD Result	LCSD %Rec	Limits	%RPD	RPD Limit	Units	Analysis Date	Flag
Chromium, Hexavalent	<0.0100	0.200	0.204	102	0.201	101	85-115	1	20	mg/L	02.29.16 16:00	

Analytical Method: **Chromium, Hexavalent (Colorimetric)**

Seq Number: 989165 Matrix: Water

Parent Sample Id: 525917-003 MS Sample Id: 525917-003 S MSD Sample Id: 525917-003 SD

Parameter	Parent Result	Spike Amount	MS Result	MS %Rec	MSD Result	MSD %Rec	Limits	%RPD	RPD Limit	Units	Analysis Date	Flag
Chromium, Hexavalent	<0.0100	0.200	0.191	96	0.187	94	85-115	2	20	mg/L	02.29.16 16:00	

Analytical Method: **Mercury by EPA 245.1** Prep Method: SW7470P

Seq Number: 989307 Matrix: Water Date Prep: 03.02.16

MB Sample Id: 705742-1-BLK LCS Sample Id: 705742-1-BKS LCSD Sample Id: 705742-1-BSD

Parameter	MB Result	Spike Amount	LCS Result	LCS %Rec	LCSD Result	LCSD %Rec	Limits	%RPD	RPD Limit	Units	Analysis Date	Flag
Mercury, Total	<0.100	5.00	5.46	109	5.48	110	85-115	0	20	ug/L	03.02.16 12:07	

Analytical Method: **Mercury by EPA 245.1** Prep Method: E245.1P

Seq Number: 989307 Matrix: Water Date Prep: 03.02.16

Parent Sample Id: 525767-001 MS Sample Id: 525767-001 S MSD Sample Id: 525767-001 SD

Parameter	Parent Result	Spike Amount	MS Result	MS %Rec	MSD Result	MSD %Rec	Limits	%RPD	RPD Limit	Units	Analysis Date	Flag
Mercury, Total	<0.100	5.00	5.37	107	5.34	107	75-125	1	20	ug/L	03.02.16 12:17	

Flagging Criteria

X In our quality control review of the data a QC deficiency was observed and flagged as noted. MS/MSD recoveries were found to be outside of the laboratory control limits due to possible matrix /chemical interference, or a concentration of target analyte high enough to affect the recovery of the spike concentration. This condition could also affect the relative percent difference in the MS/MSD.

B A target analyte or common laboratory contaminant was identified in the method blank. Its presence indicates possible field or laboratory contamination.

D The sample(s) were diluted due to targets detected over the highest point of the calibration curve, or due to matrix interference. Dilution factors are included in the final results. The result is from a diluted sample.

E The data exceeds the upper calibration limit; therefore, the concentration is reported as estimated.

F RPD exceeded lab control limits.

J The target analyte was positively identified below the quantitation limit and above the detection limit.

U Analyte was not detected.

L The LCS data for this analytical batch was reported below the laboratory control limits for this analyte. The department supervisor and QA Director reviewed data. The samples were either reanalyzed or flagged as estimated concentrations.

H The LCS data for this analytical batch was reported above the laboratory control limits. Supporting QC Data were reviewed by the Department Supervisor and QA Director. Data were determined to be valid for reporting.

K Sample analyzed outside of recommended hold time.

JN A combination of the "N" and the "J" qualifier. The analysis indicates that the analyte is "tentatively identified" and the associated numerical value may not be consistent with the amount actually present in the environmental sample.

** Surrogate recovered outside laboratory control limit.

BRL Below Reporting Limit.

RL Reporting Limit

MDL Method Detection Limit **SDL** Sample Detection Limit **LOD** Limit of Detection

PQL Practical Quantitation Limit **MQL** Method Quantitation Limit **LOQ** Limit of Quantitation

DL Method Detection Limit

NC Non-Calculable

+ NELAC certification not offered for this compound.

***** (Next to analyte name or method description) = Outside XENCO's scope of NELAC accreditation

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Chain of Custody Record 525767-D

52398

Location:

(Do not fill in this shaded area if the facility information must be confidential)

Permit #:

Region:	Organization #:	PCA Code:	Program:	Sampler telephone number:
DFW	6102		Solid Waste	8175885824

E-Mail ID:	Sampler: (signature)	Sampler: (please print clearly)
Dorothy.Lewis@tceq.texas.gov		Dorothy Lewis

Lab ID Number	Sample ID	Date	Time	# of Bottles	Grab/ Comp.	Matrix L,S,M,O,T	CL2	pH	Cond.	Analyses Requested	REMARKS
	-01	2/24/16	13:57	2	G	L				RCRA 8 metals Ni, Sb, Be, CrVI	SW-846
	-02	2/24/16	13:57	2	G	L				RCRA 8 metals Ni, Sb, Be, CrVI	SW-846
	-03	2/24/16	14:12	2	G	L				RCRA 8 metals Ni, Sb, Be, CrVI	SW-846
	-04										
	-05										
	-06										
	-07										
	-08										
	-09										
	-10										

	Date	Time		
Relinquished by:	2/26/16	10:10	Received by:	For Laboratory Use:
Relinquished by:	2/26/16	11:52	Received by: 2/26/16 11:52	Received on ice: (Y) N 2.3 3.1 deg. C
Relinquished by:	Date	Time	Received by:	Preservatives: Y N
Relinquished by: 2/26/16	Date	Time 1:30	Received by: 2/26/16 1:30	COC Seal: Y N
Shipper name)	Shipper Number:			Seals Intact: Y N

TCEQ 10065 (11/02) White (Original) -Lab Yellow-Lab Pink-Contract Lab Manager Goldenrod-Collector Copy

XENCO LABORATORIES

Custody Seal Record

Client Name: TCEQ

Lab Work Order(s): 525767

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Signature

Date 2/26/16

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Signature

Date 2/26/16

TCEQ-10058 (11/02)

XENCO Laboratories
Prelogin/Nonconformance Report- Sample Log-In

Client: TCEQ-Region 04

Date/ Time Received: 02/26/2016 01:30:00 PM

Work Order #: 525767

Acceptable Temperature Range: 0 - 6 degC
Air and Metal samples Acceptable Range: Ambient

Temperature Measuring device used : XDA

Sample Receipt Checklist		Comments
#1 *Temperature of cooler(s)?	3.1	
#2 *Shipping container in good condition?	**Yes**	
#3 *Samples received on ice?	**Yes**	
#4 *Custody Seals intact on shipping container/ cooler?	**Yes**	
#5 Custody Seals intact on sample bottles?	**N/A**	
#6 *Custody Seals Signed and dated?	**Yes**	
#7 *Chain of Custody present?	**Yes**	
#8 Sample instructions complete on Chain of Custody?	**Yes**	
#9 Any missing/extra samples?	**No**	
#10 Chain of Custody signed when relinquished/ received?	**Yes**	
#11 Chain of Custody agrees with sample label(s)?	**Yes**	
#12 Container label(s) legible and intact?	**Yes**	
#13 Sample matrix/ properties agree with Chain of Custody?	**Yes**	
#14 Samples in proper container/ bottle?	**Yes**	
#15 Samples properly preserved?	**Yes**	
#16 Sample container(s) intact?	**Yes**	
#17 Sufficient sample amount for indicated test(s)?	**Yes**	
#18 All samples received within hold time?	**No**	Received Hex Cr out of Hold
#19 Subcontract of sample(s)?	**Yes**	Xenco Houston
#20 VOC samples have zero headspace (less than 1/4 inch bubble)?	**N/A**	
#21 <2 for all samples preserved with HNO3,HCL, H2SO4? Except for samples for the analysis of HEM or HEM-SGT which are verified by the analysts.	**Yes**	
#22 >10 for all samples preserved with NaAsO2+NaOH, ZnAc+NaOH?	**N/A**	

*** Must be completed for after-hours delivery of samples prior to placing in the refrigerator**

Analyst: PH Device/Lot#:

Checklist completed by: Angelica Martinez Date: 02/26/2016

Checklist reviewed by: Gale Denman Date: 03/01/2016

32 014

Reference 33

Rebecca Comeaux

From: Omar Valdez
Sent: Tuesday, March 08, 2016 12:27 PM
To: Rebecca Comeaux
Cc: Stephen Ellis
Subject: EPA to Commence Removal Assessment at Lane Plating

Importance: High

Follow Up Flag: Follow up
Flag Status: Flagged

Good afternoon,

I wanted to let you know that EPA has agreed to commit to a Removal Assessment at the site to begin as early as late March to early April. Results of the RA will be used to both estimate the scope and costs and potentially justify a federally lead Removal Action. I will keep you posted on the progress. Let me know of any questions or concerns.

Thanks!

Omar.

Rebecca Comeaux

From: Omar Valdez
Sent: Wednesday, May 18, 2016 2:15 PM
To: Rebecca Comeaux
Subject: RE: EPA Removal Action at Lane Plating - Update

Follow Up Flag: Follow up
Flag Status: Flagged

Hi Rebecca,

The EPA is still in the removal assessment phase of the response actions at the site. The completed the sample collection in mid-April. According to the OSC update from this past Friday May 13th, they were still reviewing the data and should have the data review completed by the end of May.

Let me know how I may help.

Thanks!

Omar.

From: Rebecca Comeaux
Sent: Wednesday, May 18, 2016 1:15 PM
To: Omar Valdez <omar.valdez@tceq.texas.gov>
Subject: EPA Removal Action at Lane Plating - Update

HI Omar,

I'm making revisions to the PA report for Lane Plating. Can you tell me if the EPA already conducted the removal assessment, and if so, when that occurred?

Thanks,
Rebecca Comeaux, P.G.
Superfund Section, MC-136
Remediation Division
Texas Commission on Environmental Quality
Phone: 512-239-2466
Email: Rebecca.Comeaux@tceq.texas.gov

Reference 34

Rebecca Comeaux

From: Omar Valdez
Sent: Tuesday, March 08, 2016 2:32 PM
To: Rebecca Comeaux
Subject: FW: TCEQ - Lane Plating- signed tickets 12/3, 12/5, 12/7

Follow Up Flag: Follow up
Flag Status: Flagged

Rebecca,

Here's a good starting inventory of what's on the site.

Thanks,

Omar.

From: Dorothy Lewis
Sent: Tuesday, March 08, 2016 1:27 PM
To: Rhotenberry, William <Rhotenberry.William@epa.gov>
Cc: Sam Barrett <sam.barrett@tceq.texas.gov>; Erin Gorman <erin.gorman@tceq.texas.gov>; Alyssa Taylor <alyssa.taylor@tceq.texas.gov>; Jerrell Cooper <jerrell.cooper@tceq.texas.gov>; Tony Walker <tony.walker@tceq.texas.gov>; Abigail Ryan <Abigail.Ryan@tceq.texas.gov>; Omar Valdez <omar.valdez@tceq.texas.gov>
Subject: FW: TCEQ - Lane Plating- signed tickets 12/3, 12/5, 12/7

Bill,
Sorry about the delay but here you go.

5 containers in the attic (~2-3 gallons)=8 gallons

56 small containers in the lab of solids and liquids (various sizes that you would find in a QA lab)

- 13 (~250 mL) containers on second shelf
- 15 (≤~100 mL) containers on third shelf
- 18 (~50-75 mL) containers on fourth shelf
- 10 (various sizes) containers on bench. One container is labeled oxidizer and one was an unknown acid with white crystals around the top.

25 containers in chemical cabinets in Area 1

- Two have been removed as cyanide waste
- Others are around a gallon = ~23 gallons

66 containers in Area 1 (once you walk into the facility)

- Mostly 30-55 gallon drums=2,167.5 gallons
- Around (15) 5-gallon containers=75 gallons

4 tanks in Area 1

- ~6,400 gallons

8 containers Area 2 (where large chrome tank in located)

- 5-gallons =40 gallons

1 tank and sump in Area 2

- Pumped out into (24) 300-gallon totes =7,200 gallons

2nd tank in Area 2

- ~280 gallons

13 containers in Area 3 (Grinding Room)

- Small oil containers
- 2-5 gallons = ~45

8 tanks and 3 containers in Area 4 (Cad Plating Room)

- ~1,100 gallons

39 containers in Area 5 (Machine Shop)

- Approximately half were empty
- (19) 55-gallon containers =1,045 gallons

1 container in Area 6 (Black Oxide Room)

- 55-gallon drum=55 gallons

7 containers in Area 7 (Thinner Area)

- 55-gallon drums=285 gallons

13 containers in Area 8 (Outside shed)

- Supersacks of grinding grit soil

1 lead dip tank

- ~ 3 gallons

260 containers
14 tanks

So VERY ROUGHLY estimating 18,726 gallons not including the supersacks or lab waste.
Tank wastes at full capacity=~7,523 gallons

Dorothy Lewis
Solid Waste Section
TCEQ DFW Region
2309 Gravel Dr.
Fort Worth, TX 76118
Phone: (817) 588-5824
Fax: (817) 588-5706

From: Dorothy Lewis
Sent: Monday, December 14, 2015 1:07 PM
To: Christopher Wiatrek <Christopher.Wiatrek@tceq.texas.gov>
Cc: Sam Barrett <Sam.Barrett@tceq.texas.gov>; Tony Walker <Tony.Walker@tceq.texas.gov>; Alyssa Taylor <Alyssa.Taylor@tceq.texas.gov>; Jerrell Cooper <Jerrell.Cooper@tceq.texas.gov>
Subject: RE: TCEQ - Lane Plating- signed tickets 12/3, 12/5, 12/7

Here's is what I have so far based on the November 4 visit and last Thursday's visit.

5 containers in the attic
56 containers in the lab
25 containers in chemical cabinets in Area 1
66 containers in Area 1 (once you walk into the facility)
4 tanks in Area 1
8 containers Area 2 (where large chrome tank in located)
1 tank in Area 2
13 containers in Area 3 (Grinding Room)
8 tanks in Area 4 (Cad Plating Room)
3 containers in Area 4
39 containers in Area 5 (Machine Shop)
1 containers in Area 6 (Black Oxide Room)
7 containers in Area 7 (Thinner Area)
13 containers in Area 8 (Outside shed)
1 lead dip tank
24 containers (totes) of pumped out chromic acid

260 containers
14 tanks

From: Christopher Wiatrek
Sent: Monday, December 14, 2015 9:45 AM
To: Dorothy Lewis <dorothy.lewis@tceq.texas.gov>
Subject: RE: TCEQ - Lane Plating- signed tickets 12/3, 12/5, 12/7

Quantity is all I need if you can provide it.

Thanks,
Chris

From: Dorothy Lewis
Sent: Monday, December 14, 2015 9:43 AM
To: Christopher Wiatrek <christopher.wiatrek@tceq.texas.gov>
Subject: RE: TCEQ - Lane Plating- signed tickets 12/3, 12/5, 12/7

Yes. I know how many containers but I'm not sure what they all contain.

From: Christopher Wiatrek
Sent: Monday, December 14, 2015 9:35 AM
To: Dorothy Lewis <dorothy.lewis@tceq.texas.gov>
Subject: RE: TCEQ - Lane Plating- signed tickets 12/3, 12/5, 12/7

Dorothy,
Did the region ever do an inventory on all of the drums and containers at the site?

From: Dorothy Lewis
Sent: Monday, December 14, 2015 9:33 AM
To: Anthony Buck <Anthony.Buck@tceq.texas.gov>
Cc: Christopher Wiatrek <christopher.wiatrek@tceq.texas.gov>; Abel Garcia <abel.garcia@tceq.texas.gov>; Jerrell Cooper <jerrell.cooper@tceq.texas.gov>; Sam Barrett <sam.barrett@tceq.texas.gov>; Tony Walker <tony.walker@tceq.texas.gov>; Alyssa Taylor <alyssa.taylor@tceq.texas.gov>; Erin Gorman <erin.gorman@tceq.texas.gov>; Abigail Ryan <Abigail.Ryan@tceq.texas.gov>
Subject: FW: TCEQ - Lane Plating- signed tickets 12/3, 12/5, 12/7

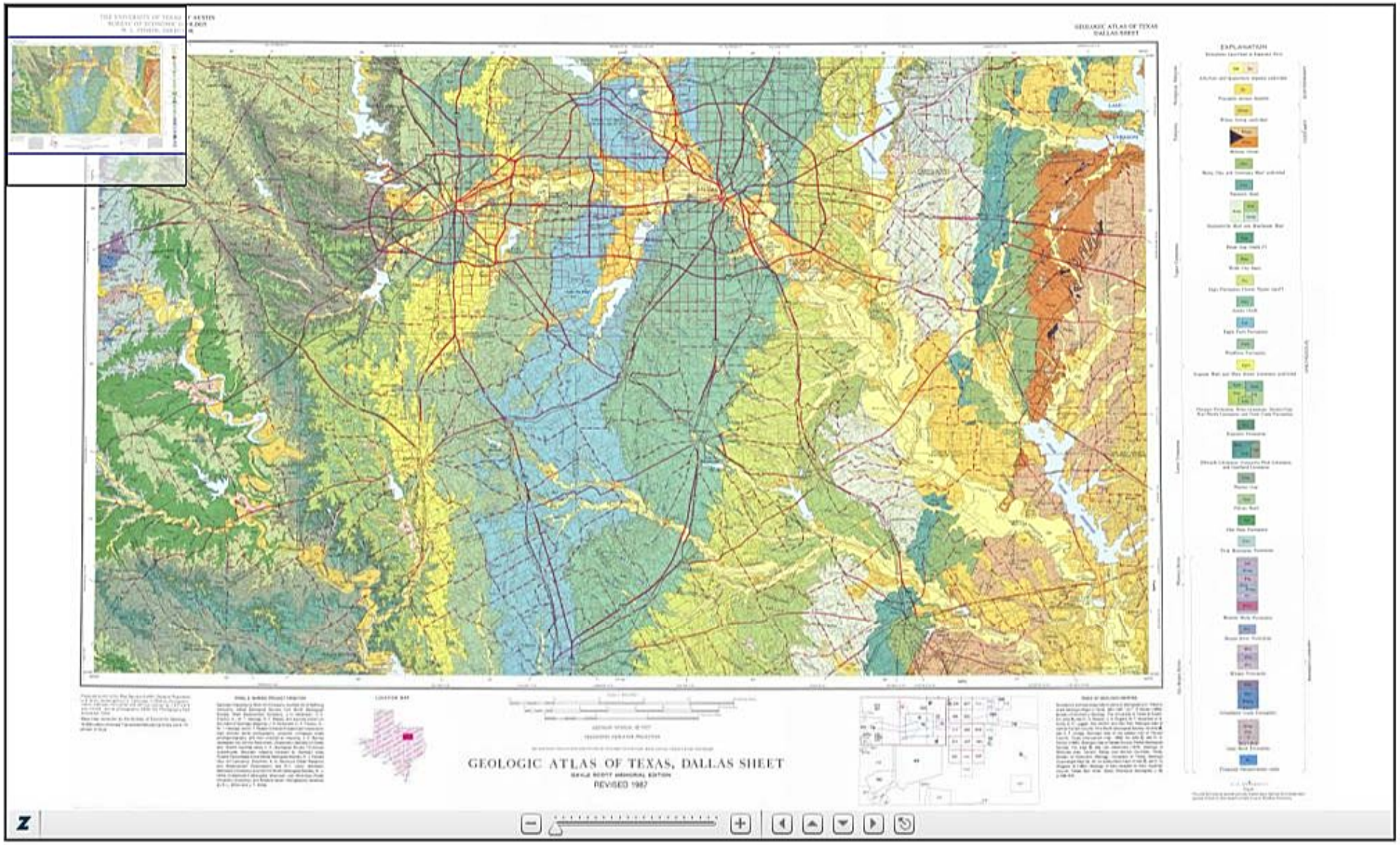
From: Cartha Vandiver [mailto:Cartha.Vandiver@swsenvironmental.com]
Sent: Monday, December 14, 2015 8:22 AM
To: Dorothy Lewis <dorothy.lewis@tceq.texas.gov>
Subject: TCEQ - Lane Plating- signed tickets 12/3, 12/5, 12/7

Good morning,
Damon asked me to send these back to you.

Cartha Vandiver
Service Center Administrator
9204 Hwy 287 NW
Fort Worth, TX 76131
817-847-1333 | Direct 682-286-2702
web: www.swsenvironmental.com

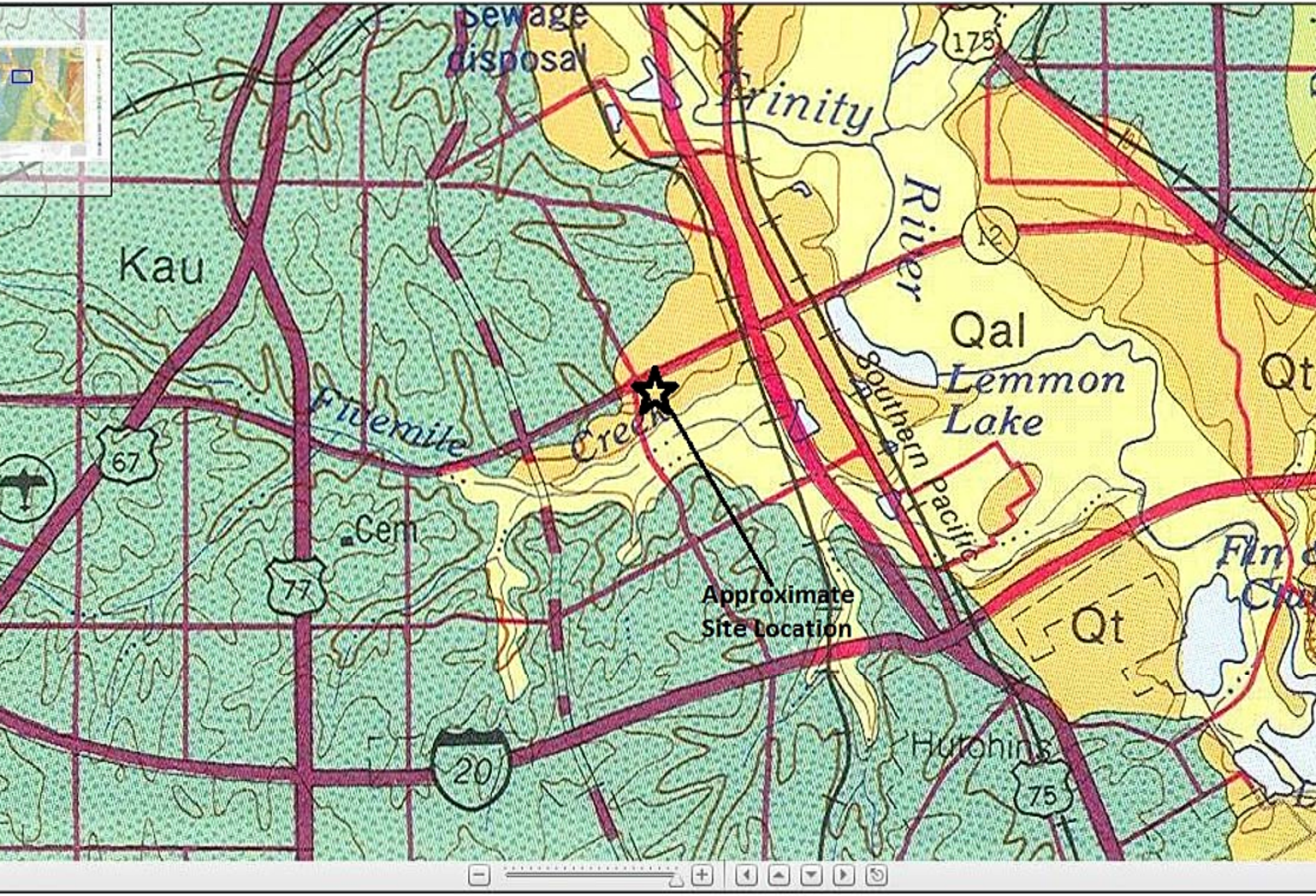
Reference 35

Dallas Sheet



Dallas Sheet

Dallas Sheet



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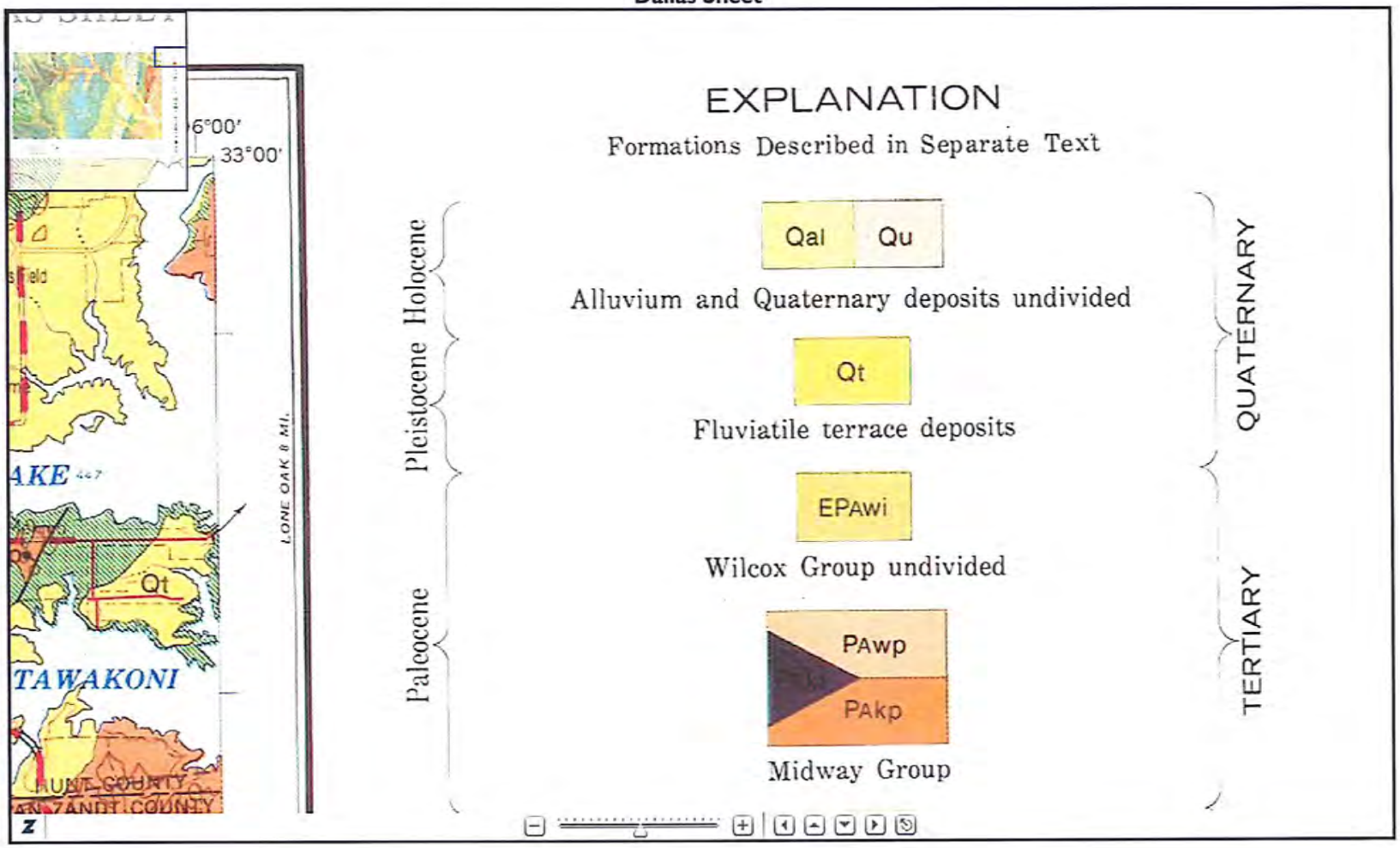
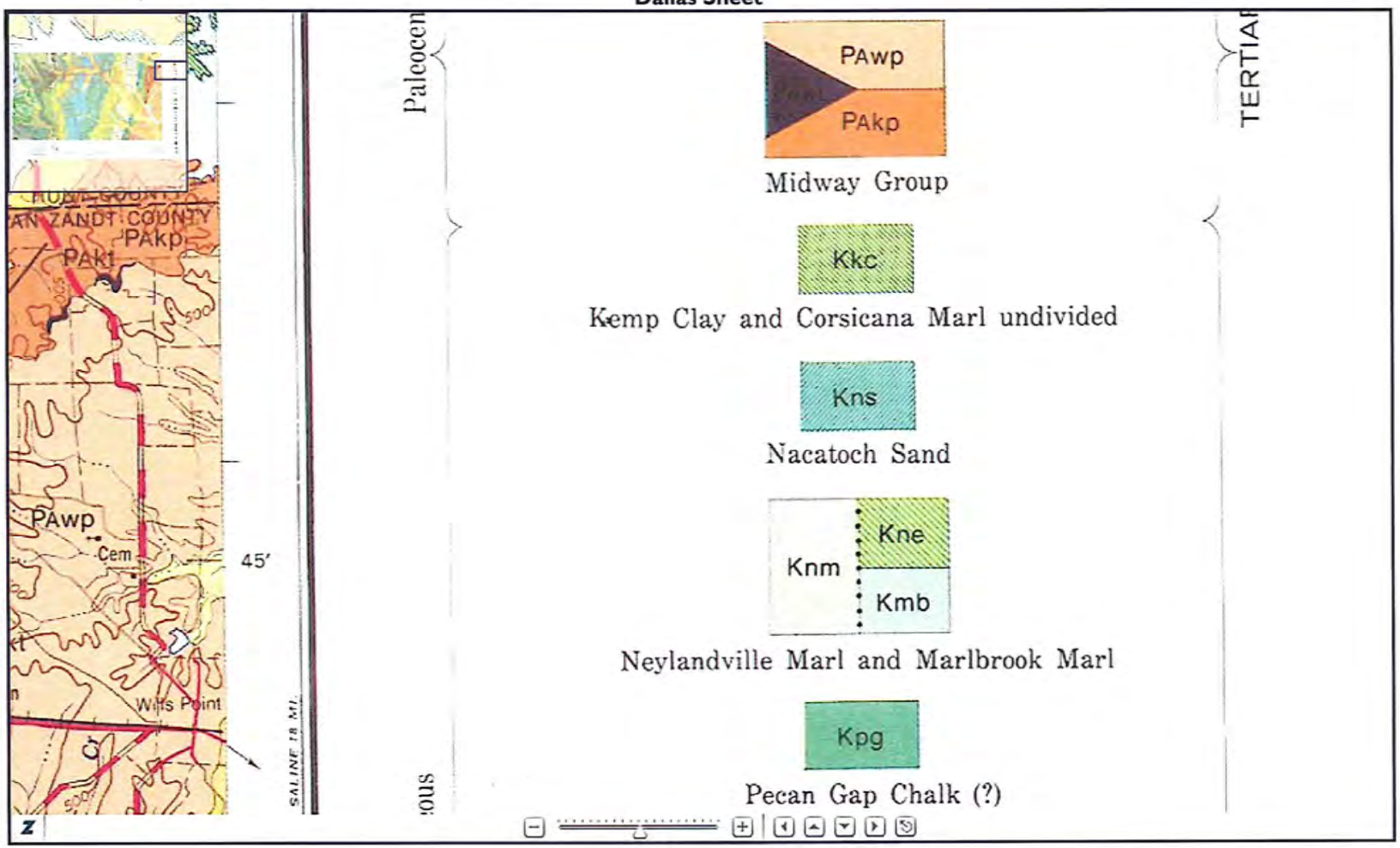


35 004

Dallas Sheet



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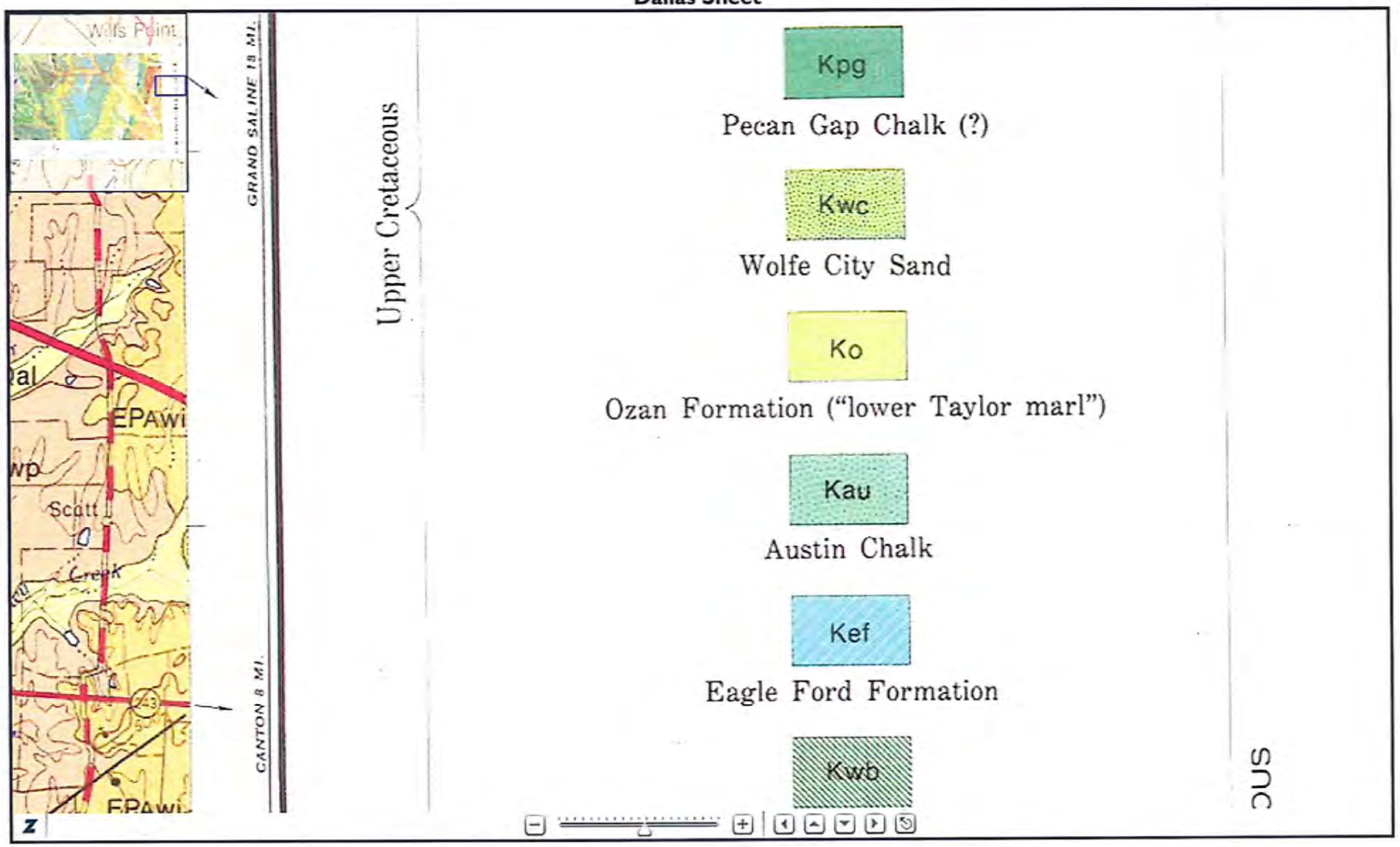
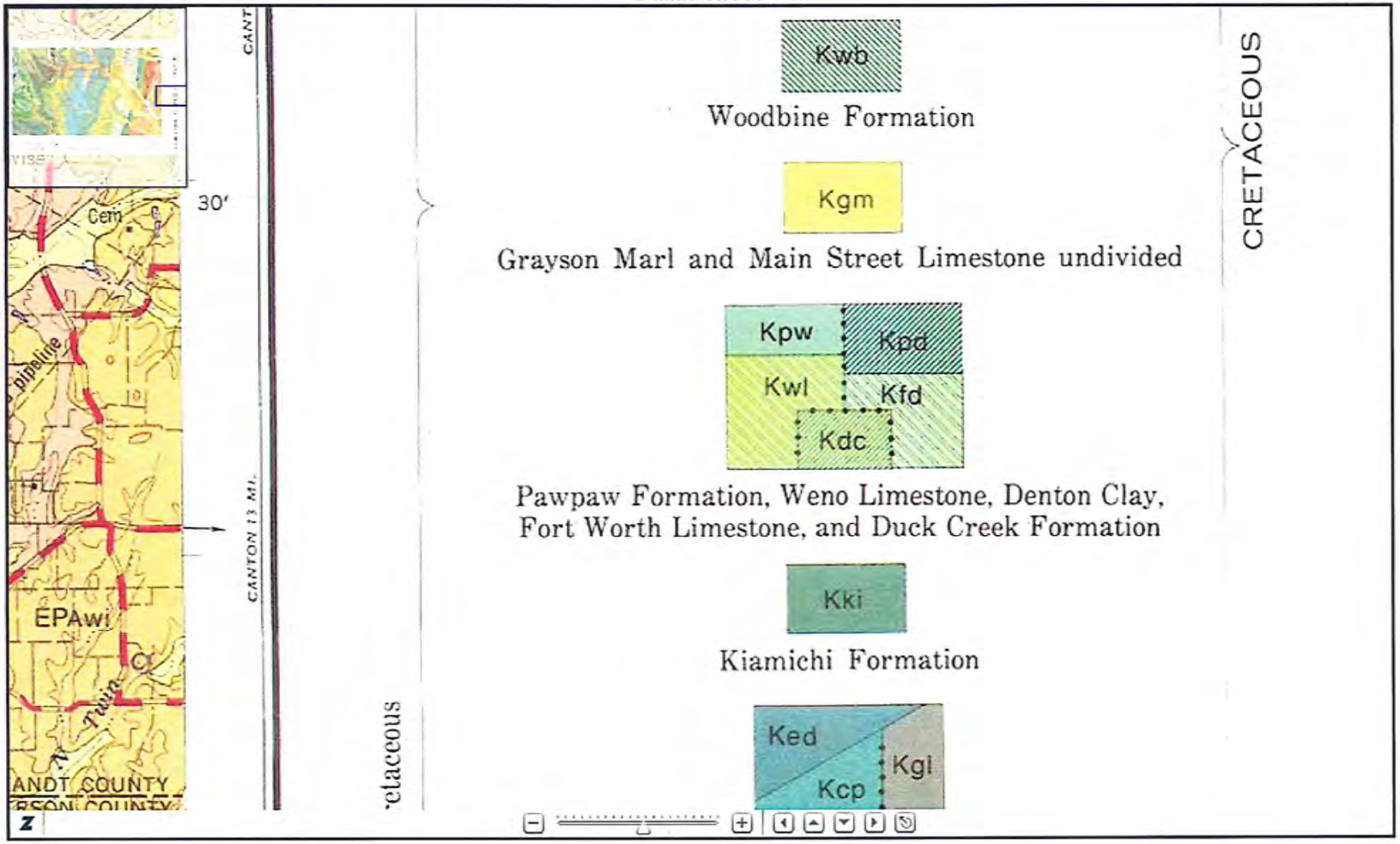


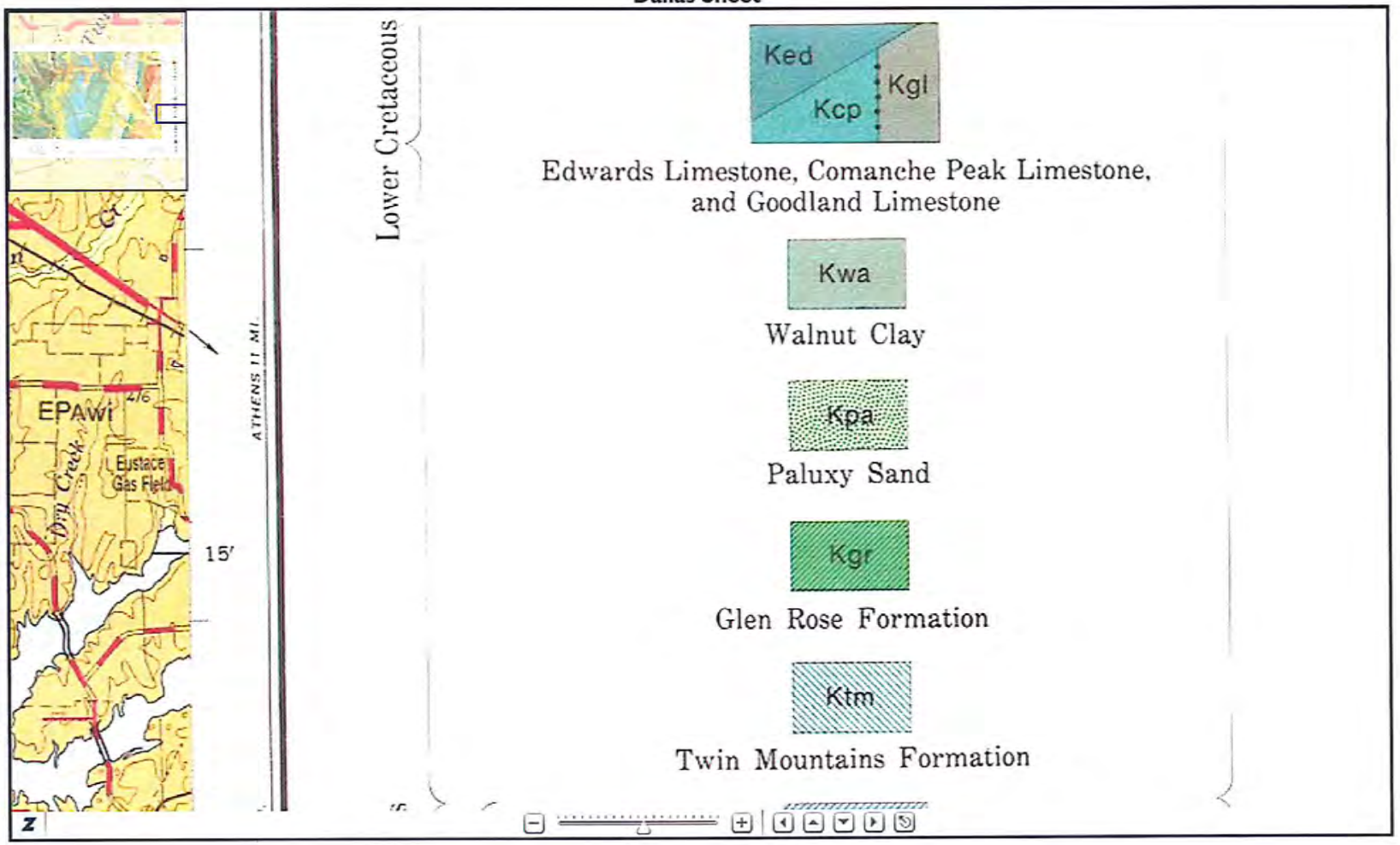
35 006

Dallas Sheet



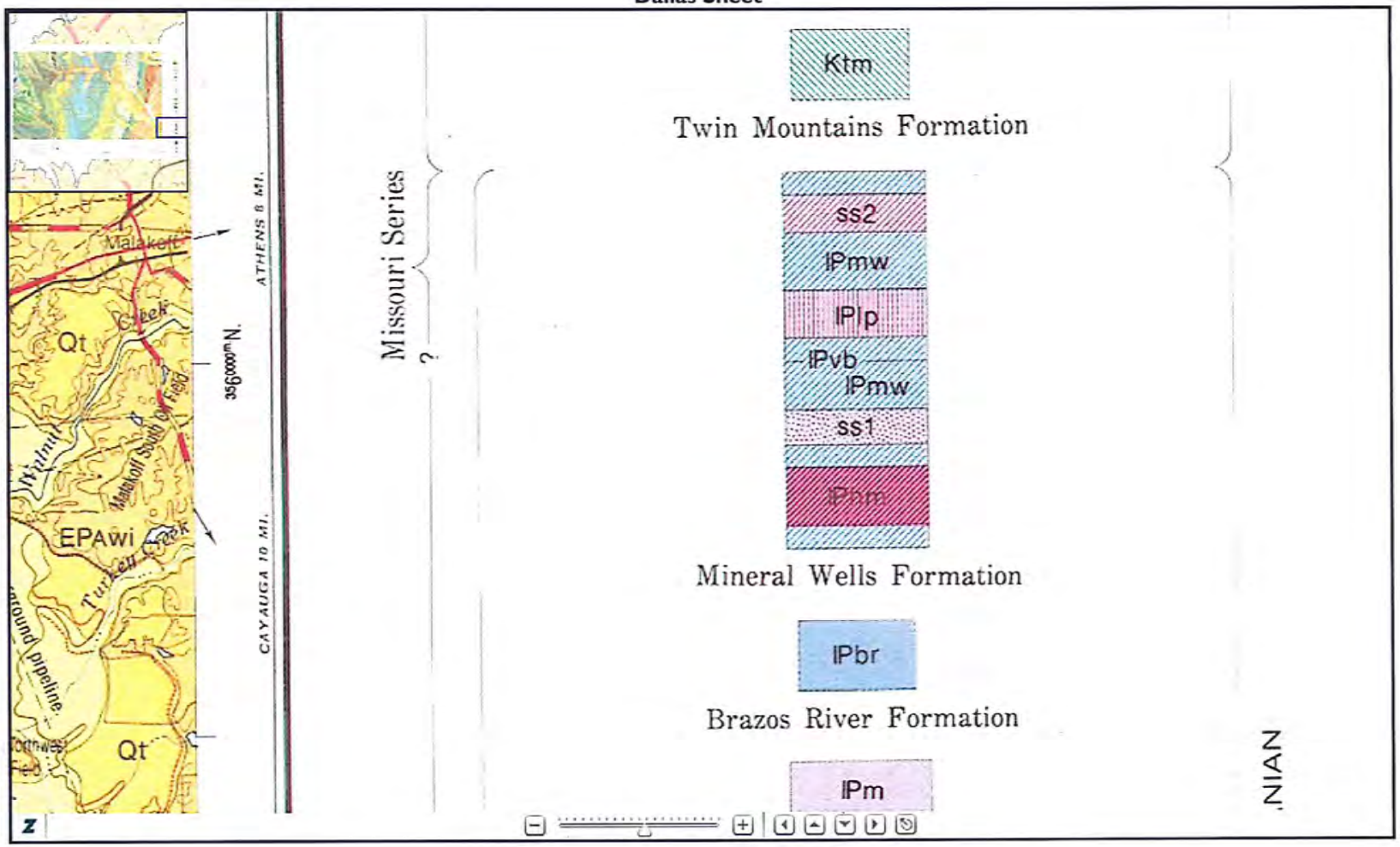
35 007

Dallas Sheet



35 008

Dallas Sheet



35 009

Dallas Sheet

MAPPING

n bibliography in "Index to
1," by T. E. Brown (1963),
versity of Texas at Austin.
ers, W. F. Buckthal, A. E.
ay Rall, Geologic map of
ogical Society; for area **B,**
e eastern half of Tarrant
); for area **C,** see G. H.
County, Dallas Geological
icks (1976), Geology of
Denton Counties, Texas,
rsity of Texas, Geologic

Des Moines Series

PENNSYLVANIAN

IPm
IPdv
IPm

Mingus Formation

IPbc
IPgr
IPbb2
IPbb1

Grindstone Creek Formation

IPmb
IPlb
ls
IPkf ? IPdb

Lazy Bend Formation

35 010

Dallas Sheet

ersity of Texas

"Index to
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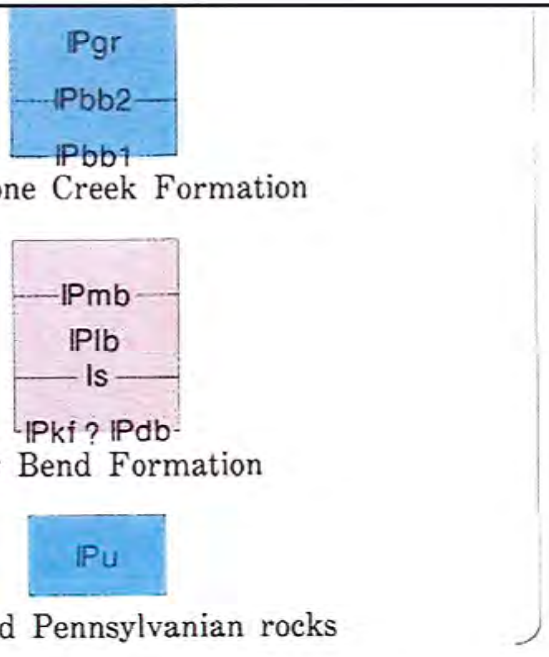
at Austin.
ers, W. F. Buckthal, A. E.
ay Rall, Geologic map of
ogical Society; for area **B,**
e eastern half of Tarrant
); for area **C,** see G. H.
County, Dallas Geological
icks (1976), Geology of
Denton Counties, Texas,
rsity of Texas, Geologic
maps of area **E,** see P. N.
Gossett oil field, Kaufman
troleum Geologists, v. 38,



Tics with ball indicate downthrown side; dashed where inferred; short dashes show position of fault in Ham Gossett oil field at top of Woodbine Formation.

35 011

THE UNIVERSITY OF TEXAS AT AUSTIN
BUREAU OF ECONOMIC GEOLOGY

TO ACCOMPANY MAP—DALLAS SHEET—
GEOLOGIC ATLAS OF TEXAS

GEOLOGIC ATLAS OF TEXAS
DALLAS SHEET

GAYLE SCOTT MEMORIAL EDITION

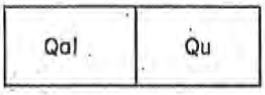
VIRGIL E. BARNES, Project Director

1972
Revised 1988

EXPLANATION

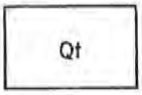
Holocene
Pleistocene
Eocene and Paleocene
Paleocene

QUATERNARY
TERTIARY



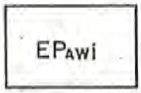
Alluvium and Quaternary deposits undivided

Alluvium, Qal, flood-plain deposits including indistinct low terrace deposits; gravel, sand, silt, silty clay, and organic matter. Quaternary deposits undivided, Qu, mostly colluvium with some alluvium and alluvial fan deposits



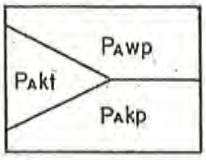
Fluviatile terrace deposits

Gravel, sand, silt, and clay; contiguous terraces of different ages separated by solid line



Wilcox Group undivided

Mostly mudstone with various amounts of sandstone, lignite, ironstone concretions, locally glauconitic in uppermost and lowermost parts. Mudstone, massive to thin bedded, interbedded with laminae of silt and very fine sand, pale brown to yellowish brown in upper part, medium to dark gray in lower part, weathers yellowish brown. Sandstone, medium to fine grained, moderately well sorted, cross-bedded, lenticular in upper part, units a few inches to 30 feet thick in lower part, light gray to pale yellowish brown and yellowish brown to moderate brown. Lignite mostly near middle of formation, seams 1–20 feet thick, brownish black. Abundant plant fossils, a few marine megafossils. Thickness 1,000–1,500 feet



Midway Group

Includes Wills Point Formation, PAwp, *Tehuacana Member of Kincaid Formation,* PAkt, *and Pisgah and Littig Members of Kincaid Formation undivided,* PAkp

Wills Point Formation, PAwp, *clay, silty, sandy, silt and sand more abundant upward, slightly glauconitic near base, 10-inch rosette limestone bed below middle, massive, poorly bedded, grades upward to mudstone and sand of Wilcox Group, light gray to dark gray; weathers medium gray to yellowish gray, topographically featureless; thickness 550± feet*

Tehuacana Member of Kincaid Formation, PAkt, *limestone, silty, slightly glauconitic, hard, white to light gray, interbedded with light gray marl, thickness up to 30 feet, outcrop discontinuous, absent south of Trinity River*

Pisgah and Littig Members of Kincaid Formation undivided, PAkp, *sand and clay. Sand, glauconitic, argillaceous, poorly sorted, medium gray to greenish gray, some hard sandstone beds near top; clay, sandy, silty, phosphatic pebbles and nodules present in lower part, medium gray to dark gray; weathers to yellow and yellowish brown soil. Thickness 150± feet*

Upper Cretaceous

CRETACEOUS

Kkc

Kemp Clay and Corsicana Marl undivided

Mostly clay, calcareous, locally silty, compact, thinly laminated, subconchoidal fracture, medium dark gray; weathers light gray and fissile; some interbeds of fine-grained sandstone near base; marine megafossils; thickness 300–400 feet.

Kns

Nacatoch Sand

Quartz sand, fine grained, poorly sorted, friable, silty, glauconitic, local lenses of silty clay, compact, light gray to greenish gray; thin calcareous sandstone beds in upper and lower parts; marine megafossils; thickness 250± feet.

Knm | Kne / Kmb

Neylandville Formation and Marlbrook Marl

Neylandville Formation and Marlbrook Marl undivided, Knm, *south of Rockwall County; where subdivided includes from top down Neylandville Formation,* Kne, *and Marlbrook Marl,* Kmb

Neylandville Formation, Kne, *clay, calcareous, silty, sandy, sand content increases upward, medium gray; weathers light gray, forms irregular topography; thickness 125± feet.*

Marlbrook Marl ("upper Taylor marl"), Kmb, *clay, calcareous, variable amount of silt and glauconite, silt content increases upward, disseminated pyrite, locally phosphate nodules and phosphatized marine megafossils, blocky, conchoidal fracture, light to dark gray; weathers light gray with poor fissility; marine megafossils; thickness 350± feet.*

Kpg

Pecan Gap Chalk (?)

Marl and clay, very sandy and silty, medium gray; thickness up to 40 feet, feathers out southward northeast of Rockwall.

Kwc

Wolfe City Formation

Marl, sand, sandstone, and mudstone. In Navarro County, marl, sandy and silty, interbedded with thin sandstone beds and massive sandstone; medium gray. Grades northward into an upper fine-grained sand and silt unit, calcareous, medium yellowish gray; and a lower mudstone unit, calcareous, dark gray, weathers medium gray. Marine megafossils. Thickness 75–300 feet, thins northward.

Upper Cretaceous

Lower Cretaceous

CRETACEOUS

Ko

Ozan Formation ("lower Taylor marl")

Clay, calcareous, silt and sand content increases upward, montmorillonitic, blocky, conchoidal fracture, medium gray; some glauconite, phosphate pellets, hematite nodules, and pyrite nodules; some very thin limestone lenses locally in lower part; weathers light brownish gray with poor fissility, grades upward to Wolfe City Formation; marine megafossils; thickness 500± feet

Kau

Austin Chalk

Upper and lower parts, chalk, mostly microgranular calcite, massive, some interbeds and partings of calcareous clay, thin bentonitic beds locally in lower part, lower part forms westward-facing scarp; light gray. Middle part, mostly thin-bedded marl with interbeds of massive chalk, locally burrowed, marcasite-pyrite nodules common, light gray. Weathers white, marine megafossils scarce, thickness 300–500 feet, thins southward

Kef

Eagle Ford Group undivided

North of Hill County, shale, sandstone, and limestone; shale, bituminous, selenitic, with calcareous concretions and large septaria; sandstone and sandy limestone in upper and middle parts, platy, burrowed, medium to dark gray; in lower part bentonitic; hard limestone bed marks base in Ellis and Johnson Counties; locally forms low cuesta; thickness 200–300 feet

Kwb

Woodbine Formation

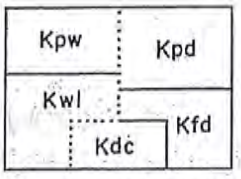
Sandstone, some clay and shale. Upper part, mostly sandstone, fine grained, well sorted, in part tuffaceous, ripple marked, large scale cross-bedding, reddish brown; near top some sandstone with large discoid concretions, medium to coarse grained, friable; some shale, jarositic, gray, fissile; some marine megafossils, oyster reefs locally. Middle part, mostly sandstone, fine grained, cross-bedded; some interbeds of clay, carbonaceous, in part sandy, gray to brown. Lower part, interbedded sandstone and clay; sandstone, fine grained, very thinly bedded to massive, some beds of ironstone and ironstone conglomerate, white, red, brown; clay, sandy, gray to brown; channeled locally. Thickness 175–250 feet, thickens northward

Kgm

Grayson Marl and Main Street Limestone undivided

Mostly Grayson Marl, *mostly calcareous clay and marl, blocky, yellowish gray and medium gray; some 0.25–1.0-foot limestone beds in upper one-third, very fine grained, fossiliferous; weathers yellowish brown, forms gentle slope; thickness 60–100 feet, thins northward*

Main Street Limestone, *medium grained, chalky, some 6–8-foot units of calcareous shale, thin bedded to massive, distinctly bedded to wavy bedded and nodular, yellowish gray; weathers light gray to white; thickness 20–35 feet, thins northward*



Pawpaw Formation, Weno Limestone, Denton Clay, Fort Worth Limestone, and Duck Creek Formation

Pawpaw Formation and upper limestone unit of Weno Limestone undivided, Kpw, *south of Fort Worth area;* Pawpaw Formation, Weno Limestone, and Denton Clay undivided, Kpd, *in Fort Worth area and northward;* middle shale and lower limestone units of Weno Limestone, Denton Clay, Fort Worth Limestone, and Duck Creek Formation undivided, Kwl, *south of Fort Worth area;* Fort Worth Limestone and Duck Creek Formation undivided, Kfd, *in Fort Worth area and northward; and* Duck Creek Formation, Kdc, *mapped separately in Parker County and western Tarrant County*

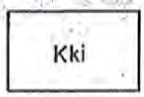
Pawpaw Formation, *claystone, mudstone, and sandstone. Claystone and mudstone, massive, slightly selenitic. Sandstone, fine to very fine grained, platy, ripple cross-laminations, light olive gray to medium gray. Forms grass-covered slopes. Marine megafossils. Thickness 10–25 feet, thins southward*

Weno Limestone, *consists of upper limestone, middle alternating clay and limestone, and lower limestone units. Upper limestone, aphanitic, in part bioclastic, soft and chalky to hard and compact, massive, light gray and yellowish gray; weathers gray and yellowish brown, forms a topographic bench; marine megafossils; thickness 2–20 feet, thins northward. Middle unit:In Tarrant County—mostly calcareous clay, massive, some lenses of sand-size shell debris, olive brown to olive gray; marine megafossils are oysters and molds of small pelecypods. In southwestern Johnson County—alternating limestone and clay; limestone, aphanitic, bioclastic, in part burrowed, some sparry bioclastic limestone, beds pinch and swell, 0.1–1.0 foot thick, medium gray, weathers yellowish brown; clay, calcareous, medium to dark gray, weathers yellowish gray and yellowish brown. fossils include pelecypods, ammonites, echinoids, vertebrate bones, and lignitized wood; thickness 15–45 feet, thins southward. Lower limestone, aphanitic, in part sandy, fossiliferous, burrowed to south, massive, progressively more resistant southward, forming scarp, light gray, medium gray where sandy, weathers yellowish brown, thickness 1–5 feet, thins northward. Thickness from about 60 feet in Tarrant County to about 25 feet in northern Hill County*

Denton Clay, *alternating clay, marl, and limestone, total limestone in unit remains about constant as amount of clay and marl varies. Clay, calcareous, considerable shell debris, locally burrowed, a few irregular calcareous concretions, units 1–3 feet thick, marine megafossils are* Anomia, Gryphaea, *and pelecypod molds. Marl, ranges from calcareous clay to aphanitic argillaceous limestone, soft, yellowish brown, weathers dusky brown. Limestone aphanitic,* Gryphaea*-bearing beds 0.1–0.6 foot thick, locally pinch and swell, dark gray, weathers dusky brown; marine megafossils are* Gryphaea, Pecten, *and* Anomia. *Thickness 0–25 feet, thins southward*

Fort Worth Limestone, *limestone and clay. Limestone, aphanitic to biosparite, burrowed, beds 0.2–2 feet becoming thicker and more massive southward, light to medium gray; weathers yellowish brown; marine megafossils are* Pecten, *oysters, echinoids, and ammonites. Clay, calcareous, in units 0.1–5 feet thick, medium gray to yellowish brown; weathers yellowish brown, forms low rolling hills. Thickness 25–35 feet*

Duck Creek Formation, Kdc, *limestone, aphanitic, in part bioclastic, locally burrowed, pyrite nodules up to 0.2 foot, beds 0.2–2 feet thick, pinch and swell, medium gray to yellowish gray; weathers dark gray with yellowish-brown patches, locally forms topographic benches; marine megafossils are* Gryphaea *and ammonites; thickness 30–100 feet, thins southward*

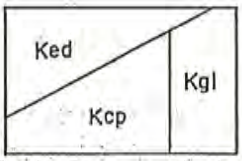


Kiamichi Formation

Clay and limestone in alternating units 0.1–5 feet thick; some sandstone. Clay, calcareous, olive brown, weathers yellowish brown, constitutes about two-thirds of formation. Limestone mostly aphanitic and bioclastic, locally burrowed, medium gray to yellowish gray; weathers yellowish brown. Sandstone, fine grained, moderately well sorted, calcareous, burrowed, beds 0.1–0.2 foot thick, medium gray; weathers yellowish brown. Marine megafossils are Gryphaea; *some* Pecten *in sandstone. Thickness 20–50 feet, thins southward*

Lower Cretaceous

CRETACEOUS

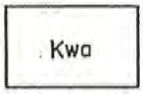


Edwards Limestone, Comanche Peak Limestone, and Goodland Limestone

Edwards Limestone, Ked, *in thicker sections consists of an upper scarp-forming rudistid facies, a middle aphanitic to biosparite fossiliferous limestone, and a lower bioclast-packed aphanitic to sparry limestone with individual corals, light gray to yellowish gray; weathers various shades of gray with moderate brown patches; thickness up to 40 feet, gradually merges with Comanche Peak Limestone or Goodland Limestone in the vicinity of the northern Hood County line*

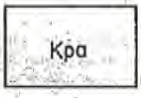
Comanche Peak Limestone, Kcp, *limestone and some clay. Limestone mostly aphanitic, bioclastic to fossiliferous, soft, a few harder* Gryphaea-*bearing beds about 25 feet above base form benches, light to medium gray; weathers various shades of gray, locally mottled yellowish brown; marine megafossils are gastropods, ammonites, echinoids,* Pecten, Lima, Gryphaea, *and* Exogyra texana. *Clay, calcareous, intergradational with nodular limestone, beds 1–5 feet thick, medium to dark gray, weathers yellowish brown, fossiliferous. Thickness 90± feet*

Goodland Limestone, Kgl, *intergradational laterally with Comanche Peak Limestone and differs from it chiefly in that the Goodland is more coarsely nodular, contains fewer and thinner clay beds, and massive resistant limestone beds are more numerous; upper 5 feet, massive, bioclast-packed aphanitic limestone and limestone composed of oolites in sparry calcite; thickness 90± feet*



Walnut Clay

Clay and limestone about equally abundant. Limestone, aphanitic; in part bioclastic, Gryphaea*-bearing, beds 0.1–1 foot thick; in part nodular, grades laterally into either resistant, bench-forming,* Gryphaea*-bearing limestone or calcareous clay; medium to dark gray, weathers yellowish brown. Clay, fossiliferous, calcareous, olive brown, weathers yellowish brown. Thickness 30± feet*



Paluxy Formation

Sandstone, mudstone, and limestone. Sandstone, fine to very fine grained, friable to calcite cemented, cross-beds common, in part massive, locally burrowed, light gray to greenish gray; weathers yellowish brown to dusky brown. Mudstone, sandy, massive, locally burrowed, greenish gray, olive green, and medium gray; weathers yellowish brown and red brown. Limestone locally in upper 40–50 feet, sandy, fossiliferous, beds 0.5–2 feet thick, yellowish gray; weathers mottled dark gray and yellowish brown. Thickness 95–105 feet

Glen Rose Formation

Limestone, alternating with units composed of variable amounts of clay, marl, and sand. Limestone, distinctly bedded, in part with variable amounts of clay, silt, and sand, soft to hard, various shades of brownish yellow and gray. Gradational to Paluxy Formation above and Twin Mountains Formation below, bench-forming beds included in the Glen Rose Formation. Thickness 40–200 feet, thins northward

Lower Cretaceous

Missouri Series

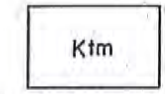
Des Moines Series

?

Strawn Group

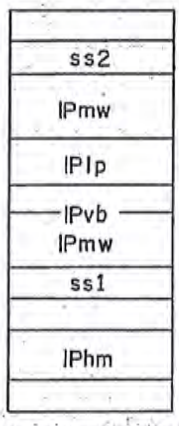
CRETACEOUS

PENNSYLVANIAN



Twin Mountains Formation

Upper part claystone, middle part sandstone above claystone, lower part mostly sandstone, some claystone and conglomerate. Sandstone, fine to medium grained in middle part, medium to coarse grained in lower part, sorting best in middle part, friable, locally large scale cross-bedding, mostly light gray, some light brown near middle. Claystone, silty, mostly gray, locally in upper part green, yellow, red. Conglomerate, pebbles of chert and quartz, argillaceous, sandy, gray, brown. Thickness about 150 feet



Mineral Wells Formation

Mineral Wells Formation, IPmw, *shale, sandstone, conglomerate, and limestone;* sandstone, ss2, Lake Pinto Sandstone, IPlp, Village Bend Limestone, IPvb, sandstone, ss1, and Hog Mountain Sandstone, IPhm, *mapped separately. Shale, calcareous, locally contains sandstone and a few thin limestone beds, gray to black, a few plant fossils*

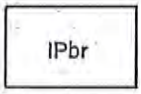
Sandstone, ss2, *fine to coarse grained, thin bedded to massive, brown, thickness 10 feet, feathers out southwestward on Abilene Sheet*

Lake Pinto Sandstone, IPlp, *medium to fine grained, locally conglomeratic, thick bedded, brown, thickness 20–40 feet*

Village Bend Limestone, IPvb, *fine grained, locally sandy, thick bedded, yellow gray, weathers to small blocks, marine megafossils, forms laterally discontinuous lentils, thickness up to 3 feet*

Sandstone, ss1, *locally conglomeratic, thickness about 30–40 feet, feathers out southwestward near Mineral Wells on Abilene Sheet*

Hog Mountain Sandstone, IPhm, *fine to medium grained, thick bedded to flaggy, brown, thickness about 25 feet. Thickness of exposed part of Mineral Wells Formation 400–500 feet, overlapping Cretaceous rocks cover upper third and other portions of formation including Turkey Creek Sandstone and Dog Bend Limestone, which are exposed on the Abilene Sheet immediately to the west*



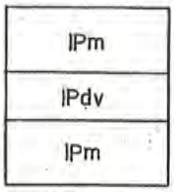
Brazos River Formation

Sandstone, conglomerate, and mudstone; sandstone, coarse grained, ferruginous, cross-bedded, thick bedded to massive, reddish brown; mudstone, silty, gray, local lenses; conglomerate, angular pebbles of chert up to 1.5 inches in size, some clay ironstone, variegated, ferruginous cement common; thickness 100 feet

Des Moines Series

Strawn Group

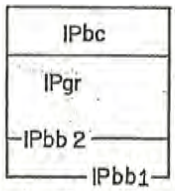
PENNSYLVANIAN



Mingus Formation

Mingus Formation, IPm, *shale and sandstone;* Dobbs Valley Sandstone, IPdv, *mapped separately. Shale, sandy, poorly bedded, gray to buff*

Dobbs Valley Sandstone, IPdv, *medium grained, locally calcareous, commonly massive, reddish brown, some interbedded sandy shale, thickness about 45 feet. Thickness of exposed part of* Mingus Formation *about 200 feet; overlapping Cretaceous rocks cover lower part of formation including Santo Limestone; the Goen Limestone feathers out above the Dobbs Valley Sandstone a few miles to the west before reaching the Dallas Sheet*

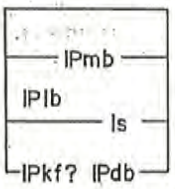


Grindstone Creek Formation

Grindstone Creek Formation, IPgr, *shale, sandstone, and limestone;* Buck Creek Sandstone, IPbc, *and* Brannon Bridge Limestones, IPbb2 *and* IPbb1, *mapped separately. Shale, in part sandy, locally contains thin coal beds and sandstone lentils, gray*

Buck Creek Sandstone, IPbc, *coarse grained, massive, reddish brown, forms prominent scarp. Thickness about 30 feet*

Brannon Bridge Limestones, IPbb2 *and* IPbb1, *fine grained, some interbedded shale, dark chert lenses in* IPbb2, *bedding uneven, indistinct to medium, gray, units up to about 15 feet thick, form distinct scarps and broad dip slopes; about 10 feet of shale separates the two limestone units. Thickness of exposed part of* Grindstone Creek Formation *about 225 feet; overlapping Cretaceous rocks cover upper part of formation; a third and higher Brannon Bridge Limestone feathers out a few miles to the west within the Abilene Sheet*



Lazy Bend Formation

Lazy Bend Formation, IPlb, *shale, sandstone, and limestone;* Meek Bend Limestone, IPmb, unnamed limestone, ls, Dennis Bridge Limestone, IPdbr, *and* Kickapoo Falls Limestone, IPkf, *mapped separately. Shale, in part sandy, in part silty, local coal beds, and unmapped limestone lentils*

Meek Bend Limestone, IPmb, *fine grained, bedding thin flaggy to massive, gray, marine megafossils; thickness about 12 feet, exposed only in small creek west of Brazos River, well exposed on Abilene Sheet to the west*

Limestone, ls, *fine grained, locally grades into sandstone, medium to thin bedded, gray to brown, marine megafossils; thickness up to 6 feet, outcrop discontinuous and poorly exposed*

Dennis Bridge Limestone, IPdb, *fine grained, massive at base to thin bedded at top, gray to light brown, marine megafossils; thickness 10 feet, exposed at south end of Dennis Bridge over Brazos River and vicinity, approximately equivalent to Kickapoo Falls Limestone*

Kickapoo Falls Limestone, IPkf, *fine grained, thick to medium bedded, upper part nodular, light gray, mottled dark gray, marine megafossils and algae; thickness up to 12 feet, approximately equivalent to Dennis Bridge Limestone, outcrop confined to Kickapoo Creek inlier. Thickness of* Lazy Bend Formation *275 feet*

Des Moines Series

Strawn Group

PENNSYLVANIAN

IPu

Unnamed Pennsylvanian rocks

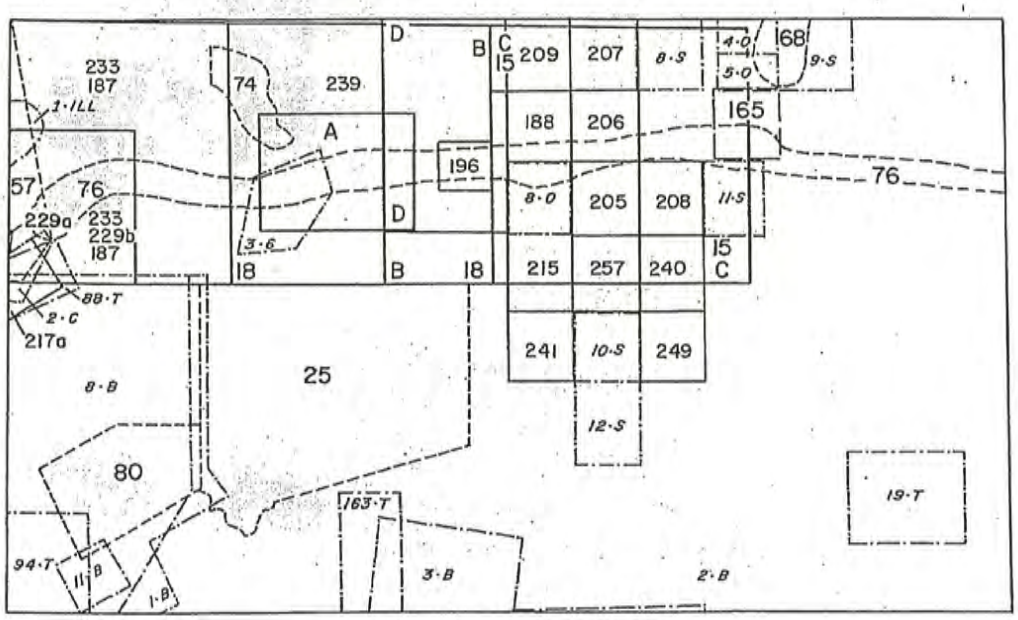
Shale, limestone, and sandstone. Shale, locally sandy and silty, some thin sandstone beds and impure limestone lentils, gray to deep dull red; thickness exposed beneath Cretaceous overlap about 75 feet, comprises rocks cropping out beneath Dennis Bridge and Kickapoo Falls Limestones, best exposed along Kickapoo Creek, downstream from Kickapoo Falls crossing

Geologic mapping by Shell Oil Company, Humble Oil and Refining Company, Dallas Geological Society, Fort Worth Geological Society, Shell Development Company, J. H. McGowen, C. V. Proctor, Jr., W. T. Haenggi, D. F. Reaser, and sources shown on the Index of Geologic Mapping. Paleozoic mapping by L. F. Brown, Jr., and J. L. Goodson. J. H. McGowen, C. V. Proctor, Jr., W. T. Haenggi, and D. F. Reaser compiled the geologic mapping on high altitude aerial photographs, compiled unmapped areas photogeologically, and field checked all mapping. V. E. Barnes remapped, but did not field check, Quaternary deposits of Dallas and Tarrant Counties using U.S. Geological Survey 7.5-minute topographic quadrangles. Geologic mapping reviewed by Geologic Atlas Project Committees of the Dallas Geological Society, R. J. Cordell (Sun Oil Company), Chairman, E. G. Wermund (Mobil Research and Development Corporation), and R. L. Laury (Southern Methodist University); and the Fort Worth Geological Society, W. J. Nolte (Independent Geologist), Chairman, Leo Hendricks (Texas Christian University), and Edward Heuer. Geology scribed by J. W. Macon and Barbara Hartmann.

Extensive revision in the southeastern part of the Dallas Sheet relied on mapping furnished by Humble Oil and Refining Company. Where needed, V. E. Barnes remapped the Quaternary deposits of the sheet using U.S. Geological Survey 7.5-minute topographic quadrangles. The revision of the Dallas Sheet was scribed by John T. Ames.

INDEX OF GEOLOGIC MAPPING

Numbers in outlined areas refer to items in bibliography in "Index to Areal Geologic Maps in Texas, 1891–1961," by T. E. Brown (1963), Bureau of Economic Geology, University of Texas, Austin. For area A, see O. D. Weaver, J. A. Rogers, W. F. Buckthal, A. E. Kurie, E. R. Leggat, Dan McGill, and Ray Rall, Geologic map of central Tarrant County, Fort Worth Geological Society; for area B, see C. F. Dodge, Geologic map of the eastern half of Tarrant County, Texas (manuscript map, 1966); for area C, see G. H. Norton (1965), Geologic map of Dallas County, Dallas Geological Society; for area D, see Leo Hendricks (1976), Geology of Midcities area, Tarrant, Dallas, and Denton Counties, Texas: The University of Texas at Austin, Bureau of Economic Geology Geologic Quadrangle Map 42; for area E, see P. N. Wiggins, III (1954), Geology of Ham Gossett Oil Field, Kaufman County, Texas: American Association of Petroleum Geologists Bulletin, v. 38, p. 306–318.



Reference 36

TEXAS DEPARTMENT OF WATER RESOURCES

REPORT 269

OCCURRENCE, AVAILABILITY, AND CHEMICAL QUALITY OF GROUND WATER IN THE CRETACEOUS AQUIFERS OF NORTH-CENTRAL TEXAS

VOLUME 1

By

Phillip L. Nordstrom, Geologist

April 1982

36 001

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TABLE OF CONTENTS

	Page
SUMMARY AND CONCLUSIONS	1
INTRODUCTION	3
Purpose and Scope	3
Location and Extent	3
Physiography	3
Climate	4
Population	4
Economy	4
Previous Investigations	4
Acknowledgements	7
Method of Investigation	7
Well-Numbering System	7
Metric Conversion	8
GEOLOGY AS RELATED TO THE OCCURRENCE OF GROUND WATER	9
Geologic History	9
Paleozoic	9
Cretaceous	9
Tertiary and Quaternary	9
General Stratigraphy	9
Structure	10
STRATIGRAPHY OF THE WATER-BEARING FORMATIONS	12
Paleozoic Rocks	12
Antlers	13

TABLE OF CONTENTS – Continued

Page

Twin Mountain Formation 13

Paluxy Formation 14

Woodbine Group 14

Blossom Sand 15

Nacatoch Sand 15

CHEMICAL QUALITY OF GROUND WATER AS RELATED TO USE 15

General Chemical Quality of Ground Water 15

Quality Criteria or Standards 16

Municipal 16

Primary Standards 20

Secondary Standards 21

Domestic and Livestock 21

Industrial 22

Irrigation 22

OCCURRENCE AND DEVELOPMENT OF GROUND WATER 25

Antlers Formation 25

Twin Mountains Formation 36

Paluxy Formation 39

Woodbine Group 46

Blossom Sand 52

Nacatoch Sand 54

AVAILABILITY OF GROUND WATER 54

Methods Used to Determine Availability 54

Steady-State Flow Methods 54

Rate of Depletion of Ground-Water That is Recoverable

From Storage 55

TABLE OF CONTENTS-Continued **Page**

Circumstances Requiring Geohydrological Judgments
Or Assumptions 55
Trinity Group 55
Woodbine Group 56
Nacatoch and Blossom Sands 56
WELL CONSTRUCTION 56
SELECTED REFERENCES 59

TABLES

1. Stratigraphic Units and their Water-Bearing Properties 11
2. Source, Significance, and Range in Concentration of Dissolved Mineral Constituents and Properties of Water 17
3. Water–Quality Tolerances for Industrial Applications 23
4. Results of Pumping Tests 26
5. Estimated Use of Ground Water for Irrigation, 1970-77 32
6. Estimated Use of Ground Water for Public Supply and Industrial Purposes from the Antlers Formation, 1955-76 33
7. Power-Yield Tests From Selected Irrigation Wells 34
8. Range of Constituents in Ground Water From Selected Wells in the Antlers Formation 35
9. Estimated Use of Ground Water for Public Supply and Industrial Purposes From the Twin Mountains Formation , 1955-75 38
10. Range of Constituents in Ground Water From Selected Wells in the Twin Mountain Formations 40
11. Estimated Use of Ground Water for Public Supply and Industrial Purposes From the Paluxy Formations, 1955-76 44
12. Range of Constituents of Ground Water From Selected Wells in the Paluxy Formation 45
13. Estimated Use of Ground Water for Public Supply and Industrial Purposes From the Woodbine Group, 1955-76 51
14. Range of Constituents in Ground Water From Selected Wells in the Woodbine Group 53

36 005

TABLE OF CONTENTS-Continued

Page

FIGURES

1. Map Showing Location of Study 3
2. Average Annual Precipitation, 1900-76, and Average Monthly Precipitation for Period of Record at Selected Stations 5
3. Well-Numbering System 8
4. Map Showing Major Structural Features From the Llano Uplift to the Red River 12
5. Diagrams of chemical Analyses of Ground Water and a Typical Oil-field Brine 19
6. Diagram for the Classification of Irrigation Waters 24
7. Hydrographs of Water Levels Under Water-Table Conditions 30
8. Hydrographs of Water Levels in Wells Completed in the Antlers and Twin Mountains Formations Under Artesian Conditions 31
9. Hydrographs of Water Levels in Wells Completed in the Paluxy Formation Under Artesian Conditions . . . 43
10. Hydrographs of Water Levels in Wells Completed in the Woodbine Group Under Artesian Conditions 48
11. Graph Showing Public Supply Ground-Water Pumpage From the Woodbine and Trinity Group Aquifers, 1955-76 50
12. Graph Showing Industrial Ground-Water Pumpage From the Woodbine and Trinity Group Aquifers, 1955-76 50
13. Diagram for the Classification of Irrigation Waters Showing Quality of Water From Wells Completed in the Outcrop of the Woodbine Group 52
14. Diagrammatic Cross Section Through a Confined Aquifer Showing Depletable Artesian Ground-Water Storage 55
15. Diagrams of Well Construction 57
16. Geologic Outcrop Map 63
17. Map Showing Approximate Altitude of the Bas of Cretaceous Rocks 65
18. Map Showing Approximate Altitude of the Top of the Paluxy and Antlers Formations 67
19. Map Showing Approximate Altitude of the Top of the Twin Mountains Formation 69

36 006

TABLE OF CONTENTS- Continued

Page

20. Map showing Approximate Net Thickness of Sand Containing Fresh to Slightly Saline Water in the Paluxy Aquifer 71

21. Map Showing Approximate Altitude of the Top of the Woodbine Group 73

22. Map Showing Approximate Net Thick ness of Sand Containing Fresh to Slightly Saline Water in the Woodbine Aquifer 75

23. Map Showing Sulfate, chloride, and Dissolved-Solids Content in Water From Selected Wells 77

24. Map Showing Approximate Altitude of Water Levels in the Antlers and Twin Mountains Aquifers, About 1955 79

25. Map Showing Approximate Altitude of Water Levels in the Antlers and Twin Mountains Aquifers, About 1976 81

26. Map Showing Location of Aquifer Tests and Approximate Coefficients Of Transmissibility and Permeability 83

27. Map showing Approximate Net Thickness and Sand Containing Fresh to Slightly Saline Water in the Antlers Aquifer 85

28. Map Showing Approximate Change in Water Levels in the Antlers and Twin Mountains Aquifers, About 1955-76 87

29. Map Showing Approximate Net Thickness of Sand Containing Fresh to Slightly Saline Water in the Twin Mountains Aquifer 89

30. Map Showing Approximate Altitude of Water Levels in the Paluxy Aquifer, About 1955 91

31. Map Showing Approximate Altitude of Water Levels in the Paluxy Aquifer, About 1976 93

32. Map Showing Approximate Water-Level Decline in the Area of Heavy Municipal Pumpage in the Paluxy Aquifer, About 1955-76 95

33. Map Showing Approximate altitude of Water Levels in the Woodbine Aquifer, About 1976 97

34. Map Showing Approximate Altitude of Water Levels in the Woodbine Aquifer, About 1955 99

35. Geologic Section A-A' 101

36. Geologic Section B-B' 103

37. Geologic Section C-C' 105

38. Geologic Section D-D' 107

39. Geologic Section E-E' 109

36 007

OCCURRENCE, AVAILABILITY, AND CHEMICAL QUALITY OF GROUND WATER IN THE CRETACEOUS AQUIFERS OF NORTH-CENTRAL TEXAS

SUMMARY AND CONCLUSIONS

The study area consists of approximately 15,500 square miles (40,145 km^2) and lies within the Red, Sulphur, Sabine, Trinity, and Brazos River basins. The region includes all or parts of Collin, Cooke, Dallas, Delta, Denton, Ellis, Fannin, Grayson, Hood, Hunt, Johnson, Kaufman, Lamar, Montague, Navarro, Parker, Red River, Rockwall, Tarrant and Wise Counties.

The Trinity Group of Cretaceous age is the largest and most prolific aquifer in the study area. The aquifer consists of the Antlers, Paluxy, and Twin Mountains Formations. The Antlers is a coalescence of the Paluxy and Twin Mountains in the northern part of the study area where the Glen Rose Limestone is absent. The Trinity Group aquifer ranges in thickness from about 100 feet (30 m) in the outcrop area to about 1,200 feet (366 m) near the downdip limit of fresh to slightly saline water. The transmissibility is highly variable with average values ranging from 3,700 (gal/d)/ft or 45,900 (l/d)/m in the Paluxy and in the Antlers near Sherman to over 10,000 (gal/d)/ft or 124,000 (l/d)/m in most downdip areas of the Twin Mountains and in the Antlers near Gainesville. A wide range in permeabilities is also encountered, but an overall value of 50 $(gal/d)ft^2$ or 2,040 $(l/d)/m^2$ is average. Artesian storage coefficients range from 0.0001 to 0.00025 and specific yields range from 15 to 25 percent in the outcrop.

Chemical quality in the Trinity Group aquifer updip from the fresh to slightly saline water limit is suitable for most public supply and industrial uses. Irrigation is usually limited to the outcrop area and quality is fair for most crops. Generally, water from wells on or near the outcrop is harder than ground water downdip and it also contains high iron concentrations in some areas. The Twin Mountains Formation contains high dissolved solids in an area centered in southeastern Wise County and is generally of poor quality along the Parker and Tarrant Counties boundary line.

Yields of wells completed in the Trinity Group aquifer increase in a downdip direction with wells producing up to 1,900 gal/min (120 l/s). Yields of wells completed on or near the outcrop are low, with maximum yields of 50 gal/min (3.2 l/s) not uncommon. Wells in the Antlers and Twin Mountains Formations have much higher yield averages than wells producing from the Paluxy Formation. However, the areal extent of groundwater production is larger in the Paluxy than in the Antlers and Twin Mountains. Paluxy wells have been developed in 16 of the 20 counties as compared to only 14 counties for the Antlers and Twin Mountains.

Water-level declines have been recorded in the Trinity Group since water-level records began in the first part of the 20th century. Significant cones of depression have formed in the Antlers around Gainesville and Sherman. The large cone of depression in the Dallas-Fort Worth metroplex involves both the Paluxy and Twin Mountains. Static water levels in this area have reached the top of the Paluxy and dewatering of the aquifer has begun, while static water levels in the Twin Mountains have reached 1,000 feet (305 m) below the land surface. Declines of over 20 feet (6 m) per year is not uncommon in the area along the Dallas and Tarrant counties boundary line. The abandonment of many Trinity wells in this area has alleviated the problem somewhat, but the large quantity of ground water pumped from surrounding areas will cause a continuation of the trend in water-level declines. Diminishing yields, lowering of pumps, and high lifting costs will continue to plague ground-water users. Water levels outside the influence of heavily pumped areas are also experiencing declines, but at a slower rate.

Total pumpage for public supply, industrial, and irrigation purposes from the Antlers, Twin Mountains, and Paluxy Formations in 1976 was, respectively 8,870 acre-feet (10.9 hm^3), 38,600 acre-feet (47.5 hm^3), and 10,000 acre-feet (12.3 hm^3). With the additional pumpage of ground water for domestic and livestock

purposes, the Trinity Group aquifer yielded over 66,000 acre-feet (81.4 hm^3) of water to wells in the study area. The total average annual ground-water availability for the Trinity Group in the study area to the year 2030 is 63,000 acre-feet (77.7 hm^3) which includes an annual effective recharge of 51,000 acre-feet (62.9 hm^3). The large discrepancy in pumpage and effective recharge emphasizes the fact that the Trinity Group aquifer is overdeveloped. Further development of ground water at present pumpage rates will continue to lower the piezometric surface and deplete storage that cannot be replenished.

The Woodbine Group provides water for all purposes to approximately half of the counties covered in this study. The group is divided into three water-bearing parts-upper, middle, and lower-which vary considerably in productivity and quality. The upper Woodbine contains water of extremely poor quality in downdip locales and contains excessive iron concentrations along the outcrop. In general, water from this part is sealed off in all wells except those used for irrigation, where iron content is not important. The middle Woodbine generally contains water of good quality; however, high iron concentrations occur in some areas. Yields are moderate and water from this part is utilized in most wells. The lower Woodbine is the most productive and contains good quality water. High yields are characteristic in this part from the outcrop downdip to the slightly saline limit which is approximately 2,000 feet (610 m) below land surface.

Total thickness of the Woodbine ranges from 230 feet (70 m) near the outcrop to 700 feet (21 3 m) near the downdip limit of fresh to slightly saline water. The net sand thickness is less than 350 feet (10 7 m) with most of this occurring in the lower Woodbine. The average artesian coefficient of storage is 0.00015 where the Woodbine is under artesian conditions, and the specific yield is about 15 percent. Transmissibility values in downdip areas average 4,700 (gal/d)/ft or 58,400 (l/d)/m and permeability values average 44 (gal/d)/ft^2 or 1,790 (l/d)/m^2.

Chemical quality deteriorates rapidly in well depths below 1,500 feet (457 m). In areas between the outcrop and this depth, quality is considered very good overall as long as ground water from the upper Woodbine is sealed off. Water is classified as soft with most chemical analyses showing total hardness as calcium carbonate below 60 mg/l.

Yields of wells completed in the Woodbine averaged 160 gal/min (10 l/s) with measured quantities of as much as 1,170 gal/min (74 l/s). The average specific capacity calculated from production tests was 2.9 (gal/min)/ft or 0.60 (l/s)/m. Wells operating under artesian conditions are experiencing declines in water levels. Declines of a few feet (less than a meter) per year to over 10 feet (3 m) per year have been recorded. Declines in the Sherman area (Grayson County) are steepest and are depicted as a cone of depression on water-level maps. The steady decline is a result of low permeabilities in water-bearing sands and large withdrawals by ground-water users.

Approximately 16,000 acre-feet (19.1 hm^3) of ground water was pumped from the Woodbine in 1976 from wells in the study region. Public supply pumpage accounted for 8,560 acre-feet (10.6 hm^3) in 1976, while industrial and irrigation users added over 2,500 acre-feet (3.08 hm^3) each to this quantity. The average annual ground-water availability as effective recharge is 24,500 acre-feet (30.2 hm^3) over the entire aquifer. This maximum quantity is based on uniform use along the entire aquifer after water levels have been lowered to a maximum of 400 feet (122 m) below the land surface. Water levels will continue to decline in heavily pumped areas. However, at the present withdrawal rate, when considered collectively, the aquifer is in no immediate danger of overdevelopment.

Information was collected on several minor water-bearing formations within the study region and all pertinent data have been included in this report. The minor aquifers included in the study are the Paleozoic rocks undifferentiated, Blossom Sand, Nacatoch Sand, and alluvium. The primary use of these aquifers is for domestic and livestock purposes although several municipalities pump from them. The Paleozoic rocks provide water mainly in Montague County with smaller usage in Wise, Parker, and Hood Counties. The Blossom and Nacatoch Sands of Cretaceous age provide ground water to wells along the eastern portion of the study area. Minor amounts of water are pumped from the alluvium along the Red River for irrigation and livestock needs.

Wells completed in the Nacatoch and Blossom Sands produce up to 500 gal/min (32 l/s) for public supply use in local areas. In regions of heavy pumpage such as around Clarksville in Red River County and Commerce in Hunt County, water levels are declining steadily. A total of 2,700 acre-feet (3.33 hm^3) of water was pumped from these aquifers in 1976 for public supply and industrial purposes. Domestic and livestock usage probably exceeds this amount. The estimated average annual amount of ground water available as effective recharge from both aquifers is about 1,620 acre-feet (2 hm^3). Annual water-level declines are a direct result of the deficit between pumpage and effective recharge.

INTRODUCTION

Purpose and Scope

The general purpose of this study was to determine the ground-water resources of the Cretaceous aquifers in north-central Texas, with emphasis on the Woodbine and Trinity Groups. Field investigations were conducted during the period from January 1975 to August 1978. Aquifers comprising the Trinity Group consist of the Antlers, Paluxy, and Twin Mountains Formations which are the most important water-bearing units in the study region. The study area is shown on Figure 1.

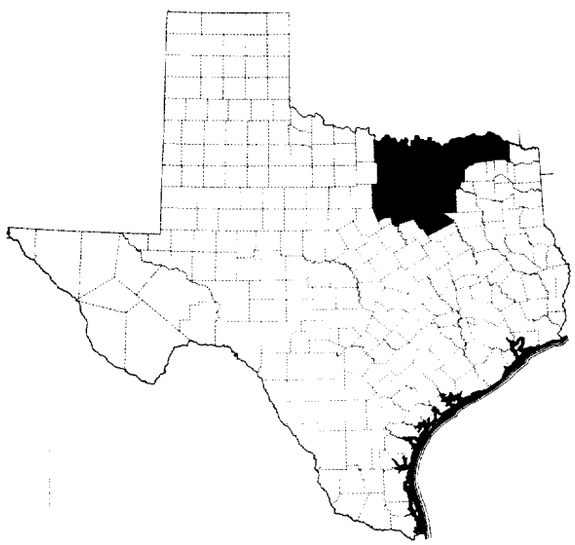


Figure 1.—Location of Study Area

The primary purpose of this study was to determine the occurrence, availability, quality, and quantity of ground water used for municipal, industrial, and irrigation purposes from the Woodbine and Trinity Groups of Cretaceous age. The secondary purpose was to include data on minor aquifers being utilized within the study region such as the Paleozoic rocks undifferentiated, Blossom Sand, Nacatoch Sand, and alluvium.

The general scope of this investigation included the collection, compilation, and analysis of data relating to ground water from the Cretaceous aquifers in north-central Texas, and the presentation of these data, results of analyses, and conclusions in a published report. The report consists of two volumes. Volume 1 contains interpretive information presented as text and related figures and tables. Volume 2 contains supporting basic data including well location maps, records of wells, water-level measurements, and chemical analyses of water.

The scope, although directed toward the quantitative aspects of water availability, also included collection and use of chemical-quality data, surface and subsurface geological data, study of ground-water contamination by oil and gas field operations in the west and northwest part of the study area, and review of previous work by federal and state agencies.

Location and Extent

The study region has an areal extent of 15,500 square miles (40,145 km^2) and represents 5.8 percent of the State's total area. It is bounded on the north by the Red River, on the west by the physical limit of the Cretaceous rocks, and on the east by the downdip limit of fresh to slightly saline water. For the purpose of this report, usable ground water is considered to be water that contains less than 3,000 milligrams per liter (mg/l) dissolved solids. The region includes all or parts of Collin, Cooke, Dallas, Delta, Denton, Ellis, Fannin, Grayson, Hood, Hunt, Johnson, Kaufman, Lamar, Montague, Navarro, Parker, Red River, Rockwall, Tarrant, and Wise Counties and lies within the Red, Sulphur, Sabine, Trinity, and Brazos River basins.

Physiography

The portion of Texas defined by the boundaries of the study area has been divided into a number of distinct physiographic subdivisions, which are also coincidental with the geologic units. The topography of a dissected region is determined chiefly by the nature of the underlying parent rock. According to Fenneman (1938) and Fenneman and Johnson (1946), the study area can be divided into six north-south trending belts which are clearly marked by distinctive soil, plant, and topographic characteristics. These belts, from west to east, are: the Osage Plains, the Western Cross Timbers, the Grand Prairie, the Eastern Cross Timbers, the Black Prairie, and the East Texas Timber Belt.

The Osage Plains is underlain by rocks of Paleozoic age and forms the western boundary of the study region. Its contact with the Western Cross Timbers coincides with the outcrop of Cretaceous rocks.

The Western Cross Timbers is underlain by the Trinity Group and also, in the south western part of the study area, by the Walnut Formation. This belt is characterized by a rolling to hilly topography that is

36 010

dissected into steep hills and deep ravines. The very sandy soil supports a heavy growth of post oak and blackjack oak.

The Grand Prairie is underlain by alternating limestones and marls of the Washita and Fredericksburg Groups. The intervening marls form low escarpments that connect successive uplands and produce a "cuesta" topography. The surfaces of the terraces slope gently eastward, broken only by the westward-facing escarpments. The thin mantle of light brown to black loamy soil is well drained and its characteristics differ depending on the nature of the underlying material. The broad, gently rolling, grass-covered plain is usually treeless except for isolated clumps of upland timber.

The Eastern Cross Timbers coincides with the narrow belt of the Woodbine Group outcrop and is characterized by low, rounded, wooded hills along the western margin and gentle slopes along the eastern margin. It is well d ssected by streams leaving some areas quite rugged in appearance. The soil is reddish sand with iron concretions and some clay. The surface supports a dense growth of timber, consisting chiefly of post oak and blackjack oak.

The remaining Cretaceous formations and the Midway Group form the base of the Black Prairie. It is characterized by a relatively flat to gently undulating surface that slopes gently to the east. The Black Prairie is poorly drained constituting the famous blackland soil and relatively treeless.

A small part of the study region falls within the East Texas Timber Belt which is underlain by the Wilcox and has a sandy, slightly hummocky surface.

Land-surface elevations range from 1,450 feet (442 m) in the west to 250 feet (76 m) above mean sea level in the northeast. The 20-county area lies within the Red, Sulphur, Sabine, Trinity, and Brazos River basins. Drainage is to the southeast.

Climate

The climate of the region covered by this report is characterized by long, hot summers and short, mild winters. The average minimum temperature for January, the coldest month, ranges from 32°F (0°C) in the northwest to 36°F (2°C) in the southeast. The average maximum temperature for July, the hottest month, is 96°F (36°C) throughout most of the study area. The annual mean free air temperature for the period 1931-70 averaged 65" F (18°C).

The average annual precipitation ranges from 30 inches (76 cm) in the northwest to 45 inches (114 cm) in the northeast. These figures are based on National Weather Service records for the 77-year period 1900-76, and are illustrated on Figure 2 along with average monthly precipitation for periods of record at selected stations.

The average annual gross lake surface evaporation for the period 1940-70 ranges from 78 inches (198 cm) in the north-central area to 61 inches (155 cm) in the southeast.

Population

According to the 1978-79 Texas Almanac, the estimated 1975 populatior for the study region is over 2.75 million people, which is an average of 180 people per square mile (69.5 per km^2). This represented about 25 percent of the State's population. More than 85 percent of the people in this region lived in urban areas having 2,500 or more inhabitants. Some of the urban areas are Bonham, Clarksville, Cleburne, the Dallas-Fort Worth metroplex, Decatur, Denton, Gainesville, Granbury, Greenville, Lewisville, McKinney, Paris, Plano, Sherman, Waxahachie, and Weatherford. The remaining inhabitants lived in rural areas or smaller communities.

Economy

The general economy is varied. Principal manufacturing plants are in or near large cities; however, some plants in smaller cities process local products. Manufacturing, transportation, business, and insurance are of primary importance in the Dallas-Fort Worth area. About one-third of the counties in the study region produce petroleum products. Cooke and Montague Counties have produced about 475 million barrels of oil since the mid-1920's. Agricultural economy, which averages about 230 million dollars per year, consists of cattle and poultry raising and dairy products with grain, grain sorghums, peanuts, cotton, and soybeans the principal crops. Industrial activities include the operation of sand and gravel pits, the production of clay and manufacture of brick and tile products, the production of cement materials, and the manufacture of cement.

Previous Investigations

Portions of the study region have been previously discussed in numerous publications related to geology

and ground-water resources, and these are listed in the selected references. Some of the investigations leading to these publications were conducted by the U.S. Geological Survey, Texas Department of Water Resources, Bureau of Economic Geology of the University of Texas, private concerns, and educational institutes.

Reports have been published on the geology of Cooke, Denton, Grayson, Johnson, and Parker Counties and on the ground-water resources of Dallas, Ellis, Grayson, Johnson, Montague, Navarro, Parker, and Tarrant Counties. Most of these publications were published prior to 1960.

Acknowledgements

Recognition is extended to the property owners within the study region for supplying information concerning their water wells and permitting access to their properties; and to all water well drillers, city officials, water superintendents, and officials of independent water companies for information, assista-ce, and cooperation rendered throughout the investigation. Cooperation of federal and other state agencies is also gratefully acknowledged. Special thanks are extended to J. L. Myers Co., Layne Texas Co., and Henry Millican for the extensive use of their water-well records and electric logs.

The author also thanks Dan Muller and Bob Price of the Texas Department of Water Resources who made many useful suggestions concerning the ground-water availability estimates and to Loyd Walker for his review and editing of the manuscript. General supervision in the preparation of this report was furnished by C. R. Baskin, Director, Data and Engineering Services Division, and Tommy R. Knowles, Chief of the Data Collection and Evalution Section.

Method of Investigation

The fieldwork for this investigation began in January 1975 and ended in April 1978. Office work, which consisted mainly of assembling data and writing the report, started concurrently with the fieldwork and was completed in August 1978.

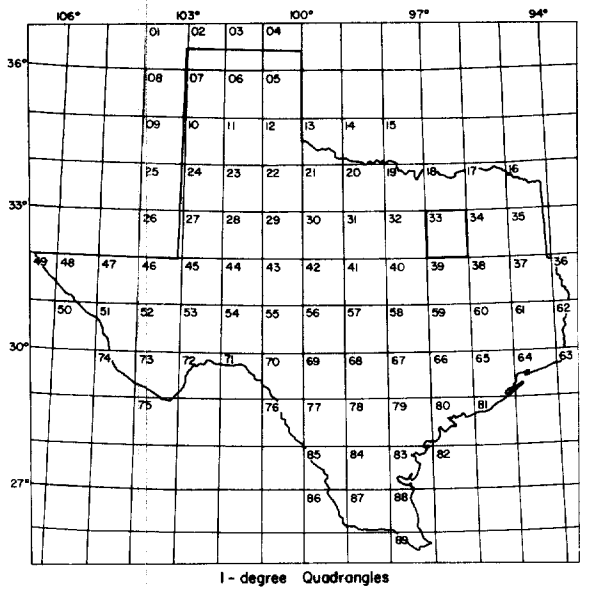
Fieldwork consisted of conducting a complete inventory of municipal, industrial, and irrigation water wells; conducting an inventory of historical pumpage; collect ng past and present water levels; collecting data on well construction, yields, pumping rates, and pumping levels; collecting drillers' logs, mechanical logs, and well completion data; determining elevations of wells having water level or stratigraphic data; conducting power and yield tests on selected irrigation wells; mapping surface geology; determining the chemical quality of ground water by using available analyses and collecting water samples for analysis, where needed; and determining the magnitude and extent of ground-water contamination in the outcrop area. Office work included constructing geologic cross-sections; tabulating water-well records, water levels, and chemical analyses; preparing well-location maps; constructing geologic maps of net sand thickness, structure, piezometric surface, chemical quality, surface geology, transmissibility, and water-level decline; and tabulating historical pumpage and projecting future water demands based on population, economic growth, and precipitation.

Well-Numbering System

The systematic well numbering used in this report was originally developed by the Texas Water Commission and is now in use statewide. It was designed to identify, facilitate the location of, and avoid duplication of numbers on all wells used in any Department report, investigation or study. The system is based on division of the State into one-degree quadrangles of latitude and longitude and the repeated division of these quadrangles into smaller ones as shown in Figure 3.

Each one-degree quadrangle is subdivided into sixty-four 7 1/2-minute quadrangles, and these quadrangles are further subdivided into nine 2 1/2-minute quadrangles. Each one-degree quadrangle has an assigned number. The 7 1/2-minute quadrangles are numbered consecutively from left to right, beginning with quadrangle number 01 in the upper left-hand corner of the one-degree quadrangle. The 2 1/2-minute quadrangles within each 7 1/2 minute quadrangle are numbered similarly. The wells are numbered consecutively, beginning with 01, within each 2%minute quadrangle. From left to right, the first and second digits of a well number identify the one-degree quadrangle in which the well belongs; the third and fourth digits, the 7 1/2-minute quadrangle; and the fifth digit, the 2 1/2-minute quadrangle. The sixth and seventh digits identify the particular well in the 2 1/2-minute quadrangle.

On the well location maps in this report, the one-degree quadrangles are identified with large open-block numbers. The 7 1/2-minute quadrangles are numbered in the upper left-hand corner or as near to that position as possible in the cases where a part of the quadrangle falls outside the county. The three-digit numbers near the wells identify the 2 1/2-minute quadrangle and the well within that quadrangle.



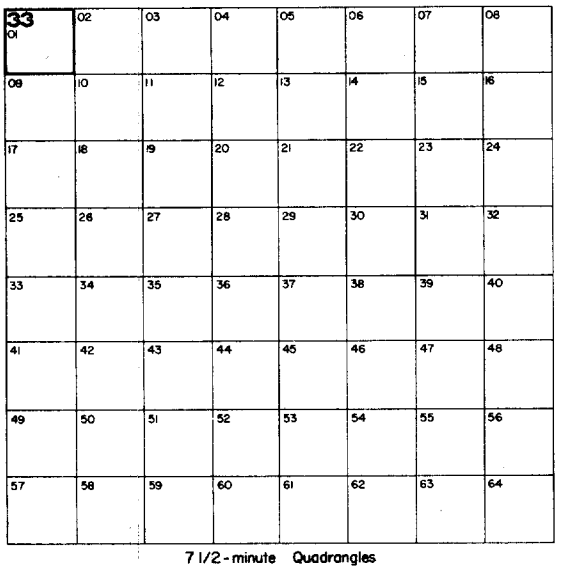
Location of Well HR-33-01-604

33 1 - degree quadrangle

01 7 1/2 - minute quadrangle

6 2 1/2 - minute quadrangle

04 Well number within 2 1/2-minute quadrangle



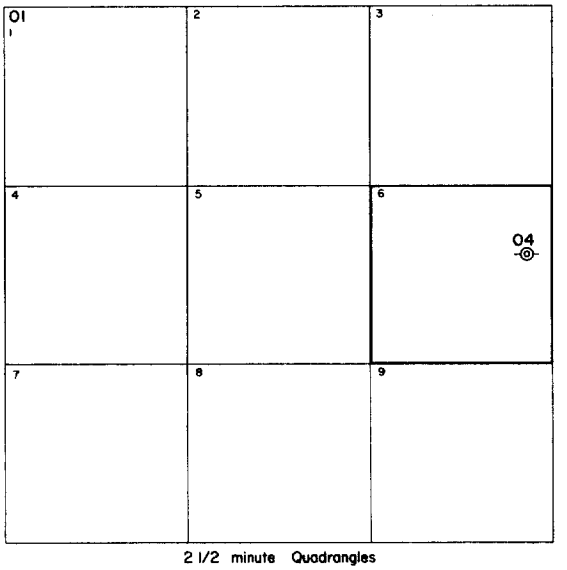


Figure 3.—Well-Numbering System

In addition to the seven-digit well number, a two letter prefix is used to identify the county. The prefixes for the 20 counties in this report are:

Prefix	County	Prefix	County
DT	Collin	KT	Grayson
HA	Cooke	LY	Hood
HR	Dallas	PH	Hunt
HU	Delta	PX	Johnson
HW	Denton	RA	Kaufman
JK	Ellis	RT	Lamar
JS	Fannin	TR	Montague
TY	Navarro	WL	Rockwall
UP	Parker	XU	Tarrant
WB	Red River	ZR	Wise

Well HR-33-01-604, shown on Figure 3, is in Dallas County (HR); 1-degree quadrangle 33; 7½-minute quadrangle 01; 2½-minute quadrangle 6; and was the fourth well inventoried in that 2½-minute quadrangle.

METRIC CONVERSIONS TABLE

For those readers interested in using the International System (SI) of Units, the metric

equivalents of English Units of measurements are given in parentheses in the text. The English units used in this report may be converted to metric units by the following conversion factors:

Multiply English units	BY	To obtain SI units
acres	0.4047	square hectometers (hm^2)
acre-feet (acre-ft)	.001233	cubic hectometers (hm^3)
cubic feet per second (ft^3/s)	28.32	liters per second (l/s)
feet (ft)	.3048	meters (m)
feet per mile (ft/m)	.189	meters per kilometer (m/km)
gallons (gal)	3.785	liters (l)
gallons per minute (gal/min)	.06309	liters per second (l/s)
gallons per minute per foot [(gal/min)/ft]	.207	liters per second per meter [(l/s)/m]
gallons per day per square foot [(gal/d)/ft^2]	40.74	liters per day per square meter [(l/d)/m^2]
gallons per day per foot [(gal/d)/ft]	12.418	liters per day per meter [(l/d)/m]
inches (in)	2.54	centimeters (cm)
miles (mi)	1.609	kilometer (km)
square miles (mi^2)	2.590	square kilometers (km^2)

To convert degrees Fahrenheit ($^\circ F$) to degrees Celsius ($^\circ C$) use the following formula:

$$^\circ C = (^\circ F - 32)(0.556)$$

GEOLOGY AS RELATED TO THE OCCURRENCE OF GROUND WATER

Geologic History

Paleozoic

During most of the Paleozoic era, a sedimentary basin existed throughout much of central and north-central Texas which received sediments consisting of sandstone, limestone, carbonaceous shales, and other marine sediments. 'Sediments were deposited in this basin until late Pennsylvanian time when the Llano Uplift and the Ouachita Fold Belt caused a regional tilting to the west and faulting in the immediate uplift area. The Pennsylvanian-Cretaceous unconformity shows a tremendous period of emergence and erosion. During Permian time, the basin shifted to the west and only the northwest corner of the study area received sediments, while the remainder of the area underwent extensive erosion.

Cretaceous

During the Triassic and Jurassic periods of the early Mesozoic era, withdrawal of the seas from the north-central Texas area along with subsidence in the Gulf Coast embayment led to a reversal of drainage direction. This resulted in an extensive truncation of Pennsylvanian strata in the Fort Worth basin and surrounding area. By the close of Jurassic time, Paleozoic rocks had been reduced to an almost flat-featureless plain, or peneplain, upon which marine sediments were deposited along an oscillating shoreline during the Cretaceous period.

Two major invasions of the seas during the Cretaceous period are represented by the Comanche and Gulf Series. During late Cretaceous (Gulf Series), a general uplift occurred to the west and the seas withdrew gullfward covering only the eastern portion of the study area.

Tertiary and Quaternary

At the close of the Cretaceous period, noted by uplifting of the western area and subsidence of the coastal area, sediments of Tertiary and Quaternary age were deposited. The repeated transgression and regression of the sea resulted in an alternating sequence of marine and continental deposits. Throughout Tertiary time, except for minor periods of subsidence, the land surface was eroded and modified by streams. During Quaternary time, the streams deposited alluvial sediments. The older sediments are represented by terrace deposits above the alluviated valleys of present streams.

General Stratigraphy

Stratigraphic units that supply fresh to slightly saline water to wells in the study region range in age from Paleozoic to Recent. The most important

36 014

water-bearing formations in north-central Texas are of Cretaceous age.

The Cretaceous System is composed of two series, Gulf and Comanche, and each is divided into groups. The Gulf Series is divided into the following five groups: Navarro, Taylor, Austin, Eagle Ford, and Woodbine. The Comanche Series is divided into the following three groups: Washita, Fredericksburg, and Trinity.

The Taylor and Eagle Ford Groups consist predominantly of shale, limestone, clay, and marl and yield only small amounts of water in localized areas. The Navarro and Austin Groups consist of chalk, limestone, marl, clay, and sand and, except for the Nacatoch and Blossom Sands, yield only small amounts of water locally. The Nacatoch Sand of the Navarro Group and the Blossom Sand of the Austin Group yield small to moderate supplies of water to limited areas. The Woodbine Group is the only important aquifer of the Gulf Series in the area covered by this report. It consists of sand, sandstone, and clay and is capable of yielding small to large amounts of water. The Woodbine Group is discussed in detail in the sections covering the stratigraphy of the water-bearing formations and the occurrence and the availability of ground water.

Both the Washita and Fredericksburg Groups of the Comanche Series consist predominantly of limestone, shale, clay, and marl and yield only small amounts of water to localized areas. The Trinity Group is the principal water-bearing group of rocks in the region and is divided into the Paluxy, Glen Rose, Twin Mountains, and Antlers Formations. The Paluxy consists of sand and shale and is capable of yielding small to moderate amounts of water. The Glen Rose is predominantly a limestone and yields small quantities of water only to localized areas. The Twin Mountains is composed of conglomerate, sand, and shale. It is the principal water-bearing formation of Cretaceous age in the region and yields moderate to large amounts of water. The name Antlers Formation is applied north of the Glen Rose pinch-out, where the Paluxy and Twin Mountains coalesce to form one unit. Water-bearing members of the Trinity Group are discussed in detail in the sections covering stratigraphy of the water-bearing formations and occurrence and availability of ground water.

The relationship, approximate maximum thickness, brief description of lithology, and summary of water-bearing properties of the stratigraphic units are shown in Table 1. Outcrop areas of the various formations are illustrated on the geologic outcrop map (Figure 16). The altitude of the top of the formations and their net sand thicknesses are shown on Figures 18 through 22, 27, and 29.

Geologic cross-sections are profiles portraying an interpretation of a vertical section of the earth. Five geologic cross-sections were constructed; two are strike sections and three are dip sections. Dip sections are constructed approximately perpendicular to the strike of the beds and parallel to the dip of the beds, while strike sections are constructed parallel to the strike of the beds. These five geologic: sections, illustrated on Figures 35 through 39, show the structure and stratigraphic relationships of the geologic units.

Structure

Pennsylvanian and Permian rocks in the outcrop along the west edge of the study area dip westward and northwestward at about 40 feet per mile (7.6 m/km). Permian beds probably extend not much farther eastward than Montague County. The Pennsylvanian sediments, which underlie the Cretaceous rocks in most of the remaining area, thicken from the outcrop eastward into the Fort Worth basin. The axis of this basin and many of the other major structural features in or near the report area are shown on Figure 4.

The Cretaceous System forms a southeastward-thickening wedge extending across the area into a structural feature known as the East Texas basin. Thickness of these rocks ranges from zero in the west to nearly 7,500 feet (2,286 m) in the southeast. Regional dip is east and southeast at rates of about 15 to 40 feet per mile (2.8 to 7.6 m/km). The dip rate increases to as much as 300 feet per mile (57 m/km) on the southeastward-plunging ridge called the Preston anticline. This anticline and an associated trough to the south (Sherman syncline) have caused a change in the regional outcrop pattern as shown on the geologic map (Figure 16).

Tertiary System beds dip regionally southeastward from the Mexia-Talco fault system, which extends in a northerly direction along the eastern margin of the report area, at a rate of about 100 feet per mile (19 m/km). Deviations from this dip rate occur locally due to the faulting. These beds attain a thickness of approximately 250 feet (76 m) within the area of study. However, just outside the area of investigation in southern Navarro County they reach a maximum thickness in excess of 1,000 feet (305 m).

Quarternary deposits occur along the floodplains of the Brazos, Red, Sulphur, and Trinity Rivers and

36 015

Table 1.—Stratigraphic Units and Their Water-bearing Properties

Yield, in gallons per minute (gal/min): small, less than 100 gal/min; moderate, 100—1,000 gal/min; large, more than 1,000 gal/min.

Era	System	Series	Group	Stratigraphic units	Approximate maximum thickness (feet)	Character of rocks	Water-bearing characteristics
Cenozoic	Quaternary	Recent		Alluvium	75	Sand, silt, clay and gravel.	Yields small to large amounts of water to wells along the Red River
		Pleistocene		Fluviatile terrace deposits			
	Tertiary	Eocene	Wilcox		100	Fine to medium sand with silt and clay	Yields small quantities of water to wells in the eastern part of the area.
		Paleocene	Midway		150	Gray, calcareous clay, in part silty to sandy	Do.
Mesozoic	Cretaceous	Gulf	Navarro	Kemp Clay Corsicana Marl	300	Fossiliferous clay and hard limy marl	Not known to yield water to wells in the area.
				Nacatoch Sand	500	Fine sand and marl, fossiliferous	Yields small to moderate quantities of water near the outcrop.
			Taylor	Marlbrook Marl Pecan Gap Chalk Wolfe City - Ozan Formations	1,500	Clay, marl, mudstone, and chalk	Yields small quantities of water to shallow wells.
			Austin	Gober Chalk Brownstown Marl Blossom Sand Bonham Formation	700	Chalk, limestone, and marl; fine to medium sand, fossiliferous	Yields small to moderate quantities of water to wells in the northeastern part of the area; very limited as an aquifer.
			Eagle Ford		650	Shale with thin beds of sandstone and limestone	Yields small quantities of water to shallow wells.
			Woodbine		700	Medium to coarse iron sand, sandstone, clay and some lignite	Yields moderate to large quantities of water to municipal, industrial and irrigation wells.
		Comanche	Washita	Grayson Marl - Mainstreet Limestone Pawpaw Formation - Weno Limestone - Denton Clay Fort Worth - Duck Creek Kiamichi Formation	1,000	Fossiliferous limestone, marl, and clay; some sand near top	Yields small quantities of water to shallow wells.
			Fredericksburg	Edwards Limestone Comanche Peak Formation — Goodland Limestone Walnut Formation	250	Limestone, clay, marl, shale, and shell agglomerates	Do.
			Trinity	Antlers Formation: Paluxy Formation	900 — 400	Fine sand, sandy shale, and shale	Yields small to moderate quantities of water to wells.
				Antlers Formation: Glen Rose Formation	900 — 1,500	Limestone, marl, shale, and anhydrite	Yields small quantities of water in localized areas.
				Antlers Formation: Twin Mountains Formation	1,000	Fine to coarse sand, shale, clay, and basal gravel and conglomerate	Yields moderate to large quantities of water to wells.
Paleozoic				Paleozoic rocks undifferentiated		Sandstone, limestone, shale and conglomerate	Yields small quantities of water in the western part of the area.

36 016

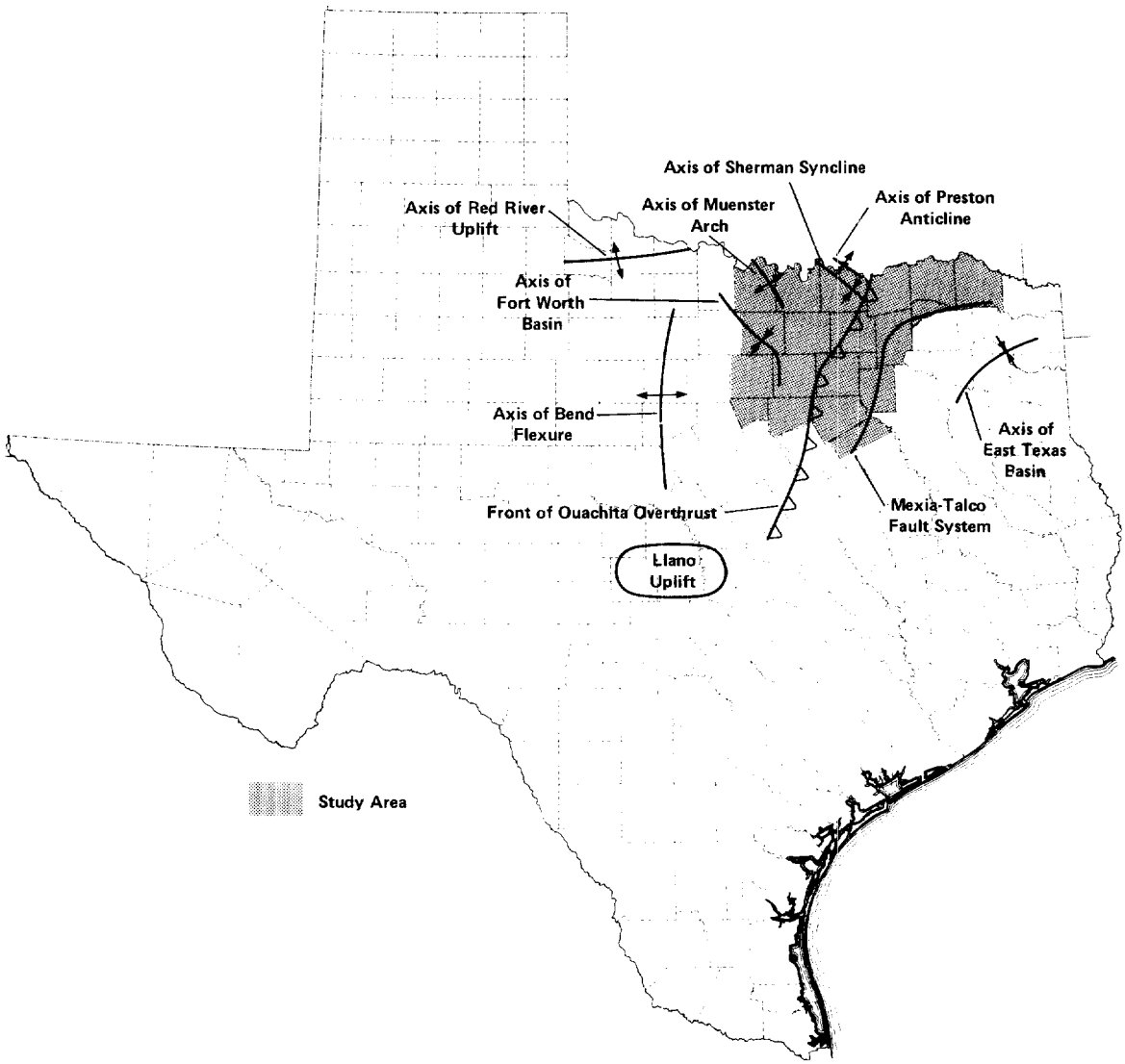


Figure 4.—Major Structural Features From the Llano Uplift to the Red River

many of their main tributaries. Terraces, which represent remnants of older floodplain deposits of these drainage systems, occur at higher elevations along some of the rivers, particularly the Red River. Alluvial deposits are reported to be as thick as 70 feet (21 m) in Fannin County. Generally, the alluvial deposits are irregular in thickness and areal extent. Regional slope of these deposits is probably less than 5 feet per mile (0.9 m/km) and generally east and southeast in the direction of slope of the land surface. Locally, the direction will vary according to the direction of stream or river flow.

STRATIGRAPHY OF THE WATER-BEARING FORMATIONS

Paleozoic Rocks

Paleozoic rocks crop out in the western part of the study area in Hood, Montague, Parker, and Wise Counties (Figure 16). The occurrence of ground water with acceptable quality in these rocks is generally limited to the outcrop and adjacent area. Figure 17 shows the approximate altitude of the base of

Cretaceous rocks, which is the top of the Paleozoic in the western part of the study area.

Of the many pre-Cretaceous rocks cropping out along the western edge of the study region, only the Wichita Group of the Permian System and several formations in the Cisco and Strawn Groups of the Pennsylvanian System yield water in any appreciable quantity and of good quality.

The Wichita Group crops out in the northwest third of Montague County and consists of fossiliferous limestone, shale, and sandstone. Sandstone is more abundant in the lower part of the group, however, the amount of sand diminishes downdip. For this reason, wells pumping ground water from this lower sandstone are located on or very near the outcrop. The rocks dip gently toward the west or northwest.

The Cisco Group crops out in the southwest corner of Montague County and underlies the Wichita Group to the north. The Cisco Group consists of alternating beds of shale, sandstone, limestone, and conglomerate. As in the Wichita Group, there is less sand downdip than in the outcrop. In the study area, rocks of Pennsylvanian age generally dip toward the west or northwsst at a rate of approximately 50 feet per mile (9.5 m/km) and are overlain by the Trinity Group of Cretaceous age to the east.

The Strawn Group crops out in the western portion of Parker County. The Garner Formation of the Strawn Group in the northern part of the outcrop is the only source of water for wells in this part of the study area. Ground water is derived from the Brazos River Conglomerate Member of the Garner Formation, and the town of Whitt in Parker County has the only public supply system that taps this source. Numerous domestic and livestock wells utilize ground water from both the Cisco and Strawn Groups.

Antlers Formation

The Antlers Formation is the lateral equivalent of the Twin Mountains and Paluxy Formation. In the northwestern part of the study region, north of the updip limit of the Glen Rose Formation (Figure 16), the elastic sand and clay of the Twin Mountains and Paluxy Formarions coalesce to form a single unit, the Antlers Formation (Figure 36 and 37).

The Antlers crops out mainly in Cooke, Montague, and Wise Counties. The Antlers dips to the southeast at an average rate of 20 feet per mile (3.8 m/km) near its outcrop to 70 feet per mile (13.3 m/km) near its southeastern limit. In parts of Grayson County on the south flank of the Preston anticline, the dip is southward in excess of 300 feet per mile (56.8 m/km).

A typical section of Antlers consists of a basal conglomerate and gravel overlain by a fine white to gray, poorly consolidated sand in massive-crossbedded layers interbedded with layers of red, purple, or gray clay in discontinuous lenses scattered throughout the formation. A middle section of Antlers contains considerably more clay beds than the upper or lower sections, and to the south, near the updip limit of the Glen Rose Formation, limestone beds also occur. Massive beds near the base and top of the Antlers probably correspond to the Twin Mountains and Paluxy Formations in the southern part of the study area. Fine white to yellow pack sand with thin beds of multicolored clay resting on a basal layer of gravel characterize a section on the outcrop.

Total thickness of the Antlers varies from about 400 feet (122 m) near the outcrop to about 900 feet (274 m) near the updip limit of the Glen Rose Limestone in southeast Grayson County. Well HA-19-22-704 in Cooke County shows a total thickness of 550 feet (167 m) while well KT-18-28-404 in Grayson County reveals a total thickness of 870 feet (265 m). The thickness gradually increases from west to east as illustrated on Figure 38. The approximate altitude of the top of the Antlers is shown on Figure 18.

Twin Mountains Formation

The Twin Mountains Formation outcrops in the western part of the study region in Hood, Parker, and Wise Counties. The Twin Mountains overlies Paleozoic rocks throughout the study region and is the lower member of the Trinity Group. The Twin Mountains underlies the Glen Rose Formation where the Glen Rose is present. In Wise, Denton, Cooke, and Grayson Counties, where the Glen Rose is absent, the Twin Mountains is equivalent to the lower unit of the Antlers Formation.

Originally the basal Cretaceous bed was named the Travis Peak Formation, but the name was changed to the Twin Mountains Formation in north-central Texas (Fisher and Rodda, 1966). The Travis Peak contains conglomerates of pebble-size and cobble-size limestone and dolomite, calcareous sands and silts, and impure limestones in central Texas. In contrast, the Twin Mountains sequence in north-central Texas consists mainly of medium- to coarse-grained sands, red and gray

silty clays, and siliceous conglomerates of chert, quartzite, and quartz pebbles.

The Twin Mountains consists of a basal conglomerate of chert and quartz, grading upward into coarse- to fine-grained sand interspersed with varicolored shale. The sand strata are more thickly bedded in the lower part of the formation than in the upper and middle and can be correlated to the Hosston Formation to the south. It is in this lower massive sand that the majority of wells are completed. Varicolored shale and clay, predominantly red, occur throughout the formation. The shale grades vertically and laterally into sandy shale and sand, making correlations over long distances almost impossible. The upper part of the Twin Mountains also contains a considerable percentage of sand and sandstone strata but less than the lower part due to the increased interbedding of shale and clay. Few wells are developed in the upper part of the formation.

Beds dip toward the east from 30 feet per mile (5.7 m/km) near the outcrop to 95 feet per mile (18 m/km) near the downdip limit of fresh to slightly saline water as illustrated on the geologic cross sections and Figure 19 which shows the approximate altitude of the top of the Twin Mountains. Thickness varies considerably over the study region, generally increasing downdip and ranging from less than 200 feet (61 m) near the outcrop to 860 feet (262 m) in oil test HR-33-28-401. However, data on cross section C-C' (Figure 37) indicate that maximum thickness at the downdip limit of fresh to slightly saline water should reach approximately 1,000 feet (305 m).

The Twin Mountains Formation is the most important source of ground water for a large part of the study region anc yields moderate to large quantities of fresh to slightly saline water to municipal and industrial wells. In 1974, over 41,000 acre-feet (50.6 hm^3) of water was pumped from this aquifer for municipal and industrial uses.

Paluxy Formation

The Paluxy Formation is the upper member of the Trinity Group south of the Glen Rose pinch-out. It crops out in Hood, Parker, Tarrant, and Wise Counties and forms the surface of the Western Cross Timbers belt. The dip is easterly at an average rate of 30 feet per mile (5.7 m/km) near the outcrop, increasing to 80 feet per mile (15.2 m/km) near the downdip limit of fresh to slightly saline water as illustrated on the geologic sections and on Figure 18, which shows the approximate altitude of the top of the Paluxy and the extent of the outcrop in the study area.

The Paluxy is composed predominantly of fine- to coarse-grained, friable, homogeneous, white quartz sand interbedded with sandy, silty, calcareous, or waxy clay and shale. In general, coarse-grained sand is in the lower part. The Paluxy grades upward into fine-grained sand with variable amounts of shale and clay. The sands are usually well sorted, poorly cemented, and crossbedded. Pyrite and iron nodules are often associated with the sands and frequently contribute a red stain to the individual beds. In some areas along the outcrop, high iron concentrations are present in ground-water analyses.

Thickness of the Paluxy varies considerably throughout the study region. From a maximum thickness nearing 400 feet (122 m) in the northern part of the study area, the Paluxy thins to the south and southeast to less than 100 feet (30 m) with a net sand thickness of less than 40 feet (12 m). This thickness change is shown on the geologic sections and on Figure 20, which shows the approximate net thickness of sand and the downdip limit of fresh to slightly saline water.

The Paluxy Formation is an important aquifer in the study region and during 1974, produced over 10,000 acre-feet (12.3 hm^3) of water for municipal and industrial use and provided water to many domestic and livestock wells. Water wells tapping the Paluxy aquifer yield small to moderate quantities of fresh to slightly saline water.

Woodbine Group

The Woodbine Group is the basal rock unit of the Gulf Series of Cretaceous age in the study area. It crops out in Cooke, Dallas, Denton, Grayson, Johnson, and Tarrant Counties with a northeast-southwest strike. In the northern part of Texas, the outcrop parallels the Red River in a west-east strike, cropping out in Fannin, Lamar, and Red River Counties (Figure 16). The regional dip is to the southeast at an average rate of 35 feet per mile (6.63 m/km) near the outcrop and up to 75 feet per mile (14.2 m/km) near the downdip limit of fresh to slightly saline water as illustrated on the geologic sections and on Figure 21, which shows the approximate altitude of the top of the Woodbine.

In the southern part of the study area, the Woodbine is composed of friable, ferruginous, fine-grained sand and sandstone with interbedded shale, sandy shale, and laminated clay. The upper part of the Woodbine displays a marked increase in shale and clay, while the lower portion exhibits a more sandy make-up. Ripple marks and large-scale crossbedding are prevalent throughout the entire Woodbine Group.

In the northern part of the study area, the Woodbine is generally divided into a lower, middle, and upper part, which drillers refer to as first, second, and third Woodbine. These three parts can be readily distinguished on individual electric logs of wells located between Dallas and Sherman but are difficult to trace accurately as a unit over long distances along the strike or in the downdip area.

The upper Woodbine is mostly a fine-grained, well sorted, crossbedded, reddish-brown sandstone with concretions and some gray shale. The middle Woodbine is a reddish sandstone with interbedded gray to brown clay and some shale. The lower Woodbine is an interbedded, red-brown to white sandstone (sometimes exhibiting massive beds) with ironstone and sandy, gray to brown clay. It yields the largest quantity of water that is low in dissolved iron. The upper Woodbine yields limitec amounts of water that contains large concentrations of iron.

The total thickness of the Woodbine ranges from 230 feet (70 m) near the southern extent of the outcrop to about 700 feet (213 m) near the downdip limit of fresh to slightly saline water in Fannin County. Regionally, the formation thickens downdip and toward the northeast. The change in thickness is shown on the geologic sections and on Figure 22, which shows the approximate net thickness of sand containing fresh to slightly saline water.

The Woodbine Group is an extremely important aquifer over a large portion of the study area, yielding over 8,500 acre-feet (10.5 hm^3) per year of water to public supply wells in nine of the 20 counties in this study.

Blossom Sand

The Blossom Sand of the Austin Group crops out in central Fannin, Lamar, and Red River Counties. The strike of the outcrop is east-west and ends in central Fannin County where the Blossom merges laterally into marl and chalk. The outcrop extends out of the study area into Bowie County to the east. The occurrence of usable quality water in the Blossom is generally limited to the Red River basin and the northern part of the Sulfur River basin. The dip is to the south averaging about 85 feet per mile (16.1 m/km).

The Blossom Sand consists of brown to light gray, unconsolidated, glauconitic, ferruginous, fine to medium sand interbedded with sandy and chalky marl. Most of the formation contains impermeable sandy clay or marl and chalk, with only about 25 percent sand. The amount of sand decreases westward near the town of Bonham.

The Blossom thickens southward downdip and eastward along the strike. Total thickness varies from zero in central Fannin County to about 400 feet (122 m) in southern Red River County. In some areas, the sand beds at the top and base of the formation approach a thickness of 50 feet (15 m). However, due to the impervious nature of the intervening beds, the sands are probably not hydrologically connected.

Nacatoch Sand

The Nacatoch Sand of the Navarro Group crops out in Delta, Hunt, Kaufman, Lamar, Navarro, and Red River Counties within the study region. It dips southward at about 80 feet per mile (15.2 m/km). In the western part of the outcrop, numerous faults of the Luling-Mexia-Talco fault system cut the formation.

The Nacatoch Sand consists of light gray, unconsolidated, massive, glauconitic, calcareous sand and marl. Approximately half of the formation is composed of sand, but individual beds vary considerably in extent and thickness laterally.

Thickness of the Nacatoch varies from 500 feet (152 m) in the eastern part of Red River County, decreasing westward along the strike, to about 350 feet (107 m) in parts of Delta and Hunt Counties. There is little change in thickness from the outcrop to the downdip limit of fresh to slightly saline water.

CHEMICAL QUALITY OF GROUND WATER AS RELATED TO USE

General Chemical Quality of Ground Water

All ground water contains minerals carried in solution, the type and concentration of which depend upon the surface and subsurface environment, rate of ground-water movement, and source of the ground water. Precipitation is relatively free of minerals until it comes in contact with the various constituents which make up the soils and component rocks of the aquifer. As a result of the water's solvent power, minerals are dissolved and carried into solution as the water moves through the aquifer. The concentration depends upon the solubility of the minerals present, the length of time water is in contact with the rocks, and the amount of dissolved carbon dioxide the water contains.

Concentrations of dissolved minerals in ground water generally increase with depth where circulation has been restricted due to various geologic conditions. Restricted circulation retards the flushing action of the fresh water moving through the aquifers, causing the water to become highly mineralized. In addition to natural mineralization, man can adversely alter the chemical quality of ground water by permitting highly mineralized water to enter fresh-water strata through inadequately constructed wells, by seepage from oil-field brine disposal pits, and disposal of animal wastes, sewage, or various industrial waste into fresh-water strata or into aquifer recharge areas.

The principal chemical constituents found in ground water are calcium, magnesium, sodium, iron, carbonate, bicarbonate, sulfate, chloride, and minor amounts of silica, potassium, manganese, nitrate, fluoride, and boron. Concentrations of these ions or chemical constituents are commonly reported in milligrams per liter (mg/l). The source, significance, and range in concentration of mineral constituents and properties of natural waters for the various aquifers in the study area are given in Table 2. Chemical analyses of water from selected wells in the study region are given in Table 4, Volume 2. Figure 23 shows the sulfate, chloride, and dissolved-solids content in water from selected wells in the Trinity and Woodbine aquifers.

Salt water is produced from oil and gas fields mainly in the norlhern half of the study area. Oil and gas wells which are not properly cemented opposite fresh to slightly saline water-producing formations and improper disposal of salt water can cause contamination of water-supply sources. Presently the area between Springtown in Parker County, and Decatur in Wise County, is experiencing apparently contaminated water in wells due to the improper completion of existing oil and gas wells. The main problem with this type of contamination is that the water may remain polluted long after the source of contamination is removed due to the slow rate of movement exhibited by ground water. Checks to insure continued good quality of ground water are now being made through a network of wells periodically sampled in each water-bearing formation. Comparisons of the relative concentrations of chemical constituents in native ground water, apparently contaminated ground water, and a typical oil-field brine are illustrated on Figure 5.

Quality Criteria or Standards

The degree and type of mineralization of ground water determines its suitability for municipal, industrial, irrigation, and other uses. Several criteria for water-quality requirements have been developed through the years which serve as guidelines in determining the suitability of water for various uses. Subjects covered by the guidelines are bacterial content; physical characteristics, including color, taste, odor, turbidity, and temperature; and the chemical constituents. Water-quality problems associated with the first two subjects can usually be alleviated economically. The neutralization or removal of most of the unwanted chemical constituents is usually difficult and often very costly.

Total dissolved-solids content is usually the main factor which limits or determines the use of ground water. Winslow and Kister (1956, p. 5) used an excellent, and very applicable, general classification of waters based on the dissolved-solids concentration in parts per million (ppm). The classification is as follows:

Description	Dissolved-Solids Content (ppm)
Fresh	Less than 1,000
Slightly saline	1,000 to 3,000
Moderately saline	3,000 to 10,000
Very saline	10,000 to 35,000
Brine	More than 35,000

In recent years, most laboratories have begun reporting analyses in mlg/l (milligrams per liter) instead of ppm. These units, for practical purposes, are identical unless the dissolved-solids concentration of water reaches or exceeds 7,000 units (ppm or mg/l). The concentrations of chemical constituents reported in this report, other than for oil-field brines, are in mg/l (Tables 8, IO, 12, and 14). Most of the chemical concentrations are below 7,000 mg/l and therefore the units are interchangeable. For the more highly mineralized waters, a density correction should be made using the following formula:

$$\text{parts per million} = \frac{\text{milligrams per liter}}{\text{specific gravity of the water}}$$

Municipal

As the first step in setting national standards for drinking water quality under the provisions of the Safe Drinking Water Act of 1974, the U.S. Environmental Protection Agency (1975) issued drinking water regulations on December 10, 1975. These standards

36 021

Table 2.–Source, Significance, and Range in Concentration of Dissolved-Mineral Constituents and Properties of Water

(Adapted from Doll and others, 1963, p. 39-43)

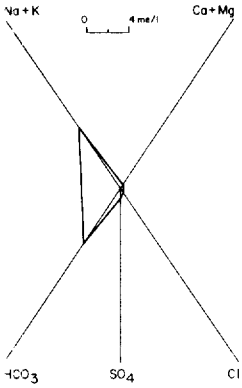
Only analyses representative of native ground water were used. Analyses are in mg/l except percent sodium, specific conductance, pH, and SAR.

Constituent or property	Source or cause	Significance	Range in concentrations, by aquifer																	
			Antlers			Paluxy			Twin Mountains			Woodbine			Blossom			Nacatoch		
Silica (SiO_2)	Dissolved from practically all rocks and soils, commonly less than 30 mg/l. High concentrations, as much as 100 mg/l, generally occur in highly alkaline waters.	Forms hard scale in pipes and boilers. Carried over in steam of high pressure boilers to form deposits on blades of turbines. Inhibits deterioration of zeolite type water softeners.	3		72	1	–	76	0	–	102	0	–	79	3	–	13	5	–	65
Iron (Fe)	Dissolved from practically all rocks and soils. May also be derived from iron pipes, pumps, and other equipment.	On exposure to air, iron in ground water oxidizes to reddish-brown precipitate. More than about 0.3 mg/l stain laundry and utensils reddish-brown. Objectionable for food processing, textile processing, beverages, ice manufacture, brewing, and other processes. Texas Department of Health (1977) drinking water standards state that iron should not exceed 0.3 mg/l. Larger quantities cause unpleasant taste and favor growth of iron bacteria.	0	–	58.5	0	–	10.0	0	–	17.2	0	–	26.9	0	–	.2	0	–	.1
Calcium (Ca) and Magnesium (Mg)	Dissolved from practically all soils and rocks, but especially from limestone, dolomite, and gypsum. Calcium and magnesium are found in large quantities in some brines. Magnesium is present in large quantities in sea water.	Cause most of the hardness and scale-forming properties of water; soap consuming (see hardness). Waters low in calcium and magnesium desired in electroplating, tanning, dyeing, and in textile manufacturing.	0 and 0	– and –	256 142	0 and 0	– and –	250 205	0 and 0	– and –	266 82	0 and 0	– and –	405 89	2 and 1	– and –	15 3	1 and 0	– and	16 9
Sodium (Na) and Potassium (K)	Dissolved from practically all rocks and soils. Found also in oil field brines, sea water, industrial brines, and sewage.	Large amounts, in combination with chloride, give a salty taste. Moderate quantities have little effect on the usefulness of water for most purposes. Sodium salts may cause foaming in steam boilers and a high sodium content may limit the use of water for irrigation.	7 and 5	– and	580 22.5	5 and 1	– and	1,050 10.0	5 and 0	– and	760 20.0	5 and 1	– and	1,390 20.0	49 and 3.4	– and	813 4.8	9 and 1	and –	663 10.0
Bicarbonate (HCO_3) and Carbonate (CO_3)	Action of carbon dioxide in water on carbonate rocks such as limestone and dolomite.	Bicarbonate and carbonate produce alkalinity. Bicarbonates of calcium and magnesium decompose in steam boilers and hot water facilities to form scale and release corrosive carbon dioxide gas. In combination with calcium and magnesium, cause carbonate hardness.	54	(HCO_3) –	790	122	(HCO_3) –	822	35	(HCO_3) –	700	40	(HCO_3) –	1,210	123	(HCO_3)	784	27	(HCO_3) –	740
Sulfate (SO_4)	Dissolved from rocks and soils containing gypsum, iron sulfides, and other sulfur compounds. Commonly present in some industrial wastes.	Sulfate in water containing calcium forms hard scale in steam boilers. In large amounts, sulfate in combination with other ions gives bitter taste to water. Texas Department of Health (1977) drinking water standards recommend that the sulfate content should not exceed 300 mg/l.	10	–	600	4	–	1,711	4		940	3	–	1,460	52	–	458	0	–	320
Chloride (Cl)	Dissolved from rocks and soils. Present in sewage and found in large amounts in oil-field brines, sea water, and industrial brines.	In large amounts in combination with sodium, gives salty taste to drinking water. In large quantities, increases the corrosiveness of water. Texas Department of Health (1977) drinking water standards recommend that the chloride content should not exceed 300 mg/l.	2	–	590	0	–	815	3	–	980	4	–	1,633	29	–	762	6	–	580
Fluoride (F)	Dissolved in small to minute quantities from most rocks and soils. Added to many waters by fluoridation of municipal supplies.	Fluoride in drinking water reduces the incidence of tooth decay when the water is consumed during the period of enamel calcification. However, it may cause mottling of the teeth, depending on the concentration of fluoride, the age of the child, amount of drinking water consumed, and susceptibility of the individual (Maier, 1950, p. 1120-1139).	0	–	4.2	0		8.0	0	–	16.0	0		7.9	.3	–	2.6	0	–	3.0
Nitrate (NO_3)	Decaying organic matter, sewage, fertilizers, and nitrates in soil.	Concentration much greater than the local average may suggest pollution. Texas Department of Health (1977) drinking water standards suggest a limit of 45 mg/l (as NO_3) or 10 (as N). Waters of high nitrate content have been reported to be the cause of methemoglobinemia (an often fatal disease in infants) and therefore should not be used in infant feeding (Maxcy, 1950, p. 271). Nitrate shown to be helpful in reducing inter-crystalline cracking of boiler steel. It encourages growth of algae and other organisms which produce undesirable tastes and odors.	0	–	90	0		135	0	–	170	0		294	.2	–	4.2	0		11.0

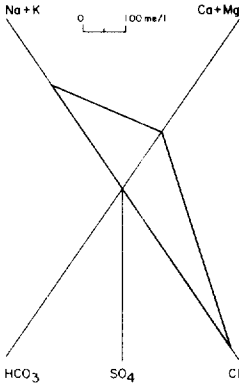
Table 2.–Source, Significance, and Range in Concentration of Dissolved-Mineral Constituents and Properties of Water–Continued

Constituent or property	Source or cause	Significance	Range in concentrations, by aquifer																	
			Antlers			Paluxy			Twin Mountains			Woodbine			Blossom			Nacatoch		
Boron (B)	A minor constituent of rocks and of natural waters.	An excessive boron content will make water unsuitable for irrigation. Wilcox (1955, p. 11) indicated that a boron concentration of as much as 1.0 mg/l is permissible for irrigating sensitive crops; as much as 2.0 mg/l for semitolerant crops; and as much as 3.0 mg/l for tolerant crops. Crops sensitive to boron include most deciduous fruit and nut trees and navy beans; semitolerant crops include most small grains, potatoes and some other vegetables, and cotton; and tolerant crops include alfalfa, most root vegetables, and the date palm.	3		1.3	0.3	–	3.0	0.1		1.9	0		5.7				0.4	–	0.9
Dissolved solids	Chiefly mineral constituents dissolved from rocks and soils	Texas Department of Health (1977) drinking water standards recommend that waters containing more than 1,000 mg/l dissolved solids not be used if other less mineralized supplies are available. For many purposes the dissolved-solids content is a major limitation on the use of water. A general classification of water based on dissolved-solids content, in mg/l, is as follows (Winslow and Kister, 1956, p. 5): Waters containing less than 1,000 mg/l of dissolved solids are considered fresh; 1,000 to 3,000 mg/l, slightly saline; 3,000 to 10,000 mg/l, moderately saline; 10,000 to 35,000 mg/l, very saline; and more than 35,000 mg/l, brine.	208	–	1,870	200		3,008	133	–	2,002	72	–	3,494	182	–	2,031	97	–	1,711
Hardness as $CaCO_3$	In most waters nearly all the hardness is due to calcium and magnesium. All of the metallic cations other than the alkali metals also cause hardness.	Consumes soap before a lather will form. Deposits soap curd on bathtubs. Hard water forms scale in boilers, water heaters, and pipes. Hardness equivalent to the bicarbonate and carbonate is called carbonate hardness. Any hardness in excess of this is called noncarbonate hardness. Waters of hardness up to 60 mg/l are considered soft; 61 to 120 mg/l, moderately hard; 121 to 180 mg/l, hard; more than 180 mg/l, very hard.	1	–	1,160	2		1,400	1	–	914	0	–	940	6	–	47	2	–	56
Sodium-adsorption ratio (SAR)	Sodium in water.	A ratio for soil extracts and irrigation waters used to express the relative activity of sodium ions in exchange reactions with soil (U.S. Salinity Laboratory Staff, 1954, p. 72, 156). Defined by the following equation: $$SAR = \frac{Na^{+}}{\sqrt{\frac{Ca^{++} + Mg^{++}}{2}}},$$ where Na^{+}, Ca^{++}, and Mg^{++} represent the concentrations in milliequivalents per liter (me/l) of the respective ions.	.1	–	98.1	.1	–	85.6	.2	–	73.2	.2	–	129.5	3.1		117.2	.7	–	75.0
Residual sodium carbonate (RSC)	Sodium and carbonate or bicarbonate in water.	As calcium and magnesium precipitate as carbonates in the soil, the relative proportion of sodium in the water is increased (Eaton, 1950, p. 123-133). Defined by the following equation: $$RSC = (CO_3^{--} + HCO_3^{-}) - (Ca^{++} + Mg^{++})$$ where CO_3^{--}, HCO_3^{-}, Ca^{++}, and Mg^{++} represent the concentrations in milliequivalents per liter (me/l) of the respective ions.	0	–	13.8	0	–	132	0	–	11.1	0	–	19.2	1.1		12.6	0	–	11.8
Specific conductance (micromhos at 25°C)	Mineral content of the water.	Indicates degree of mineralization. Specific conductance is a measure of the capacity of the water to conduct an electric current. Varies with concentration and degree of ionization of the constituents.	338	–	2,646	345	–	5,280	201		4,030	139	–	6,060	315	–	3,590	527	–	2,680
Hydrogen ion concentration (pH)	Acids, acid-generating salts, and free carbon dioxide lower the pH. Carbonates, bicarbonates, hydroxides, phosphates, silicates, and borates raise the pH.	A pH of 7.0 indicates neutrality of a solution. Values higher than 7.0 denote increasing alkalinity; values lower than 7.0 indicate increasing acidity. pH is a measure of the activity of the hydrogen ions. Corrosiveness of water generally increases with decreasing pH. However, excessively alkaline waters may also attack metals. The Texas Department of Health (1977) recommends a pH greater than 7.	6.1	–	9.4	6.6	–	10.4	6.8	–	9.3	6.1	–	9.4	7.6	–	8.9	6.2	–	9.1
Percent Sodium	Sodium in water.	A ratio (using me/l) of the sodium ions to the total sodium, calcium, and magnesium ions. A percent Na exceeding 50 percent is a warning of a sodium hazard. Continued irrigation with this type of water will impair the tilth and permeability of the soil.	5.2	–	100	2.1		100	6.7	–	100	3.8		100	20.0	–	99.5	34.4	–	99.6

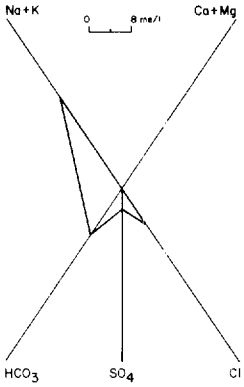
36 023



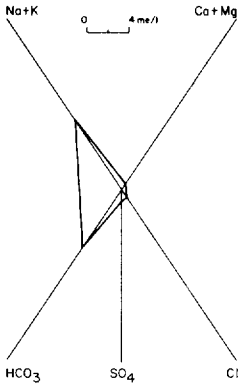
Native Ground Water
Well HA-19-21-902
Depth: 683ft. (208m)
Aquifer: Antlers



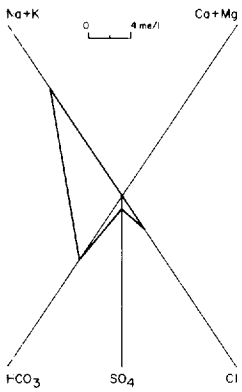
Apparently Contaminated Water
Well TR-19-13-701
Depth: 324ft. (99m)
Aquifer: Antlers



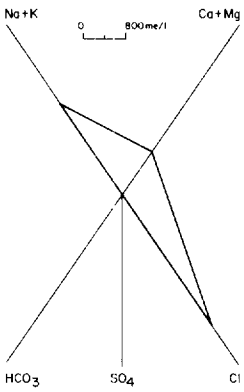
Native Ground Water
Well HR-33-27-202
Depth: 3,669ft. (1,118m)
Aquifer: Twin Mountains



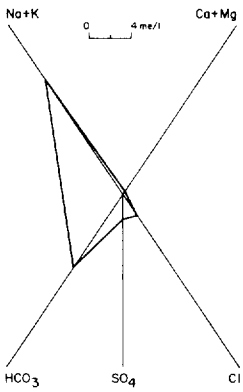
Native Ground Water
Well LY-32-34-602
Depth: 225ft. (69m)
Aquifer: Twin Mountains



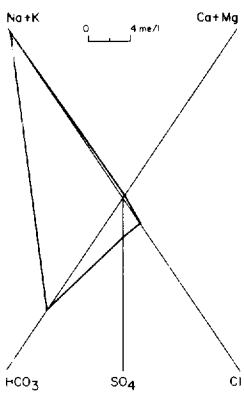
Native Ground Water
Well PH-17-41-902
Depth: 580ft. (177m)
Aquifer: Nacatoch Sand



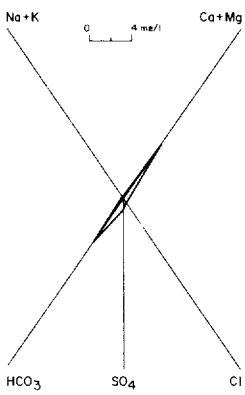
Illinois-Bend Field
Brine produced from Pennsylvanian
Montague County



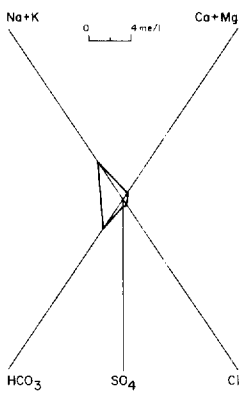
Native Ground Water
Well RT-17-21-710
Depth: 168ft. (51m)
Aquifer: Blossom Sand



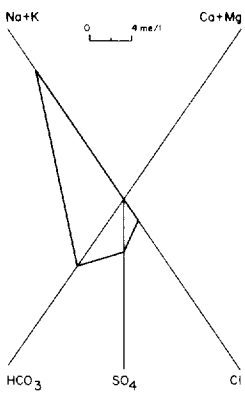
Native Ground Water
Well WB-17-22-902
Depth: 2,025ft. (617m)
Aquifer: Paluxy



Native Ground Water
Well UP-32-11-801
Depth: 231ft. (70m)
Aquifer: Paluxy



Native Ground Water
Well HW-18-33-809
Depth: 280ft. (85m)
Aquifer: Woodbine



Native Ground Water
Well JS-18-32-501
Depth: 1,660ft. (506m)
Aquifer: Woodbine

Distance along each axis shows concentration of ions (in milliequivalents per liter) expressed as a percentage of the total concentration of dissolved solids.

Figure 5

Diagrams of Chemical Analyses of Ground Water and a Typical Oil-Field Brine

apply to all of the public water systems of Texas and became effective June 1977. The responsibility for enforcement of these standards was assumed by the Texas Department of Health on July 1, 1977. Minor revision of the standards became effective on November 30, 1977.

As defined by the Texas Department of Health, municipal systems are classified as follows:

1. A "public water system" is any system for the delivery to the public of piped water for human consumption, if such a system has 4 or more service connections or regularly serves at least 25 individuals daily at least 60 days out of the year.

2. A "community water system" is any system which serves at least 4 or more service connections or regularly serves 25 permanent type residents for at least 180 days per year.

3. A "non-community water system" is any public water system which is not a community water system.

Standards which relate to municipal supplies are of two types: (1) primary and (2) secondary. Primary standards are devoted to constituents and regulations affecting the health of consumers. Secondary standards are those which deal with the esthetic qualities of drinking water. Contaminants for which secondary maximum contaminant levels are set in these standards do not have a direct impact on the health of the consumers, but their presence in excessive quantities may discourage the use of the water.

Primary Standards

Primary standards for dissolved minerals apply to community water systems and are as follows:

Contaminant	Maximum concentration (mg/l)
Arsenic (As)	0.05
Barium (Ba)	1.0
Cadmium (Cd)	.OlO
Chromium (Cr6)	.05
Lead (Pb)	.05
Mercury (Hg)	.002
Selenium (Se)	.Ol
Silver (Ag)	.05
Nitrate (as NO_3)	45
Nitrate (as N)	10

Except for nitrate content, none of the above contaminant levels for toxic minerals applies to non-community water systems. The maximum of 10 mg/l nitrate as nitrogen (about 45 mg/l nitrate as NO_3) applies to community and non-community systems alike.

Maximum fluoride concentrations are applicable to community water systems and they vary with the annual average of the maximum daily air temperature at the location of the system. These are shown in the following tabulation:

Temperature (^{0}F)	Ternperature (^{o}C)	Maximum concentration (mg/l)
63.9 to 70.6	17.7 to 21.4	1.8
70.7 to 79.2	21.5 to 26.2	1.6
79.3 to 90.5	26.3 to 32.5	1.4

Maximum contaminant limits for organic chemicals, as specified, apply to community water systems and are as follows:

Constituent	Maximum concentration (mg/l)
1. Chlorinated hydrocarbons:	
Endrin (1,2,3,4,10,10-hexachloro-6,7,-epoxy-1,4,4a,5,6,7,8,8a-octahydro-1,4-endo, endo-5,8-dimethano napthalene).	0.0002
Lindane (1,2,3,4,5,6 hexachloro-cyclohexane, gamma isomer).	.004
Methoxychlor (I,1,l-Trichloro-2,2-bis [p-methoxyphenyl] ethane).	.I
Toxaphene ($C_{10}H_{10}$ &Cl_8-Technical chlorinated camphene, 67-69 percent chlorine).	005
2. Chlorophenoxys:	
2,4-D (2,4-Dichlorophenoxyacetic acid).	.I
2,4,5-TP Silvex (2,4,5-Trichlorophenoxypropionic acid).	.0l

Maximum levels for coliform bacteria, as specified by the Texas Department of Health, apply to

36 025

community and non-community water systems. The limits specified are basically the same as in the 1962 Public Health Service Standards which have been widely adopted in most states.

In addition to the previously stated requirements, there are also stringent rules regarding general sampling and the frequency of sampling which apply to all public water systems. Additionally, community water systems are subject to rigid radiological sampling and analytical requirements.

Secondary Standards

Recommended secondary standards applicable to all public water systems are given in the following table:

Constituent	Maximum level
Chloride (Cl)	300 mg/l
Color	15 color units
Copper (Cu)	1 .O mg/l
Corrosivity	non-corrosive
Foaming agents	.5 mg/l
Hydrogen sulfide (H_2S)	.05 mg/l
Iron (Fe)	.3 mg/l
Manganese (Mn)	.05 mg/l
Odor	3 Threshold Odor Number
pH	> 7.0
Sulfate (SO_4)	300 mg/l
Dissolved solids	1,000 mg/l
Zinc (Zn)	5.0 mg/l

The above secondary standards are recommended limits, except for water systems which are not in existence as of the effective date of these standards. For water systems which are constructed after the effective date, no source of supply which does not meet the recommended secondary standards may be used without written approval by the Texas Department of Health. The determining factor will be whether there is an alternate source of supply of acceptable chemical quality available to the area to be served.

After July 1, 1977, for all instances in which drinking water does not meet the recommended limits and is accepted for use by the Texas Department of Health, such acceptance is valid only until such time as water of acceptable chemical quality can be made available at reasonable cost to the area in question from an alternate source. At such time, either the water which was previously accepted would have to be treated to lower the constituents to acceptable levels, or water would have to be secured from the alternate source.

Domestic and Livestock

Ideally, waters used for rural domestic purposes should be as free of contaminants as those used for municipal purposes; however, this is not economically possible. At present, there are no controls placed on private domestic or livestock wells. In general, the chemical constituents of waters used for domestic purposes should not exceed the concentrations shown in the following table, except in those areas where more suitable supplies are not available (Texas Department of Health, 1977).

Substance	Maximum concentration (mg/l)
Chloride (Cl)	300
Fluoride (F)	1.6 *
Iron (Fe)	.3
Manganese (Mn)	.05
Nitrate (as; N)	10
Nitrate (as NO_3)	45
Sulfate (SO_4)	300
Dissolved solids	1,000

'Maximum fluoride limit based on annual average of maximum daily air temperature range of 70.7 to 79.Z°F (21.5 to 26.2°C).

Many areas of north-central Texas do not have and cannot obtain domestic water supplies which meet the above recommended standards; however, supplies which do not meet these standards have been used for long periods of time without any apparent ill effects to the user. It is not generally recommended that water used for drinking purposes contain more than a maximum of 2,000 mg/l dissolved solids; however, water containing somewhat higher mineral concentrations has been used where water of better quality was not available.

Generall'y, water used for livestock purposes is subject to the same quality limitations as those relating to drinking water for humans; however, the tolerance limits of the v8ars chemical constituents as well as the dissolved-solids concentration may be considerably higher for livestock than that which is considered satisfactory for human consumption. The type of animal, the kind of soluble salts, and the respective amount of soluble salts determine the tolerance limits (Heller, 1933, p. 22). In the western United States, cattle may tolerate drinking water containing nearly 10,000 mg/l dissolved solids providing these waters contain mostly sodium and chloride (Hem, 1970, p. 324). Waters containing high concentrations of sulfate are usually considered undesirable for livestock use.

Many investigators recommend an upper limit of dissolved solids near 5,000 mg/l as necessary for maximum growth and reproduction. Hem (1970, p. 324) cited a publication of the Department of Agriculture of the state of Western Australia as recommending the following maximum upper limits for dissolved-solids concentration in livestock water.

Animal	Maximum dissolved-solids concentration (mg/l)
Poultry	2,860
Hogs	4,290
Horses	6,435
Cattle (dairy)	7,150
Cattle (beef)	10,100
Sheep (adult)	12,900

Water having concentrations of chemical constituents in excess of the Texas Department of Health's standards may be objectionable for many reasons. Brief explanations for these objections, as well as the significance of each constituent, are given in Table 2.

Industrial

The chemical quality of ground water from the Cretaceous aquifers is generally favorable for industrial use throughout most of the study region. The tolerance in chemical quality of water for industrial use differs widely for different industries and different processes. Suggested water-quality tolerances are presented in Table 3.

Irrigation

The chemical composition of ground water is important in determining its usefulness for irrigation in that it should not adversely affect the productivity of the land. The extent to which chemical quality limits the suitability of ground water for irrigation depends on the nature, composition, and drainage of the soil and subsoil; the amounts of water used and methods of application; the kinds of crops grown; and the climate of the region, including the amounts and distribution of rainfall.

The characteristics of an irrigation water that seem to be most important in determining its quality are: 1) total concentration of soluble salts; 2) relative proportion of sodium to other principal cations (magnesium, calciurr, and potassium); 3) concentration of boron or other elements that may be toxic; and 4) under some conditions, the bicarbonate concentration as related to the concentration of calcium plus magnesium. These have been termed the salinity hazard, the sodium (alkali) hazard, the boron hazard, and the bicarbonate ion hazard (U.S. Salinity Laboratory Staff, 1954, p. 69-82; Wilcox, 1955, p. 11-12; and Lyerly and Longenecker, 1957, p. 13-15).

For purposes of diagnosis and classification, the total concentration of soluble salts (salinity hazard) in irrigation water can be adequately expressed in terms of specific conductance. Specific conductance is the measure of the ability of the ionized organic salts in solution to conduct an electrical current, and is usually expressed in terms of micromhos per centimeter at 25°C (77°F). In general, water having a conductance below 750 micromhos per centimeter is satisfactory for irrigation insofar as salt content is concerned, although salt-sensitive crops may be adversely affected by irrigation water having a conductance in the range of 250 to 750 micromhos per centimeter. Water in the range of 750 to 2,250 micromhos per centimeter is widely used, and satisfactory crop growth is obtained under good management (U.S. Salinity Laboratory Staff, 1954).

In the past, the sodium hazard had been expressed simply as the percent sodium and was divided into the following three classes: (a) water with a percent sodium less than 60, excellent to good; (b) water with a percent sodium between 60 and 75, good to injurious, and (c) water with a percent sodium greater than 75, injurious to unsatisfactory. A better measure of the sodium hazard of water for irrigation is the sodium-adsorption ratio (SAR) which is used to express the relative activity of sodium ions in exchange reactions with soil. The SAR is easily computed from the data determined in the usual water analysis by using the equation found in Table 2.

When the SAR and the specific conductance of a water are known, the classification of the water for irrigation can be determined by graphically plotting these values on the diagram shown in Figure 6. Low sodium water (SI) can be used for irrigation on almost all soils with little danger of the development of harmful levels of exchangeable sodium. Medium-sodium water (S2) will present an appreciable sodium hazard in certain fine-textured soils having high cation-exchange capacity under low leaching conditions. This water may be used on coarse-textured or organic soils having good permeability. High-sodium water (S3) may produce harmful levels of exchangeable sodium in most soils and will require special soil management. Very high sodium water (S4) is generally unsatisfactory for irrigation unless special action is taken, such as addition of gypsum

Table 3.--Water-Quality Tolerances for Industrial Application[1]

(Allowable Limits in Milligrams Per Liter Except as Indicated)

Industry	Turbidity	Color	Color $+O_2$ consumed	Dissolved oxygen (ml/l)	Odor	Hardness	Alkalinity (as $CaCO_3$)	pH	Total solids	Ca	Fe	Mn	Fe+Mn	Al_2O_3	SiO_2	Cu	F	CO_3	HCO_3	OH	$CaSO_4$	Na_2SO_4 to Na_2SO_3 ratio	General[2]
Air Conditioning[3]	--	--	--	--	--	--	--	--	--	--	0.5	0.5	0.5	--	--	--	--	--	--	--	--	--	A, B
Baking	10	10	--	--	--	(4)	--	--	--	--	.2	.2	.2	--	--	--	--	--	--	--	--	--	C
Boiler feed:																							
0-150 psi	20	80	100	2	--	75	--	8.0+	3,000-1,000	--	--	--	--	5	40	--	--	200	50	50	--	1 to 1	--
150-250 psi	10	40	50	.2	--	40	--	8.5+	2,500-500	--	--	--	--	.5	20	--	--	100	30	40	--	2 to 1	--
250 psi and up	5	5	10	0	--	8	--	9.0+	1,500-100	--	--	--	--	.05	5	--	--	40	5	30	--	3 to 1	--
Brewing:[5]																							
Light	10	--	--	--	Low	--	75	6.5-7.0	500	100-200	.1	.1	.1	--	--	--	1	--	--	--	100-200	--	C, D
Dark	10	--	--	--	Low	--	150	7.0+	1,000	200-500	.1	.1	.1	--	--	--	1	--	--	--	200-500	--	C, D
Canning:																							
Legumes	10	--	--	--	Low	25-75	--	--	--	--	.2	.2	.2	--	--	--	--	--	--	--	--	--	C
General	10	--	--	--	Low	--	--	--	--	--	.2	.2	.2	--	--	--	1	--	--	--	--	--	C
Carbonated beverages[6]	2	10	10	--	0	250	50	--	850	--	.2	.2	.3	--	--	--	.2	--	--	--	--	--	C
Confectionary	--	--	--	--	Low	--	--	(7)	100	--	.2	.2	.2	--	--	--	--	--	--	--	--	--	--
Cooling[8]	50	--	--	--	--	50	--	--	--	--	.5	.5	.5	--	--	--	--	--	--	--	--	--	A, B
Food, general	10	--	--	--	Low	--	--	--	--	--	.2	.2	.2	--	--	--	--	--	--	--	--	--	C
Ice (raw water)[9]	1-5	5	--	--	--	--	30-50	--	300	--	.2	.2	.2	--	10	--	--	--	--	--	--	--	C
Laundering	--	--	--	--	--	50	--	--	--	--	.2	.2	.2	--	--	--	--	--	--	--	--	--	--
Plastics, clear, undercolored	2	2	--	--	--	--	--	--	200	--	.02	.02	.02	--	--	--	--	--	--	--	--	--	--
Paper and pulp:[10]																							
Groundwood	50	20	--	--	--	180	--	--	--	--	1.0	.5	1.0	--	--	--	--	--	--	--	--	--	A
Kraft pulp	25	15	--	--	--	100	--	--	300	--	.2	.1	.2	--	--	--	--	--	--	--	--	--	--
Soda and sulfite	15	10	--	--	--	100	--	--	200	--	.1	.05	.1	--	--	--	--	--	--	--	--	--	--
Light paper, HL-Grade	5	5	--	--	--	50	--	--	200	--	.1	.05	.1	--	--	--	--	--	--	--	--	--	B
Rayon (viscose) pulp:																							
Production	5	5	--	--	--	8	50	--	100	--	.05	.03	.05	< 8.0	< 25	< 5	--	--	--	--	--	--	--
Manufacture	.3	--	--	--	--	55	--	7.8-8.3	--	--	.0	.0	.0	--	--	--	--	--	--	--	--	--	--
Tanning[11]	20	10-100	--	--	--	50-135	135	8.0	--	--	.2	.2	.2	--	--	--	--	--	--	--	--	--	--
Textiles:																							
General	5	20	--	--	--	20	--	--	--	--	.25	.25	--	--	--	--	--	--	--	--	--	--	--
Dyeing[12]	5	5-20	--	--	--	20	--	--	--	--	.25	.25	.25	--	--	--	--	--	--	--	--	--	--
Wool scouring[13]	--	70	--	--	--	20	--	--	--	--	1.0	1.0	1.0	--	--	--	--	--	--	--	--	--	--
Cotton bandage[13]	5	5	--	--	Low	20	--	--	--	--	.2	.2	.2	--	--	--	--	--	--	--	--	--	--

1/ American Water Works Association, 1950.
2/ A--No corrosiveness; B--No slime formation; C--Conformance to Federal drinking water standards necessary; D--NaCl, 275 mg/l.
3/ Waters with algae and hydrogen sulfide odors are most unsuitable for air conditioning.
4/ Some hardness desirable.
5/ Water for distilling must meet the same general requirements as for brewing (gin and spirits mashing water of light-beer quality; whiskey mashing water of dark-beer quality).
6/ Clear, odorless, sterile water for syrup and carbonization. Water consistent in character. Most high quality filtered municipal water not satisfactory for beverages.
7/ Hard candy requires pH of 7.0 or greater, as low value favors inversion of sucrose, causing sticky product.
8/ Control of corrosiveness is necessary as is also control of organisms, such as sulfur and iron bacteria, which tend to form slimes.
9/ Ca $(HCO_3)_2$ particularly troublesome. $Mg(HCO_3)_2$ tends to greenish color. CO_2 assists to prevent cracking. Sulfates and chlorides of Ca, Mg, Na should each be less than 300 mg/l (white butts).
10/ Uniformity of composition and temperature desirable. Iron objectionable as cellulose adsorbs iron from dilute solutions. Manganese very objectionable, clogs pipelines and is oxidized to permanganates by chlorine, causing reddish color.
11/ Excessive iron, manganese, or turbidity creates spots and discoloration in tanning of hides and leather goods.
12/ Constant composition; residual alumina 0.5 mg/l.
13/ Calcium, magnesium, iron, manganese, suspended matter, and soluable organic matter may be objectionable.

36 028

to the soil (Lyerly and Longenecker, 1957, p. 14-15). Low-salinity water (C1) can be used for irrigation of most crops on most soils with little likelihood that soil salinity will develop. Medium-salinity water (C2) can be used if a moderate amount of leaching occurs. High salinity water (C3) cannot be used on soils with restricted drainage. Very high-salinity water (C4) is not suitable for irrigation under ordinary conditions.

Boron is necessary for plant growth, but is highly toxic and unsuitable for irrigation at concentrations only slightly more than optimum. Scofield (1936, p. 286) suggests the following permissible limits of boron for irrigation water:

Classes of water

Rating	Grade	Sensitive crops (mg/l)	Semitolerant crops (mg/l)	Tolerant crops (mg/l)
1	Excellent	< 0.33	< 0.67	< 1.00
2	Good	.33 to .67	.67 to 1.33	1.00 to 2.00
3	Permissible	.67 to 1.00	1.33 to 2.00	2.00 to 3.00
4	Doubtful	1.00 to 1.25	2.00 to 2.50	3.00 to 3.75
5	Unsuitable	> 1.25	> 2.50	> 3.75

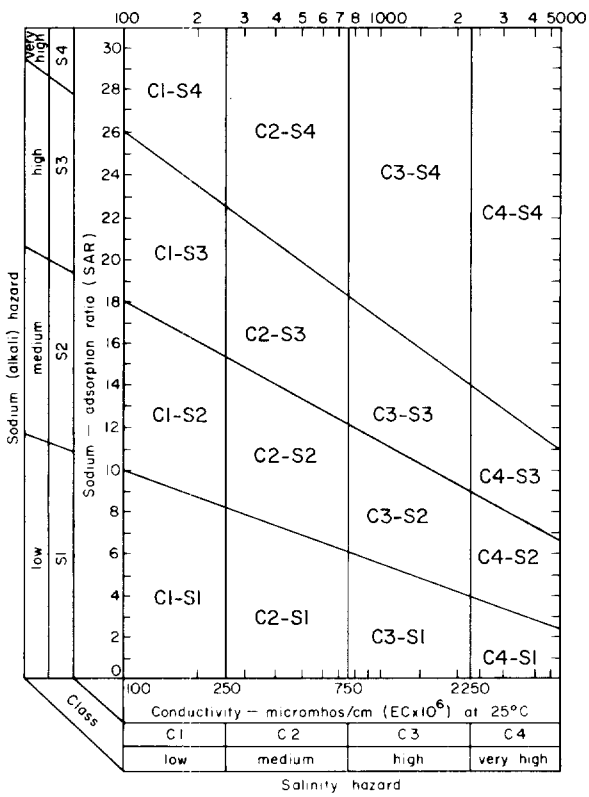


Figure 6.—Diagram for the Classification of Irrigation Waters (After United States Salinity Laboratory Staff, 1954, p. 80)

In water having high concentrations of bicarbonate, there is a tendency for calcium and magnesium to precipitate as the water in the soil becomes more concentrated. Due to this reaction, the relative proportion of sodium in the water is increased in the form of sodium carbonate. Using this residual sodium carbonate (RSC) concept, it was concluded by the U.S. Department of Agriculture that water having more than 2.50 milliequivalents per liter (me/l) RSC is not suitable for irrigation purposes. Water containing 1.25 to 2.50 me/l RSC is marginal, and water containing less than 1.25 me/l is safe. The method of calculating RSC is found in Table 2.

In appraising the quality of an irrigation water, first consideration must be given to salinity and sodium hazards. Then consideration should be given to independent characteristics such as boron and bicarbonate, either of which may change the quality rating. The use of water of any quality must take into account such factors as drainage and management practices.

Most irrigation wells in the study area are scattered over the Trinity and Woodbine outcrops with only a few areas of concentrated activity. Occasionally deeper wells are found downdip from the outcrop and are used primarily to irrigate golf courses. Approximately 5,000 acre-feet (6.17 hm^3) of water was pumped for irrigation purposes in 1977 from Cretaceous formations in the

study area, with about 55 percent of the water from the Woodbine Group. The largest concentration of irrigation wells is located on the Woodbine outcrop in an area bounded by western Grayson County, the eastern edge of Cooke County, and the northeastern corner of Denton County. Approximately 80 irrigation wells operate in this area and several produce as much as 900 gpm (56.8 l/s). Several smaller irrigation well developments are located in Parker and Hood Counties (Twin Mountains) and in Wise County (Antlers). There are also irrigation wells in Fannin County producing from the alluvium along the Red River, but not enough water-quality data were collected for inclusion in this study.

OCCURRENCE AND DEVELOPMENT OF GROUND WATER

Antlers Formation

The Antlers combines the ground-water availablity of both the Paluxy and Twin Mountains Formations to the south (Table I). Small-capacity wells tap the upper part of the Antlers while large production wells pump from either the lower section or the entire aquifer.

The primary source of ground water in the Antlers Formation is precipitation on the outcrop. The average annual precipitation on the outcrop is about 32 inches (81.3 cm), and the mean annual temperature is about 64^0F (18^0C). Surface-water seepage from lakes and streams on the outcrop is also a source of ground water. Water in the outcrop area is unconfined and therefore under water-table conditions. Downdip from the outcrop, the water in confined under hydrostatic pressure and is under artesian conditions.

Recharge to the sandy portion of the 650 square miles (1,684 km^2) of Antlers outcrop is less than 1 inch (2.5 cm) of precipitation per year. The rate of movement of water through an aquifer depends upon the permeability, porosity, and hydraulic gradient. The average rate of movement of water in the Antlers is about 1 to 2 feet (0.3 to 0.6 m) per year (Baker, 1960, p. 37). Ground water moves slowly downdip in an east-southeast direction. Water-level measurements indicate the present gradient of the piezometric surface is 7 to 24 feet per mile (1.3 to 4.5 m/km) except for local fluctuations and around areas of heavy
In areas of heavy pumping, a cone of depression forms and the direction of ground-water movement is toward these points of discharge from all directions. Altitudes of water levels about 1955 and about 1976 are shown on Figures 24 and 25. Cones of depression can be seen around the cities of Gainesville and Sherman.

Wells tap the Antlers in the outcrop area of Montague and Wise Counties and in the downdip areas of Cooke, Denton, and Grayson Counties. Discharge from the Antlers occurs naturally through the pumpage of water wells. In 1976, approximately 10,760 acre-feet (13.3 hm^3) of water was pumped from the Antlers in this area.

Table 4 shows the results of pumping tests conducted in the study region, including the aquifer coefficients of storage, permeability, transmissibility, and specific capacities. The locations of the tests and the coefficients of transmissibility and permeability are shown on Figure 26. Test results were obtained from existing literature and data reported by well drillers. Permeability coefficients were computed by dividing the transmissibility of the well by its screened interval. Net sand thicknesses throughout the aquifer are illustrated on Figure 27..

Transmissibility values were considerably higher for wells tested in Cooke County than in Grayson County. Results of the eight tests conducted on wells in the vicinity of Gainesville showed a range of transmissibilities of 5,800 to 17,879 (gal/d)/ft, or 72,000 to 222,000 (l/s)/m, with an average value of 9,970 (gal/d)/ft, or 123,800 (l/s)/m. In contrast with this area, the range of transmissibilities of nine tests conducted in the Sherman vicinity was 1,860 to 4,727 (gal/d)/ft, or 23,100 to 58,700 (l/s)/m, with an average value of 3,735 (gal/d)/ft, or 46,400 (l/s)/m. Similarly, the coefficients of permeability around Gainesville averaged about 53 (gal/d)/ft^2, or 2,200 (l/s)/m^2 while in the Sherman area, the average was 24 (gal/d)/ft^2, or 978 (l/s)/m^2.

Only two coefficient of storage values, both in Sherman, were determined by the U.S. Geological Survey in 1945. An approximate value of 2.5 X 10^{-4} seems representative for this area. The average artesian storage coefficient was estimated by multiplying the average net saturated sand thickness, in feet, by 10^{-6} per foot, which is proper for most confined aquifers (Lohman, 1972, p. 8).

The specific yield of the Antlers is on the order of 20 to 25 percent as estimated by seismic methods (Duffin and Elder, 1979). The yields from the Antlers range from less than 20 (1.3 l/s) to 920 gal/min (58 l/s), with an average of 200 gal/min (13 l/s) for the 119 measured wells. Yields were highest around Gainesville and Sherman because these wells penetrate the total thickness of the aquifer and are screened opposite all

Table 4.—Results of Pumping Tests

Aquifer: Kca, Antlers Formation; Kcpa, Paluxy Formation; Kct, Trinity Group; Kctm, Twin Mountains Formation; Kgbl, Blossom Sand of Austin Group; Kgna, Nacatoch Sand of Navarro Group; Kgw, Woodbine Group.

Coefficient of transmissibility values shown are the averages from drawdown and recovery test data.

Well	Aquifer	Test Date	Screened from (ft)	Interval to (ft)	Yield (gal/min)	Coefficient of Transmissibility [(gal/d)/ft]	Coefficient of storage	Coefficient of Permeability [(gal/d)/ft^2]	Specific Capacity [(gal/min)/ft]
				Collin County					
DT-18-44-202	Kgw	Apr. 6, 1976	1,300	1,526	150	1,885	--	17	1.1
50-501	Kctm	Sept. 18, 1953	2,266	2,515	1,940	20,683	--	83	11.3
502	do	Mar. 20, 1954	2,378	2,640	1,845	21,486	--	82	12.2
504	Kcpa	July 26, 1973	1,333	1,652	238	1,263	--	6	1.0
51-301	Kctm	Oct. 22, 1952	3,110	3,410	690	29,724	--	99	7.7
				Cooke County					
HA-19-23-401	Kca	Aug. 29, 1942	--	--	385	5,800	--	--	2.0
503	do	Aug. 23, 1942	660	910	340	9,250	--	44	5.0
		Aug. 17, 1960	660	910	580	12,303	--	67	5.0
805	do	Aug. 4, 1971	629	893	818	10,972	--	54	8.2
901	do	May 8, 1952	723	890	375	8,316	--	55	1.7
903	do	May 30, 1960	767	927	320	17,879	--	--	18.5
906	do	Mar. 5, 1965	754	961	800	6,414	--	43	3.7
31-302	do	Mar. 28, 1959	726	978	720	8,818	--	53	4.8
				Dallas County					
HR-33-01-301	Kctm	May 7, 1957	2,017	2,260	1,254	20,130	--	100	9.7
02-102	do	May 27, 1975	2,245	2,455	1,697	17,256	--	102	7.1
09-102	do	June 27, 1973	1,930	2,120	759	13,905	--	99	5.9
402	do	May 20, 1965	1,922	2,074	708	17,076	--	112	6.3
403	do	Apr. 3, 1972	1,924	2,077	754	12,141	--	80	6.2
507	do	Oct. 10, 1972	2,102	2,240	759	13,085	--	106	5.5
508	do	Jan. 14, 1972	1,999	2,145	703	17,718	--	124	7.7
701	do	May 4, 1965	1,880	2,039	708	8,400	--	53	6.1
908	Kcpa	Nov. 29, 1965	1,375	1,504	317	6,118	--	62	2.8
10-501	Kctm	Nov. 14, 1948	2,567	2,734	1,014	17,000	9×10^{-5}	102	--
805	do	Nov. 14, 1948	2,534	2,735	511	16,300	8×10^{-5}	81	4.1
831	Kcpa	Nov. 17, 1948	--	--	166	2,890	2×10^{-5}	--	0.7
17-115	Kctm	Oct. 19, 1953	1,900	2,065	480	12,500	2×10^{-4}	76	--
802	do	Mar. 31, 1969	2,394	2,518	638	3,660	--	31	2.8
18-201	do	Apr. 11, 1955	2,620	2,883	750	12,300	5×10^{-5}	47	--
803	do	Nov. 6, 1973	2,904	3,088	1,051	13,242	--	--	6.9
26-104	do	June 4, 1964	2,604	2,745	650	7,692	--	55	3.4
105	do	Aug. 5, 1968	2,644	2,814	715	10,397	--	61	4.1
27-205	do	Sept. 29, 1964	3,322	3,442	300	3,593	--	30	3.3
602	Kgw	June 1, 1965	1,288	1,352	170	4,700	--	78	4.2
				Delta County					
HU-17-42-806	Kgna	Oct. 14, 1965	422	525	200	2,300	--	29	1.0
807	do	Nov. 15, 1965	507	620	254	2,563	--	28	1.2
808	do	Dec. 8, 1965	425	525	200	2,151	--	26	1.0
				Denton County					
HW-18-33-703	Kca	May 10, 1957	1,372	1,514	167	4,900	--	35	--
57-602	Kctm	Nov. 19, 1974	2,235	2,390	795	12,369	--	--	10.2
19-47-901	Kctm, Kcpa	July 8, 1960	770	1,184	888	6,900	--	28	3.4
55-305	Kctm	Dec. 15, 1948	1,029	1,130	450	4,150	5×10^{-5}	46	--
56-101	co	Dec. 1, 1948	1,082	1,214	450	4,150	5×10^{-5}	23	--
103	co	Dec. 1, 1951	1,055	1,200	450	5,020	--	34	5.0
104	Kct	May 14, 1957	624	1,142	670	3,000	--	19	5.1
64-905	Kctm	Jan. 20, 1972	1,690	1,892	560	8,963	--	47	6.4
906	Kcpa	Mar. 27, 1972	853	944	236	5,197	--	84	0.7
32-07-205	Kctm	June 17, 1974	1,291	1,391	510	12,680	--	127	4.8

Table 4.—Results of Pumping Tests—Continued

Aquifer: Kca, Antlers Formation; Kcpa, Paluxy Formation; Kct, Trinity Group; Kctm, Twin Mountains Formation; Kgbl, Blossom Sand of Austin Group; Kgna, Nacatoch Sand of Navarro Group; Kgw, Woodbine Group.

Coefficient of transmissibility values shown are the averages from drawdown and recovery test data.

Well	Aquifer	Test Date	Screened from (ft)	Interval to (ft)	Yield (gal/min)	Coefficient of Transmissibility [(gal/d)/ft]	Coefficient of storage	Coefficient of Permeability [(gal/d)/ft^2]	Specific Capacity [(gal/min)/ft]
				Ellis County					
JK-32-40-608	Kctm	Feb. 10, 1976	2,290	2,390	250	5,442	–	65	2.9
901	Kcpa	June 2, 1965	1,230	1,338	79	3,140	–	32	2.7
33-33-101	Kctm	June 6, 1965	2,175	2,335	450	5,900	–	39	3.0
34-702	do	Mar. 14, 1948	–	–	617	8,960	8×10^{-5}	–	2.6
703	do	do	–	–	504	8,800	9×10^{-5}	–	–
35-503	Kgw	June 2, 1965	1,330	1,390	120	11,300	–	183	3.9
41-203	Kctm	Jan. 25, 1975	2,410	2,540	160	16,547	–	165	3.1
49-602	Kgw	May 17, 1957	839	929	201 *	1,320	–	22	0.8
				Fannin County					
JS-18-01-201	Kgw	Aug. 1, 1957	1,096	1,240	740	14,000	–	75	9.3
09-702	do	June 23, 1975	1,464	1,606	300	1,371	–	14	3.8
				Grayson County					
KT-18-10-406	Kgw	Aug. 20, 1958	–	–	132	16,700	–	167	7.0
802	do	Aug. 15, 1958	189	345	145	7,870	–	84	2.2
11-802	do	Mar. 27, 1958	241	341	73	2,250	–	43	2.2
17-901	Kca	May 9, 1957	1,388	1,519	330	4,600	–	23	3.2
20-701	Kgw	July 14, 1945	721	788	249	2,400	–	42	–
702	do	do	725	776	260	2,190	9×10^{-5}	43	–
703	Kca	do	1,965	2,136	360	2,420	1×10^{-4}	17	–
704	Kgw	do	541	580	260	2,420	2×10^{-4}	22	–
705	do	do	726	785	260	2,320	1.9×10^{-4}	39	–
706	do	do	724	786	260	2,340	1.8×10^{-4}	38	–
709	Kca	do	1,382	2,084	360	3,440	2×10^{-4}	11	–
801	Kgw	Aug. 9, 1966	650	980	608	6,710	–	24	5.1
802	Kca	Jan. 17, 1967	1,510	2,214	567	4,288	–	11	3.4
804	Kgw	May 5, 1970	570	1,034	708	4,938	–	21	3.4
25-601	Kca	Apr. 8, 1957	1,355	–	110	4,500	–	23	4.2
27-801	Kgw	Oct. 10, 1973	630	934	554	2,389	–	14	2.1
802	Kca	Oct. 27, 1975	1,594	2,454	608	3,081	–	8	1.8
803	do	July 12, 1976	–	–	638	4,727	–	–	2.6
28-102	do	Jan. 28, 1959	1,590	2,420	602	4,690	–	97	3.5
103	Kgw	do	832	1,012	602	5,950	–	40	4.7
402	do	May 4, 1970	840	969	457	3,442	–	33	3.1
403	do	June 7, 1972	794	1,064	402	2,976	–	27	2.2
404	Kca	Mar. 8, 1972	1,700	2,450	510	1,860	–	5	3.4
702	Kgw	Apr. 21, 1954	908	1,054	105	7,920	–	78	2.0
29-902	do	Mar. 26, 1958	1,109	1,189	80	2,394	–	30	2.2
35-402	do	Mar. 24, 1958	655	730	52	14,700	–	178	1.5
36-502	do	July 31, 1957	1,165	1,400	250	7,900	–	99	2.7
503	Kca	July 29, 1970	2,010	2,290	250	1,100	–	6	0.6
				Hunt County					
PH-17-41-901	Kgna	Nov. 9, 1943	374	412	285	2,670	–	70	5.1
902	do	Nov. 7, 1943	375	435	285	2,660	–	44	9.3
				Johnson County					
PX-32-30-502	Kcpa	May 10, 1960	472	586	134	1,573	–	26	1.3
37-901	Kctm	Apr. 21, 1958	961	1,245	423	4,600	–	19	1.7
38-309	do	Jan. 8, 1969	1,135	1,425	164	1,948	–	8	–
901	do	Oct. 5, 1964	1,522	1,575	100	4,761	–	110	0.5
39-702	Kcpa, Kctm	May 4, 1947	766	1,634	296	4,568	–	26	2.8
45-302	Kctm	Feb. 19, 1945	898	1,204	472	4,509	–	43	2.6
304	do	Jan. 25, 1938	941	1,251	405	4,656	–	28	1.5
601	do	Apr. 12, 1955	895	1,165	560	7,400	–	31	2.8
47-802	Kcpa	Mar. 24, 1955	802	846	84	6,517	–	148	1.7
803	Kgw	Nov. 16, 1966	187	210	47	2,208	7×10^{-5}	56	–
806	do	do	182	204	47	1,837	–	84	1.0
54-101	Kctm	Dec. 6, 1966	1,137	1,215	168	4,247	–	55	1.8

Table 4.—Results of Pumping Tests—Continued

Aquifer: Kca, Antlers Formation; Kcpa, Paluxy Formation; Kct, Trinity Group; Kctm, Twin Mountains Formation; Kgbl, Blossom Sand of Austin Group; Kgna, Nacatoch Sand of Navarro Group; Kgw, Woodbine Group.

Coefficient of transmissibility values shown are the averages from drawdown and recovery test data.

Well	Aquifer	Test Date	Screened from (ft)	Interval to (ft)	Yield (gal/min)	Coefficient of Transmissibility [(gal/d)/ft]	Coefficient of storage	Coefficient of Permeability [(gal/d)/ft^2]	Specific Capacity [(gal/min)/ft]
Red River County									
WB-17-24-803	Kgbl	Dec. 3, 1969	465	530	164	1,316	–	21	1.3
32-201	do	Aug. 9, 1960	523	600	630	4,100	6×10^{-5}	54	–
203	do	Aug. 10, 1960	510	602	630	3,690	3×10^{-5}	41	–
39-508	Kgna	Aug. 16, 1972	150	270	349	6,330	–	53	3.6
Tarrant County									
XU-32-07-602	Kctm	May 15, 1972	1,500	1,573	602	6,667	–	92	4.1
13-701	Kcpa	Mar. 24, 1954	–	–	100	3,100	3.4×10^{-4}	–	–
703	do	do	–	–	–	7,500	–	72	3.3
901	do	May 27, 1955	–	–	60	4,100	7.4×10^{-5}	–	–
14-609	Kctm	Dec. 4, 1954	958	1,090	361	6,860	–	69	2.8
701	do	Dec. 3, 1953	867	964	247	3,250	6.2×10^{-5}	34	–
702	do	Aug. 12, 1954	855	952	236	2,900	7.6×10^{-5}	30	–
15-104	Kcpa	May 19, 1961	575	692	164	13,808	–	138	3.0
105	do	Apr. 26, 1961	434	549	107	2,934	–	28	1.3
207	do	Apr. 24, 1961	538	677	101	1,536	–	18	0.7
15-401	Kcpa	Mar. 17, 1954	460	522	80	2,660	1.2×10^{-4}	37	0.7
412	Kctm	June 10, 1955	1,059	1,225	412	3,580	–	28	3.4
413	Kcpa	Aug. 1, 1961	511	624	105	3,126	–	35	2.0
507	Kctm	Jan. 12, 1965	1,232	1,428	717	9,756	–	60	6.4
512	do	June 9, 1966	1,219	1,350	708	9,147	–	70	4.0
601	do	Mar. 20, 1955	1,179	1,450	793	11,789	–	85	5.0
902	Kcpa	June 4, 1954	668	809	408	6,150	–	49	3.1
16-503	Kgw	Mar. 22, 1951	236	266	15	2,740	–	91	1.2
21-204	Kcpa	Aug. 11, 1962	280	375	107	3,312	–	42	1.3
405	do	Mar. 12, 1960	193	248	126	2,867	–	60	1.6
502	do	Mar. 25, 1960	209	270	105	2,164	–	48	1.4
22-601	do	Apr. 9, 1953	209	270	52	4,250	1.8×10^{-4}	–	–
702	do	Aug. 17, 1953	380	450	80	3,350	–	70	1.9
901	Kctm	June 18, 1972	1,108	1,335	455	6,231	–	47	4.5
907	Kcpa	June 19, 1965	507	580	108	10,937	–	150	2.7
909	Kctm	Aug. 1, 1966	1,042	1,280	556	8,925	–	72	4.7
910	Kcpa	July 31, 1962	488	586	125	2,005	–	25	1.2
23-101	Kctm	Aug. 21, 1945	1,154	1,334	260	11,000	6×10^{-5}	74	2.8
102	do	Nov. 7, 1950	1,180	1,340	768	8,837	–	59	3.9
103	do	Jan. 8, 1954	–	–	259	7,400	4×10^{-5}	37	3.9
104	do	Aug. 25, 1948	1,210	1,330	240	7,850	5×10^{-5}	65	2.5
106	do	do	1,239	1,359	473	10,000	–	83	3.4
108	do	Jan. 11, 1954	1,305	1,423	260	9,000	7×10^{-5}	95	–
401	do	Feb. 15, 1951	1,004	1,326	705	9,800	–	54	2.9
404	Kctm	Jan. 21, 1971	1,064	1,350	708	1,525	–	–	3.8
603	Kcpa	May 5, 1954	628	776	465	3,900	–	43	1.0
802	Kctm	May 26, 1966	1,408	1,580	503	16,795	–	125	4.6
24-101	do	Sept. 16, 1942	1,567	1,751	450	12,500	–	68	4.5
202	Kcpa	Feb. 26, 1954	888	1,058	402	6,300	–	45	3.2
31-605	Kctm	Apr. 2, 1955	1,592	1,708	390	6,700	–	69	2.7

36 033

fresh water-bearing sands. The specific capacity of a well is generally expressed as the ratio of the yield in gallons per minute (liters per second) to the drawdown in feet (meters). A word of caution must be used in comparing specific capacities of wells. The method of well completion is an important function of specific capacity. For example, a gravel-walled and screened well of the same diameter and in the same location as a well with either torch-slotted or gun-perforated casing would have a considerably higher specific capacity. Specific capacir es of 63 wells that obtain water from the Antlers Formation in the study region ranged from 0.3 to 8.5 (gal/min)/ft or 0.06 to 1.8 (l/s)/m, with an average of 2.7 (gal/min)/ft or 0.56 (l/s)/m.

Except for water levels in wells on or near the outcrop, static levels have been steadily declining over the years. Long-range declines have averaged up to 7 feet (2 m) per year, with as much as 10 ft/yr (3 m/yr) during recent measurements in developed areas. Figure 28 shows the approximate change in water levels in Antlers wells from about 1955 to about 1976. Hydrographs showing long-term water-level changes under water table and artesian conditions are illustrated by Figures 7 and 8.

Long-range declines in the water table seem to increase from west to east, parallel to the Red River in a line from Muenster in Cooke County, to Sherman in Grayson County. The water level in well HA-19-21-903 in Muenster declined 133 ft (41 m) in 37 years; well HA-19-23-905 in Gainesville declined 146 ft (45 m) in 40 years; well KT-18-17-902 in Whitesboro lowered 209 feet (64 m) in 42 years; and well KT-18-20-709 declined 228 ft (69 m) in 32 years. Along this strike, water levels have fallen from 3.6 ft/yr (1 m/yr) in western Cooke County to 7.1 ft/yr (2 mlyr) in central Grayson County. Wells outside the influence of large centers of pumpage also show declines but not near as severe, with deficits of only a few feet per year (less than one meter per year).

Water levels in the vicinity of Gainesville are near the top of the Antlers, while pumping levels there drop about 100 feet (30 m) below the top. The static level in a well at Era, in southern Cooke County, is 200 feet (61 m) below the top of the Antlers. Pumping levels in most of the large-capacity wells in Cooke County are below the top of the formation. However, due to the influence of the Preston anticline and the Sherman syncline, the top of the Antlers at the city of Sherman is about 1,480 feet (451 m) below land surface. Consequently, static water levels there are about 1,000 feet (305 m) above the top of the formation and pumping levels are about 700 feet (213 m) above the top of the Antlers.

Of the estimated 82,000 acre-feet (101hm^3) of water pumped from the Woodbine and Trinity Group aquifers in 1976, only 13 percent or 10,670 acre-feet (13.2 hm^3) was pumped from the Antlers. Most of this ground water is utilized for municipal purposes. About 70 percent of the large-capacity Antlers wells inventoried for this study were public supply wells and accounted for 77 percent of the total pumpage from the Antlers. Public supply pumpage increased from 4,920 acre-feet (6.07 hm3) in 1955 to 8,260 acre-feet (10.2 hm^3) in 1976. The estimated amounts of ground water pumped from the Antlers for irrigation and for public supply and industrial purposes are shown in Tables 5 and 6. Domestic wells pumped an estimated 1,800 acre-feet (2.22 hm^3) of water from the Antlers in 1975.

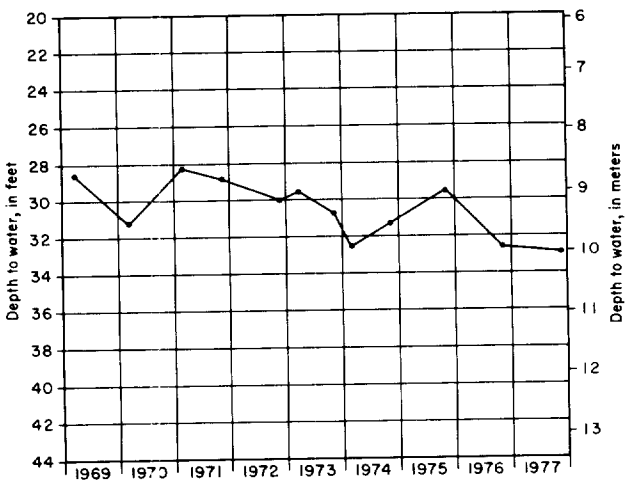
The development of the Antlers as a public supply source began in the city of Sherman with a 2,300 foot (701 m) well located near well KT-18-20-715. It was drilled in 1889 and produced 200 gal/min (12.6 l/s). Sherman had two more deep wells drilled in 1921 and 1923, respectively. Gainesville and Valley View in Cooke County had wells in production in 1912. By 1940, most of the larger towns in Cooke and western Grayson County were obtaining water from the Antlers.

Grayson County is the largest user of public supply water from the Antlers aquifer, pumping 4,627 acre-feet (5.71 hm^3) of water in 1976. Cooke County is second with a total use of 2,803 acre-feet (3.46 hm^3). The city of Sherman used 3,735 acre-feet (4.61 hm^3) in 1976 which is 45 percent of the total amount of ground water pumped from the Antlers for public-supply purposes. The city of Gainesville is the second largest individual user with a total of 1,916 acre-feet (2.36 hm^3) pumped in 1976. These two cities accounted for over 68 percent of the water pumped for public supply use from the Antlers in 1976.

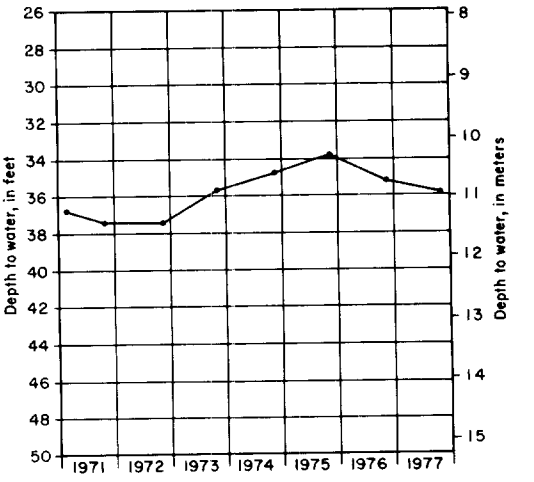
Only 29 industrial wells were located and many are no longer in use. Many industries purchase their water from municipalities. In 1976, ground water pumped from the Antlers for industrial use amounted to only 287 acre-feet (0.354 hm^3). Table 6 shows the amount of industrial pumpage from 1955 to 1976, by county. The largest amount used in a year was 845 acre-feet (1.04 hm^3) pumped in 1959. Wise County had the most pumpage in 1976 with 144 acre-feet (0.188 hm^3), all attributed to one industry. Cooke County produced 113 acre-feet (0.139 hm^3) for industrial purposes in 1976.

Irrigation is mostly confined to wells located on the Antlers outcrop in Wise, Montague, and Cooke Counties. Only 28 irrigation wells were inventoried, and

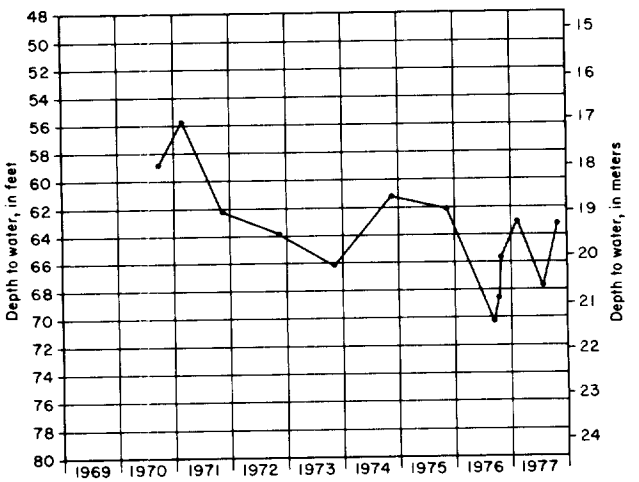
36 034



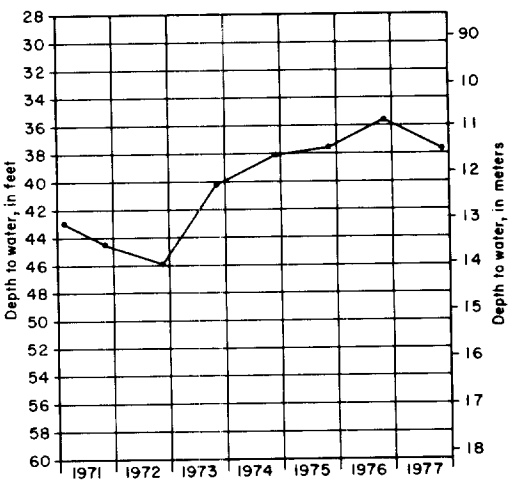
Hood County
Well LY-31-32-901
depth: 46ft. (14m)
Twin Mountains Formation



Montague County
Well TR-19-20-201
depth: 128ft. (39m)
Antlers Formation



Parker County
Well UP-32-18-201
depth: 96ft. (29m)
Paluxy Formation

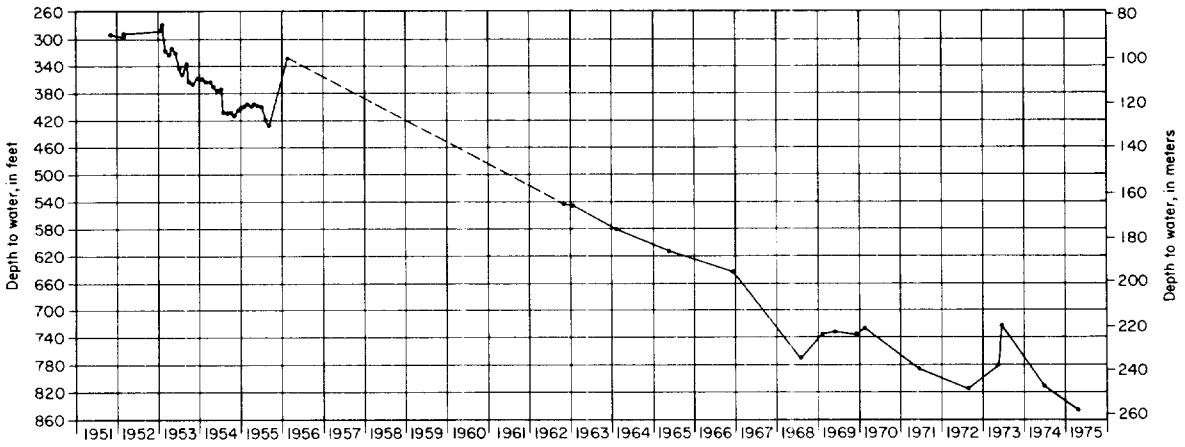


Denton County
Well HW-18-41-201
depth: 210ft. (64m)
Woodbine Group

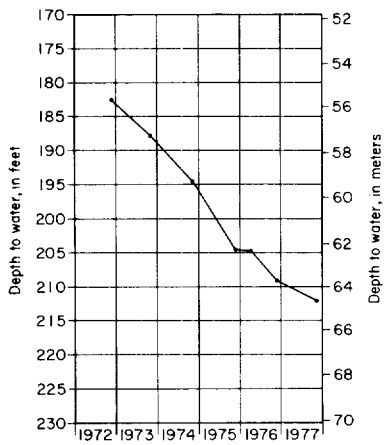
Figure 7

Hydrographs of Water Levels Under Water-Table Conditions

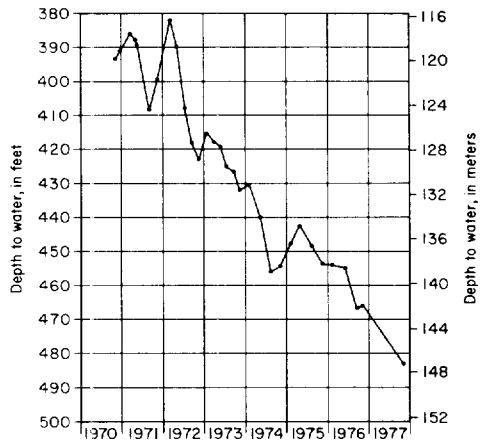
36 035



Tarrant County
Well XU-32-15-601
depth: 1,483ft.(452m)
Twin Mountains Formation



Grayson County
Well KT-18-33-301
depth: 923ft. (281m)
Antlers Formation



Dallas County
Well HR-33-19-101
depth: 3,076ft. (938m)
Twin Mountains Formation

Figure 8

Hydrographs of Water Levels in Wells Completed in the Antlers and Twin Mountains Formations Under Artesian Conditions

36 036

Table 5.-Estimated Use of Ground Water for Irrigation, 1970-77

Includes irrigation of commercial landscapes as well as crops. Amounts are in acre-feet.
Water-bearing units: Kgw, Woodbine Group; Kcpa, Paluxy Formation; Kctm, Twin Mountains Formation; Kca, Antlers Formation

County	Aauifer	1970	1971	1972	1973	1974	1975	I976	I977
Cooke	Kgw	88	88	88	88	88	88	221	234
	Kca	175	215	275	279	279	279	278	242
Dallas	Kgw	40	40	40	188	228	285	293	347
	Kcpa	23	23	23	23	23	23	70	89
	Kctrn	285	278	350	353	270	124	371	435
Denton	Kgw	255	255	473	506	566	546	554	50.
	Kctrn	0	150	212	212	341	357	708	762
Grayson	Kgw	890	1,000	1,281	1,313	1,313	1,012	1,158	1,225
Hood	Kctrn	0	57	75	200	200	223	223	199
Johnson	Kgw	0	41	41	41	41	41	41	41
	Kcpa	55	83	83	83	83	83	83	83
Parker	Kcpa	0	0	3	3	3	3	3	3
	KCirl.	0	20	26	28	36	28	30	34
Tarrant	Kgw	83	83	83	129	314	314	340	363
	Kcpa	258	258	275	294	163	163	163	186
	Kctm	99	99	99	99	99	99	99	99
Wise	Kca	8	19	120	135	135	135	45	76
	Kctm		—	–	–	–	–	16	16
Totals	Kgw	1,356	1,507	2,006	2,265	2,550	2,286	2,607	2.717
	Kcpa	336	364	384	403	272	272	319	361
	Kctm	384	604	762	892	946	831	1,447	1,545
	Kca	183	234	395	414	414	414	323	318
		2,259	2,709	3,547	3,974	4,182	3,803	4,696	4,941

production in 1977 accounted for 318 acre-feet (0.392 hm^3). Most of the wells are of small capacity, and there is currently no extensive ground-water irrigation pumpage from the Antlers. The estimates of pumpage are based on power and yield tests and the results of these tests are given in Table 7.

The water provided by the Antlers in the north-northwest part of the study area is excellent for most purposes. Ground water derived from the outcrop is mostly hard to very hard, while water from downdip locations is generally soft. Approximately one-third of the analyses taken had over 60 mg/l hardness as calcium carbonate, with many analyses in Montague and northern Wise Counties containing over 300 mg/l. High iron concentrations near the outcrop are also encountered, with 27 samples exceeding the 0.3 mg/l limit. Of the more than 280 water samples taken from the Antlers, only 26 had dissolved-solids concentrations over 1,000 mg/l and none had more than 2,000 mg/l. Less than 5 percent of the samples contained excess amounts of chloride and sulfate. Two dozen analyses contained fluoride concentrations exceeding the 1.6 mg/l acceptable level for this area. Results of chemical analyses on water from irrigation wells completed in the outcrop showed very low sodium hazard but medium to high salinity hazard. Residual sodium carbonate for all samples was zero. Table 8 shows the range of constituents in ground water from selected wells in the Antlers Formation.

Recharge to the Antlers also occurs on the outcrop in Oklahoma, and well records in northern Grayson County indicate that the Trinity is also being recharged by Lake Texoma. Static and pumping levels in Grayson County are still well above the top of the formation, but higher lifting costs from deeper pumping levels will probably be the limiting factor in development here.

Development of the Antlers in Cooke County is only in the lower section of the aquifer, and although both static and pumping levels are below the top of the upper section, or Paluxy equivalent, the levels are still well above the top of the lower section, or Twin Mountains equivalent. Based on this and pumping levels that are hundreds of feet above the screened intervals, the Antlers is in no immediate danger of being dewatered.

36 037

Table 6.--Estimated Use of Ground Water for Public Supply and Industrial Purposes From the Antlers Formation, 1955-76

Use: PS, public supply; Ind, industrial. Values are in acre-feet.

County	Use	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	Totals
Cooke	PS	2,649.2	2,682.4	2,289.4	2,073.7	2,052.7	1,896.8	2,019.8	2,770.9	2,732.3	2,124.6	1,859.5	2,051.6	2,107.3	2,061.9	2,497.8	2,909.6	2,929.3	3,373.3	2,952.1	2,864.3	2,650.4	2,802.8	54,351.7
	Ind	422.8	422.8	422.8	202.9	656.0	144.4	154.0	152.3	108.2	78.7	55.3	55.4	55.7	45.6	45.2	66.3	146.6	152.8	152.1	106.2	131.2	112.6	3,889.9
Denton	PS	191.6	240.0	254.8	220.1	226.8	235.9	231.6	243.9	293.7	271.2	260.3	279.5	329.3	312.8	339.0	386.2	405.8	457.1	431.3	514.0	526.2	619.2	7,270.3
Grayson	PS	1,647.8	2,050.8	1,890.1	1,812.0	1,848.1	1,869.1	1,928.8	2,137.0	2,646.7	2,626.2	2,687.4	2,661.4	2,728.7	2,934.1	3,461.4	3,832.3	4,352.5	4,504.0	4,488.0	4,544.6	4,221.2	4,627.1	65,499.3
	Ind	18.0	18.0	18.0	54.4	55.0	36.5	36.5	43.2	62.1	77.9	72.2	73.8	73.8	73.9	73.9	73.5	51.7	61.2	58.1	67.6	32.1	31.1	1,162.5
Montague	PS	114.2	153.1	89.1	69.1	83.8	87.0	95.9	95.8	116.8	109.8	108.5	111.0	120.2	125.3	133.2	138.5	134.7	152.4	141.9	143.6	132.3	145.4	2,601.6
Wise	PS	316.8	343.7	405.1	364.6	331.2	367.3	312.7	432.9	528.8	475.4	460.0	322.0	114.5	67.5	107.7	108.8	64.2	65.7	63.9	64.9	66.6	65.3	5,449.6
	Ind	96.8	96.8	96.8	164.2	134.4	171.0	168.3	165.4	76.5	154.1	153.9	153.9	153.5	152.4	152.4	153.0	152.7	137.5	132.6	116.2	117.9	143.6	3,043.9
Totals	PS	4,919.6	5,470.0	4,928.5	4,539.5	4,542.6	4,456.1	4,588.8	5,680.5	6,318.3	5,607.2	5,375.7	5,425.5	5,400.0	5,501.6	6,539.1	7,375.4	7,886.5	8,552.5	8,077.2	8,131.4	7,596.7	8,259.8	135,172.5
	Ind	537.6	537.6	537.6	421.5	845.4	351.9	358.8	360.9	246.8	310.7	281.4	283.1	283.0	271.9	271.5	292.8	351.0	351.5	342.8	290.0	281.2	287.3	8,096.3
	PS and Ind	5,457.2	6,007.6	5,466.1	4,961.0	5,388.0	4,808.0	4,947.6	6,041.4	6,565.1	5,917.9	5,657.1	5,708.6	5,683.0	5,773.5	6,810.6	7,668.2	8,237.5	8,904.0	8,420.0	8,421.4	7,877.9	8,547.1	143,268.8

36 038

Table 7.--Power-Yield Tests From Selected Irrigation Wells

Method of Distribution: OD, irrigation well pumping into earthen or concrete tank; D, irrigation well pumping directly to the field through sprinkler lines; OD-EB, irrigation well pumping into earthen or concrete tank, and an electric booster pumping water from the tank to the field through sprinkler lines.

Test Number	Well	Date of Test	Method of distribution	Length of Test		Pump Horsepower		Yield in gal/min		Total kwh used	Gals/ kwh	Kwh/ hr	Remarks
				Hours	Minutes	Well	Booster	Well	Sprinkler				
						Dallas County							
1	HR-33-02-203	Sept. 7, 1976	OD	4	00	125	--	470	--	--	--	--	
2	303	do	OD	4	00	20	--	85	--	96	213	24	
						Denton County							
3	HW-18-41-501	Aug. 12, 1976	D	7	00	20	--	--	185	120	648	17.1	
4	19-55-606	Oct. 8, 1976	OD	31	20	20	--	107	--	280	720	8.9	
	606	Aug. 4, 1976	OD	21	30	20	--	105	--	148	910	6.9	
						Grayson County							
5	KT-18-17-601	Aug. 11, 1976	OD	3	00	15	--	182	--	41	799	13.7	
6	18-407	Aug. 10, 1976	D	2	20	5	--	55	--	12.2	632	5.2	
7	408	do	D	2	00	10	--	80	--	17.1	842	8.6	
8	409	do	D	1	45	3	--	45	--	4.8	985	2.8	
9	410	do	D	17	25	1.5	--	35	--	29.6	1,236	1.7	
10	412	Aug. 11, 1976	D	4	00	3	--	32	--	13	591	3.3	
11	413	do	D	4	00	3	--	80	--	15.7	1,223	3.9	
12	414	do	OD	4	00	.5	--	8.5	--	4.1	498	1.0	
13	415	Aug. 10, 1976	D	17	35	2	--	60	--	45.2	1,400	2.6	
14	701	Aug. 11, 1976	OD	2	30	20	--	230	--	45.1	765	18	
15	25-606	Aug. 12, 1976	D	2	00	25	--	--	195	45.7	512	22.8	
16	610	Sept. 15, 1976	D	3	00	20	--	--	175	58.2	541	19.4	
17	33-501	Aug. 6, 1976	D	2	12	40	--	--	301	83	478	37.8	
18	602	Aug. 17, 1976	D	0	56	25	--	--	218	26	470	28	
						Hood County							
19	LY-32-26-902	Aug. 23, 1976	OD	4	00	30	--	300	--	100	720	25	
20	903	do	OD	3	45	30	--	170	--	100	383	26.7	
21	27-703	do	OD-EB	4	00	30	50	150	--	270	133	67.5	
22	34-112	Aug. 24, 1976	OD	3	20	10	--	145	--	35	829	10.5	
						Parker County							
23	UP-32-17-512	July 21, 1976	OD	0	30	5	--	105	--	1.5	2,100	3	
24	516	do	OD	0	22	5	--	105	--	2	1,155	5.4	
						Tarrant County							
25	XU-32-07-907	Oct. 19, 1977	OD	2	42	5	--	48	--	36	572	13.3	Three wells pump into earthen tank. All on one meter.
	908					3		40					
	913					5		40					
26	15-903	Sept. 14, 1976	OD	2	30	5	--	20	--	17	177	6.8	
27	904	do	OD	2	30	5	--	20	--	13	232	5.2	
28	22-607	Sept. 15, 1976	OD	3	08	20	--	108	--	52.8	385	16.9	
29	23-607	do	OD	2	30	3	--	39	--	10	578	4	
30	608	do	OD	2	30	3	--	56	--	9	927	3.6	
						Wise County							
31	ZR-19-34-703	Aug. 26, 1976	D	3	00	10	--	--	95	86.6	200	28.9	Three wells on three meters pumping through one sprinkler line.
	33-901					15							
	902					5							
32	34-701	do	D	3	30	3	--	--	80	39.1	430	11.2	Five wells on three meters pumping through one sprinkler line.
	702					3							
	42-101					5							
	102					1							
	103					1							

36 039

Table 8.--Range of Constituents in Ground Water From Selected Wells in the Antlers Formation

Analyses given are in milligrams per liter except percent sodium, specific conductance, pH, SAR, and RSC.

Single values appear where only one analysis or value was available.

Constituent or property	Montague County	Cooke County	Grayson County	Denton County	Wise County
Silica (SiO_2)	5 - 32	8 - 57	3 - 72	11 - 18	10 - 40
Iron (Fe)	.2- 15	0 - 1.7	0 - 58.5	0 - .1	--
Calcium (Ca)	19 - 256	1 - 127	1 - 253	0 - 7	3 - 235
Magnesium (Mg)	5 - 82	0 - 15	0 - 39	0 - 8	1 - 142
Sodium (Na)	13 - 200	10 - 432	9 - 580	181 - 310	7 - 149
Bicarbonate (HCO_3)	54 - 504	315 - 700	151 - 790	234 - 502	142 - 540
Sulfate (SO_4)	21 - 304	19 - 130	11 - 600	46 - 108	10 - 419
Chloride (Cl)	7 - 434	2 - 484	8 - 590	10 - 67	5 - 394
Fluoride (F)	.1- 1.2	0 - 2.8	.1- 4.2	.1- 1.5	.1- .9
Nitrate (NO_3)	0 - 90	0 - 7.0	0 - 3.7	0 - 4.0	0 - 30
Boron (B)	.1	.3- 1.3	0 - 1.2	--	.1
Dissolved solids	358 -1,238	221 -1,202	269 -1,870	335 - 602	201 -1,587
Total hardness ($CaCO_3$)	20 - 930	1 - 374	1 - 770	1 - 43	7 -1,160
Percent sodium (%)	6.7- 93.7	5.5- 99.5	5.8- 99.6	92.5- 100	5.2- 96.5
pH	6.8- 8.7	7.2- 9.4	6.1- 9.1	8.1- 9.3	6.9- 8.6
Sodium-adsorption ratio (SAR)	.2- 16	.2- 60	.2- 98.1	14.5- 69.7	.1- 19.0
Residual sodium carbonate (RSC)	0 - 6.7	0 - 11.2	0 - 13.8	3.3- 8.2	0 - 5
Specific conductance (micromhos at 25°C)	599 -2,110	594 -2,080	448 -2,646	720 -1,030	338 -2,300

36 040

As previously stated, the water table is declining by as much as 7 feet (2 m) per year, reflecting the fact that more water is removed annually from the Antlers than is recharged. With the large saturated sand thicknesses available and proper use of well construction and spacing, no problems seem likely in the immediate future as far as Antlers ground-water availability is concerned.

According to Baker (1960, p. 65), the amount of fresh-water sand decreases northward in Grayson County, chiefly as a result of increasing amounts of salt water in the northern part of the county. The lower part of the Antlers contains saline water in the vicinity of the Preston anticline; therefore, the upper part of the Antlers or the Woodbine should be developed for ground water in this area.

Twin Mountains Formation

The Twin Mountains provides moderate to large quantities of fresh to slightly saline water to wells in nine of the twenty counties included in this study. The outcrop covers approximately 370 square miles (958 km^2) and lies within Hood, Parker, and Wise Counties. As illustrated on the geologic map (Figure 16), this basal Cretaceous aquifer forms the western boundary of this study. Data on the Twin Mountains were obtained prirnarily through the inventory of over 600 public supply, industrial, and irrigation wells located in the study area.

The primary source of ground water in the Twin Mountains is precipitation falling on the outcrop. Other minor sources include surface-water seepage from ponds, lakes, and streams cutting the outcrop. The average annual precipitat ion is about 30 inches (76cm). However, probably less than 1 inch (2.5cm) per year is available for recharge.

Ground water in the Twin Mountains usually occurs under water-table conditions in or near the outcrop, while ground water downdip from the outcrop is under artesian conditions. The lower sands and shales of the Twin Mountains are the hydrologic equivalent of the basal portion of the Antlers. Water-level maps for the Antlers and the Twin Mountains Formations have been combined and are shown on Figures 24, 25 and 28.

The average rate of movement of water in the Twin Mountains is estimated to be less than 2 feet (1m) per year. Ground water moves slowly downdip in an easterly direction except for local changes. Water-level measurements indicate the present hydraulic gradient is extremely variable due to the large cone of depression surrounding the Dallas-Fort Worth metroplex, but in areas beyond this influence, a gradient of approximately 22 feet per mile (4.2 m/km) is average. Altitudes of water levels about 1955 and about 1976 are shown on Figures 24 and 25.

Water is discharged naturally from the Twin Mountains by springs and evapotranspiration and artificially by pumpage. In 1976, over 40,000 acre-feet (49.3 hm^3) of ground water was pumped from the Twin Mountains in the study area.

The coefficients of transmissibility, permeability, and storage for the Twin Mountains Formation are shown in Table 4. This table was compiled from existing literature and from data supplied by well drillers. Transmissibility and permeability values are also represented graphically on Figure 26. Permeability coefficients were computed by dividing the transmissibility of the well by its screened interval. Aquifer test results on 58 Twin Mountains wells were analvzed.

Review of the test results, illustrated on Figure 26, show that transmissibility values are generally higher in the central, northern, and eastern sections of the study area. The range of transmissibility was 1,950 to 29,700 (gal/d)/ft, or 24,200 to 369,000 (I/d)/m. The average for tests in Dallas County was 12,700 (gal/d)/ft, or 158,100 (I/d)/m; tests in Tarrant County was 8,450 (gal/d)/ft, or 105,000 (I/d)/m; and tests in the Johnson-Ellis County area was 6,480 (gal/d)/ft, or 80,500 (I/d)/m. Permeability values ranged from 8 to 165 (gal/d)/ft^2, or 326 to 6,720 (I/d)/m^2, with an average value of 68 (Ngal/d)/ft^2, or 2,770 (I/d)/m^2. Storage coefficients were obtained from 14 tests and ranged from 5 X 10^{-4} to 4 X 10^{-5} with an average value of 1 X 10^{-4}, or 0.0001. The specific yield in the outcrop is on the order of 15 percent as estimated by seismic methods (Duffin and Elder. 1979).

Yields of wells completed in the Twin Mountains range from 10 to 1,940 gallons per minute (gal/min) (0.63 to 122 l/s), with an average yield of 286 gal/min (18 l/s) for the 525 wells measured. Yields were considerably lower on or near the outcrop than yields of wells further downdip. Well yields generally increase from the southern part of the study area to the northern part. Both Collin and Dallas Counties have average well yields in excess of 700 gal/min, (44 l/s), while Hood, Parker, and Wise Counties average less than 100 gal/min (6.3 l/s). Denton, Ellis, and Tarrant Counties each average about 300 gal/min (19 l/s). Since many of the wells measured were of small capacity, improperly developed, or did not penetrate the full thickness of the aquifer, well yields are probably greater than the stated averages.

36 041

Specific capacities of 233 wells screened in the Twin Mountains range from 0.3 to 12.2 or 0.06 to 2.53 (l/s)/m, and averaged 3.3 (gal/min)/ft, or 0.68 (l/s)/m. Specific capacities are generally higher in the northern and eastern parts of the study area.

Wells completed in the Twin Mountains outcrop have not experienced water-level declines other than the normal seasonal fluctuations. Water levels in wells east of the outcrop are declining steadily. The changes in water levels are illustrated on Figure 28 and by hydrographs (Figures 7 and 8). Long-range declines average over 20 feet (6 m) per year in eastern Tarrant and western Dallas Counties, corresponding to the center of the cone of depression as illustrated by the water-level maps (Figures 24 and 25). In areas outside this influence, water levels are declining 9 (3 m) to 17 (5 m) feet annually.

The large cone of depression depicted on Figure 25 is centered in the area between Euless in Tarrant County and Grand Prairie in Dallas County. Static water levels in several wells have reached the 1,000 foot (305 m) level and pumps are set as low as 1,500 feet (457 m) below the land surface. Yields have diminished and pumping-lift costs have risen. Lowering of pumps is a common occurrence. Several large ground-water users in this area, namely Euless, Bedford, and Arlington, have changed to surface-water supplies. This resultant decrease in pumpage may help alleviate the water-level declines now being experienced.

Wells which are not in the immediate vicinity of the cone of depression have also experienced large annual declines. A well at Everman in Tarrant County, had a water-level decline of 530 feet (162 m) over a 26-year period. The level in a well at Lancaster in Dallas County, declined 362 feet (110 m) in a 23-year period, and at Flower Mound in Denton County, a decline of 160 feet (49 m) in less than 9 years has occurred. Water-level declines are commonplace and are about average over most of the study area.

About half the ground water from the Woodbine and Trinity Group aquifers, over 40,000 acre-feet (49.3 hm^3), was pumped from the Twin Mountains in 1976. Public-supply use accounted for over 31,000 acre-feet (38.2 hm^3), more than the total public-supply use for all other aquifers in the study area combined. Almost all municipal, industrial, and irrigation wells were inventoried for this study. Data on 613 wells were tabulated and compiled within the record of wells. In areas where no large capacity wells exist, livestock or domesr'c wells were inventoried to provide more complete coverage. The estimated amount of ground water pumped from the Twin Mountains is shown in Tables 5 and 9. Domestic wells pumped an estimated 1,200 acre-feet (1.48 hm^3) of water from the Twin Mountains in 1975.

Public-supply wells accounted for 31,120 acre-feet (38.4 hm^3) of water from the Twin Mountains in 1976. This amount is double the quantity pumped in 1960. The greatest amount pumped during a single year was 32,468 acre-feet (40.0 hm^3) in 1974. Over the years, Dallas County pumpage has steadily increased, with almost 18,000 acre-feet (22.2 hm^3) pumped in 1976. Tarrant County increased each year until 1972, when Arlington, Bedford, and Euless changed to surface water. The amount of ground water pumped from the Twin Mountains in Tarrant County declined from 12,688 acre-feet (15.6 hm^3) in 1972 to only 6,080 acre-feet (7.50 hm^3) in 1976. Table 9 shows the public supply and industrial pumpage from 1955 to 1976.

Data were collected on 437 public-supply wells completed in the Twin Mountains. Of this amount, 105 are located in Tarrant County. Dallas, Denton, and Hood Counties average 70 wells each. Many of the wells inventoried in Tarrant and Dallas Counties have been abandoned. The largest individual user of ground water is Grand Prairie, pumping approximately 6,706 acre-feet (8.26 hm^3) in 1976. The four largest users are all in Dallas County, including Grand Prairie, Irving (4,812 acre-feet) (5.93 hm^3), Carrollton (2,080 acre-feet) (2.56 hm^3), and Lancaster (I ,348 acre-feet) (1.66 hm^3). These four cities had a 1976 total pumpage of almost 15,000 acre-feet (18.5 hm^3), which is about half of all the ground water pumped from the Twin Mountains for public-supply purposes in the study area. Grand Prairie and Irving are both situated near the center of the cone of depression previously mentioned. When Arlington, Bedford, and Euless were operating wells, an additional 5,000 acre-feet (6.17 hm^3) of ground water was also pumped from near the center of the cone.

Use of ground water for industrial purposes has diminished over the last 12 years. As shown in Table 9, approximately 6,000 acre-feet (7.40 hm^3) was pumped in 1976, just about one-half the amount, used in 1964. The inventory of wells resulted in the location of 113 industrial wells in the study area, many of which are now abandoned. About 70 percent of the industrial wells inventoried are located in Dallas and Tarrant Counties.

Ground-water irrigation constitutes only a small portion of the pumpage from the Twin Mountains. According to Table 5, approximately 1,545 acre-feet (1.90 hm^3) was pumped for irrigation purposes in 1977. Most of the water was used to irrigate golf courses and lawns. Irrigation of crops is limited to the outcrop area

36 042

Table 9.--Estimated Use of Ground Water for Public Supply and Industrial Purposes From the Twin Mountains Formation, 1955-76

Use: PS, public supply; Ind, industrial. Values are in acre-feet.

County	Use	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	Totals
Collin	PS	1,205.9	1,012.8	326.8	309.1	302.6	22.1	24.6	24.6	30.9	64.4	63.1	64.3	102.7	106.7	120.6	127.8	134.4	171.8	177.2	205.8	185.3	193.2	4,976.1
	Ind	1,739.8	1,723.2	1,707.8	1,525.9	1,079.3	1,734.5	1,646.1	2,019.8	1,859.4	2,689.0	2,019.9	1,967.1	1,821.2	1,730.8	1,968.8	2,250.8	2,241.8	2,012.5	1,808.0	770.0	339.0	451.0	37,088.7
Dallas	PS	10,481.6	10,573.2	7,451.8	7,918.5	7,888.0	6,103.5	7,232.6	7,323.5	7,882.5	8,239.2	8,126.3	8,875.7	9,391.0	8,755.5	9,440.7	10,095.1	9,451.4	11,108.4	11,817.4	13,263.8	13,569.2	17,848.2	214,837.1
	Ind	6,414.6	6,414.6	6,414.6	4,928.3	5,635.5	5,075.2	5,111.7	5,450.1	6,230.3	5,898.8	5,606.3	5,774.0	5,626.7	4,641.3	5,002.0	4,585.9	4,055.4	4,792.3	4,907.6	4,441.6	2,309.0	2,232.5	110,348.3
Denton	PS	3,271.5	3,762.5	3,552.8	674.1	381.0	374.8	418.6	505.4	618.2	609.8	586.3	718.6	927.3	1,081.2	1,325.5	1,576.9	1,846.6	2,558.3	2,434.5	3,148.5	2,237.1	1,389.4	33,998.9
Ellis	PS	1,384.9	1,586.6	1,041.8	1,172.9	1,005.2	162.7	199.0	177.3	194.3	302.2	214.9	329.8	438.6	411.0	793.1	856.6	1,014.7	1,268.8	1,184.1	1,409.9	1,463.5	1,490.0	18,121.9
	Ind	--	--	--	--	--	220.0	220.0	220.0	220.0	220.0	270.0	420.0	420.0	445.0	462.5	638.5	788.1	868.4	1,052.7	1,042.8	1,013.3	1,011.9	9,533.2
Hood	PS	111.6	196.0	236.4	267.4	366.0	387.2	367.1	199.2	410.3	447.0	415.2	373.1	364.2	343.8	407.4	479.2	601.0	758.4	773.9	899.4	1,080.7	1,092.5	10,677.0
	Ind	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	41.5	43.2	84.7
Johnson	PS	2,211.0	2,580.0	2,307.6	1,937.1	2,452.9	2,144.3	2,568.2	2,632.7	2,533.1	2,413.2	1,221.8	628.7	942.5	993.9	1,150.8	1,448.6	1,583.0	1,955.0	1,806.2	2,487.5	2,397.6	2,581.4	43,177.1
	Ind	--	--	--	--	--	76.1	260.9	260.9	260.9	182.3	182.3	271.9	271.9	271.9	271.9	271.9	709.6	708.3	708.3	797.7	698.0	747.6	6,952.4
Parker	PS	808.0	910.8	972.6	17.0	13.0	16.0	51.0	50.9	66.5	68.2	242.7	247.3	262.8	280.7	332.1	389.8	472.4	488.2	443.2	478.1	483.5	358.1	7,454.9
	Ind	161.3	161.3	161.3	145.2	80.9	161.3	177.4	168.0	168.0	168.0	168.0	168.0	168.0	159.0	187.2	236.0	240.6	219.4	18.4	18.4	4.1	4.3	3,144.1
Tarrant	PS	6,193.8	6,191.6	6,844.5	5,927.4	6,217.2	6,026.4	5,710.7	6,112.2	7,824.4	8,001.7	9,881.0	9,366.6	10,850.1	10,928.3	12,254.2	11,298.7	10,891.2	12,688.3	10,623.4	10,493.0	6,591.0	6,079.5	186,995.2
	Ind	3,654.7	3,654.7	3,654.7	3,597.9	2,773.3	2,546.9	2,532.3	2,894.1	2,904.9	3,150.0	2,973.6	3,006.0	2,962.1	3,079.1	2,915.9	2,697.4	1,593.6	1,710.6	1,742.2	1,534.6	1,512.1	1,415.1	58,105.8
Wise	PS	90.3	90.3	90.3	90.3	37.0	34.4	32.6	29.1	19.1	44.6	21.6	22.3	40.2	36.7	22.9	22.9	68.2	84.5	74.0	81.9	75.5	87.8	1,198.5
	Ind	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	64.3	80.7	161.3	80.7	387.0
Totals	PS	25,758.6	26,903.8	22,824.6	18,313.8	18,644.9	15,271.4	16,604.4	17,254.9	19,578.7	20,190.3	20,774.9	20,626.4	23,339.4	22,937.8	26,047.3	26,295.6	26,062.9	31,081.7	29,333.9	32,467.9	30,003.4	31,120.1	521,436.7
	Ind	11,970.4	11,953.8	11,936.4	10,197.3	9,569.0	9,804.0	9,948.5	11,012.9	11,636.5	12,108.1	11,220.1	11,607.0	11,269.9	10,327.1	10,808.3	10,680.5	9,629.1	9,911.5	9,301.5	8,685.8	6,078.3	5,986.3	225,644.2
	PS and Ind	37,729.0	38,857.6	34,763.0	28,511.1	28,213.9	25,075.4	26,552.8	28,267.8	31,215.2	32,298.4	31,995.0	32,233.4	34,609.3	33,264.9	36,855.6	36,976.1	35,692.0	40,993.2	38,635.4	41,153.7	36,081.7	37,106.4	747,080.9

36 043

in Hood, Parker, and Wise Counties. Forty-seven irrigation wells that were inventoried accounted for 16 percent of the 1977 pumpage from the Twin Mountains.

The Twin Mountains Formation is the most prolific of the Cretaceous aquifers in the study area with about 55 percent of the total quantity of ground water utilized for municipal and industrial purposes. The quality of water is generally not as good as from the Paluxy or Antlers. However, higher well-yields allow some sacrifice in chemical quality. Approximately 700 analyses of water samples from the Twin Mountains have been tabulated and included in Table 10 which shows the range of constituents and properties of the water from representative wells. About 22 percent of these analyses contained dissolved-solids concentrations in excess of 1,000 mg/l.

Similar to the other Cretaceous aquifers in this study, the ground water from wells drilled on the outcrop of the Twin Mountains is hard and contains high concentrations of dissolved iron. In the downdip area, about 9 percent of the samples contain dissolved iron concentrations in excess of the recommended limit of 0.3 mg/, and about 83 percent of'the water is soft. The maximum allowable level for fluoride in the study area is 1.6 mg/l according to Drinking Water Standards adopted by the Texas Department of Health. Over 230 analyses contained fluoride levels exceeding 1.6 mg/l. Most of the other constituent levels were close to the maximum. Therefore, the main problems related to water quality for this aquifer are excessive fluoride and dissolved-solids concentrations. The downdip limit of fresh to slightly saline water is encountered about 60 to 75 miles (97 to 121 km) east-southeast of the outcrop in the majority of the study area (Figure 25). This distance is considerably less in the northern part of the study area where the outcrop trends eastward in the vicinity of Red River.

Since there are no concentrated areas of ground-water irrigation on the Twin Mountains outcrop, not enough chemical-quality data could be obtained to present a detailed classification of irrigation waters. Generally speaking, the Twin Mountains irrigation wells that are scattered through northeastern Hood County showed a very high sodium hazard, medium to high salinity hazard, and RSC levels classified as unsuitable for irrigation. Limited use of these wells accompanied with crop rotation and good management is necessary for continued good land productivity.

Irrigation wells, located near Brock in Parker County and completed on the Twin Mountains outcrop, were sampled and the results showed a low sodium hazard, medium salinity hazard, and zero RSC. The quality of water from 30 wells was suitable for irrigation use, but well yields limited extensive development.

Figure 29 shows the net sand thickness of fresh to slightly saline water-bearing sand in the Twin Mountains. Net sand thickness generally increases downdip in an easterly direction. Thickness increases from less than 100 feet (30 m) near the outcrop to over 400 feet (122 m) near the downdip limit of fresh to slightly saline water.

Areas for future development would have to be outside the Dallas-Fort Worth metroplex cone of depression. Even outside this influence, water levels are dropping over 10 feet (3 m) per year. There are several areas where waier quality restricts development of wells for irrigation use as previously noted and depicted on Figure 23. Wells tapping the Twin Mountains aquifer in areas downdip from the outcrop and in areas where quality is not a problem can expect a steady decline in water levels and yields.

Paluxy Formation

The Paluxy yields small to moderate amounts of fresh to slightly saline water to public supply, industrial, domestic and livestock wells in 16 of the 20 counties included in this study. The majority of the Paluxy outcrop occurs in Hood, Parker, Tarrant, and Wise Counties as illustrated on the geologic map (Figure 16) and occupies about 650 square miles (1,684 km^2).

The primary source of recharge to the Paluxy is precipitation on the outcrop. Secondary sources include recharge from streams flowing across the outcrop and surface-water seepage from lakes. The Brazos and Trinity River systems and Eagle Mountain Reservoir are a few examples. The average annual precipitation on the outcrop is about 31 inches (79 cm). Only a small fraction of the amount is available as effective recharge since there is much runoff and evapotranspiration.

Water in the outcrop area is under water-table conditions and water levels remain fairly constant with only normal seasonal fluctuations. In downdip areas, water is under artesian conditions, and is confined under hydrostatic pressure from overlying formations. The average rate of movement of water in the Paluxy amounts to less than 2 feet (0.6 m) per year in an easterly direction except in downdip areas of heavy pumpage where cones of depression have occurred and movement is towards the center of the pumped wells. Water-level measurements indicate that the present hydraulic gradient is approximately 27 feet per mile

Table 10.--Range of Constituents in Ground Water From Selected Wells in the Twin Mountains Formation

Analyses given are in milligrams per liter except percent sodium, specific conductance, pH, SAR, and RSC.

Single values appear where only one analysis or value was available.

Constituent or property	Collin County	Dallas County	Denton County	Ellis County	Hood County	Johnson County	Parker County	Tarrant County	Wise County
Silica (SiO_2)	10 - 21	4 - 40	7 - 38	2 - 79	0 - 102	8 - 28	9 - 48	5 - 79	8 - 27
Iron (Fe)	0 - .8	0 - 9.4	0 - 8.8	.1- .9	0 - 3.6	0 - .4	0 - 17.2	0 - 2.6	.1- 1.3
Calcium (Ca)	3 - 21	0 - 36	0 - 34	2 - 26	1 - 192	1 - 17	1 - 266	1 - 114	1 - 182
Magnesium (Mg)	1 - 4	0 - 56	0 - 11	0 - 25	0 - 35	0 - 8	1 - 79	0 - 11	1 - 82
Sodium (Na)	228 - 620	150 - 666	170 - 760	241 - 532	8 - 283	192 - 305	5 - 442	141 - 670	34 - 600
Bicarbonate (HCO_3)	293 - 538	185 - 640	244 - 680	360 - 646	240 - 590	356 - 483	35 - 700	288 - 659	303 - 550
Sulfate (SO_4)	73 - 504	19 - 940	38 - 335	70 - 500	4 - 339	41 - 251	4 - 519	21 - 579	24 - 263
Chloride (Cl)	28 - 740	36 - 364	10 - 090	67 - 383	3 - 258	13 - 93	7 - 306	14 - 650	8 - 680
Fluoride (F)	.2- 3.6	.2- 16.0	0 - 3.4	1.1- 3.0	.1- 3.2	.1- 2.7	0 - 3.9	0 - 7.0	.1- 1.5
Nitrate (NO_3)	0 - 2.0	0 - 3.9	0 - 5.2	0 - 5.0	0 - 162	0 - 3.0	0 - 170	0 - 5.9	.4- 44.0
Boron (B)	--	.1- 1.0	.3- 1.0	.4- 1.1	.1- .8	.4- .7	.1- 1.0	.2- 1.9	.2- .7
Dissolved solids	590 -1,612	420 -2,002	307 -1,973	554 -1,408	265 -1,366	382 - 844	133 -1,735	381 -1,735	387 -1,654
Total hardness ($CaCO_3$)	11 - 65	8 - 230	1 - 60	2 - 110	6 - 600	4 - 28	9 - 914	5 - 302	5 - 770
Percent sodium (%)	93.2- 98.5	80.1- 99.2	88.4- 100	77.7- 98.9	6.7- 99.5	87.0- 99.3	8.5- 99.1	12.8- 99.3	18.6- 98.7
pH	8.0- 8.8	7.7- 9.1	7.2- 9.3	7.8- 9.2	6.9- 8.9	7.9- 9.0	7.0- 8.8	7.4- 9.1	6.8- 8.8
Sodium-adsorption ratio (SAR)	21.8- 57.7	5.4- 66.0	11.1- 73.2	9.2- 63.8	.2- 64.1	11.2- 65.0	.2- 56.5	.4- 72	.8- 38.0
Residual sodium carbonate (RSC)	4.3- 7.9	0 - 10.2	2.3- 10.6	2.6- 10.1	0 - 9.3	5.6- 7.7	0 - 11.1	0 - 10.1	0 - 8.5
Specific conductance (micromhos at 25°C)	1,040 -2,790	510 -3,108	610 -4,030	1,000 -2,310	451 -1,960	780 -1,420	201 -2,270	607 -3,317	706 -2,880

36 045

(5.1 m/km). Altitudes of water levels about 1955 and about 1976 are shown on Figures 30 and 31.

Discharge from the Paluxy occurs naturally through springs and evapotranspiration and artificially through pumpage from water wells. In 1976, approximately 13,550 acre-feet (16.7 hm^3) was pumped from the Paluxy for municipal, industrial, irrigation, and domestic purposes. Livestock use would probably add several thousand acre-feet (several cubic hectometers) more to this quantity.

Table 4 shows the results of pumping tests conducted in the study area. Test results were obtained from existing literature or from data supplied by well drillers. A total of 25 Paluxy public-supply wells were tested and transmissibilities determined. Permeabilities were determined by dividing the transmissibility of the well by its screened interval. No tests were conducted on the outcrop, under water-table conditions.

Transmissibility values in 25 tests range from 1,263 to 13,808 (gal/d)/ft, or 15,700 to 171,500 (I/d)/m, with an overall average of 3,700 (gal/d)/ft, or 45,900 (I/d)/m. Only three tests exceeded 6,600 (gal/d)/ft, or 82,000 (I/d)/m, while nine tests fell below 3,000 (gal/d)/ft, or 37,300 (I/d)/m. Generally, the net sand thickness increases from less than 50 feet (15 m) in the southwest portion of the study area to 190 feet (58 m) in Denton County. Coefficients of permeability at 25 well locations were highly variable. A range of 6 to 150 (gal/d)/ft^2, or 244 to 6,110 (I/d)/m^2, was encountered with an overall average of 50 (gal/d)/ft^2, or 2,040 (I/d)/m^2. Of the 18 aquifer tests conducted in Tarrant County, two transmissibilities were extremely high and probably not representative. Eliminating the two high results, the average transmissibility for 16 tests is 3,580 (gal/d)ft, or 44,500 (I/d)/m, and the average permeability is 44 (gal/d)/ft^2, or 1,790 (l/d)/m^2. Permeabilities probably increase from the outcrop in a downdip direction and from south to north, corresponding to increasing sand thicknesses. Storage coefficients were determined at five sites, four of which are in Tarrant County. Values range from 0.00002 to 0.00034 with an average of 0.00014. This value is probably applicable to most of the study area. The specific yield in the outcrop is on the order of 15 to 20 percent as estimated by seismic methods (Duffin and Elder, 1979).

Yields of wells completed in the Paluxy ranged from 10 to 482 gal/min (0.63 to 30 l/s). A total of 344 wells were measured with an average yield of 97 gal/min (6.1 l/s). Lower yields were obtained in wells completed on or near the outcrop, while wells in downdip areas had significantly larger yields due mainly to the larger available heads. The following table lists counties that use water from the Paluxy aquifer extensively.

County	Number of Wells Measured	Average Yield (gal/min)	Number of Wells Tested	Average Specific Capacity [(gal/min)/ftl
Collin	9	132	3	2.39
Dallas	37	189	13	2.13
Denton	27	84	12	1.85
Johnson	19	68	6	1.08
Parker	21	45	13	1.35
Tarrant	214	84	95	1.56

Many of the wells do not penetrate the entire aquifer and are not designed for maximum production. Well completion techniques and pump capacities also affect production. Therefore, yields of many wells are somewhat less than the maximum yields that could be developed. Four flowing wells were measured in Red River County near the Red River and had an average yield of 300 gal/min (19 l/s). Several wells in Fannin, Lamar, Kaufman, Rockwall, and Ellis Counties were measured and yields of at least 100 gal/min (6.3 l/s) were obtained. The specific capacities of 152 wells screened in the Paluxy sand ranged from 0.3 to 5.4 (gpl/min)/ft, or 0.06 to 1.1 (l/s)/m, and averaged 1.64 (gal/min)/ft, or 0.34 (l/s)/m. The specific capacities increase toward the east in a downdip direction. Variations over short distances are due mainly to well construction and to lithologic changes.

Changes in water levels of wells completed in the Paluxy aquifer are illustrated by hydrographs (Figures 7 and 9) and a water-level decline map (Figure 32) showing approximate declines in the vicinity of Dallas and Tarrant Counties from about 1955 through about 1976. There are no long-range declines in the outcrop of the Paluxy or adjacent to it. The aquifer is under water-table condtions in this region and observation wells show minor fluctuations from year to year. However, the Lake Worth-White Settlement-Benbrook area of Tarrant County lies adjacent to the outcrop and due to heavy pumpage of the Paluxy, declines of several feet (meters) per year have been observed. Substantial withdrawals of water in the Tarrant County vicinity are reflected in the large cone of depression illustrated on Figure 31. The cone is at its deepest point in the Euless area of Tarrant County where the static water level of the Paluxy declined over 350 feet (107 m) in the last 20 years. The abandonment of Paluxy public-supply wells in this area during recent years should reflect rising water levels in the near future. The steady decline exhibited throughout the study area downdip from the outcrop is a result of the low permeability of the water-bearing sands and the large amount of ground water used for public supply and domestic purposes.

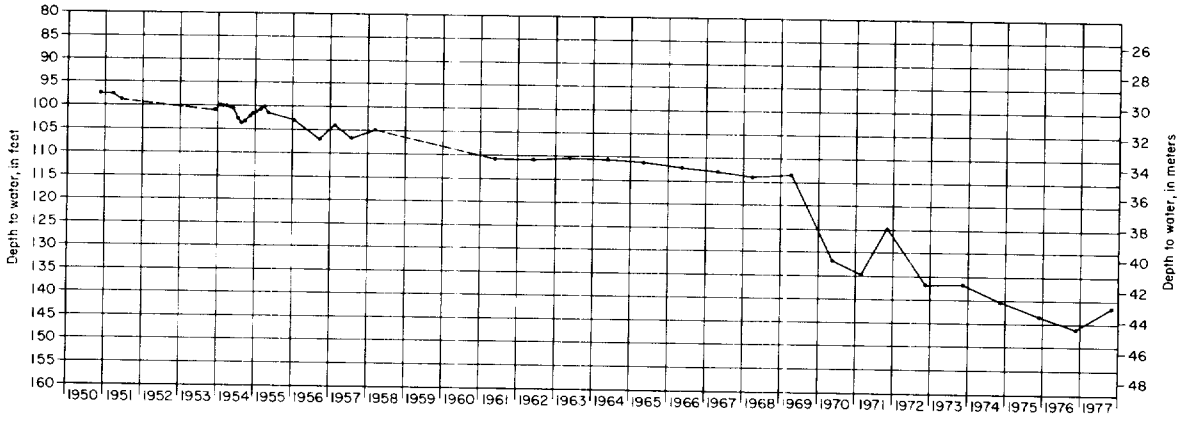
Approximately 15,000 acre-feet (18.5 hm^3) of water was withdrawn from the Paluxy in 1976, which is about 17 percent of the total amount pumped from the Woodbine and Trinity Group aquifers for the year. Municipal pumpage accounted for over half of this amount while domestic use accounted for about 24 percent. An attempt was made to inventory all large-capacity Paluxy wells developed for public supply, industry, and irrigation purposes. Of the 650 wells inventoried, 480 were used for public supply, and of this amount, approximately 40 percent are no longer in use. The estimated amount of ground water pumped from the Paluxy is shown in Tables 5 and 11.

Public-supply wells pumped 8,320 acre-feet (10.3 hm^3) of ground water from the Paluxy in 1976. Development of the Paluxy, especially in Tarrant County, began at the turn of the century and by the 1950's. large quantities of water were being withdrawn. In 1955, Tarrant County used 5,628 acre-feet (6.94 hm^3) for public supply, and Dallas County pumped 1,718 acre-feet (2.12 hm^3). This accounted for 88 percent of the public-supply pumpage from the Paluxy for the year. According to Table 11, Dallas and Tarrant Counties pumped 72 percent of the ground water used for public-supply in 1976. The concentrated pumpage in these two counties has resulted in the large cone of depression located in eastern Tarrant County. Of the 480 Paluxy public-supply wells inventoried, 285 were located in Tarrant County and 105 of these have been abandoned. Many of the cities near the center of the cone of depression have abandoned Paluxy wells due to diminishing well yields and declining water levels. Pumping levels in some wells fall below the top of the screened interval. Dewatering of the aquifer in this area has been taking place for the last 25 years. Municipalities using large amounts of ground water in 1976 include the cities of Benbrook, acre-feet (1.34 hm^3); Grand Prairie, 900 acre-feet (1.11 hm^3); Colleyville, 433 acre-feet (0.533 hm^3); and White Settlement, 420 acre-feet (0.517 hm^3). Domestic pumpage for 1976 is estimated at 3,550 acre-feet (4.38 hm^3).

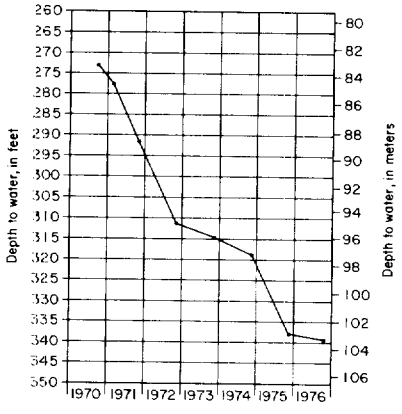
Industrial use accounted for 1,365 acre-feet (1.68 hm^3) in 1976. Of the 126 Paluxy industrial wells inventoried, 80 were located in Tarrant County and pumped 643 acre-feet (0.793 hm^3) in 1976. About one-fourth of these wells are no longer used. Only 18 industrial wells were developed in Dallas County but production in 1976 amounted to 519 acre-feet (0.640 hm^3). The most ground water pumped in any one year for industrial purposes from the Paluxy was in 1973 when 2,035 acre-feet (2.51 hm^3) was withdrawn.

Only minor amounts of water for irrigation purposes are pumped from the Paluxy, with about 361 acre-feet (0.445 hm^3) used in 1977 from 44 wells, Most of these wells are located in Dallas, Parker, Red River, and Tarrant Counties. The wells are widely scattered and are primarily used for watering golf courses and greenbelt areas around industries. Four flowing wells in Red River County were inventoried; one well was flowing in excess of 400 gal/min (25 l/s).

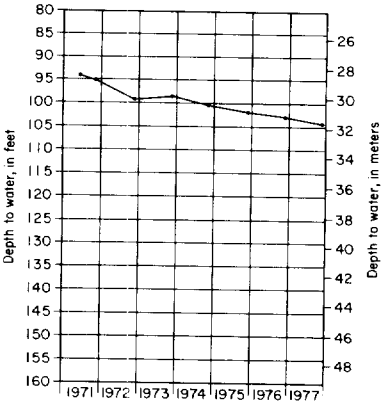
Wells completed in the Paluxy have water with chemical quality that is generally better than water from other Cretaceous aquifers in the study area. Over 600 analyses were collected or obtained from other sources, providing an adequate chemical quality network with the exception of the northeastern area. Most of the minor deficiencies found in Paluxy water exist on or near the outcrop, hardness and higher iron concentrations occur. Approximately 25 percent of the analyses show hardness as $CaCO_3$ exceeding the 60 mg/l level, and many exceed the 120 mg/l and 180 mg/l level. About 40 analyses had iron concentrations in excess of the recommended level of 0.3 mg/l. Only 7 percent of the analyses had more than 1,000 mg/l dissolved-solids and only 9 analyses had concentrations in excess of 2,000 mg/l. Fluoride levels increase in the downdip part of the aquifer, with rnost of the water exceeding 1.6 mg/l near the downdip limit of fresh to slightly saline water. Only a few water wells tap the Paluxy in Fannin, Lamar, and Red River Counties; however, they contain water of good quality. 'Well yields and construction costs limit Paluxy well development in this area. Table 12



Tarrant County
Well XU-32-21-501
depth: 227ft.(69m



Denton County
Well HW-18-57-901
depth: 1,308ft.(399m)



Lamar County
Well RT-17-29-601
depth: 2,644ft.(806m)

Figure 9

Hydrographs of Water Levels in Wells Completed in the Paluxy Formation Under Artesian Conditions

Table 11.--Estimated Use of Ground Water for Public Supply and Industrial Purposes from the Paluxy Formation, 1955-76

Use: PS, public supply; Ind, industrial. Values are in acre-feet.

County	Use	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	Totals
Collin	PS	134.1	156.8	100.0	112.3	96.0	127.7	112.8	114.4	133.9	108.3	109.0	128.0	158.5	132.3	157.6	176.2	186.2	204.1	229.6	264.6	258.5	281.3	3,482.2
	Ind	154.7	154.7	154.7	138.1	150.0	156.5	162.7	159.6	159.6	161.1	165.7	153.4	147.3	7.2	59.0	117.4	107.3	124.8	309.1	242.7	183.1	203.2	3,371.9
Dallas	PS	1,718.3	1,723.3	1,285.7	1,668.8	1,549.9	1,555.2	1,472.5	1,390.4	1,570.8	1,413.8	1,221.0	1,083.7	1,084.7	1,106.7	1,223.4	1,219.8	1,340.9	1,283.1	1,094.6	849.6	1,255.0	1,238.0	29,349.4
	Ind	947.2	947.2	1,100.6	742.0	992.2	898.2	785.3	831.4	765.9	704.0	836.0	849.1	903.7	769.1	786.9	756.5	781.1	1,034.2	971.5	938.4	579.4	518.5	18,438.4
Delta	PS	--	--	--	--	--	--	--	--	--	2.2	12.9	21.5	40.6	51.2	61.7	69.6	71.6	71.6	67.6	81.7	96.3	64.7	713.2
Denton	PS	203.8	193.0	227.8	240.9	275.7	526.1	395.1	363.5	398.7	458.8	489.2	460.9	485.1	573.3	593.2	446.7	476.5	607.1	626.0	747.2	539.9	469.9	9,798.4
	Ind	8.5	9.2	9.2	46.3	50.0	60.0	48.1	55.7	41.5	45.3	45.0	60.3	61.3	56.7	40.1	1.7	2.7	2.8	--	--	--	--	644.4
Ellis	Ind	--	--	--	--	--	--	--	--	--	--	--	--	--	119.0	119.0	119.0	119.0	117.8	156.1	183.2	181.7	175.2	1,290.0
Fannin	PS	--	--	--	--	--	--		--	19.9	46.7	46.2	68.5	76.0	66.9	70.8	76.3	83.0	87.1	100.7	257.9	372.6	345.2	1,717.8
Johnson	PS	348.6	401.8	386.6	389.6	397.5	437.3	520.8	510.9	556.7	469.9	449.8	532.7	401.9	440.4	851.0	572.7	378.5	357.8	340.9	393.7	385.1	473.2	9,995.9
Kaufman	PS	92.1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	92.1
Lamar	PS	--	--	--	--	--	--	--	--	--	--	9.0	29.4	34.7	48.3	63.9	62.3	94.0	104.7	92.0	95.8	131.9	100.5	866.5
Parker	PS	2.5	2.5	2.5	2.5	2.5	3.0	3.0	3.7	3.9	6.3	11.8	27.0	36.4	51.7	76.1	75.5	112.1	138.4	140.1	197.5	213.1	277.3	1,389.4
Red River	PS	--	--	--	--	--	--	--	5.0	25.0	26.0	28.0	30.0	30.0	30.0	33.2	43.5	54.7	55.4	56.2	57.7	58.0	67.8	600.5
Rockwall	PS	143.4	139.7	59.2	8.4	3.3	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	354.0
Tarrant	PS	5,627.7	5,631.9	5,804.1	5,795.5	5,916.2	6,349.8	6,880.5	7,763.4	8,945.2	8,050.4	7,887.9	6,831.4	7,214.4	7,050.8	7,891.1	6,871.7	6,135.5	6,346.1	5,608.0	5,197.0	4,789.8	4,724.3	143,312.7
	Ind	720.2	720.2	720.2	825.1	827.2	808.1	802.8	797.1	908.6	791.5	603.0	681.8	888.0	774.3	957.2	745.1	591.1	613.9	753.6	590.1	518.3	642.6	16,280.0
Wise	PS	48.9	32.4	36.7	58.8	61.4	63.4	43.2	37.3	42.2	23.0	24.9	69.6	72.2	74.4	75.2	61.9	79.6	69.0	81.0	96.4	85.3	98.8	1,335.6
	Ind	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	.9	.4	.4	.9	.4	3.0
Totals	PS	8,319.4	9,281.4	7,901.6	8,276.8	8,302.5	9,062.5	9,427.9	10,188.6	11,696.3	10,605.4	10,289.7	9,282.7	9,634.5	9,745.0	11,250.0	9,795.2	9,131.6	9,442.4	8,592.8	8,421.8	8,367.2	8,316.2	204,297.7
	Ind	1,830.6	1,831.3	1,984.7	1,751.5	2,019.4	1,922.8	1,798.9	1,843.8	1,875.6	1,701.9	1,649.7	1,744.6	2,000.3	1,607.3	1,843.2	1,620.7	1,482.2	1,776.6	2,034.6	1,771.6	1,281.7	1,364.7	38,737.7
	PS and Ind	10,150.0	10,112.7	9,886.3	10,028.3	10,321.9	10,985.3	11,226.8	12,032.4	13,571.9	12,307.3	11,939.4	11,027.3	11,634.8	11,352.3	13,059.4	11,415.9	10,613.8	11,219.0	10,627.4	10,193.4	9,648.9	9,680.9	243,035.4

36 049

Table 12.--Range of Constituents in Ground Water From Selected Wells in the Paluxy Formation

Analyses given are in milligrams per liter except percent sodium, specific conductance, pH, SAR, and RSC.

Single values appear where only one analyses or value was available.

Constituent or property	Collin County	Dallas County	Denton County	Ellis County	Hood County	Johnson County	Lamar County	Parker County	Red River County	Tarrant County	Wise County
Silica (SiO_2)	1 - 26	3 - 76	3 - 23	13 - 14	10 - 21	9 - 41	16 - 21	10 - 54	7 - 17	1 - 30	10 - 21
Iron (Fe)	0 - .5	.1- 3.6	0 - .9	--	2.6	0 - 1.7	.2- .5	0 - 10.0	0 - 1.0	0 - 9.9	0.2
Calcium (Ca)	1 - 8	0 - 129	0 - 58	5 - 7	68 - 157	1 - 79	3 - 7	2 - 225	3 - 109	0 - 120	5 - 250
Magnesium (Mg)	0 - 3	0 - 24	0 - 18	1 - 4	2 - 23	0 - 21	1 - 5	1 - 205	1 - 33	0 - 43	2 - 18
Sodium (Na)	245 - 340	30 -1,050	42 - 770	466 - 696	7 - 44	17 - 408	401 - 486	5 - 194	22 - 729	11 - 740	7 - 409
Bicarbonate (HCO_3)	470 - 691	122 - 695	293 - 790	666 - 710	256 - 447	296 - 710	620 - 820	192 - 620	131 - 822	177 - 689	295 - 497
Sulfate (SO_4)	73 - 125	21 -1,711	15 - 494	354 - 864	13 - 74	5 - 280	143 - 192	11 - 167	4 - 191	6 -1,080	31 - 421
Chloride (Cl)	18 - 110	16 - 307	5 - 399	54 - 74	5 - 65	7 - 66	72 - 197	0 - 815	10 - 680	5 - 117	6 - 240
Fluoride (F)	.2- 1.9	.4- 4.0	0 - 3.9	5.4- 7.0	.2- .5	.1- 8.0	3.4- 4.6	0 - 3.2	.1- 6.2	0 - 4.5	.1- 1.1
Nitrate (NO_3)	.2- 2.5	0 - 4.6	0 - 3.2	.4- 3.2	0 - 69	0 - 5.7	.4- 3.5	.4- 135	0 - 2.0	0 - 10.0	.4- 31
Boron (B)	--	2.1	3.0	--	--	.3- 1.4	--	.1- .2	.3	.1- .6	--
Dissolved solids	615 - 847	257 -3,008	310 -2,076	1,250 -1,999	282 - 586	280 -1,071	1,012 -1,237	264 -1,870	200 -1,840	264 -2,176	316 -1,050
Total hardness ($CaCO_3$)	5 - 30	4 - 423	2 - 214	15 - 36	227 - 487	3 - 251	11 - 34	9 -1,400	12 - 350	2 - 401	21 - 699
Percent sodium (%)	95.5- 99.3	29.4- 99.6	30.2- 100	97.5- 98.4	5.6- 24.0	12.9- 99.1	96.4- 98.6	3.5- 97.1	24.0- 98.8	7.1- 99.5	21 - 97.7
pH	8.2- 8.9	7.2- 9.2	7.1- 10.4	8.0- 8.4	6.6- 7.9	7.4- 9.3	8.1- 9.0	6.8- 8.7	7.3- 8.5	7.1- 9.2	6.9- 8.3
Sodium-adsorption ratio (SAR)	23.0- 74.1	1.0- 85.6	1.2- 75.7	49.8- 52.0	.2- 1.0	.4- 52.2	30.8- 57.0	.1- 21.5	.8- 57.6	.2- 68.8	.1- 39.1
Residual sodium carbonate (RSC)	7.4- 10.8	0 - 10.4	.9- 12.1	10.2- 11.3	0 - .3	0 - 11.3	9.6- 13.2	0 - 6.6	0 - 13.2	0 - 10.0	0 - 7.7
Specific conductance (micromhos at 25°C)	1,029 -1,260	451 -5,280	540 -3,770	1,900 -2,970	470 - 905	485 -1,700	1,040 -2,272	461 -3,110	345 -3,180	427 -3,193	518 -1,790

36 050

shows the range of constituents and properties of water from representative wells in the Paluxy Formation.

Figure 20 shows the net sand thickness of fresh to slightly saline water-bearing sand in the Paluxy. Net sand thicknesses increase from less than 50 feet (15 m) in Johnson County to 190 feet (58 m) in Denton County. Ordinarily, the most favorable areas for development of ground water would be where the saturated sand is greatest. However, due to the heavy pumpage over the past 30 years, most areas are already overdeveloped and water levels are declining at an alarming rate. The only area that seems available for increased development would be in areas of Fannin and Lamar Counties. The six public supply wells in these counties are located in an area where water from the Woodbine is saline. Well yields in excess of 100 gal/min (6.3 l/s) with pumping levels below 300 feet (91 m) are encountered.

Any Paluxy wells developed in the area of the cone of depression in eastern Tarrant County can expect pumping levels, and in some areas static water levels, to be below the top of the aquifer. Pumps are usually set near the base of the formation. Outside this area and downdip from the outcrop, water levels are declining from 4 to 12 feet (1 to 4 m) per year. Correct spacing of wells is a prerequisite throughout the study region. Any additional development of the Paluxy will result in further lowering of the artesian head in areas where the water levels are still above the formation top. In sone areas, additional development will result in dewatering of the aquifer.

Woodbine Group

The Woodbine Group is an important aquifer in the study region. The outcrop extends in a south-north direction through the center of the report area and then trends to the east parallel to the Red River. The Woodbine dips eastward where it reaches a maximum thickness of about 700 feet (213 m) and has a maximum depth of 2,500 feet (762 m) below land surface. The areal extent of the outcrop and the approximate altitude to the top of the Woodbine are illustrated on Figure 21.

The primary source of ground water in the Woodbine is rainfall on the outcrop area. This area receives an annual rainfall of from 33 inches (84 cm) in the south to 37 inches (94 cm) in the north. Other sources of ground water include surface-water seepage from lakes and streams, such as Lake Grapevine, Garza-Little Elm Reservoir, and the Trinity River tributaries.

Water occurs in saturated sand beds under both water-table and artesian conditions. Water-table conditions occur in or near the outcrop while artesian conditions prevail downdip.

Recharge to the Woodbine occurs in the outcrop area, about 1,200 square miles (3,108 km^2), which consists of a permeable, sandy soil conductive to infiltration of rainfall and seepage from streams. The quantity of recharge to the Woodbine is estimated to be equivalent to less than one inch of precipitation per year on the sandy portion of the outcrop. The movement of water follows an east-southeast direction from the outcrop, generally paralleling the dip of the beds. According to Baker (1960). the average rate of water movement in the Woodbine is estimated to be about 15 feet per year (4.6 m/yr). The hydraulic gradient varies from over 30 feet per mile (5.7 m/km) to less than 13 feet per mile (2.5 m/km) within the study area except for minor local variations and for cones of depression around areas of excessive ground-water pumpage. The hydraulic gradient and a large cone of depression around the city of Sherman are illustrated on Figure 33, which also shows the approximate altitude of water levels in the Woodbine aquifer about 1976.

Discharge from the Woodbine occurs naturally through springs and seeps, evaporation, and transpiration by plants. Evapotranspiration is greatest in the summer and where vegetation is dense. Pumpage of wells constitutes most of the water artificially discharged from the aquifer and includes some flowing wells along the Red River portion of the outcrop. In 1976, about 20,500 acre-feet (25.3 hm^3) of ground water was pumped from the Woodbine in the region.

The coefficients of storage, permeability, and transmissibility and the specific capacity for the Woodbine are shown on Table 4. Aquifer test locations and results are shown on Figure 26. The table was compiled from existing literature and from tests conducted by water-well drillers. Data from aquifer tests were analyzed by using the modified Theis nonequilibrium formula in conjunction with a computer program which provides a means of computing transmissibility from the water-level recovery of a step-drawdown test. The permeability coefficients were computed by dividing the transmissibility by the effective sand thickness. Specific capacities of wells were determined by dividing the yield by the total water-level drawdown measured in the well.

The specific yield was estimated using seismic methods (Duffin and Elder, 1979) in the outcrop under

water-table conditions and is on the order of 15 percent. Downd p, where the aquifer is under artesian conditions, the average coefficient of storage is approximately 0.00015, or 1.5×10^{-4} The coefficient of storage is dimensionless and indicates the volume of water that an aquifer releases from or takes into storage per unit surface area of the aquifer per unit change in the component of head normal to that surface.

Generally, the more permeable sands of the Woodbine occur on or near the outcrop, where permeability coefficients range from 84 to 167 gallons per day per square foot [(gal/d)/ft^2], or 3,400 to 6,800 liters per day per square meter [(l/d)/m^2]. Farther downdip, a range of 14 to 183 (gal/d)/ft^2, or 570 to 7,500 (l/d)/m^2, was encountered with an average coefficient of permeability of 44 (gal/d)/ft^2, or 1,800 (l/d)/m^2.

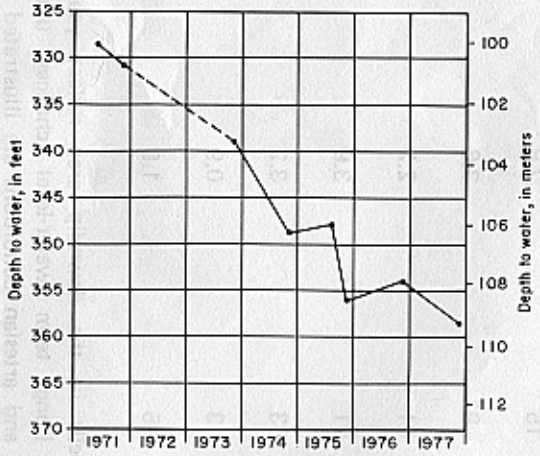
Transmissibility values are estimated to be considerably higher along the outcrop where water-table conditions exist. Two tests were conducted on irrigation wells completed in the outcrop in Grayson County and even though the tests were of short duration and thus not completely accurate, values of 7,870 and 16,700 gallons per day per foot [(gal/d)/ft], or 97,800 and 207,400 liters per day per meter [(l/d)/m], were obtained. The 24 remaining tests conducted mainly on public supply wells and utilizing data provided by the well driller showed a range of 1,320 to 14,700 (gal/d)/ft or 16,400 to 182,500 (l/d)/m and an average value of 4,700 (gal/d),lft, or 58,400 (l/d)/m, can be expected. ln 1945, the U.S. Geological Survey conducted five pumping tes-ts (drawdown and recovery) on several Woodbine wells owned by the city of Sherman and obtained an average transmissibility of 2,400 (gal/d)/ft, or 29,800 (l/d)/m, and an average coefficient of permeability of 37 (gal/d)/ft^2, or 1,500 (l/d)/m^2.

Yields from 336 wells were measured and production ranged form 10 to 1,170 (gal/min) or 0.63 to 74 l/s. The average yield is 106 gal/min (6.7 l/s). Areas of largest production from the Woodbine aquifer are on the outcrop in Denton and Grayson Counties and downdip in Fannin, Grayson, Collin, Dallas, and Ellis Counties. Specific capacities were determined for 139 wells and ranged from 0.2 to 8.7 gallons per minute per foot [(gal/min)/ft], or 0.04 to 1.8 (l/s)/m, of drawdown with an overall average specific capacity of 2.9 (gal/min)/ft, or 0.60 (l/s)/m. The average yields and specific capacities by county are presented below:

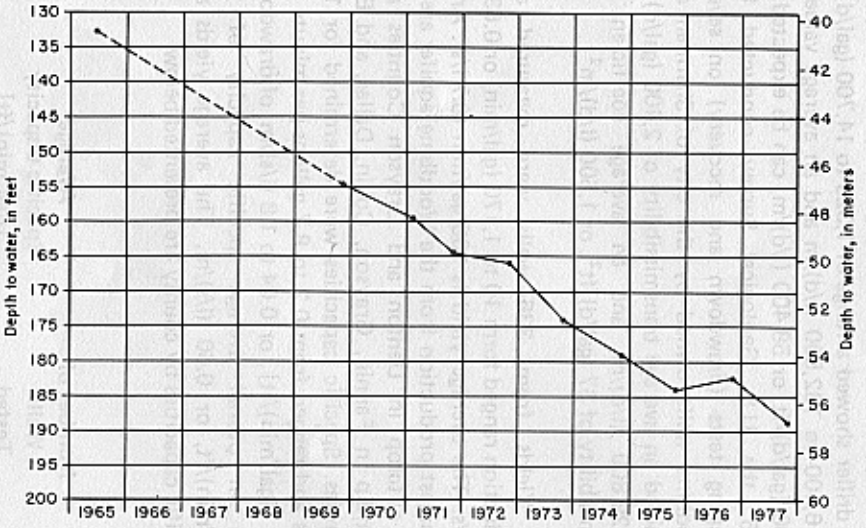
County	Number of Wells Measured	Average Yield (gal/ min.	Number of Wells Tested	Average Specific Capacity [(gal/min)/ft]
Collin	20	139	8	2.7
Cooke	8	124	2	1.6
Dallas	67	111	15	2.8
Denton	20	215	9	3.6
Ellis	24	177	11	2.2
Fannin	34	214	21	3.9
Grayson	108	223	5'3	3.2
Johnson	12	51	3	0.9
Tarrant	37	45	15	1.5

Water levels fluctuate seasonally as indicated by the periodic measurements in a number of observation wells completed in the Woodbine Group. Changes in water levels are illustrated by hydrographs. Water levels in the outcrop seem to recover to static level each year whereas wells in the downdip area reflect yearly declines. Long term water-level changes under water-table and artesian conditions are illustrated by Figures 7 and 10. The approximate altitude of water levels in Woodbine wells around 1955 is shown on Figure 34.

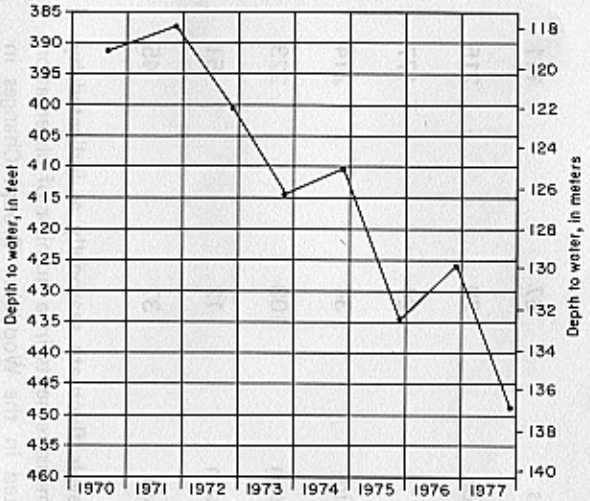
36 052



Lamar County
Well RT-17-27-201
depth: 1,675ft.(511m)



Ellis County
Well JK-32-48-501
depth: 367ft. (112m)



Grayson County
Well KT-18-27-701
depth: 613ft. (187m)

Figure 10
Hydrographs of Water Levels in Wells Completed in the Woodbine Group Under Artesian Conditions

36 053

In February 1959, well KT-18-20-714 (Grayson County) had a water level of 342 feet (104 m) below ground level. This same well was measured in February 1972 and the static water level had declined to 428 ft (130 m). In April 1977, the water level was 536 feet (163 m) resulting in a net decline of 194 ft (59 m) in just 18 years, or 10.8 feet per year (3.29 m/yr). In Ellis County, well JK-32-48-501 declined 56 feet (17 m) in 12 years, while well JK-33-26-802, further downdip, dropped 138 feet (42 m) in 15 years. However, there are some areas downdip that are not experiencing large declines. For example, well DT-18-50-901 in Collin County declined about 5 feet (1.8 m) in 5 years.

As would be expected, the greatest declines are found in areas where large quantities of water are pumped for industrial and public-supply purposes. This fact, coupled with the low permeability of the water-producing sands, has resulted in a steady decline in the water table. In some downdip areas, especially in the southern part of the study region, the static water level has already dropped below the top of the Woodbine.

Since the initial years of the 20th century, the Woodbine aquifer has been characterized by ever-increasing development. The primary uses of ground water from Woodbine wells are for domestic, livestock, and public-supply purposes. Initial large increases in industrial-water use was followed by a generally, constant reported usage over the last 25 years. The development of ground water for irrigation purposes is relatively new, beginning about 10 years ago with large withdrawals. The increase in production from the Woodbine in the study area is due primarily to the increase in population and in irrigation activities.

In 1976, about 13,750 acre-feet (17.0 hm^3) of ground water was pumped from the Woodbine for public supply, industrial, and irrigation purposes in the study area. This accounts for approximately 20 percent of the ground water pumped from the Woodbine and Trinity Group aquifers for these uses.

Increase in population and home modernization in towns and cities have created a constantly increasing demand for water over the years. This demand is illustrated by Figure 11, which shows the amount of ground water used for public-supply purposes from 1955 to 1976 from the Woodbine and Trinity Group aquifers. The estimated use of ground water from the Woodbine for public supply and industrial purposes from 1955-76 is shown, by county, in Table 13.

In 1976, Grayson County pumped about 4,870 acre-feet (6.01 hm^3) of ground water from the Woodbine for public-supply use. This represents about 57 percent of the 8,560 acre-feet (10.6 hm^3) withdrawn by all counties in the study area. Fannin County was second with about 1,000 acre-feet (1.23 hm^3) of pumpage. The largest, municipal ground-water user is the city of Sherman. In 1933, Sherman pumped 426 acre-feet (0.525 hm^3) from the Woodbine, increasing to 609 acre-feet (0.751 hm^3) in 1943; 1,102 acre-feet (1.36 hm^3) in 1955; 1,795 acre-feet (2.21 hm^3) in 1965; and 3,448 acre-feet (4.25 hm^3) in 1976, which is about 40 percent of the total Woodbine ground-water use in the study region for the year. Many large ground-water users have changed to surface-water supplies, thus decreasing the amount of water pumped from the Woodbine. This decrease is more than offset by the increase in ground-water use by water-supply corporations and smaller, growing towns. A total of 377 public-supply wells were inventoried for this study, which includes those municipal wells no longer in use.

In 1976, approximately 2,581 acre-feet (3.18 hm^3) of ground water was pumped for industrial purposes from the Woodbine, which is about 25 percent of the total quantity of water pumped for industry from the Woodbine and Trinity Group aquifers. About 115 industrial wells were inventoried for this study, most of which are located in Dallas County, where over 50 percent of the industrial pumpage occurs. Industrial pumpage has remained fairly constant with only minor fluctuations occurring from 1955 to 1976, as illustrated on Figure 12 and in Table 13. Some of the declines in industrial usage may be misleading because many businesses purchase ground water from cities where it is reported as municipal pumpage.

In 1977, approximately 135 irrigation wells pumped 2,717 acre-feet (3.35 hm^3) of ground water for irrigation purposes from the Woodbine Group. The irrigation pumpage represents about 20 percent of the total ground water pumped from the Woodbine during 1976 in the study region. This pumpage was principally from Grayson and northern Denton Counties, which accounted for 64 percent of the irrigation pumpage. Irrigation ground-water pumpage in these and adjacent counties for the period 1970-77 is illustrated on Table 5. In most cases, these wells are pumped from 4 to 6 weeks annually and the water is generally used to irrigate peanuts and grasses.

The quantity of ground water used for irrigation was determined in part on power and yield tests conducted on selected irrigation wells, and in part on using measured yields in conjunction with the owner's estimate of the time the irrigation well was pumped annually. The results and data collected from the power and yield tests are given in Table 7. The industrial and municipal use was determined by compiling the data on

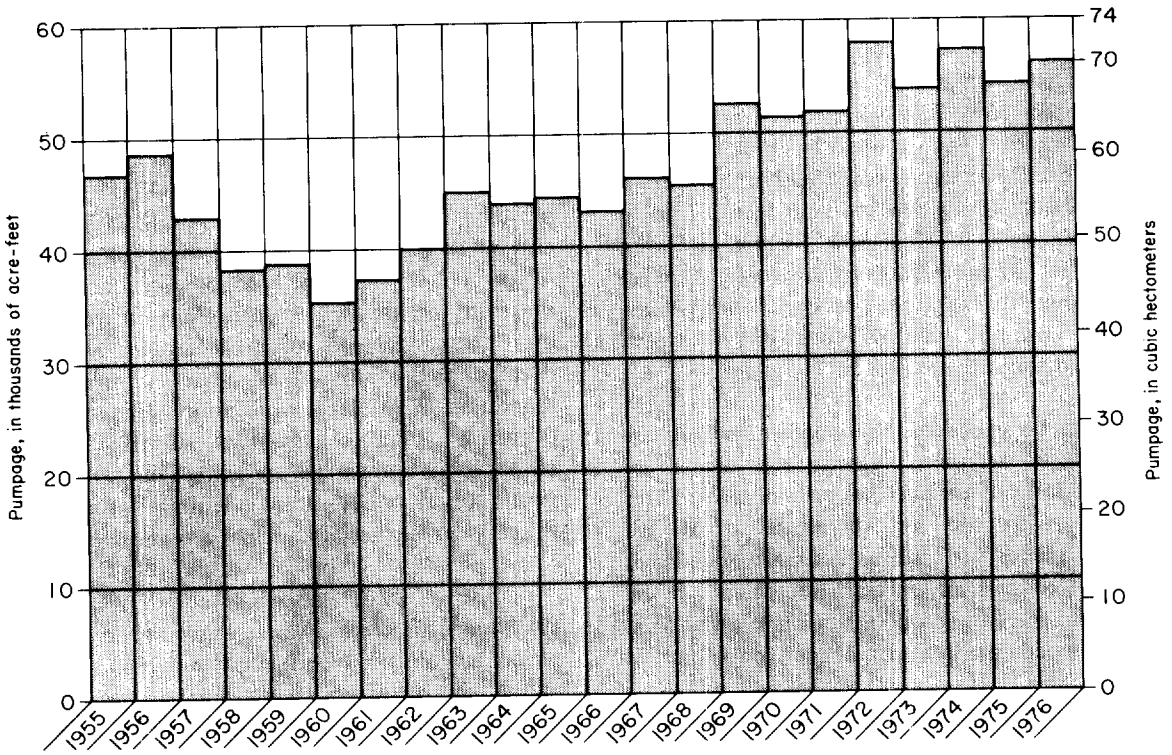


Figure 11.—Public Supply Ground-Water Pumpage From the Woodbine and Trinity Group Aquifers, 1955-76

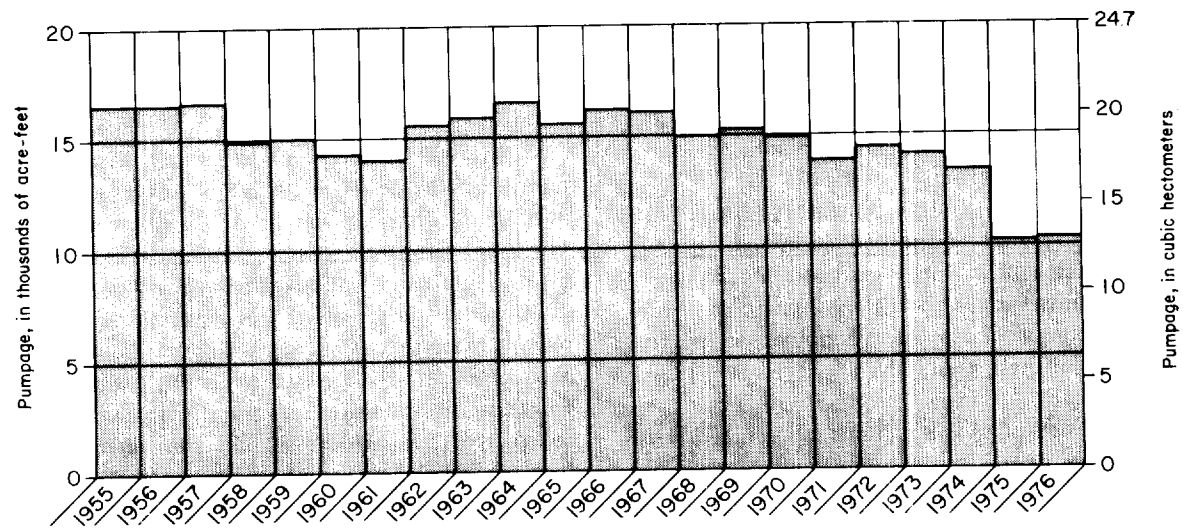


Figure 12.—Industrial Ground-Water Pumpage From the Woodbine and Trinity Group Aquifers, 1955-76

returned questionnaires mailed annually by the Department to the various surface- and ground-water users.

There was little irrigation ground-water use prior to 1965. However, since 1965, many wells have been drilled and ground-water withdrawals continue to rise. The amount of water pumped from the Woodbine for irrigation doubled during the years 1970 to 1977.

Water quality in wells completed on or near the outcrop of the Woodbine is fresh and of good quality

36 055

Table 13.--Estimated Use of Ground Water for Public Supply and Industrial Purposes From the Woodbine Group, 1955-76

Use: PS, public supply; Ind, industrial. Values are in acre-feet.

County	Use	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	Totals
Collin	PS	716.2	696.0	301.3	327.6	312.3	267.7	242.9	195.7	237.4	242.6	247.5	309.9	365.9	360.9	406.1	487.7	616.7	739.9	664.6	741.3	809.0	599.6	9,888.8
	Ind	--	--	--	--	--	--	--	--	--	--	--	--	--	--	100.1	42.9	34.0	34.0	34.0	34.0	34.0	34.0	347.0
Dallas	PS	1,819.6	1,828.0	1,686.0	1,448.5	1,560.4	1,556.2	1,344.4	1,436.6	1,483.3	1,350.1	1,454.0	1,457.5	1,576.8	1,429.5	1,412.0	1,159.8	989.6	891.6	896.7	910.6	887.0	835.5	29,413.7
	Ind	1,596.1	1,596.1	1,596.1	1,441.7	1,221.0	1,119.0	1,070.7	1,577.1	1,031.2	1,327.3	1,632.6	1,463.1	1,390.5	1,332.6	913.1	1,009.7	1,005.2	1,158.3	1,088.5	1,214.7	1,187.2	1,326.0	28,297.8
Denton	PS	--	--	--	1.0	1.0	95.0	61.9	64.0	86.4	112.2	118.4	123.2	129.2	161.2	156.7	81.9	46.7	73.1	63.3	75.3	137.1	193.0	1,780.6
	Ind	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.6	1.6	4.7	57.7	7.2	72.8
Ellis	PS	1,558.0	1,530.0	1,616.6	1,420.7	1,298.1	1,317.8	1,328.4	1,314.0	1,376.4	1,406.7	1,534.0	1,190.7	539.6	528.1	569.4	614.1	656.7	763.4	724.8	825.3	860.8	716.2	23,629.8
	Ind	--	--	--	--	--	140.0	140.0	140.0	280.0	280.0	280.0	280.0	280.0	336.0	336.0	336.0	336.0	471.2	624.6	732.6	726.8	700.4	6,419.6
Fannin	PS	1,380.6	1,494.7	1,335.2	1,397.4	1,484.5	1,378.2	1,417.1	1,394.8	1,503.8	1,518.9	1,494.4	1,563.6	1,479.8	1,127.5	1,962.0	1,091.4	1,827.9	1,843.7	874.4	997.5	927.5	993.4	30,468.3
	Ind	--	--	--	--	--	40.0	90.0	90.0	90.0	90.0	95.0	95.1	159.6	198.2	83.8	82.2	143.7	122.9	118.3	120.3	125.0	117.1	1,861.3
Grayson	PS	1,862.3	2,037.6	1,866.6	2,004.2	2,131.5	1,864.4	2,010.7	2,237.6	2,563.2	2,560.6	2,729.3	3,059.6	3,233.8	3,436.9	4,038.8	4,195.2	4,360.7	4,365.3	4,432.5	4,630.5	4,474.5	4,872.0	68,967.8
	Ind	593.7	593.7	593.7	1,033.0	1,318.4	888.6	630.6	592.5	730.9	758.6	798.6	760.2	732.4	745.6	760.8	730.5	573.3	495.1	530.5	429.5	337.9	395.9	15,024.0
Hunt	PS	28.0	39.3	46.0	33.6	37.0	39.9	34.2	36.3	43.2	44.6	45.4	55.3	64.9	78.7	87.8	105.9	102.6	126.0	116.0	129.6	134.6	131.3	1,560.2
Johnson	PS	112.3	66.6	59.0	87.3	75.4	100.4	64.8	58.0	58.3	65.8	66.0	86.8	66.5	64.6	85.1	67.6	70.8	74.9	70.9	65.2	158.7	72.4	1,697.4
Kaufman	PS	132.6	100.7	100.7	84.0	81.4	80.7	76.7	61.4	67.5	67.5	22.1	--	--	--	--	--	--	--	--	--	--	--	875.3
Lamar	PS	--	--	--	--	--	--	--	--	--	3.5	20.7	10.6	11.5	13.1	15.0	11.6	10.2	13.2	13.4	13.6	17.9	19.7	174.0
Navarro	PS	183.0	147.6	159.8	179.7	158.9	119.3	99.1	126.8	120.9	116.3	108.6	112.0	161.6	128.9	97.4	102.2	100.7	171.5	101.5	105.4	110.4	112.1	2,823.7
Tarrant	PS	80.0	80.0	80.0	64.0	79.3	65.4	65.4	80.0	90.0	90.0	81.6	81.8	85.7	2.5	3.7	6.2	8.6	6.8	7.7	7.4	7.0	14.3	1,087.4
	Ind	1.2	1.2	1.2	1.8	1.3	1.5	1.2	1.1	1.0	.8	.9	.8	.3	.1	--	.3	167.0	50.4	.3	.3	.3	--	233.1
Totals	PS	7,872.6	8,020.5	7,251.2	7,048.0	7,219.8	6,885.0	6,745.6	7,005.2	7,630.4	7,578.8	7,922.0	8,031.0	7,715.3	7,327.9	8,830.0	7,919.6	8,787.2	9,069.4	7,965.8	8,501.7	8,524.5	8,559.5	172,411.0
	Ind	2,191.0	2,191.0	2,191.0	2,476.5	2,540.7	2,189.1	1,932.5	2,400.7	2,133.1	2,456.7	2,807.1	2,599.2	2,562.8	2,616.8	2,197.8	2,205.6	2,263.2	2,333.4	2,397.8	2,536.1	2,468.9	2,580.6	52,271.6
	PS and Ind	10,063.6	10,211.5	9,442.2	9,524.5	9,760.5	9,074.1	8,678.1	9,405.9	9,763.5	10,035.5	10,729.1	10,630.2	10,278.1	9,944.7	11,027.8	10,125.2	11,050.4	11,402.8	10,363.6	11,037.8	10,993.4	11,140.1	224,682.6

36 056

with the exception of high iron concentrations occurring in the upper Woodbine sands or in improperly completed wells. This iron contamination can be alleviated by insur ng that the well penetrates the entire Woodbine Group, or at least to the middle of the Woodbine, and cementing off the upper member of the group. It is not uncommon for water from wells in the upper part of the Woodbine to contain iron concentrations in excess of 3.0 mg/l. Water from 9 wells contained concentrations greater than 10 mg/l. Water quality deteriorates rapidly downdip from the outcrop with concentrations increasing in sodium, chloride, and bicarbonate. The downdip limit of fresh to slightly saline water (Figure 33) occurs approximately 35 miles (56 km) downdip from the outcrop. Along the outcrop, well water contains an average dissolved-solids content of 550 mg/l, while water from areas farther downdip approach the 2,000 mg/l level. Of the more than 800 analyses tabulated, 325 (40 percent) exceeded 1,000 mg/l, and 90 (11 percent) contained more the 2,000 mg/l dissolved solids. Only 90 samples exceeded 300 mg/l chloride and 263 (32 percent) of the analyses exceeded 300 mg/l sulfate. High nitrate levels are not naturally found in the Woodbine and only a few, shallow dug wells exceeded 45 mg/l. Over 80 percent of the analyses collected had a total hardness as calcium carbonate of less than 60 mg/l, giving the water a general classification as soft. Table 14 shows the range of constituents in ground water from selected wells in the Woodbine Group.

The specific conductance of irrigation waters from the northern Woodbine outcrop ranges from 298 to 1,720 micromhos per cubic centimeter (cm^3) at 25°C (77°F). The five samples containing over 750 micromhos per cm^3 were taken in the Sadler area of Grayson County. Other water samples in this vicinity were between 600 and 750 micromhos per cm^3. The remaining 28 samples showed an average specific conductance of 470 micromhos per cm^3, well below the 750 level.

The diagram for the classification of irrigation waters from the Woodbine (Figure 13) shows that the sodium hazard is low, with an SAR ranging from 0.4 to 7.8. Only two samples fell into the medium catagory while the major ty of samples had an SAR below 2. According to classification by percent sodium, all but five samples were below 60 percent and only three exceeded 75 percent.

Of the 33 samples taken, only 13 were tested for boron. The range was from 0 to 0.4, giving the water in this area an excellent rating for even sensitive crops. RSC was calculated for all samples and a range of 0 to 2.6 was determined. Only four samples had an RSC in excess of 0.9 me/l and of these, three were considered marginal and one not safe. The wells from which these samples were taken are pumped about 4 to 6 weeks per year and the water is generally used to irrigate peanuts and grasses.

Blossom Sand

The Blossom Sand aquifer crops out in central Fannin County and extends eastward through Lamar and Red River Counties. Its thickness can range up to about 400 feet (122 m). In general, ground water from the Blossom is fairly high in dissolved-solids content (120 to 2,030 mg/l) and is soft.

Only four of the eleven municipal wells found in the study area are in operation. The largest ground-water user is the city of Clarksville, Red River County. Yields range from 45 to 500 gal/min (2.8 to 31.5 l/s). Specific capacities average slightly more than 1 (gal/min)/ft, or 0.21 (l/s)/m. Several pumping tests conducted on wells in Clarksville showed an average transmissibility of 3,800 (gal/d)/ft, or 47,200 (l/d)/m, and an average

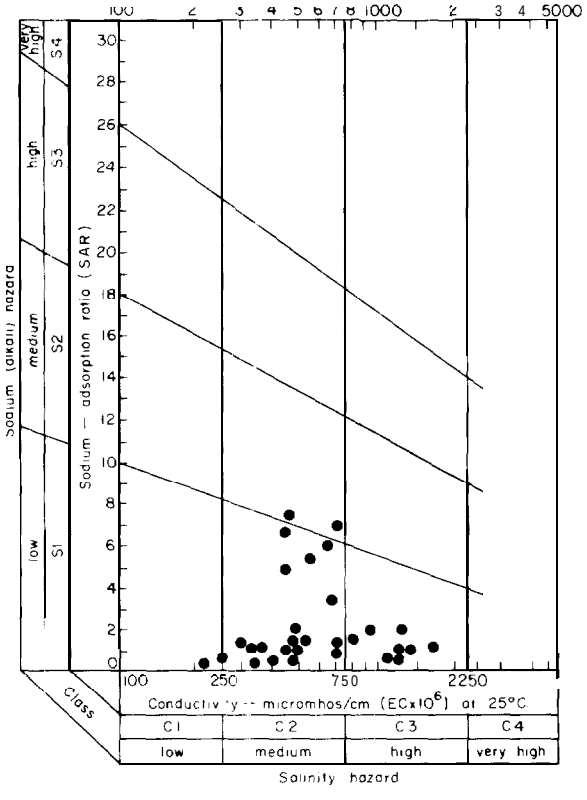


Figure 13.-Diagram for the Classification of Irrigation Waters Showing Quality of Water From Wells Completed in the outcrop of the Woodbine Group (After United States Salinity Laboratory Staff, 1954, p. 80)

Table 14.--Range of Constituents in Ground Water From Selected Wells in the Woodbine Group

Analyses given are in milligrams per liter except percent sodium, specific conductance, pH, SAR, and RSC.

Single values appear where only one analysis or value was available.

Constituent or property	Collin County	Dallas County	Denton County	Ellis County	Fannin County	Grayson County	Johnson County	Kaufman County	Lamar County	Navarro County	Tarrant County
Silica (SiO_2)	5 - 49	5 - 59	0 - 33	8 - 29	1 - 79	3 - 40	8 - 27	6 - 68	15 - 39	11 - 18	6 - 21
Iron (Fe)	0 - 3.4	0 - 6.5	.1- 21.2	0 - .9	0 - 4.7	0 - 18.0	0 - 7.2	0 - .7	9	.1- 5.8	.4- 13.0
Calcium (Ca)	1 - 52	0 - 105	0 - 269	0 - 14	0 - 34	0 - 230	3 - 405	6 - 28	2 - 34	3 - 11	1 - 194
Magnesium (Mg)	0 - 35	0 - 24	0 - 101	0 - 11	0 - 53	0 - 89	1 - 89	2 - 26	1 - 9	1 - 5	0 - 22
Sodium (Na)	150 -1,370	113 - 930	15 - 790	208 -1,200	151 -1,318	9 -1,070	53 - 447	897 -1,356	20 - 405	570 -1,390	5 - 408
Bicarbonate (HCO_3)	246 -1,130	165 -1,050	77 - 800	370 -1,060	317 -1,150	54 - 850	79 - 580	1,100 -1,210	52 - 590	705 -1,170	40 - 529
Sulfate (SO_4)	37 - 479	44 - 824	17 - 530	16 - 586	30 - 406	3 -1,460	60 - 580	269 - 453	5 - 157	69 - 520	4 - 560
Chloride (Cl)	12 - 640	10 - 610	12 - 492	17 -1,310	13 -1,633	4 - 910	18 - 139	543 -1,210	47 - 155	127 -1,420	7 - 154
Fluoride (F)	.6- 4.0	0 - 5.7	.1- 4.1	0 - 7.9	0 - 4.6	.1- 3.0	.3- 2.0	1.8- 4.7	.1- 1.9	2.1- 6.1	.1- 2.5
Nitrate (NO_3)	0 - 7	0 - 31.0	.2- 294	0 - 50.0	0 - 7.0	0 - 20.0	0 - 56	.4- 14.0	.4- 2.4	.2- 11.0	.4- 44
Boron (B)	--	.1- 4.2	.3	1.5- 4.8	--	0 - 1.7	.7- .8	--	--	5.7	.3
Dissolved solids	377 -2,611	338 -2,430	141 -2,133	429 -3,032	386 -3,256	106 -3,386	367 -1,234	2,563 -3,480	161 -1,038	1,522 -3,494	72 -1,220
Total hardness ($CaCo_3$)	2 - 108	3 - 359	2 - 510	4 - 450	1 - 303	0 - 940	13 - 700	24 - 177	8 - 120	11 - 50	4 - 550
Percent sodium (%)	91.9- 99.3	67.9- 99.7	18.9- 100	42.8- 100	90.4- 99.6	9.9- 99.6	27.8- 98.6	91.7- 99.1	30 - 98.9	98.0- 99.1	9.8- 98.3
pH	7.5- 9.2	6.9- 8.9	6.6- 9.1	7.1- 8.8	7.5- 8.9	6.5- 9.4	6.4- 8.5	8.0- 8.2	6.1- 8.3	7.5- 8.5	6.4- 9.1
Sodium-adsorption ratio (SAR)	13.0- 93.9	5.3- 129.5	.7- 76.6	3.1- 103.6	21.3- 88.4	.3- 101.1	1.8- 51.8	29.3- 109.2	.9- 56.4	58.1- 98.0	.2- 38.5
Residual sodium carbonate (RSC)	3.8- 17.8	1.0- 16.0	0 - 12.6	5.7- 17.0	5.0- 18.4	0 - 13.5	0 - 9.2	17.5- 19.2	0 - 9.5	11 - 18.4	0 - 8.3
Specific conductance (micromhos at 25°C)	609 -4,710	697 -3,549	220 -3,844	895 -3,616	624 -2,760	162 -4,020	551 -1,830	4,860	251 -1,650	2,055 -6,060	139 -1,750

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permeability of 45 (gal/d)/ft^2, or 1,830 (l/d)/m^2. The coefficient of storage was calculated to be 4.5 X10^{-5}.

Public-supply pumpage within the study area was 561 acre-feet (0.692 hm^3); all but 1 acre-foot (0.001 hm^3) was withdrawn by the city of Clarksville. Water levels have declined since development at Clarksville began in 1905 which indicates pumpage exceeds effective recharge (Baker and others, 1963).

Nacatoch Sand

The outcrop of the Nacatoch Sand extends in a northerly direction from Limestone to Hunt County where it trends to the northeast and passes through Red River County into Bowie County. It ranges in thickness from 350 feet (107 m) to 500 feet (152 m). The depth to the top of the aquifer is about 800 feet (244 m) along the southward extent of the fresh to slightly saline water line near the boundary of Red River and Bowie Counties.

Of the 52 public-supply wells and 5 industrial wells located in the study area which were completed in the Nacatoch, 20 are no longer used. Yields measured in municipal and industrial wells ranged from 20 gal/min (1.3 l/s) to 500 gai,'min (31.5 l/s) with an average of 135 gal/min (8.5 l/s). Specific capacities obtained from 15 wells ranged from 0.3 to 9.3 (gal/min)/ft, or 0.06 to 1.9 (l/s)/m. Several pumping tests conducted on Nacatoch wells owned by the city of Commerce (Table 4) showed an average transmissibility of 2,500 (gal/d)/ft, or 31,000 (l/d)/m, and coefficients of permeability ranging from 26 to 53 (gal/d)/ft^2, or 1,060 to 21,200 (l/d)/m^2.

Flowing wells exist in Red River and Bowie Counties. Dissolvea-solids content generally ranges from 100 to 1,700 mg/l. A total of 50 chemical analyses were obtained from inventoried wells and included in this study.

Pumpage has steadily increased over the years and water levels have declined since development began in 1914 (Baker and others, 1963). Municipal and industrial pumpage increased from 687 acre-feet (0.47 hm^3) in 1955 to 1,591 acre-feet (1.96 hm^3) in 1965, and to 2,135 acre-feet (2.63 hm^3) in 1975.

AVAILABILITY OF GROUND WATER

Methods Used to Determine Availability

The procedural steps used to appraise the ground-water availability of the Trinity and Woodbine aquifers were to review pertinent publications and then select an evaluation method or combination of methods to derive the average annual ground-water availability. These methods generally fell into three basic catagories, namely; (I) steady-state flow under the supposition that water levels did not change with time and natural recharge balanced discharge; (2) rate of depletion of ground-water that is recoverable from storage; and (3) circumstances requiring geohydrological judgements or assumptions. In general, only fresh to slightly saline ground water containing less than 3,000 mg/l dissolved solids was evaluated. A discussion of methodologies developed to appraise the ground water available in the study area follows.

Steady-State Flow Methods

Although steady-state flow does not generally happen in nature, the concept that it is approximated in nature is beneficial to the development of analyical methods used to evaluate the available ground water in an aquifer. If so, the discovery by Henri Darcy in 1856 that the rate of water flowing through sand is proportional to the hydraulic gradient is applicable here (Lohman, 1972). This relation is known as Darcy's Law, and Bennett (1976) states that it "relates specific discharge, or discharge per unit area, to the gradient of hydraulic head. It is the fundamental relation governing steady-state flow in porous media." Darcy's Law may be expressed by the equation:

$$q = Q/A = -K\, dh/dl.$$

where q is the specific discharge per unit area, Q/A; Q is the rate of discharge or flow, A is the cross-sectional area through which the discharge or flow passes and is normal to the direction of flow; K is the hydraulic conductivity or permeability of the porous medium; and dh/dl is the head gradient or hydraulic gradient. Values for the parameters of discharge, Q; applicable area, A; permeability, K; and the hydraulic gradient, dh/dl were obtained by the best procedures depending on the form of the available data.

The trough method is a geometric application of Darcy's Law and is used to evaluate the sustainable annual yield or annual effective recharge available from an artesian (confined) aquifer (Klemt and others, 1975, p. 11-12). This steady-state flow method assumes the lowering of water levels to the top of the aquifer downdip from the outcrop to a maximum of 400 feet (112 m) below land surface, but not below the top of the aquifer. The trough axis would be an imaginary line connecting innumerable points of discharge along which the top of the aquifer is approximately the same depth below land surface, roughly parallel to the outcrop of

the aquifer. The quantity of water that the aquifer will transmit under the hydraulic gradients established between the recharge area and the innumerable points of discharge along an approximate line of discharge, provides an index to the aquifer's maximum effective recharge capability if the water is available as precipitation.

Rate of Depletion of Ground Water That is Recoverable From Storage

The methodology used to determine the depletion rate of recoverable ground-water storage differs for artesian and water-table aquifers. In the case of the Trinity aquifer, the amount of artesian storage proposed for development was determined by constructing a present thickness map of the recoverable artesian storage zone, computing the total volume in the depletion zone, and multiplying it by the storage coefficient. With due consideration given to the transmission capacity of the Trinity aquifer and to pumping lift costs, the lowering of water levels by innumerable discharge points lying in the area between the aquifer outcrop and the downdip limit of fresh to slightly saline water was limited to a maximum level of 100 feet (30 m) above the top of the aquifer (Figure 14). The annual storage depletion rate was calculated by dividing the recoverable storage by 53 years which is the depletable or planning period to the year 2030 (Texas Water Development Board, 1977, Vol. 1, p. 1 l-65). This depletion rate was then added to the annual effective recharge to give the average annual ground-water availability.

Circumstances Requiring Geohydrological Judgements or Assumptions

In order to make a determination of ground-water or assumptions availability utilizing the methodologies just discussed, it was necessary to make certain judgements or assumptions based on unique aquifer attributes. For example, a judgement was made as to whether or not the transmission capacity of the aquifer was compatible to the effective recharge which is based on a percentage of the mean annual precipitation. Judgements or assumptions employed in these methods will become more explicit in the Trinity and Woodbine aquifer discussions which follow.

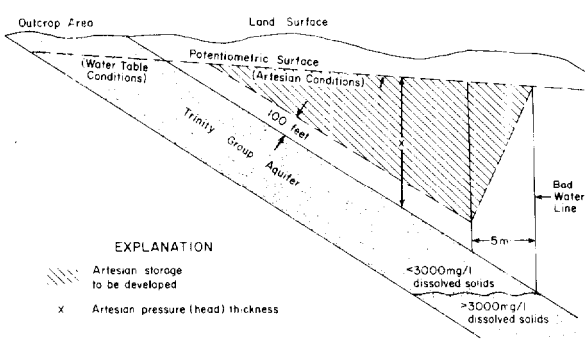

Figure 14.-Diagrammatic Cross Section Through a Confined Aquifer Showing Depletable Artesian Ground-Water Storage

Trinity Group

The ground water available for future development was determined collectively for the Antlers, Paluxy, and Twin Mountains Formations and called the Trinity Group aquifer (Table 1). The annual effective recharge or transmission capacity of the Trinity Group aquifer in the study area was determined using the trough method. The methodology is based on pumpage under assumed conditions and is related mainly to the ability of the aquifer to transmit water to the areas of pumpage. To compute the amount of water available from the Trinity Group aquifer, several assumptions had to be made.

It was assumed that water levels in the outcrop would not decline. An imaginary line of discharge was constructed approximately parallel to the outcrop where the depth to the top of the Trinity Group was 400 feet (122 m) below land surface. The line of discharge was approximately 135 miles (217 km) long, extending from Johnson County west of Cleburne, through Fort Worth in Tarrant County, through Denton County west of Denton, and through Grayson County east of Gainesville. All the recharge was assumed to occur in the middle of the outcrop along a line parallel to the strike. The line of discharge averages 13 miles (21 km) from the assumed line source of recharge. Pumping along the line of discharge will lower water levels to the top of the Trinity Group, which is 400 feet (122 m) below land surface. The hydraulic gradient under which ground water is being transmitted through the aquifer is the difference in the altitude of the water level in the outcrop and the altitude of the top of the Trinity where it is 400 feet (122 m) below land surface divided by the distance between these points of altitude, which is approximately 13 miles (21 km). It was also assumed that recharge along the outcrop will be uniformly transmitted to the line of discharge and that the slope of the piezometric surface will be constant after drawdown to the 400-foot (122 m) level. The average coefficient of transmissibility used for the Trinity Group aquifer was 11,000 (gal/d)/ft or 136,600 (l/d)/m.

Using these assumptions and provided that sufficient water is available as recharge, it was

determined that approximately 1.5 percent of the average annual precipitation falling on the outcrop, or approximately 51,000 acre-feet (62.9 hm^3), can be transmitted through the Trinity Group aquifer to the line of discharge. This is the computed amount of water that can be pumped annually by wells located downdip from the outcrop in the study area. The 1.5 percent was judged to be acceptable since effective recharge for the Trinity Group in North Texas is probably not greater than 5 percent.

The thickness of artesian storage was determined by using a geologic structure map of the top of the Trinity Group aquifer and the 1977 water-level observation well measurements. The thickness equals the distance between the potentiometric surface and 100 feet (30 m) above the top of the aquifer (Figure 14). The top of the Trinity Group is represented by the Antlers Formation in the northern part of the study area and by the Paluxy Formation south of the Antlers. Contouring of the recoverable artesian storage area was limited as follows: (1) within 5 miles (8 km) of the downdip limit of fresh to slightly saline water; (2) within 5 miles (8 km) of the Texas-Oklahoma border; and (3) where 100 feet (30 m) of artesian head was present above the top of the Trinity Group aquifer. The area of recoverable artesian storage was determined by using a planimeter. The area was multiplied by the thickness of artesian storage and then by the coefficient of storage to give the volume of recoverable storage. A conservative artesian storage coefficient of 1×10^{-4} was used. In January 1977, it was estimated that slightly more than 646,000 acre-feet (797 hm^3) of ground water in the study area could be withdrawn from storage.

The total annual ground-water availability of the Trinity Group aquifer was determined by dividing the volume of recoverable storage by 53 years (January 1, 1977 through December 31, 2029) and adding it to the annual effective recharge. The total annual ground-water availability for the Trinity Group aquifer in the study area to the year 2030 is about 63,000 acre-feet (77.7 hm^3) which consists of 51,000 acre-feet (62.9 hm^3) of annual effective recharge and 12,000 acre-feet (14.8 hm^3) of recoverable storage.

Woodbine Group

In calculating the estimated transmission capacity of the Woodbine aquifer, the following assumptions were made: (a) pumpage would draw water levels down to the top of the aquifer where it is 400 feet below land surface; (b) ground water passes through a vertical section of the aquifer which is 180 miles long and located 5 to 10 miles downdip from the outcrop along a line through Ellis, Dallas, Denton, Collin, Grayson, Fannin, and Lamar Counties; (c) the average transmissibility for the aquifer is 4,700 (gal/d)/ft or 58,365 (l/d)/m.

Based on the above assumption, approximately 24,500 acre-feet (30.2 hm^3) of water can theoretically be transmitted by the Woodbine aquifer in the study area to pumping wells downdip from the outcrop. This amount of water can be pumped annually and is less than 5 percent of the estimated average annual precipitation of 35 inches available to the outcrop area as recharge.

Nacatoch and Blossom Sands

The methodology used to appraise the annual ground-water availability of the Nacatoch and Blossom Sands was a comparison of pumpage and water-level trends.

In regions of heavy pumpage around Clarksville in Red River County and Commerce in Hunt County, water levels have declined steadily. These annual water-level declines are a direct result of pumpage exceeding the effective recharge. After analyzing water-level data presented by Baker and others (1963), it is estimated that the average annual ground-water availability, as effective recharge, within the study area for both of the aquifers is 1,619 acre-feet (2 hm^3). This includes an annual effective recharge for the Nacatoch Sand of 994 acre-feet (1.23 hm^3) and 625 acre-feet (0.771 hm^3) for the Blossom Sand.

WELL CONSTRUCTION

Well construction in the study region is generally based on water requirements and economics. Some of the well designs used to produce ground water from the sand and gravel aquifers in the study area are illustrated on Figure 15.

Within the Trinity Group outcrop area, irrigation wells producing from the Antlers, Paluxy, and Twin Mountains Formations are generally of medium to high capacity (15-470 gal/min) (0.95-30 l/s), cased, and gravel packed. The casing is usually slotted opposite the desired water-bearing unit. Irrigation wells completed in the Woodbine Group are of high capacity (30-900 gal/min) (1.9-57 l/s); however, in some areas of the outcrop, the lower Woodbine is non-(productive, and yields are small (IO-50 gal/min) (0.63-13.2 l/s). Other than the high capacities, completion of wells in the Trinity and Woodbine Groups are similar. The diameter of the well

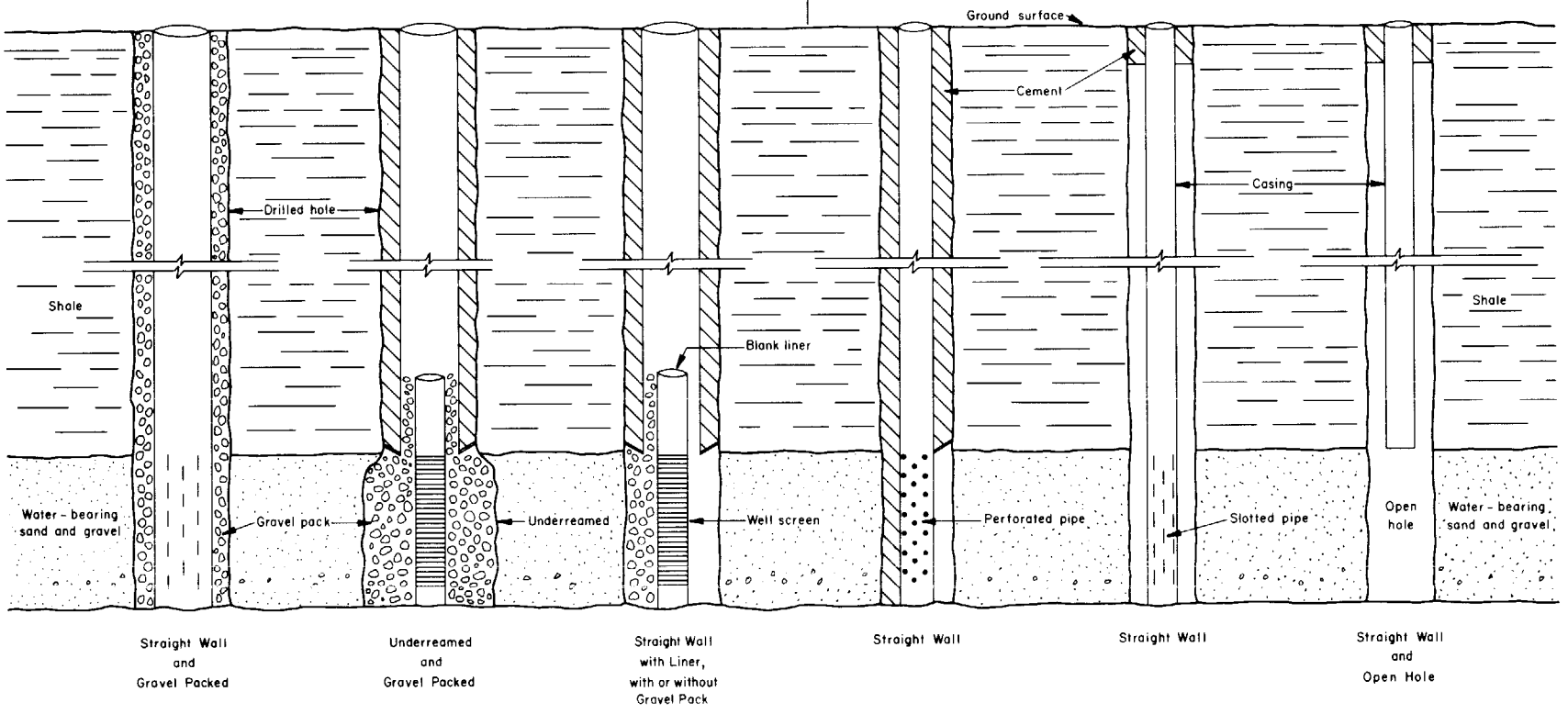

Figure 15

Diagrams of Well Construction

casing varies with the formation and the pumping capacity. In general, the most common size of casing is between 6 and 8 inches (15 and 20 cm). High-capacity Woodbine irrigation wells fall in the 12- to 16-inch (30.5- to 40.6-cm) diameter range. A number of high-capacity Twin Mountains wells in Hood County are 10 inches (25 cm) in diameter.

Generally, public supply and industrial wells are straight walled, cased, and may be cemented from the surface to the top of the desired water-bearing unit. Casing is either slotted or perforated opposite the water-producing interval or selectively screened with intervening blank liner. Large-capacity wells are often underreamed and Gravel packed. Small-capacity wells, in some cases, are cemented from top to bottom and the casing is gun perforated opposite the water-bearing strata. Open-hole completions are rarely found in large-capacity wells in this area. Usually a large diameter casing is used at tne surface and cemented into place to restrict seepage of surface water into the bore hole. Generally, the casing opposite the water-bearing strata ranges from 3 to 12 inches (7.6 to 30 cm) in diameter.

Domestic and livestock wells are generally straight walled, cased from top to bottom, slotted or perforated, and cemented around the top of the casing. In some areas, the wells are gravel packed, and in others, the casing extends only to the top of the producing beds and left as an "open hole" type completion. Casing used in these small-capacity wells generally ranges from 3 to 8 inches (7.6 to 20 cm) in cliameter.

Improperly completed wells can lead to problems such as insufficient yield and poor water quality, which may not only be a problem affecting the well in question, but can also result in contamination of wells in the surrounding area. One of the most common problems occurring in the study region involves water from the Woodbine that is used for domestic purposes. The upper part, and sometimes the middle part, of the Woodbine aquifer contains water that is high in dissolved iron. An iron concentration of more than the recommended upper limit of 0.3 mg/l will stain laundry, utensils, and plumbing fixtures reddish brown and also impart an unpleasant taste. To eliminate this problem, the upper strata, and in some areas the middle strata, of the Woodbine are cemented off and the wells are completed in the lower Woodbine, which contains better quality water. Wells completed in this part also have a higher capacity.

36 063

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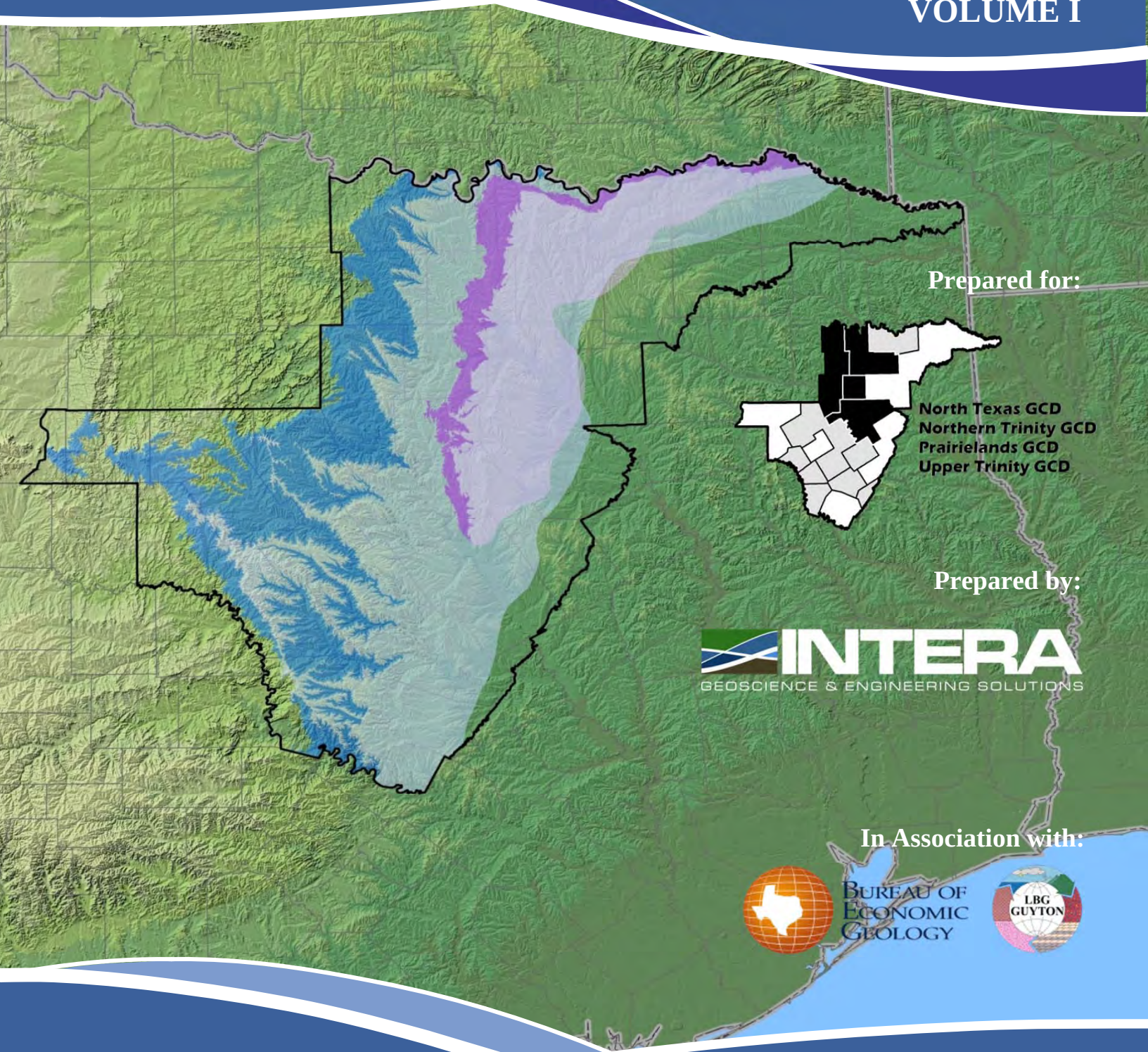
Reference 37

Updated Groundwater Availability Model of the Northern Trinity and Woodbine Aquifers

FINAL MODEL REPORT

VOLUME I



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Prepared by:

INTERA
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Bureau of Economic Geology

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AUGUST 2014

37 001

FINAL REPORT
Updated Groundwater Availability Model of the Northern Trinity and Woodbine Aquifers

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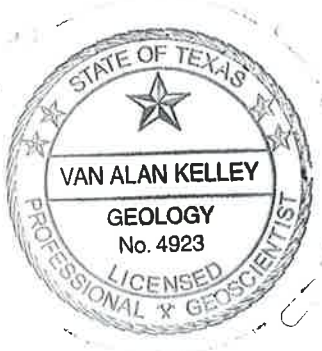

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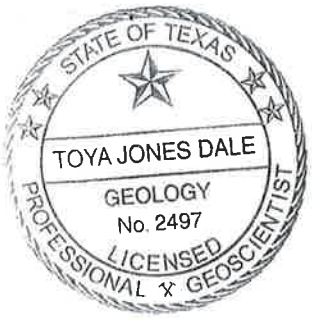

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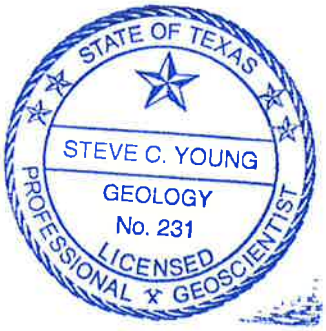

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Table of Contents

Executive Summary ES-1

1.0 Introduction 1.0-1

2.0 Study Area 2.0-1
2.1 Physiography and Climate 2.1-1
2.2 Geology 2.2-1

3.0 Previous Investigations 3.1-1
3.1 Previous Geologic Investigations 3.1-1
3.2 Previous Hydrogeological Investigations 3.2-1
3.3 Previous Numerical Modeling Studies 3.3-1
3.3.1 Model Documented in Klemt and others (1975) 3.3-1
3.3.2 The Model of Morton (1992) 3.3-2
3.3.3 The Model of Dutton and Others (1996) 3.3-3
3.3.4 2004 Northern Trinity and Woodbine Aquifers GAM by Bené and others (2004) 3.3-7

4.0 Hydrogeologic Setting 4.1-1
4.1 Hydrostratigraphy of the Northern Trinity and Woodbine Aquifers 4.1-1
4.1.1 Introduction 4.1-1
4.1.2 Previous Studies 4.1-2
4.1.3 Overview of Hydrostratigraphy 4.1-2
4.1.4 Structural Features 4.1-6
4.1.5 Paleogeography and Depositional Environment 4.1-8
4.1.6 Methods and Data 4.1-9
4.1.7 Lithologic Character of Enclosing Formations 4.1-12
4.1.8 Regional Sandstone Distribution and Depositional Systems 4.1-13
4.1.9 Water Quality from Resistivity Logs 4.1-19
4.1.10 Hydrostratigraphy for the GCDs Comprising the Inter-local Agreement 4.1-21
4.1.10.1 Upper Trinity GCD 4.1-21
4.1.10.2 North Texas GCD 4.1-22
4.1.10.3 Northern Trinity GCD 4.1-23
4.1.10.4 Prairielands GCD 4.1-24
4.1.11 Summary of Northern Trinity and Woodbine Aquifers Hydrostratigraphy 4.1-25
4.2 Aquifer Hydraulic Properties 4.2-1
4.2.1 Aquifer Flow Concepts and Terminology 4.2-1
4.2.1.1 Horizontal Hydraulic Conductivity and Transmissivity 4.2-1
4.2.1.2 Vertical Hydraulic Conductivity and Vertical Anisotropy 4.2-2
4.2.1.3 Scale-Dependency of Hydraulic Conductivity Measurements 4.2-3

37 006

Table of Contents, continued

4.2.1.4 Scale Dependent Heterogeneity 4.2-4
4.2.1.5 Aquifer Pumping Tests and Specific Capacity Tests 4.2-4
4.2.2 Description of a Geohydrostratigraphic (GHS) Model 4.2-5
4.2.3 Transmissivity Values from Aquifer Pumping Test Data 4.2-7
4.2.3.1 Published Transmissivity Values 4.2-7
4.2.3.2 Aquifer Pumping Test Elapsed Time-Drawdown Data 4.2-8
4.2.4 Analysis of Aquifer Pumping Test Elapsed Time-Drawdown Data 4.2-9
4.2.5 Sand, Shale, and Limestone Profiles from Lithologic Analyses 4.2-12
4.2.6 Assignment of Hydraulic Conductivity Values to Litho-Units 4.2-15
4.2.6.1 Estimating Hydraulic Properties from Aquifer Pumping Tests 4.2-15
4.2.6.2 Assignment of Hydraulic Conductivities 4.2-17
4.2.7 Application and Refinement of the GHS Model 4.2-19
4.2.7.1 Hydraulic Conductivity Fields for Aquifers/Formations 4.2-19
4.2.7.2 Transmissivity Fields for Aquifers/Formations 4.2-20
4.2.7.3 Vertical Hydraulic Conductivity 4.2-21
4.2.7.4 Storativity, Specific Storage, and Specific Yield 4.2-22
4.2.8 Collection and Analysis of Specific Capacity Tests 4.2-24
4.2.8.1 Relationship between Specific Capacity Tests and Transmissivity 4.2-25
4.2.8.2 Assessment of Transmissivity Values from Specific Capacity Tests 4.2-27
4.2.8.3 Potential Changes to the GHS Model Baseline for Hydraulic Conductivity 4.2-28
4.3 Hydraulic Heads and Groundwater Flow 4.3-1
4.3.1 Data Sources and Description 4.3-1
4.3.2 Predevelopment Hydraulic Head Surfaces 4.3-8
4.3.3 Transient Hydraulic Head Data (Hydrographs) 4.3-11
4.3.4 Historical Hydraulic Head Data and Hydraulic Head Declines 4.3-20
4.3.5 Transient Hydraulic Head Calibration Targets 4.3-25
4.3.6 Vertical Hydraulic Gradients 4.3-26
4.4 Groundwater Quality 4.4-1
4.4.1 Relevant Previous Work 4.4-1
4.4.2 Regional-scale Flow Observations Inferred from Geochemistry Data 4.4-3
4.4.3 Hydrogeochemical Facies 4.4-4
4.4.4 TDS and Chloride Concentrations and Limits of Freshwater 4.4-9
4.4.5 Implications for Recharge Boundaries 4.4-12
4.4.6 Implications for Discharge Boundaries 4.4-12
4.5 Recharge 4.5-1
4.5.1 Conceptual Understanding of Recharge 4.5-1
4.5.2 Previous Investigations of Recharge in the Study Area 4.5-3
4.5.3 Controls on Aquifer Recharge 4.5-6

Table of Contents, continued

4.5.3.1 Precipitation 4.5-6
4.5.3.2 Soil Physical Properties 4.5-6
4.5.3.3 Land Use/Land Cover 4.5-8
4.5.4 Methods of Recharge Estimation 4.5-10
4.5.4.1 Stream Hydrograph Separation Method 4.5-10
4.5.4.2 Water Balance Method 4.5-11
4.5.4.3 Chloride Mass Balance (CMB) Method 4.5-16
4.5.4.4 Evaluation of Other Sources of Chloride to Groundwater 4.5-18
4.5.4.5 Tritium Concentrations in the Northern Trinity and Woodbine Aquifers 4.5-21
4.5.5 Results and Discussion 4.5-22
4.5.5.1 Comparison of Recharge Estimates from the Hydrograph Separation Analysis and the CMB Method 4.5-22
4.5.5.2 Comparison of Recharge Estimates from the Hydrograph Separation Analysis and from the SSURGO Soil Parameters and Precipitation 4.5-24
4.5.6 Spatial and Temporal Recharge Model 4.5-24
4.6 Natural Aquifer Discharge 4.6-1
4.6.1 Stream-Aquifer Interaction 4.6-1
4.6.1.1 Streamflow Characteristics 4.6-3
4.6.1.2 Groundwater Level/Stage Relationships 4.6-3
4.6.1.3 Gain/Loss Studies 4.6-8
4.6.1.4 Hydrographic Separation Studies 4.6-11
4.6.1.5 Calibration Targets for Streams 4.6-18
4.6.2 Groundwater ET, Springs, and Reservoirs 4.6-19
4.6.2.1 Groundwater ET 4.6-19
4.6.2.2 Springs 4.6-21
4.6.2.3 Lakes and Reservoirs 4.6-22
4.6.3 Groundwater Discharge to Younger Formations 4.6-22
4.7 Groundwater Pumping and Discharge from Flowing Wells 4.7-1
4.7.1 Discharge from Flowing Wells 4.7-2
4.7.2 Historical Pumping for 1900 to 1980 in Texas 4.7-4
4.7.2.1 Literature Sources of Historical Pumping Estimates 4.7-4
4.7.2.2 Calculation of Historical Pumping Estimates for 1900 to 1980 ..... 4.7-6
4.7.2.3 Summary of Historical Pumping Estimates for 1900 to 1980 ..... 4.7-6
4.7.3 Historical Pumping for 1980 to 2010 and 2011 Mining Pumping in Texas 4.7-9
4.7.3.1 TWDB Methodology for Estimating Historical Pumping 4.7-9
4.7.3.2 Calculation of Rural Domestic Pumping 4.7-10

37 008

Table of Contents, continued

4.7.3.3 Summary of Historical Pumping Estimates for 1980 through 2010 ..... 4.7-11
4.7.3.4 Estimates of Mining Pumping 4.7-16
4.7.4 Pumping Data Received from GCDs 4.7-16
4.7.5 Historical Pumping Estimates for Oklahoma and Arkansas 4.7-17
4.7.6 Combined Historical Pumping Estimates for 1900 through 2010 ..... 4.7-18
4.7.7 Implementation of Historical Pumping 4.7-22
4.7.8 Pumping Volume Uncertainty 4.7-22

5.0 Conceptual Model for Groundwater Flow in the Northern Trinity and Woodbine Aquifers 5.1-1
5.1 Hydrogeologic Framework 5.1-1
5.2 Aquifer Properties 5.2-1
5.3 Hydraulic Heads and Groundwater Flow 5.3-1
5.4 Recharge and Natural Aquifer Discharge 5.4-1
5.5 Groundwater Quality 5.5-1
5.6 Groundwater Pumping 5.6-1
5.7 Conceptual Aquifer Water Balance 5.7-1
5.8 Model Implementation 5.8-1

6.0 Model Design 6.1-1
6.1 Code and Processor 6.1-1
6.2 Model Layers and Grid 6.2-1
6.3 Boundary Condition Implementation 6.3-1
6.3.1 Lateral Model Boundaries 6.3-2
6.3.2 Vertical Boundaries 6.3-2
6.3.3 Surface Water Implementation 6.3-3
6.3.4 Implementation of Recharge and ET 6.3-5
6.3.5 Implementation of Pumping Discharge 6.3-7
6.4 Model Hydraulic Parameters 6.4-1
6.4.1 Hydraulic Conductivity 6.4-1
6.4.2 Fault Conductance 6.4-3
6.4.3 Storage Coefficient 6.4-4

7.0 Modeling Approach 7.0-1
7.1 Calibration 7.1-1
7.2 Calibration Target Uncertainty 7.2-1
7.3 Conceptual Model Uncertainty 7.3-1
7.4 Sensitivity Analysis 7.4-1

8.0 Steady-State Model 8.1-1
8.1 Calibration 8.1-1
8.1.1 Calibration Targets 8.1-1
8.1.2 Horizontal and Vertical Hydraulic Conductivities 8.1-1
8.1.3 Recharge and Groundwater ET 8.1-3

Table of Contents, continued

8.1.4 Head-Dependent Boundaries Representing Younger Formations 8.1-3
8.1.5 Stream Conductances 8.1-3
8.2 Simulation Results 8.2-1
8.2.1 Hydraulic Heads 8.2-1
8.2.2 Streams, Springs, and ET 8.2-3
8.2.3 Cross-Formational Flow 8.2-3
8.2.4 Groundwater Age 8.2-3
8.2.5 Water Budget 8.2-4
8.3 Sensitivity Analysis 8.3-1

9.0 Transient Model 9.1-1
9.1 Calibration 9.1-1
9.1.1 Calibration Targets 9.1-1
9.1.2 Storage Properties 9.1-2
9.1.3 Horizontal and Vertical Hydraulic Conductivities 9.1-2
9.2 Simulation Results 9.2-1
9.2.1 Hydraulic Heads 9.2-1
9.2.2 Stream Discharge 9.2-8
9.2.3 Water Budget 9.2-8
9.3 Sensitivity Analysis 9.3-1

10.0 Limitations of the Model 10.1-1
10.1 Key Limitations of Supporting Data 10.1-1
10.1.1 Historical Pumping 10.1-2
10.1.2 Multi-Layer Well Completions and Unknown Completion Data 10.1-3
10.1.3 Aquifer and Fault Hydraulic Properties 10.1-3
10.1.4 Other Important Data Gaps 10.1-4
10.2 Key Assumptions Regarding the Model Construction and Calibration 10.2-1
10.3 Limits for Model Applicability 10.3-1

11.0 Future Improvements 11.1-1
11.1 Additional Supporting Data 11.1-1
11.2 Future Model Implementation Improvements 11.2-1
11.2.1 Use of the USGS Unstructured Grid Version of MODFLOW 11.2-1
11.2.2 Coupling of the Model with an Analytical Element Model (AEM) for Near-Field Prediction 11.2-2

12.0 Conclusions 12.0-1

13.0 Acknowledgements 13.0-1

14.0 References 14.0-1

Table of Contents, continued

Appendix A Database of GCD Data
Appendix B Bibliography of Historical Reports
Appendix C Stratigraphic Cross Sections and Geophysical Logs
Appendix D Aquifer Pumping Test Plots and Analyses
Appendix E Summary of Historical Development of the Aquifers
Appendix F Natural Aquifer Discharge
Appendix G Historical Pumping Estimates
Appendix H Three-Dimensional Geologic Models
Appendix I Comparison of Observed and Simulated Hydrograph Data for the Transient Calibration Period (1890 through 2012) for the Updated Northern Trinity and Woodbine Aquifers GAM
Appendix J Electronic Files and Geodatabase
Appendix K Responses to Comments in the Conceptual Model Report
Appendix L Responses to Comments in the Draft Final Model Report
Appendix M Hydrographs of Transient Water-Level (Hydraulic Head) Data

Executive Summary

This report documents the development of a three-dimensional groundwater model for the northern Trinity and Woodbine aquifers. The model also includes the Washita/Fredericksburg groups as a confining layer separating the northern Trinity Aquifer from the overlying Woodbine Aquifer. The Trinity Aquifer is a major aquifer in Texas [George and others, 2011; Texas Water Development Board (TWDB), 2012] and the northern portion is a major water resource for a large portion of north-central Texas and growing population centers along the Interstate 35 corridor from the Dallas-Fort Worth Metropolitan Area to Austin. The northern Trinity Aquifer generally coincides with the portion of the Trinity Group located north of the Colorado River. The northern Trinity Aquifer outcrops in a broad area in Texas along its western extent from Montague County in the north, as far west as Eastland and Callahan counties, and south to Travis County. North of the Brazos River, the northern Trinity Aquifer is overlain by the Woodbine Aquifer, designated as a minor aquifer in Texas by the TWDB (George and others, 2011; TWDB, 2012). The Woodbine Aquifer is named for the Cretaceous-age Woodbine Group. In Texas, this aquifer generally outcrops in a band parallel to and east of the northern Trinity Aquifer outcrop and is an aquifer from the Texas-Oklahoma border south to northern McLennan County. The eastern extent of the northern Trinity and Woodbine aquifers is defined by the TWDB to be an arc extending from middle of Red River County in northeast Texas through western Kaufman County south to northwestern Bastrop County.

Both the northern Trinity and Woodbine aquifers were deposited in a variety of terrestrial and marine depositional environments. This variety in depositional environments resulted in a complex system of aquifers that can be mapped in the subsurface but have wide variation in lithology from sand and gravel dominated systems to shale and limestone. This large degree of variability has led to a very complex geologic nomenclature. However, persistent stratigraphic layers are physically continuous across the study area while their thickness and dominant lithology may change. This study defines five distinct aquifers/formations within the northern Trinity Aquifer from oldest to youngest; the Hosston Aquifer, the Pearsall Formation, the Hensell Aquifer, the Glen Rose Formation, and the Paluxy Aquifer. The aquifers are comprised of interbedded sands and shales and potable water quality can be found over most of the study

area with the exception of the Paluxy Aquifer. The Paluxy Aquifer only extends as far south as northern McLennan County.

The Washita/Fredericksburg groups are situated between the northern Trinity Aquifer and the Woodbine Aquifer and constitute what is generally considered a confining unit but can produce potable groundwater. The Edwards Balcones Fault Zone (BFZ) Aquifer, designated as a major aquifer (George and others, 2011; TWDB, 2012), is situated within the Washita/Fredericksburg groups in Travis, Williamson, and Bell counties. The Woodbine Aquifer is the youngest aquifer included in this model and is predominantly a sandstone with interbedded shale. The Woodbine Group is an aquifer from the Texas-Oklahoma state line in the north to northernmost McLennan County in the south where it thins and becomes predominantly shale. Potable water quality is found in the Woodbine Aquifer outcrop and in some areas the subcrop. Water quality is variable in the confined portions of the aquifer downdip of the outcrop.

This report documents the updated northern Trinity and Woodbine aquifers groundwater availability model (GAM) which is a redevelopment of the original northern Trinity and Woodbine aquifers GAM developed by Bené and others (2004). This updated northern Trinity and Woodbine aquifers GAM was developed using the groundwater simulation code MODFLOW-NWT. MODFLOW is a three-dimensional finite-difference groundwater flow code that is supported by enhanced boundary condition packages to handle recharge, evapotranspiration (ET), streams, springs, and reservoirs. The updated northern Trinity and Woodbine aquifers GAM is divided into eight model layers. Model Layer 1 represents the shallow surficial flow system in the outcrop areas of the northern Trinity Aquifer, Washita/Fredericksburg groups, and Woodbine Aquifer as well as the younger formations overlying the Woodbine and Washita/Fredericksburg groups east of the Woodbine Aquifer and Washita/Fredericksburg groups outcrops. Model Layers 2 through 8 represent the Woodbine Aquifer, Washita/Fredericksburg groups, Paluxy Aquifer, Glen Rose Formation, Hensell Aquifer, Pearsall Formation, and Hosston Aquifer, respectively. The model grid cells are quarter-mile by quarter-mile squares throughout the model domain, which has 1,412 columns and 1,124 rows for a total of 12,696,704 grid cells for the eight model layers. The model grid origin (lower left-hand corner) is located at GAM coordinates 19,067,743 feet north and

6,169,014 feet east. The model is oriented with the x-axis 65 degrees counter-clockwise of east-west to directly overly the grid for the 2004 northern Trinity and Woodbine aquifers GAM.

The first phase of work in the model development was the development of the conceptual model for the northern Trinity and Woodbine aquifers. A conceptual model is a description of the physical processes governing groundwater flow in an aquifer system. During development of the conceptual model, data was collected and interpreted for all the important hydrogeological features that govern groundwater flow in the aquifers including hydrostratigraphy, hydraulic properties, hydraulic heads, recharge, mechanisms of natural discharge, and pumping and information regarding flowing wells. The data collected, the interpretation of that data, and how the data were used to define the conceptual understanding of the northern Trinity and Woodbine aquifers is discussed in detail in this report. The data are also publically available so that future investigators can build on the data and the interpretation of that data.

The more significant contributions of the analyses performed in support of the aquifers conceptual model are hydrostratigraphy, properties, water quality, and pumping. The northern Trinity and Woodbine aquifers are a complex aquifer system with significant variability in aquifer and formation properties in the study area.

The study used 1,302 geophysical logs to correlate stratigraphic boundaries and interpret lithologies. Stratigraphic unit boundaries were defined in outcrop and traced into the subsurface using advanced modern well log correlation techniques. Lithology was interpreted at the scale of 2 to 3 feet creating a high resolution three-dimensional lithologic data set of the aquifers. Net sand and percent sand maps were developed as well as maps of the dominant depositional environments for each aquifer/formation. This stratigraphic framework provided the basis for developing initial model hydraulic properties.

This study collected, analyzed, and/or reviewed over 1,000 long-term (24 hours or longer) aquifer pumping tests collected from the Texas Commission on Environmental Quality (TCEQ) Public Water Supply well records and literature and over 29,000 specific capacity tests obtained from TCEQ well driller's reports. An assessment of the quality of the hydraulic tests resulted in 450 good aquifer pumping tests and 16,000 good specific capacity tests. Hydraulic conductivity values were estimated using multiple datasets including values available from the literature.

A conceptual geohydrostratigraphic (GHS) model was used for estimating hydraulic properties for the aquifers and formations in the northern Trinity and Woodbine aquifers. The GHS model combined depositional and lithological information interpreted in this study with aquifer pumping test data collected and analyzed to provide a framework for estimating hydraulic properties for each aquifer/formation in the model. The GHS model was used to provide an initial, regional set of aquifer parameters for model calibration and to guide the adjustment of aquifer parameters during model calibration. This approach enabled the use of the larger lithologic dataset to estimate aquifer properties across the model domain.

Several methods were used to estimate recharge including water balance methods, the chloride mass balance method, and stream hydrograph separation analyses. Stream hydrograph separation analysis (sometimes referred to as base flow analysis) was conducted on 36 stream gages and associated watersheds intersecting outcrops of the northern Trinity Aquifer, Washita/Fredericksburg groups, and Woodbine Aquifer. These data were used to develop a recharge model for the northern Trinity and Woodbine aquifers. The recharge rate estimated for the outcrop areas of the northern Trinity and Woodbine aquifers in the study area averaged 1.6 inches per year and ranged from a high of 7.2 inches per year in southwestern Arkansas to a low of 0.25 inches per year in Taylor County, Texas. Because the recharge model is fundamentally based upon precipitation, recharge varies spatially and temporally as a function of climate (precipitation). The recharge model also takes into account the effects of urbanization through the historical period.

This study reviewed the relevant literature discussing water quality of the northern Trinity and Woodbine aquifers and developed maps of total dissolved solids (TDS), chloride, and hydrogeochemical facies to better describe and understand the hydrodynamics of the aquifers. The hydrogeochemical facies analysis suggested that the outcrop areas of the northern Trinity and Woodbine aquifers are an active recharge zone with a strong similarity in groundwater chemistry (calcium-magnesium facies) across aquifers and formations suggesting a well-connected shallow groundwater system. The extent of TDS concentration less than or equal to 1,000 mg/L was mapped for each of the aquifers. It is important to note that the model includes significant portions of the northern Trinity and Woodbine aquifers that would be classified as brackish groundwater (greater than 1,000 mg/L and less than 10,000 mg/L).

Pumping was estimated for the northern Trinity and Woodbine aquifers in Texas from 1890 through 2012. A variety of sources and methods were used to estimate pumping in the period prior to 1980. Because flowing wells were an important source of aquifer discharge prior to the 1930s, a literature review was performed to locate flowing wells and obtain estimates of flow rates where available. After 1980, pumping was estimated using water use survey data from the TWDB and metered data made available by Groundwater Conservation Districts (GCDs) in the study area. Groundwater production increased significantly from the late 1930s through 1980 and is still increasing to date but at a slower rate than that prior to 1980. It is estimated that approximately 260,000 acre-feet of groundwater was pumped from the aquifers/formations in the study area in 2012 (this includes the Edwards BFZ Aquifer).

This updated northern Trinity and Woodbine aquifers GAM was developed using a modeling protocol that is standard to the groundwater modeling industry and has been adopted by the TWDB in their GAM Program. This protocol is based upon industry standards and American Society for Testing and Materials standard guides. The GAM protocol includes: (1) the development of a conceptual model for groundwater flow in the aquifers, including defining physical limits and properties, (2) model design, (3) model calibration, (4) sensitivity analysis, and (5) reporting. The conceptual model is a description of the physical processes governing groundwater flow in the aquifer system. Model design is the process used to translate the conceptual model into a physical model, which in this case is a numerical model of groundwater flow. This involves organizing and distributing model parameters, developing a model grid and model boundary conditions, and determining the model integration time scale. Model calibration is the process of modifying model parameters so that observed field measurements (e.g., water levels in wells) can be reproduced.

The updated GAM for the northern Trinity and Woodbine aquifers was calibrated to predevelopment conditions representing, as closely as possible, conditions in the aquifers prior to significant development and to transient aquifer conditions from predevelopment through 2012. The steady-state model and transient model are combined into the same model to ensure consistent model parameterization between the models and to allow the steady-state hydraulic heads to set the initial transient hydraulic heads. The generally accepted practice for groundwater calibration includes performance of a sensitivity analysis, which was performed as

part of model calibration. Sensitivity analyses were performed on both the steady-state and transient portions of the model to offer insight into the uniqueness of the model and the impact of uncertainty in model parameter estimates.

The steady-state model represents a period of long-term equilibrium between aquifer recharge and aquifer discharge. Simulating steady-state conditions is important in overall model calibration because it ensures that the model of the aquifers is physically plausible in ways a transient model cannot. The transient model calibration period extends predevelopment from 1890 through 2012. An effort was made to include as many water-level observations as possible and to simulate, to the degree possible, the significant regional water-level declines that resulted from initial development and the practice of allowing wells to freely flow and the historical onset of significant groundwater development in the 1940s and 1950s. Relative to the 2004 northern Trinity and Woodbine aquifers GAM, this updated GAM extends the calibration period 90 years prior to 1980 and 12 years past 2000.

Both the steady-state and transient calibrations adequately reproduce aquifer hydraulic heads within their bounds of uncertainty and within engineering best practices and consistent with the standards required in previous TWDB GAMs (TWDB, 2014). Steady-state targets included water-level measurements from 96 well locations in the northern Trinity and Woodbine aquifers. By comparison to the transient model (27,490 water-level targets) there is a distinct lack of water-level data for the steady-state model. To help better constrain the steady-state model, several other metrics were used to guide calibration. These included a comparison to the number and location of flowing wells and the location and extent of the artesian zone as reported in the literature. Particle tracking was performed to qualitatively evaluate whether groundwater age dates were within reason given the observed water quality within the aquifers.

The adjusted mean absolute error (i.e., mean absolute error divided by the range in observed hydraulic heads) is 9.1 percent for the steady-state model, which is within the acceptable GAM standard of 10 percent for the adjusted mean absolute error. The mean error for the steady-state model is 12.0 feet, indicating that the model simulates hydraulic heads slightly higher than the hydraulic head targets. This is considered acceptable because the hydraulic head targets were

expected to be biased low due to reductions in hydraulic heads prior to early water-level measurements.

Out of a total of 420 flowing well locations included in the model, 304 exhibit artesian conditions within the Hensell Aquifer and an additional 47 wells exhibit flowing conditions in the Hosston Aquifer. This qualitative check indicates that the steady-state model is consistent with regard to the artesian conditions observed at the turn of the 20th century. Groundwater age contours were calculated based on particle tracking for 30,000 and 100,000 years in the Hensell and Hosston aquifers and both were qualitatively consistent with the extent of freshwater.

The calibrated average recharge to the northern Trinity and Woodbine aquifers (including the Fredericksburg and Washita groups) totals 1,766,567 acre-feet per year (AFY) which is approximately 4.4 percent of precipitation model wide. Water discharges from the northern Trinity and Woodbine aquifers through ephemeral streams (54.1 percent of net inflow), perennial streams (41.7 percent of net inflow), riparian ET (3.0 percent of net inflow), net upward cross-formational flow to the overlying younger formations (0.8 percent of net inflow), and to springs (0.1 percent of net inflow). It is important to note that only 0.8 percent of the entire water budget gets to the confined downdip aquifers and discharges through diffuse discharge to the overlying younger formations or through the Mexia-Talco Fault Zone. This is a low percent of the predevelopment water balance. However, particle tracking shows that the groundwater velocities downdip are reasonable. Under predevelopment conditions, the northern Trinity and Woodbine aquifers were full and almost all recharge was rejected back to the surface through discharge to surface processes. Development altered this condition as can be seen in the transient model results.

The northern Trinity and Woodbine aquifers transient model simulates the period from 1890 through 2012. Calibration targets included water-level measurements, long-term hydrographs of water levels, which document transient water-level trends over time, and streamflow measurements. There were 27,490 individual water-level measurements used in the calibration period. Wells selected for hydrograph comparisons were chosen from the entire historical period from 1890 to 2012. The many hydrographs that show evidence of drawdown indicate that drawdown began occurring long before 1980, after which the most reliable pumping estimates

are available from the TWDB water use survey data. These early water-level declines motivated the inclusion of pre-1980 water-level measurements in the transient calibration. Transient water-level data with at least five measurements over a period of years were selected as long-tern hydrographs for comparison to model results. This yielded 706 hydrographs. The model streamflows were compared to available base flow estimates.

The transient model performs well at reproducing transient hydraulic heads across the historical calibration period. The model hydraulic head residuals (defined as the simulated hydraulic head minus the observed hydraulic head) show no systematic bias, with a relatively even distribution around zero. The calibration statistics for all layers meet the GAM requirement of a model simulated mean absolute error divided by the range in observed hydraulic heads of less than 10 percent. Typically, GAMs look at calibration statistics for the period from 1980 through the latest date of pumping estimates from the TWDB water use survey data because those data are considered to have the least pumping uncertainty. The mean absolute error from 1980 to 2012 ranges from 38.3 to 56.2 feet across all model layers. The mean absolute error divided by the range in observed hydraulic heads ranges from 1.8 to 5.2 percent for all model layers.

Calibration statistics for the transient period from 1890 through 1949 and from 1950 through 1979 were also calculated. Much fewer calibration targets exist for the pre-1950 time period. The mean absolute error ranges from 28.3 to 74.1 feet for the pre-1950 period and from 34.2 to 64.2 feet for the period between 1950 and 1980. The mean absolute error divided by the range is less than 10 percent in all units, with the exception of the Washita/Fredericksburg groups prior to 1950, when it is 14.5 percent.

Analysis of the transient water budget provides insight into the current conditions within the deep confined portions of the northern Trinity Aquifer. As pumping rapidly increases from 1940 through 1980 in the deeper confined portions of the aquifer downdip of the outcrop, the amount of groundwater flowing to the deep aquifer increases by a factor of four. Early on, a large fraction of deep pumping is supplied by aquifer storage. However, by 1980, capture from the updip portions of the northern Trinity aquifer supplies greater than 60 percent of the groundwater pumped at depth. By 2010, it is estimated that storage contributes less than 15 percent to the groundwater pumped at depth.

The results from this study suggest that this aquifer behavior is the result of the very low vertical conductivities of the northern Trinity and Woodbine aquifers and the low aquifer storage coefficients. The result is that deep pumping quickly depletes available storage with very large water-level declines. At this point, the groundwater must be supplied by capture of water that would normally discharge at ground surface in the outcrop. This is a very inefficient process because it would likely take tens, if not hundreds, of years for the deepest wells to benefit from the discharge capture of the shallower groundwater. The net result is that water levels keep declining even as the rate of groundwater use stabilizes.

The purpose of this model update was to make improvements to the original 2004 GAM by Bené and others (2004), including incorporation of data collected after the 2004 GAM was developed and results from recent studies in the region, and implementation of the model at a scale that better bridges the gap between regional models and a model that can be used at the scale of a typical GCD for pursuit of their groundwater management objectives. This study provides a model that has been calibrated across the entire period of record through 2012, which is a benefit to GCDs, Groundwater Management Area (GMA) 8, and stakeholders. This study provides significant advancement in the hydrogeological framework and understanding of these aquifers. The updated GAM and the information collected and interpreted to support the study provide GCDs with the best available science to inform final rule making, groundwater management within GCD boundaries, and joint planning. The data collected and made public from this study provides a wealth of knowledge to support GCDs in local-scale hydraulic calculations with analytic tool to address such issues as well spacing.

Development of this updated GAM was unique in Texas in that the entire effort was organized and funded by four GCDs in GMA 8. Desiring to make improvements and updates to the 2004 northern Trinity and Woodbine aquifers GAM and to enhance understanding of the aquifers, the North Texas, Northern Trinity, Prairielands, and Upper Trinity GCDs entered into an inter-local agreement in 2012 to support and fund this updated GAM for the northern Trinity and Woodbine aquifers in GMA 8. This work was performed in a public process similar to that used by the TWDB in their GAM Program. A Technical Advisory Committee made up of technical representatives from the GCDs within GMA 8, the TWDB, and the United States Geological

Survey were appointed and utilized throughout development of this updated GAM to ensure, for one, that local hydrological conditions were accurately incorporated into the model.

Through consultation with the Contract Management Committee and the Contract Manager, INTERA was requested to perform three predictive simulations with the updated GAM to support the GMA 8 joint planning process. Those runs are documented in Kelley and Ewing (2014).

2.0 Study Area

The location of the study area, as defined by the active model boundary, for the update of the northern Trinity and Woodbine aquifers GAM is shown in Figure 2.0.1. This area includes a large portion of central and north-central Texas, a narrow band in southeastern Oklahoma, and a small portion of southwestern Arkansas. The outcrop and downdip boundaries of the northern Trinity and Woodbine aquifers in the study area are shown in Figure 2.0.2. In Texas, these boundaries are defined by the Texas Water Development Board (TWDB) (George and others, 2011; TWDB, 2012). The spatial extent of the aquifers has been extended beyond the official TWDB boundaries into Oklahoma and Arkansas based on surface geology and estimated downdip extents. The active model boundary is defined on the west and north as the contact between northern Trinity Group formations and the underlying Paleozoic-age strata, on the south by the Colorado River, and on the east by the approximate center line of the Mexia-Talco Fault Zone. The eastern boundary in Arkansas connects the eastern extent of the northern Trinity Group with the center line of the Mexia-Talco Fault Zone.

In Texas, the northern Trinity Aquifer extends across much of the central and north-central portions of the state (see Figure 2.0.2). The outcrop consists of a north-south trending band from Montague County in the north to Travis County in the south. The outcrop width varies across this band, which exists in parts of 26 counties in Texas, and is widest in the area of Callahan, Eastland, Comanche, Erath, and Somervell counties. The outcrop extends into Oklahoma and Arkansas as a relatively narrow band trending east-west. The downdip portion of the northern Trinity Aquifer lies to the east and south of the outcrop area and exists in 39 counties.

In Texas, the Woodbine Aquifer is located in the north-central portion of the State (Figure 2.0.2). The aquifer outcrops in a north-south trending band from Cooke and Grayson counties in the north to McLennan County in the south and as a narrow, east-west trending band from Grayson County in the west to Red River County in the east. The aquifer outcrops in parts of 11 Texas counties. The downdip portion of the Woodbine Aquifer lies to the east and south of the outcrop area and exists in 13 Texas counties.

Roadways, cities, and towns located in the study area are shown in Figure 2.0.3. The largest urban area in the study area is the Dallas-Fort Worth Metroplex. In general, urban areas lie along the Interstate 35 corridor in Texas from Austin to the Dallas-Fort Worth Metroplex and along U.S. 82 in the northern part of Texas and U.S. 75 from Dallas north to Sherman and Denison, Texas. Figure 2.0.4 shows the locations of rivers and lakes/reservoirs in the study area. Numerous small streams and rivers are located in the study area as well as five major rivers, which, from north to south, are the Red, Sabine, Trinity, Brazos, and Colorado rivers. Numerous large and small lakes/reservoirs are also located in the study area.

Figures 2.0.5 and 2.0.6 show the surface outcrop and downdip subcrop of the Texas major and minor aquifers, respectively, that are present in the study area. In addition to the northern Trinity Aquifer, major aquifers are the northern segment of the Edwards Balcones Fault Zone (BFZ) Aquifer and small portions of the Carrizo Aquifer outcrop and subcrop. In addition to the Woodbine Aquifer, minor aquifers include the entire Blossom Aquifer, the majority of the Nacotoch Aquifer, portions of the Brazos River Alluvium Aquifer, an insignificant portion of the Queen City Aquifer outcrop and subcrop, and small portions of the Marble Falls Aquifer outcrop, Hickory Aquifer subcrop, and Ellenburger-San Saba Aquifer outcrop and subcrop.

Portions of six RWPGs are located in the study area as shown on Figure 2.0.7. They are Region D (North East Texas), Region B, Region C, Brazos G, Region F, and Region K (Lower Colorado). Six GCDs and portions of nine other GCDs are located in the study area. Figure 2.0.8 and Table 2.0.1 provide the locations of and list, respectively, these GCDs. The study area includes most of GMA 8 and small portions of GMAs 6, 11, and 12 (Figure 2.0.9). River authorities in the study area include the Red River Authority, Sulphur River Basin Authority, Sabine River Authority, Trinity River Authority, Brazos River Authority, and Lower Colorado River Authority (Figure 2.0.10). The study area includes portions of six river basins (Figure 2.0.11). These are the Red, Sulphur, Sabine, Trinity, Brazos, and Colorado river basins.

Table 2.0.1 Texas GCDs in the study Area.

GCDs Located in the Study Area	GCDs Located Partially in the Study Area
Clearwater UWCD	Brazos Valley GCD
North Texas GCD	Central Texas GCD
Northern Trinity GCD	Fox Crossing WD
Prairielands GCD	Lost Pines GCD
Red River GCD	Middle Trinity GCD
Southern Trinity GCD	Neches & Trinity Valleys GCD
	Post Oak Savannah GCD
	Saratoga UWCD
	Upper Trinity GCD

UWCD – Underground Water Conservation District

Table 2.0.2 River basins and approximate river length and river basin area in the study area.

River Basin	Approximate River Length (miles)	Approximate River Basin Area (square miles)
Brazos	259	13,860
Colorado	145	1,879
Red	1,010	9,634
Sabine	23	542
Sulphur	56	2,267
Trinity	199	9,455

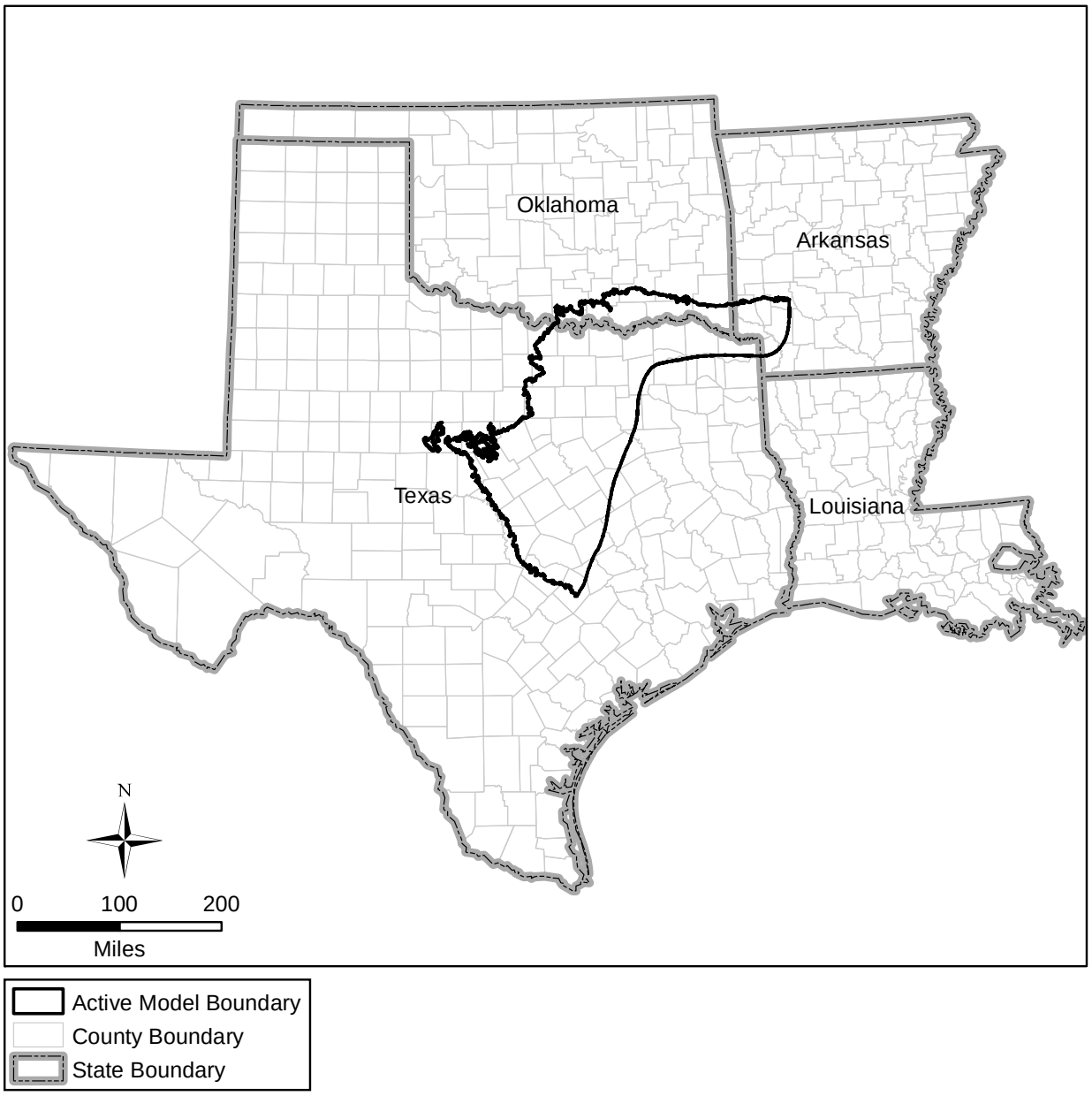


Figure 2.0.1 Study area for the updated northern Trinity and Woodbine aquifers GAM.

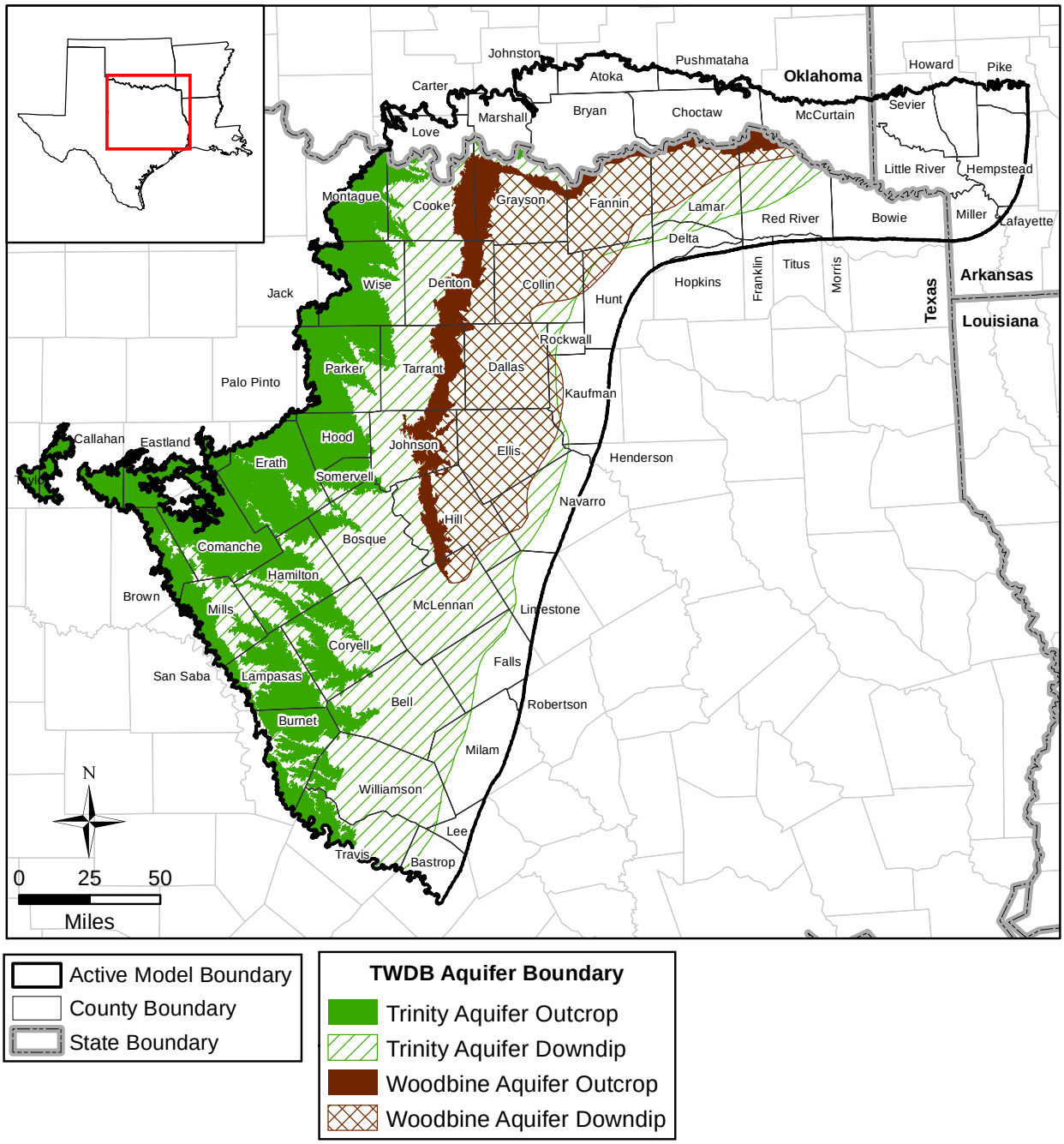


Figure 2.0.2 **Boundaries for the northern Trinity and Woodbine aquifers in the study area as determined by the TWDB in Texas (TWDB, 2006a, b, 2012) and extrapolated into Oklahoma and Arkansas.**

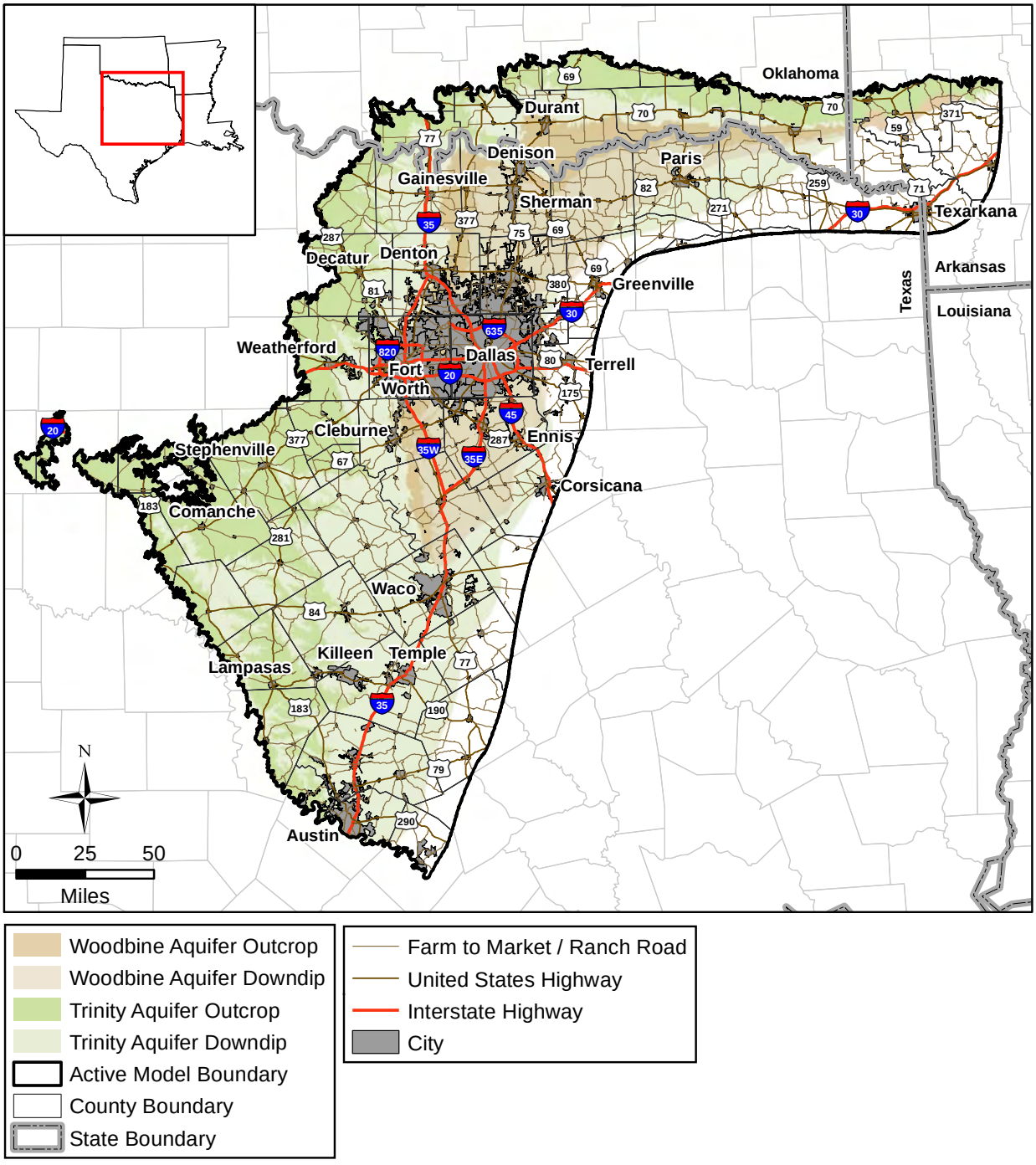


Figure 2.0.3 Cities and major roadways in the study area.

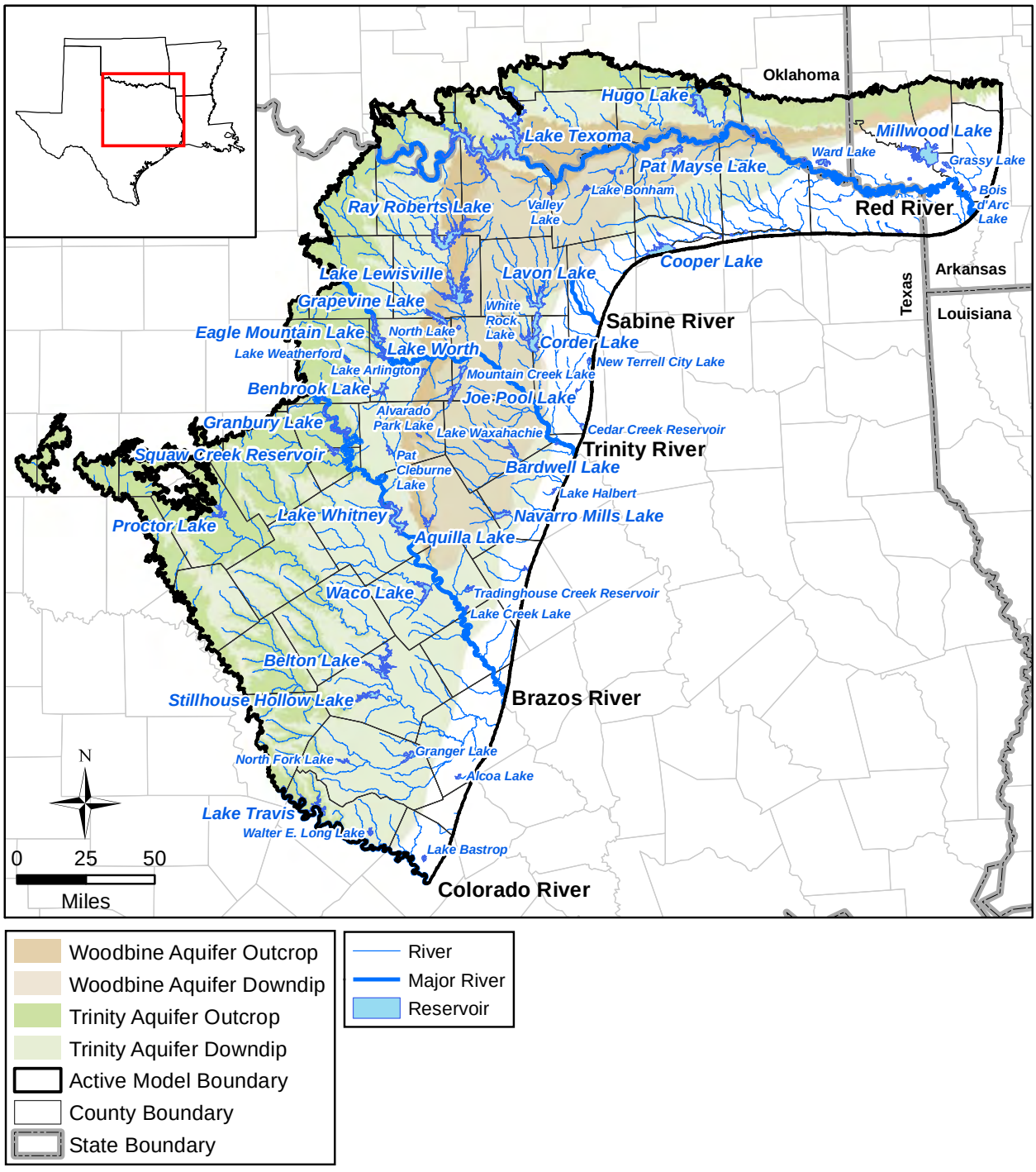


Figure 2.0.4 Rivers, streams, lakes, and reservoirs in the study area.

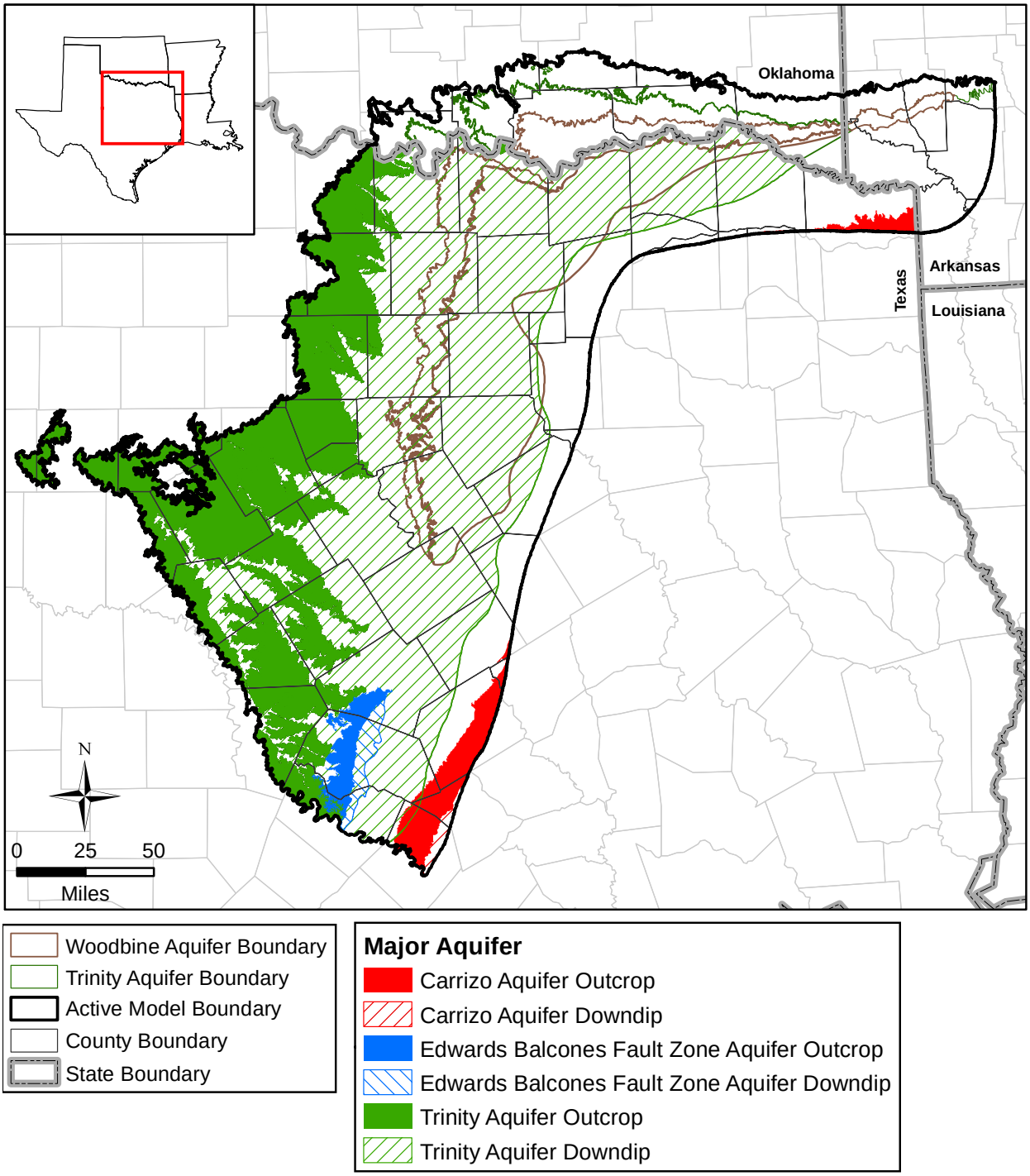


Figure 2.0.5 Major Texas aquifers in the study area (TWDB, 2006a, 2012).

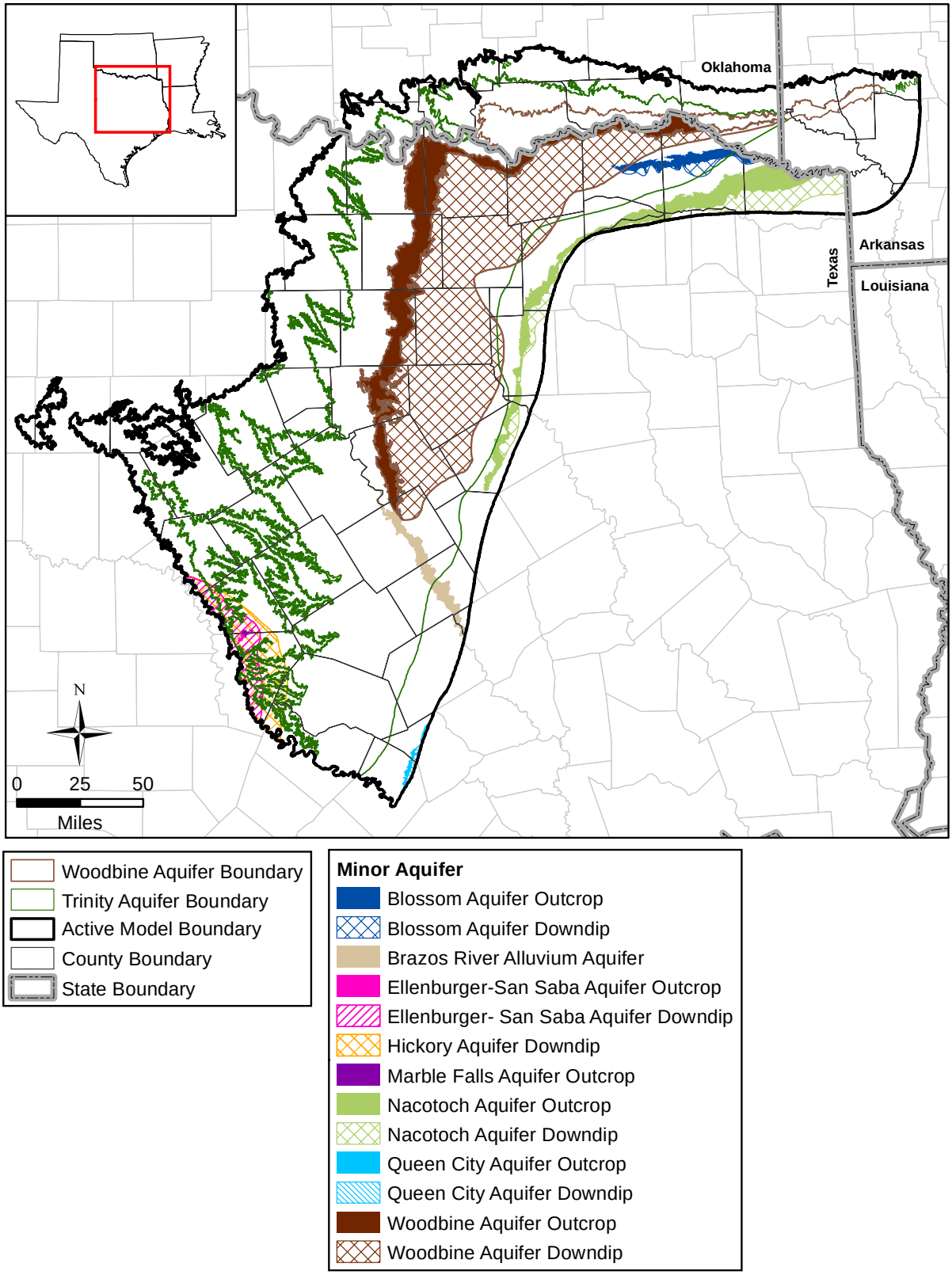


Figure 2.0.6 Minor Texas aquifers in the study area (TWDB, 2006b, 2012).

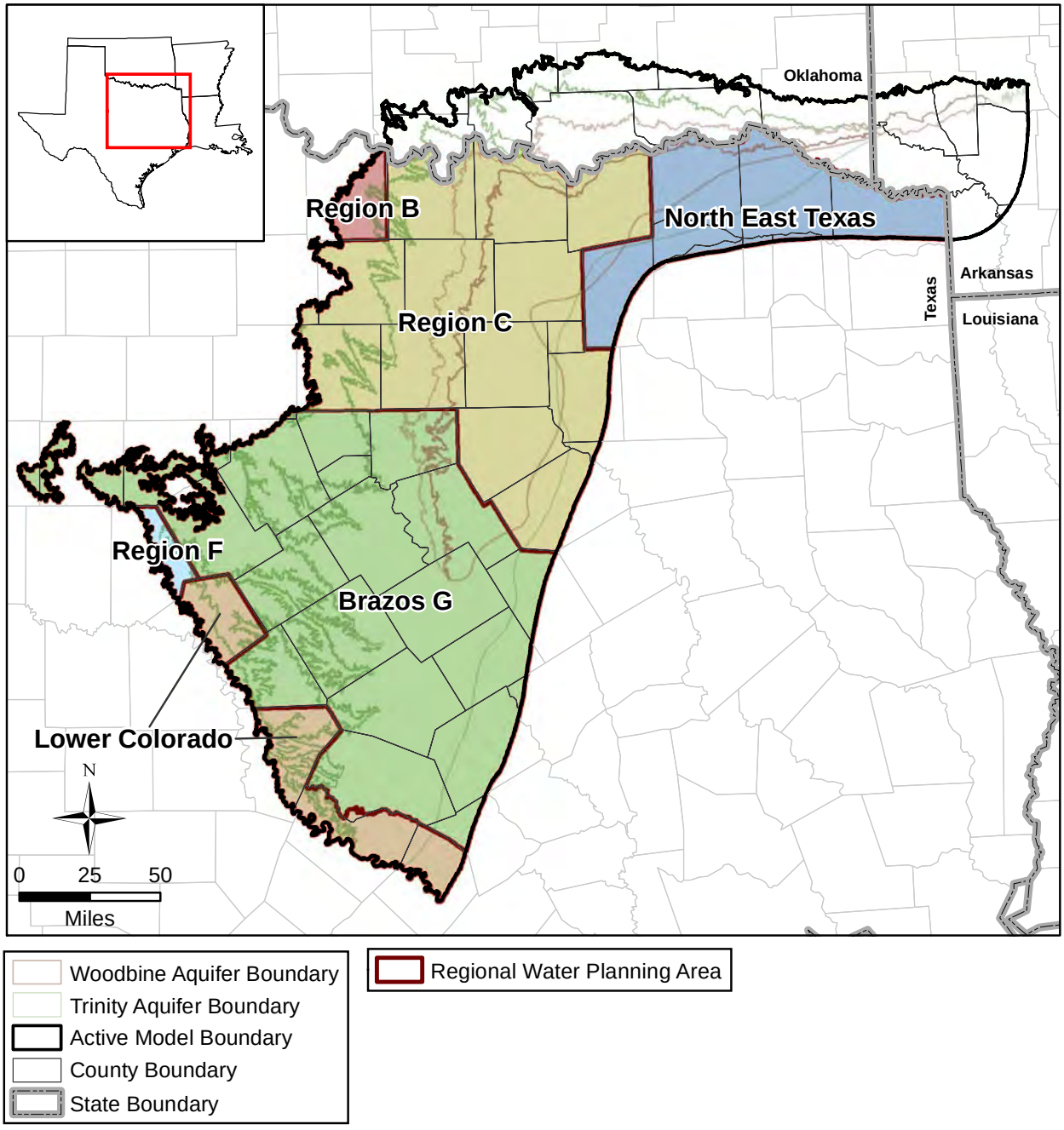


Figure 2.0.7 Texas RWPGs in the study area (TWDB, 2008).

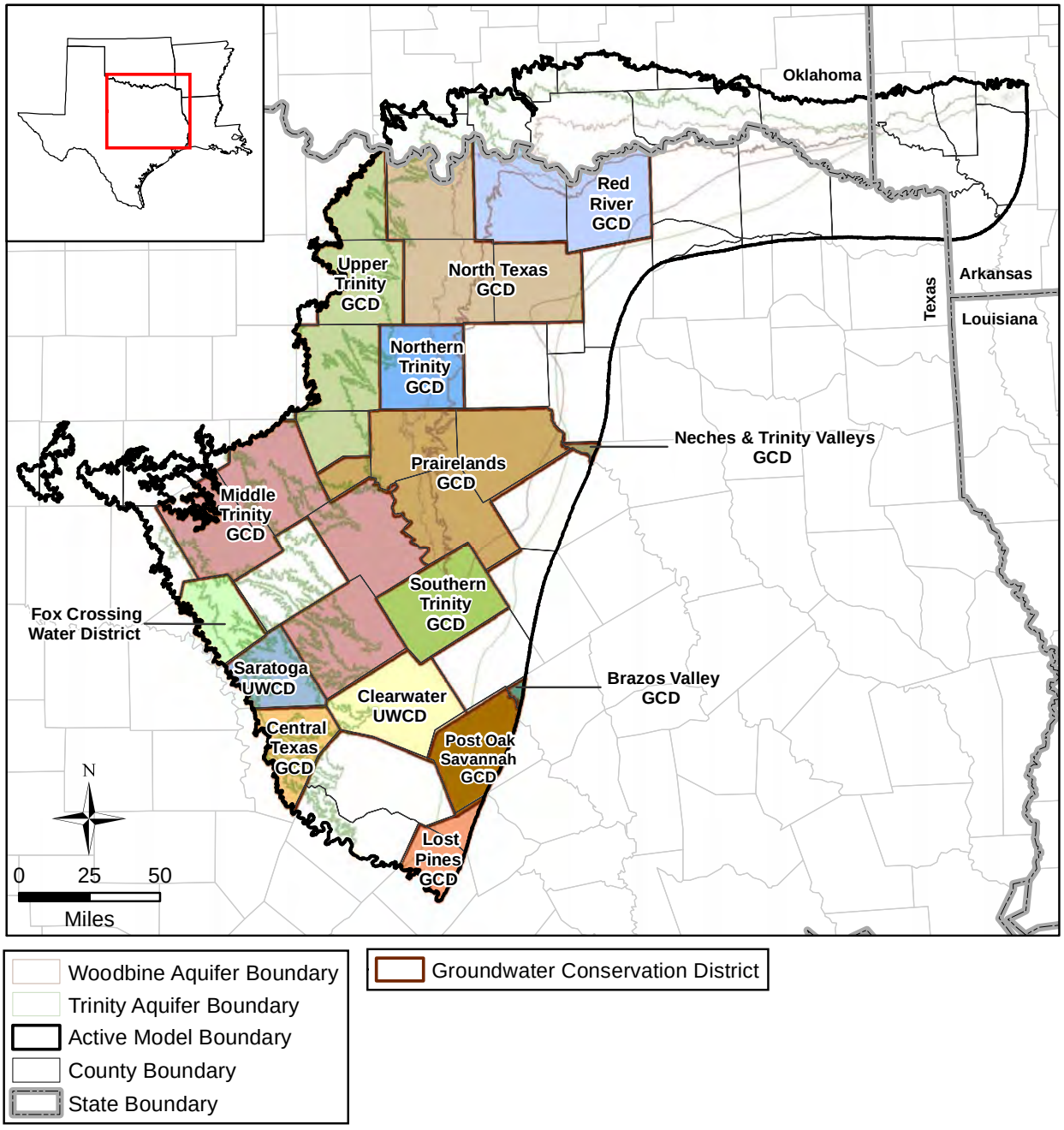


Figure 2.0.8 Texas GCDs in the study area (TWDB, 2010a).

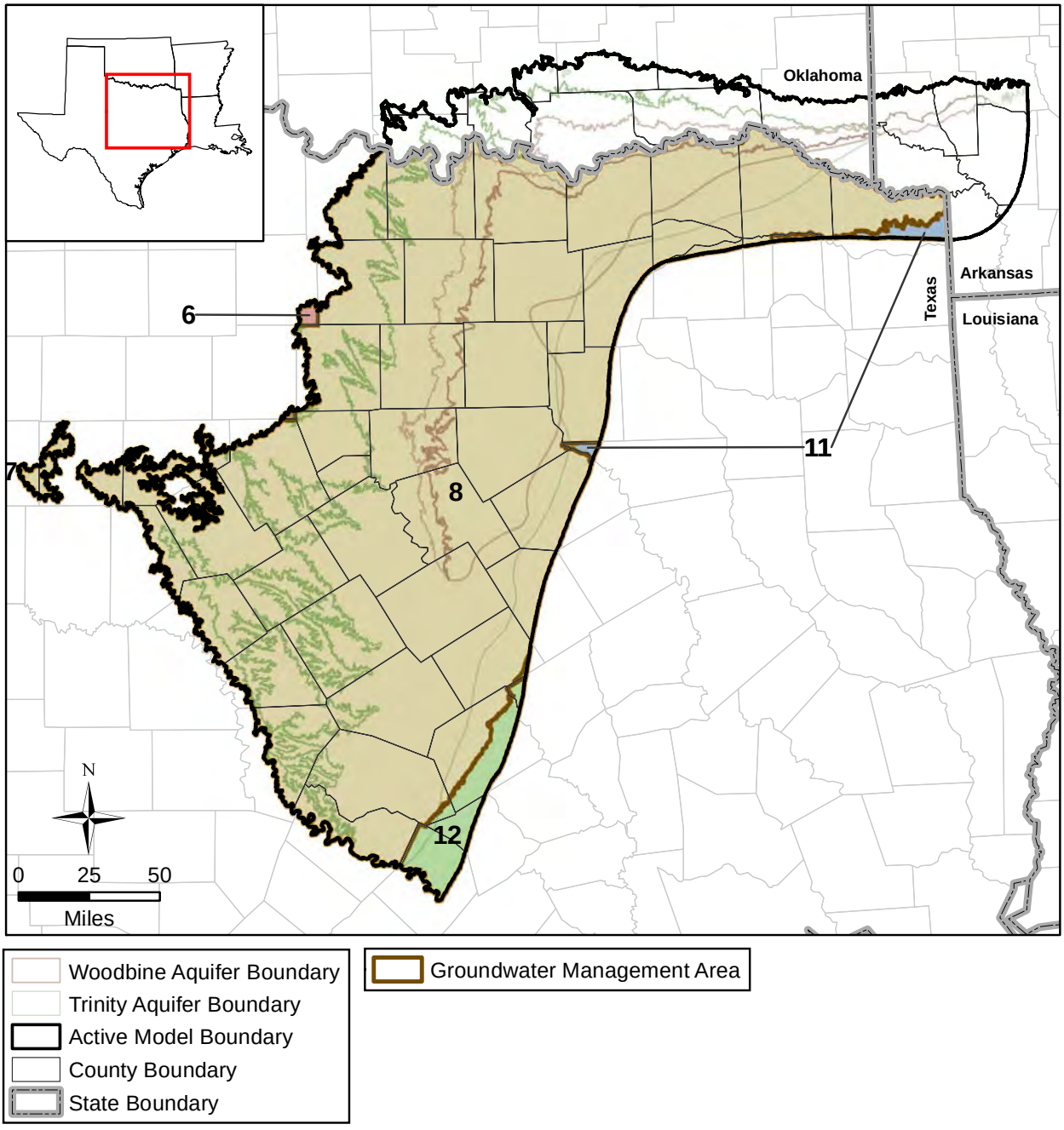


Figure 2.0.9 Texas GMAs in the study area (TWDB, 2007b).

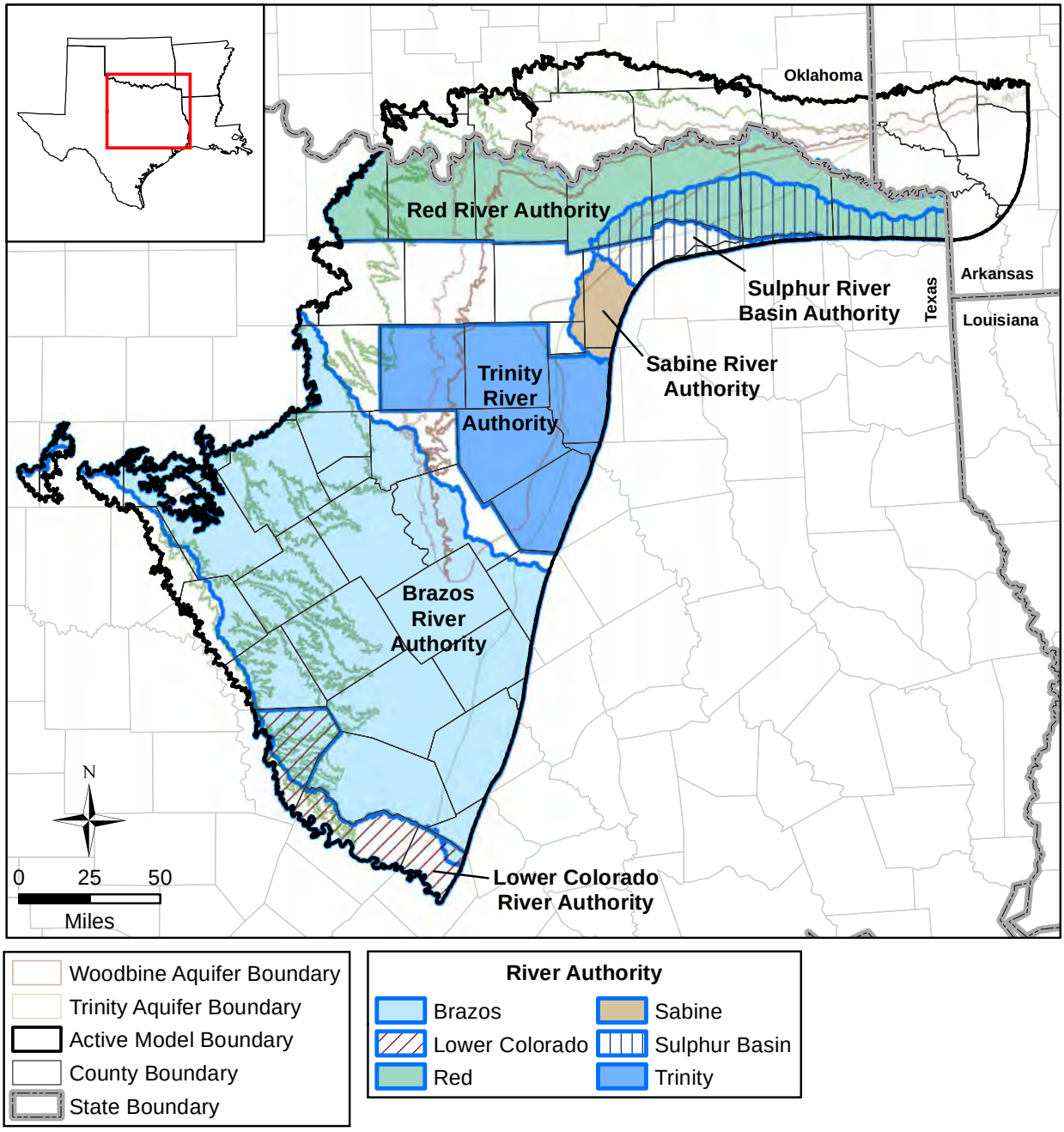


Figure 2.0.10 Texas river authorities in the study area (TWDB, 1999).

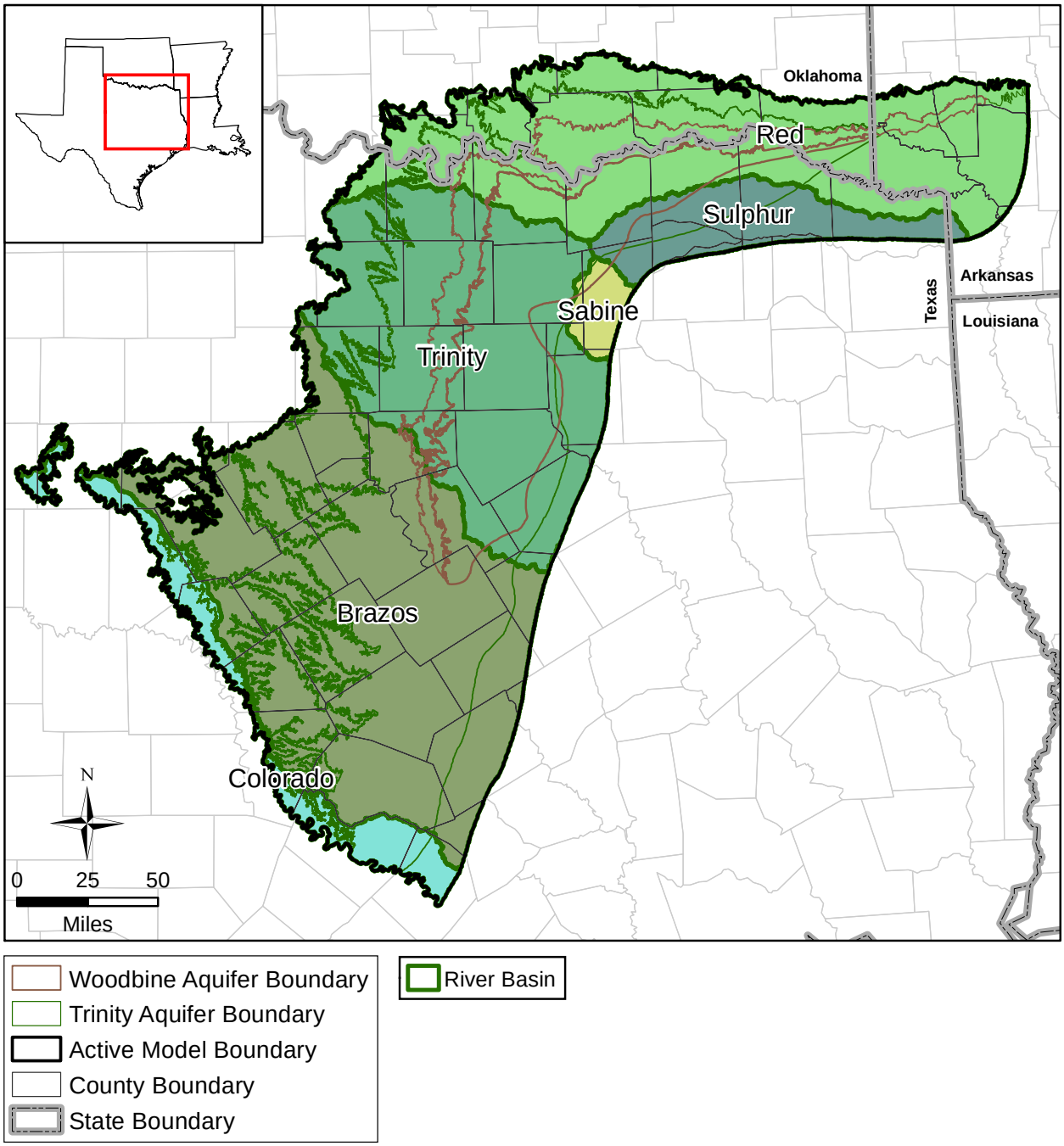


Figure 2.0.11 Major river basins in the study area (TWDB, 2010b; Oklahoma Water Resources Board, 2013; U.S. Department of Agriculture, 2013).

2.2 Geology

The rocks and sediments that comprise the northern Trinity and Woodbine aquifers are contained in the northern Trinity and Woodbine groups deposited during the geologic time period known as the Cretaceous Period, which lasted from about 145 to 65 million years ago. Cretaceous-age strata are exposed at the surface across broad areas of Texas. The geologic units that make up the northern Trinity and Woodbine groups extend from the Colorado River near Austin north to southern Oklahoma and into far southwestern Arkansas. Cretaceous-age stratigraphic units in north and central Texas lie on the northwestern margin of the Gulf of Mexico Basin. Through geologic time, the Gulf of Mexico Basin has progressively filled from the margins toward the center until achieving the shoreline configuration that exists today. Cretaceous-age strata are the oldest part of the Gulf of Mexico Basin fill that is still exposed at the surface.

The Cretaceous-age sediments were unconformably deposited on an erosional surface of Paleozoic-age strata of predominantly Permian and Pennsylvanian age and dip and thicken towards the East Texas Basin to the east. This indicates that the basin was subsiding during the Cretaceous Period while the sediments were being deposited. The sediments deposited during the Cretaceous Period are subdivided, from oldest to youngest, into the Trinity, Fredericksburg, Washita, Woodbine, Eagle Ford, Austin, Taylor, and Navarro groups (Hill, 1901) (Table 2.2.1). For the aquifers considered in the current study, only the Trinity through Woodbine groups are of interest. As discussed in Section 4.1, the sediments of the northern Trinity and Woodbine groups were deposited in a variety of terrestrial and marine depositional environments including coastal plain fluvial and interfluve, deltaic shoreline, and marine shelf environments. This complexity in depositional environments resulted in a complex system of formations that can be mapped in the subsurface but have a wide variation in lithology from sand and gravel dominated systems to shale and off shore limestone units. This large degree of variability has led to a very complex geologic nomenclature (see Table 2.2.1).

As previously noted, the Cretaceous-age strata were deposited unconformably on Paleozoic-age strata, which were deposited on the eastern shelf of the Permian Basin. The Paleozoic-age sediments underlying the northern Trinity Group are comprised, from oldest to youngest, of the Strawn, Canyon, Cisco, Bowie, and Wichita groups. The Strawn Group is primarily a fluvial-

deltaic system comprised of several sandstone units inter-layered with shales. The Canyon Group is a fluvial-deltaic system composed of sandstones and shales, but which also has limestones reflecting a lower energy depositional environment. The Cisco Group is composed of fluvial-deltaic and marine deposits. The Cisco Group contains many intermittent sandstone units that are poorly mapped and extensive limestone units (Brown and others, 1990). The Bowie Group represents a continental depositional facies and is typically composed of more coarse grained sediments than the underlying Cisco Group. The Wichita Group is also a continental deposit and is composed of highly heterogeneous deposits of sand, gravel, and shale. The Paleozoic-age strata generally dip in a westerly direction, while the northern Trinity Group dips to the east-southeast.

The nomenclature of the formations in the northern Trinity Group varies across the study area as shown in Table 2.2.1. In the northern and western portions of the study area, the northern Trinity Group consists of the undifferentiated sediments of the Antlers Formation. Nordstrom (1982, 1987) describes the Antlers Formation as consisting of an upper sand and sandstone with some clay lenses; a middle section composed of sandy clay with sandstone, siltstone, and clayey sand streaks; and a lower section of conglomerate, gravel, sand, and sandstone, with some clay lenses.

In the central and southern portions of the study area, the northern Trinity Group is divided into three formations: the uppermost Paluxy Formation and a middle Glen Rose Formation in both portions and lower Twin Mountains and Travis Peak formations in the central and southern portions, respectively (see Table 2.2.2). Fisher and Rodda (1966) make a distinction between the differences in the facies in the portion of the northern Trinity Group located below the Glen Rose Formation. They describe a more clastic facies in the central portion of the study area (the Twin Mountains Formation) and a more carbonate facies in the southern portion of the study area (the Travis Peak Formation).

The Travis Peak Formation consists of three units. The lowermost unit is the Hosston/Sligo Member. These two members of the Travis Peak Formation were deposited generally at the same time but the Sligo Member consists of finer grained sediments that were deposited in an off shore or marine environment generally in the eastern portions of the study area near the Mexia-Talco Fault Zone. The Hosston Member is a bedded sandstone with high sand percentages

(greater than 60 percent) across its extent. The entirety of the Hosston Member in the study area was deposited in a fluvial coastal plain depositional environment. In the west, this lower unit is named the Sycamore Member and "is a conglomerate consisting of limestone and dolomite pebbles with a calcareous cement" (Klemt and others, 1975).

The middle unit of the Travis Peak Formation consists of the Pearsall/Cow Creek/Hammett Members. These members are carbonate and clay rich sediments deposited primarily in a marine shelf environment and composed of limestone and shale in the southern part of the study area transitioning to deltaic and coastal plain sediments to the north. The Cow Creek Member (predominately limestone) and Hammett Member (predominately shale) occur to the east. The limestones of the Cow Creek Member thin and gradually pinch out to the west. Where this occurs, shale in the Cow Creek Member and the shale of the Hammett Member coalesce to form the Pearsall Member (Klemt and others, 1975).

The Pearsall Member is overlain by the Hensell Member of the Travis Peak Formation, which Hill (1901) identified as the uppermost sand of the Travis Peak Formation. Like the Hosston Member, the Hensell Member is predominantly a sandstone unit with nearly its entire extent being composed of at least 50 percent sandstone or greater. Bené and others (2004) point out that the Hensell Member differs from other Cretaceous-age sandstone units in the northern Trinity Group in that it does not thicken toward the East Texas Basin. The Hensell Member was deposited primarily in coastal plain and deltaic environments with lower energy marine shelf depositional environments in the far east of the study area near the Mexia-Talco Fault Zone.

In the central portion of the study area, the Travis Peak Formation is called the Twin Mountains Formation based on the nomenclature change recommended by Fisher and Rodda (1966). The Hosston, Pearsall, and Hensell members of the Travis Peak Formation tend to become more dominantly sand to the north and comprise the members of the Twin Mountains Formation.

The Glen Rose Formation is a limestone unit that conformably overlies the Twin Mountain and Travis Peak formations and was deposited on an extensive shallow-marine shelf. The formation is composed of dense, finely crystalline limestone with inter-bedded shale, sandy-shale and anhydrite.

The Paluxy Formation, composed of upper sands in the northern Trinity Group, was deposited in a coastal plain environment in the northeast and western portions of the study area and transitions in central Texas to a deltaic shoreline depositional environment and to a marine shelf environment in the southern study area. As a result, the thickest net sand is found in the northeast and northern portions of the formation and essentially no sand is found in the southernmost portion of the formation. Where the Paluxy Formation is predominantly a sand unit, it is characterized as being composed of fine-grained, friable quartz sand, which is poorly cemented and exhibits cross bedding (Klemt and others, 1975).

The northern Trinity Group is overlain by the Fredericksburg and Washita groups (see Table 2.1.1 and Figure 2.2.3). The nomenclature of these two groups is complex. In general, they are composed of limestone, dolomite, marl, and shale (Leggat, 1957). The Fredericksburg and Washita groups comprise a significant percentage of the land surface (outcrop) in the central and southern portion of the study area (see Figure 2.2.2) and separate the northern Trinity and Woodbine groups.

The Woodbine Group was deposited in late Cretaceous time. Both a sand facies and a shale facies are found in the Woodbine Group. The sand facies occurs in the outcrop and in the subsurface in and north of Hill County. The shale facies occurs in the subsurface south of Hill County. In general, the sand facies of the Woodbine Group consists of sand and sandstone with some interbedded shale and clay. Typically, the lower portion of the Woodbine Group contains less clay and shale than the upper portion of the group. The sand facies of the Woodbine Groups was deposited in a deltaic shoreline depositional environment. This portion of the group is composed of two members; the lower Dexter Member and the upper Lewisville Member. The shale facies of the Woodbine Group is referred to as the Pepper Shale. The Woodbine Group is unconformably overlain by shale of the Eagle Ford Group.

Figures 2.2.1 and 2.2.2 show the generalized surface geology for the northern and southern portions of the study area, respectively. The relationship between the terminology used on these figures and the stratigraphic column is provided in Table 2.2.1. Figure 2.2.3 shows structural cross sections of the stratigraphic units in north and central Texas (George and others, 2011;

Bené and others, 2004; Nordstrom, 1982; Klemt and others, 1975). On this figure, the unit identified as “Younger formations” corresponds to Tertiary- and Quaternary-age sediments.

Table 2.2.1 Stratigraphic column for the study area.

Period	Group	North and West	Central		South		Terminology for Generalized Surface Geology in Figures 2.2.1 and 2.2.2
		Formation	Formation	Member	Formation	Member	
Quaternary	differentiation not necessary for this study						Alluvium
Tertiary	differentiation not necessary for this study						Tertiary System
Cretaceous	Navarro	differentiation not necessary for this study					Cretaceous above the Woodbine Group
	Taylor	differentiation not necessary for this study					
	Austin	differentiation not necessary for this study					
	Eagle Ford	differentiation not necessary for this study					
	Woodbine	Lewisville	Lewisville		Pepper Shale		Woodbine Group
		Dexter	Dexter				
	Washita	Grayson Marl	Buda, Del Rio		Buda, Del Rio		Washita Group
		Mainstreet, Pawpaw, Weno, Denton	Georgetown		Georgetown		
		Fort Worth, Duck Creek					
	Fredericksburg	Kiamichi	Kiamichi		Kiamichi		Fredericksburg Group
		Goodland	Edwards		Edwards		
			Comanche Peak		Comanche Peak		
		Walnut Clay	Walnut Clay		Walnut Clay		

Table 2.2.1, continued

Period	Group	North and West	Central		South		Terminology for Generalized Surface Geology in Figures 2.2.1 and 2.2.2
		Formation	Formation	Member	Formation	Member	
Cretaceous (continued)	Trinity	Antlers	Paluxy		Paluxy		Antlers Formation (north and west) or Paluxy Formation (central and south)
			Glen Rose		Glen Rose		Antler Formation (north and west) or Glen Rose Formation (central and south)
			Twin Mountains	Hensell	Travis Peak	Hensell	Antlers Formation (north and west) or Hensell Member (south)
				Pearsall		Pearsall/ Hammett/ Cow Creek	Antlers Formation (north and west), Twin Mountains Formation (central), Travis Peak Formation (south), or Cow Creek Member (south)
				Hosston		Sycamore /Hosston/ Sligo	Antlers Formation (north and west), Twin Mountains Formation (central), Travis Peak Formation (south), or Sycamore Member (south)
Permian	Wichita	differentiation not necessary for this study					na
	Bowie	differentiation not necessary for this study					
Pennsylvanian	Cisco	differentiation not necessary for this study					
	Canyon	differentiation not necessary for this study					
	Strawn	differentiation not necessary for this study					

na - Permian- and Pennsylvanian-age groups do not outcrop in the study area

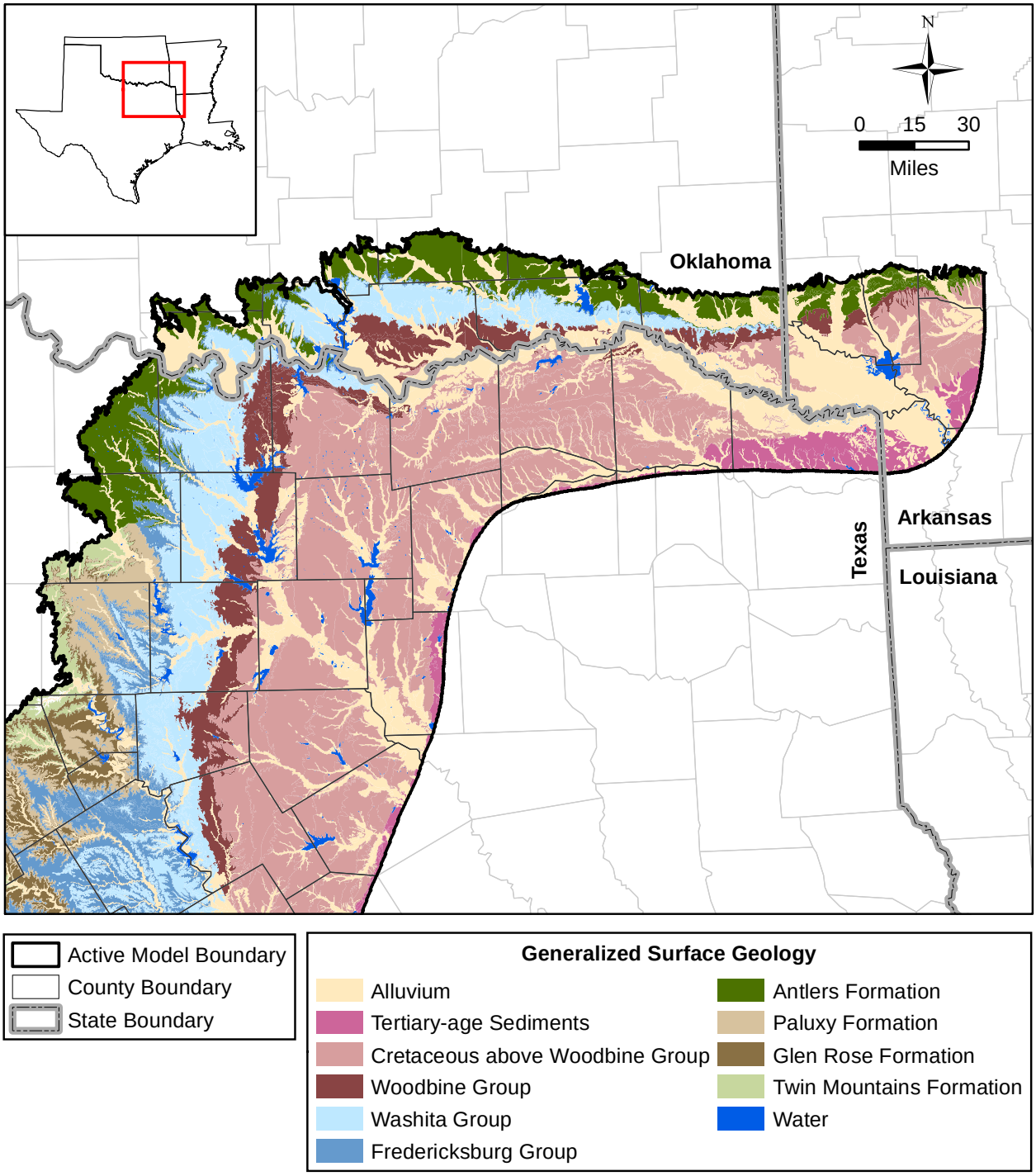


Figure 2.2.1 Generalized surface geology for the northern portion of the study area (Bureau of Economic Geology, 2012).

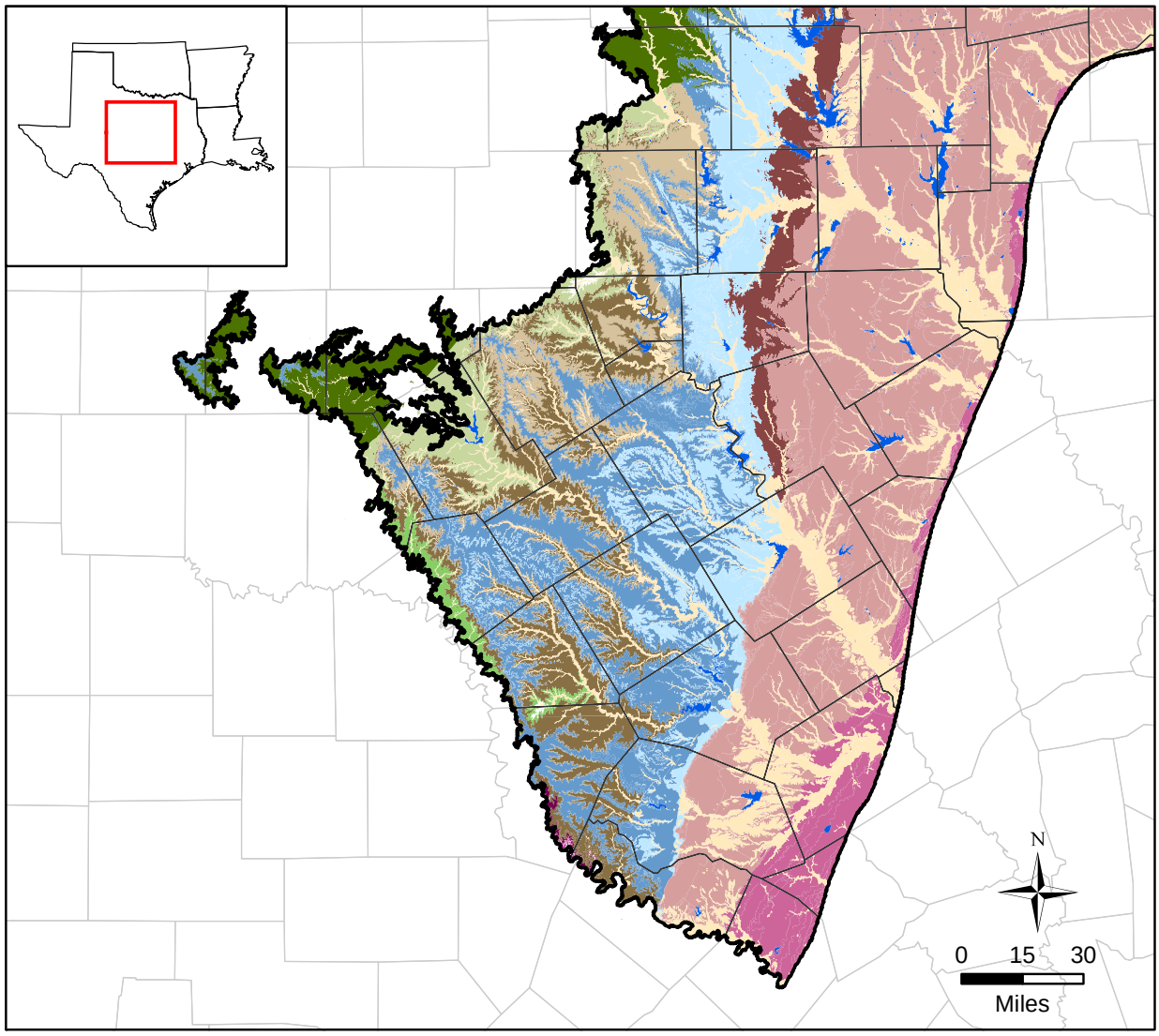


Figure 2.2.2 **Generalized surface geology for the southern portion of the study area (Bureau of Economic Geology, 2012).**

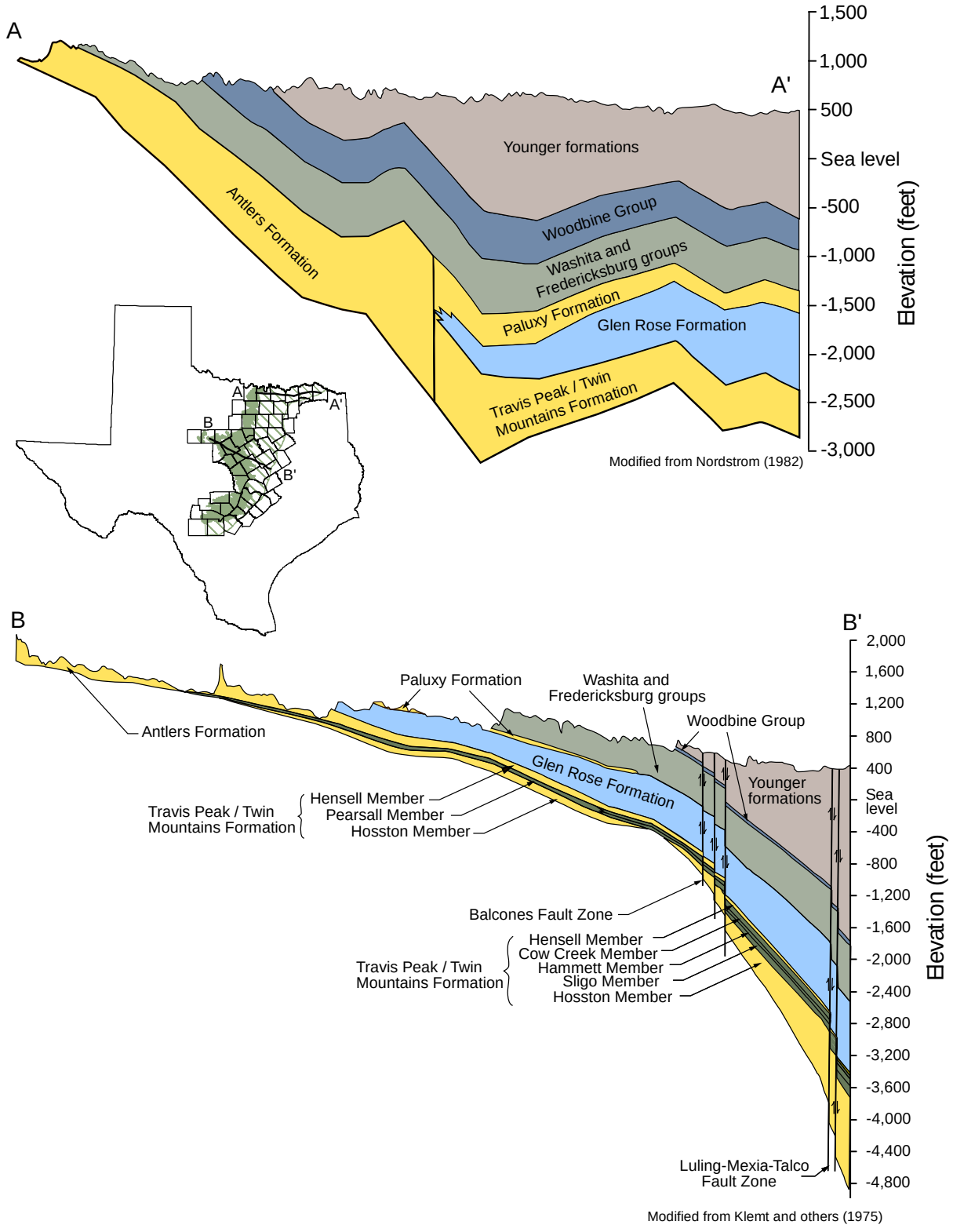


Figure 2.2.3 Cross sections of the stratigraphic units in the study area (after George and others, 2011; Bené and others, 2004; Nordstrom, 1982; Klemt and others, 1975).

4.0 Hydrogeologic Setting

This section details the data compilation and analyses used to support development of the conceptual model for the northern Trinity and Woodbine aquifers. This information, in total, defines the hydrogeologic setting and it includes a discussion of hydrostratigraphy, hydraulic properties, hydraulic heads, water quality, recharge, natural aquifer discharge, and pumping.

4.1 Hydrostratigraphy of the Northern Trinity and Woodbine Aquifers

In this subsection, the hydrostratigraphy of the northern Trinity and Woodbine aquifers is discussed, including structure, lithology, and depositional environment. In addition, this subsection includes an introductory discussion of water quality based on geophysical log analyses. The analysis of water quality is expanded in Section 4.4 through the analysis of groundwater quality samples from wells.

4.1.1 Introduction

The rocks and sediments that host the northern Trinity and Woodbine aquifers formed during the geologic time period known as the Cretaceous Period, which lasted from about 145 to 65 million years ago. Cretaceous-age strata are exposed at the surface across broad areas of Texas (Figure 4.1.1). The most abundant rock type in the Cretaceous-age strata in Texas is limestone, which covers the Edwards Plateau (see Figure 2.1.1) and much of central Texas. Light colored limestone road cuts are a common sight along highways in these areas. However, with the exception of the limestone of the Edwards BFZ Aquifer, the most important aquifers in the study area are composed of sand and sandstone of Cretaceous age. Sandstones in the Trinity Group form major aquifers in the Hill Country, Edwards Plateau, and north-central Texas and minor aquifers under the High Plains of west Texas. Sandstones in the Woodbine Group and Nacatoch and Blossom formations host minor aquifers in northeast Texas (George and others, 2011). The focus of the northern Trinity and Woodbine aquifers GAM are the sand-dominated aquifers in the geologic formations of the northern Trinity and Woodbine groups in central and north-central Texas north of the Colorado River (Figure 4.1.2).

Cretaceous-age stratigraphic units in north-central Texas lie on the northwestern margin of the Gulf of Mexico Basin. To the west are Paleozoic-age strata, which were deposited in the Fort Worth and Permian basins (Figure 4.1.1). These older oceanic basins existed prior to the

opening of the Gulf of Mexico. To the east are younger Tertiary- and Quaternary-age strata, which record sedimentary infilling of the Gulf of Mexico Basin. Through geologic time, the Gulf of Mexico Basin has progressively filled from the margins toward the center until achieving the shoreline configuration that exists today (Figure 4.1.3). Cretaceous-age strata are the oldest part of the Gulf of Mexico Basin fill exposed at the surface. Freshwater aquifers occupy only the uppermost few thousand feet of Cretaceous-age strata.

4.1.2 Previous Studies

R.T. Hill conducted the first geologic and hydrogeologic studies of the Trinity and Woodbine groups and aquifers in Texas (Hill, 1891, 1894, 1901). Hill named the various formations and established their stratigraphic relationships to each other. The nomenclature for Cretaceous-age formations is complex and varies between outcrop and subsurface and from north to south (Figure 4.1.2). This complication arises from lithologic and stratigraphic variability, as formations thin, thicken, or merge together. Lithologies change from limestone-dominated in the south to sandstone-dominated in the north. Fisher and Rodda (1966, 1967) revised Trinity Group stratigraphy based on the distribution of limestone in the Glen Rose Formation and lithologic changes that occur between outcrop and subsurface. A comprehensive volume of papers on lower Cretaceous-age stratigraphy (Hendricks, 1957) further documented lithology, paleontology, and stratigraphy, defining three geologically distinctive regions in north and central Texas (Figure 4.1.2). Subsequent studies focused on depositional patterns of sandstone in the Trinity Group (Boone, 1968; Hall, 1976; Caughey, 1977). The understanding of stratigraphy and depositional environments for the Woodbine Group was refined by Dodge (1968, 1969) and Oliver (1971). Nordstrom (1982) in the north and Klemt and others (1975) in the south provide two key hydrogeologic studies relating stratigraphic and lithologic variability to aquifer development.

4.1.3 Overview of Hydrostratigraphy

Stratigraphy and lithology are fundamental properties of aquifers and primary controls on groundwater flow rates and volumes and on groundwater quality and chemical composition. This section describes the stratigraphy and lithology of the formations of the northern portion of the Trinity Group and the Woodbine Group as these properties relate to aquifer development. Stratigraphy is essentially the arrangement of layers in sedimentary rocks. Sediments (gravel, sand, silt, and clay particles) are typically transported by currents in rivers and oceans and

deposited in horizontal layers. Depositional layering is preserved in stratified rocks, imparting directionality to rock properties. Hydraulic conductivity, for example, is commonly much greater in the horizontal direction than in the vertical direction. Lithology is also more persistent in the horizontal direction. A sandstone formation, such as the Hosston Formation, extends laterally across many counties relatively unchanged, but in the vertical direction, sandstone in the Hosston Formation changes to shale abruptly across a stratigraphic boundary only a few feet thick. These properties of stratified rocks result in a system composed of lithologically contrasting layers (aquifers and aquitards) that extend from shallow recharge areas to deeply buried areas, providing conduits for regional groundwater flow.

Lithologic changes in the horizontal direction, although more gradational than vertical changes, result in regional differences in formation properties. Based on geologic variations, the northern Trinity Group can be divided into five regions in the study area based on stratigraphic and lithologic similarities (Figure 4.1.4). Stratigraphic layers are physically continuous across the regions, but layer thicknesses, lithologies, and formation names, as well as corresponding aquifer names, change. Figure 4.1.5 shows a cross section composed of typical digital geophysical logs transecting Regions 1 through 5. The digital logs show the spontaneous potential curve on the left and a resistivity (short normal) curve on the right.

Region 1 encompasses the western and northwestern portions of the study area in Texas as well as Oklahoma and Arkansas (see Figure 4.1.4). In this region, the northern Trinity Group consists of undifferentiated sandstones and shales referred to as the Antlers Formation, which is an aquifer in this region and locally referred to as the Antlers Aquifer. Region 2 lies south and east of Region 1. In this region, limestones of the Glen Rose Formation separate the sandstones in the upper portion of the northern Trinity Group from the undifferentiated sandstones and shales in the lower portion of the northern Trinity Group. In this region, the upper sandstones are referred to as the Paluxy Formation and make up the Paluxy Aquifer and the undifferentiated lower sandstones and shales are referred to as the Twin Mountains Formation. The water-bearing sandstones in the Twin Mountains Formation are locally referred to as the Twin Mountains Aquifer. Region 3 is stratigraphically similar to Region 2, the main distinctions being a somewhat arbitrary name change and more shale and limestone in the lower portion of the northern Trinity Group. In Region 3, the upper sandstones are also referred to as the Paluxy

Formation and make up the Paluxy Aquifer and the undifferentiated sandstones, shales, and limestones in the lower portion of the northern Trinity Group are referred to as the Travis Peak Formation. The water-bearing sandstones in the Travis Peak Formation are locally referred to as the Travis Peak Aquifer.

In Regions 4 and 5, located in the southern portion of the study area, the Glen Rose Formation is thicker than in Regions 2 and 3 and the stratigraphic layers in the lower portion of the northern Trinity Group can be differentiated into individual formations. In these two regions, the stratigraphy above the Glen Rose Formation is also referred to as the Paluxy Formation. These two regions are distinguished by the presence of sandstone in the Paluxy Formation in Region 4, which makes up the Paluxy Aquifer, and the absence of sandstone in the Paluxy Formation in Region 5, corresponding to an absence of the Paluxy Aquifer.

In Region 4, the stratigraphy of the northern Trinity Group underlying the Glen Rose Formation (i.e., the Twin Mountains Formation) is divisible into sandstones of the Hensell and Hosston members separated by limestones and shales of the Pearsall Member. In Region 5, the stratigraphy of the northern Trinity Group underlying the Glen Rose Formation (i.e., the Travis Peak Formation) is also divided into three units. The upper unit consists of sandstones of the Hensell Member. The middle unit consists of the Pearsall/Cow Creek/Hammett members. The limestones of the Cow Creek Member and shales of the Hammett Member occur to the east and coalesce to form the Pearsall Member in the west. The lower unit consists of limestones and dolomites of the Sycamore Member in the outcrop area to the west, sandstones of the Hosston Member to the east and downdip, and shales of the Sligo Member, which overly the Hosston Member in the vicinity of the Mexia-Talco Fault Zone. In both Regions 4 and 5, the sandstones of the Hensell and Hosston members are referred to as the Hensell and Hosston aquifers, respectively.

The Woodbine Group is separated from the northern Trinity Group by the limestone and shale of the Washita/Fredericksburg groups (Figures 4.1.5 and 4.1.6). Across the entire study area, sandstones are rare to absent in the Washita/Fredericksburg groups. In the south (Bell, Williamson, and Travis counties), the Fredericksburg Group includes the Edwards BFZ Aquifer (Jones, 2003). The Woodbine Group is not present west or north of its outcrop, which extends

through the middle of the study area (Figure 4.1.4). In the southern portion of Region 4 and all of Region 5, sandstone is absent in the Woodbine Group (Figure 4.1.5).

For the model, the Woodbine, Washita/Fredericksburg, and northern Trinity groups in the study area were divided into seven layers based on significant differences in geologic properties. These are the Woodbine Aquifer, Washita/Fredericksburg groups, Paluxy Aquifer, Glen Rose Formation, Hensell Aquifer, Pearsall Formation, and Hosston Aquifer (Figure 4.1.6). Generally, the layering differentiates between sandstone-dominated layers that are aquifers and shale- and limestone-dominated layers that are typically confining units. Shales have low hydraulic conductivities and include soluble mineral salts that decrease groundwater quality. Most limestones in the study area possess similar properties. Sand and sandstone, in contrast, typically have high hydraulic conductivities and are composed of relatively insoluble quartz and feldspar grains. The presence of seven contrasting layers does not occur everywhere in the study area. For example, in Region 1 there are only two or three contrasting layers; the sandstones of the Antlers Formation, the shale and limestone of the Washita/Fredericksburg groups, and the sandstone of the Woodbine Group, where present. In fact, all seven contrasting layers are present together only in portions of Region 4. Vertically adjacent model layers can have similar hydraulic properties, and subdividing a thick sandstone sequence, such as the Antlers Formation, adds resolution to the model.

For modeling purposes, all seven layers shown in Figure 4.1.6 were extended throughout the study area. This was done because it was not feasible to distinguish the complex nomenclature used across the study area in the model and the groundwater code used requires that model layers be continuous over the entire model domain. The nomenclature for Region 4 was selected for use because it has the greatest number of divisions that require implementation as individual layers in the model. Mapping of the model layers to the Antlers, Twin Mountains, and Travis Peak aquifers in Regions 1, 2, and 3, respectively, can be done using the cross section in Figure 4.1.5 and the chart in Figure 4.1.6. For example, the Paluxy Aquifer maps to the upper sands of the Antlers Aquifer in Region 1 and the Hosston Aquifer maps to the lower sands of the Travis Peak Aquifer in Region 3, the lower sands of the Twin Mountains Aquifer in Region 2, and the lower sands of the Antlers Aquifer in Region 1. The layer terminology shown in Figure 4.1.6 is used throughout the remainder of this report.

4.1.4 Structural Features

Structural geology deals with structural changes to sedimentary rocks after deposition in horizontal layers. Most rock formations have been structurally deformed by compressive forces within the Earth's crust or by subsidence. Subsidence of the Gulf of Mexico Basin caused Cretaceous-age formations to tilt (dip) toward the southeast (Figure 4.1.3). Formations at land surface in the west are thousands of feet below surface in the east. The structural dip of the strata in the northern Trinity and Woodbine groups is regular and concentric to the East Texas Basin, which is an embayment (now filled with sediment) of the Gulf of Mexico Basin (Figure 4.1.7). Structural dip increases toward the center of the East Texas Basin (to the southeast). The lowest dips (15 feet per mile) occur in the southwest outcrop area. In the northwest outcrop area, dips are 25 to 30 feet per mile. Along the downdip margin of the study area, dips range from 250 to 350 feet per mile (Figure 4.1.7). Along with lithology and stratigraphy, structural dip is another key property of layered aquifers, because it enables downward groundwater flow.

Subsidence also impacts sedimentary thicknesses. Without subsidence of the land surface, sediments would not be able to accumulate to form sedimentary rocks. The opposite of subsidence is uplift. Sediments are eroded in uplifted areas (plateaus and mountains) and deposited in subsided areas (river valleys and ocean basins). Gulfward increasing subsidence has resulted in the formation of sedimentary wedges that thicken Gulfward (Figure 4.1.3). The stratigraphic intervals of the northern Trinity and Woodbine groups in the study area thicken southeastward in a regular pattern, which parallels the structural dip (compare Figures 4.1.7 and 4.1.8).

The same structural forces that tilt stratigraphic layers also break them along surfaces of discontinuity called faults or fractures. A fault displaces the broken layer so that the two sides are no longer fully in contact. Fault displacements range from a few feet to hundreds of feet. In the latter case, a faulted layer may be completely disconnected. Fractures are breaks in layers without displacement. Both faults and fractures are generally oriented vertically and provide opportunities for vertical groundwater flow. Fault locations and properties in the study area were compiled from the geologic literature in Ewing (1990, 1991). These documented faults represent the largest faults (most laterally extensive and largest vertical displacements) in the study area that disrupt Cretaceous-age strata (Figure 4.1.7). Small faults and fractures are common in most geologic formations, and have been mapped in outcrops of the Cretaceous-age strata and

excavated tunnels (Nance and others, 1994). These localized structures are typically less than 1 mile long, have displacements less than 10 feet, and are subvertically oriented (cross cutting horizontal bedding). Many small faults drip or even flow water into excavated tunnels, indicating that they form pathways for vertical groundwater flow.

Faults tend to occur in closely spaced groups (fault zones) in response to geographically focused structural forces. The study area includes three regions of large-scale faulting and structural deformation. The Balcones Fault Zone extends into the study area from the south through Travis, Bell, McLennan, and Hill counties (Figure 4.1.7). Displacements across faults in this fault zone range from 100 to 400 feet, which are sufficient to completely disconnect some layers (Klemt and others, 1975). Faults in the Balcones Fault Zone are mostly down to the east, with the disconnected layer deeper on the east side of the fault relative to its position on the west side. The Mexia-Talco Fault Zone is a complex zone of interweaving faults that extends along the entire length of the downdip boundary of the study area (Figure 4.1.7). Individual faults in this fault zone have as much as 700 feet of displacement (Ewing, 1990). Fresh groundwater in the aquifers in the study area does not extend beyond the Mexia-Talco Fault Zone (Klemt and others, 1975).

An area of faulted and folded strata occurs in Cooke and Grayson counties and extends northwest into Oklahoma (Figure 4.1.7). This structurally deformed area is commonly known as the Sherman Syncline and Preston Anticline. In some cases, strata that experience compressive forces will fold instead of break along faults. Near the city of Sherman in Grayson County, there are several faults that parallel the southeast-trending folds (Figure 4.1.7). Structural complexity in the Sherman area is mainly confined to underlying Paleozoic-age strata, but is manifested in overlying Cretaceous-age strata as gentle folds. The thickness patterns in the Cretaceous-age strata also reflect the folds (Figure 4.1.8), indicating that structural movement occurred during deposition in the Cretaceous Period. The structures in the area of Sherman, Texas lie at the hinge between north-oriented outcrops to the south and east-oriented outcrops through Oklahoma (Figure 4.1.7). These large-scale trends resulted from continental breakup that preceded formation of the Gulf of Mexico Basin.

4.1.5 Paleogeography and Depositional Environment

Paleogeography and depositional environment affect the properties of sedimentary rocks. Paleogeography is the configuration of landforms and water bodies that existed at the time of deposition. Depositional environment is the specific setting of sediment accumulation, such as a river or a marine shoreline. A depositional system, introduced later in this section, is a three-dimensional body of rock or sediments deposited in a specific depositional environment. Paleogeography is reconstructed from the rocks themselves (the rock record), which involves comparison of properties of rocks of the same age across broad regions. Missing rocks indicate that an area was uplifted (nondeposition or erosion). Fossils are important to paleogeographic reconstruction because the habitats of specific plant and animal species are generally understood. Fossils of marine shellfish are ubiquitous in Cretaceous-age limestones, for example. Paleogeography provides a context for interpreting depositional environments, which are more specific and localized. A marine shoreline (sandy) is different from a marine bay (muddy). Sandstones are deposited where currents are strong, such as river channels and shorelines; shales are deposited in quiet water, such as bays and lagoons. Understanding depositional environments allows prediction of rock properties where data are discontinuous (in between wells). Depositional environments for all formations in the northern Trinity and Woodbine groups were interpreted and used to infer rock properties and directionality of those properties as discussed in Section 4.2.

Paleogeographic reconstructions of North and Central America during the Cretaceous Period provide a starting point and context for the exploration of depositional history and environments for the northern Trinity and Woodbine groups. The Cretaceous Period was characterized by long-term rising sea level and flooding of the continents. At the beginning of the Cretaceous Period, most of North America was covered by terrestrial landforms, much like today (Figure 4.1.9a). The ancestral Gulf of Mexico was in a similar position as it is today, and rivers carried sediment from mountainous areas in the northwest across north-central Texas to depositional sites farther southeast. Figure 4.1.9a is a schematic representation of the eroded surface of the Paleozoic-age strata upon which basal sands in the Trinity Group were deposited (Boone, 1968).

Later in the early Cretaceous Period, rising sea level caused the Gulf of Mexico shoreline to move west and north, flooding east Texas and changing north-central Texas into a low-lying

coastal area (Figure 4.1.9b). Basal sands (Hosston Aquifer) of the northern Trinity Group, which were deposited in river channels, represent the first Cretaceous-age depositional system to develop along that coast. The shoreline coincided approximately with the downdip boundary of the study area (Figure 4.1.9b). Following deposition of the Hosston Aquifer, the coastal plain partly flooded, and the shales and limestones of the Pearsall Formation were deposited in the south and east. Pearsall Formation deposition was followed, in turn, by another sandy coastal plain system (Hensell Aquifer). Glen Rose Formation limestones and Paluxy Aquifer sandstones record yet another episode of rising sea level followed by shoreline progradation.

In the late Cretaceous Period, sea levels continued to rise, eventually flooding the northern Trinity Group coastal plain and creating marine conditions across most of Texas as well as the central portion of North America (Figure 4.1.9c). Limestones and shales of the Washita and Fredericksburg groups were deposited at this time in shallow marine waters similar to the modern Florida Keys. By late Cretaceous time, renewed input of sand-rich sediments from land areas to the north formed the depositional systems of the Woodbine Group in a variety of near-shore environments.

Rising sea levels in the Cretaceous Period were periodically offset by input of sand-rich sediment. Each episode of sand deposition built up the coastal plain and pushed the shoreline back toward the southeast. Sand was supplied discontinuously by episodic uplift in the north and west. During times when the supply of sand was low, the study area flooded and limestones and shales were deposited. Thus, fluctuating paleogeographic conditions resulted in vertical alternation of sandstone-rich and limestone-rich sedimentary formations. The western and northwestern portions of the study area, which were always farthest from the coast, are sand dominated, whereas the eastern and southern portions are limestone and shale dominated.

4.1.6 Methods and Data

Data compilation and quality control represent major tasks in creating the hydrostratigraphic framework. Previous geologic studies did not cover the entire study area and were not focused on data compilation. Furthermore, hydrostratigraphic frameworks used to construct previous groundwater models were not preserved. In addition to developing a well-documented hydrostratigraphic framework for the GCDs in GMA 8, another goal was to build an equally well-documented, publically available database, encompassing all raw data and interpretations

used to complete this study. This database will provide a firm foundation for further studies and future work in a large and complex aquifer system.

The stratigraphic and lithologic study presented here was based on geophysical logs. Geophysical logs are required for correlating stratigraphic boundaries. Lithologic descriptions from previous studies were used to calibrate geophysical logs, but standard logging principles provided the basis for interpreting lithology from spontaneous potential and resistivity log responses. Although there is some uncertainty where limestone and sandstone are interbedded in a freshwater environment, an attempt was made to reduce this uncertainty by referring to published descriptions.

Geophysical well logs were used to correlate boundaries, map lithologies, interpret depositional environments, and estimate water quality in each layer of the northern Trinity and Woodbine aquifers. Large amounts of time and effort were spent searching for, evaluating the quality of, and depth calibrating geophysical well logs. When that work was complete, a database comprising 1,498 geophysical well logs distributed across the study area was compiled. During the progress of the study, some of those logs were eliminated from the database owing to problems with log quality or incomplete vertical coverage. The final database includes 1,302 logs, which represent the best available coverage of Cretaceous-age formations across the study area (Figure 4.1.10). Almost all logs in the final database are electric logs, meaning they include spontaneous potential and resistivity curves. Some wells also have gamma-ray and other log types, but for consistency and comparability, only the spontaneous potential and resistivity curves were used. The final database includes 408 geophysical logs from water wells and 894 geophysical logs from oil and gas wells.

The well log database is primarily composed of electronic image files, such as TIFF or JPEG, which are typically referred to as rasters. Before the advent of desktop computing, well logs were printed on long, folded paper. Rasters are scanned versions of those paper logs. The commercially available Petra software (IHS, Inc.) was used to prepare and interpret logs and display results. Petra is a GIS-type program that specializes in spatial data from wells. Raster versions of well logs are just images with no attached quantitative information. Petra provides functions for visually examining the images and recording observations at specific depths.

Raster logs were used to correlate stratigraphic boundaries and interpret lithologies. Geologic formation boundaries were defined in outcrop and traced into the subsurface using standard well log correlation techniques. The work documented here established that formation definitions in various portions of the study area are essentially correct; no significant changes are necessary. This study focused on regional consistency and connecting layers across lithologic changes. For example, it was confirmed that the Paluxy and Glen Rose formations in the south are at the same stratigraphic level as the upper part of the Antlers Formation in the north (Figure 4.1.5). In other words, strata in the Paluxy and Glen Rose formations are physically connected to strata in the upper Antlers Formation even though lithologies differ. In contrast, strata in the Fredericksburg Group everywhere overlie strata in the Antlers or Paluxy formations. Actual stratigraphic details are complicated, however, and most formation boundaries are gradational to some extent. The layer definitions and well-to-well correlations establish a regionally consistent stratigraphic framework while preserving as much local detail as possible.

Lithology interpretations were based on geophysical well logging principles supported by limited well sample information and best professional judgment. Lithologic interpretation was conducted on 988 geophysical logs. Electrical properties, as measured in wells, provide information about both lithology and fluid saturation. If fluid saturation is relatively homogeneous (as is expected in an aquifer), then lithology has a pronounced effect on electric log responses. Shales are relatively conductive (low resistivity), whereas limestones generally have high resistivities. Sandstones display intermediate resistivities, which are partly controlled by pore fluid composition (salinity). Shales display distinctive responses on electric logs and can be interpreted with high confidence. Sandstones and limestones can be distinguished from each other with less confidence, especially in a freshwater environment. The spontaneous potential log, which under certain conditions provides a qualitative measure of hydraulic conductivity, is useful for distinguishing permeable sandstone from impermeable limestone. Knowledge of local lithologies from previous studies provides a context for lithologic interpretation. Using Petra functions, a foot-by-foot continuous vertical record of lithology for each electric log was constructed. Lithologies (sandstone, shale, limestone) were then summed by layer and mapped.

Electric logs in digital format were used to interpret water quality and for graphical display (Figure 4.1.11). Whereas raster images are just pictures, digital logs are computer files of measured log responses. Digital logs are tables of measured values, generally having one log

value for every half foot of depth. Information can be extracted wholesale from digital logs without painstaking log-by-log measurement. Digital log values can be analyzed statistically and used in equations to create derivative logs. Unfortunately, the availability of digital logs is limited, and the cost is high. For older wells, and most water wells, log curves must be manually traced using digitizing software. A distribution of 109 digital electric logs across the study area was compiled. The locations of the digital logs are shown in red on Figure 4.1.10.

4.1.7 Lithologic Character of Enclosing Formations

Prior to the onset of deposition during the Cretaceous Period, north-central Texas was covered by eroded landforms comprising three different geologic provinces. These underlying rocks possess differing hydraulic properties that may influence groundwater flow in the aquifers. Where log depths permitted, lithologies of underlying rocks extending 300 feet below the base of the Cretaceous-age strata were interpreted. Paleozoic-age strata underlie the western and northwestern portions of the study area (Figure 4.1.12). Paleozoic-age strata are composed of sandstone, shale, and limestone similar to the overlying Cretaceous-age strata (Brown and others, 1990). Paleozoic-age sandstones are potential aquifers and may be in hydraulic communication with Cretaceous-age sandstones where the two are superimposed.

Deformed rocks of the Ouachita fold belt underlie Cretaceous-age sandstones east of the Paleozoic-age terrain (Figure 4.1.12). Ouachita rocks are also Paleozoic in age, but have a different history. Ouachita rocks were squeezed between two continental plates (ancestral North and South America) during a collision that took place during the Paleozoic Era (Flawn and others, 1961). During that collision, Ouachita rocks experienced high pressures and temperatures, which destroyed whatever hydraulic conductivity they originally possessed. Ouachita rocks in the study area are aquitards.

Jurassic-age sandstones (Cotton Valley Group) underlie Cretaceous-age sandstones along the downdip margin of the study area (Figure 4.1.12). Sandstones of the Cotton Valley Group and overlying Hosston Aquifer are lithologically similar and in hydraulic communication.

Black shales of the Eagle Ford Group overlie the sandstones of the Woodbine Group, forming an effective aquitard and top seal across the eastern portion of the study area. Additional low hydraulic conductivity rocks of the Austin Chalk overlie Eagle Ford shales. Somewhat higher in the stratigraphic section, sandstones forming minor aquifers are present in uppermost

Cretaceous-age strata (Nacatoch and Blossom aquifers). These overlying formations are only present east of the Woodbine Aquifer outcrop. Through the TWDB, a GAM has been developed and is available for the Nacatoch Aquifer (Beach and others, 2009) and a GAM is currently under development for the Blossom Aquifer.

4.1.8 Regional Sandstone Distribution and Depositional Systems

Sandstones in the northern Trinity and Woodbine groups record a major pulse of sediment input in the face of rising sea levels during the Cretaceous Period (Figure 4.1.9). Within that overall sandy interval, smaller scale pulses of sand deposition alternated with marine flooding. This back and forth fluctuation formed the layered system of aquifers and aquitards in the northern Trinity and Woodbine groups in the study area, which is the focus of this report. This section describes regional lithologic properties and sandstone depositional systems of each layer in the Woodbine, Washita/ Fredericksburg, and northern Trinity groups (see Figure 4.1.6). Sandstone distribution, geometry, and orientation are illustrated using net and percent sandstone maps. Depositional systems interpretations are also illustrated on maps. Sandstone and depositional systems maps are shown on Figures 4.1.13 through 4.1.30 by layer from deepest to shallowest. Net sandstone maps show total sandstone thickness in the layer, which is sensitive to the gross layer thickness, whereas the percent sandstone maps show a measure of sandstone concentration without regard to absolute thickness. Where sandstone percentages are high, individual sandstone beds are thick and interbedded shales are thin. Together, the two types of sandstone maps delineate fairways where potential for groundwater flow is greatest.

Figures 4.1.31 through 4.1.37 are schematic, reduced-scale cross sections showing depths, lithologies, and water quality in profile. The cross sections were developed using high-resolution digital electric logs. Large-format versions of the cross sections, showing the digital logs, are included in Appendix C.

Depositional systems maps are based largely on sandstone patterns in paleogeographic context and further emphasize sandstone geometries and orientations. Sandstones in the northern Trinity and Woodbine groups were deposited in two contrasting environments settings: fluvial and shoreline. Fluvial environments include river channels and valleys, whereas shoreline environments include coastal barrier and near offshore areas. The term “fluvial” is also used here for rivers in coastal plains and delta plains. The term “deltaic shoreline” is used here for

coastal barrier and near offshore areas and on adjacent to river deltas. Both fluvial and shoreline environments produce sandstone bodies having elongated external geometries, but orientations vary. Both of these environments produce sandstone bodies having elongated external geometries, but orientations vary. Fluvial sandstones are elongated in the direction of river flow, mainly toward the coast, whereas shoreline sandstones are elongated parallel to the coast. In the northern Trinity and Woodbine depositional systems, fluvial sandstones are oriented mainly northwest-southeast, whereas shoreline sandstone are oriented mainly southwest-northeast. Sandstone geometry and orientation are important because they influence groundwater flow directions. The following discussion is presented by layer from deepest to shallowest.

The specific depositional environments and systems described here are based on previous studies. The depositional systems of the Hensell and Hosston aquifers and the Antlers Aquifer equivalent are documented by Boone (1968) and Hall (1976). The depositional systems of the Paluxy Aquifer are documented by Caughey (1977) and those of the Woodbine Aquifer are documented by Dodge (1968, 1969) and Oliver (1971). Along the downdip margin of the study area, the depositional systems of the Hosston Member of the Travis Peak Formation are documented by McGowen and Harris (1984). The work conducted for this study supports these earlier studies and adds detail relevant to groundwater modeling.

Hosston Aquifer

The Hosston Aquifer is sand-dominated across the entire study area. The aquifer is relatively thin (less than 100 feet) in western outcrops but thickens greatly (500 to 1,000 feet) in downdip areas to the east (see Figures 4.1.31 through 4.1.35). Net sandstone thickness ranges from less than 50 feet to greater than 800 feet along the downdip margin of the study area (Figure 4.1.13). The percent sandstone map displays the opposite pattern, with highest sandstone percentages occur in the west (Figure 4.1.14). High percentage sandstone lobes extend eastward from the outcrop. Net sandstone patterns show relatively thicker sandstones at and near the outcrop, which coincide with high sandstone percentages (compare Figures 4.1.13 and 4.1.14). Two broad high-sand trends dominate the study area: one in the north from Cooke to Parker counties and extending downdip to Dallas and Collin counties and another one in the south centered on Comanche and Erath counties and extending downdip to Bell, McLennan, and Hill counties. The Hosston Aquifer typically has a sharp lower contact with the underlying Paleozoic-age strata

and is sandiest in its lower part. Individual sandstones range from a few feet to about 100 feet thick and average 20-feet thick.

Based on the orientation of sand-rich trends (Figure 4.1.14) and paleogeographic context (Figure 4.1.9b), sandstones of the Hosston Aquifer were deposited in a fluvial environment. Major rivers (channel axes) entered the study area from the west and flowed east and southeast into the East Texas Basin (Figure 4.1.15). Based on the concentration of sand (percent sandstone), the coastal plain must have contained several broad sandy rivers. These rivers were not confined in steep-walled valleys but were free to migrate laterally, depositing sand in wide, coalescing belts. Thus, individual sandstones in the Hosston Aquifer display broad, sheet-like geometries, which are elongated toward the southeast (Figure 4.1.14). These rivers supplied abundant sand to deltaic shoreline systems located beyond the study area in the East Texas Basin (McGowen and Harris, 1984). Increased subsidence in the Mexia-Talco Fault Zone along the eastern boundary of the study area allowed sand to accumulate in thick sequences (Figure 4.1.13).

Pearsall Formation

The Pearsall Formation is composed of sandstone and shale in the north and limestone and shale in the south (see Figures 4.1.36 and 4.1.37). Sandstone is best developed in northwestern counties extending south into Collin and Dallas counties (Figure 4.1.16). Thickest sandstone is located mainly downdip in northeastern counties. Unlike the Hosston Aquifer, sandstones in the Pearsall Formation do not display strong west-east orientation, rather, they are oriented mainly north-south (Figure 4.1.16). The Pearsall Formation is not a sand-dominated sequence; percent sand is less than 50 percent in most wells (Figure 4.1.17). Limestone dominates in downdip counties in the southern half of the study area (see Figures 4.1.33 through 4.1.35).

The Pearsall Formation was deposited during a transgressive episode. The supply of abundant sand that fed fluvial systems in the Hosston Aquifer was shut off, and the marine waters flooded (transgressed) the south. Sand deposition persisted in the north where a deltaic shoreline system formed (Figure 4.1.18). Relatively small rivers supplied sand to the delta from source areas to the north and northeast. Sand-poor coastal plain environments flanked the small rivers. South of the sandstone area, limestone and shale were deposited in offshore marine environments. In summary, shallow marine environments encroached the area from the southeast in response to

rising sea level, while coastal plain and shoreline environments persisted in the north (Figure 4.1.18).

Hensell Aquifer

The Hensell Aquifer is another sand-dominated interval. This aquifer, which is generally relatively thin (less than 120 feet), is thickest in outcrop areas and thins downdip (Figures 4.1.31 through 4.1.35). Net sandstone thickness ranges from 0 to 100 feet, averaging 50 feet (Figure 4.1.19). Percent sandstone is greater than 50 percent across most of the study area (Figure 4.1.20). Several high sandstone trends extend directly away from the outcrop and are west-east oriented in the south but become more north-south oriented to the north (Figure 4.1.20). Most high sandstone trends terminate before reaching the downdip margin of the study area. In more downdip areas, sandstones display north to northeast orientations (Figure 4.1.20). Individual sandstones in the Hensell Aquifer are thickest (15 to 25 feet) within the high percent sandstone trends.

The Hensell Aquifer was deposited in fluvial and deltaic shoreline systems that migrated (prograded) into the study area mainly from the west and northwest. Broad sandy rivers flowed eastward and merged with an equally broad sandy shoreline system (Figure 4.1.21). The Hensell Aquifer coastal plain and shoreline never extended as far southeast as they did in the Hosston Aquifer. In effect, the Hosston Aquifer constructed a platform of sand that completely covered the study area, and Hensell Aquifer depositional systems never reached the edge of that stable platform. Thus, the Hensell Aquifer never experienced large-scale subsidence in downdip areas and, consequently, does not thicken downdip. Along the downdip margin of the area, the Hensell Aquifer was deposited in shale-dominated offshore marine systems. Uppermost sands in the Hensell Aquifer were partly reworked during the marine transgression that deposited the limestones of the overlying Glen Rose Formation.

Glen Rose Formation

The Glen Rose Formation is limestone dominated across most of the study area except in the northwest. Limestones in the Glen Rose Formation range from 0 to 400 feet thick in the outcrop and 300 to 1,300 feet thick in downdip areas (Figures 4.1.31 through 4.1.37). The Glen Rose Formation includes a northeast-oriented lobe of sandstone in the northwest, which reaches 200 feet in thickness (Figure 4.1.22) and consist of 40 to 60 percent sandstone (Figure 4.1.23).

Individual sandstones in the Glen Rose Formation are thinner than those in the Hensell and Hosston aquifers, averaging only 8-feet thick. Thus, the Glen Rose Formation is composed of thick limestones across most of the study area and thinly interbedded sandstone and shale in the northwest.

Limestones in the Glen Rose Formation record a marine transgressive episode, which was more extensive than the transgression during deposition of the Pearsall Formation. Shallow marine waters covered most of the study area, although sand deposition persisted in the northwestern corner (Figure 4.1.24). Based on sandstone geometries and bed thicknesses, sandstones in the Glen Rose Formation were deposited in marginal marine environments, including small fluvial systems, coastal lowlands, and shorelines. In summary, deposition of the Glen Rose Formation was coincident with another sea level rise and another flooded coastal plain. Shallow marine limestones covered much of the study area, but marginal marine and shoreline environments persisted in the northwest.

Paluxy Aquifer

The Paluxy Aquifer is a sandstone-dominated interval centered in the north. The aquifer is thickest (greater than 400 feet) in the northeast and thins to the south (Figure 4.1.37). Net sandstone is also thickest in the northeast (Figure 4.1.25). Net sandstone is closely related to interval thickness, so the percent sandstone map shows that the Paluxy Aquifer is commonly sand-dominated even where it is thin (Figure 4.1.26). The Paluxy Aquifer is shale dominated in a thin remnant in the southeast and in the far northeast. Sandstones in the Paluxy Aquifer display elongate trends that enter the study area from the north, northwest, and west (Figure 4.1.26). In the north, sandstone trends in the aquifer extend completely across the study area, exiting to the southeast. However, in the south, sandstones in the aquifer thin to zero thickness before reaching the eastern boundary of the study area (Figure 4.1.26). Within high percent sandstone trends (greater than 60 percent), individual sandstones in the Paluxy Aquifer average 20 feet in thickness. In areas with lower percent sandstone, individual sandstones average 10 to 15 feet in thickness.

During deposition of the Paluxy Aquifer, fluvial systems converged on the study area from the north, northwest, and west. Rivers flowed east to southeast across most of the study area but flowed directly south in the northeast portion of the area (Figure 4.1.27). In the north, the

shoreline was beyond the downdip boundary of the study area but, in the south, a broad sandy shoreline extended from Coryell County northeast to Dallas County (Figure 4.1.27). A shale-dominated marine shelf existed south and east of the shoreline system. Fluvial sandstones in the Paluxy Aquifer are elongated directly away from the outcrop (sandstone orientation perpendicular to outcrop orientation). In summary, deposition of the Paluxy Aquifer was coincident with major sediment input from the north, northwest, and west, which constructed broad sandy coastal plain and shoreline deposits. The offshore marine environments in the south resulted in shale-dominated deposits.

Washita/Fredericksburg Groups

The Washita/Fredericksburg groups are composed of limestone and shale across the entire study area (Figures 4.1.31 through 4.1.5.) The Washita/Fredericksburg groups are exposed at the surface in between the northern Trinity and Woodbine group outcrops. The Washita/Fredericksburg groups thicken downdip from about 400 feet near the outcrop to 800 feet along the downdip boundary of the study area. The thickness of the Washita/Fredericksburg groups is relatively constant from north to south (Figure 4.1.37). The deposition of the Washita/Fredericksburg groups records a major marine transgression similar to the Glen Rose Formation, but even more extensive. There were no significant sources of sand during the Washita/Fredericksburg depositional episode; shallow marine conditions prevailed across the area.

Woodbine Aquifer

The Woodbine Aquifer is sandstone dominated from Hill County in the south to Fannin County in the north, but is shale dominated in the far northeast and in the south (Figure 4.1.28). This aquifer is not present west or north of its outcrop. Net sandstone is thickest in the area where outcrop trends change from north to east oriented, forming a lobe of sandstone greater than 300-feet thick (Figure 4.1.28). Sandstone concentration (percent sandstone) is actually greater to the south of this net sandstone maximum (Figure 4.1.29). Sandstones in the Woodbine Aquifer are generally elongated to the northeast, paralleling outcrop trends. Thick sandstones are concentrated in the lower half of the interval. In the area where the Woodbine Aquifer includes greater than 200 feet of net sandstone (Figure 4.1.28), individual sandstones in the lower part of the interval average 20 feet in thickness. In Collin County, individual sandstones reach 80 feet in

thickness. South of Hill County, the Woodbine Aquifer is thin (less than 20 feet) and composed entirely of shale (Figure 4.1.37).

The Woodbine Aquifer records the final progradation of sandy depositional systems into the study area. Subsequent to deposition of the Woodbine Aquifer, the entire area was covered by an offshore marine, shale-dominated environment. Depositional systems in the Woodbine Aquifer were primarily deltaic marine shorelines and related coastal lowlands (Figure 4.1.30). Small fluvial systems may be present in Grayson County and in Oklahoma. Thick stacks of marine shoreline sandstones cover eastern Collin and western Hunt counties (Figure 4.1.28). Ellis and Dallas counties are covered by thinner but more concentrated shoreline sandstones (Figure 4.1.29). In summary, sandstones in the Woodbine Aquifer were deposited primarily in deltaic shoreline environments.

4.1.9 Water Quality from Resistivity Logs

Groundwater quality in sandstone aquifers can be estimated using electric log resistivities. Freshwater is more resistive to the flow of electrical current than is saline water. Therefore, in general, higher sandstone resistivity coincides with better quality groundwater. Empirical relationships have been established between groundwater salinity, as determined by chemical analysis, and resistivity of the corresponding saturated sandstone (Jones and Buford, 1951; Alger, 1966; Fogg and Blanchard, 1984; Hamlin and others, 1988; Collier, 1993). Lithology, bed thickness, porosity, water composition, and temperature among other variables also influence measured resistivities. Specific resistivity cutoffs for fresh or slightly saline groundwater are usually only valid in limited geographic areas where formation properties are relatively constant (Collier, 1993). Resistivity was mapped in selected sandstone-dominated layers without attempting to quantify corresponding groundwater salinities. Instead, resistivity maps and descriptions are presented in terms of relatively lower and higher groundwater salinities. Using digital electric logs, average (median) resistivity in the aquifers was calculated. To reduce bed thickness effects, only sandstones greater than 10-feet thick were included in the averaging process. The resistivity maps show trends that can be related, at least in part, to groundwater salinity changes. The approximate downdip limit of freshwater in each sandstone layer is marked on the cross sections in Figures 4.1.31 through 4.1.35. These downdip limits of freshwater, which is also general and qualitative, were based on resistivities, previous studies

(Klemt and others, 1975; Nordstrom, 1982), and the groundwater quality data in water wells presented in Section 4.4 of this report.

Low salinity groundwater extends deepest and farthest downdip in the Hosston Aquifer. Low salinity groundwater is present at depths of 3,500 to 5,000 feet below land surface in Collin, Dallas, and Ellis counties and at depths of 2,500 to 3,500 feet in Hill and McLennan counties (Figures 4.1.31 through 4.1.34). Farther south, low salinity groundwater in the Hosston Aquifer extends less than 2,000 feet below land surface (Figure 4.1.35). Resistivities in the Hosston Aquifer are relatively high in areas coincident with high percent sandstone trends (compare Figures 4.1.14 and 4.1.38), suggesting that recharging (low salinity/high resistivity) groundwater preferentially flows along these high conductivity pathways. Exceptionally high resistivities in the south are probably caused by high bicarbonate concentrations (Collier, 1993). Resistivities in the Hosston Aquifer are uniformly low in the far northeast, indicating generally high groundwater salinities in that region.

Groundwater in the Hensell Aquifer has relatively low salinity in and near the outcrop area, but the lower salinity groundwater does not extend as far downdip in the Hensell Aquifer as in the Hosston Aquifer. Higher salinity groundwater in the Hensell Aquifer commonly overlies lower salinity groundwater in the Hosston Aquifer, an example of decreasing salinity with depth (Figures 4.1.31 through 4.1.35). Resistivities in the Hensell Aquifer also show some geographic coincidence with high percent sandstone trends (compare Figures 4.1.19 and 4.1.39). As in the Hosston Aquifer, resistivities in the Hensell Aquifer are uniformly low in the northeast.

In the northern portion of the study area, relatively low salinity groundwater in the Paluxy Aquifer extends as far or farther downdip than it does in the Hosston Aquifer, although not as deep (Figures 4.1.31 and 4.1.32). Except in the far northeast, areas of high sandstone coincide with higher resistivities in the Paluxy Aquifer (compare Figures 4.1.26 and 4.1.40).

Resistivities in the sandstones of the Woodbine Aquifer are lower than in the sandstones of the Paluxy, Hensell, and Hosston aquifers. Formation-specific properties unrelated to water quality probably cause these resistivity differences within the Woodbine Aquifer, however, downdip decreasing resistivities reflect increasing groundwater salinity (Figure 4.1.41). High resistivities (low salinities) extend further downdip in two areas: in the south, where the Woodbine Aquifer is thin but the sandstone percentage is high (Figure 4.1.29), and, in the north, where the net

sandstone in the Woodbine Aquifer is high (Figure 4.1.28). In the Woodbine Aquifer, low salinity groundwater is best developed in Collin, Dallas, and Ellis counties, coinciding with greater concentrations of sandstone in those counties (compare Figures 4.1.29, 4.1.31, and 4.1.32). Even in this area, however, low salinity groundwater in the Woodbine Aquifer does not extend deeper than about 2,000 feet below land surface.

Resistivity maps were not constructed for other layers, owing to the effects of mixed lithologies, but approximate downdip limits of lower salinity groundwater are shown on cross sections. The Pearsall Formation generally contains higher salinity groundwater than do the other sandstone-bearing layers (Figures 4.1.31 through 4.1.35). The Glen Rose Formation contains low salinity groundwater in the northwest where it is sandstone-dominated (Figure 4.1.31).

4.1.10 Hydrostratigraphy for the GCDs Comprising the Inter-local Agreement

Hydrostratigraphy specific to each of the GCDs comprising the inter-local agreement (Prairielands, North Texas, Northern Trinity, and Upper Trinity GCDs) is provided in this subsection. Included are cross sections and discussions of aquifer characteristics in the GCDs. The following discussion is organized by GCD location from east to west and north to south.

4.1.10.1 Upper Trinity GCD

The Upper Trinity GCD is located almost entirely in the outcrop of the northern Trinity Aquifer (Figure 4.1.42). The northern Trinity Aquifer is missing where Paleozoic-age strata are exposed at the surface in the western portions of Montague, Wise, and Parker counties. The Woodbine Aquifer is not present in the Upper Trinity GCD. Two digital electric log cross sections were constructed to display the stratigraphy and sandstone development in the northern Trinity Aquifer in the Upper Trinity GCD (Figures 4.1.43 and 4.1.44). On these cross sections, both the layer terminology for the model (see Figure 4.1.6) and the local terminology of the Antlers Aquifer are given. In the west, the northern Trinity Aquifer extends from land surface down to 100 to 300 feet below land surface (Figure 4.1.43) and includes only the Hensell Aquifer, Pearsall Formation, and Hosston Aquifer. In the eastern portion of the Upper Trinity GCD, the northern Trinity Aquifer extends from land surface down to as much as 700-feet deep. The Paluxy Aquifer and Glen Rose Formation, as well as the Hensell Aquifer, Pearsall Formation, and Hosston Aquifer, are present in the southeast (Figure 4.1.44).

The northern Trinity Aquifer is sandstone-dominated across most of the Upper Trinity GCD. Shallow sandstones, 30- to 50-feet thick, are common in the west (Figure 4.1.43). Most of these thick sandstones correspond to the Hosston and Hensell aquifers. The Pearsall Formation is more shale dominated. The underlying Paleozoic-age sediments also include thick sandstones, which are in hydrologic communication with the Hosston Aquifer in some areas. In the eastern portion of the Upper Trinity GCD, sandstones are thickest in Montague County (Figure 4.1.44). In southern Parker and Hood counties, limestones of the Glen Rose Formation occupy a large part of the northern Trinity Aquifer, but sandstones of the Paluxy Aquifer are well developed above the Glen Rose Formation at depths less than 250 feet (Figure 4.1.44). Sandstones are thick locally below the Glen Rose Formation at depths ranging from 200 to 700 feet. Groundwater quality is generally good throughout the Upper Trinity GCD.

4.1.10.2 North Texas GCD

The North Texas GCD is located mostly east of the northern Trinity Aquifer outcrop, but the Woodbine Aquifer outcrop extends through the center of the District (Figure 4.1.45). Two digital electric log cross sections were constructed to display the stratigraphy and sandstone development in the northern Trinity and Woodbine aquifers in the North Texas GCD (Figures 4.1.46 and 4.1.47). In the western portion of Cooke and Denton counties, limestones of the Washita/Fredericksburg groups are exposed at the surface, overlying 500 to 800 feet of sandstones in the northern Trinity Aquifer. Limestones of the Glen Rose Formation are present in southern Denton County (Figure 4.1.46). In Collin County, sandstones in the northern Trinity Aquifer are present at much greater depths than in Denton County, owing to the eastward dipping stratigraphy (Figure 4.1.47). Sandstones in the Hosston Aquifer are found at depths greater than 5,000 feet in eastern Collin County. Sandstones in the Woodbine Aquifer range from 300- to 3,000-feet deep in Collin County. Sandstones in the Paleozoic-age sediments underlie the northern Trinity Aquifer locally in western Cooke County, but in most of the North Texas GCD, the northern Trinity Aquifer is underlain by shale and limestone. In southeastern Collin County, the Jurassic-age sandstones of the Cotton Valley Formation underlie and are in hydrologic communication with the Hosston Aquifer (Figure 4.1.47).

Sandstones in the Woodbine, Paluxy, Hensell, and Hosston aquifers are well developed in the North Texas GCD. Maximum sandstone thicknesses (summing all aquifers/formations across the study area) containing good quality groundwater are located in the North Texas GCD and in

adjacent Grayson and Dallas counties. Multiple, sandstone-dominated, fluvial and shoreline depositional systems are superimposed in the North Texas GCD. The western portion of the North Texas GCD includes thick sequences of northern Trinity Aquifer sandstones and relatively minor shales and limestones (Figure 4.1.46). In the eastern portion of the North Texas GCD in Collin County, sandstones in the northern Trinity Aquifer, although more deeply buried, are thicker than in the western portion of the North Texas GCD (Figure 4.1.47). In the Hosston Aquifer, the base of low salinity groundwater is 5,000-feet deep or deeper in parts of Collin County. The Woodbine Aquifer comprises 200 to 350 feet of sandstone having low to moderate salinity groundwater in Collin County.

4.1.10.3 Northern Trinity GCD

The Northern Trinity GCD is located east of the northern Trinity Aquifer outcrop, but the Woodbine Aquifer outcrop extends through the eastern portion of the District (Figure 4.1.48). Two digital electric log cross sections were constructed to display stratigraphy and sandstone development in the northern Trinity and Woodbine aquifers in the Northern Trinity GCD (Figures 4.1.49 and 4.1.50). On these cross sections, both the layer terminology used for the model and the local terminology of Twin Mountains Aquifer are given. The limestones of the Glen Rose Formation and the Washita/Fredericksburg groups are well developed confining layers throughout the Northern Trinity GCD. Sandstones of the Hensell and Hosston aquifers range in depth from about 500 feet in the west to 2,000 feet in the east (Figure 4.1.50). Sandstones in the Paluxy Aquifer range in depth from 100 to 1,000 feet. Sandstones in the Woodbine Aquifer are present at the surface to about 400 feet in the eastern portion of the District. The northern Trinity Aquifer is underlain by Paleozoic-age sandstone, shale, and limestone sediments throughout the Northern Trinity GCD, which are generally thin bedded and shale dominated (Figure 4.1.49).

The sandstones of the Paluxy, Hensell, and Hosston aquifers are well developed in the Northern Trinity GCD. The Paluxy Aquifer is composed of greater than 60 percent sandstone everywhere except in the northwest corner of Tarrant County. Major, east-oriented, fluvial channel axes in the Paluxy Aquifer are expressed as thick-bedded sandstone (Figure 4.1.49). The Hosston and Hensell aquifers also contain greater than 60 percent sandstone. The sandstones of the Paluxy and Hosston aquifers form the most hydraulically conductive and transmissive layers in the Northern Trinity GCD. In the channelized fluvial depositional systems of the Paluxy, Hensell,

and Hosston aquifers, however, well-to-well variability is high. Thick, river-channel sandstones are enclosed in shale-dominated interchannel areas. The abrupt sandstone-shale transitions are well displayed on the cross sections in Figures 4.1.49 and 4.1.50. Groundwater quality is good throughout the Northern Trinity GCD.

4.1.10.4 Prairielands GCD

The Prairielands GCD covers a broad region in the center of the study area. The western portion of the Prairielands GCD is located in the northern Trinity Aquifer outcrop, and the Woodbine Aquifer outcrop extends through the center (Figure 4.1.51). Both aquifers are deeply buried in the eastern portion of the Prairielands GCD. Three digital electric log cross sections were constructed to display the stratigraphy and sandstone development in the northern Trinity and Woodbine aquifers in the Prairielands GCD (Figures 4.1.52 through 4.1.54). In Somervell County, limestones of the Glen Rose Formation overlie sandstones in the Hensell and Hosston aquifers, which range in depth from about 250 to 700 feet. The Pearsall Formation is mostly shale in Somervell County. Sandstones in the Paluxy Aquifer are exposed at the surface in the southern and eastern portions of Somervell County (Figure 4.1.52). In portions of Johnson and western Hill counties, sandstones in the Woodbine Aquifer are exposed at the surface. Thick sequences of limestones in the Washita/Fredericksburg groups and Glen Rose Formation confine the Paluxy, Hensell, and Hosston aquifers (Figure 4.1.53). Sandstones of the Paluxy Aquifer are buried at depths ranging from 300 to 1,000 feet in Johnson and western Hill counties. Sandstones in the Hensell and Hosston aquifers range in depth from 1,000 to 2,000 feet (Figure 4.1.53). Ellis and eastern Hill counties include the full suite of sandstones in the northern Trinity and Woodbine aquifers (Figure 4.1.54). Sandstones in the Hosston Aquifer are underlain by shale- and limestone-dominated strata of Paleozoic age.

Sandstones in the northern Trinity and Woodbine aquifers are variably developed across the Prairielands GCD. Sandstones in the Woodbine and Paluxy aquifers are thick and concentrated (high sandstone percentages) in the northern portions of Ellis and Johnson counties, but thin southward, reaching essentially zero thickness in southern Hill County (Figures 4.1.53 and 4.1.54). Sandstones in the Hensell Aquifer are thick in Somervell and Johnson counties but are much thinner in Ellis and eastern Hill counties. Sandstones in the Hosston Aquifer, however, are well developed and contain low salinity groundwater throughout the Prairielands GCD. The Woodbine and Paluxy aquifers contain low salinity groundwater in Johnson and western Ellis

37 069

counties, whereas low salinity groundwater in the Hensell Aquifer is mainly restricted to Johnson and Somervell counties.

4.1.11 Summary of Northern Trinity and Woodbine Aquifers Hydrostratigraphy

Cretaceous-age sandstones in the northern Trinity and Woodbine groups in central and north-central Texas are important sources of groundwater and comprise the northern Trinity and Woodbine aquifers. The stratigraphy of the Cretaceous-age strata consists of interbedded sandstones, limestones, and shales. Cretaceous-age strata thicken and dip toward the East Texas Basin where they are overlain by thousands of feet of younger strata. Only along the western and northern margins of the East Texas Basin are Cretaceous-age sandstones saturated with fresh groundwater. The northern Trinity and Woodbine aquifers extend from the Edwards Plateau, through the Hill Country, and to the northeast into Oklahoma and Arkansas.

The Cretaceous Period (145 to 65 million years ago) was characterized by rising sea level and episodic input of sandy sediment. Limestones were deposited in shallow marine waters, whereas sandstones were deposited mainly in rivers on sandy coastal plains and along marine shorelines. Depositional environment controls sandstone geometry and orientation, which in turn, influence groundwater flow directions. Geographically fluctuating shorelines resulted in stratigraphic interlayering of sandstone and limestone (shale is interbedded with both). Sandstones form the aquifer units, and limestones form the confining units in the northern Trinity, Washita/Fredericksburg, and Woodbine groups. The hydrostratigraphy of the northern Trinity and Woodbine aquifers is based on this lithologic interlayering. The Woodbine, Paluxy, Hensell and Hosston aquifers are sandstone-dominated, the Glen Rose and Pearsall formations are mixed lithology, and the Washita/Fredericksburg groups are limestone-dominated.

At the regional level, geologic structure is relatively simple in the Cretaceous-age strata of north-central Texas. Stratigraphic dips range from eastward in the south to southward in the northeast. Gently folded strata are present in the northwest, and large, northeast-oriented fault zones are present in the south (Balcones Fault Zone) and along the eastern margin of the study area (Mexia-Talco Fault Zone). Faults in the Balcones Fault Zone displace aquifer sandstones by several hundred vertical feet and have the greatest potential to influence vertical groundwater flow within the freshwater interval. Faults in the Mexia-Talco Fault Zone are located downdip from the freshwater interval. Smaller, more localized faults and fractures are known to be

abundant in Cretaceous-age strata, but their effects on groundwater flow and quality have not been documented.

The northern Trinity Aquifer is sandstone-dominated in the northwest, where it is locally referred to as the Antlers Aquifer. In the rest of the study area, limestones of the Glen Rose Formation separate the lower portion of the northern Trinity Aquifer (i.e., sandstones of the Hosston and Hensell aquifers and the Pearsall Formation) from the sandstones in the upper portion of the northern Trinity Aquifer (i.e., Paluxy Aquifer). Sandstones in the Woodbine Aquifer are separated from the underlying northern Trinity Aquifer by limestones and shales in the Washita/and Fredericksburg groups. The Hosston Aquifer, which is the stratigraphically lowest sandstone layer, is the most widespread and best developed aquifer in the system. The Hosston Aquifer includes greater net sandstone and thicker individual sandstones than any other layer. The Hensell Aquifer is well developed in western portions of the study area, but thins and becomes increasingly shale dominated to the east. The Pearsall and Glen Rose formations include sandstones only in the north. The Paluxy Aquifer is dominated by thick sandstones across broad areas, where it rivals the Hosston Aquifer, but thins across the southern one-third of the study area. The Woodbine Aquifer includes thick sandstones in the east-central and northeastern portions of the study area.

With two exceptions, the distribution of low salinity groundwater in the northern Trinity and Woodbine aquifers coincides in a general way with sandstone development. Low salinity groundwater extends deepest and farthest southeast in widespread sandstones of the Hosston Aquifer. In the other aquifers/formations, low salinity groundwater is more limited geographically, coinciding with areas of maximum sandstone thickness. One exception is in the counties in northeastern Texas located east of Fannin County. Sandstones in the northern Trinity and Woodbine aquifers are present in this area, but contain poor quality groundwater. The second exception occurs along the eastern boundary of the study area at depths below the base of the low salinity groundwater.

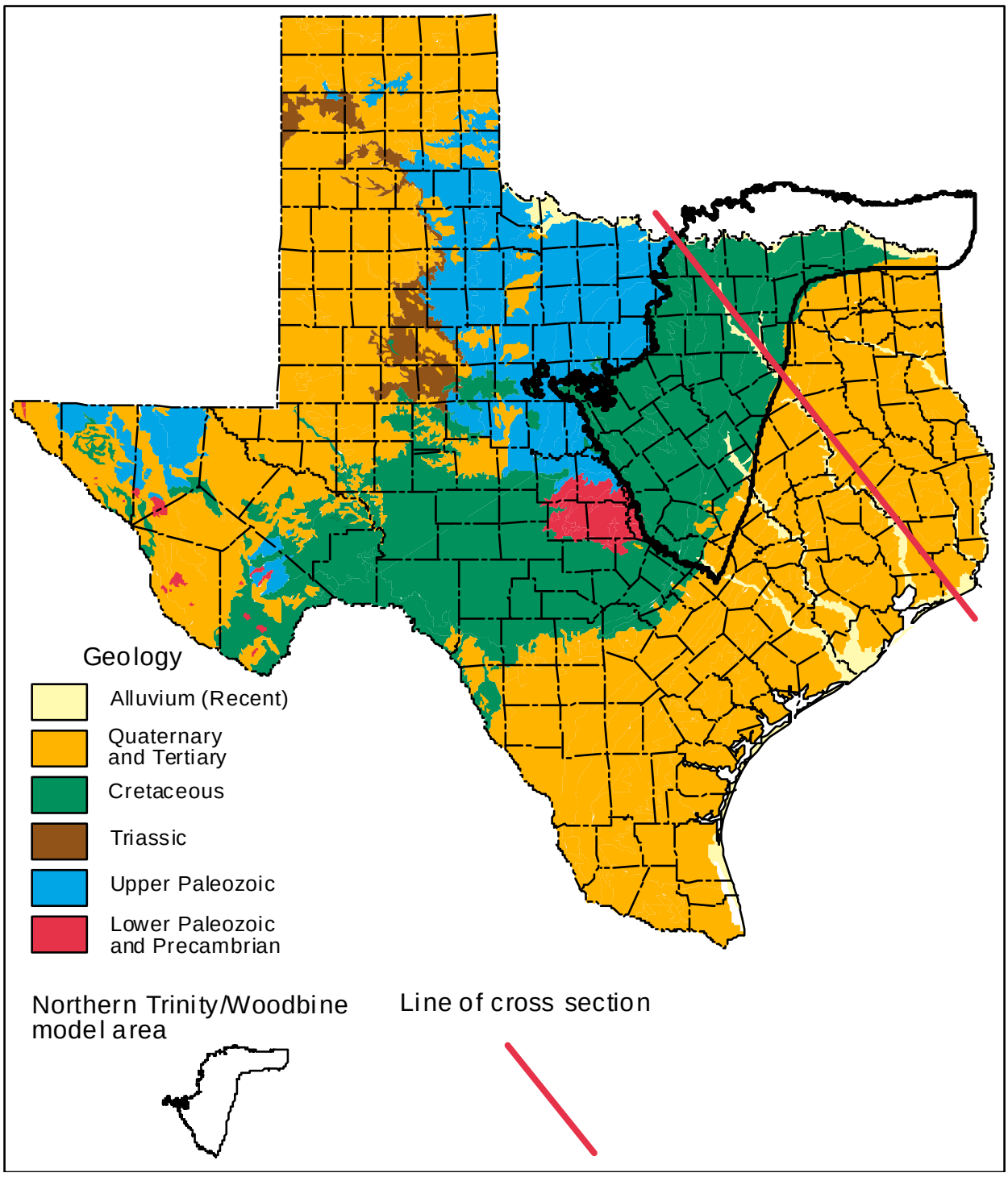


Figure 4.1.1 Simplified surface geology of Texas showing the study area and the location of the cross section in Figure 4.1.3 (modified from Bureau of Economic Geology, 1992).

Age m.y	Period	Group	Formations					
			North and West	Central		South		
65	Upper Cretaceous	Eagle Ford	not present	undifferentiated		undifferentiated		
		Woodbine	not present	undifferentiated		undifferentiated		
		Washita	Grayson Mainstreet Pawpaw Weno Denton Fort Worth Duck Creek	Buda Del Rio Georgetown		Buda Del Rio Georgetown		
100	Lower Cretaceous	Fredericksburg	Kiamichi Goodland Walnut	Kiamichi Edwards Comanche Peak Walnut		Kiamichi Edwards Comanche Peak Walnut		
		Trinity	Antlers	Paluxy Glen Rose		Paluxy Glen Rose		
				Twin Mountains	Hensell Pearsall Hosston	Travis Peak	Hensell Pearsall/Cow Creek/Hammett Hosston/Sligo	

Figure 4.1.2 Stratigraphic correlation showing Cretaceous-age stratigraphy in various portions of the study area (modified from Fisher and Rodda, 1966, 1967; Salvador and Muneton 1989; Walker and Geissman, 2009).

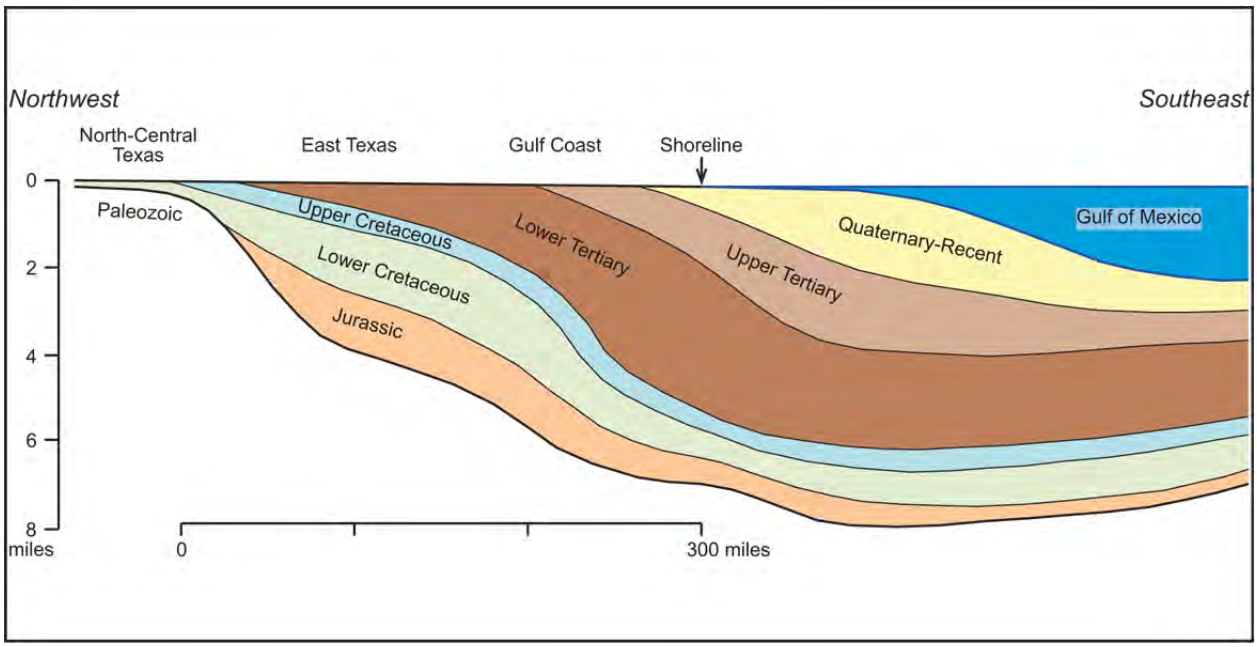


Figure 4.1.3 Schematic cross section showing sedimentary fill of the Gulf of Mexico Basin (modified from Salvador, 1991).

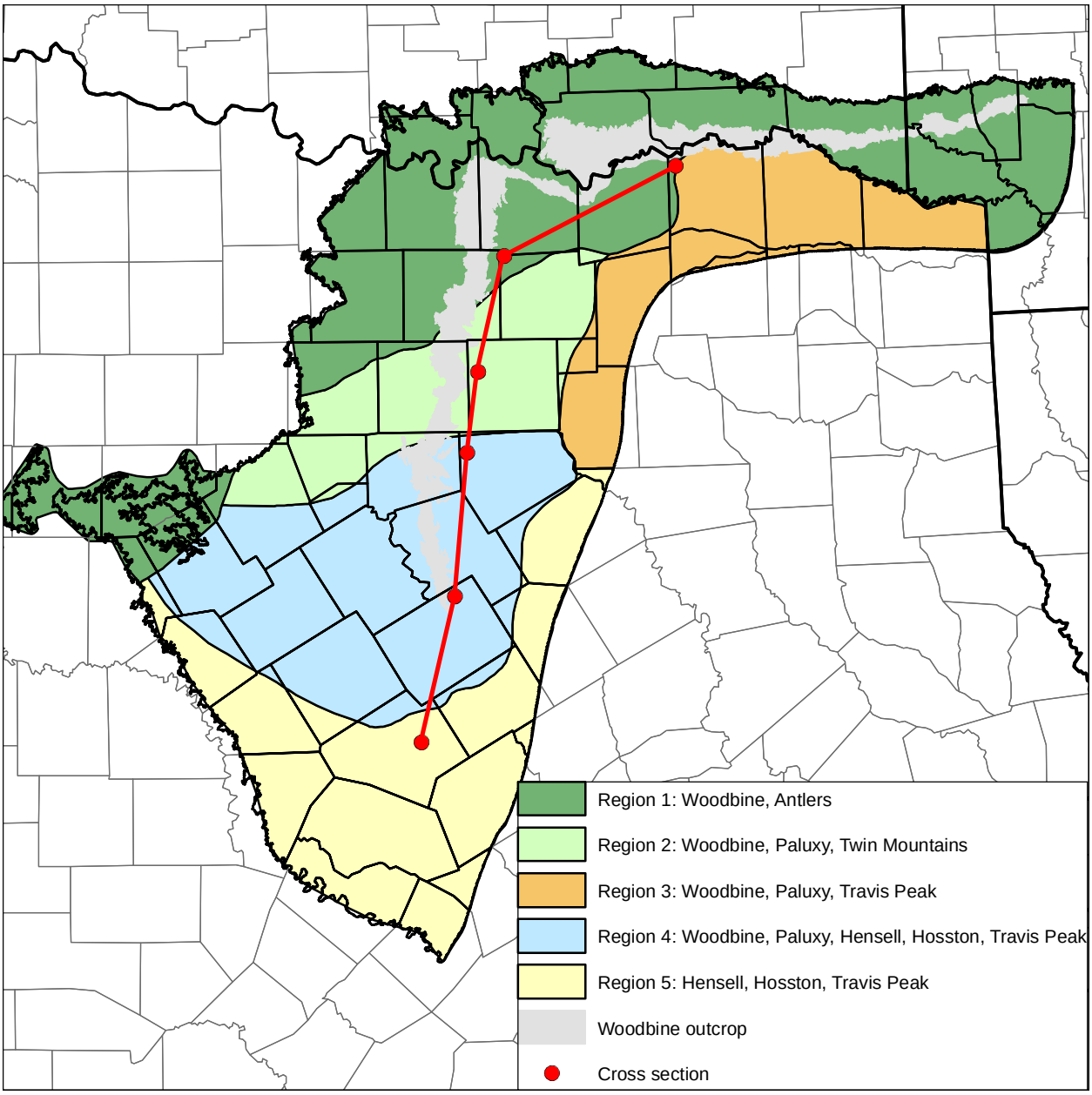
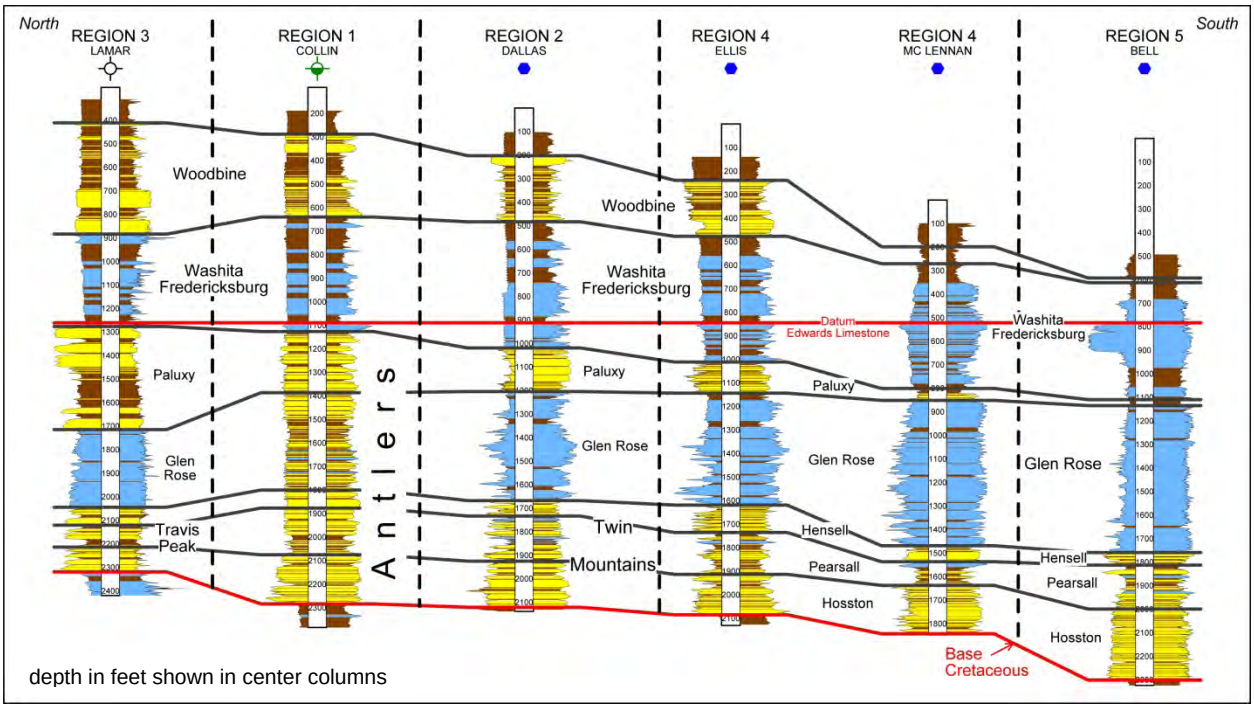


Figure 4.1.4 **Study area showing regions defined by stratigraphic and lithologic similarities and aquifer names common to each region, and the location of the cross section shown in Figures 4.1.5.**



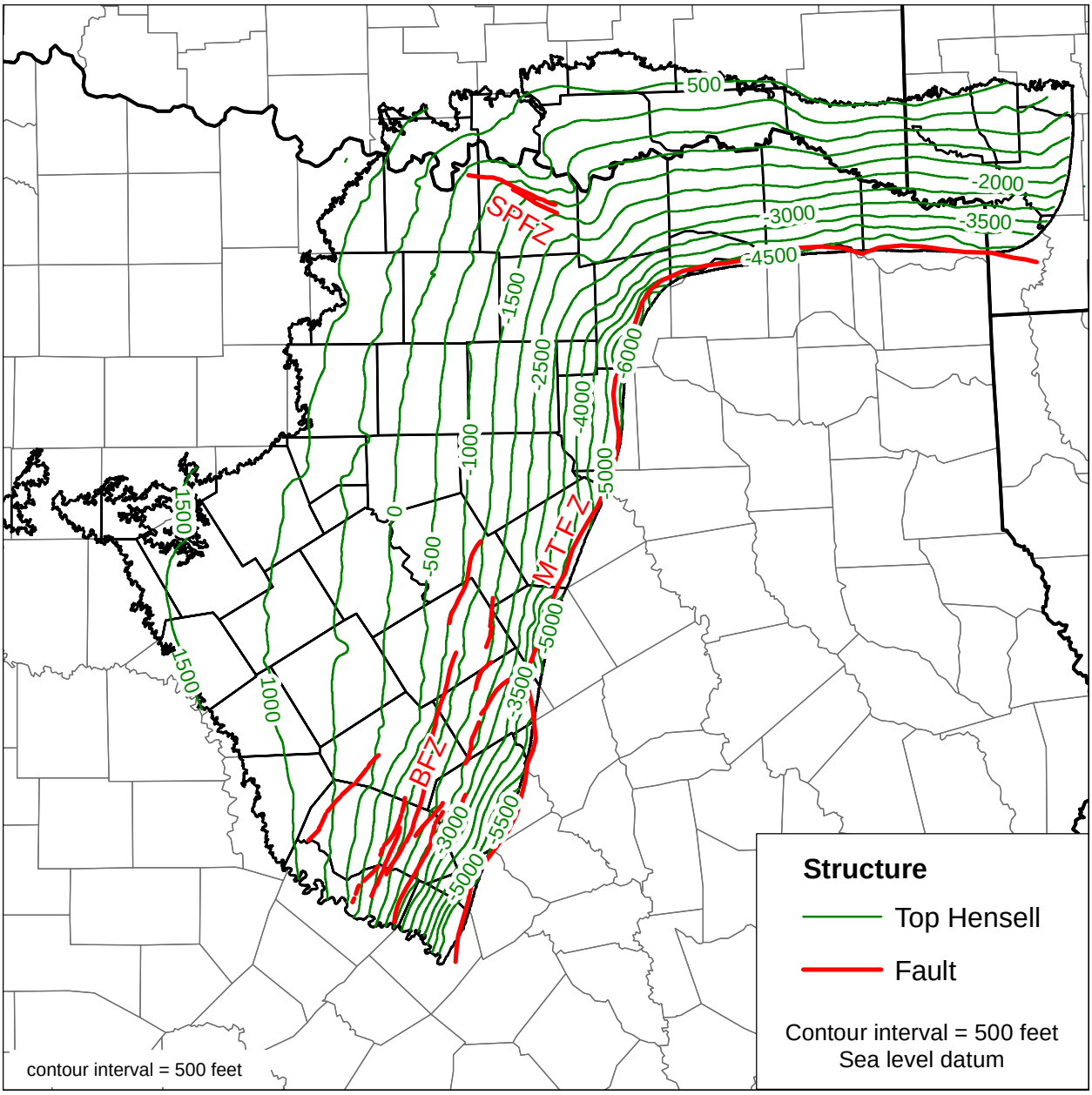
yellow = greater than 50 percent sandstone, blue = greater than 50 percent limestone, brown = greater than 50 percent shale

Figure 4.1.5 Cross section composed of typical electric logs in Regions 1 through 5 showing digital spontaneous potential curve on the left and a resistivity (short normal) curve on the right and aquifer names common to each region.

Model Terminology	Region 1	Region 2	Region 3	Region 4	Region 5
Woodbine Aquifer	Woodbine	Woodbine	Woodbine	Woodbine	Woodbine (no sand)
Washita/ Fredericksburg Groups	Washita/ Fredericksburg	Washita/ Fredericksburg	Washita/ Fredericksburg	Washita/ Fredericksburg	Washita/ Fredericksburg
Paluxy Aquifer	Antlers	Paluxy	Paluxy	Paluxy	Paluxy (no sand)
Glen Rose Formation	Antlers	Glen Rose	Glen Rose	Glen Rose	Glen Rose
Hensell Aquifer	Antlers	Twin Mountains	Travis Peak	Hensell/ Travis Peak	Hensell/ Travis Peak
Pearsall Formation	Antlers	Twin Mountains	Travis Peak	Pearsall/ Sligo	Pearsall/ Sligo
Hosston Aquifer	Antlers	Twin Mountains	Travis Peak	Hosston/ Travis Peak	Hosston/ Travis Peak

yellow = sandstone aquifers

Figure 4.1.6 Chart showing model terminology and corresponding formation names and aquifer names common to each region.



BFZ = Balcones Fault Zone
MTFZ = Mexia-Talco Fault Zone (numerous closely spaced faults are represented by a single line)
SPFZ = Sherman/Preston Fault Zone

Figure 4.1.7 Top of the Hensell Aquifer in feet above mean sea level and locations of faults that displace Cretaceous-age strata (from Ewing, 1990, 1991).

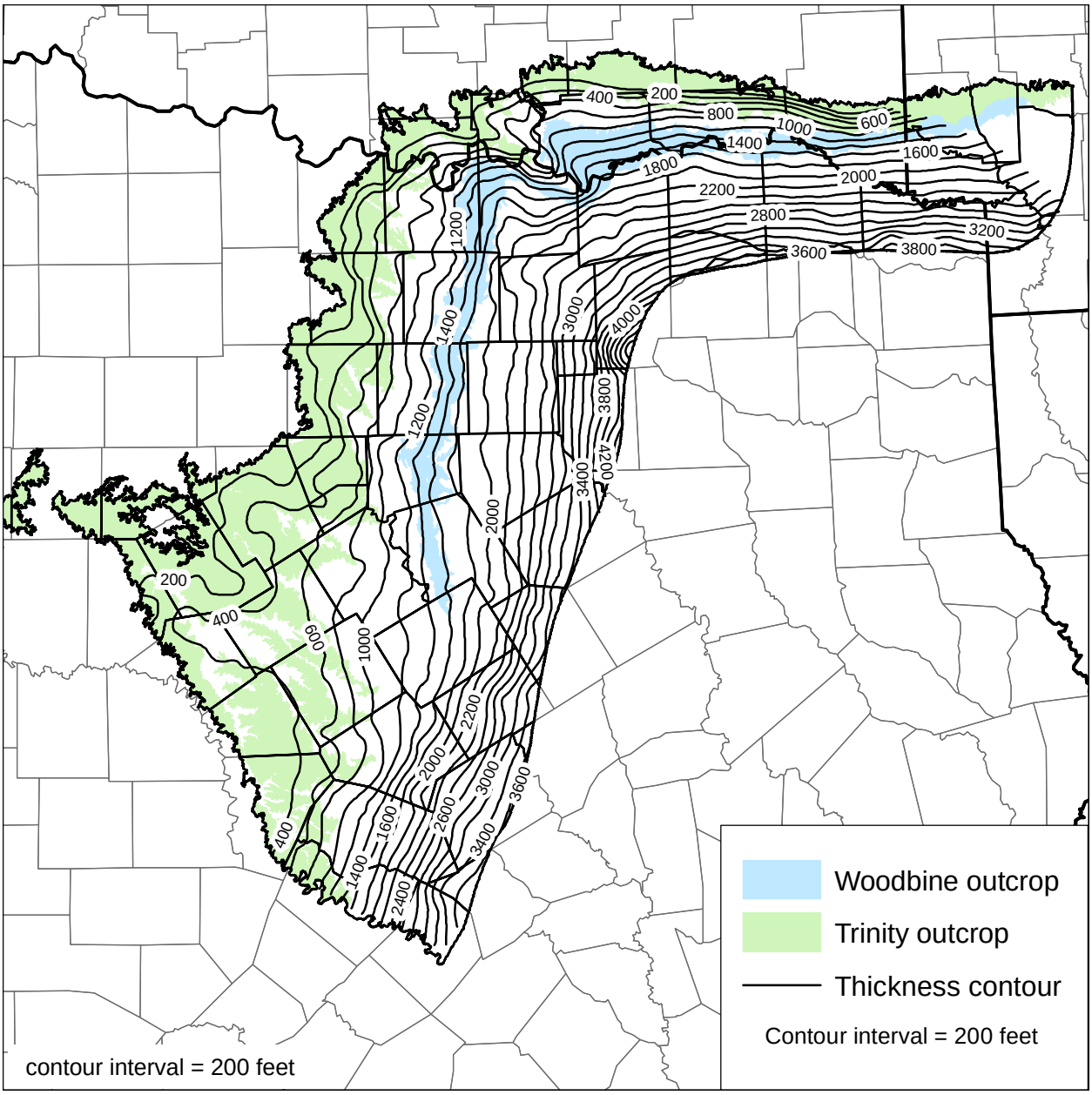


Figure 4.1.8 Isopach (thickness) map in feet from the base of the Cretaceous-age strata to the top of the Woodbine Aquifer.

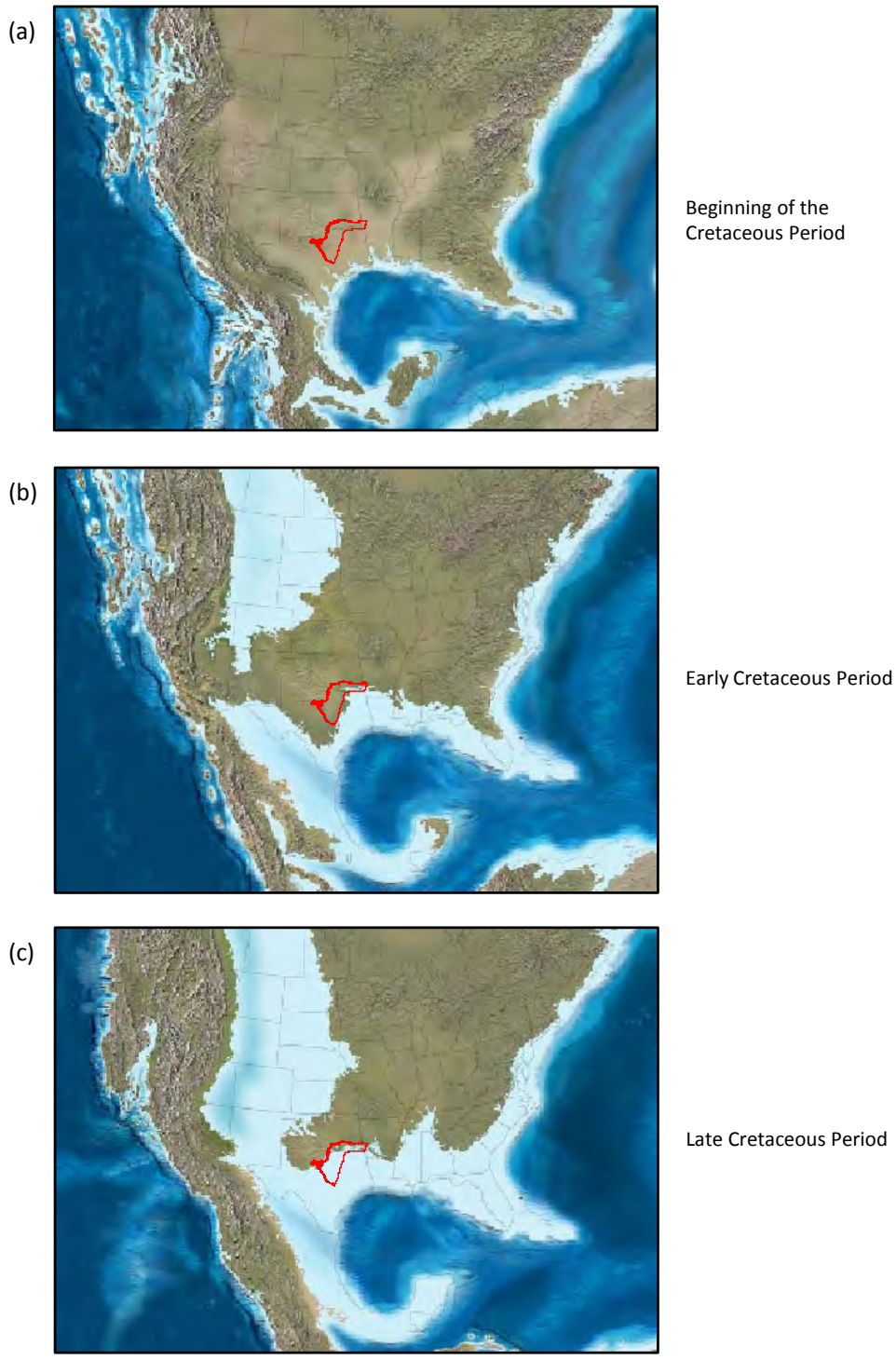


Figure 4.1.9 **Paleogeographic reconstructions showing (a) the beginning of the Cretaceous Period prior to deposition of the northern Trinity Group, (b) the early Cretaceous Period during deposition of the lower northern Trinity Group sandstones, and (c) the late Cretaceous Period during deposition of the Woodbine Group sandstones (modified from Blakey, 2011). (Brown areas represent land, light blue areas represent shallow marine water, and dark blue areas represent deep marine water.)**

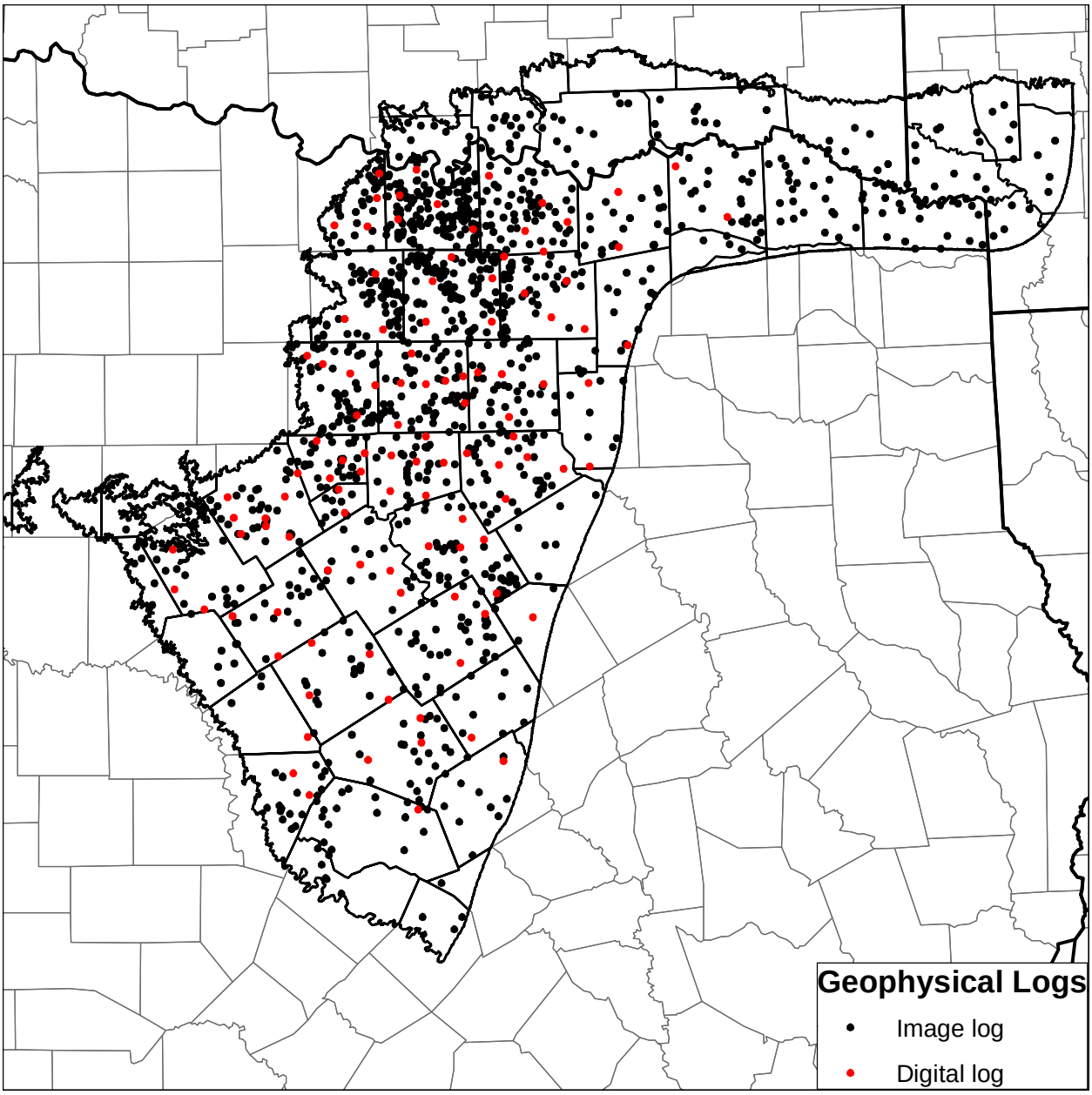
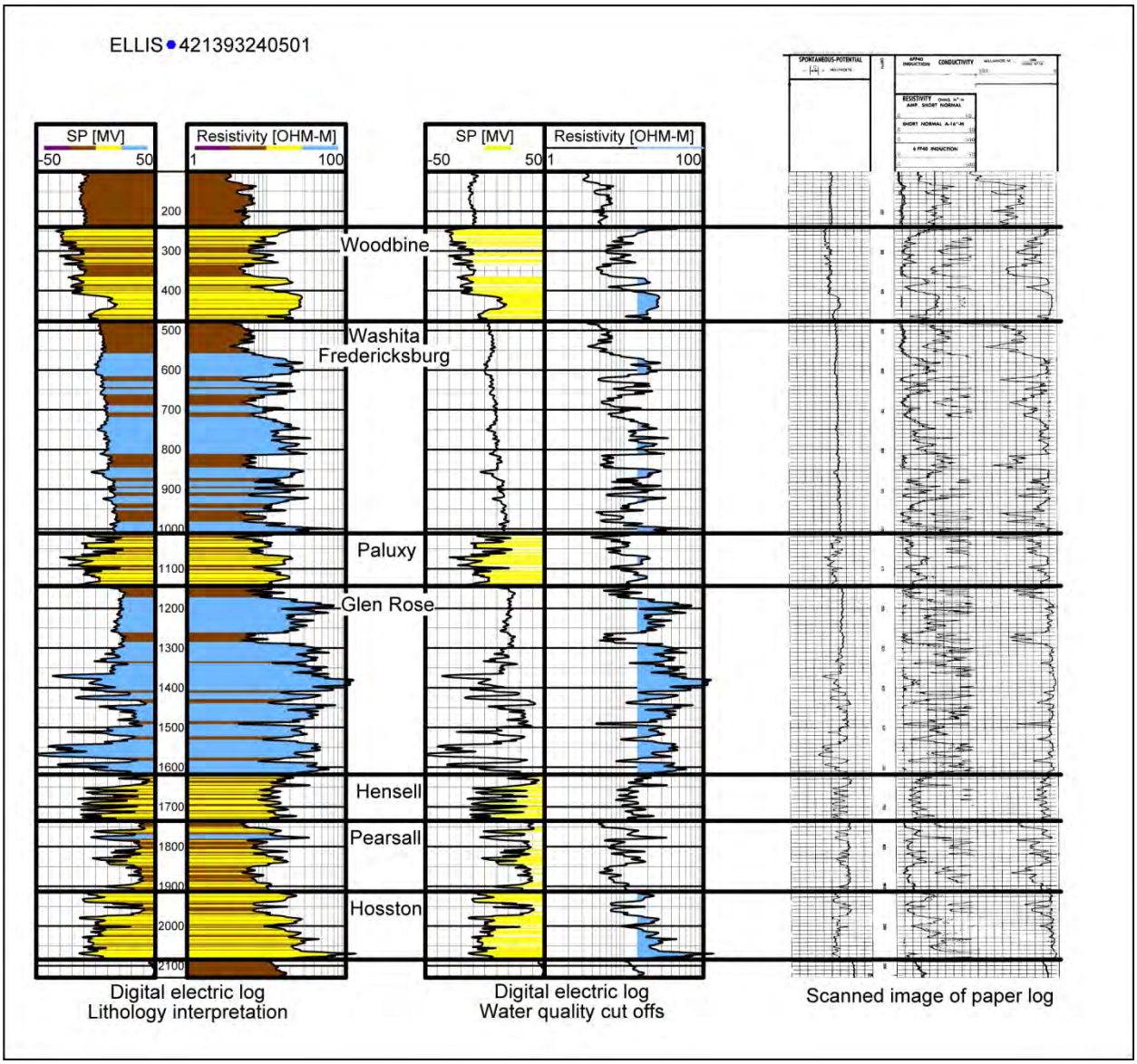


Figure 4.1.10 Location of geophysical well log data used for this study distinguishing between the 1,193 image logs and the 109 digital logs.



yellow = greater than 50 percent sandstone, blue = greater than 50 percent limestone, brown = greater than 50 percent shale

Figure 4.1.11 Example electric log from a well in Ellis County showing differences between digital logs and image (raster) logs from the same well.

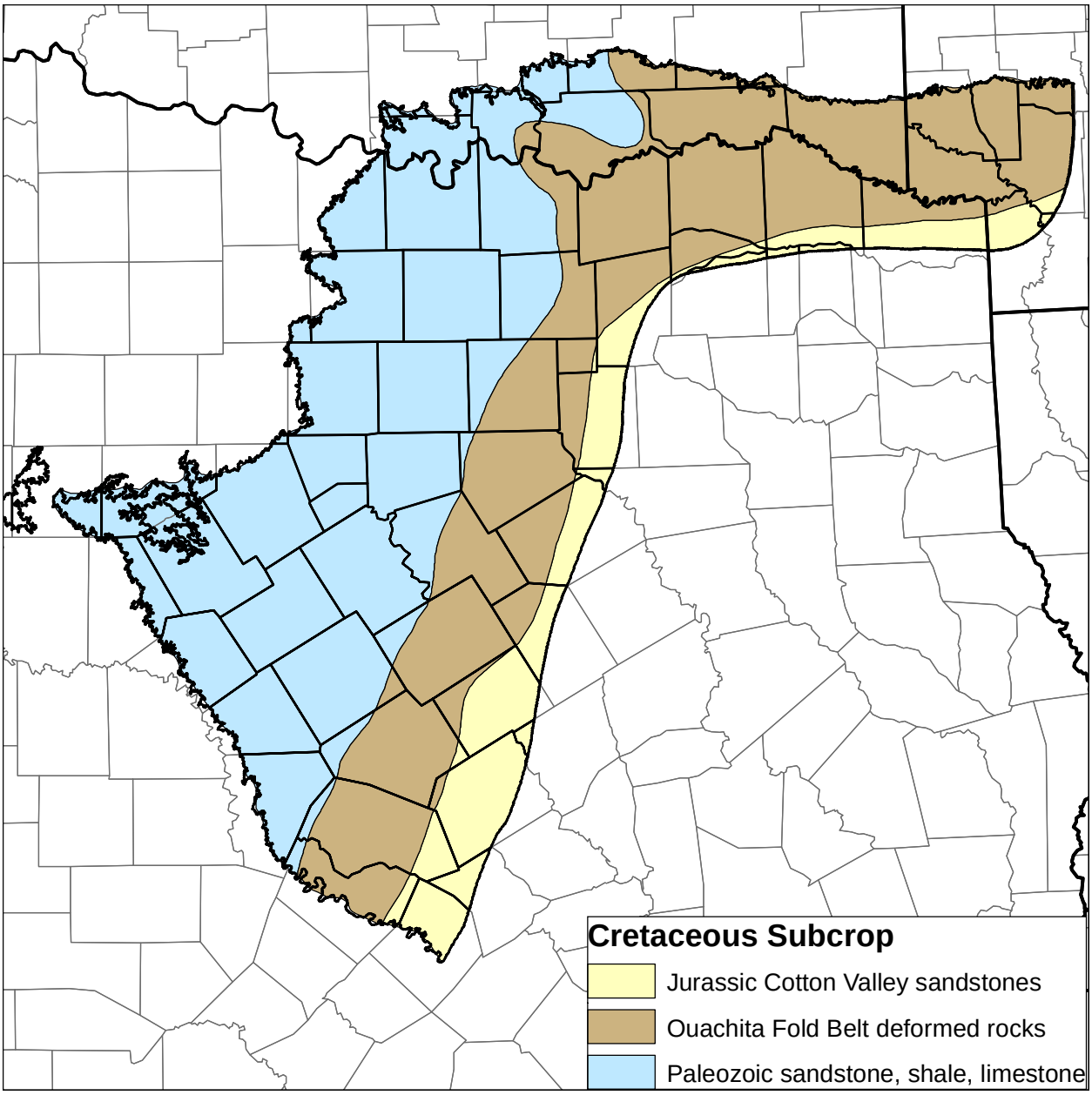


Figure 4.1.12 Geologic terrains underlying Cretaceous-age strata in the study area (modified from Ewing, 1990).

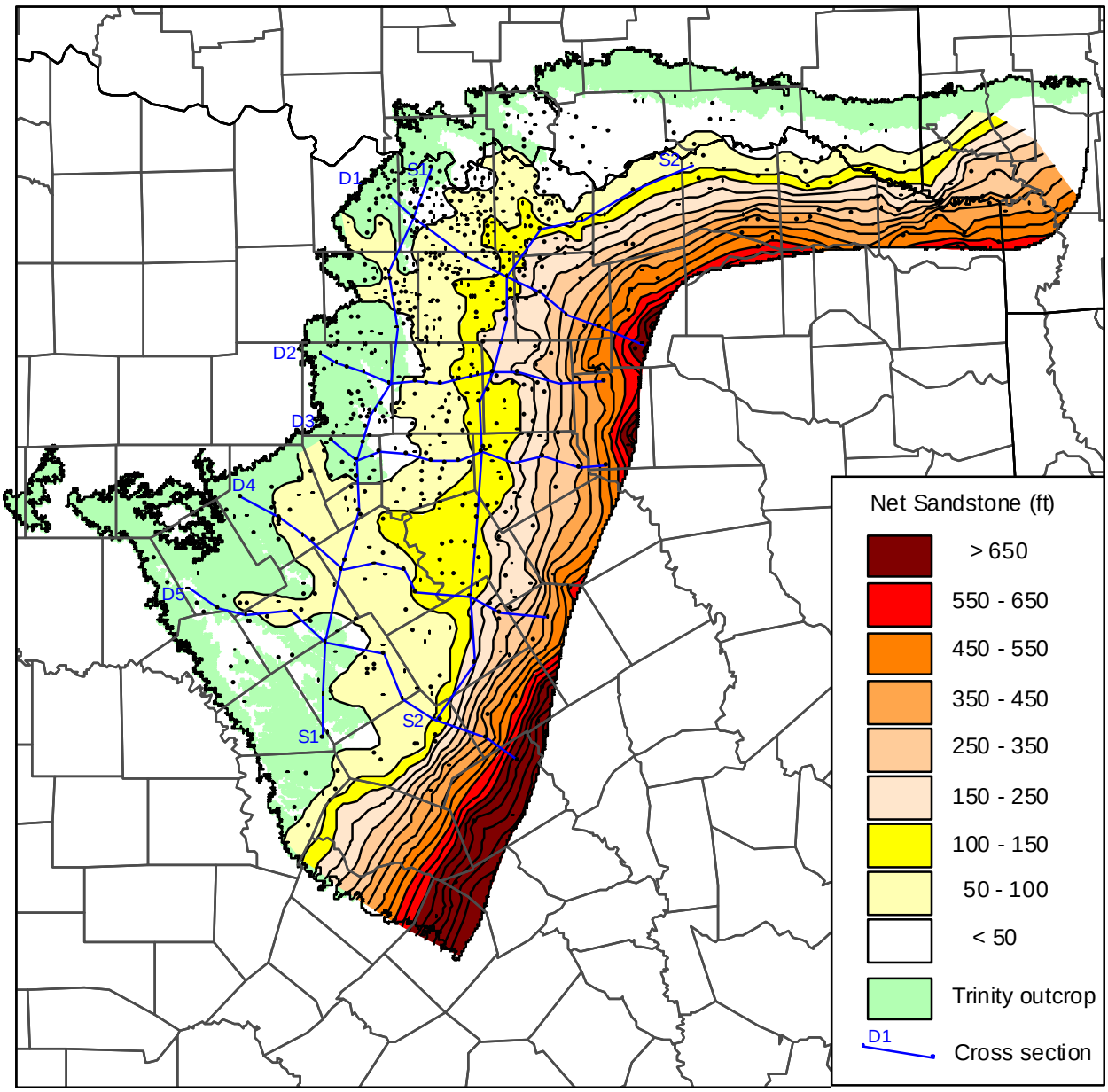


Figure 4.1.13 Net sandstone in the Hosston Aquifer in feet and location of cross sections shown in Figures 4.1.31 through 4.1.37.

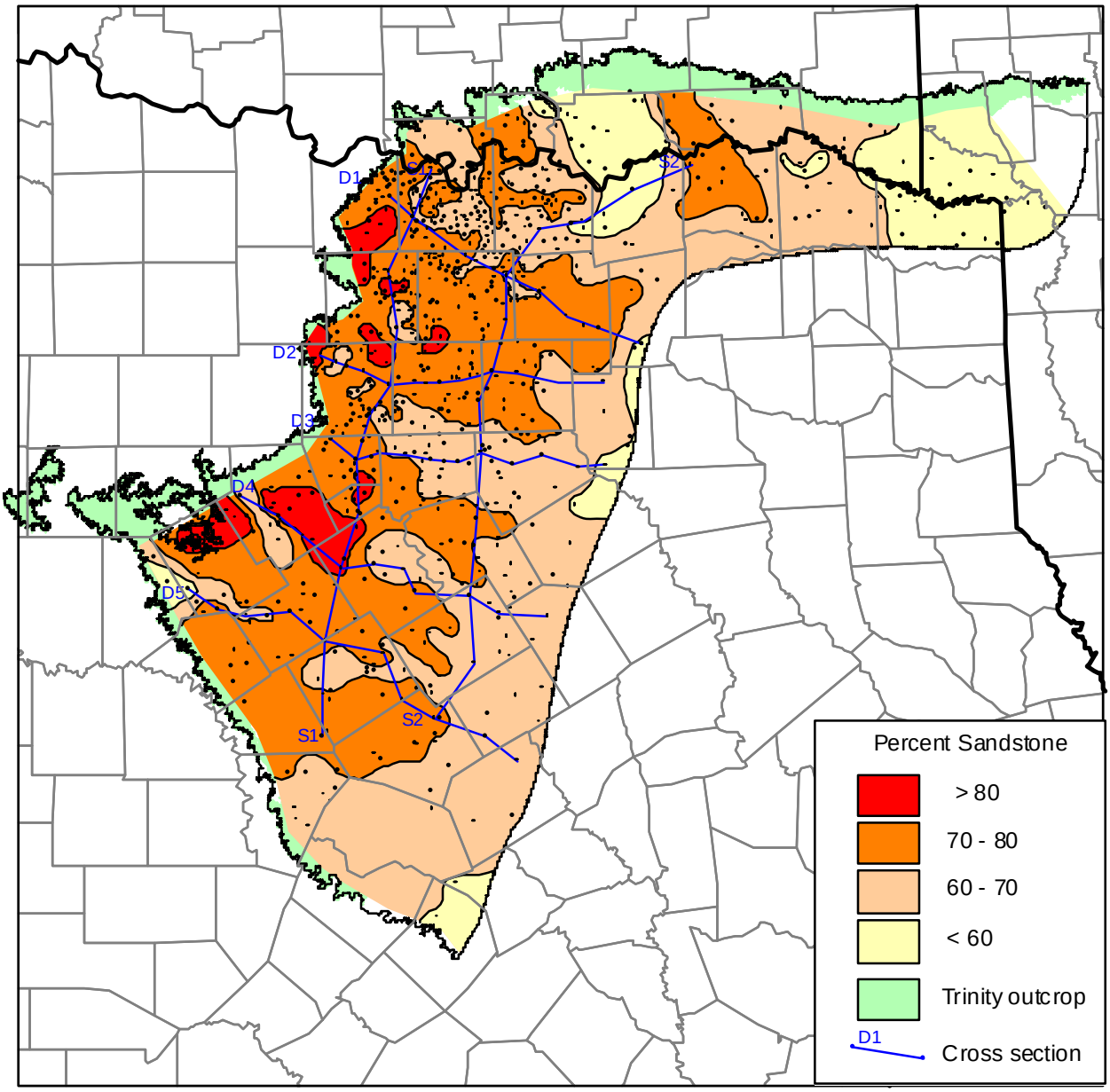


Figure 4.1.14 Percent sandstone in the Hosston Aquifer and location of cross sections shown in Figures 4.1.31 through 4.1.37.

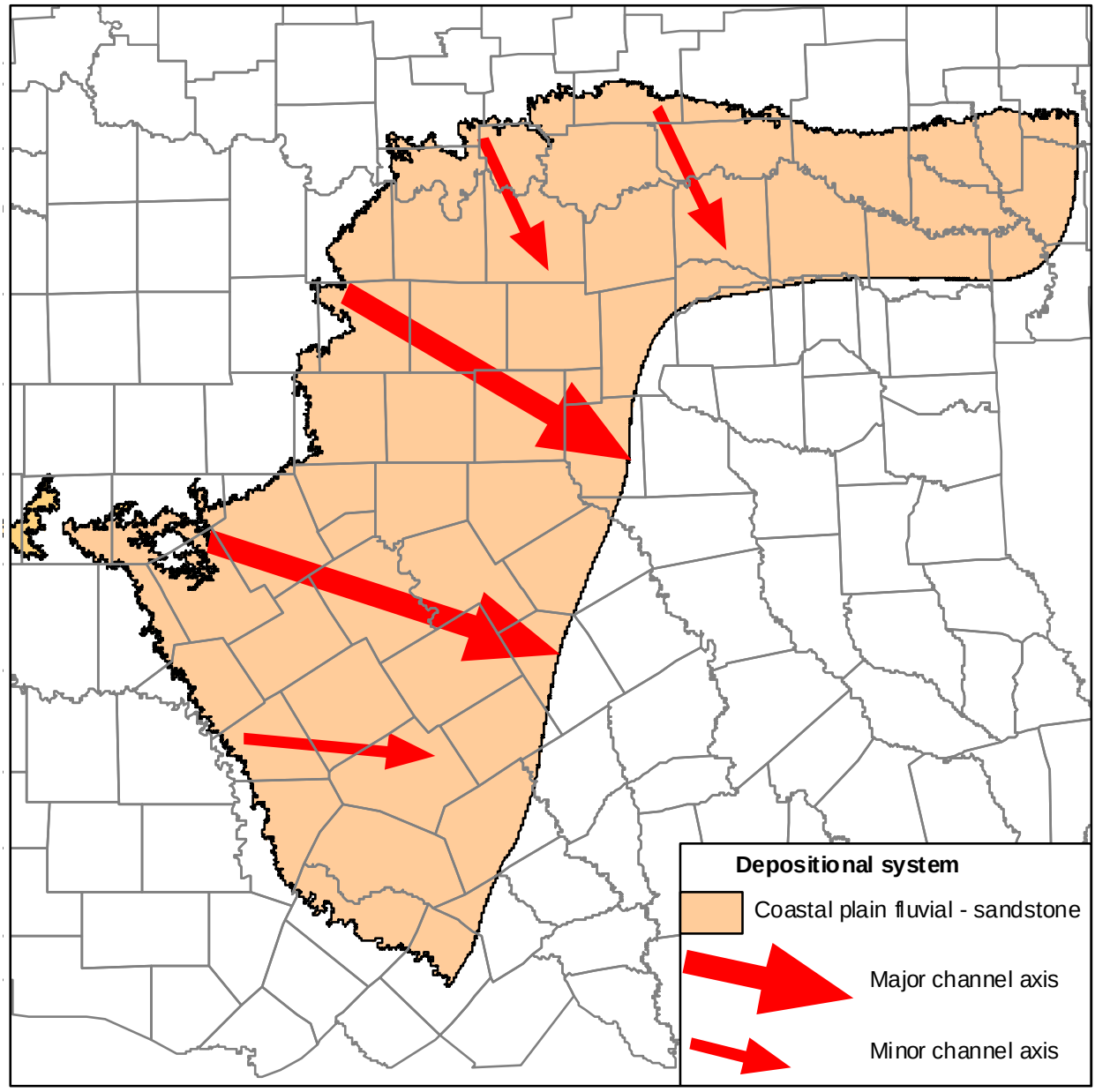


Figure 4.1.15 Depositional systems of the Hosston Aquifer showing locations where larger rivers persisted.

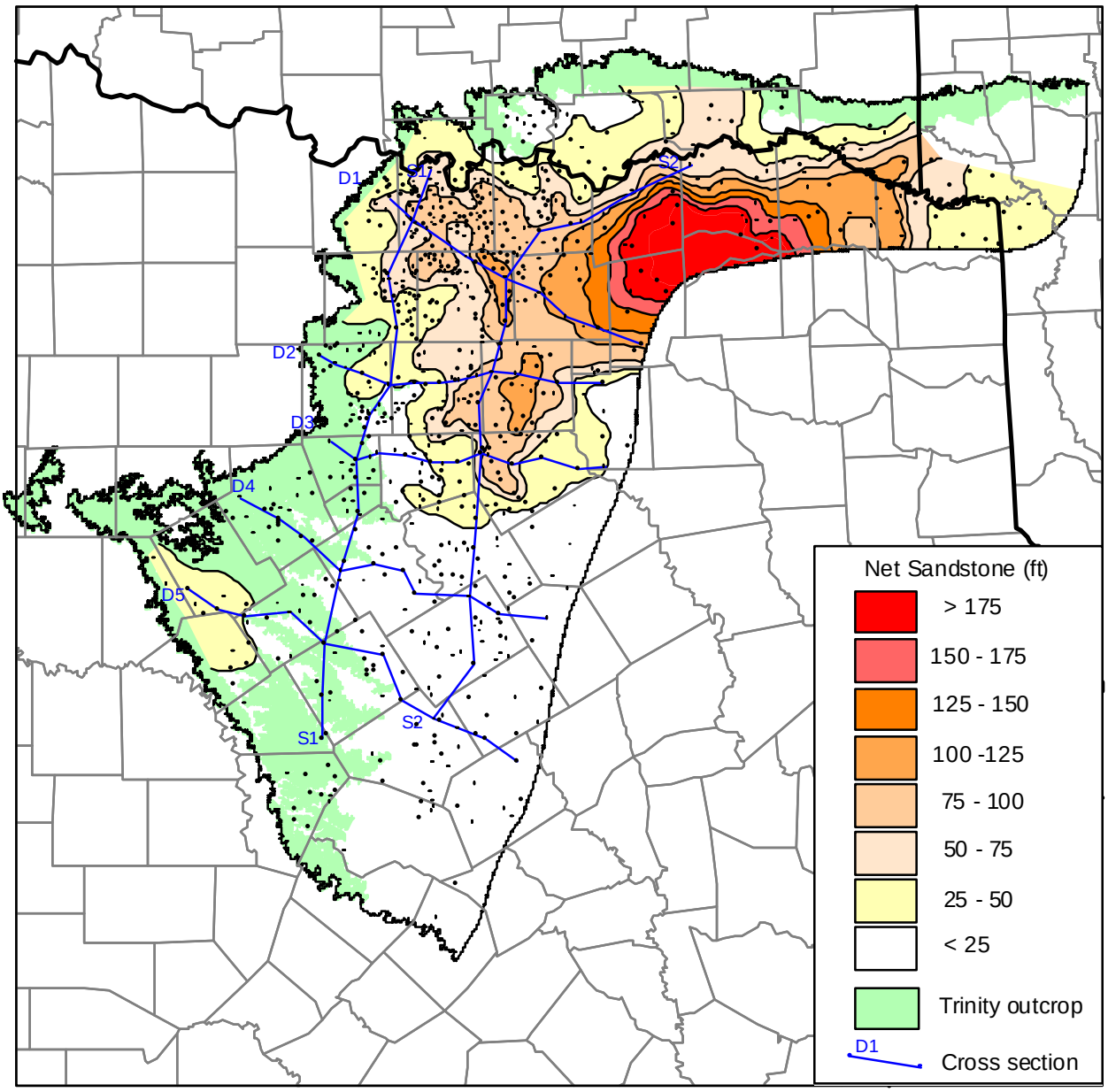


Figure 4.1.16 Net sandstone in the Pearsall Formation in feet and locations of cross sections shown in Figures 4.1.31 through 4.1.37.

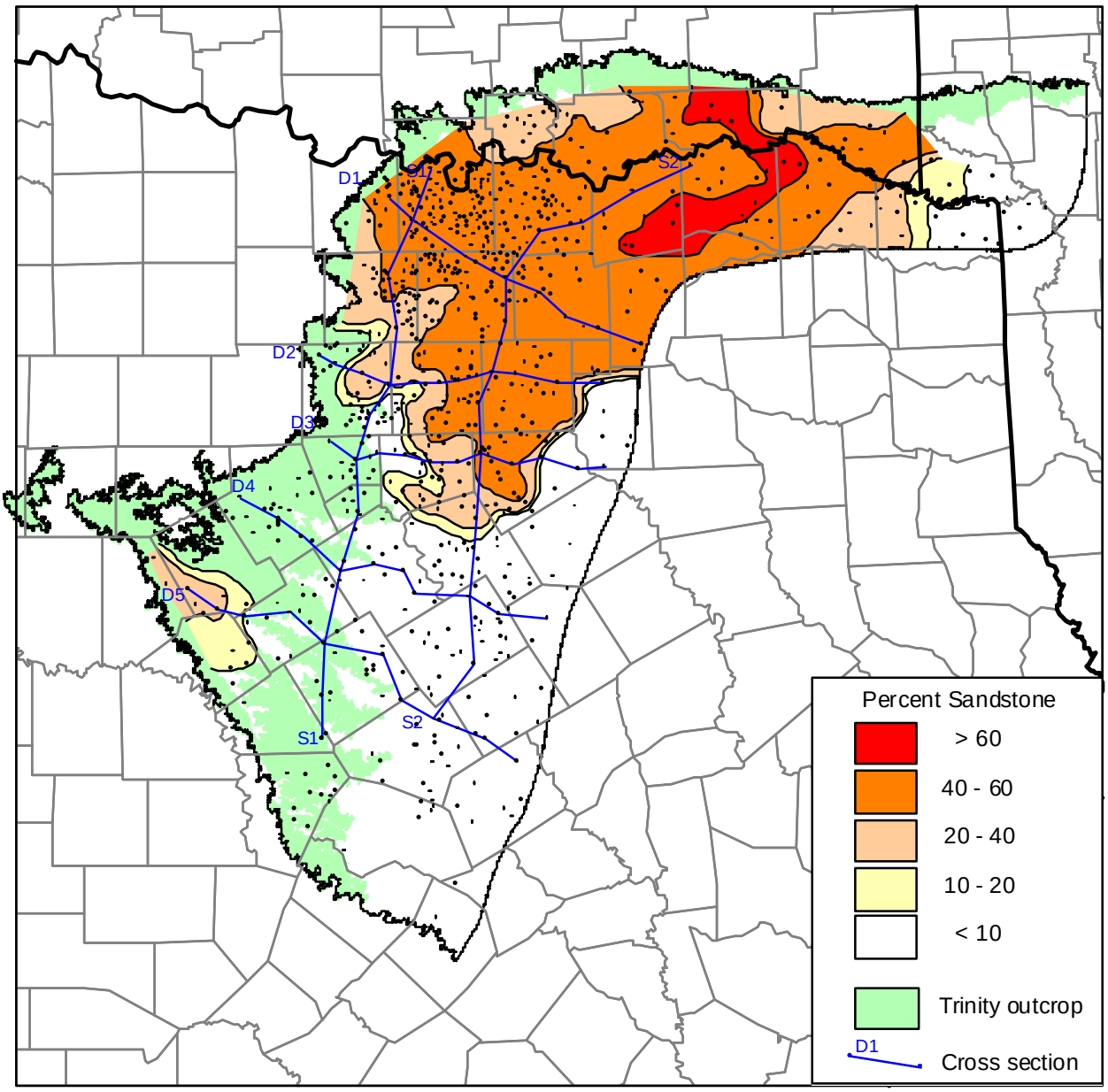


Figure 4.1.17 Percent sandstone in the Pearsall Formation and locations of cross sections shown in Figures 4.1.31 through 4.1.37.

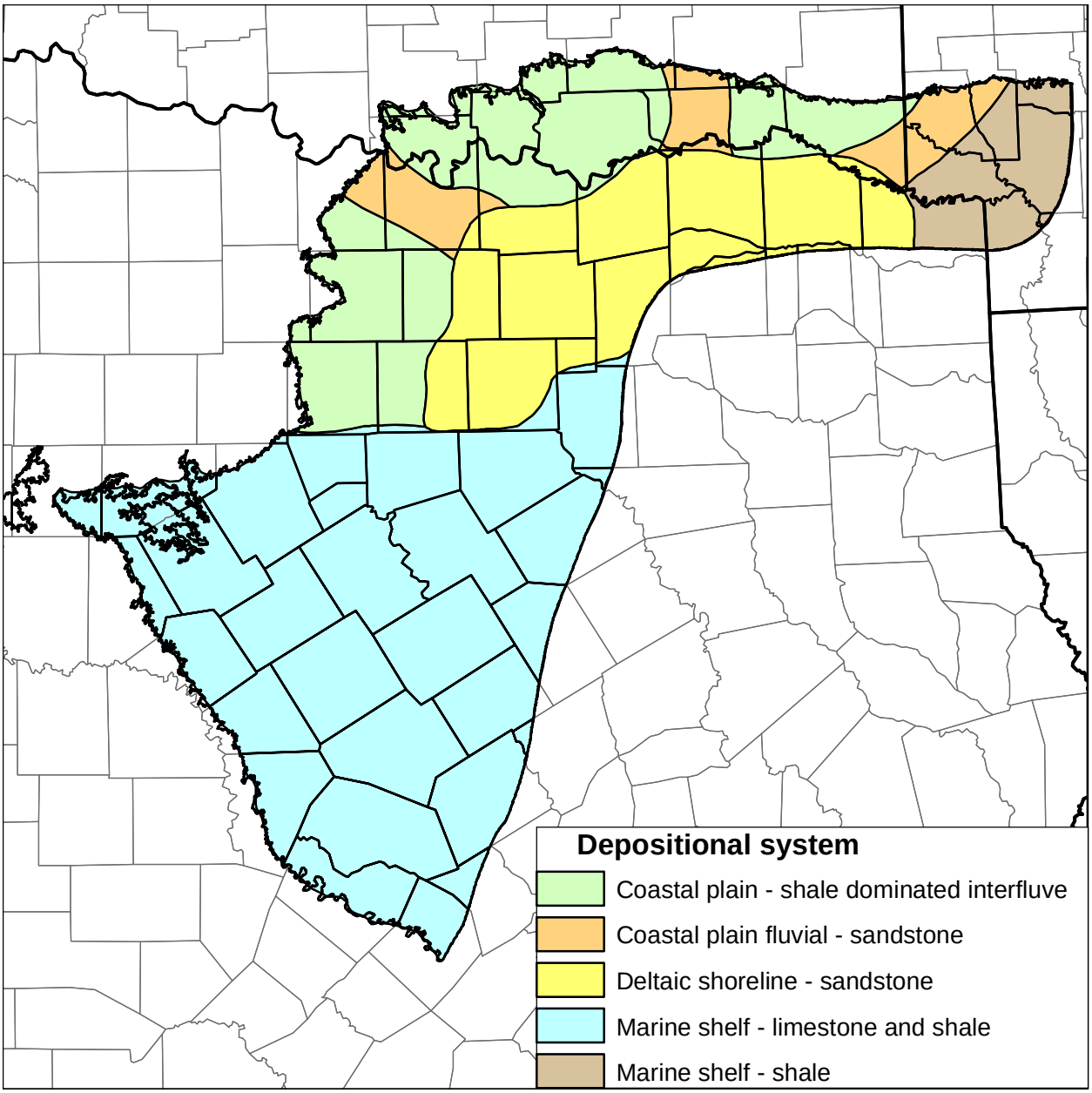


Figure 4.1.18 Depositional systems of the Pearsall Formation.

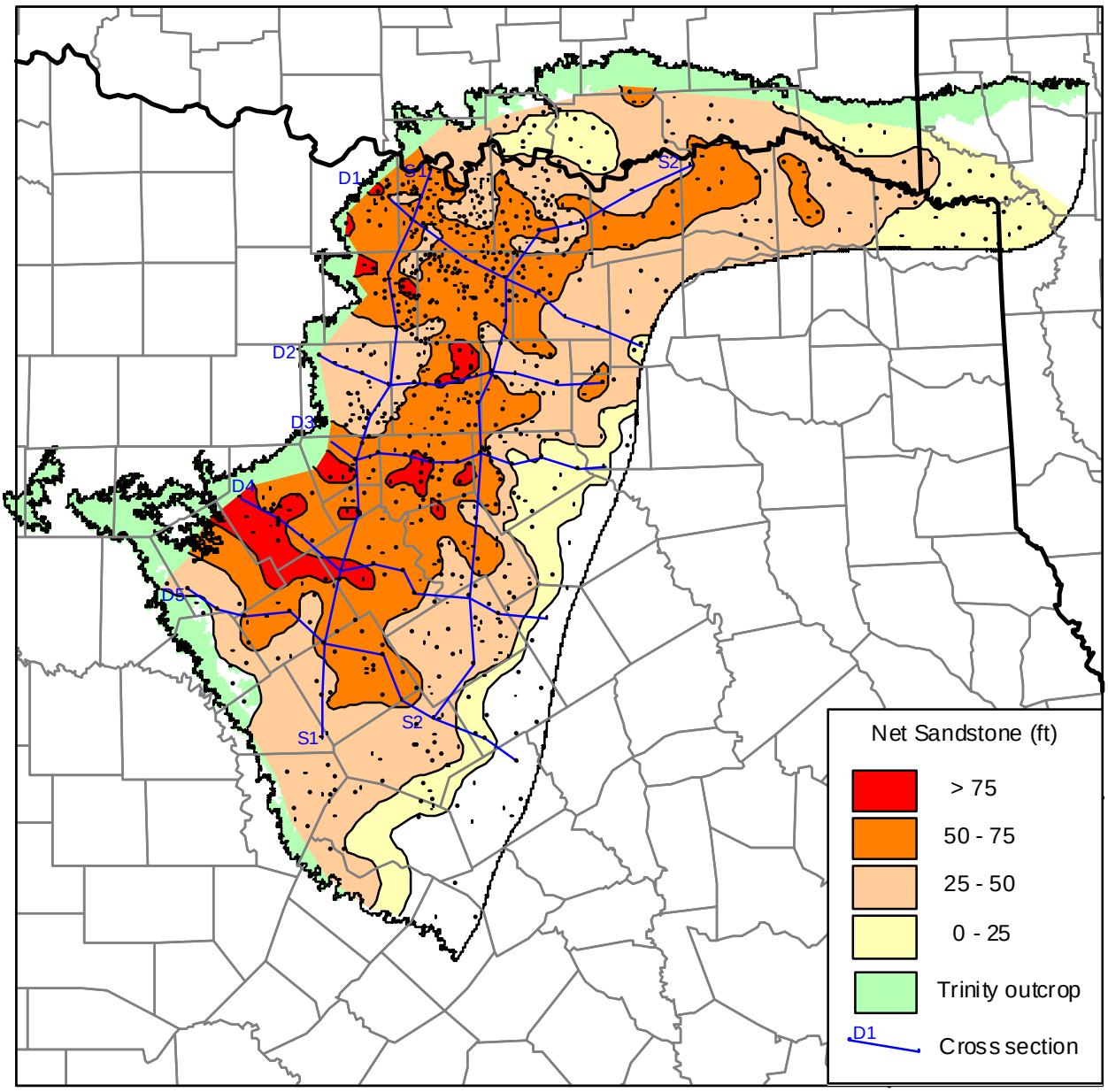


Figure 4.1.19 Net sandstone in the Hensell Aquifer in feet and locations of cross sections shown in Figures 4.1.31 through 4.1.37.

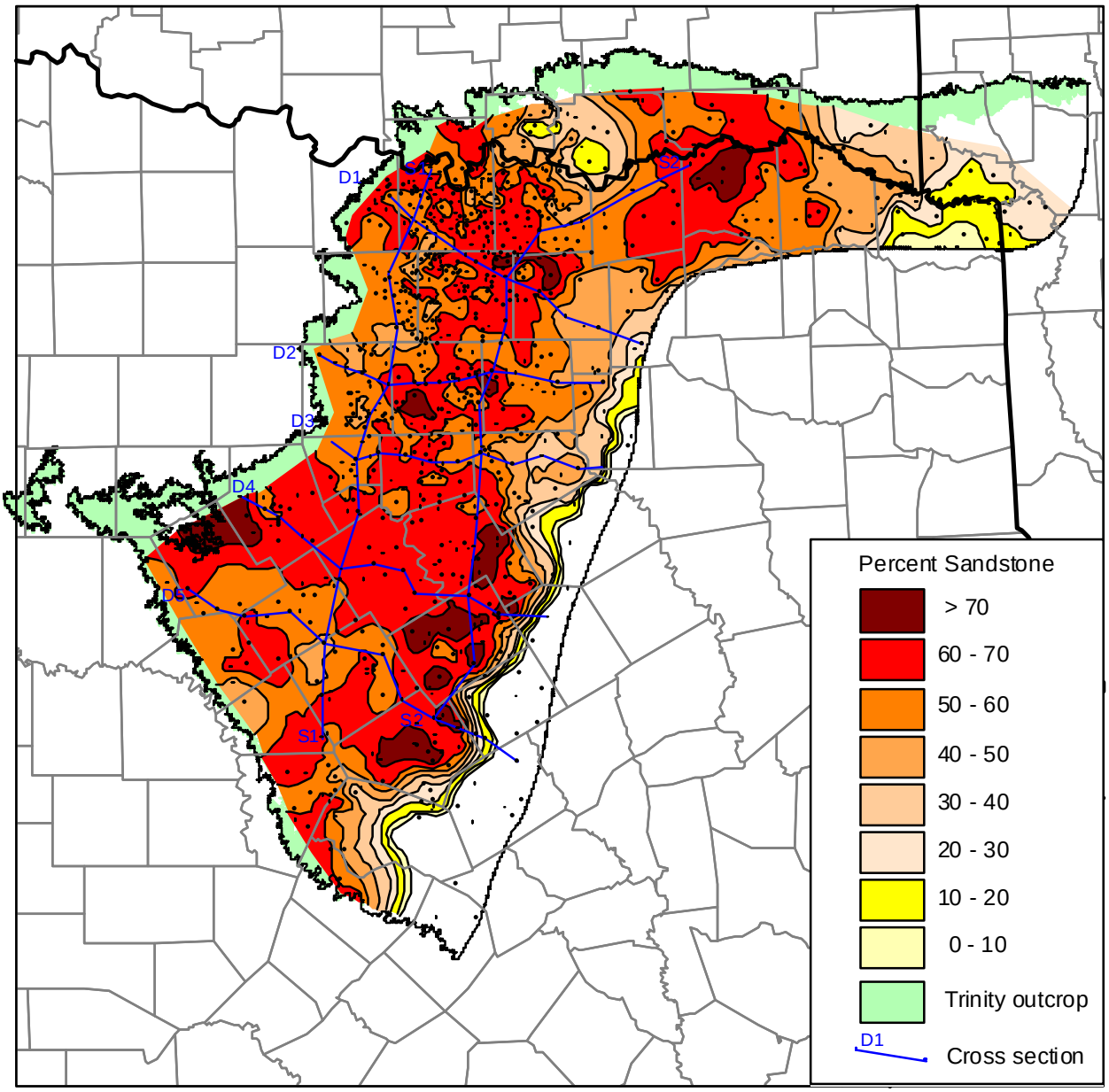


Figure 4.1.20 Percent sandstone in the Hensell Aquifer and locations of cross sections shown in Figures 4.1.31 through 4.1.37.

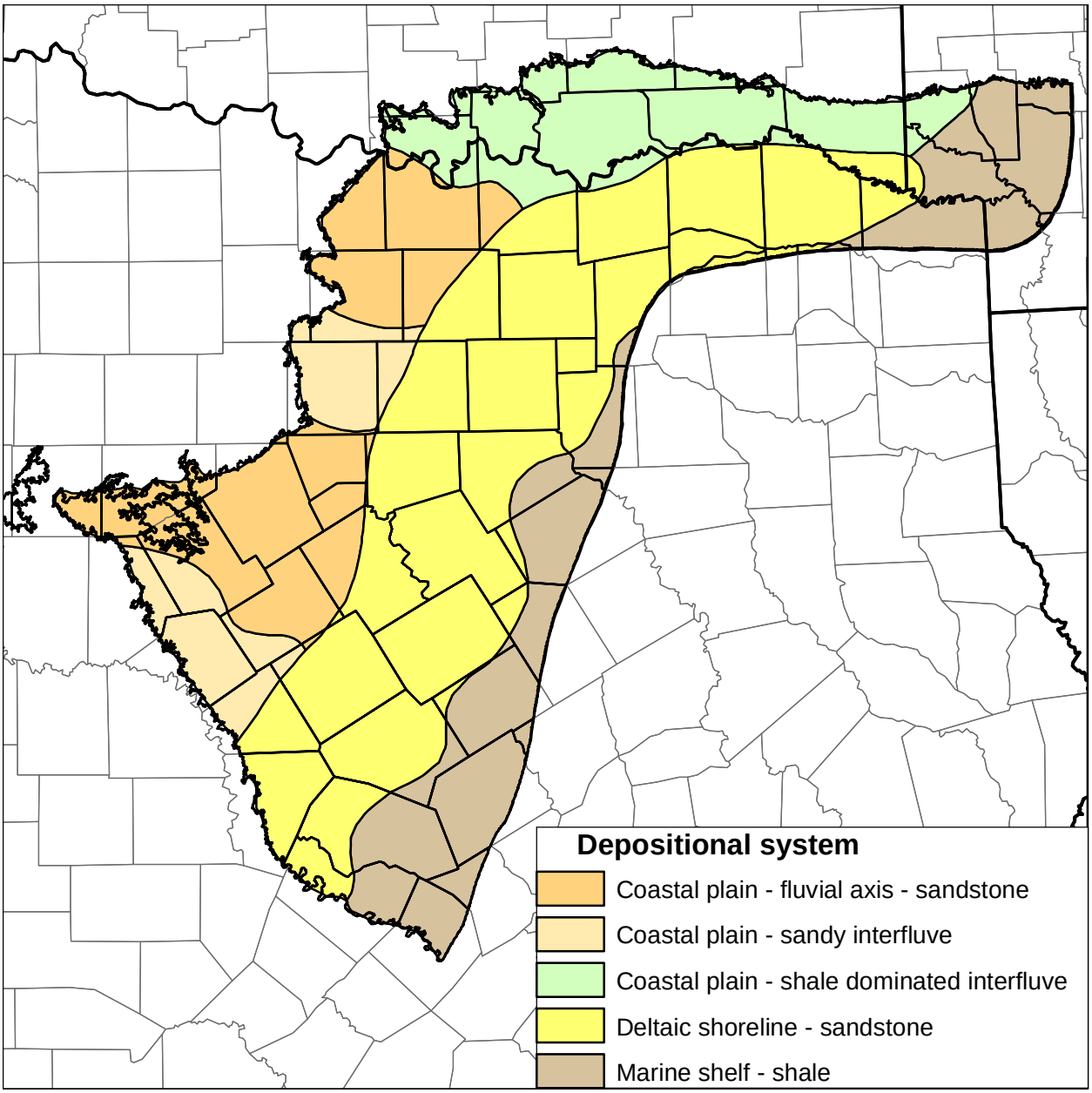


Figure 4.1.21 Depositional systems of the Hensell Aquifer.

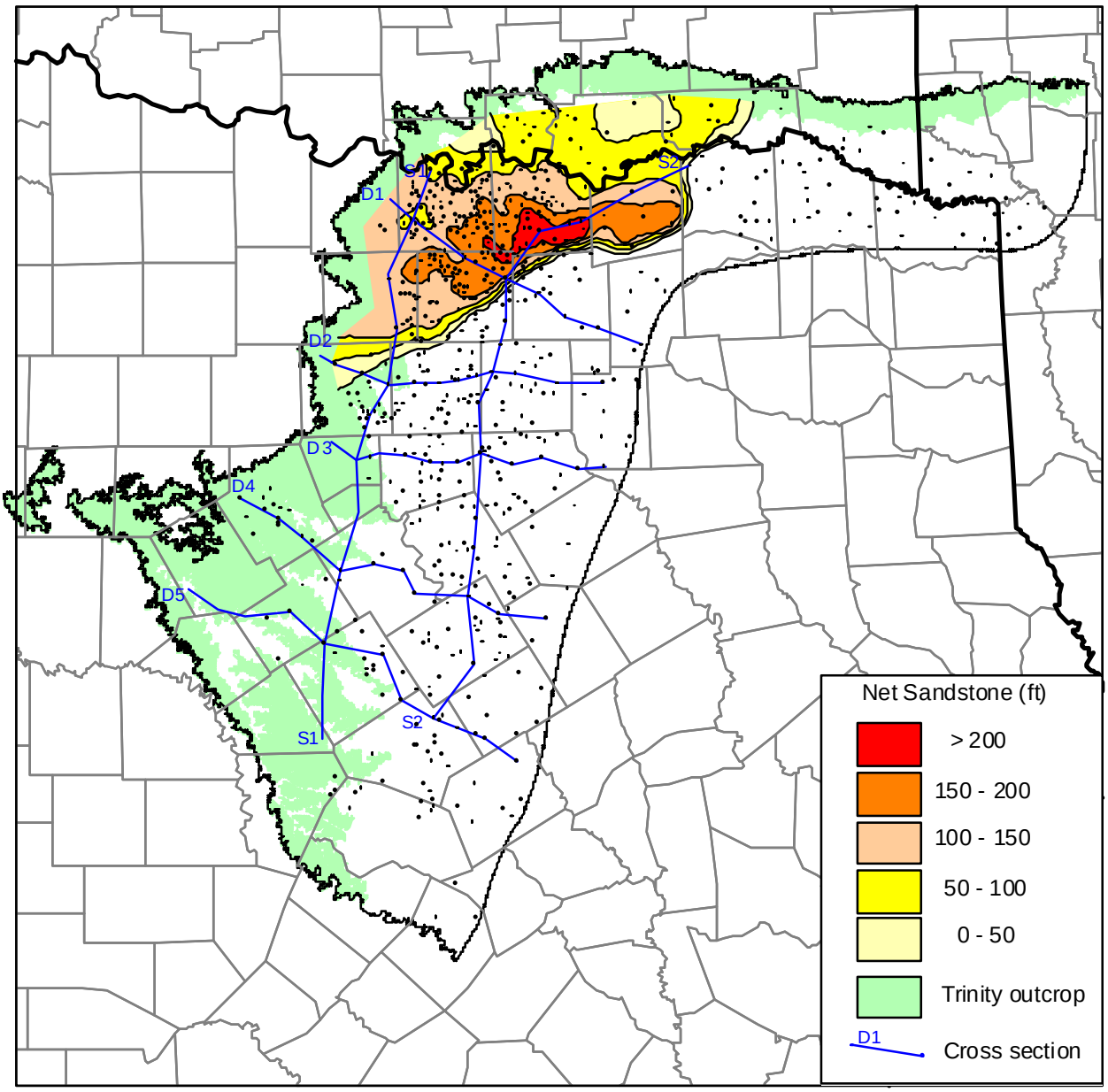


Figure 4.1.22 Net sandstone in the Glen Rose Formation and locations of cross sections shown in Figures 4.1.31 through 4.1.37.

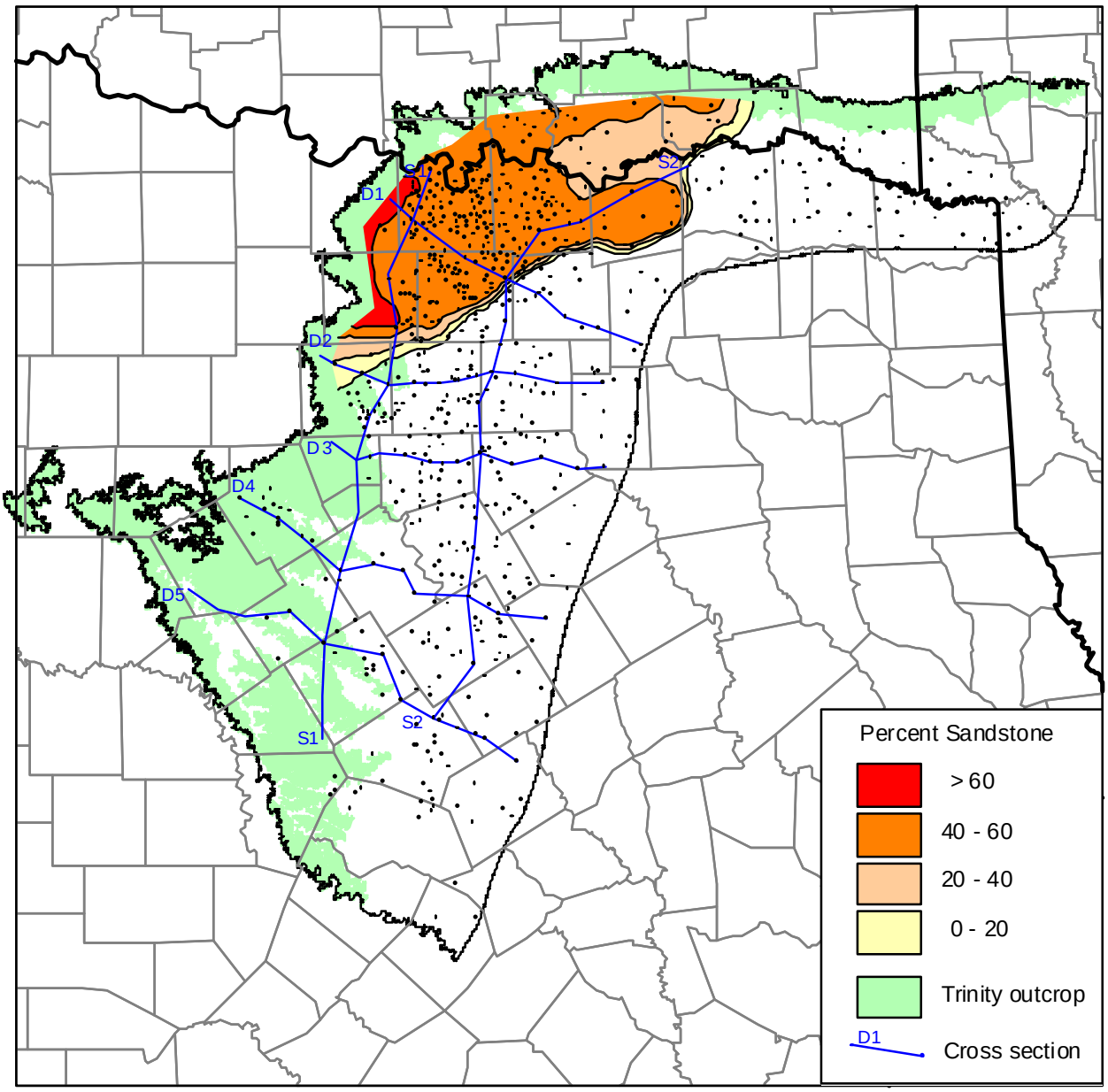


Figure 4.1.23 Percent sandstone in the Glen Rose Formation and locations of cross sections shown in Figure 4.1.31 through 4.1.37.

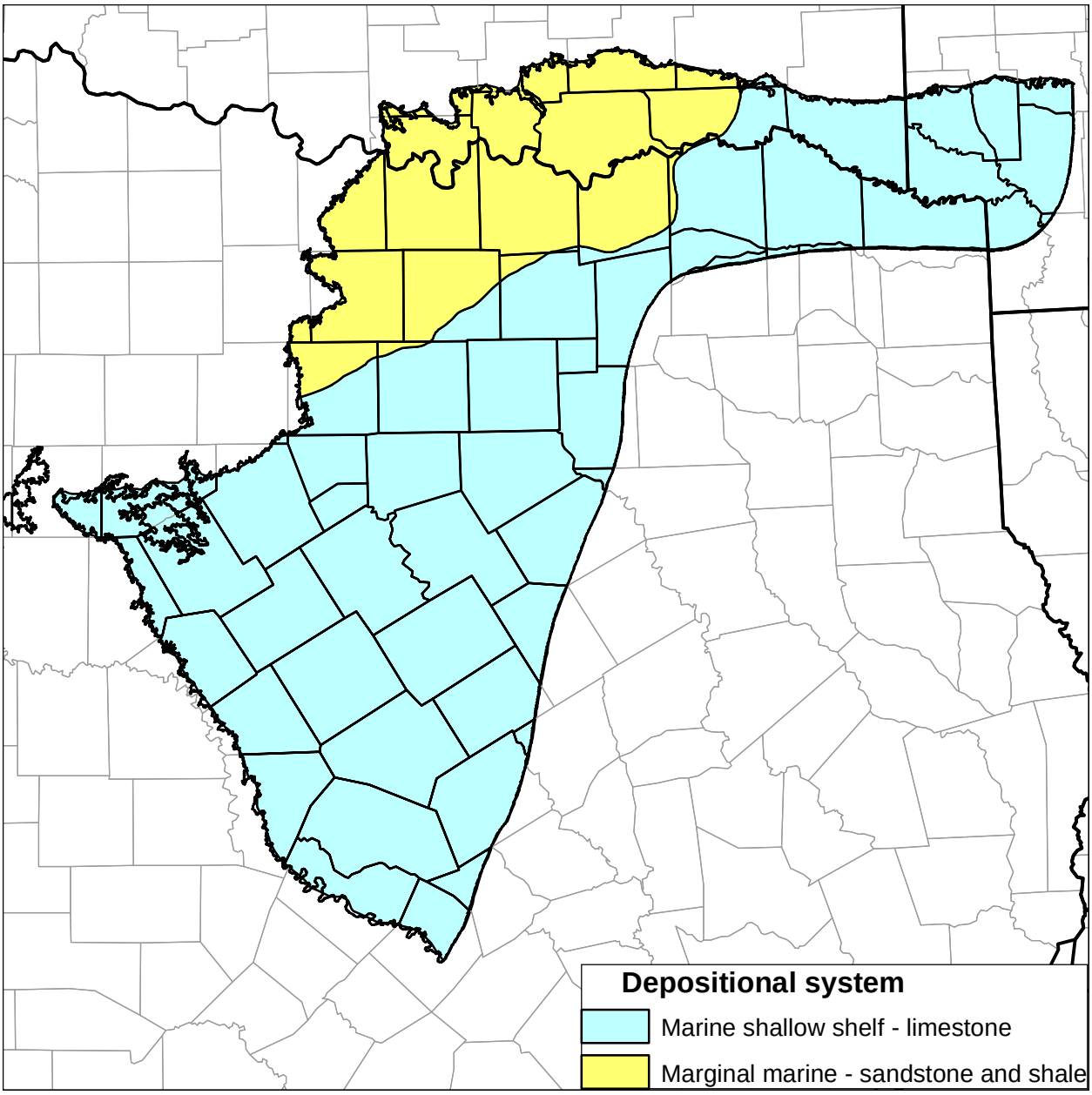


Figure 4.1.24 Depositional systems of the Glen Rose Formation.

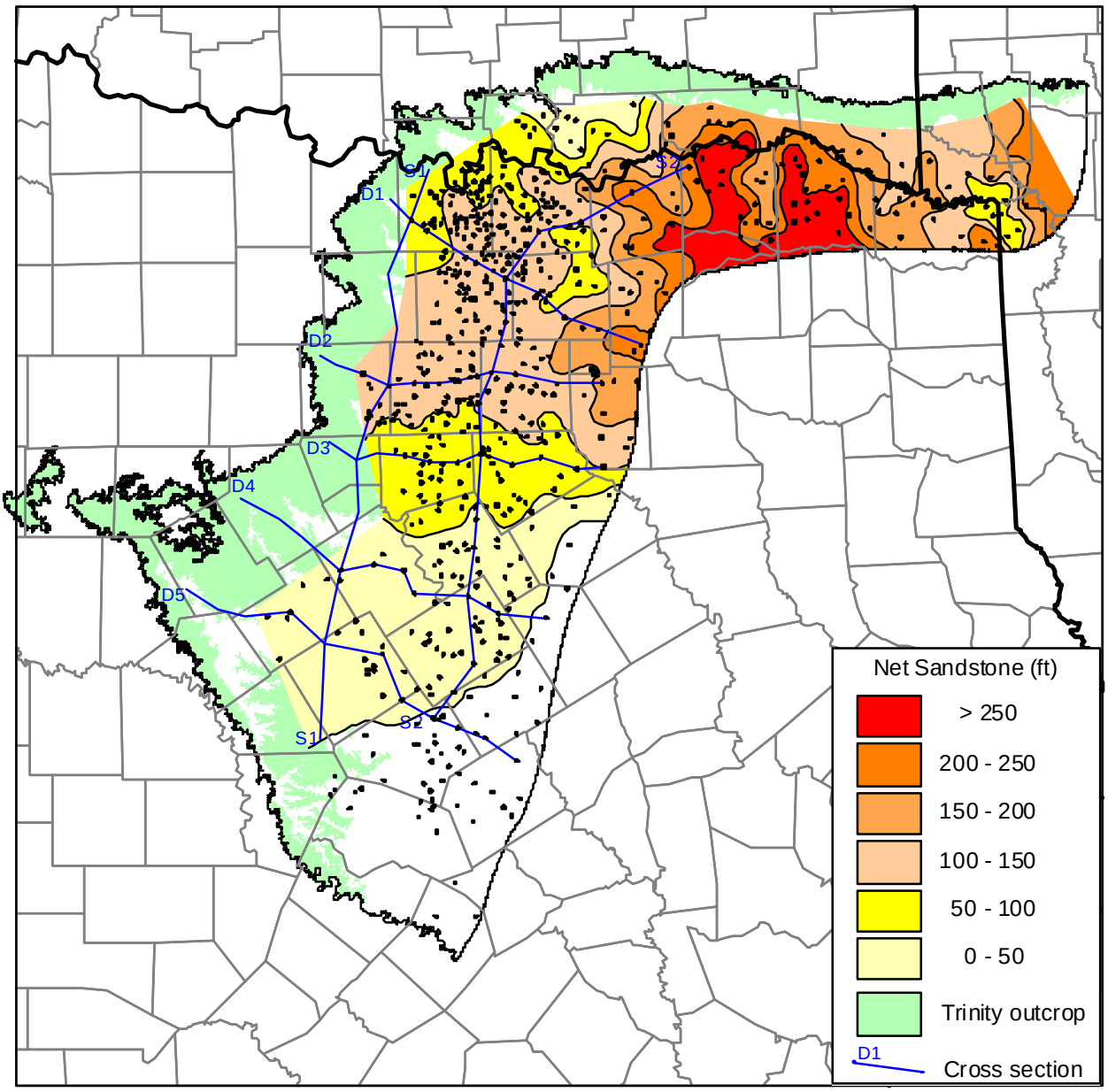


Figure 4.1.25 Net sandstone in the Paluxy Aquifer in feet and locations of cross sections shown in Figures 4.1.31 through 4.1.37.

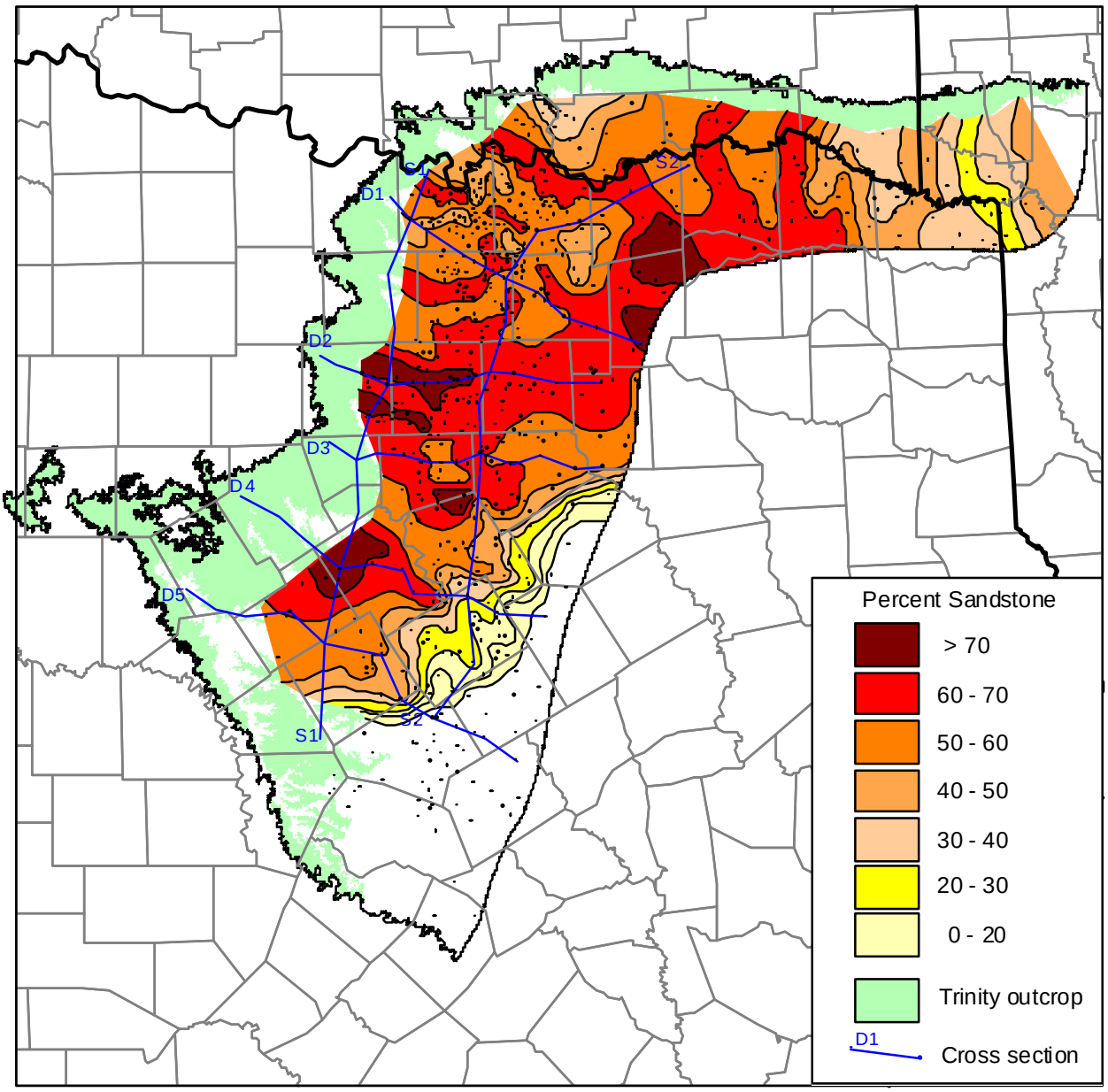


Figure 4.1.26 Percent sandstone in the Paluxy Aquifer and locations of cross sections shown in Figures 4.1.31 through 4.1.37.

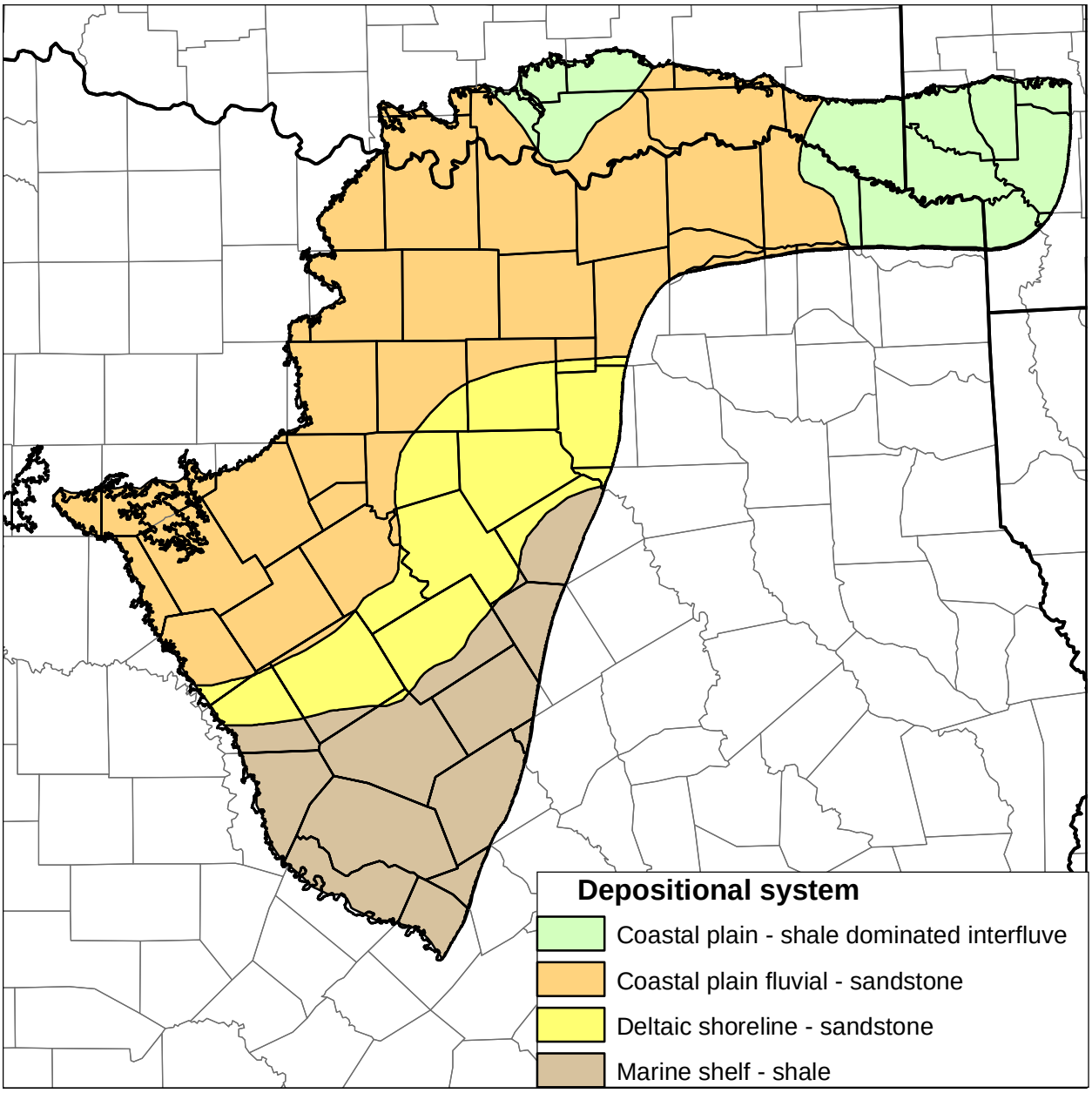


Figure 4.1.27 Depositional systems of the Paluxy Aquifer.

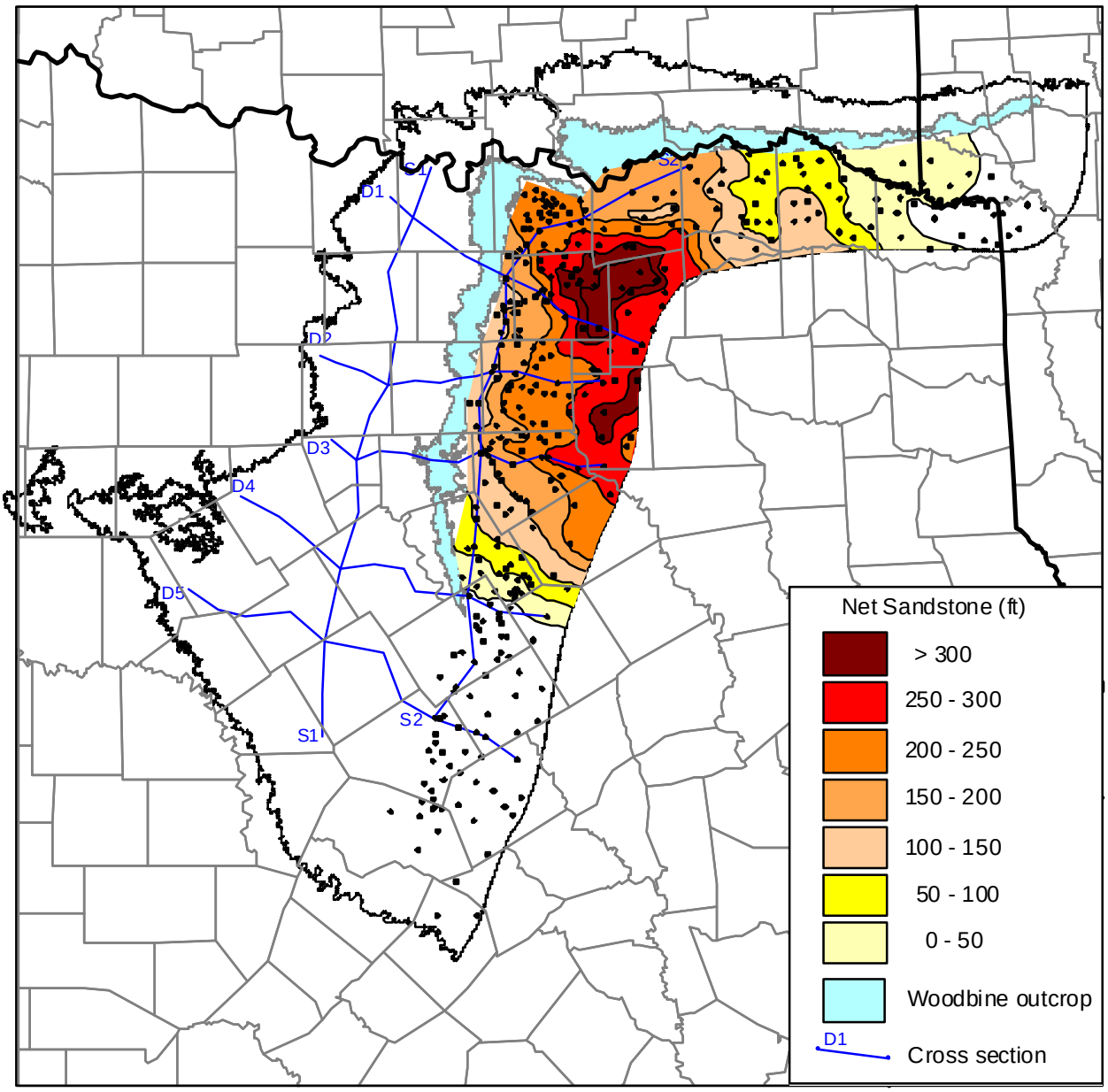


Figure 4.1.28 Net sandstone in the Woodbine Aquifer in feet and locations of cross sections shown in Figures 4.1.31 through 4.1.37.

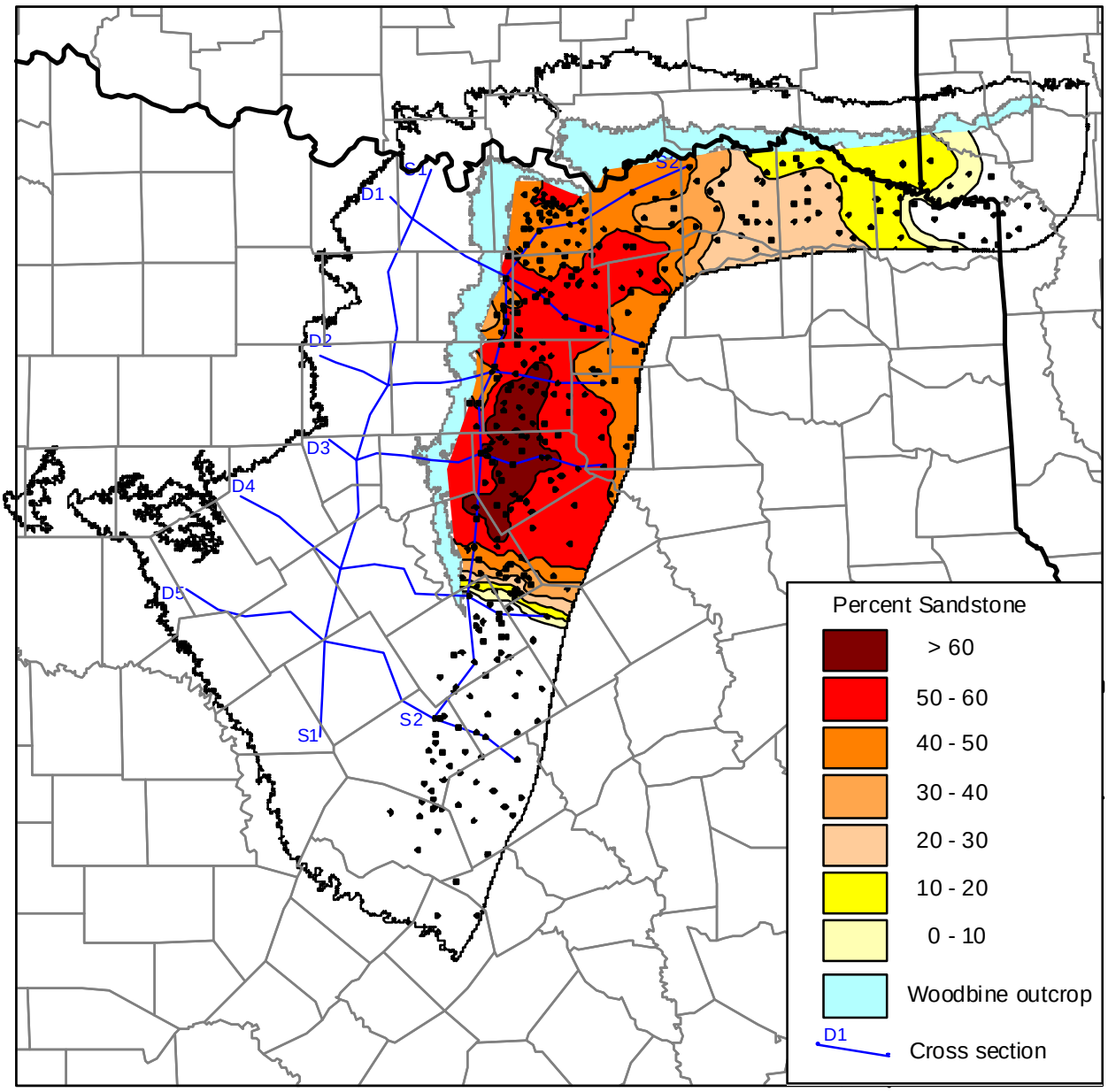


Figure 4.1.29 Percent sandstone in the Woodbine Aquifer and locations of cross sections shown in Figures 4.1.31 through 4.1.37.

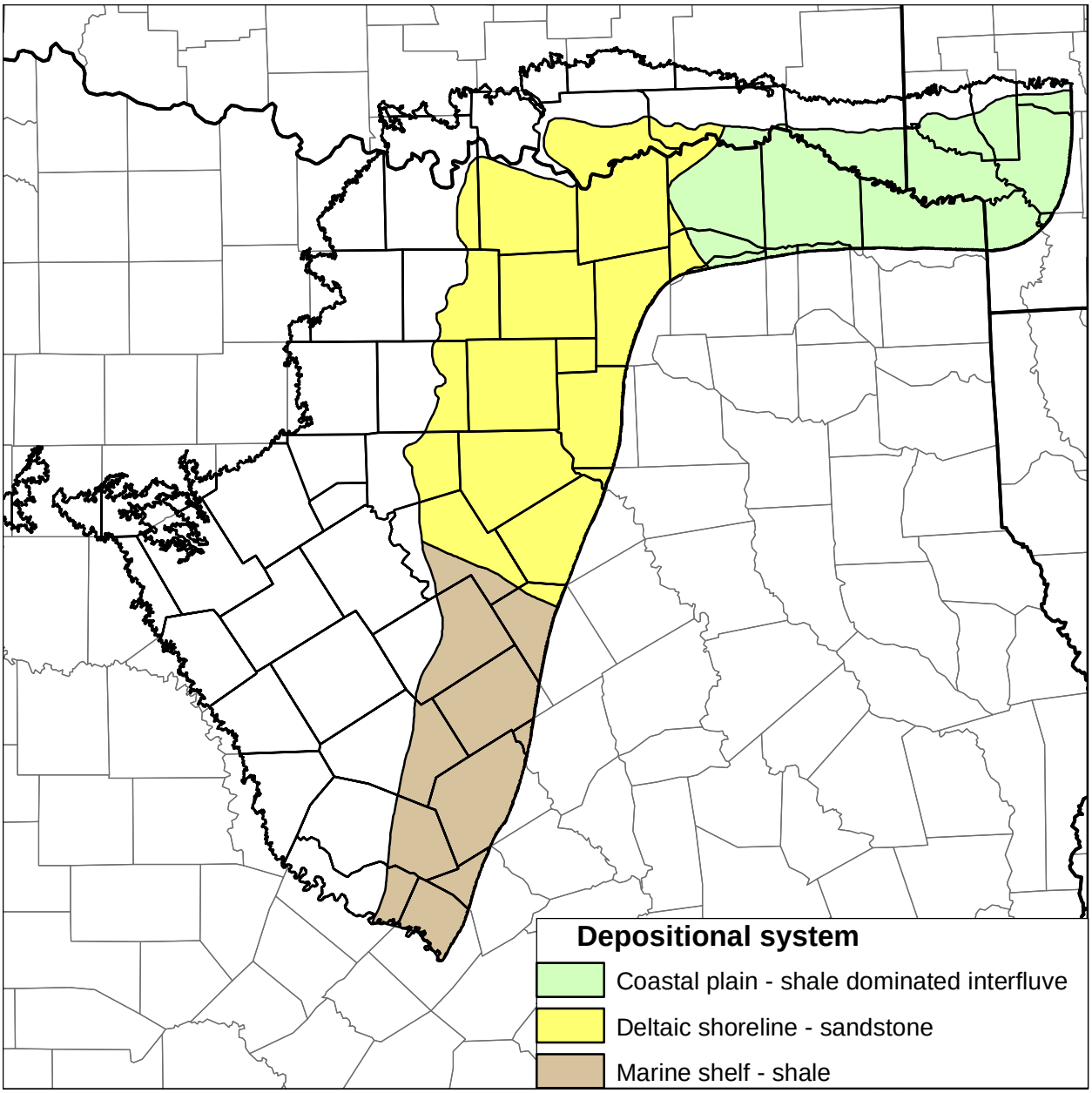


Figure 4.1.30 Depositional systems of the Woodbine Aquifer.

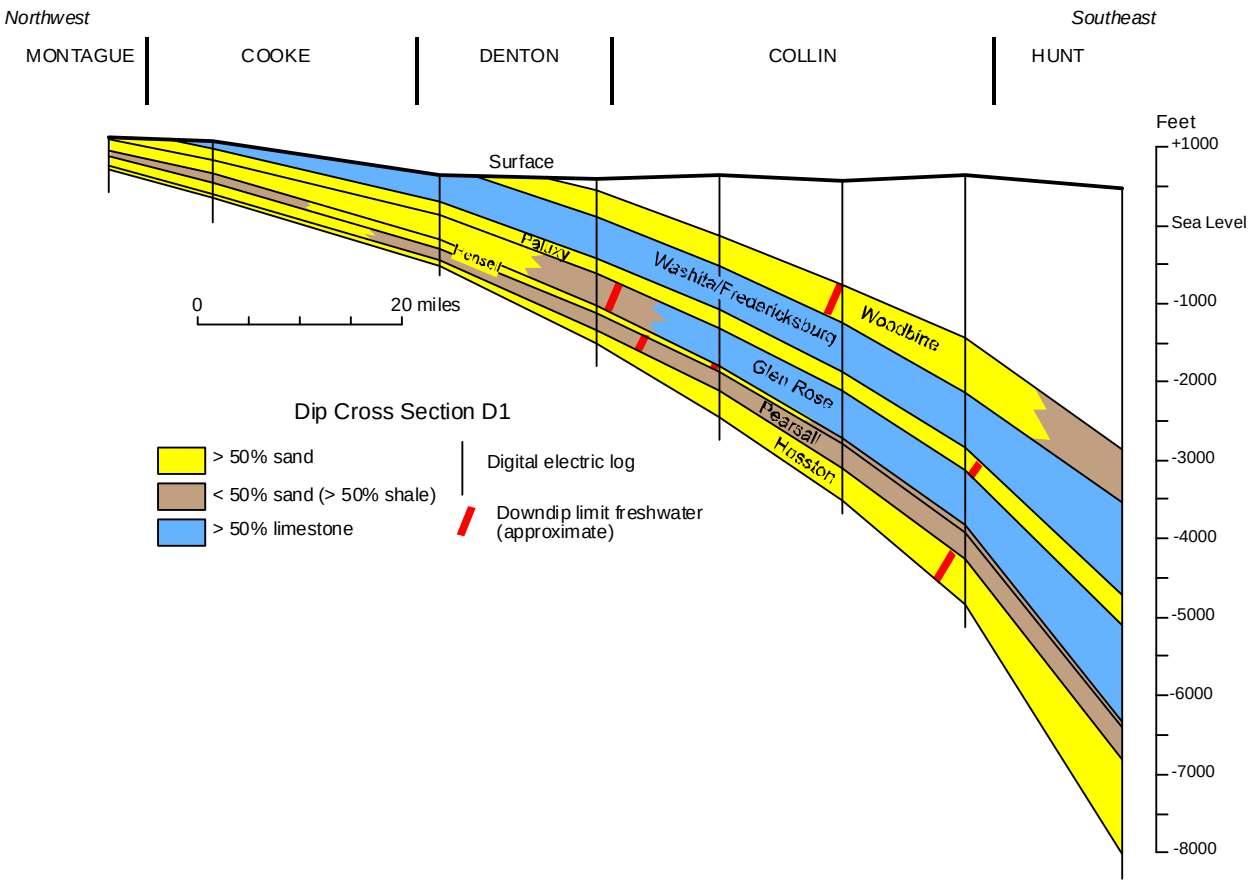


Figure 4.1.31 Dip-oriented cross section D1 showing stratigraphic boundaries, dominant lithologies, depths in feet, and downdip limits of freshwater in sandstone and shale layers.

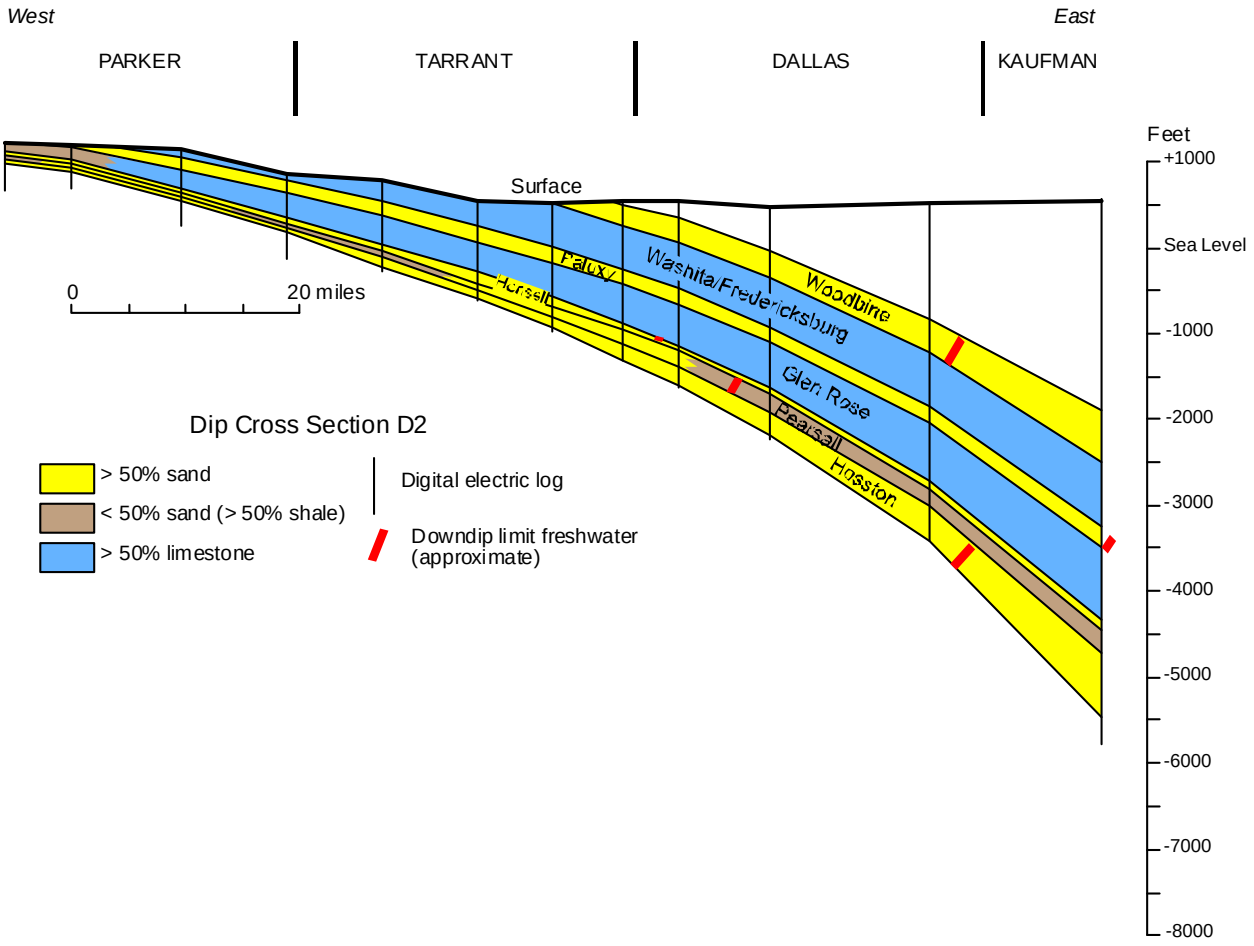


Figure 4.1.32 Dip-oriented cross section D2 showing stratigraphic boundaries, dominant lithologies, depths in feet, and downdip limits of freshwater in sandstone and shale layers.

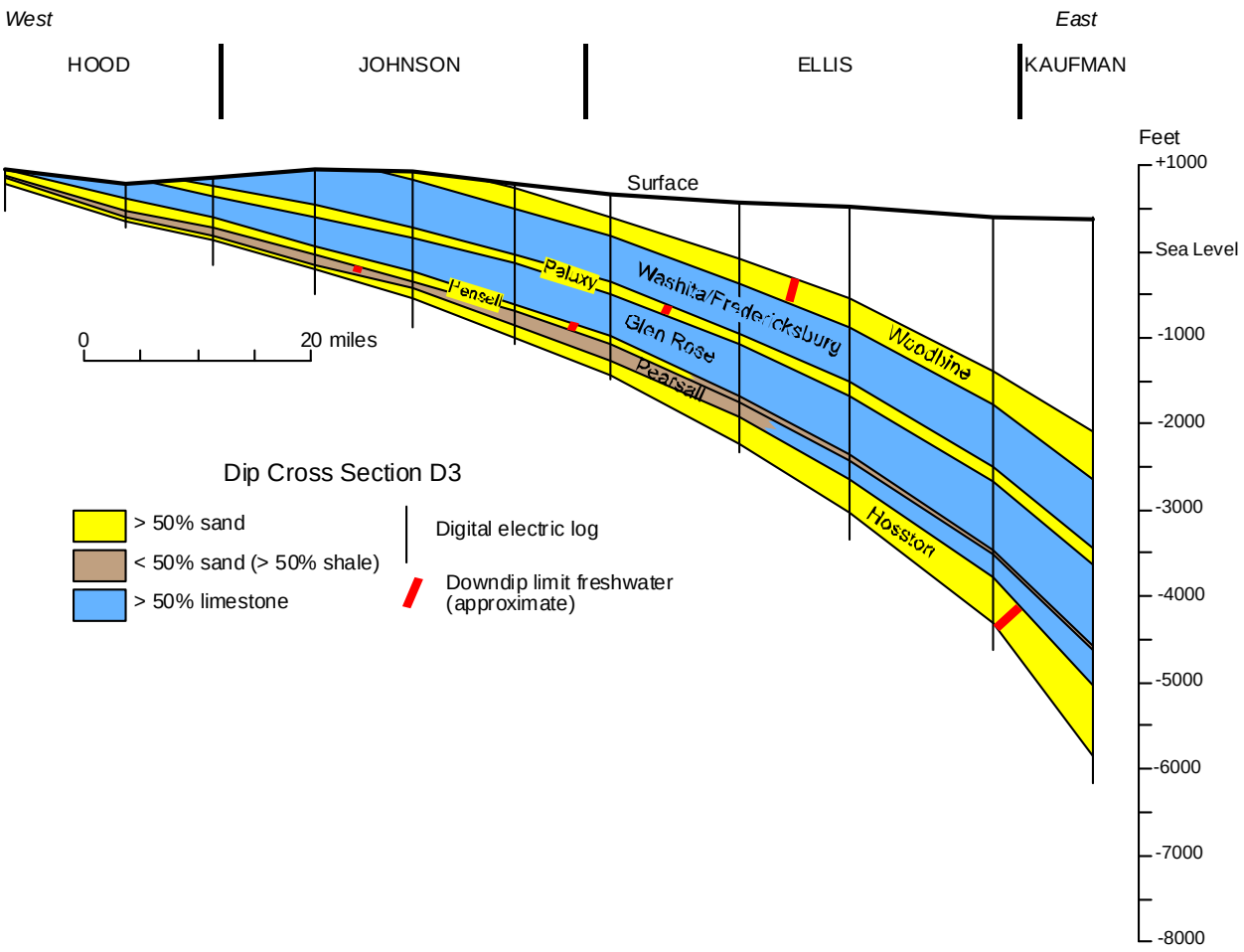


Figure 4.1.33 Dip-oriented cross section D3 showing stratigraphic boundaries, dominant lithologies, depths in feet, and downdip limits of freshwater in sandstone and shale layers.

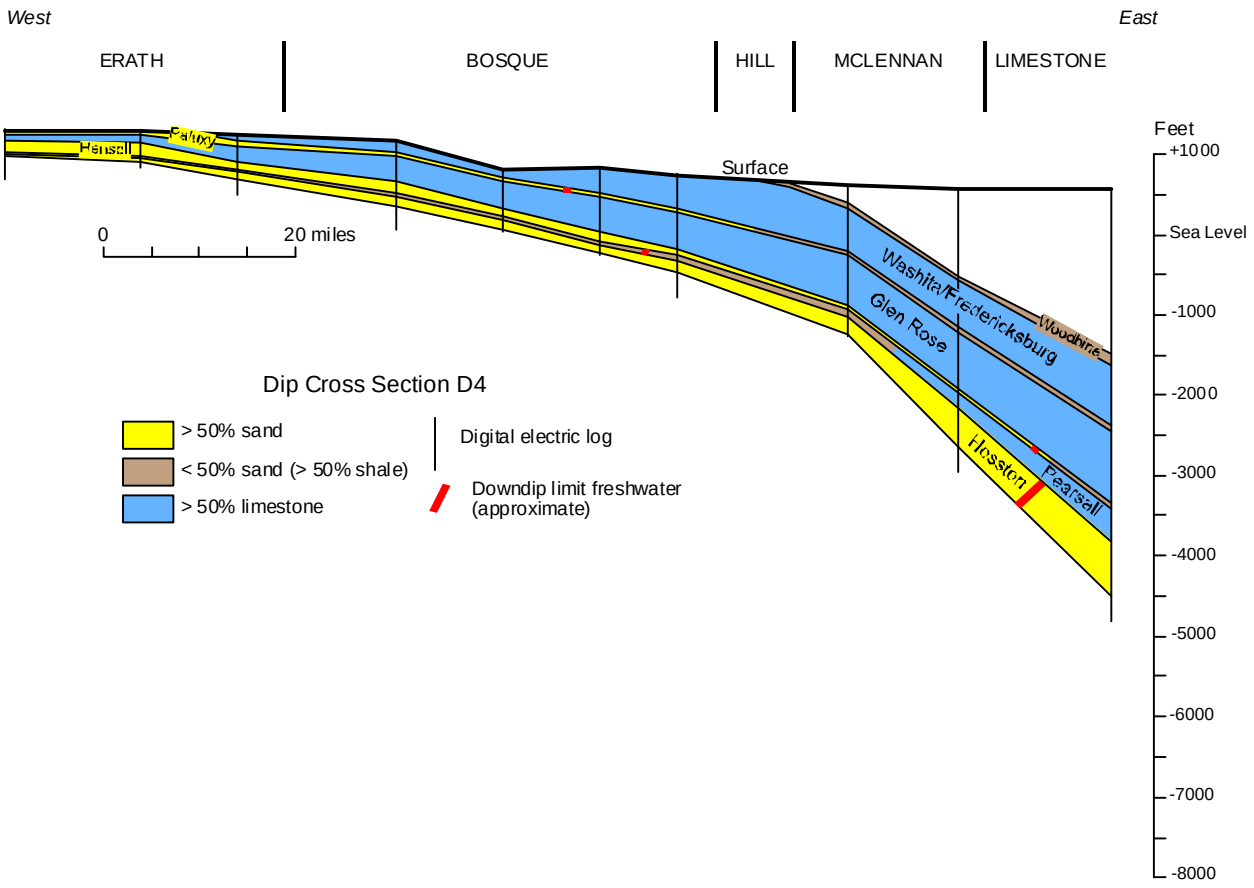


Figure 4.1.34 Dip-oriented cross section D4 showing stratigraphic boundaries, dominant lithologies, depths in feet, and downdip limits of freshwater in sandstone and shale layers.

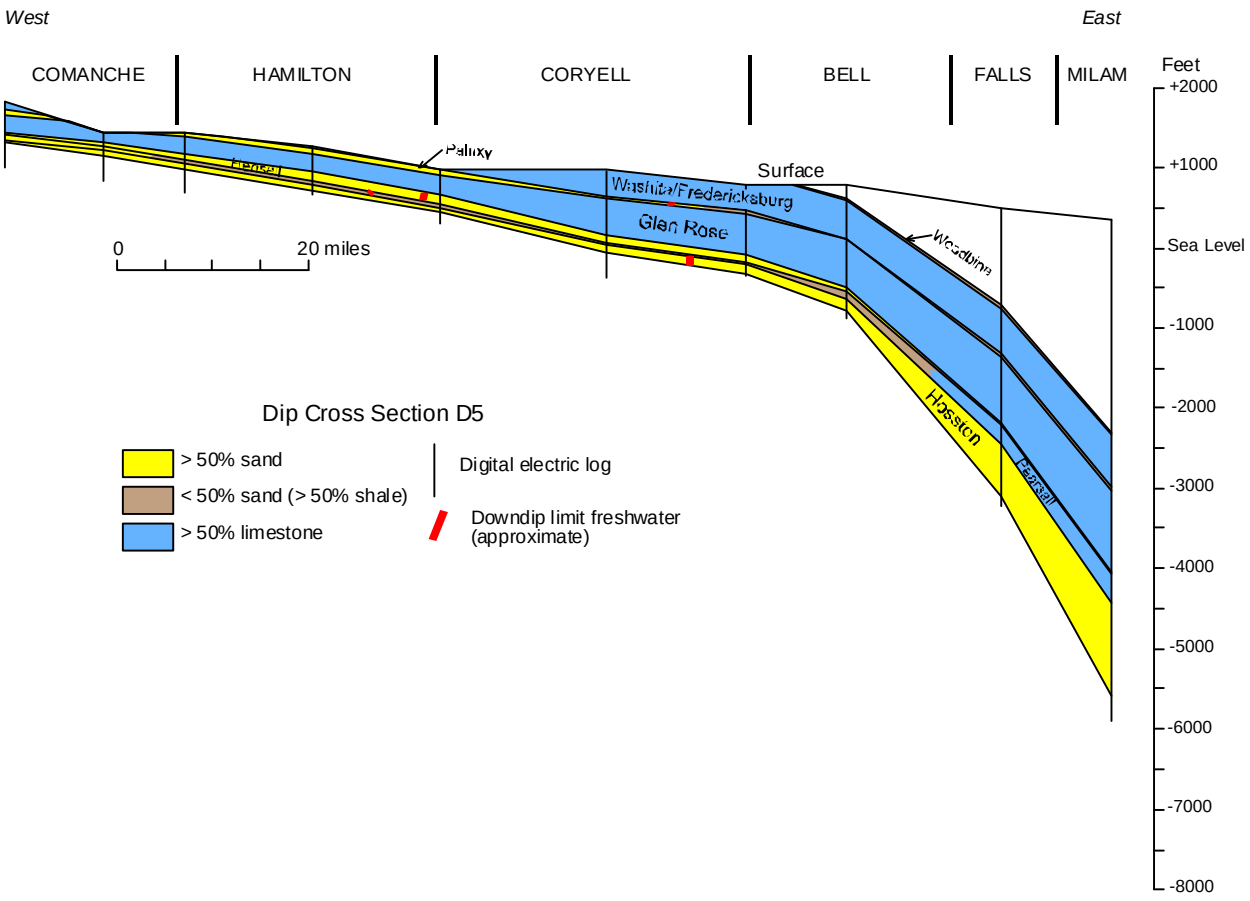


Figure 4.1.35 Dip-oriented cross section D5 showing stratigraphic boundaries, dominant lithologies, depths in feet, and downdip limits of freshwater in sandstone and shale layers.

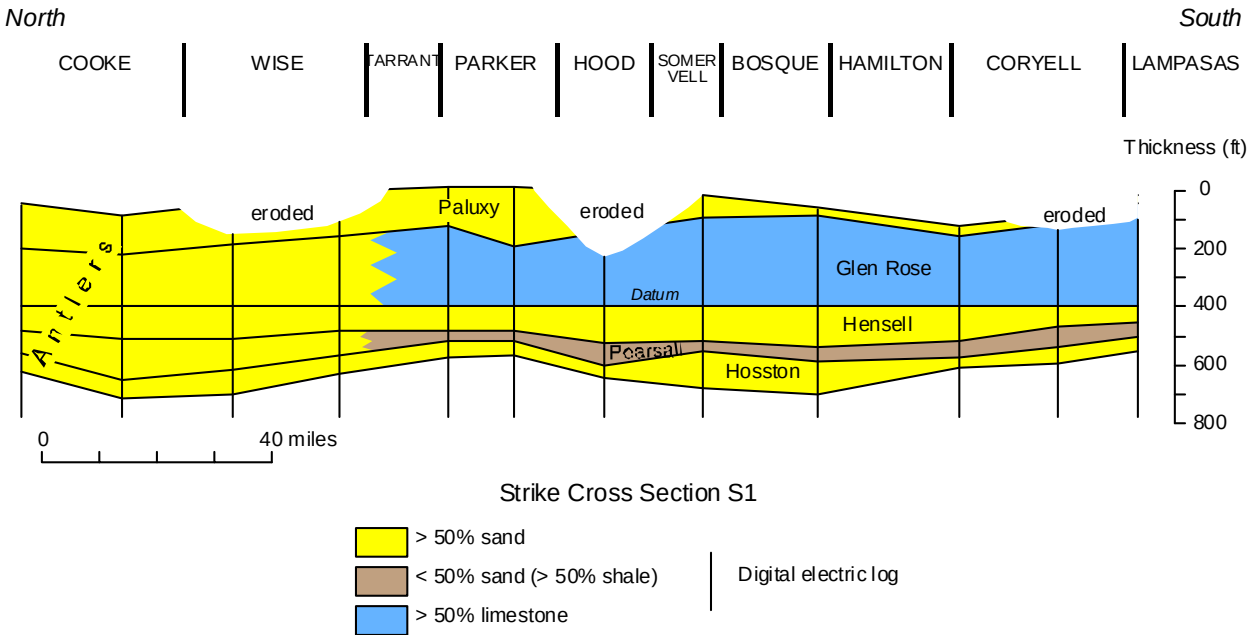


Figure 4.1.36 Strike-oriented cross section S1 showing stratigraphic boundaries, dominant lithologies, and thicknesses in feet.

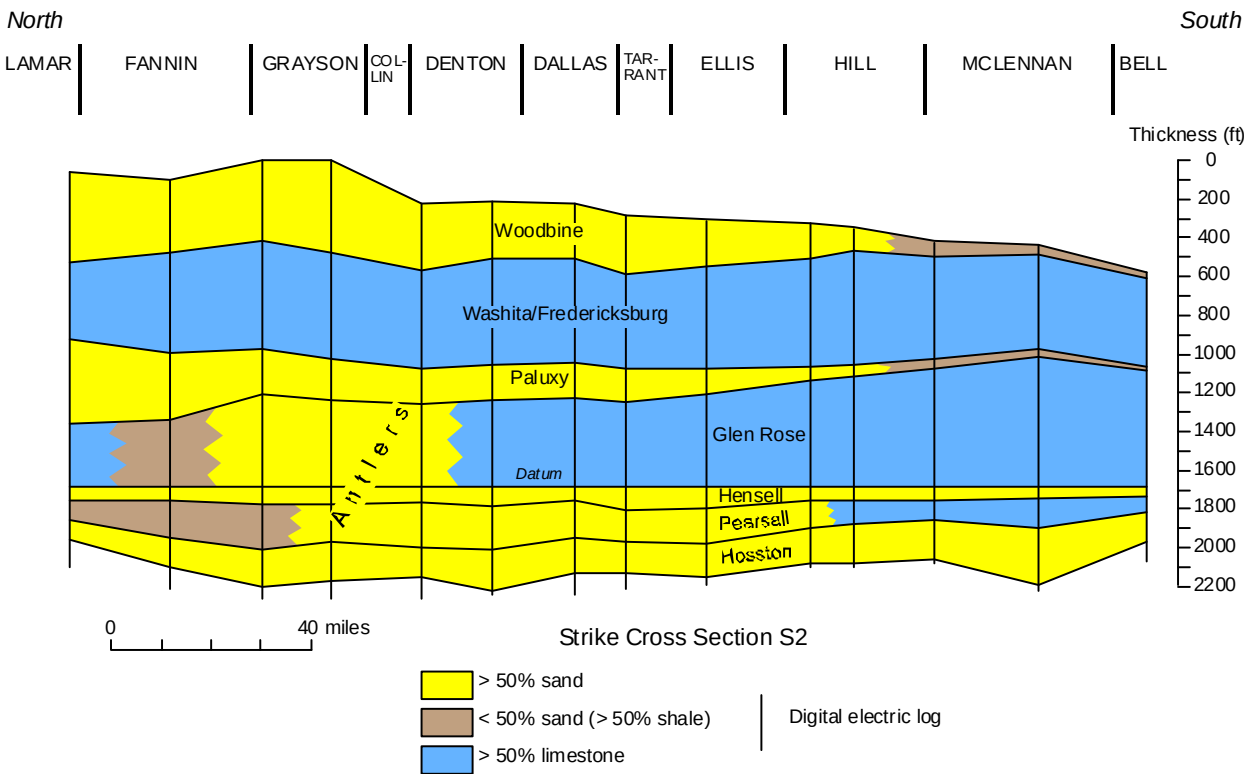


Figure 4.1.37 Strike-oriented cross section S2 showing stratigraphic boundaries, dominant lithologies, and thicknesses in feet.

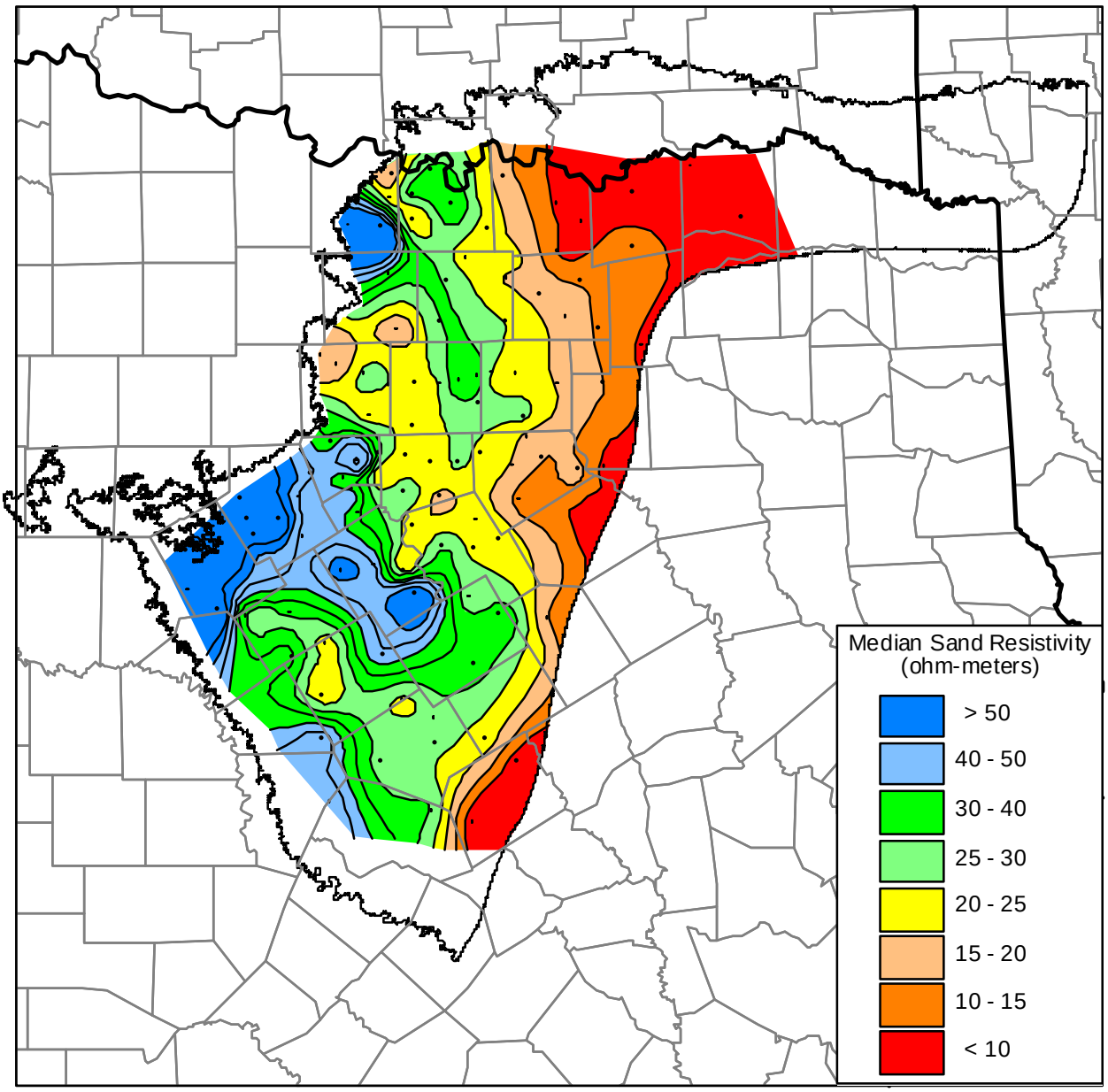


Figure 4.1.38 Median resistivity of sandstones greater than 10-feet thick in the Hosston Aquifer.

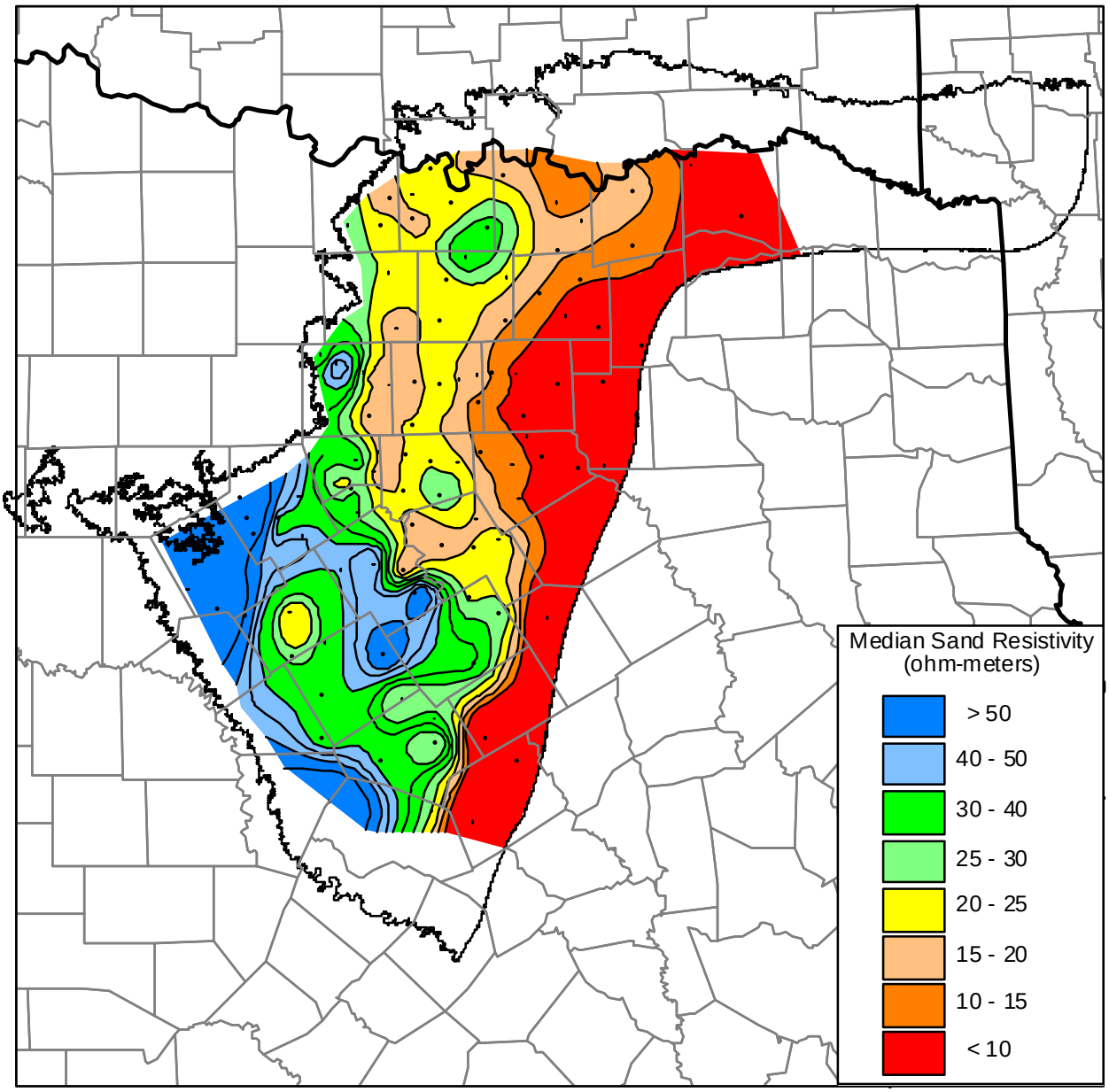


Figure 4.1.39 Median resistivity of sandstones greater than 10-feet thick in the Hensell Aquifer.

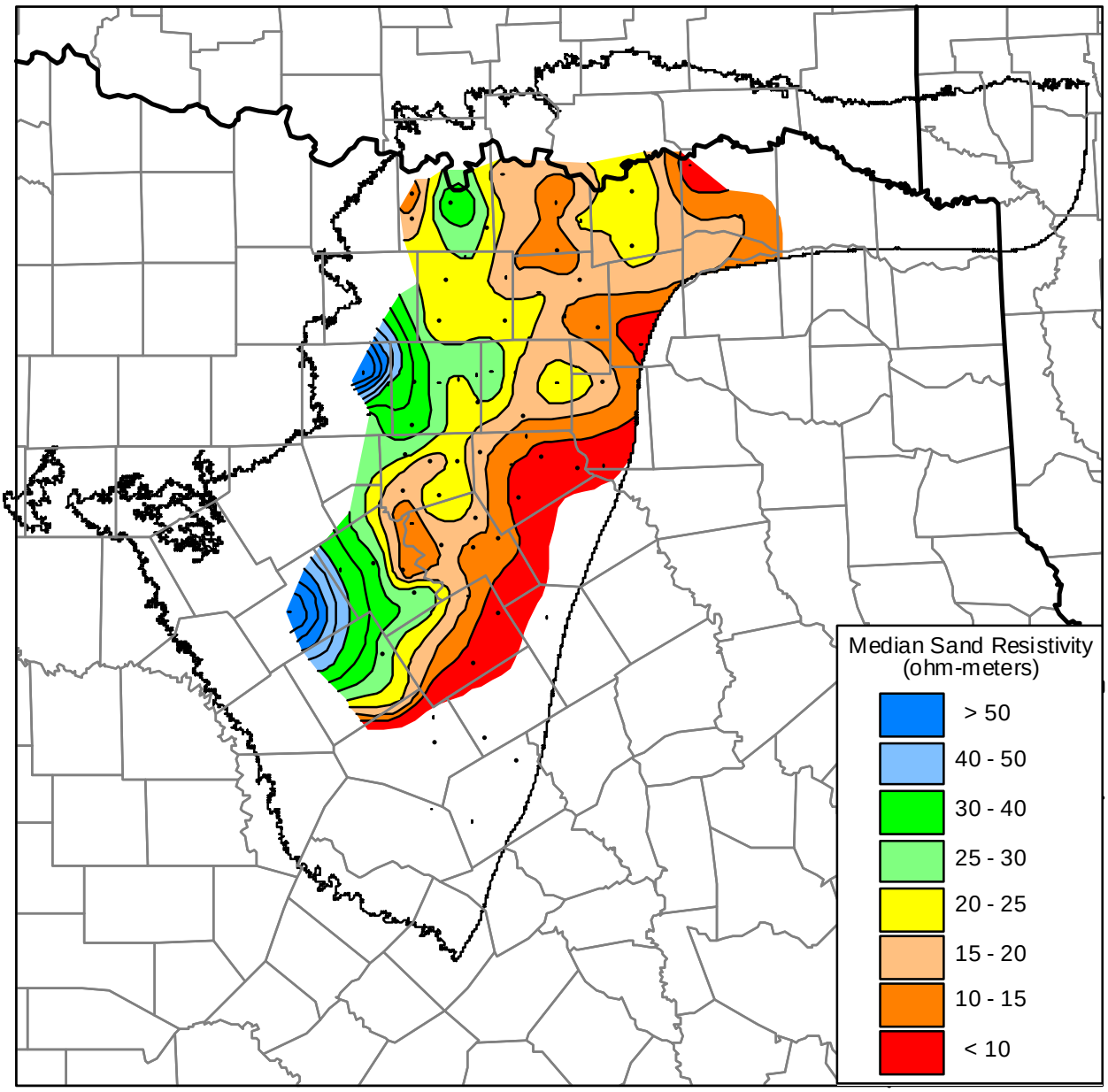


Figure 4.1.40 Median resistivity of sandstones greater than 10-feet thick in the Paluxy Aquifer.

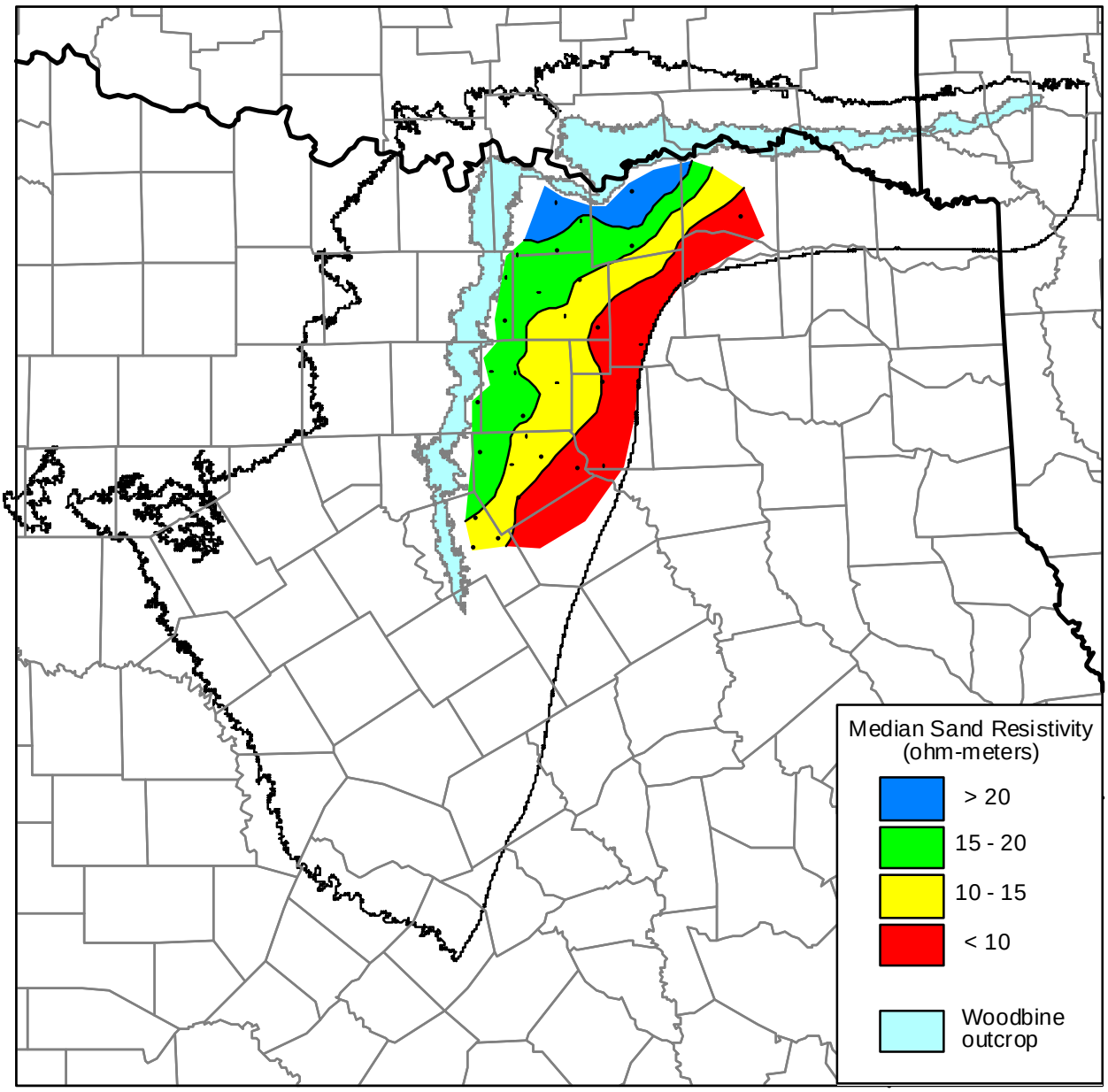


Figure 4.1.41 Median resistivity of sandstones greater than 10-feet thick in the Woodbine Aquifer.

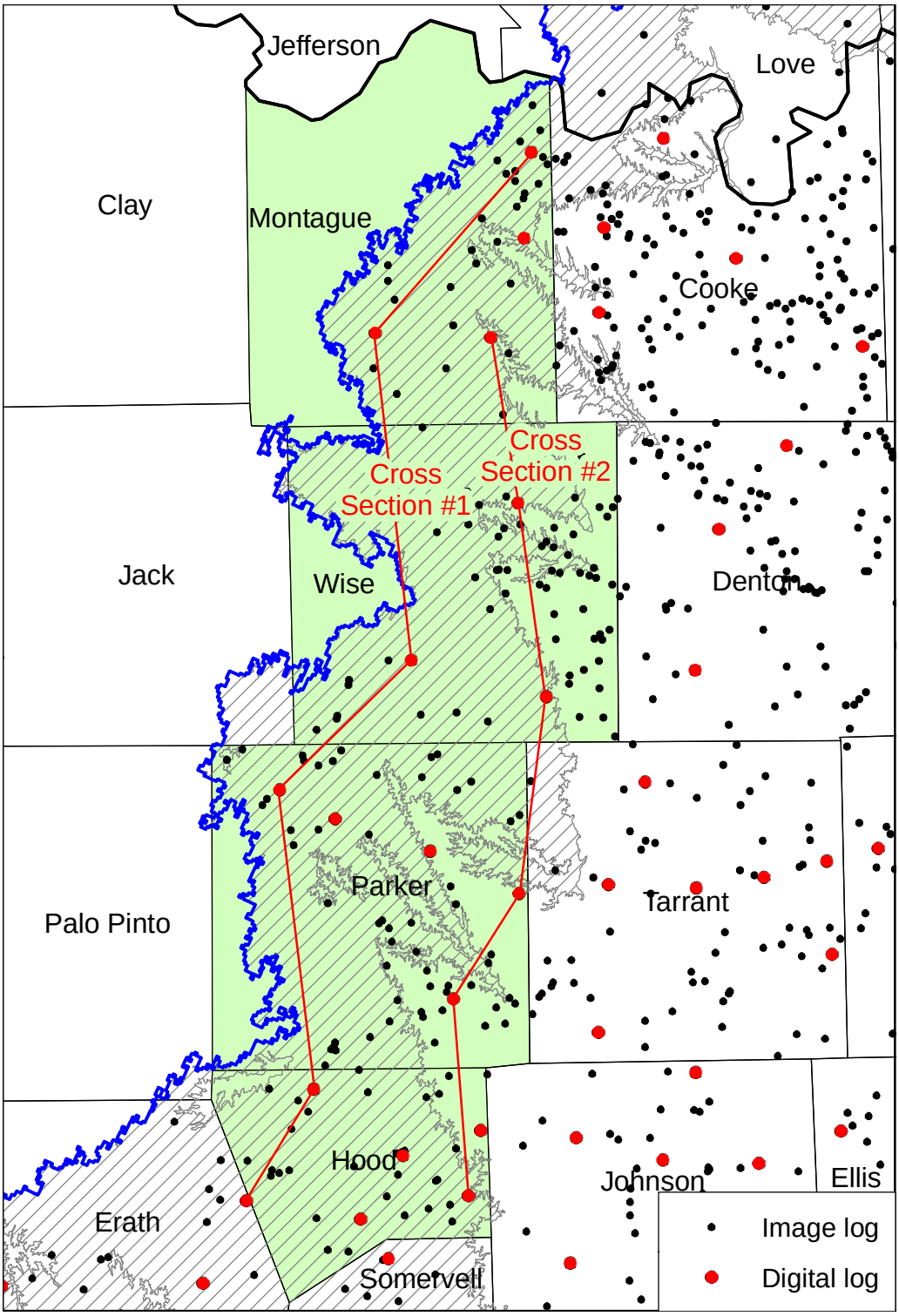
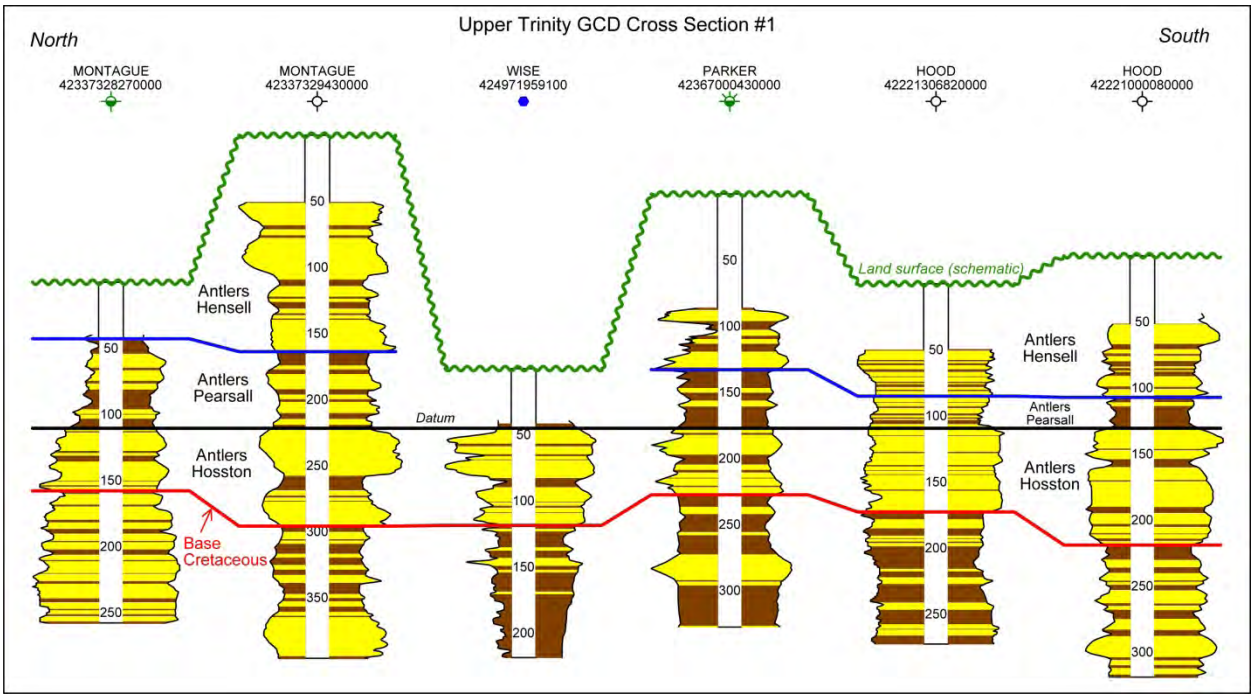
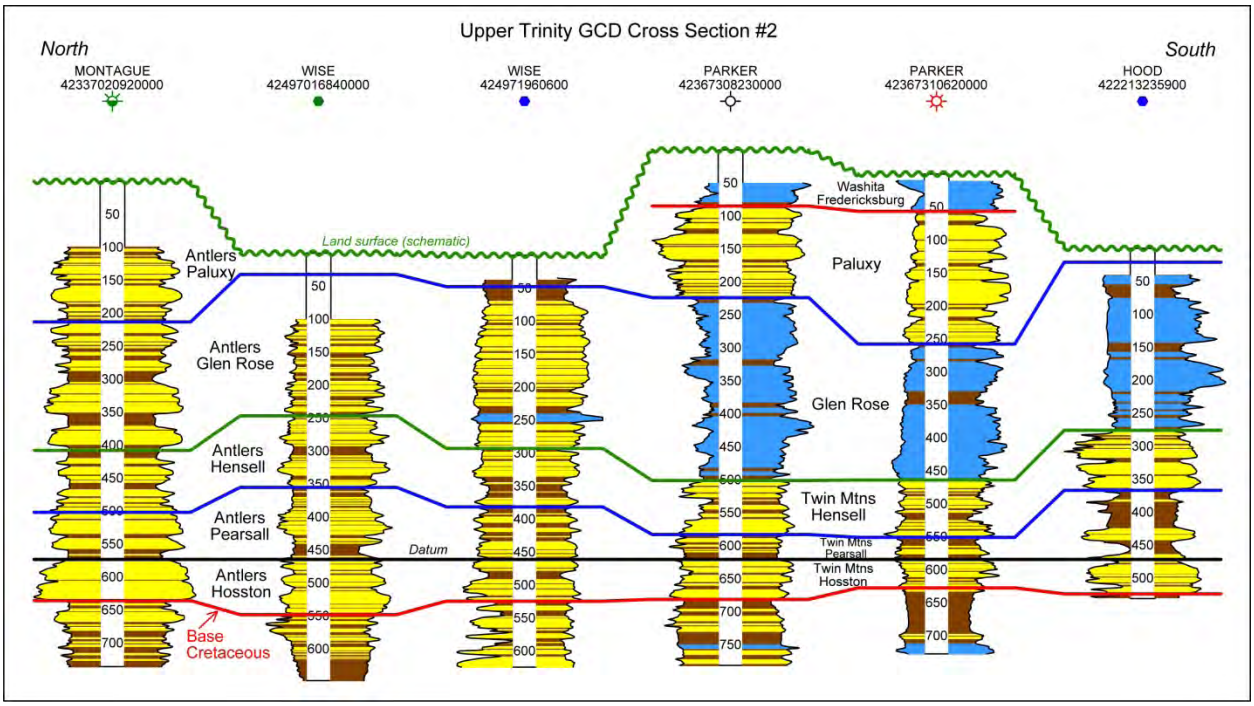


Figure 4.1.42 Upper Trinity GCD (green) showing the northern Trinity Aquifer outcrop (grey cross hatching), locations of geophysical well logs, and locations of cross sections shown in Figures 4.1.43 and 4.1.44.



yellow = greater than 50 percent sandstone, brown = greater than 50 percent shale

Figure 4.1.43 Upper Trinity GCD digital cross section # 1 with stratigraphic layers flattened on the top of the Hosston Aquifer (datum), so true elevations relative to sea level are not shown.



yellow = greater than 50 percent sandstone, blue = greater than 50 percent limestone, brown = greater than 50 percent shale

Figure 4.1.44 Upper Trinity GCD digital cross section # 2 with stratigraphic layers flattened on the top of the Hosston Aquifer (datum), so true elevations relative to sea level are not shown.

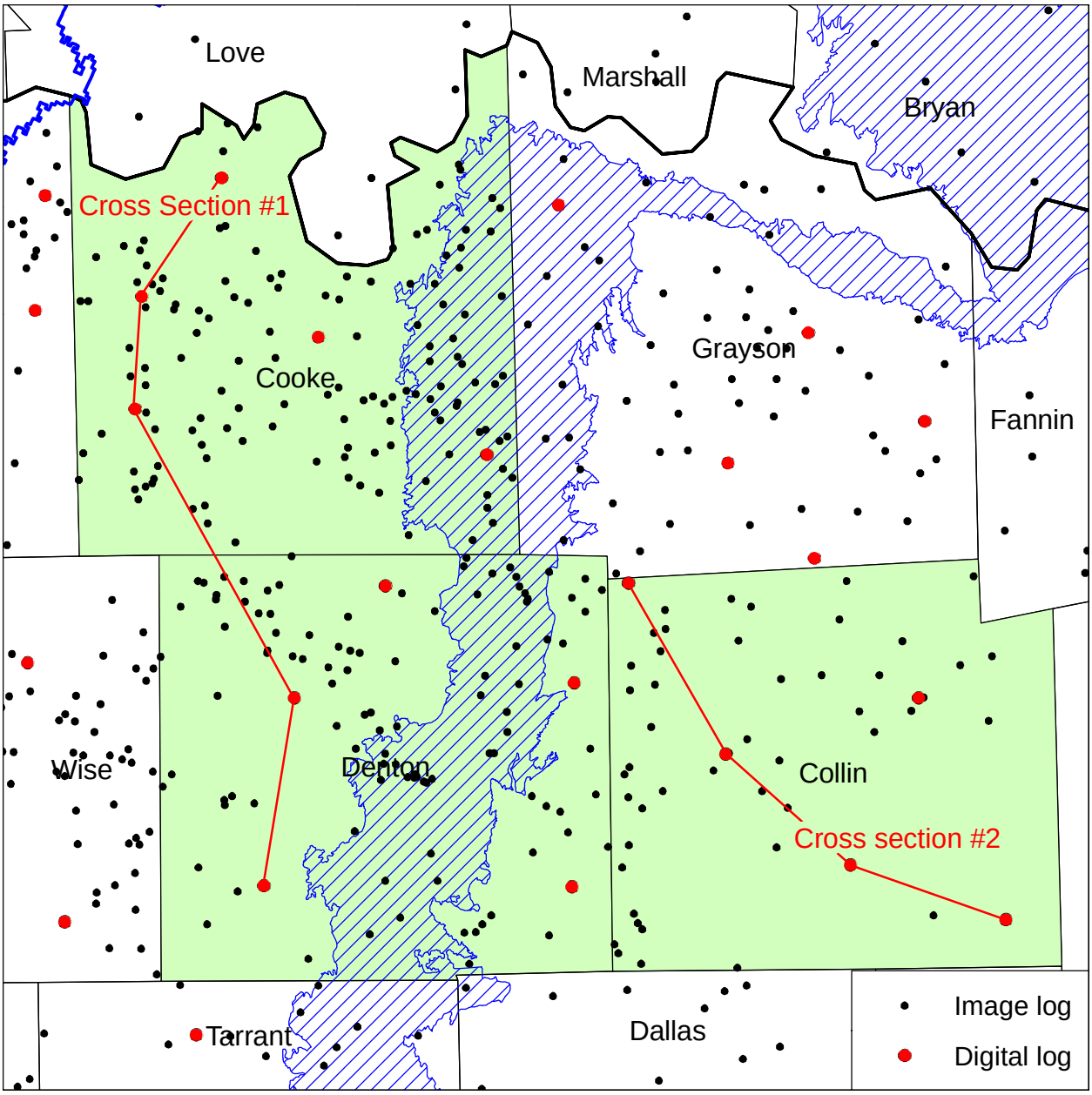
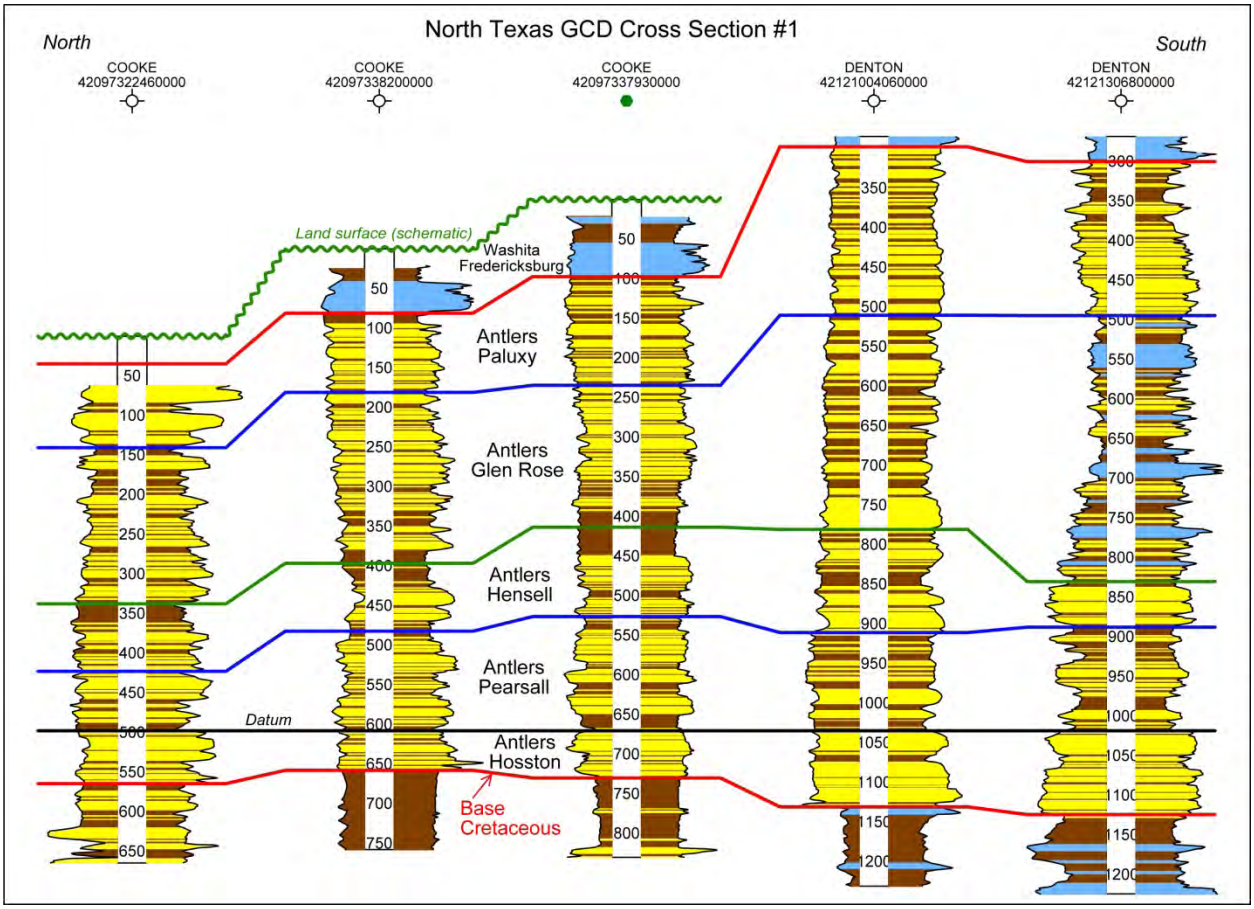
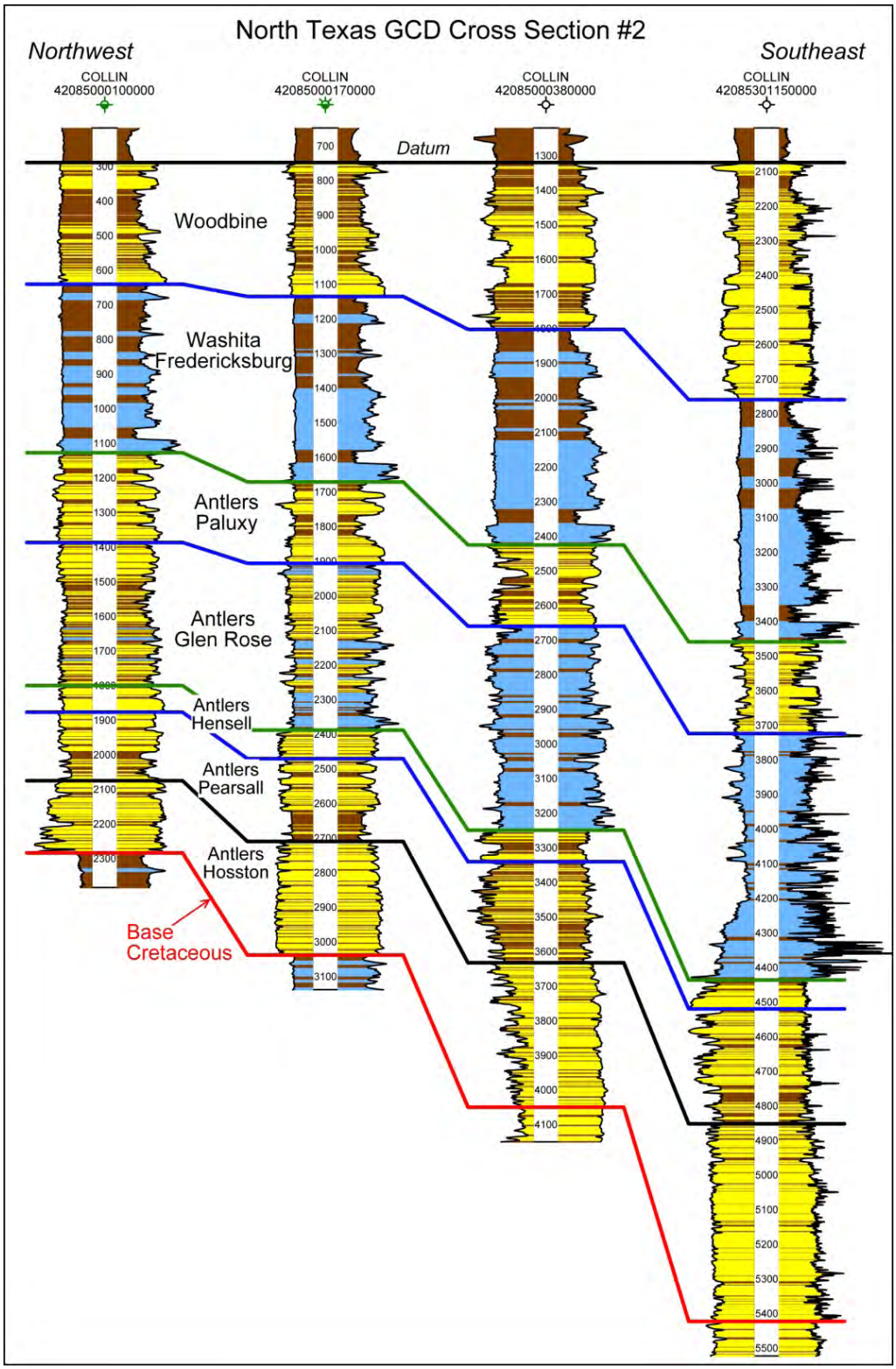


Figure 4.1.45 **North Texas GCD (green) showing the Woodbine Aquifer outcrop (blue cross hatching), locations of geophysical well logs, and locations of cross sections shown in Figures 4.1.46 and 4.1.47.**



yellow = greater than 50 percent sandstone, blue = greater than 50 percent limestone, brown = greater than 50 percent shale

Figure 4.1.46 North Texas GCD digital cross section # 1 with stratigraphic layers flattened on the top of the Hosston Aquifer (datum), so true elevations relative to sea level are not shown.



yellow = greater than 50 percent sandstone, blue = greater than 50 percent limestone,
brown = greater than 50 percent shale

Figure 4.1.47 North Texas GCD digital cross section # 2 with stratigraphic layers flattened on the top of the Woodbine Aquifer (datum), so true elevations relative to sea level are not shown.

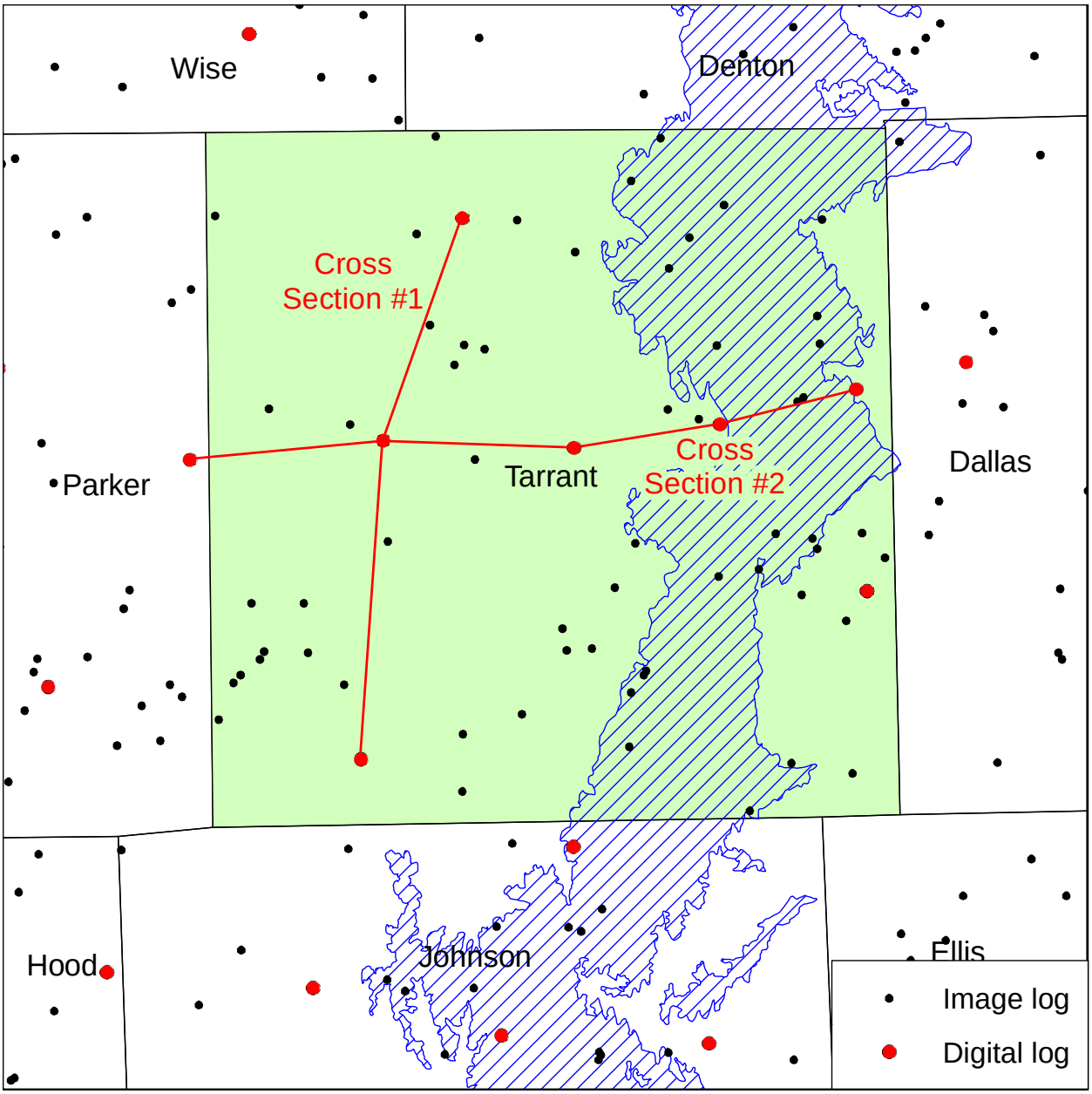
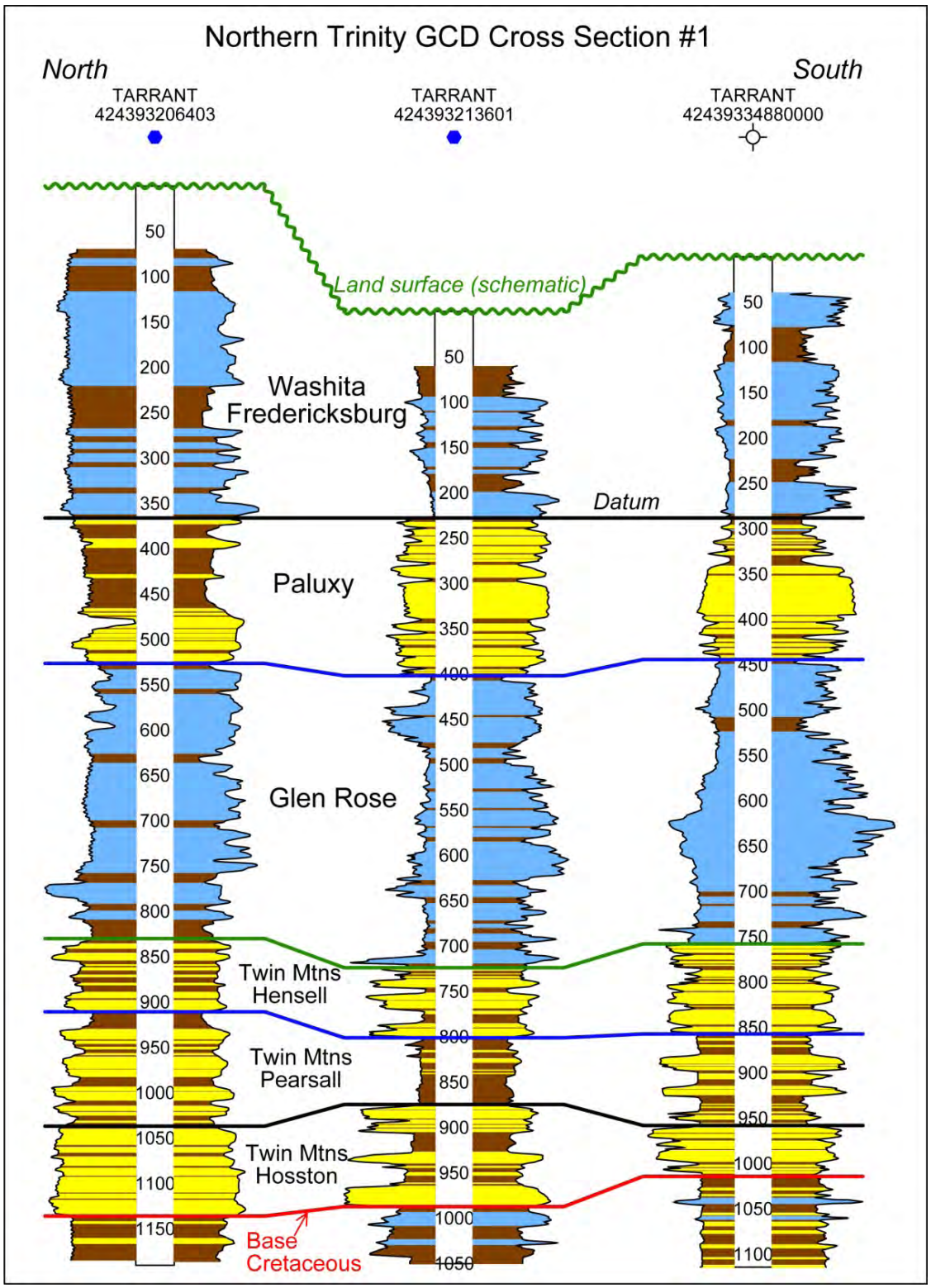


Figure 4.1.48 Northern Trinity GCD (green) showing the Woodbine Aquifer outcrop (blue cross hatching), locations of geophysical well logs, and locations of cross sections shown in Figures 4.1.49 and 4.1.50.



yellow = greater than 50 percent sandstone, blue = greater than 50 percent limestone,
brown = greater than 50 percent shale

Figure 4.1.49 Northern Trinity GCD digital cross section # 1 with stratigraphic layers flattened on the top of the Paluxy Aquifer (datum), so true elevations relative to sea level are not shown.

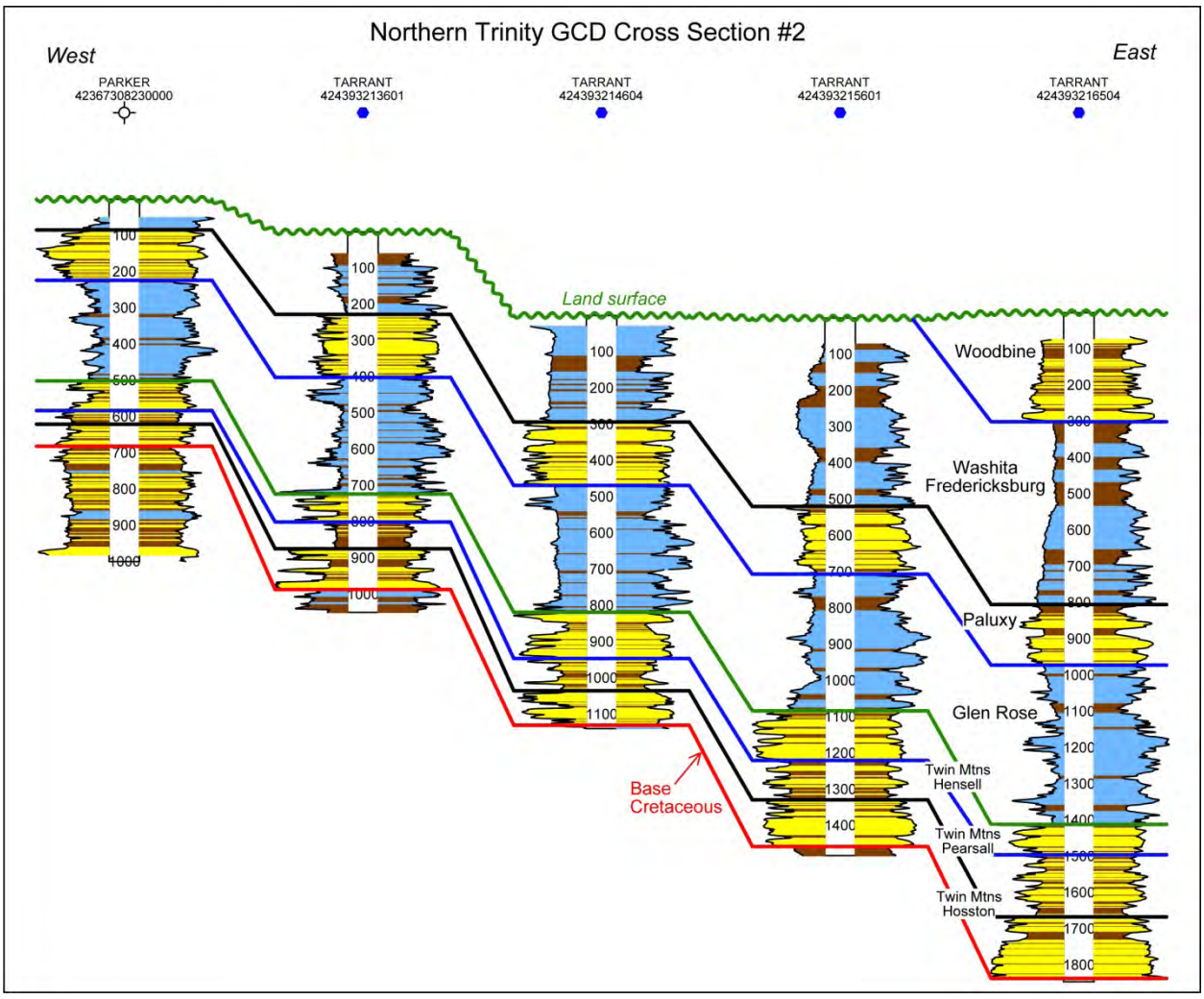


Figure 4.1.50 Northern Trinity GCD digital cross section # 2 with stratigraphic layers and land surface shown as true depths relative to sea level.

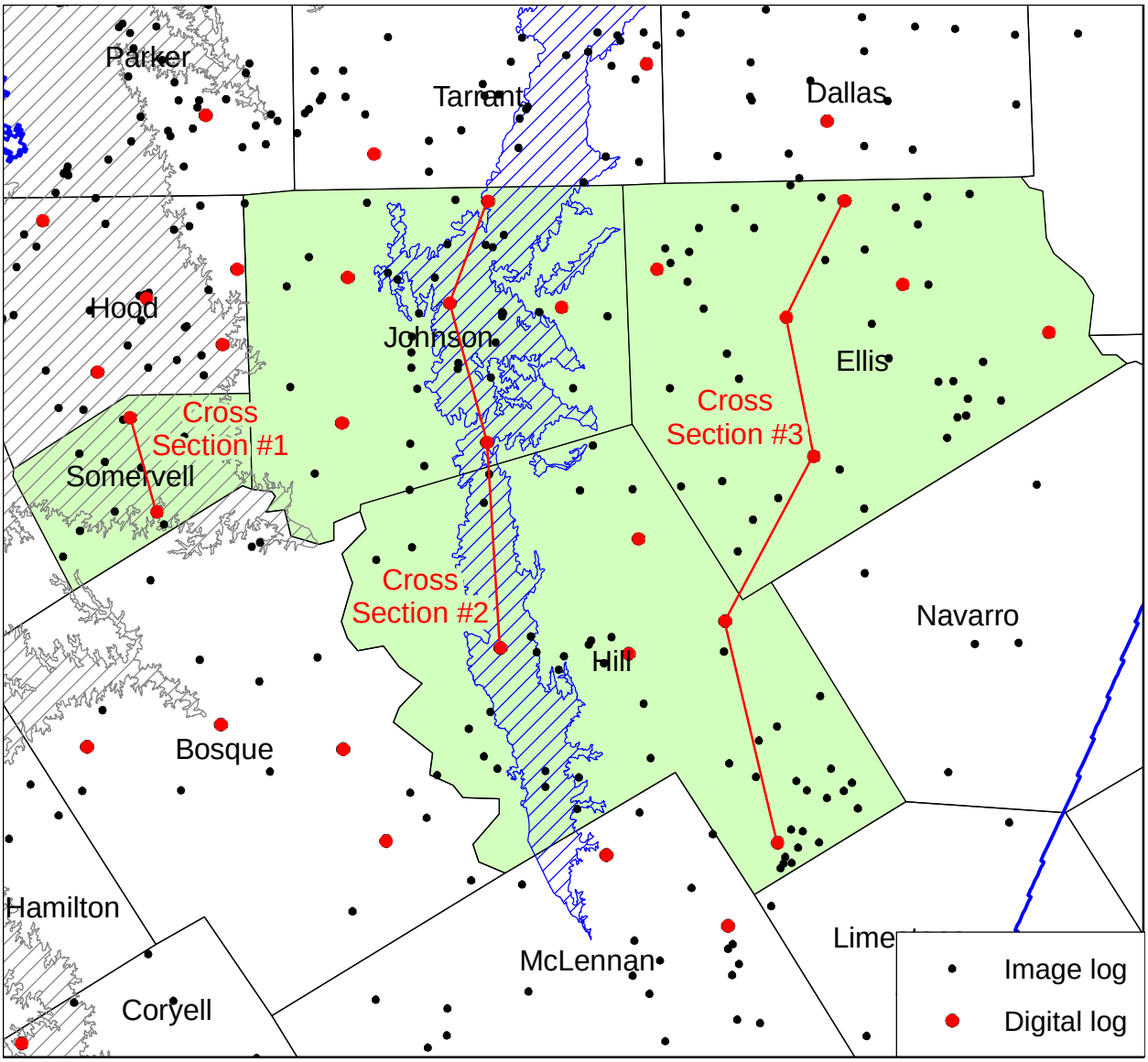
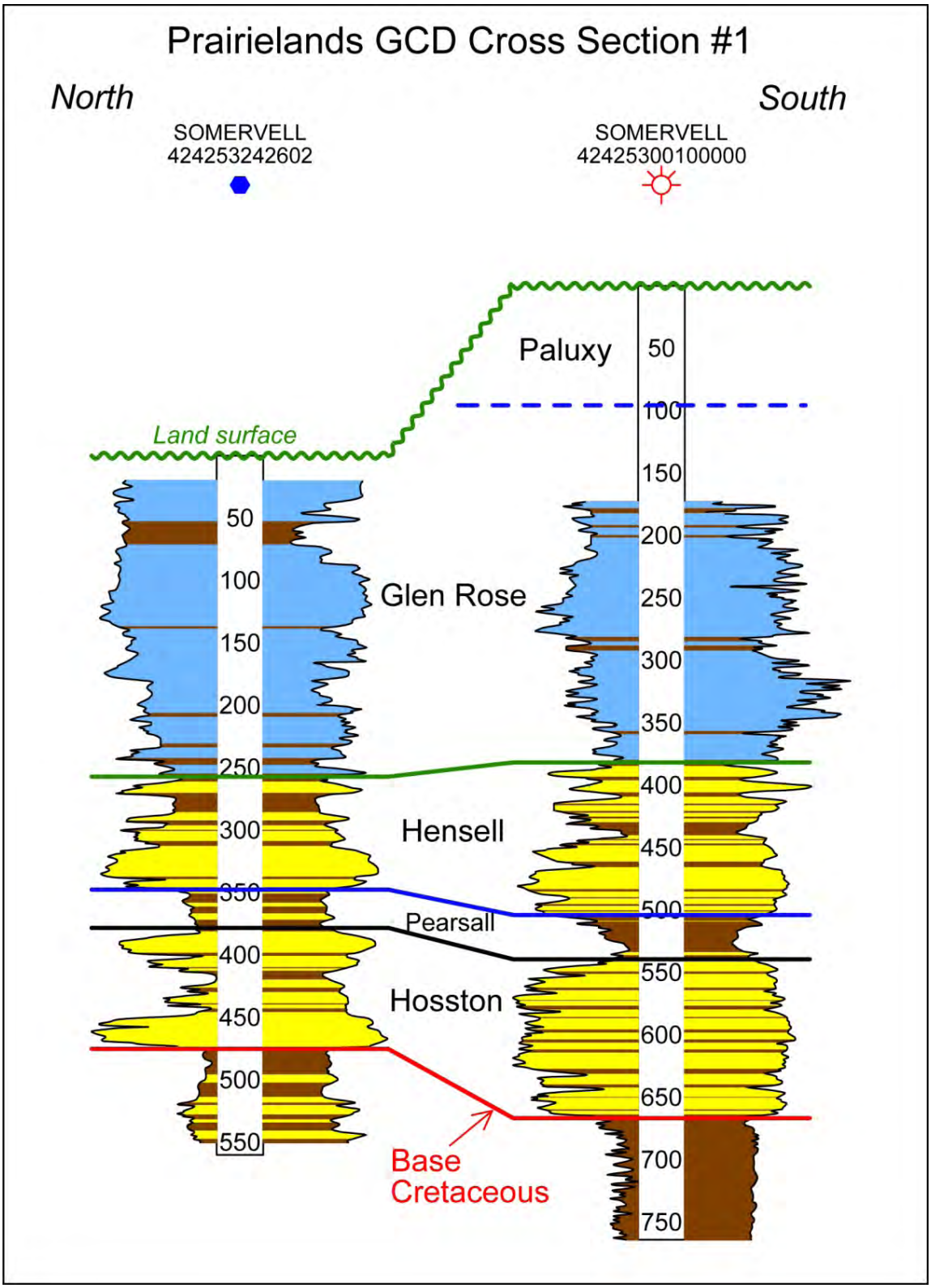
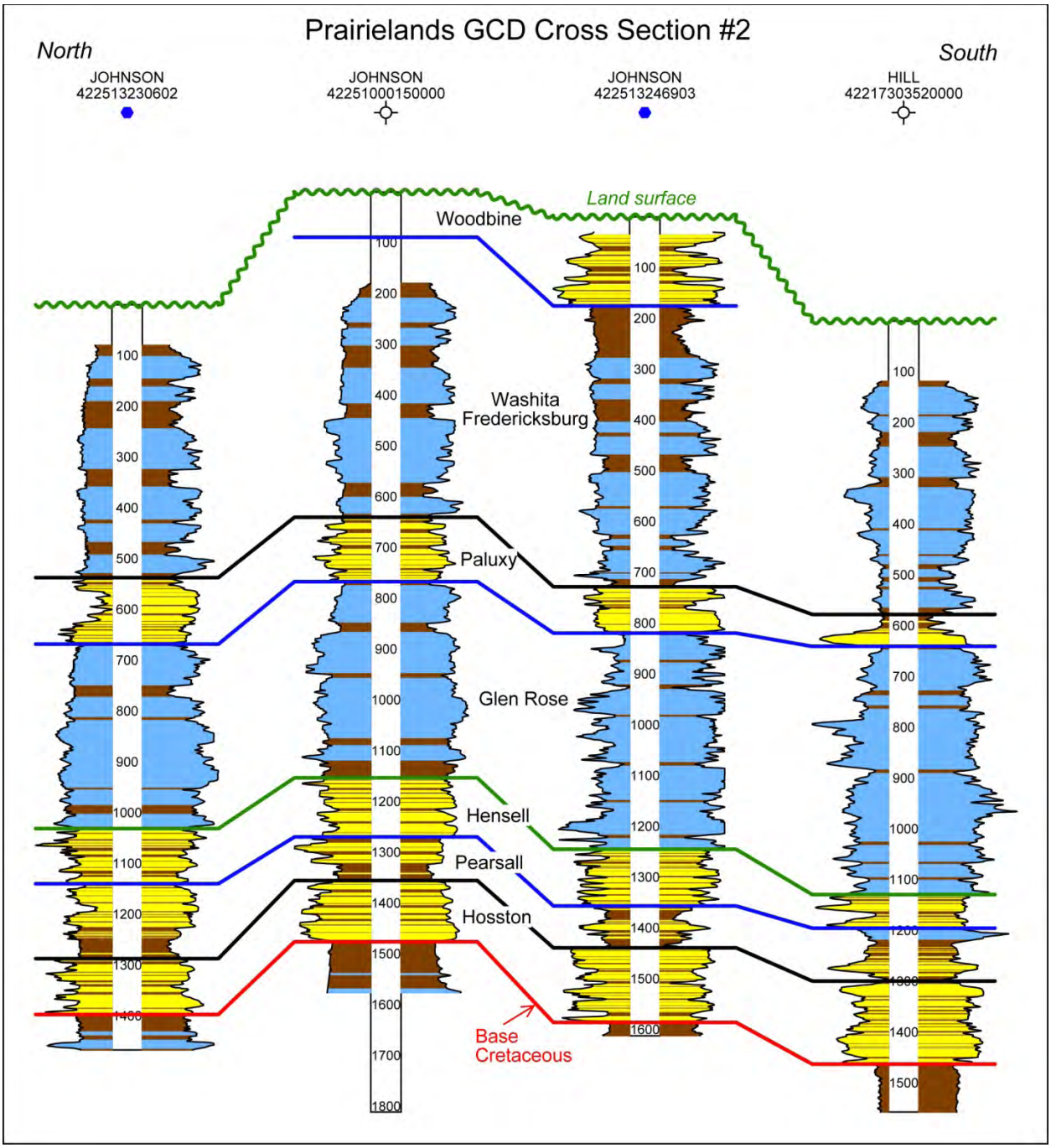


Figure 4.1.51 The Prairielands GCD (green) showing the northern Trinity and Woodbine aquifer outcrops (grey and cross hatching, respectively), locations of geophysical well logs, and locations of cross sections shown in Figures 4.1.52 and 4.1.54.



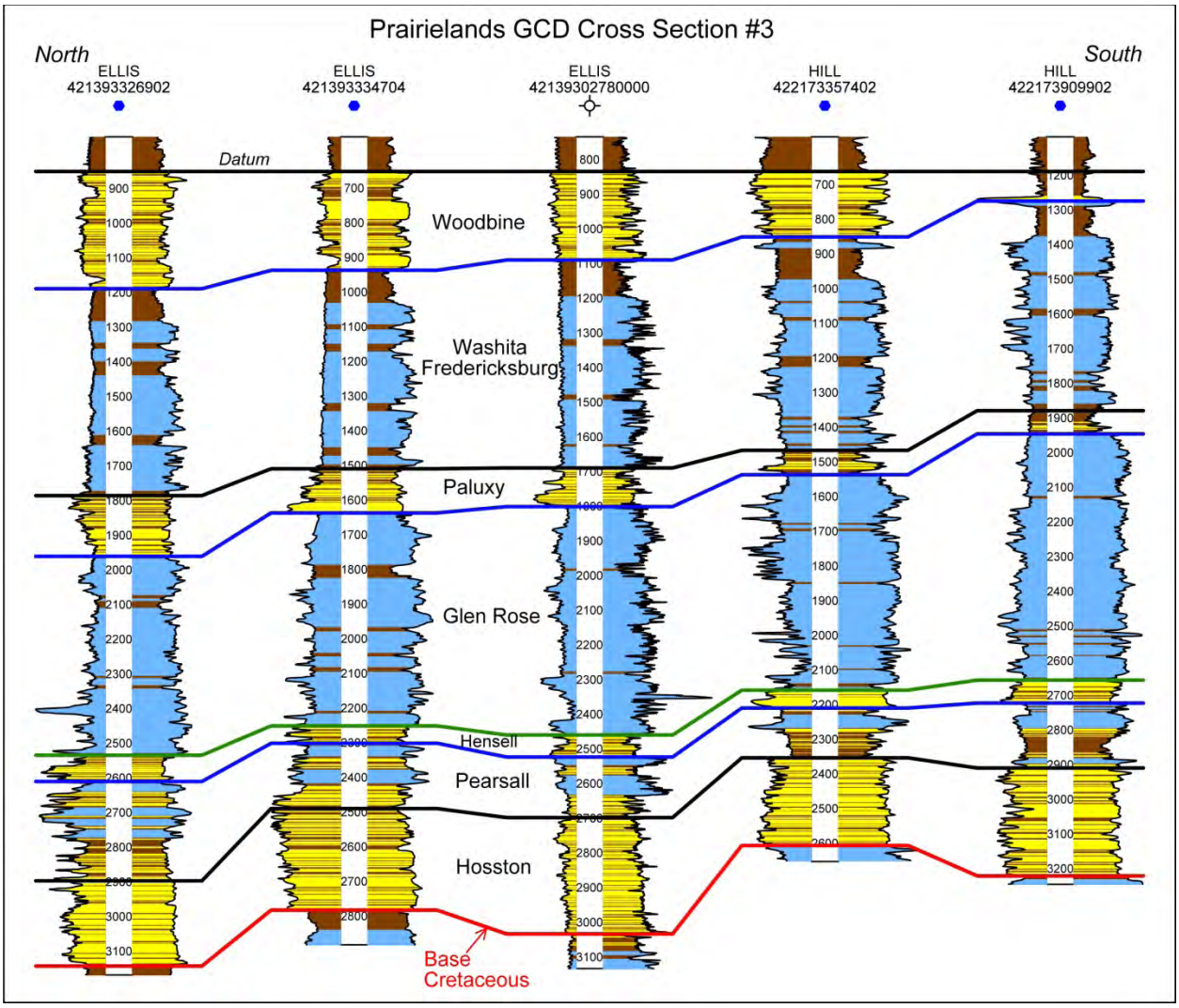
yellow = greater than 50 percent sandstone, blue = greater than 50 percent limestone,
brown = greater than 50 percent shale

Figure 4.1.52 Prairielands GCD digital cross section # 1 with stratigraphic layers and land surface shown as true depths relative to sea level.



yellow = greater than 50 percent sandstone, blue = greater than 50 percent limestone, brown = greater than 50 percent shale

Figure 4.1.53 Prairielands GCD digital cross section # 2 with stratigraphic layers and land surface shown as true depths relative to sea level.



yellow = greater than 50 percent sandstone, blue = greater than 50 percent limestone, brown = greater than 50 percent shale

Figure 4.1.54 Prairielands GCD digital cross section # 3 with stratigraphic layers flattened on the top of the Woodbine Aquifer (datum), and so true elevations relative to sea level are not shown.

14.0 References

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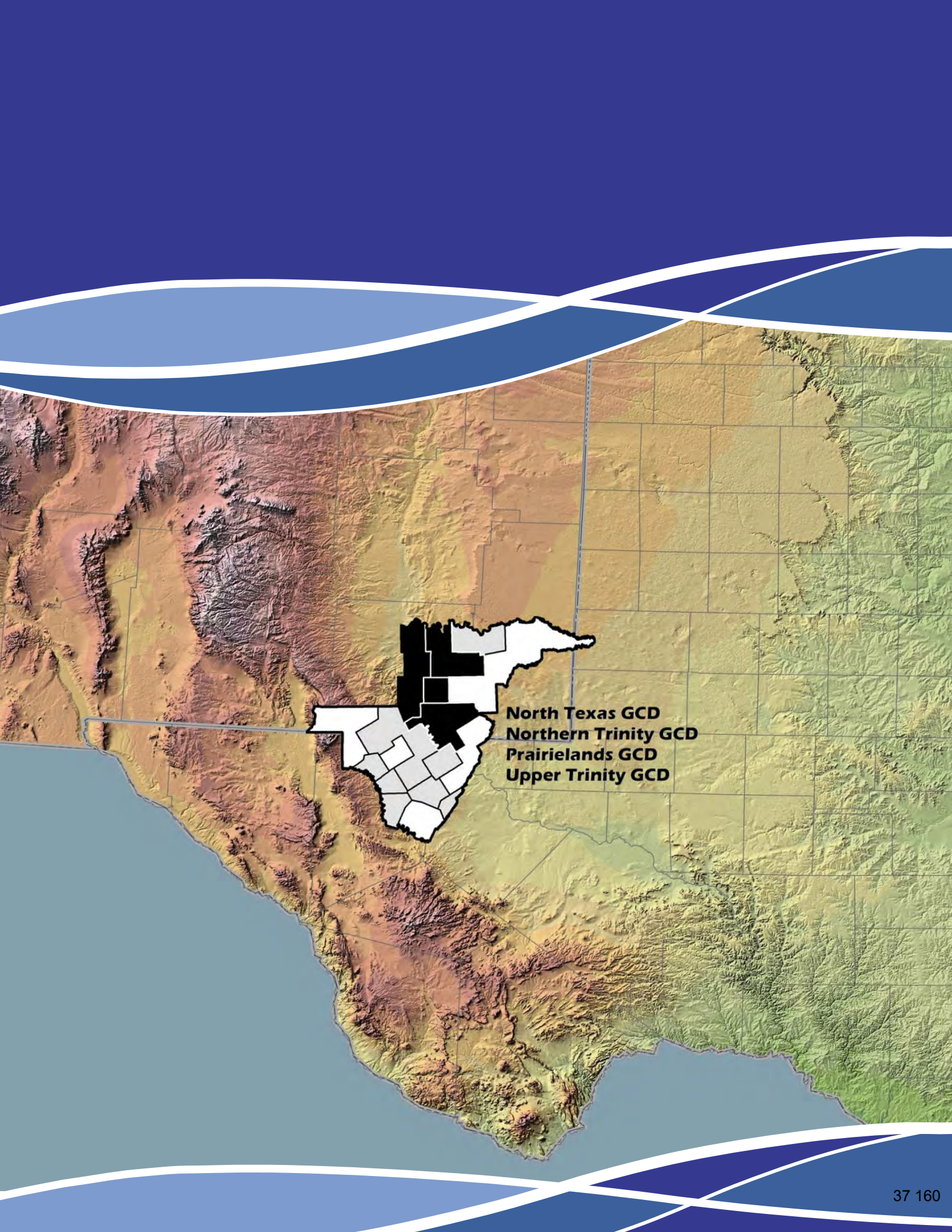
North Texas GCD
Northern Trinity GCD
Prairielands GCD
Upper Trinity GCD

Reference 38

U.S. climate data
Temperature - Precipitation - Sunshine - Snowfall

US Climate Data on

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Monthly | Daily | History | Geo & Map | Weather Forecast

You are here: United States > Texas > Dallas

Climate Dallas - Texas

°C | °F

	Jan	Feb	Mar	Apr	May	Jun
Average high in °F:	57	61	69	77	84	91
Average low in °F:	30	35	42	51	60	67
Av. precipitation in inch:	2.32	2.99	3.7	3.43	4.61	4.65
Days with precipitation:	-	-	-	-	-	-
Hours of sunshine:	-	-	-	-	-	-

	Jul	Aug	Sep	Oct	Nov	Dec
Average high in °F:	95	96	89	80	68	58
Average low in °F:	71	71	64	52	43	32
Av. precipitation in inch:	2.8	2.13	3.35	4.88	3.31	2.8
Days with precipitation:	-	-	-	-	-	-
Hours of sunshine:	-	-	-	-	-	-

Dallas weather averages

Annual high temperature:	77.1°F
Annual low temperature:	51.5°F
Average temperature:	64.3°F
Average annual precipitation - rainfall:	40.97 inch
Days per year with precipitation - rainfall:	-
Annual hours of sunshine:	-
Av. annual snowfall:	-

20

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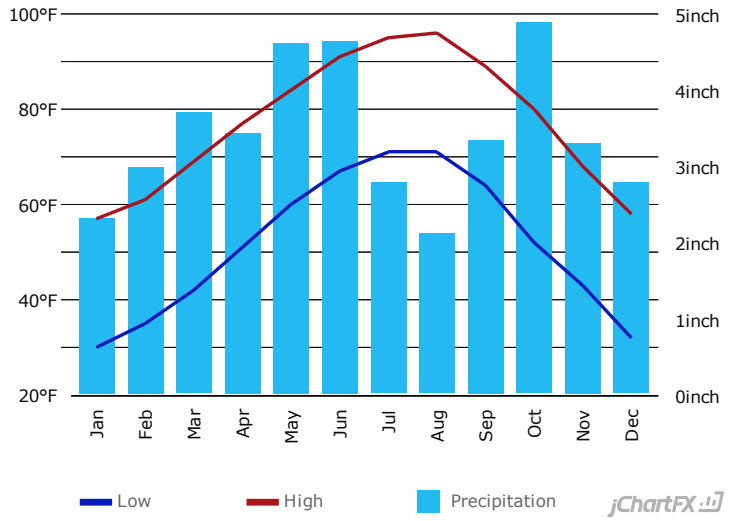
Dallas Climate Graph - Texas Climate Chart

Climate data for joe pool lake, Longitude: -96.974, Latitude: 32.6406
Average weather Dallas, TX - 75201 - 1981-2010 normals

Jan: January, Feb: February, Mar: March, Apr: April, May: May, Jun: June, Jul: July, Aug: August, Sep: September, Oct: October, Nov: November, Dec:

December



Climograph of Dallas on your website

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Reference 39

Aquifers of Texas

by Peter G. George, Ph.D., P.G. • Robert E. Mace, Ph.D., P.G. •
Rima Petrossian, P.G.

Report 380
July 2011

Texas Water Development Board
www.twdb.texas.gov

Aquifers of Texas

Report 380

by
Peter G. George, Ph.D., P.G.
Robert E. Mace, Ph.D., P.G.
Rima Petrossian, P.G.

Texas Water Development Board

39 003

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The contents of this report (including figures and tables) document the work of the following licensed Texas geoscientists:

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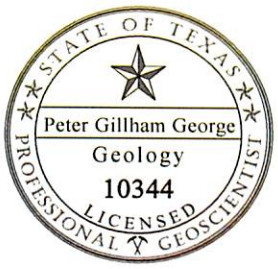

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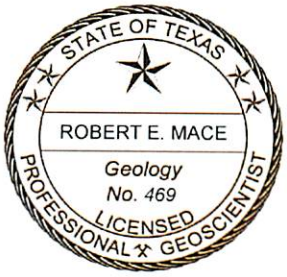

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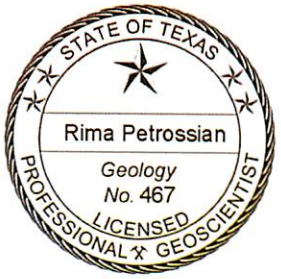

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Table of Contents

1 Executive Summary 1
2 Introduction 3
2.1 TWDB Monitoring and Modeling Programs 5
2.2 Statewide Groundwater Issues 8
2.3 Groundwater Management 16
2.4 Basic Groundwater Principles 17
3 Aquifer Summaries 21
Major Aquifers 22
Carrizo–Wilcox 23
Edwards (Balcones Fault Zone) 27
Edwards–Trinity (Plateau) 35
Gulf Coast 43
Hueco–Mesilla Bolsons 47
Ogallala 51
Pecos Valley 57
Seymour 63
Trinity 67
Minor Aquifers 73
Blaine 75
Blossom 79
Bone Spring–Victorio Peak 83
Brazos River Alluvium 87
Capitan Reef Complex 91
Dockum 97
Edwards–Trinity (High Plains) 101
Ellenburger–San Saba 107
Hickory 111
Igneous 115
Lipan 121
Marathon 125
Marble Falls 129
Nacatoch 133
Queen City 137
Rita Blanca 141
Rustler 145
Sparta 149
West Texas Bolsons 153
Woodbine 159
Yegua-Jackson 165
4 Possible Additions to the Aquifers of Texas 171
5 Acknowledgments 172

List of Figures

Figure 2-1 Major aquifers of Texas 3
Figure 2-2 Minor aquifers of Texas 4
Figure 2-3 Water level measurement sites 5
Figure 2-4 Water level recorder measurement sites 6
Figure 2-5 Water quality measurement sites 7
Figure 2-6 Water level declines in the major aquifers of Texas 9
Figure 2-7 Historical estimates of groundwater withdrawals 10
Figure 2-8 Concentration of total dissolved solids in sampled wells 11
Figure 2-9 Concentration of arsenic in sampled wells 12
Figure 2-10 Gross alpha radiation in sampled wells 13
Figure 2-11 Concentration of nitrate in sampled wells 14
Figure 2-12 Projected existing groundwater supplies through 2060 15
Figure 2-13 Groundwater availability compared to reported groundwater use 15
Figure 2-14 Groundwater conservation districts and management areas 16
Figure 2-15 Schematic diagram illustrating basic groundwater principles 18

Major Aquifers

Carrizo-Wilcox Aquifer 23
- Structural cross section of the Carrizo-Wilcox Aquifer and overlying strata 24
- Estimated total water level declines for the Carrizo-Wilcox Aquifer 24

Edwards (Balcones Fault Zone) Aquifer 27
- Diagrammatic cross section showing hydrogeologic framework and generalized groundwater flow 28
- Potentiometric surface and inferred groundwater flow 29
- Distribution of horizontal hydraulic conductivity 30

Edwards-Trinity (Plateau) Aquifer 35
- Stratigraphic chart of the eastern Edwards Plateau region 36
- Stratigraphic chart of the central Edwards Plateau region 37
- Stratigraphic chart of the Trans-Pecos region of the Edwards Plateau 38
- Stratigraphic chart of the northwestern Edwards Plateau region 39
- Stratigraphic chart of the southwestern Edwards Plateau region 39
- Conceptual model of the Edwards-Trinity (Plateau) and Pecos Valley aquifers and Hill Country part of the Trinity Aquifer 40

Gulf Coast Aquifer 43
- Cross sections across the Gulf Coast Aquifer 44
- Groundwater withdrawals and substantial water level declines in the Houston and Evadale areas from predevelopment times to 2000 45

Hueco-Mesilla Bolsons Aquifer 47
- Cross sections across the Hueco-Mesilla Bolsons Aquifer 48

Ogallala Aquifer 51
- Total groundwater level declines in the Ogallala Aquifer over the last 60 years 52
- Geologic cross sections showing the relationship of the Ogallala Formation to underlying strata 53

39 008

Pecos Valley Aquifer 57
Generalized cross section across the Pecos Valley Aquifer 58
Distribution of total dissolved solids in wells 59
Interpolated hydraulic conductivity 60
Seymour Aquifer 63
Generalized stratigraphy of the Seymour Aquifer and underlying Permian rocks 64
Trinity Aquifer 67
Estimated total water level declines 68
Structural cross sections across the northern Trinity Aquifer 69
Structural cross section across the Trinity Aquifer in the Hill Country 70

Minor Aquifers

Blaine Aquifer 75
East-west structural cross section across Hardeman County 76
Contour maps of groundwater elevations 77
Blossom Aquifer 79
East-west geologic cross section along the Blossom Aquifer 80
North-south geologic cross section across the Blossom Aquifer 81
Bone Spring–Victorio Peak Aquifer 83
Generalized geologic cross section for northeastern Hudspeth County 84
Water level map for northwestern Hudspeth County 85
Brazos River Alluvium Aquifer 87
Thickness of the Brazos River Alluvium Aquifer 88
Capitan Reef Complex Aquifer 91
Cross section locations overlaying a Digital Elevation Model 92
Stratigraphic cross section of Permian strata exposed in the Guadalupe Mountains 92
Stratigraphic cross section of Permian strata exposed in the Apache Mountains 93
Dockum Aquifer 97
Geologic cross sections along and across the Dockum Aquifer 98
Total dissolved solids in groundwater from the Dockum Aquifer 99
Edwards-Trinity (High Plains) Aquifer 101
Geologic cross sections across the Edwards-Trinity (High Plains) Aquifer 102
Thickness of the Antlers Sand and Cretaceous Limestone 103
Combined thickness of Cretaceous shale 104
Ellenburger-San Saba Aquifer 107
Total dissolved solids for the Ellenburger-San Saba Aquifer 108
Regional north-south cross section across Gillespie County 109
Hickory Aquifer 111
Regional north-south cross section across Gillespie County 112
Gross alpha particle activity in Hickory wells 113
Igneous Aquifer 115
Geologic cross sections across the Igneous Aquifer 116
Thickness of the Igneous Aquifer 117

Lipan Aquifer 121
Geologic cross sections of the Lipan Aquifer in Tom Green County 122
Marathon Aquifer 125
Geologic map of the Marathon Aquifer area 126
Marble Falls Aquifer 129
Total dissolved solids in the Marble Falls Aquifer 130
Structure map for the base of the Marble Falls Formation 131
Nacatoch Aquifer 133
Geologic cross sections along and across the Nacatoch Sand 134
Queen City Aquifer 137
Total dissolved solids and thickness for the Queen City Formation 138
Rita Blanca Aquifer 141
Geologic cross sections across the Rita Blanca Aquifer 142
Rustler Aquifer 145
Geologic cross section across the Rustler Aquifer 146
Structure map at the top of the Rustler Formation 147
Sparta Aquifer 149
Total dissolved solids in the Sparta Aquifer 150
Total sand thickness in the Sparta Aquifer 151
West Texas Bolsons Aquifer 153
Geologic cross section across the northern West Texas Bolsons Aquifer and the southern Presidio Bolson 154
Exposure of Bolson sediments in the southern Presidio Bolson 155
Woodbine Aquifer 159
Structural cross sections along and across Woodbine Group rocks 160
Total dissolved solids from Woodbine Aquifer wells 161
Yegua-Jackson Aquifer 165
Geologic cross sections across the Yegua-Jackson Aquifer 166
Percent-sand maps for the Upper and Lower Yegua layers 167
Percent-sand maps for the Upper and Lower Jackson layers 168
Figure 4-1. Other aquifers recognized by regional water planning groups in Texas 171

39 010

1 Executive Summary

This report is an update to the Texas Water Development Board (TWDB) Report 345, *Major and Minor Aquifers of Texas*, published in 1995 and coauthored by John B. Ashworth and Janie Hopkins. Since the publication of that report more than 15 years ago, a great deal of information has become available through research at universities, state and federal agencies, and private environmental engineering firms as part of the TWDB's Groundwater Availability Modeling Program. The TWDB itself collects a large amount of data annually on water levels and water quality from wells around the state, which is incorporated into its groundwater availability models.

In addition to new research becoming available, the aerial extent of the aquifers has changed since 1995. In the 2007 Texas State Water Plan, the TWDB adjusted the boundaries of the Blaine, Bone Spring–Victorio Peak, Edwards (Balcones Fault Zone), Igneous, Lipan, Ogallala, Pecos Valley (formerly the Cenozoic Pecos Alluvium), Seymour, and Trinity aquifers. These changes are incorporated into the aquifer summaries presented in this report.

The aquifer summaries are short descriptions covering geology, hydrology, and water use, based largely on reports generated through the Groundwater Availability Modeling Program. The summaries are preceded by sections on groundwater in Texas, including the monitoring and modeling programs at the TWDB, a discussion of statewide groundwater issues, a summary of groundwater management in the state, and basic groundwater principles. The latter is included as a layman's guide to the state's groundwater resources.

As in any scientific report, the summary descriptions are based on current and past information. To keep the information current, aquifer descriptions will be updated and posted on the TWDB Web site as new research is completed.

39 011

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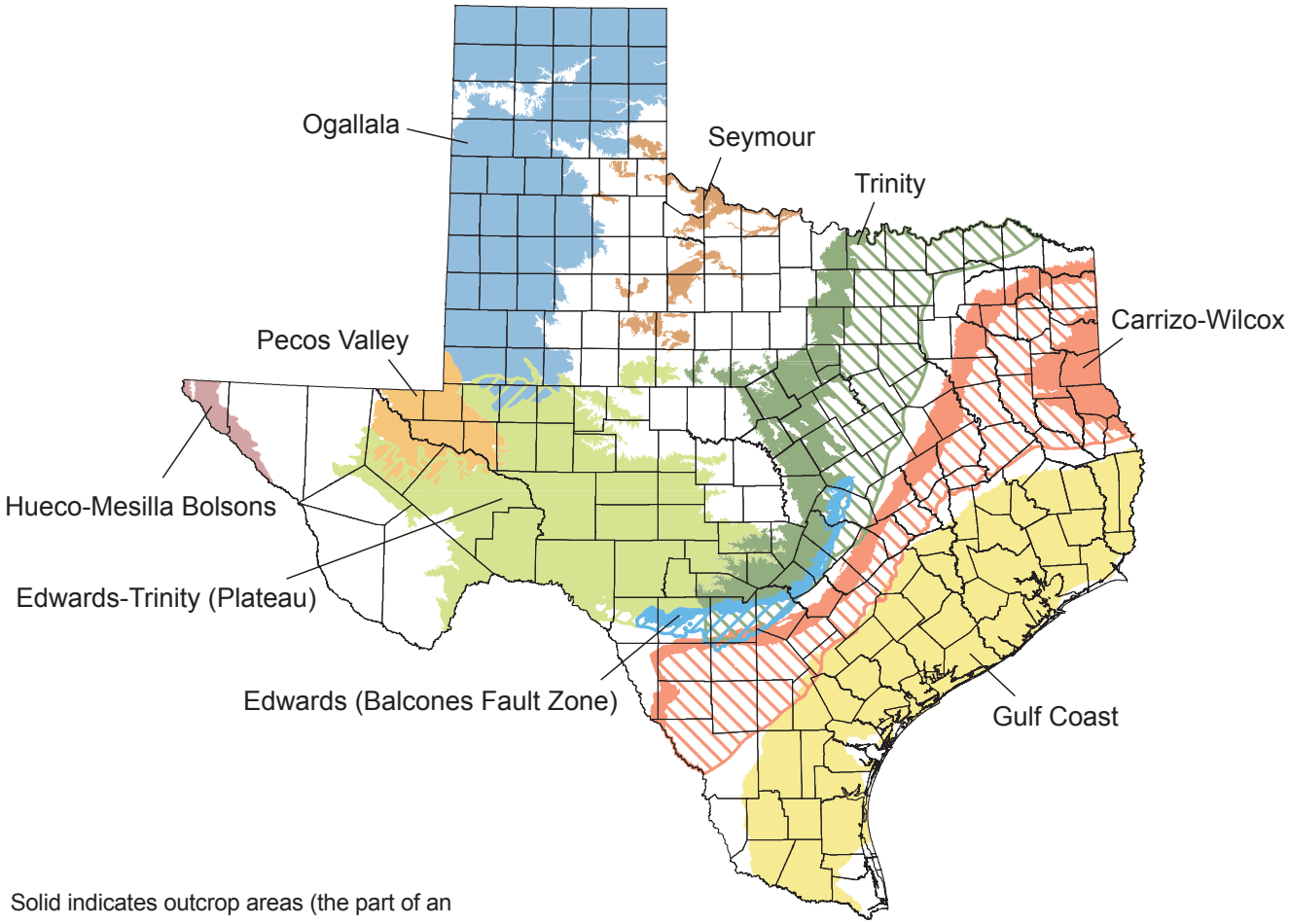
2 Introduction

Texas has numerous aquifers capable of producing groundwater for households, municipalities, industry, farms, and ranches. The Texas Water Development Board (TWDB) recognizes 9 major aquifers—aquifers that produce large amounts of water over large areas (Figure 2-1)—and 21 minor aquifers—aquifers that produce minor amounts of water over large areas or large amounts of water over small areas (Figure 2-2). These aquifers are a critical source of water for Texas, supplying 59 percent of the 15.6 million acre-feet of water used in the state in 2003. About 79 percent of this water is used for irrigation, with irrigators withdrawing most of this water from the Ogallala Aquifer alone (82 percent of all groundwater used for irrigation, or 6.0 million acre-feet per year). About 36 percent of water used to meet municipal demands is from groundwater. The number of aquifers appearing in reports and maps produced by the TWDB, and its predecessor agencies, has changed considerably over the years. In 1961, the



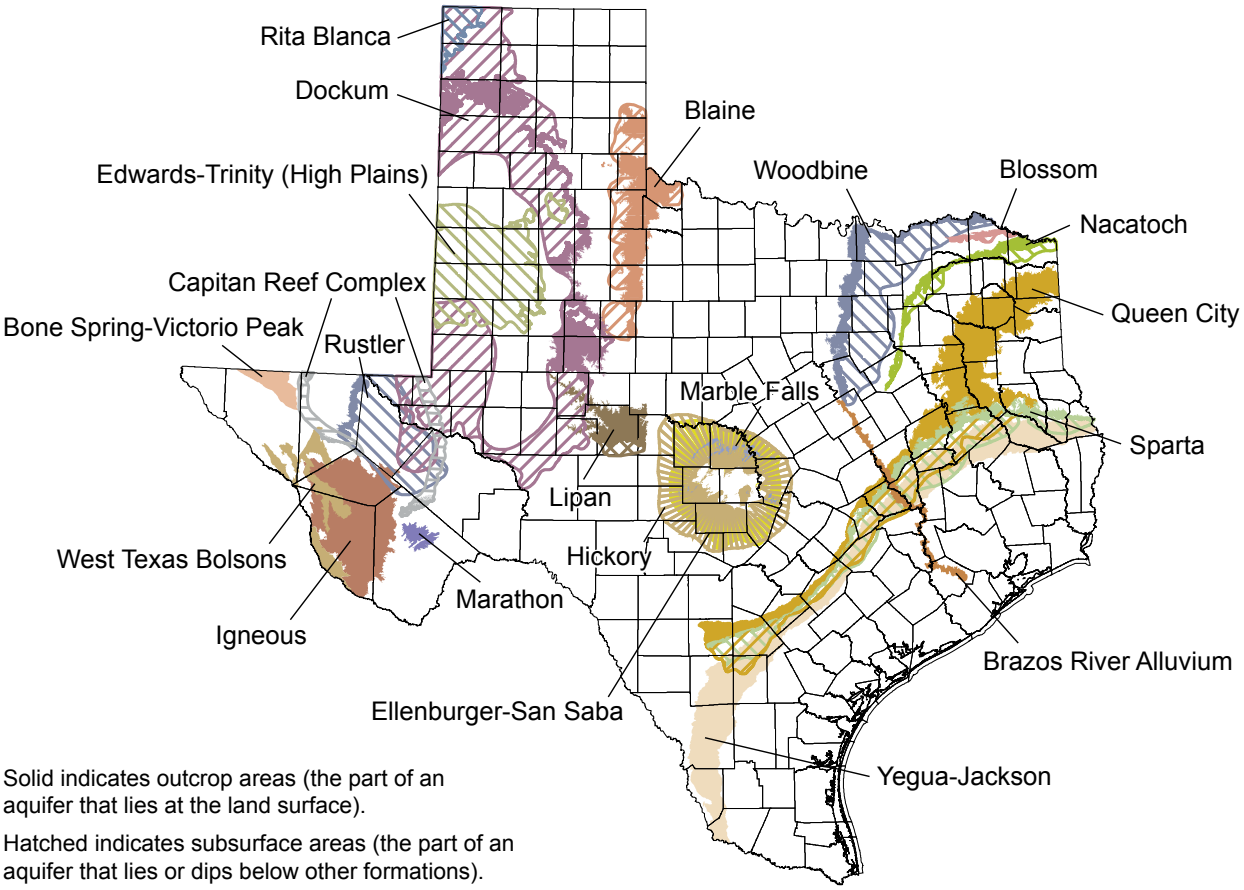
Solid indicates outcrop areas (the part of an aquifer that lies at the land surface).
Hatched indicates subsurface areas (the part of an aquifer that lies or dips below other formations).

Figure 2-1.
The major aquifers of Texas

Texas Board of Water Engineers recognized only nine "principal" aquifers in the first state water plan. By 2002, the number of named aquifers increased to 30 with the addition of the Yegua-Jackson Aquifer. This increase was mainly due to the addition of minor aquifers.

The mapped extent of the aquifers has also changed over time. In the most recent water plan of 2007, the TWDB adjusted the boundaries of the Blaine, Bone Spring–Victorio Peak, Edwards (Balcones Fault Zone), Igneous, Lipan, Ogallala, Pecos Valley (formerly the Cenozoic Pecos Alluvium), Seymour, and Trinity aquifers. These changes were based on groundwater availability modeling and other scientific studies, and comments from the public supported by existing information. The TWDB also changed the name of the Hueco-Mesilla Bolson Aquifer to the Hueco-Mesilla Bolsons Aquifer to reflect that the aquifer is made up of sediments in two separate bolsons: the Hueco Bolson and the Mesilla Bolson.

It should be noted that this report is an update to TWDB reports of Ashworth and Flores (1991) and Ashworth and Hopkins (1995). Since their publication, a great deal of information has become available through research at universities, state and federal agencies, and private environmental



Solid indicates outcrop areas (the part of an aquifer that lies at the land surface).

Hatched indicates subsurface areas (the part of an aquifer that lies or dips below other formations).

The Edwards-Trinity (High Plains) and Rita Blanca aquifers are almost entirely subsurface.

Figure 2-2.
The minor aquifers of Texas

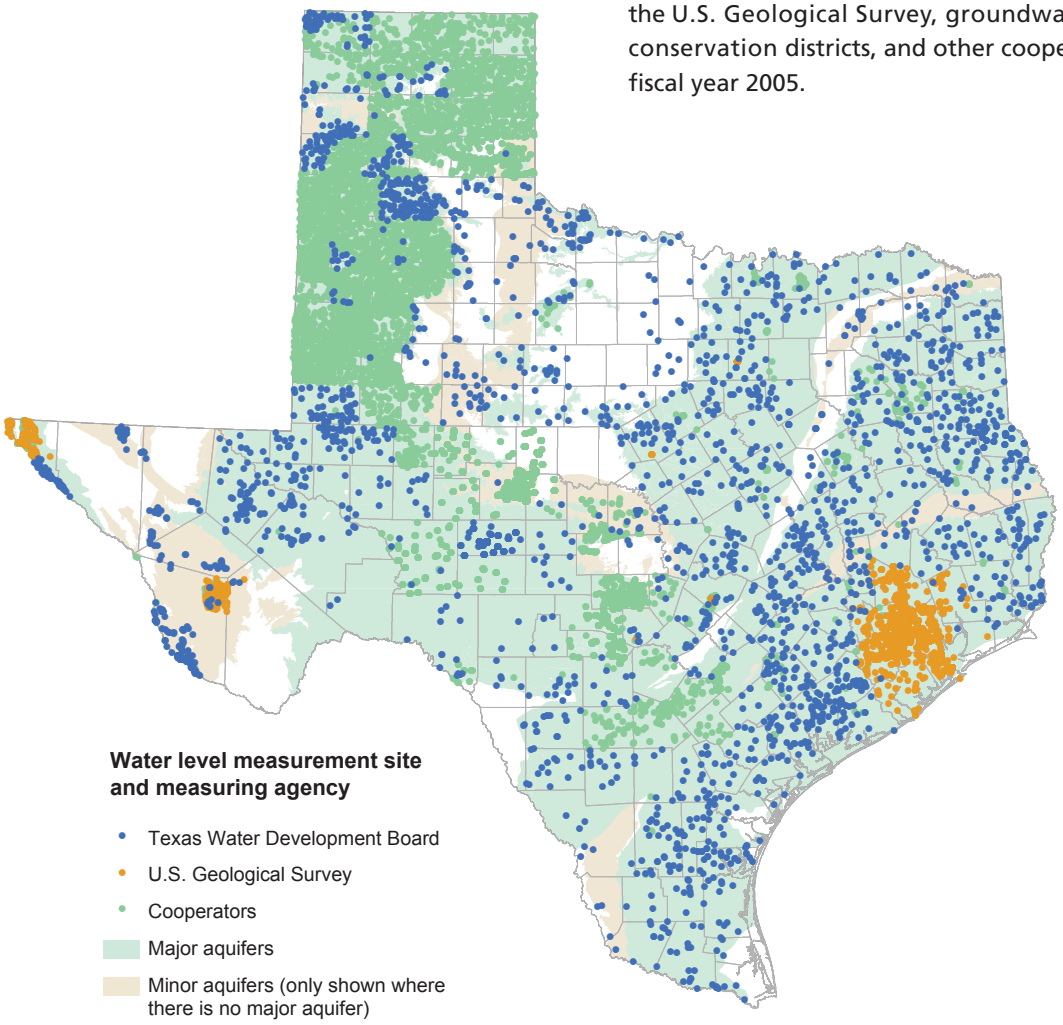


Figure 2-3. Location of wells measured by TWDB, the U.S. Geological Survey, groundwater conservation districts, and other cooperators in fiscal year 2005.

engineering firms as part of the Groundwater Availability Modeling (GAM) Program at the TWDB. The GAM reports have been particularly useful for this report in describing general aquifer characteristics. These characteristics are described at the end of individual reports for each aquifer.

2.1 TWDB Monitoring and Modeling Programs

To assess the quality and quantity of groundwater in Texas, the TWDB operates three monitoring programs that complement other local, state, and federal monitoring programs within the state. The first of the three is the annual groundwater level observation program. Its purpose is to detect trends in water levels over time on a regional basis, to provide support for groundwater management and state and regional water planning, and to collect information for groundwater modeling. In operation since 1957, the program relies on a network of approximately 8,000 observation wells (Figure 2-3). The majority of the wells—86 percent—are in major aquifers, with the remainder in minor or other undesignated aquifers, such as the Rio Grande Alluvium. The TWDB collects more than 2,000 water level measurements each year and receives at least another 11,000 measurements from other organizations, primarily groundwater conservation districts. Once collected, groundwater levels are stored in TWDB's groundwater database and are available on the agency's Web site at http://www.twdb.texas.gov.

The TWDB, along with other entities, operates

a second groundwater level program to detect trends in groundwater levels on a daily basis at more than 100 specific well sites. These water levels are from wells called "recorders" or "recorder wells" equipped to record water levels continuously (Figure 2-4). The information from these wells is transmitted daily to the TWDB, where it is posted on the agency's Web site.

The final program involves monitoring groundwater quality. Its purpose is to monitor natural, or ambient, water quality in each of the state's major and minor aquifers, to observe any trends in water quality over time, and to support state and regional water planning and groundwater management. Sample analyses include major ions, trace elements (primarily metals), and nutrients. The TWDB annually samples water from 600 to 700 sites, and cooperators collect samples from at least 200 more. Most of the samples are collected from wells, but, on occasion, springs are also sampled. Through these collection efforts, all aquifers are sampled once every four to five years, and five or six major and minor aquifers are sampled each year (Figure 2-5). The water quality data collected by the TWDB and other outside

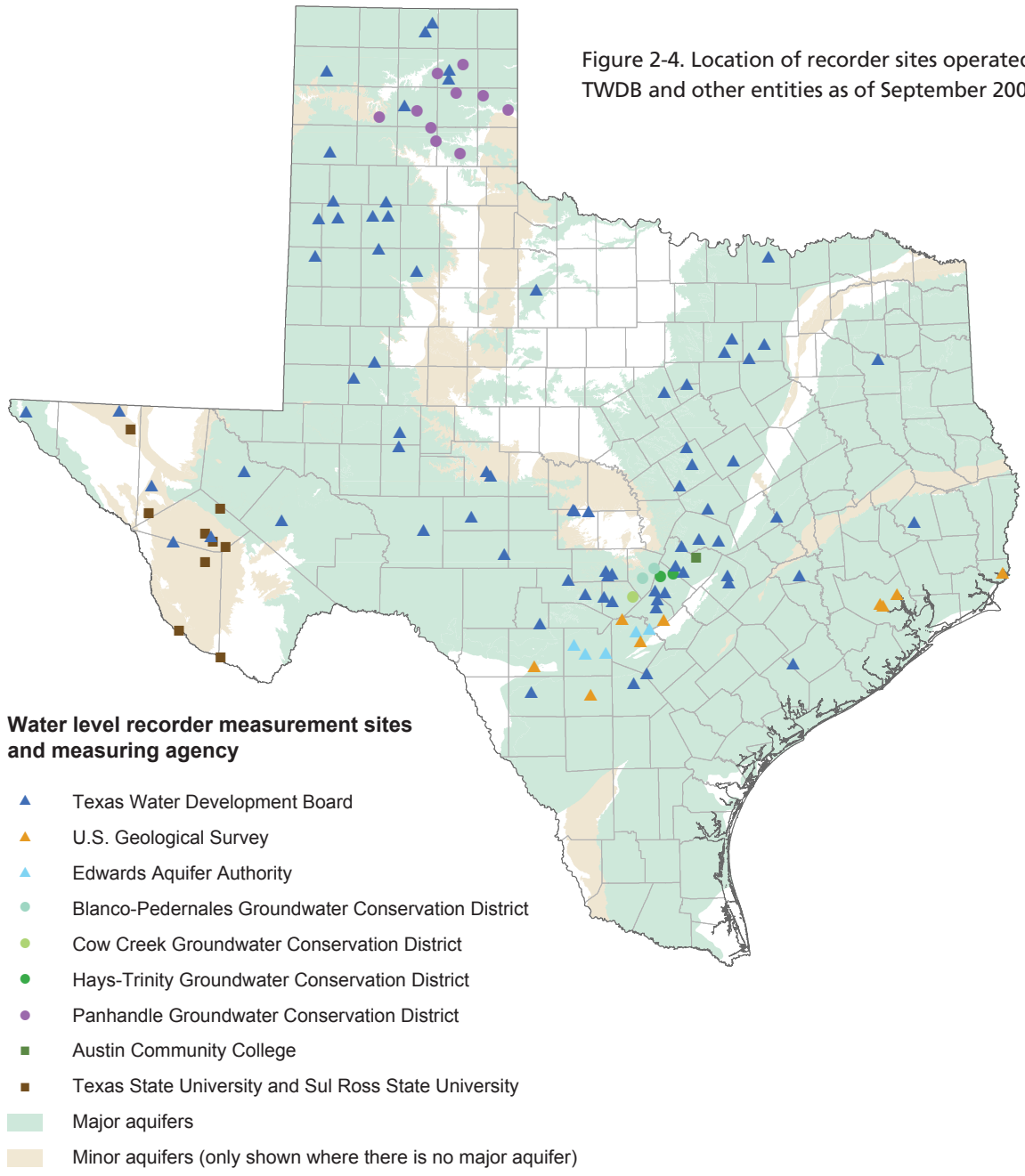


Figure 2-4. Location of recorder sites operated by TWDB and other entities as of September 2006.

groups are stored along with groundwater levels in the TWDB groundwater database. Other local, state, and federal organizations also monitor water quality. Groundwater conservation districts perform water quality analyses, usually at the request of well owners. Their analyses provide a general characterization of water quality based on concentrations of a few key constituents, such as bacteria, nitrate, total dissolved solids, and selected metals. Public water suppliers, as required by the Texas Commission on Environmental Quality, monitor groundwater quality, although generally after treatment. The U.S. Geological Survey collects water quality information in localized parts of the state to assess groundwater conditions and to determine how these conditions change over time and how natural features and human activities affect these conditions.

Groundwater availability models estimate current and future trends in the amount of water available for use from an aquifer. As part of its ongoing effort to provide vital, scientific information to the citizens and policy makers of Texas, the TWDB has obtained or developed models for all major aquifers and 8 of the 21 minor aquifers. In addition, the agency has begun to update some of the initial models and plans to review and update each model every five years.

TWDB groundwater availability models are computer-based, three-dimensional, numerical groundwater flow models that

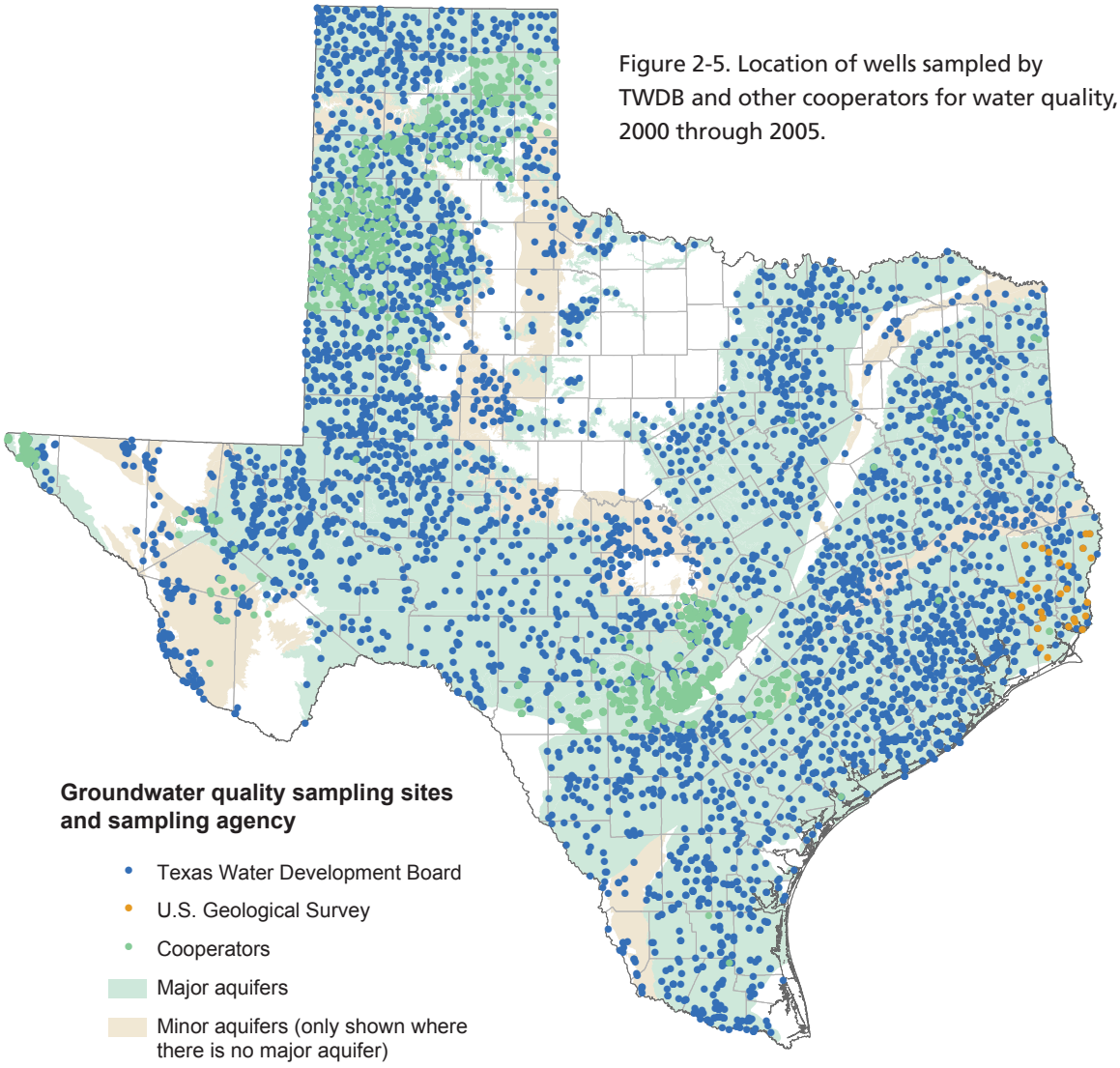


Figure 2-5. Location of wells sampled by TWDB and other cooperators for water quality, 2000 through 2005.

39 017

simulate groundwater flow systems at a regional scale. The models estimate current and future trends in the amount of water available for use from an aquifer. They are meant to be "living tools" that can be updated as new information becomes available, adapted to reflect changing aquifer conditions, or refined to better address the needs and concerns of the groups using them. Because the groundwater availability models simulate large areas, these models allow users to see the big picture and understand groundwater flow through all or large parts of an aquifer. Complex physical parameters such as hydrogeologic properties, groundwater levels, pumpage, recharge, aquifer geometry, and groundwater–surface water interactions are simplified into mathematical equations that the model solves. The models are then calibrated using historically measured water levels, spring flows, and base flows to streams and rivers as targets.

Once an initial model has been created and calibrated, it becomes a tool that groundwater conservation districts, planning groups, and others can use to estimate groundwater availability and predict future water levels and regional groundwater flow in their aquifers on the basis of different scenarios. Ongoing refinement and improvement of the groundwater availability models are essential to addressing the needs and concerns of these various entities so that they can manage and plan the use of groundwater supplies. To view modeling reports, request a model, or check the status of the program, visit the TWDB Web site.

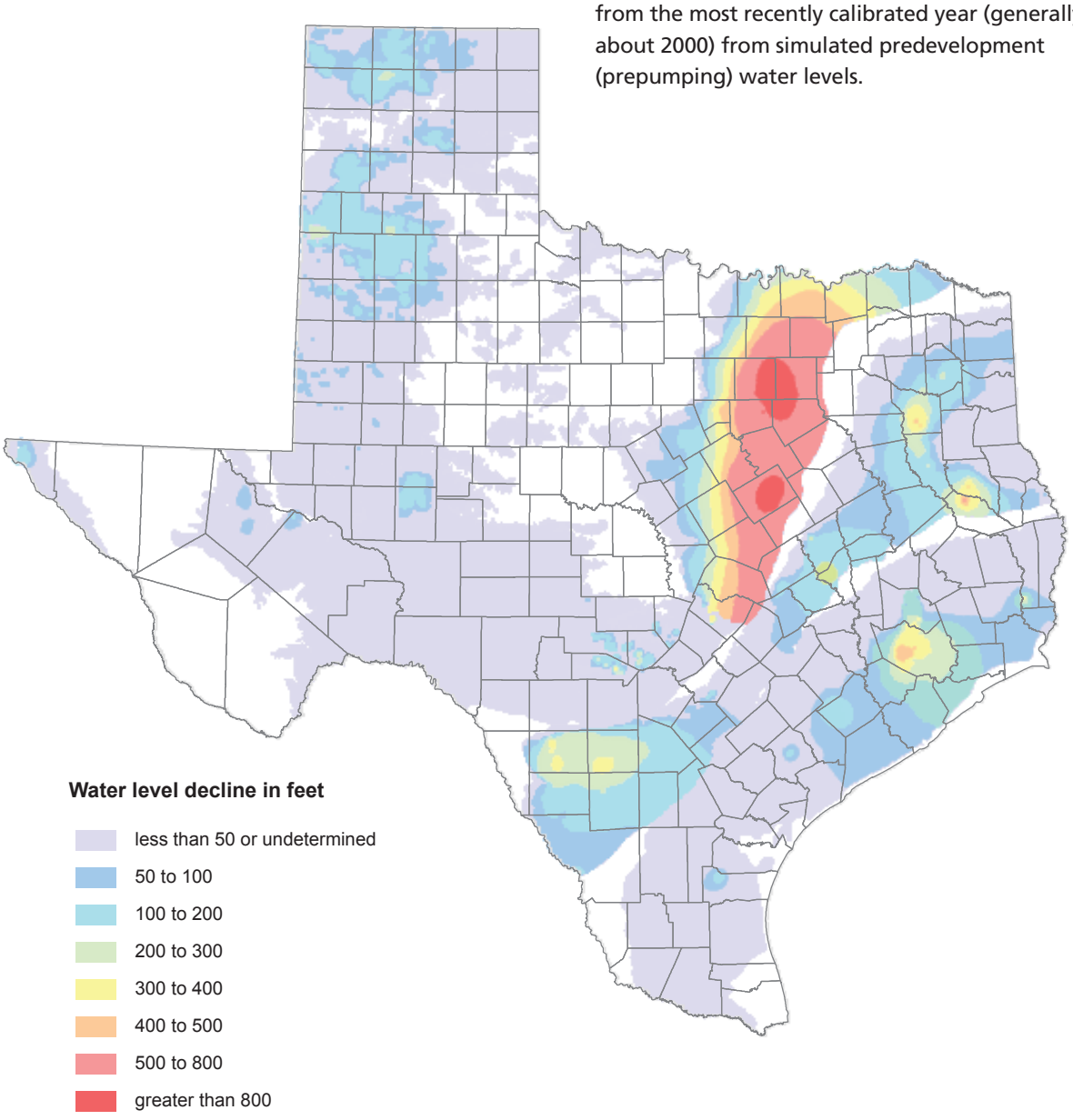
2.2 Statewide Groundwater Issues

2.2.1 Water Levels

TWDB monitoring of water wells throughout the state has identified areas of significant water level declines (Figure 2-6). Total water level declines in the state's aquifers range from less than 50 feet to more than 1,000 feet. The largest water level declines are in the Trinity Aquifer, focused in the Dallas–Fort Worth and Waco areas (Figure 2-6). One hundred years ago wells in much of the Trinity Aquifer flowed at the surface, releasing so much artesian pressure that most ceased to flow by the mid-1910s. Other areas of large water level declines are in the Carrizo-Wilcox Aquifer in the Winter Garden irrigation area north of Laredo; near Lufkin, Nacogdoches, and Tyler; and in the Gulf Coast Aquifer near Houston. Water levels in the Ogallala Aquifer have also declined more than 200 feet. All of these water level declines have been caused by groundwater withdrawals, primarily since the 1950s. Before the 1950s, it is estimated

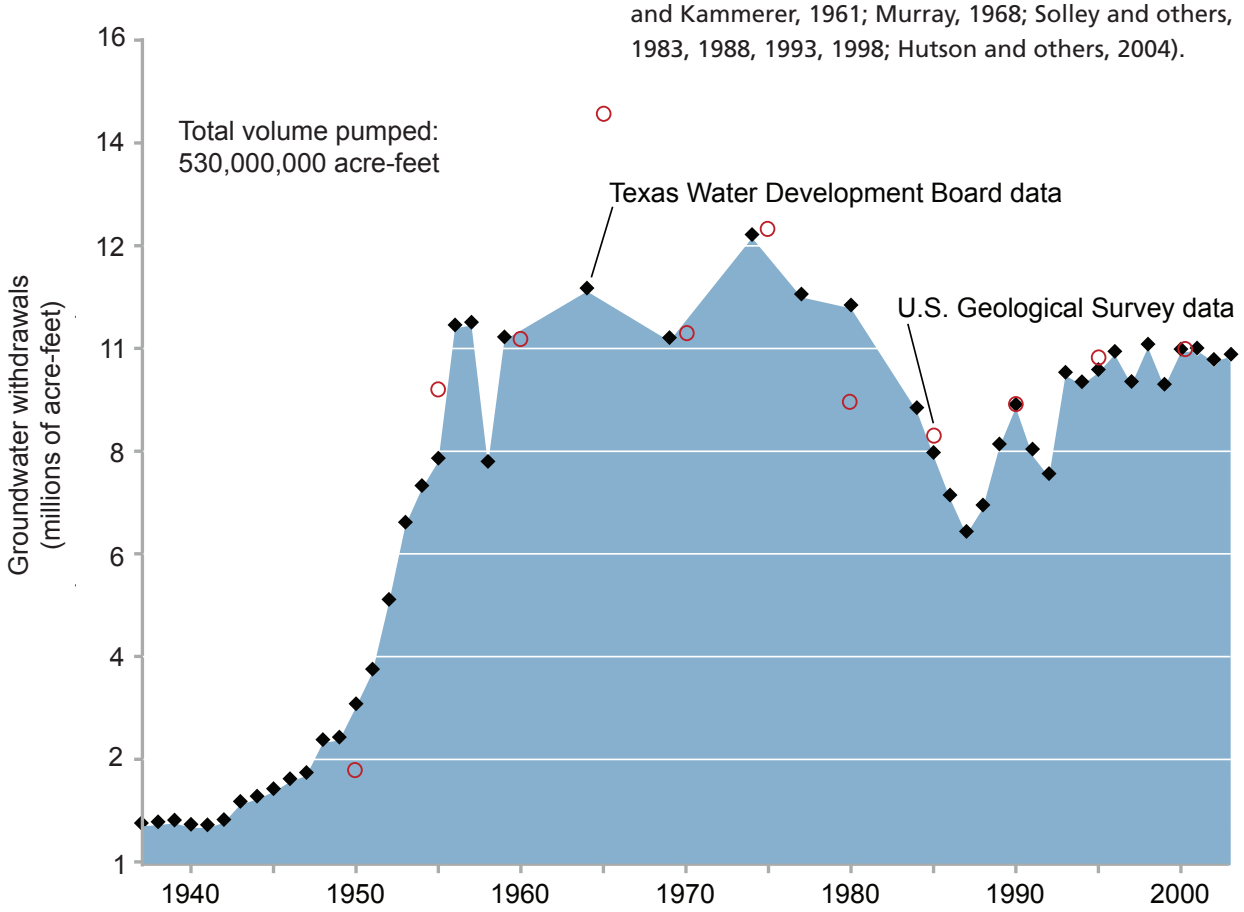
39 018

Figure 2-6. Estimated total water level declines in the major aquifers of Texas. Water level declines in the eastern part of the state tend to be declines in artesian pressure, whereas water level declines in the western part of the state tend to be declines in the water table. These estimates are from the groundwater availability models and are calculated by subtracting water levels from the most recently calibrated year (generally about 2000) from simulated predevelopment (prepumping) water levels.



39 019

Figure 2-7. Historical estimates of groundwater withdrawals from the aquifers of Texas (data from the TWDB water use database; MacKichan, 1951, 1957; MacKichan and Kammerer, 1961; Murray, 1968; Solley and others, 1983, 1988, 1993, 1998; Hutson and others, 2004).



that Texans withdrew less than 2 million acre-feet of groundwater per year (Figure 2-7). After the 1950s, groundwater withdrawals have been estimated to be about 10 million acre-feet per year. (TWDB estimates withdrawals of about 9.2 million acre-feet in 2003). Between 1937 and 1993, about 530 million acre-feet of groundwater was withdrawn from the aquifers of Texas.

Between 1994 and 2004, water levels in the state's aquifers declined in some parts of the state and rose in others. Water levels continued to decline in much of the Ogallala Aquifer in West Texas, with declines greater than 40 feet in parts of the aquifer. However, other parts of the Ogallala Aquifer showed water level rises, presumably due to increased recharge resulting from fallow fields in areas of dry land farming. Water levels have risen more than 40 feet in 10 years in the Houston area because of reduced pumping to prevent land subsidence. Water levels have fallen more than 40 feet, however, in the suburbs north of Houston.

2.2.2 Groundwater Quality

Although the vast majority of groundwater used for drinking in Texas meets state and federal requirements for safety, in some parts of the state naturally occurring levels of total dissolved solids, arsenic, and radionuclides, as well as human-caused contamination, prevent the water from meeting those standards.

Total dissolved solids are a measure of the salinity of water and represent the amount of minerals dissolved in water, generally reported as milligrams per liter of water. If water is too saline, then it may not be drinkable without treatment, or it may not be suitable for

irrigation. Water with total dissolved solids less than 1,000 milligrams per liter is considered fresh and is generally usable. Water with total dissolved solids of as much as 1,500 milligrams per liter may be used to irrigate crops, depending on the type of crop and the levels of salt, sodium, carbonate, bicarbonate, nitrogen, and boron. Water with total dissolved solids as high as 3,000 milligrams per liter may still be used for livestock. Water with total dissolved solids between 1,000 and 10,000 milligrams per liter, also called brackish groundwater, is a potential source of water for desalination. Much of the water in the state's aquifers is fresh; however, brackish groundwater is more common than fresh groundwater in the southern Gulf Coast area and in large parts of West Texas (Figure 2-8).

Although arsenic can occur both naturally and through human contamination, most of the arsenic in Texas groundwater is naturally occurring. Arsenic is a concern in drinking water because high levels of it can cause cancer and other health problems. Since January 2006, arsenic has become more of a concern because at that time the U.S. Environmental Protection Agency lowered the maximum acceptable level of arsenic in drinking water from 50 micrograms per liter to 10 micrograms per liter. Because this maximum acceptable level was lowered, many communities in Texas will now have to treat their

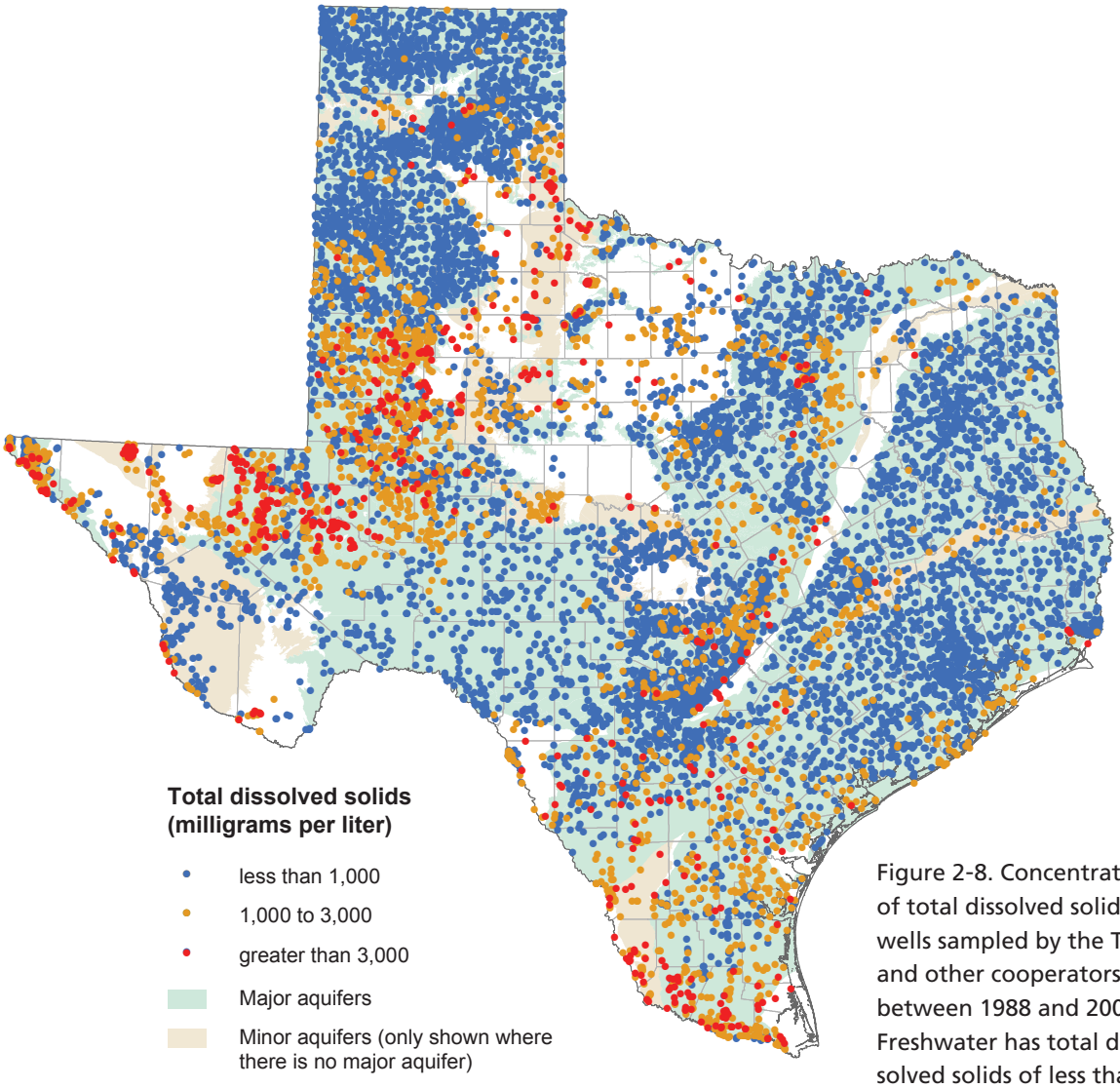


Figure 2-8. Concentration of total dissolved solids in wells sampled by the TWDB and other cooperators between 1988 and 2004. Freshwater has total dissolved solids of less than 1,000 milligrams per liter.

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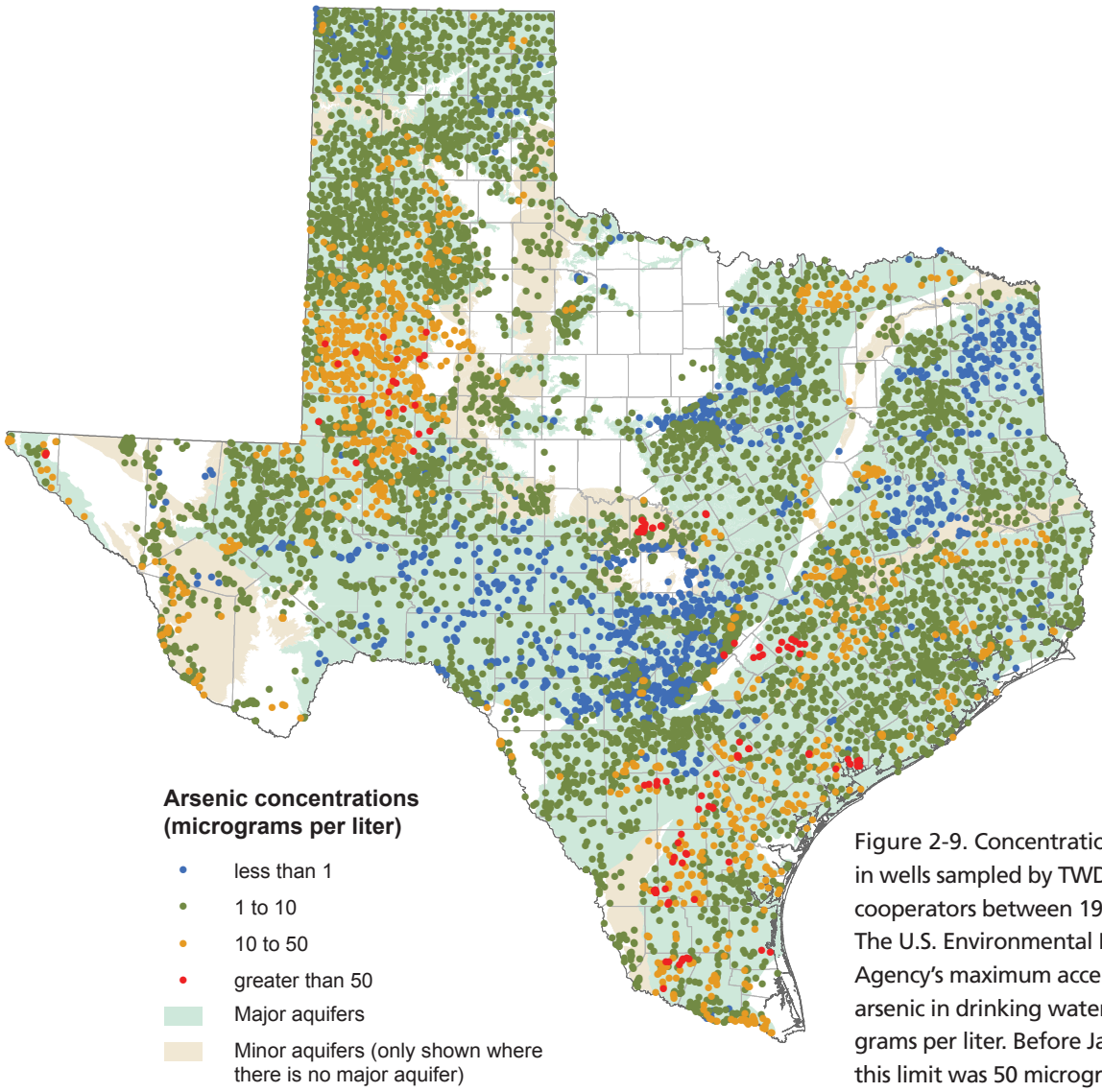

Figure 2-9. Concentration of arsenic in wells sampled by TWDB and other cooperators between 1988 and 2004. The U.S. Environmental Protection Agency's maximum acceptable limit for arsenic in drinking water is 10 micrograms per liter. Before January 2006, this limit was 50 micrograms per liter.

groundwater, blend it with another source, or find an alternative source of supply. Most of the groundwater in Texas with arsenic concentrations greater than 10 micrograms per liter is in southeast Texas in the Gulf Coast Aquifer, in West Texas in the southern half of the Ogallala Aquifer, and in parts of Far West Texas in the Hueco-Mesilla Bolsons and West Texas Bolsons aquifers (Figure 2-9).

A radionuclide is an atom having an unstable nucleus that emits radiation. One measure of radionuclides is gross alpha radiation, which represents the radiation emitted from uranium, radium, and radon. If groundwater contains enough radionuclides—most commonly radium, uranium, and radon gas—and if large enough quantities are consumed over time, there may be enough radiation to cause cancer and other health problems. The U.S. Environmental Protection Agency has set the maximum acceptable level of gross alpha radiation in drinking water at 15 picocuries per liter. Most groundwater in Texas with gross alpha radiation greater than the maximum acceptable level is found in the Hickory Aquifer in Central Texas and the Dockum Aquifer of West Texas (Figure 2-10). The Edwards-Trinity (Plateau), Gulf Coast, and Ogallala aquifers also have significant numbers of wells with high levels of gross alpha radiation. Although

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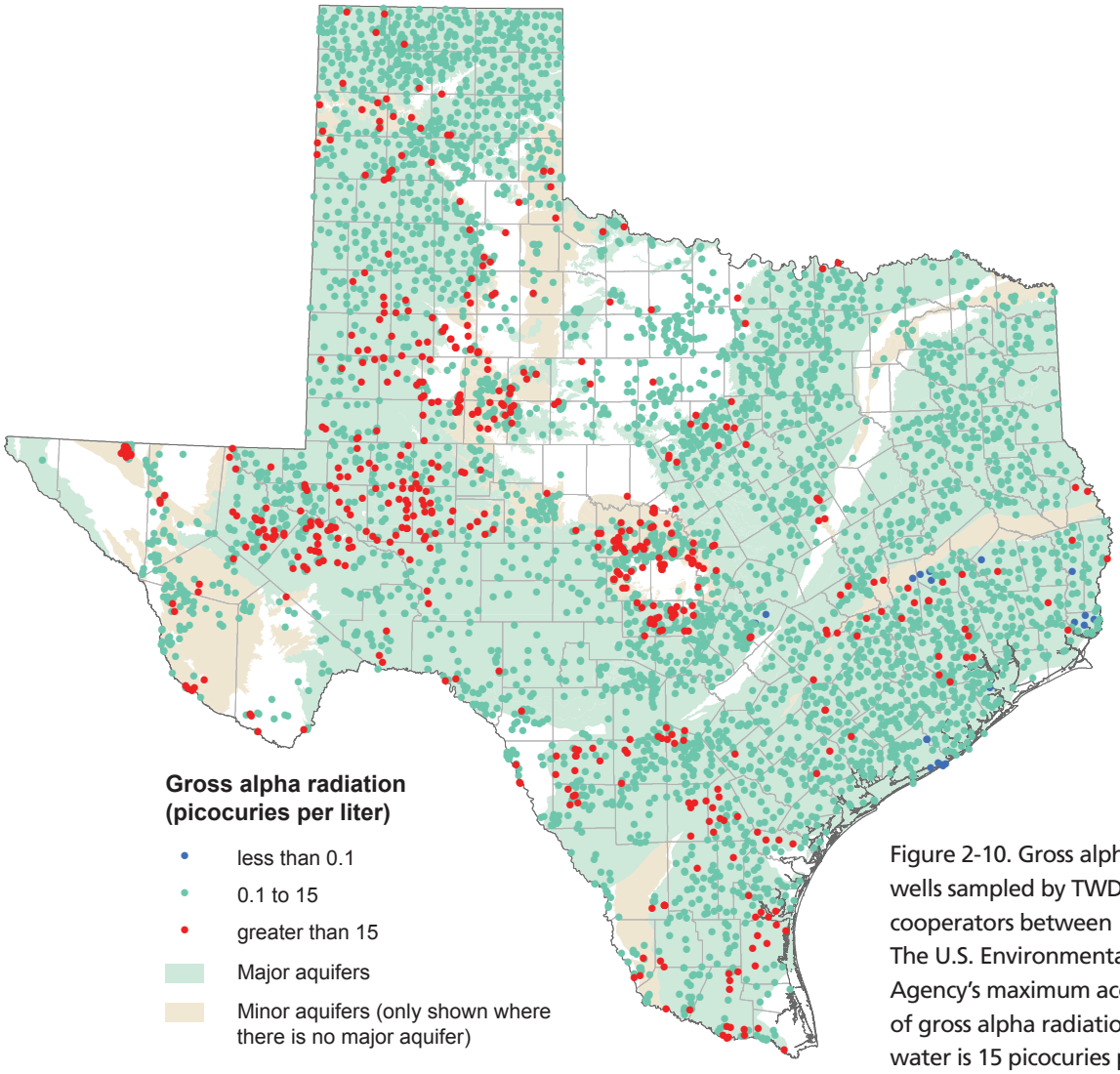


Figure 2-10. Gross alpha radiation in wells sampled by TWDB and other cooperators between 1988 and 2004. The U.S. Environmental Protection Agency's maximum acceptable limit of gross alpha radiation for drinking water is 15 picocuries per liter.

contamination from human activity can be a source of radionuclides, most of the radionuclides in Texas groundwater occur naturally. Where radionuclides are found in drinking water supplies, communities and water providers must treat the groundwater, blend it with another source, or find an alternative source of drinking water.

Although nitrate exists naturally in groundwater, elevated levels generally result from human activities, such as overuse of fertilizer and improper disposal of human and animal wastes. High levels of nitrate in groundwater often coexist with other contaminants: if the source is human and animal wastes, then bacteria, viruses, and protozoa are often present; if the source is fertilizer, then herbicides and pesticides are commonly found. The U.S. Environmental Protection Agency has established a maximum acceptable level of nitrate in drinking water of 10 milligrams of nitrogen per liter and 44.3 milligrams per liter of nitrogen oxide. Groundwater in Texas that exceeds this limit is located mostly in the Ogallala and Seymour aquifers, although parts of the Edwards-Trinity (High Plains), Dockum, and Trinity aquifers also have high levels of nitrate (Figure 2-11). High levels of nitrate in water can cause methemoglobinemia, referred to as "blue baby syndrome," in infants under six months of age.

39 023

2.2.3
Supply and Availability

Existing groundwater supply is the amount of groundwater that can be produced with current permits and existing infrastructures on an annual basis. Because permits and existing infrastructure, such as wells and pipelines, limit how much groundwater can be produced, groundwater supply can be—and often is—less than the total amount of groundwater that can be produced from an aquifer.

Regional water planning groups in Texas estimated that existing groundwater supplies would be about 8.5 million acre-feet per year in 2010 and decline 32 percent to about 5.8 million acre-feet per year by 2060 (Figure 2-12). The decline is due primarily to reduced supply from the Ogallala Aquifer as a result of depletion (reduction of about 2.5 million acre-feet per year by 2060), as well as reduced supply from the Gulf Coast Aquifer due to mandatory reductions in pumping to prevent land surface subsidence (reduction of about 160,000 acre-feet per year by 2060). In most cases, groundwater supplies either remain at current amounts or decrease by 2060.

Groundwater availability is the amount of water from an aquifer that is available for use. One might think that the amount of groundwater available for use is all of the water in the aquifer; however, that may not be—and probably is not—the case. Whereas groundwater supplies are limited by permits and existing infrastructure, groundwater availability is limited by law, groundwater management goals and rules, and planning group policy.

Total groundwater availability in 2010, as assessed by the planning groups, is about 12.7 million acre-feet per year (Figure 2-13). Because of projected decreases in availability in the Dockum, Edwards-Trinity (High Plains), Gulf Coast, Ogallala, and Seymour aquifers, this availability decreases to 9.9 million acre-feet per year by 2060.

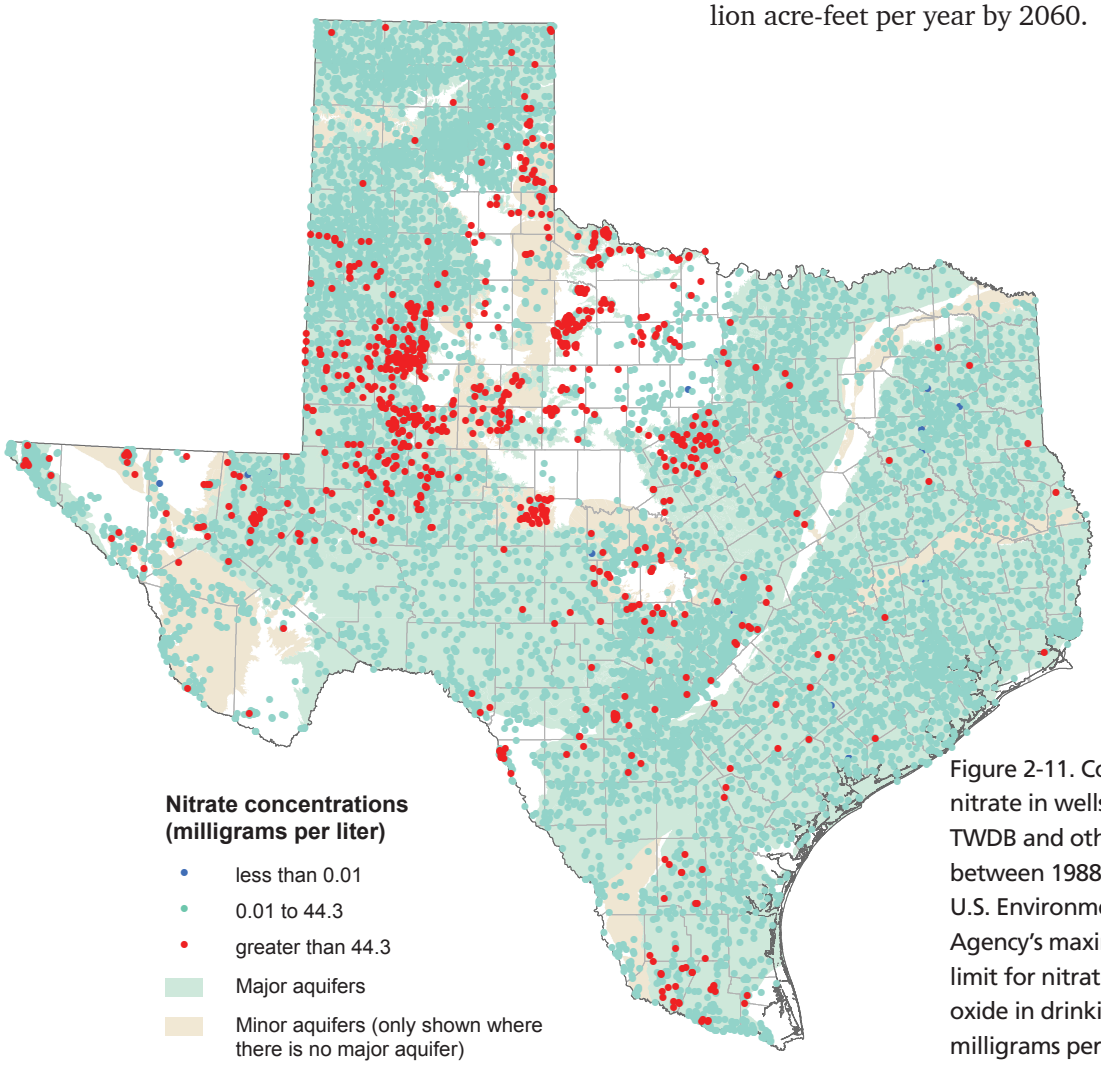


Figure 2-11. Concentration of nitrate in wells sampled by TWDB and other cooperators between 1988 and 2004. The U.S. Environmental Protection Agency's maximum acceptable limit for nitrate as nitrogen oxide in drinking water is 44.3 milligrams per liter.

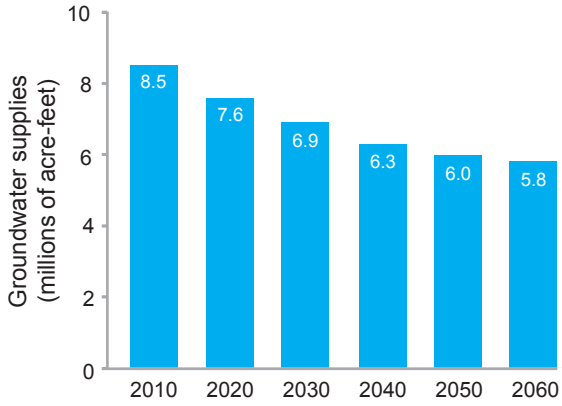
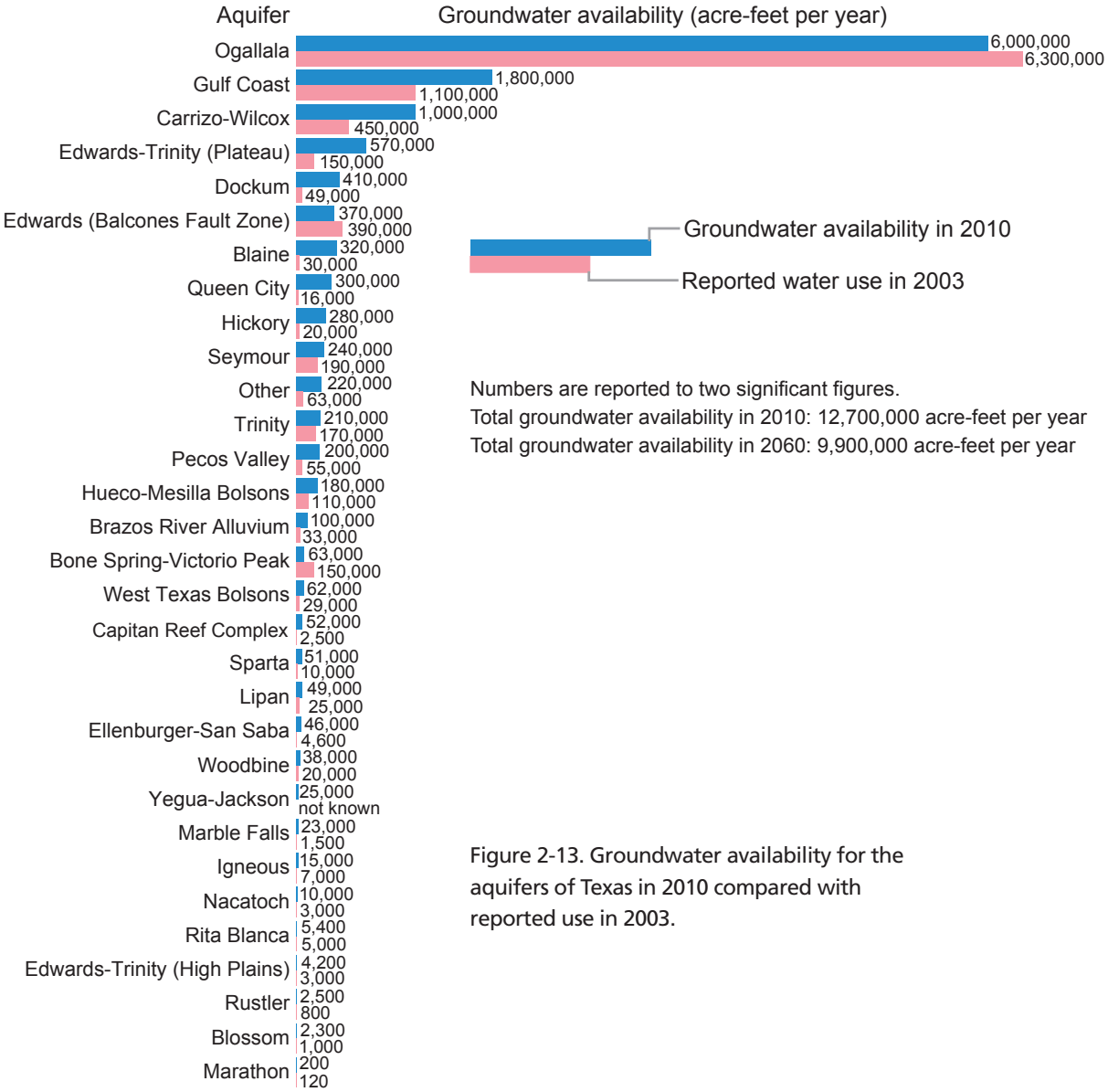


Figure 2-12. Projected existing groundwater supplies through 2060.



Numbers are reported to two significant figures.
Total groundwater availability in 2010: 12,700,000 acre-feet per year
Total groundwater availability in 2060: 9,900,000 acre-feet per year

Figure 2-13. Groundwater availability for the aquifers of Texas in 2010 compared with reported use in 2003.

39 025

2.3 Groundwater Management

In 1949, the legislature passed regulations establishing groundwater conservation districts as political subdivisions of the state (Figure 2-14). The districts originated as a way of establishing local control of groundwater resources, as opposed to state control. Over the past 60 years, a total of 120 districts have sprung up. As of September 2010, Texans have created 96 districts serving around 66 percent of the land area. In areas without groundwater conservation districts, the common law rule of capture prevails, with the exception of any applicable county subdivision or city rules, if they exist. More information on groundwater conservation districts is available on the TWDB Web site.

The common law rule of capture was the basis for groundwater ownership prior to the development of groundwater management by district. The Texas judicial system heard the first groundwater dispute case in 1904, explicitly establishing rule of capture as the basis for groundwater ownership. This rule meant that landowners retain the right to capture and beneficially use groundwater from their property. Furthermore, this decision allows landowners having superior pumping capability to ignore conservation

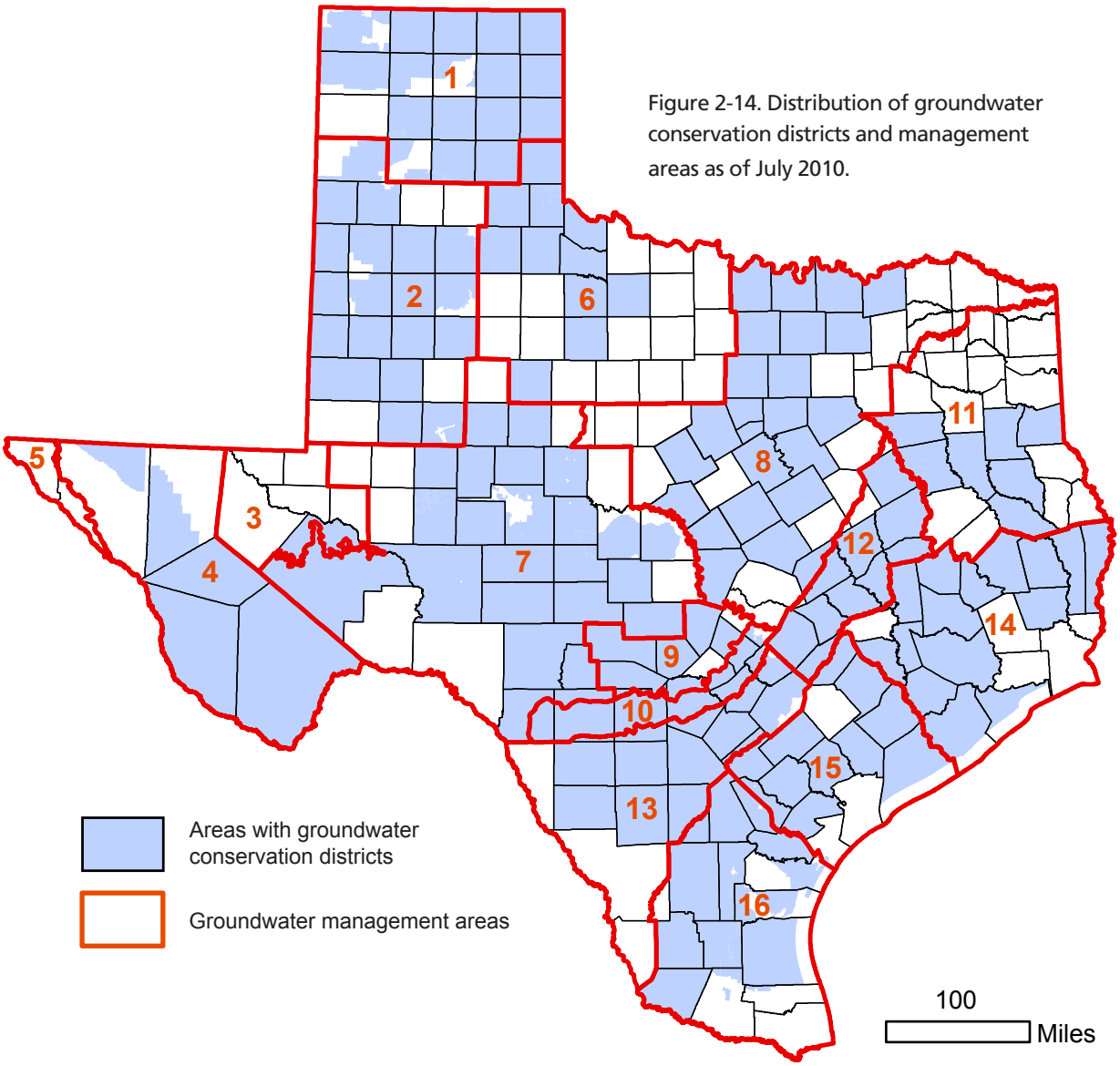


Figure 2-14. Distribution of groundwater conservation districts and management areas as of July 2010.

and to pump and pull groundwater into their well from surrounding properties and extract it without redress. Although the 1917 Texas Constitution addresses the state responsibility for conserving natural resources, it does not address groundwater specifically. Since then, the definition of water conservation has changed—conserving used to mean using water before it ran off property or traveled downstream in rivers to the Gulf of Mexico, quite the opposite of what it means today.

Texas Water Code Chapter 36 delineates the fundamental rules under which each district must operate. Through Chapter 36, groundwater conservation districts modify the rule of capture by respecting private ownership rights but reserve the option to register, permit, and establish production limitations or fees on the exploration and production of groundwater. According to Texas Water Code §36.117, all districts must exempt wells capable of producing up to or equal to 25,000 gallons per day, but they may choose to increase that amount. This exemption is restricted to domestic wells or wells serving as water supply for livestock or poultry on a 10-acre or larger piece of land. Wells permitted by the Railroad Commission of Texas for oil and gas operations are also exempt. Each district's enabling legislation or petition language indicates additional specific guidelines for that particular district to follow. Not all districts issued production permits, but in each district management plan, required by Senate Bill 1 in 1997, districts established the total usable amount of groundwater in the district, or groundwater availability.

In 2005, the legislature modified the process of establishing groundwater availability. Rather than allowing each district to develop an amount for its management plan, the legislature introduced a new collaborative process. Prior to that, in 2002, TWDB established 16 groundwater management areas, on the basis of aquifer and political boundaries, covering the entire state (Figure 2-14). These areas are composed of groundwater conservation districts within these areas, and each district has a vote on the future state of the aquifers in the region. The preferred state of an aquifer over the ensuing 50 years is called the desired future condition. Once a desired future condition is established, it is used to generate a quantity of groundwater that can be permitted—called managed available groundwater—to maintain or reach this adopted condition. Managed available groundwater is an annual rate used for issuing permits and is included in the regional water plans as the groundwater availability. Examples of desired future conditions include average drawdown rates and spring flow rates. At least every five years, or more often if the groundwater conservation districts choose, the districts consider and adopt desired future conditions for the relevant aquifers in their area.

2.4 Basic Groundwater Principles

Geologic *formations* are laterally continuous rock units having distinct lithologic characteristics that allow recognition and mapping from one outcrop or well to another. *Aquifers* are delineated by a formation or group of formations. Aquifers consist of subsurface rock or sediment that is porous and permeable. *Porosity* is the volume of pore space in rock or sediment, usually expressed as a percentage. This pore space can include openings between grains, fractures, and caverns. *Permeability* is a measure of how well a material can transmit water. Materials like gravel transmit water quickly and have high values of permeability. Materials such as shale transmit water poorly and have low permeability values. Permeability is primarily determined by the size of the pore spaces and their degree of interconnection.

Some of the largest aquifers in Texas, including the Ogallala, Gulf Coast, and Carrizo-Wilcox, consist of sedimentary rocks with intergranular porosity and relatively high permeability. Limestone aquifers, such as the Edwards (Balcones Fault Zone) Aquifer, contain water in crevices and caverns caused mainly by dissolution of the limestone by groundwater. The Igneous Aquifer in West Texas is an example of where groundwater flows through cracks, fractures, and joints developed in more competent igneous and volcanic rocks.

In addition to being porous and permeable, an aquifer must be able to store and transmit significant quantities of water. A measure of

39 027

the ability of an aquifer to transmit water is its *hydraulic conductivity*. Hydraulic conductivity is defined as the volume of water that will move in a porous medium in a unit time under a unit hydraulic gradient through a unit area measured at right angles to the direction of flow. In contrast to permeability, it is a function of the properties of the liquid as well as of the porous medium. A measure of an aquifer's ability to store water is its storativity value. *Storativity* is the volume of groundwater that an aquifer will release (or gain) per unit decline (or rise) in hydraulic head per unit area of aquifer (Figure 2-15). In an unconfined aquifer, the storativity value is equal to the specific yield. The *specific yield* represents the volume of groundwater released by pore-water drainage per unit drop in the water table per unit (horizontal) area of unconfined aquifer.

Unconfined aquifers are sometimes referred to as "water table aquifers." An unconfined aquifer is one in which the water table is at or near atmospheric pressure and is the upper boundary of the aquifer. Because the aquifer is not under pressure, the water level in a well is the same as the water table outside the well (Figure 2-15). Water levels in a well from an unconfined aquifer rise and fall in response to changes in recharge and discharge. When water levels decline, water physically drains from the aquifer from the higher water level to the lower water level. *Recharge* is the amount of water that infiltrates to the water table of an aquifer. This water may come from precipitation, streams, and lakes directly into a formation. Generally, only a small portion of the total precipitation seeps down through the soil to reach the water table. Among the factors that influence the amount of recharge to an aquifer are the amount and frequency of precipitation; the areal extent of the outcrop or recharge area; the topography, type and amount of vegetation, and condition of soil cover in the outcrop area; and the ability of the aquifer to accept recharge and transmit it to areas of discharge. *Discharge* is the loss of water from an aquifer by either artificial or natural means. Artificial discharge occurs from flowing and pumped water wells, from drainage ditches, gravel pits, or other excavations that intersect the water table. Natural discharge occurs as springs, evaporation, transpiration, and leakage between formations.

Confined aquifers are sometimes referred

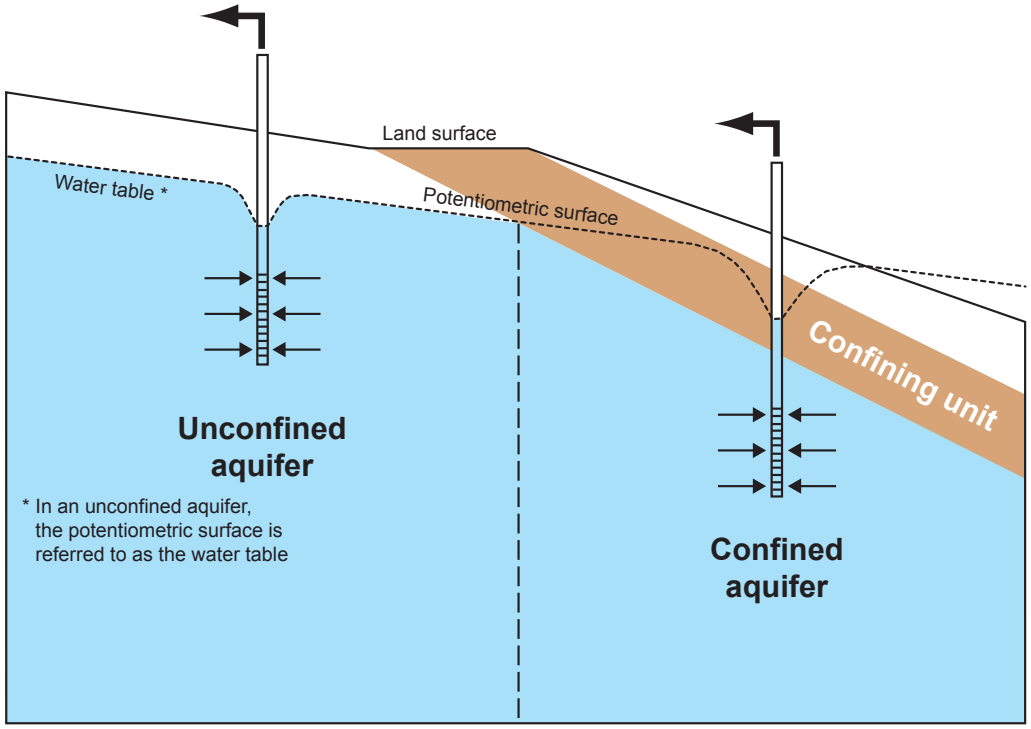


Figure 2-15. Schematic diagram showing unconfined and confined aquifers separated by a confining unit. Note that the dashed line represents the potentiometric surface for the confined aquifer.

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to as “artesian aquifers.” These aquifers are overlain by confining units, such as clay and shale layers that do not readily transmit groundwater (Figure 2-15). These aquifers usually occur well below the land surface, are completely saturated with groundwater, and are under pressure. Because of this pressure, water in wells penetrating confined aquifers rises above the top of the aquifer. In some cases, water levels may rise above the land surface, resulting in a flowing well. The level to which water rises in a confined aquifer is the potentiometric surface of the confined aquifer. Pumping of wells reduces the water pressure in the aquifer, resulting in a lowering of the potentiometric surface even though the aquifer continues to be fully saturated.

Groundwater moves from areas of recharge to areas of discharge, or from points of higher water level to points of lower water level. Under normal artesian conditions, movement of groundwater is usually in the direction of the aquifer’s regional dip. Under water table conditions, the slope of the water table, and consequently the direction of groundwater movement, is usually closely related to the slope of the land surface. However, in the case of both artesian and water table conditions, local anomalies develop in which some water moves toward areas of groundwater pumping. When a water well is pumped, water levels in the vicinity are drawn down in the shape of an inverted cone with its apex at the pumped well (Figure 2-15). The development of these *cones of depression* depends on the aquifer’s ability to store and move water and on the rate of pumping. If the cone of one well overlaps the cone of another, additional lowering of water levels will occur as the wells compete for the same water.

The rate of groundwater movement in an aquifer is normally very slow, in the magnitude of a few feet to a few hundred feet per year. The rate of movement in a limestone aquifer, such as the Edwards (Balcones Fault Zone) Aquifer, is relatively greater than that in a sandstone aquifer, such as the Carrizo-Wilcox Aquifer, and can be miles per day.

39 029

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3 Aquifer Summaries

Aquifers summaries are listed in this section alphabetically in major and minor categories, along with additional references. The content for their description comes from TWDB reports and maps, TWDB groundwater availability modeling studies, scientific studies from outside institutions, and data from regional water planning groups in Texas. As TWDB groundwater availability modeling reports and other outside studies are completed or updated, this information will be incorporated into individual aquifer descriptions posted on the agency's Web site.

Photo (next page)

The Fort Terrett Formation of the Edwards-Trinity (Plateau) Aquifer west of Kerrville along Interstate 10. The Fort Terrett Formation is part of the Edwards Group and consists of carbonate rocks deposited in supratidal, intertidal, and subtidal depositional settings. It has a complex diagenetic history that affects groundwater flow.

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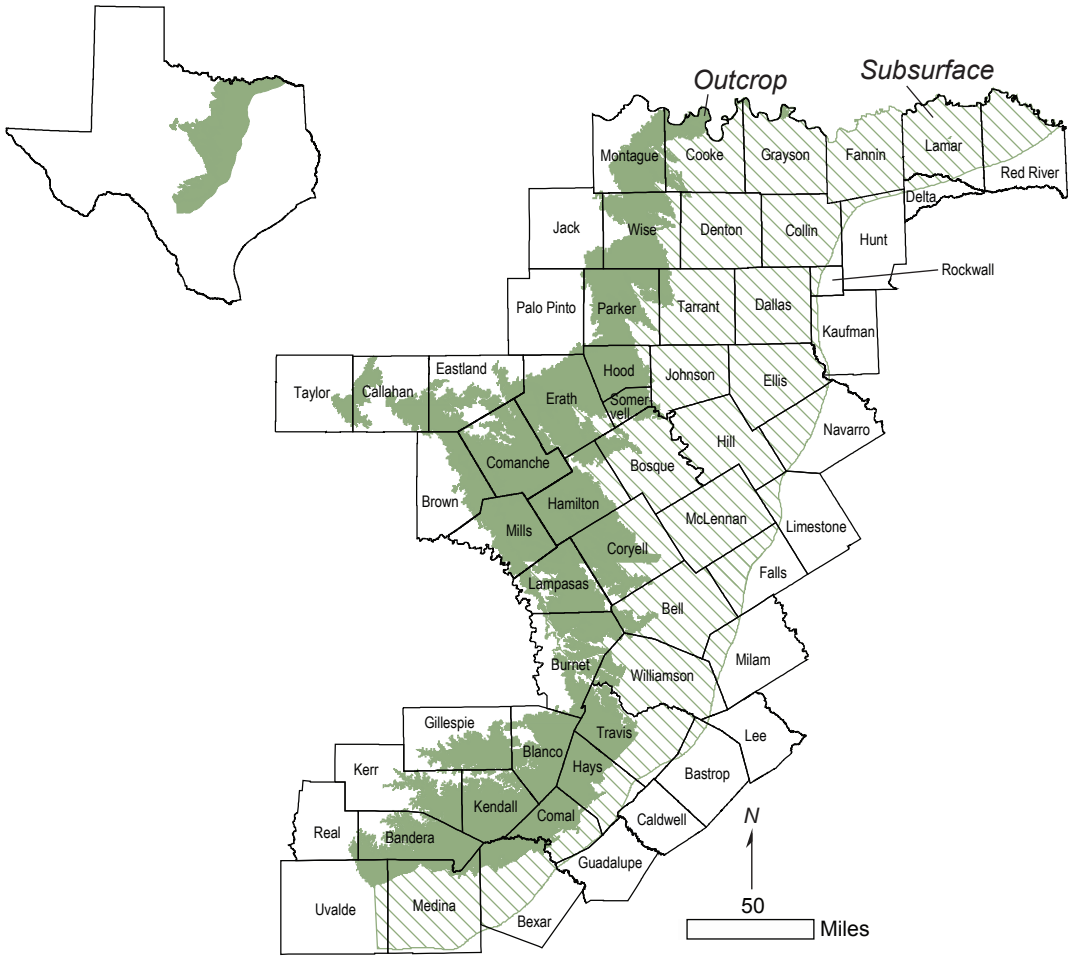
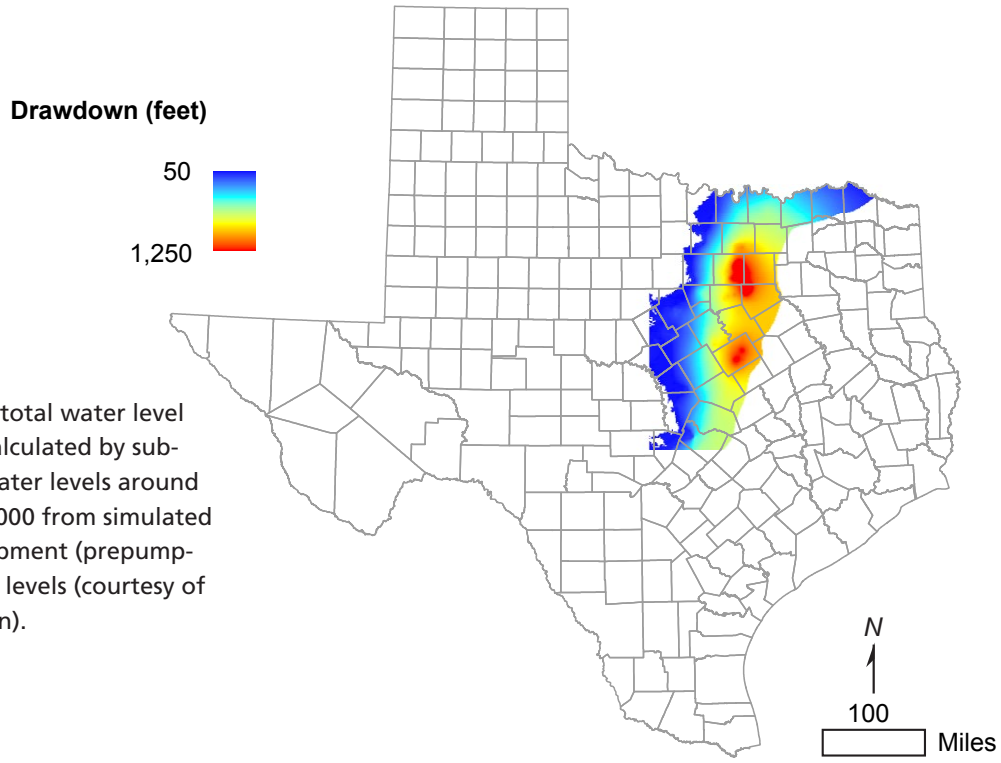
Major
Aquifers

Trinity
Aquifer



The Trinity Aquifer, a major aquifer, extends across much of the central and northeastern part of the state. It is composed of several smaller aquifers contained within the Trinity Group. Although referred to differently in different parts of the state, they include the Antlers, Glen Rose, Paluxy, Twin Mountains, Travis Peak, Hensell, and Hosston aquifers. These aquifers consist of limestones, sands, clays, gravels, and conglomerates. Their combined freshwater saturated thickness averages about 600 feet in North Texas and about 1,900 feet in Central Texas. In general, groundwater is fresh but very hard in the outcrop of the aquifer. Total dissolved solids increase from less than 1,000 milligrams per liter in the east and southeast to between 1,000 and 5,000 milligrams per liter, or slightly to moderately saline, as the depth to the aquifer increases. Sulfate and chloride concentrations also tend to increase with depth. The Trinity Aquifer discharges to a large number of springs, with most discharging less than 10 cubic feet per second. The aquifer is one of the most extensive and highly used groundwater resources in Texas. Although its primary use is for municipalities, it is also used for irrigation, livestock, and

other domestic purposes. Some of the state's largest water level declines, ranging from 350 to more than 1,000 feet, have occurred in counties along the IH-35 corridor from McLennan County to Grayson County. These declines are primarily attributed to municipal pumping, but they have slowed over the past decade as a result of increasing reliance on surface water. The regional water planning groups, in their 2006 Regional Water Plans, recommended numerous water management strategies for the Trinity Aquifer, including developing new wells and well fields, pumping more water from existing wells, overdrafting, reallocating supplies, and using surface water and groundwater conjunctively.



Estimated total water level declines calculated by subtracting water levels around the year 2000 from simulated predevelopment (prepumping) water levels (courtesy of H.S. Hamlin).

Upper Glen Rose Formation along Southwest Parkway southeast of Bee Cave, Texas.

Lower Glen Rose Formation along State Highway 71 northwest of Bee Cave, Texas (note 6-inch ruler).

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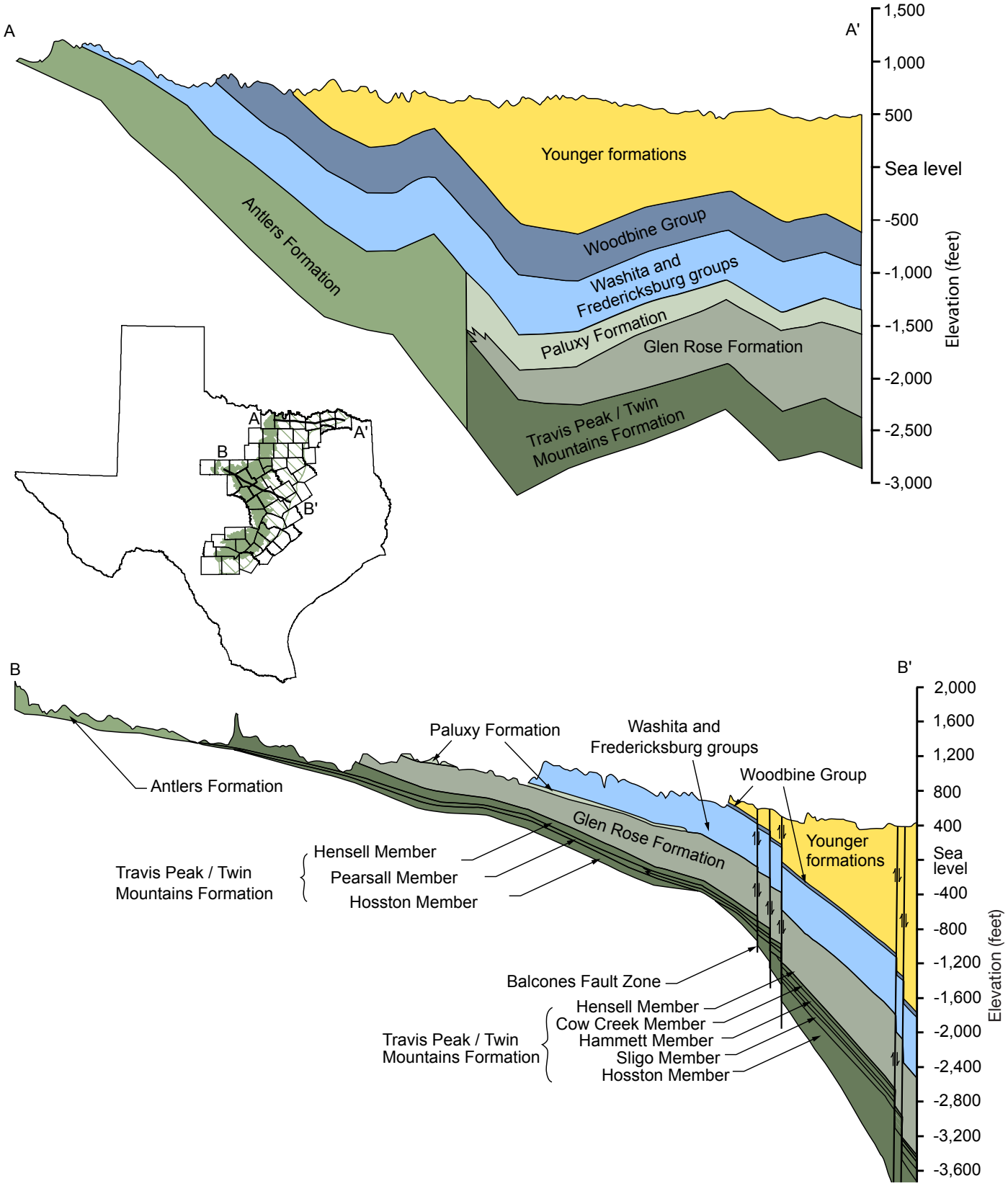
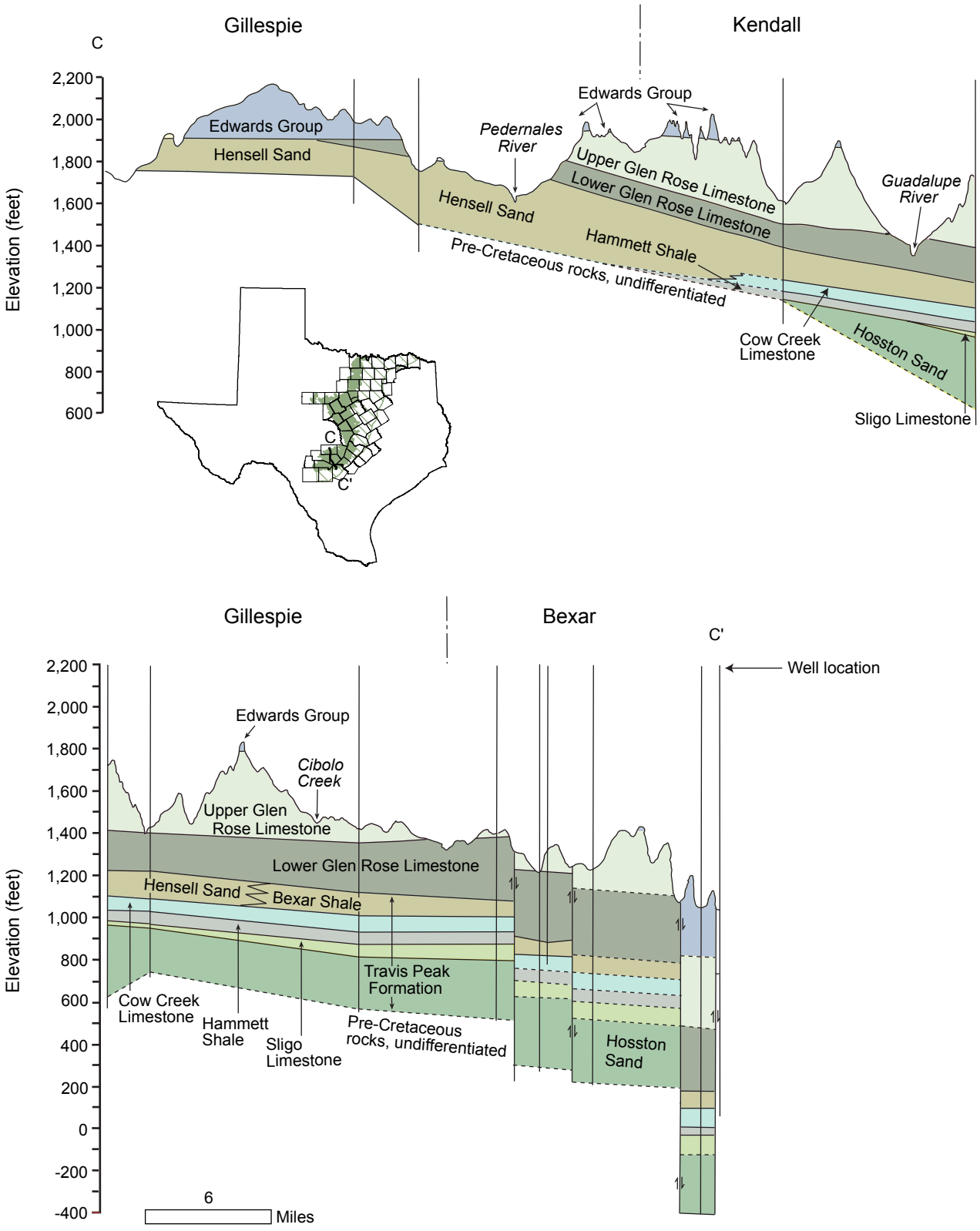
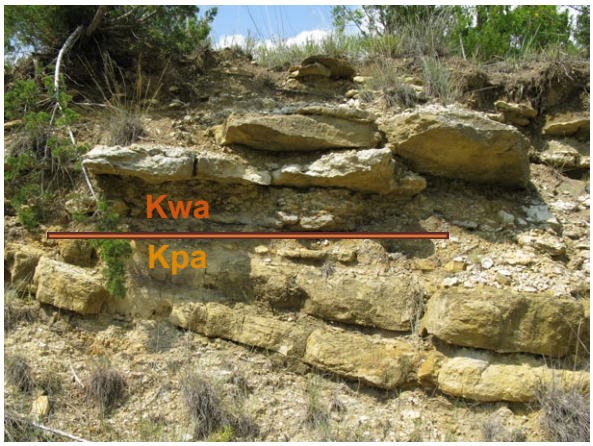
Structural cross sections across the northern Trinity Aquifer, shown in shades of green (modified from Klemt and others; 1975; Nordstrom, 1982).



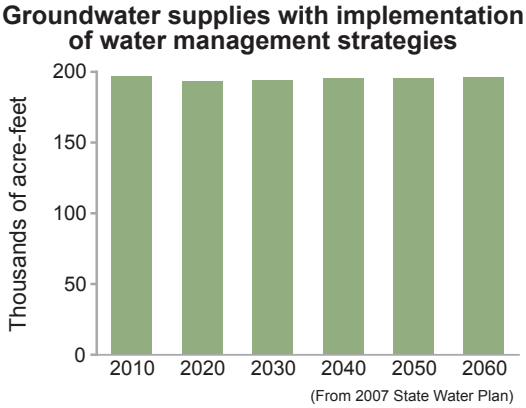
Structural cross section across the Trinity Aquifer in the Hill Country, including rocks from the Upper Glen Rose Formation to the Hosston Sand (modified from Ashworth, 1983; Mace and others, 2000b).



Theropod dinosaur track from the Glen Rose Formation at Dinosaur Valley State Park.



Paluxy Formation (Kpa) beneath the Walnut Formation (Kwa) along State Highway 67 southwest of Comanche, Texas.



Aquifer characteristics

- Area of outcrop: 10,652 square miles
- Area in subsurface: 21,308 square miles
- Proportion of aquifer with groundwater conservation districts: 32 percent
- Number of counties containing the aquifer: 61

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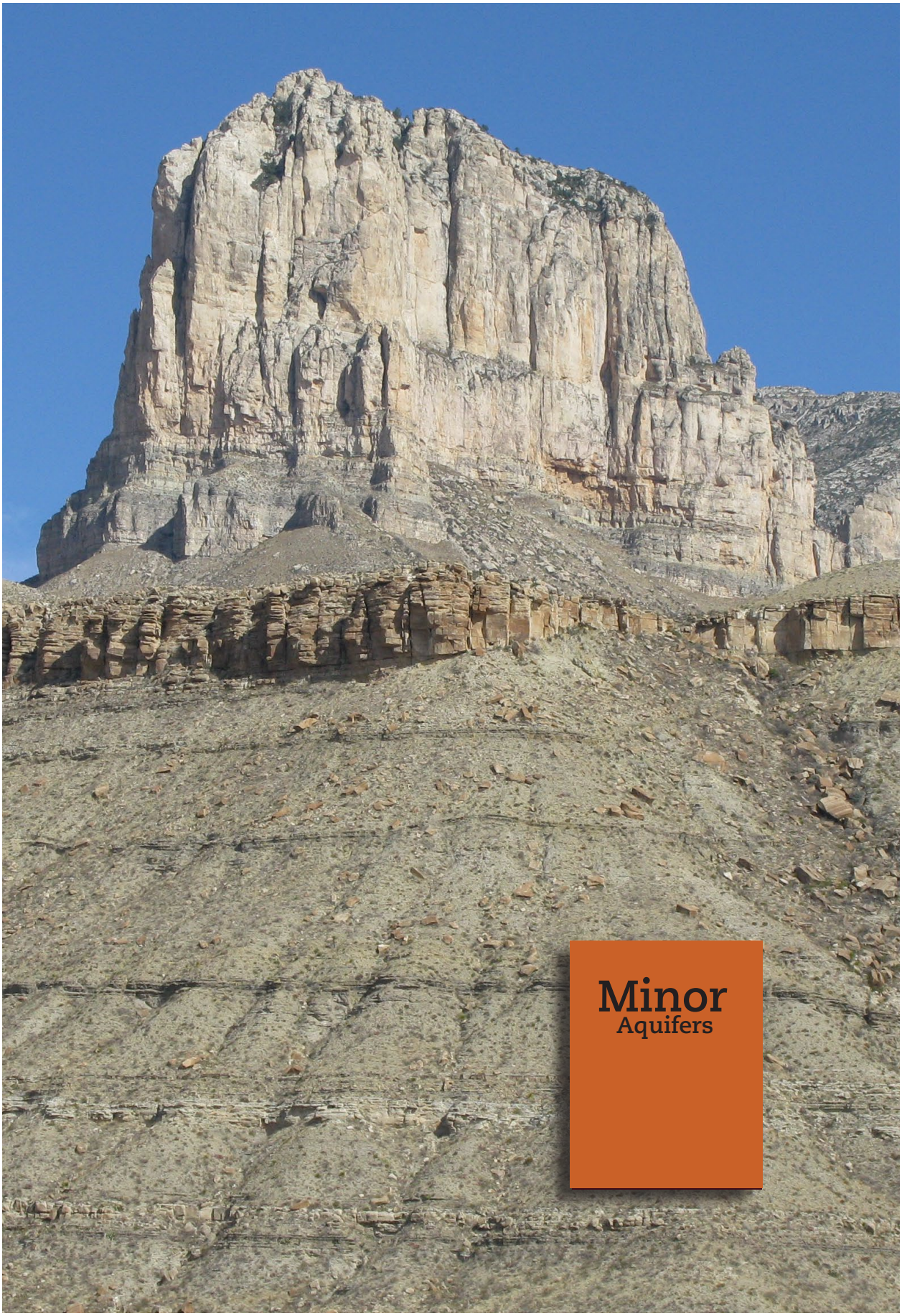


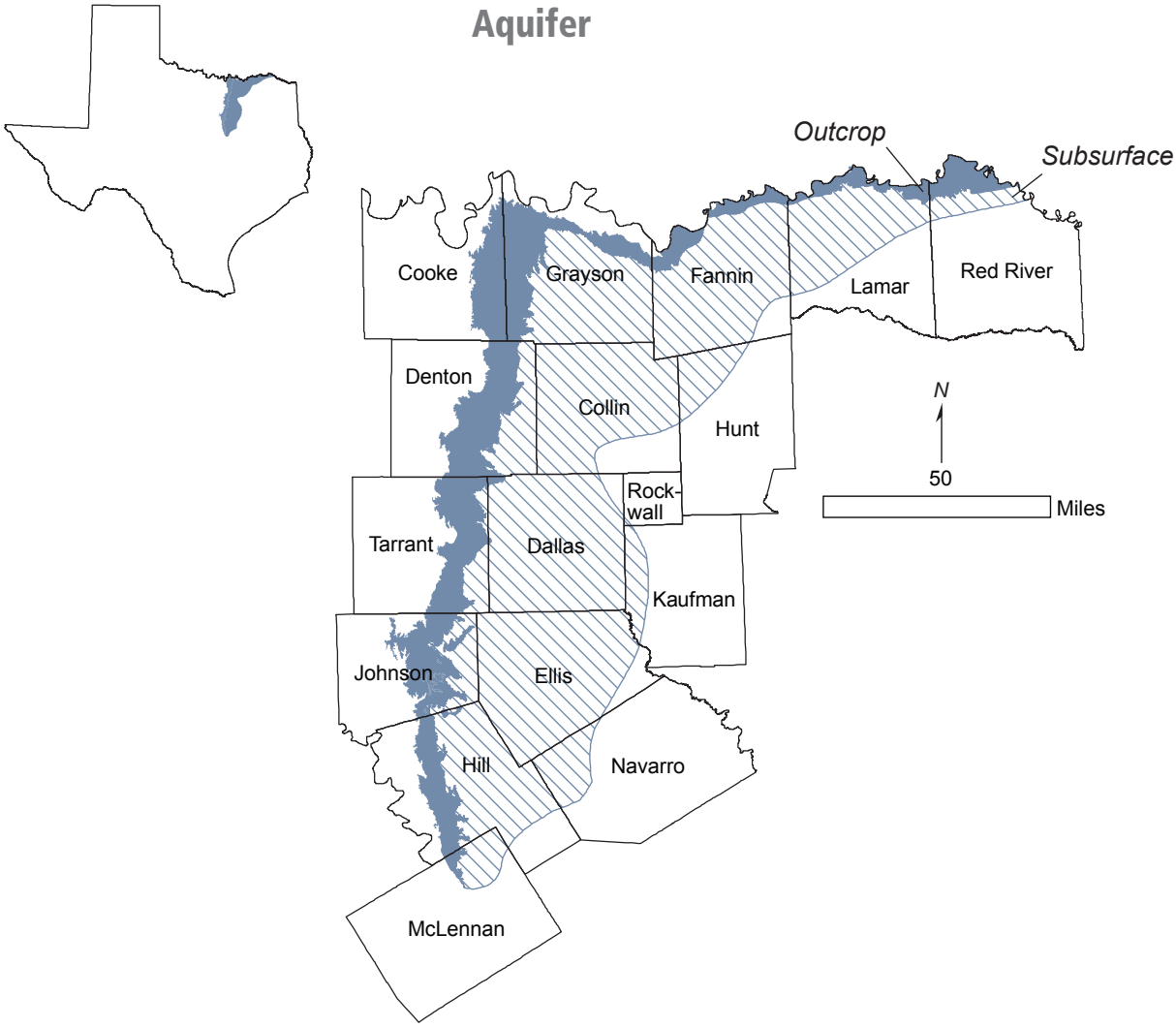
39 039

Photo (previous page)

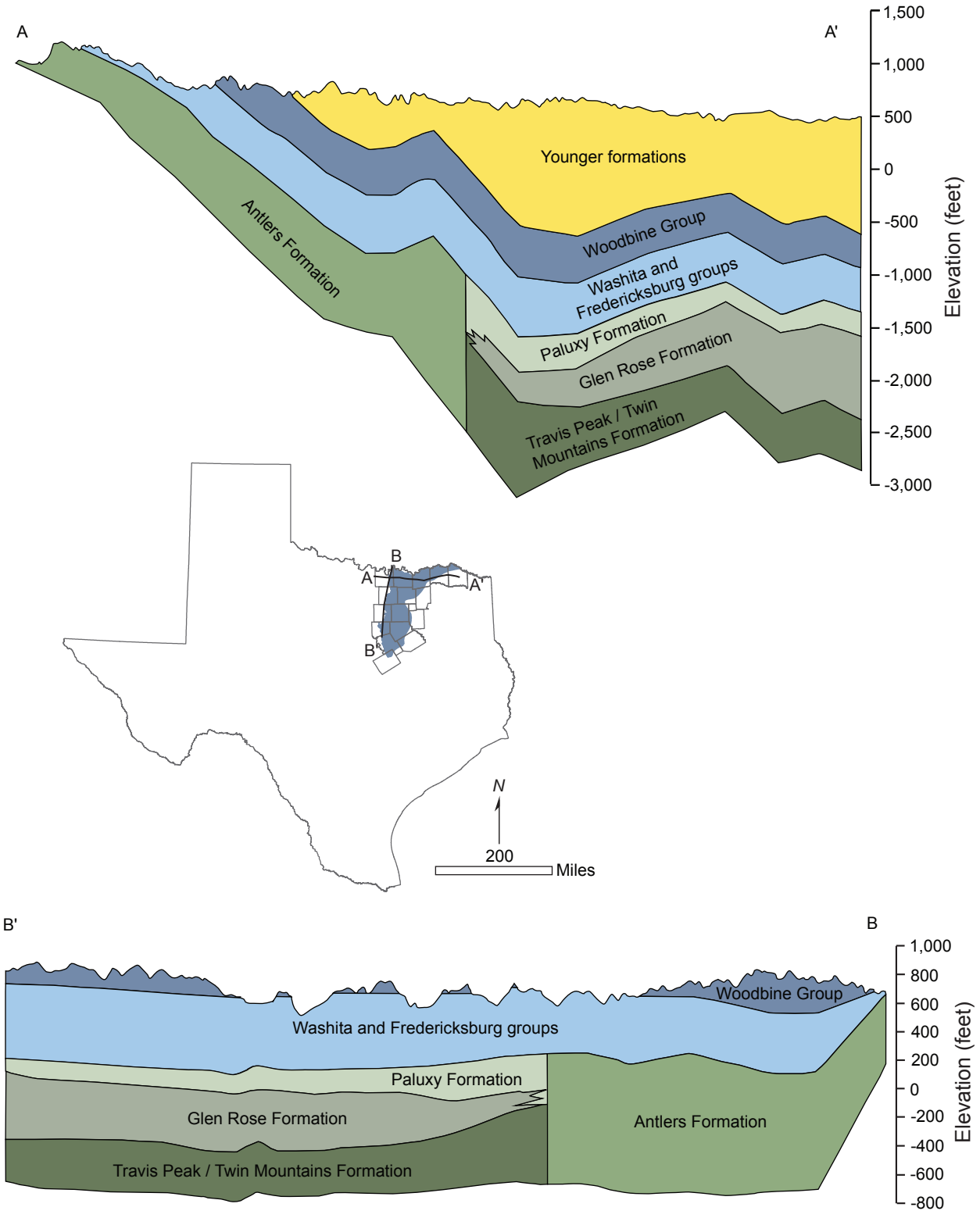
El Capitan at the southern end of the Guadalupe Mountains in northwest Culberson County, Texas. The upper part of the mountain is composed of forereef rubble facies of the Capitan Limestone, which is part of the Capitan Reef Complex Aquifer.

39 040

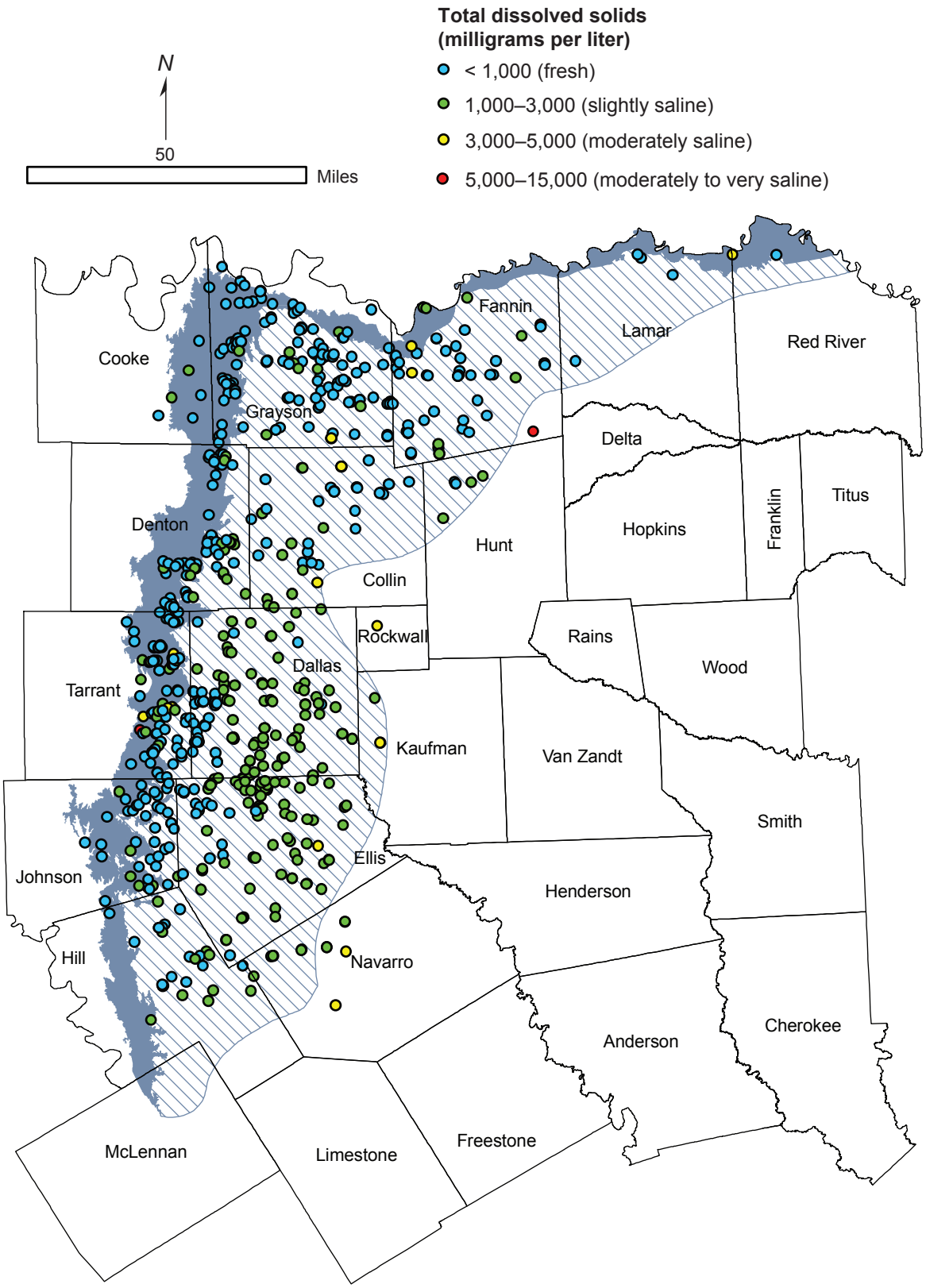
Woodbine
Aquifer



The Woodbine Aquifer is a minor aquifer located in northeast Texas. The aquifer overlies the Trinity Aquifer and consists of sandstone interbedded with shale and clay that form three distinct water-bearing zones. The Woodbine Aquifer reaches 600 feet in thickness in subsurface areas, and freshwater saturated thickness averages about 160 feet. Water quality and yield vary with the depth of the aquifer. The lower zones of the aquifer typically yield the most water, whereas the upper zone yields limited water that tends to be very high in iron. In general, water to a depth of 1,500 feet is fresh, containing less than 1,000 milligrams per liter of total dissolved solids. Water at depths below 1,500 feet is slightly to moderately saline, containing from 1,000 to 4,000 milligrams per liter of total dissolved solids. The aquifer provides water for municipal, industrial, domestic, livestock, and small irrigation supplies. Large water level declines, due to heavy municipal and industrial pumping in the Sherman-Denison area of Grayson County, have moderated in the past decade as suppliers have switched to surface water. The regional water planning groups, in their 2006 Regional Water Plans, recommended several water management strategies that use the Woodbine Aquifer, including constructing new wells, pumping more water from existing wells, developing supplemental wells to maintain current supplies, temporary overdrafting, and reallocating supplies.



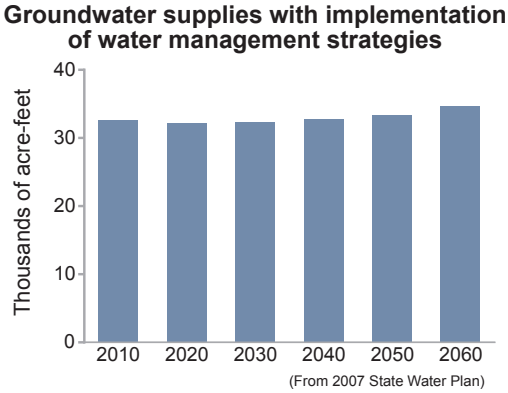
Structural cross sections along and across Woodbine Group rocks (modified from Nordstrom, 1982).



Total dissolved solids from Woodbine Aquifer wells (based on TWDB groundwater database).

Ferruginous sand of the Woodbine Formation 2 miles southwest of Denison, Grayson County, Texas (from Stephenson, 1919).

Lens of tuffaceous sand in laminated sandy clay of the Woodbine Formation along the Red River, Lamar County, Texas (from Ross and others, 1929).



Aquifer characteristics

- Area of outcrop: 1,557 square miles
- Area in subsurface: 5,766 square miles
- Proportion of aquifer with groundwater conservation districts: 0 percent
- Number of counties containing the aquifer: 17

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5 Acknowledgments

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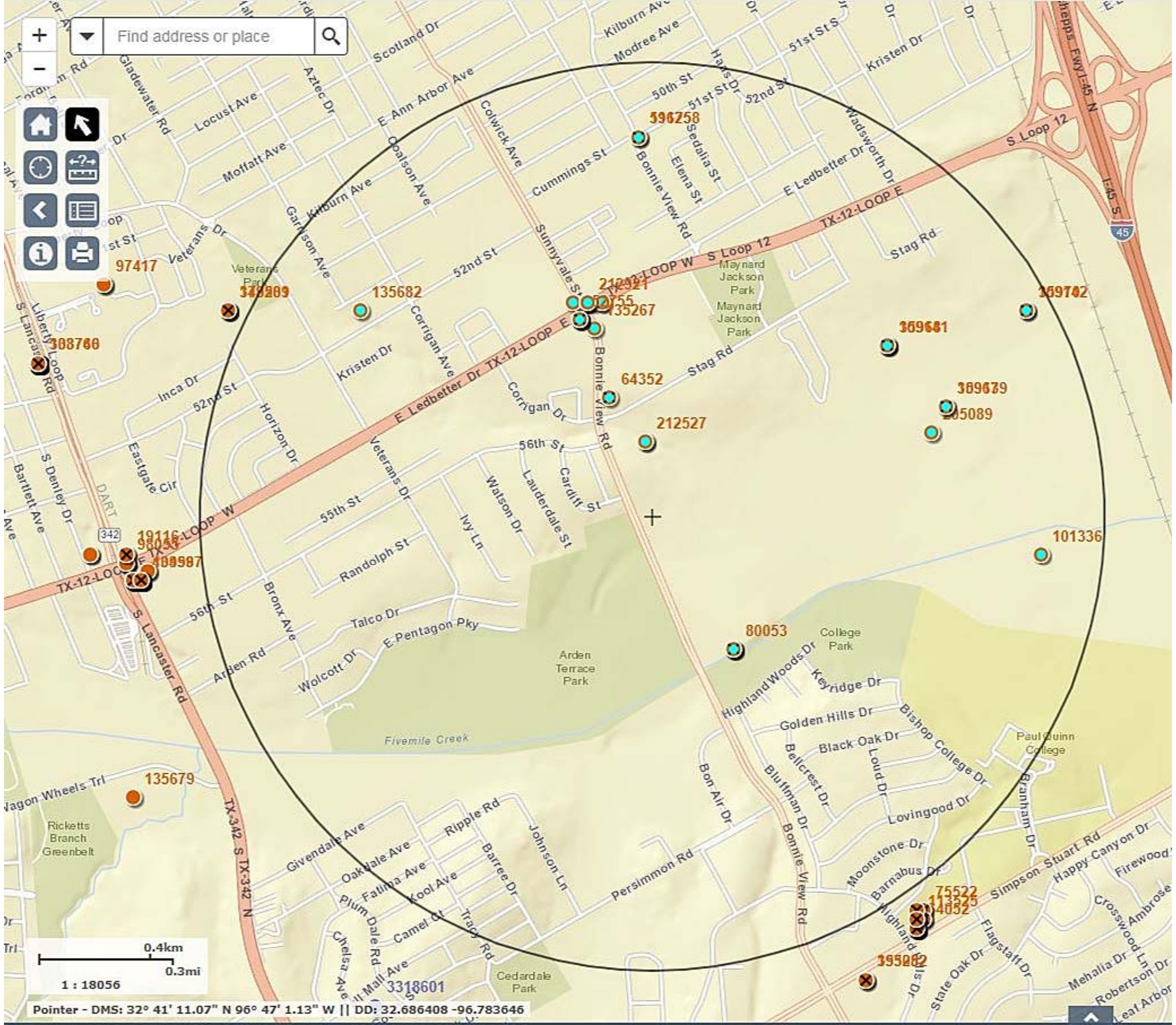
39 047

Reference 40

Wells within a 4-Mile Radius of the Lane Plating Works, Inc. Site

Tracking	Latitude	Longitude	Use	Elevation (ft)	Depth (ft)	Aquifer	Street	City	Zip Code	County	Owner	Distance (mi)	Direction from site
WW-1	32.687988087	-96.769711490	Site well	unknown	unknown	unknown	Bonnie View Rd.	Dallas	75241	Dallas	Lane Plating Works	0-1	on-site
WW-2	32.688122428	-96.769584775	Site well	unknown	unknown	unknown	Bonnie View Rd.	Dallas	75241	Dallas	Lane Plating Works	0-1	on-site
3318301	32.713611	-96.752777	Irrigation	414	30	100ALVM - Alluvium	unkown	unkown	unkown	Dallas	unknown	1-2	NE
3318302	32.713611	-96.752777	Irrigation	410	30	100ALVM - Alluvium	unkown	unkown	unkown	Dallas	Certain-Teed Products	1-2	NE
3318303	32.733888	-96.757222	Industrial	410	1000	212WDBN - Woodbine	unkown	unkown	unkown	Dallas	W.E. Grace Co.	3-4	N, NE
3318304	32.739166	-96.755555	Industrial	420	25	100ALVM - Alluvium	unkown	unkown	unkown	Dallas	Metzger Dairy	3-4	N, NE
3318306	32.744444	-96.782221	Industrial	406	944	212WDBN - Woodbine Sand	unkown	unkown	unkown	Dallas	Dallas Packing Co.	3-4	N, NW
3318307	32.738333	-96.780277	Industrial	410		212WDBN - Woodbine Sand	unkown	unkown	unkown	Dallas	Valcar Enterprises of	3-4	N, NW
3318308	32.74361	-96.782221	Industrial	409	939	212WDBN - Woodbine Sand	unkown	unkown	unkown	Dallas	unknown	3-4	N, NW
3318502	32.674166	-96.810277	Irrigation	566	853	212WDBN - Woodbine Sand	unkown	unkown	unkown	Dallas	unknown	2-3	W
3318503	32.674166	-96.810277	Irrigation	566	859	212WDBN - Woodbine Sand	unkown	unkown	unkown	Dallas	unknown	2-3	W
3318601	32.672221	-96.779999	Public Supply	545	1100	212WDBN - Woodbine Sand	unkown	unkown	unkown	Dallas	Community Water	1-2	W, SW
3318802	32.648055	-96.814444	Public Supply	615	900	212WDBN - Woodbine Sand	unkown	unkown	unkown	Dallas	Community Water Srv	3-4	W, SW
3318902	32.654444	-96.775277	Public Supply	588	1101	212WDBN - Woodbine Sand	unkown	unkown	unkown	Dallas	Urban Services	2-3	SW
3319401	32.706111	-96.748055	Industrial	410	1030	212WDBN - Woodbine Sand	unkown	unkown	unkown	Dallas	Dallas County Buffalo	1-2	NE
3319402	32.689444	-96.724999	Stock	397	22	100ALVM - Alluvium	unkown	unkown	unkown	Dallas	Teamsters Union	2-3	E
3319403	32.682777	-96.728054	Irrigation	394	30	100ALVM - Alluvium	unkown	unkown	unkown	Dallas	Casa Flora	2-3	E, SE
3319404	32.703333	-96.743055	Industrial	405	44	100ALVM - Alluvium	unkown	unkown	unkown	Dallas	Go-Crete	1-2	E, NE
3319405	32.692221	-96.725277	Domestic	392	20	100ALVM - Alluvium	unkown	unkown	unkown	Dallas	F. Wullschleger	2-3	E
3319503	32.668332	-96.706944	Stock	407	25	100ALVM - Alluvium	unkown	unkown	unkown	Dallas	T.E. Gladivey	3-4	SE
135679	32.678889	-96.789167	Irrigation	unknown	137	unknown	1902 WAGON WHEELS TRL.	DALLAS	75241	Dallas	NEIL AND JO ANN WILABAY	1-2	W, SW
135682	32.694445	-96.780555	Irrigation	unknown	117	unknown	1902 WAGON WHEELS TRL.	DALLAS	75241	Dallas	NEIL AND JO ANN WILABAY	0-1	NW
408239	32.710333	-96.708944	Irrigation	unknown	1086	unknown	6300 Great Trinity Forest Way	Dallas	75217	Dallas	Landscapes Unlimited	3-4	W, NW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Cummings St
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Wolcott Dr
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Highland Woods Dr
Keyridge Dr
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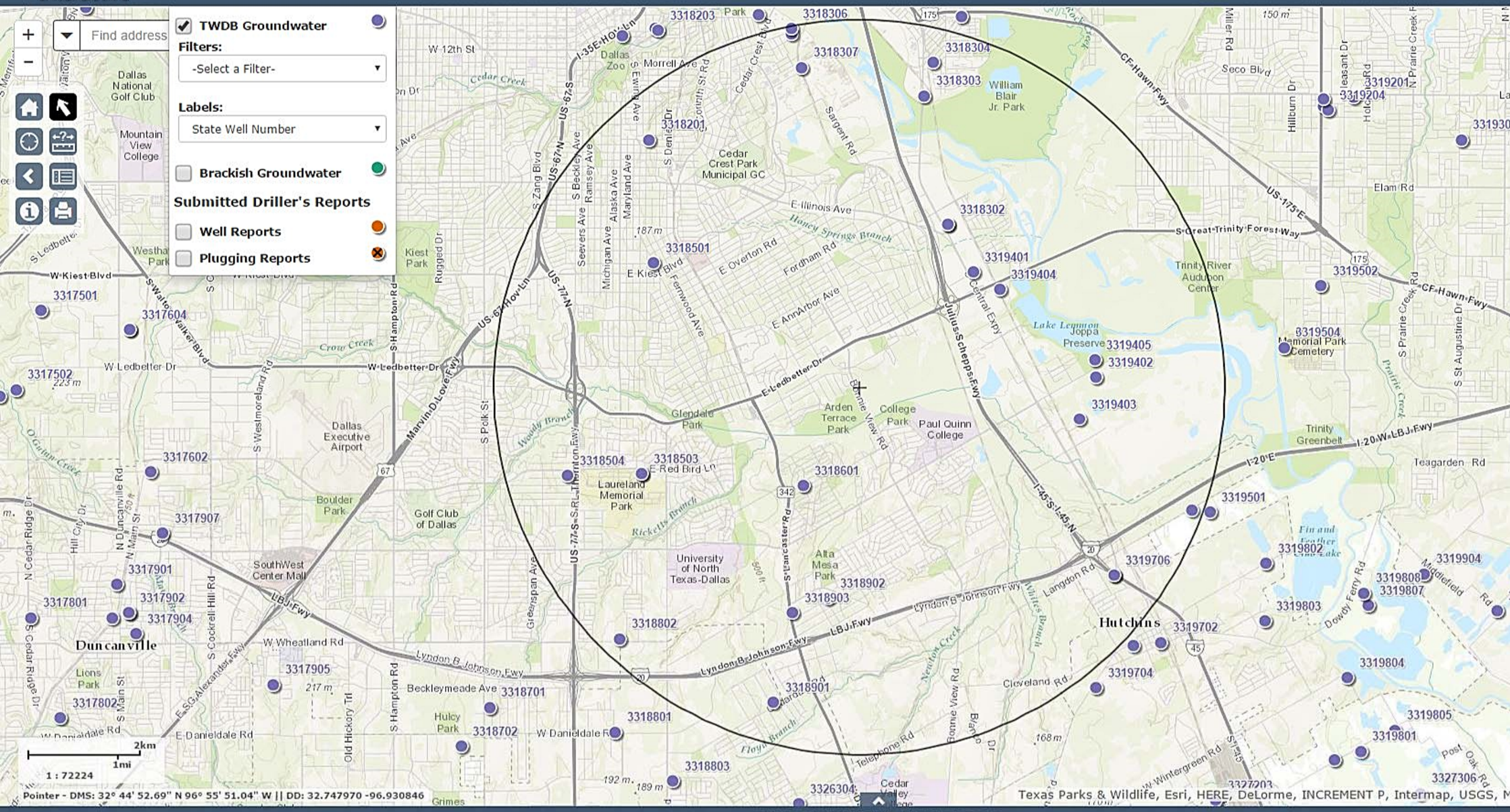
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William Blair Jr. Park
Trinity River Audubon Center
Joppa Preserve
Memorial Park Cemetery
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Glendale Park
Arden Terrace Park
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Golf Club of Dallas
Boulder Park
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STATE OF TEXAS WELL REPORT for Tracking #212527

Owner:	**7- Eleven # 12301**	Owner Well #:	**MW# 13,14**
Address:	**2911 E' Ledbetter Dallas, TX 75216**	Grid #:	**33-18-6**
Well Location:	**2911 E, Ledbetter Dallas, TX 75216**	Latitude:	**32° 41' 25" N**
		Longitude:	**096° 46' 11" W**
Well County:	**Dallas**	Elevation:	**No Data**

Type of Work: **New Well** Proposed Use: **Monitor**

Drilling Start Date: **4/1/2010** Drilling End Date: **4/1/2010**

	Diameter (in.)	*Top Depth (ft.)*	*Bottom Depth (ft.)*
Borehole:	**8.25**	**0**	**40**

Drilling Method: **Hollow Stem Auger**

Borehole Completion: **Sand Packed**

Annular Seal Data:

Top Depth (ft.)	*Bottom Depth (ft.)*	*Description (number of sacks & material)*
0	**2**	**1 Cement**
2	**8**	**3 Bentonite**
8	**40**	**23 Sand**

Seal Method: **TCEQ Standards**

Sealed By: **Strata Core**

Distance to Property Line (ft.): **No Data**

Distance to Septic Field or other concentrated contamination (ft.): **No Data**

Distance to Septic Tank (ft.): **No Data**

Method of Verification: **No Data**

Surface Completion: **Surface Slab Installed**

Water Level: **No Data**

Packers: **No Data**

Type of Pump: **No Data**

Well Tests: **No Test Data Specified**

Water Quality:

Strata Depth (ft.)	Water Type
No Data	**No Data**

Chemical Analysis Made: **Unknown**

Did the driller knowingly penetrate any strata which contained injurious constituents?: **No**

Certification Data: The driller certified that the driller drilled this well (or the well was drilled under the driller's direct supervision) and that each and all of the statements herein are true and correct. The driller understood that failure to complete the required items will result in the report(s) being returned for completion and resubmittal.

Company Information: **Strata Core Drilling Co.**

5066 Brush Creek Rd.
Fort Worth, TX 76119

Driller Name: **Gilbert Mario Robles** License Number: **52694**

Comments: **No Data**

Lithology:
DESCRIPTION & COLOR OF FORMATION MATERIAL

From (ft)	To (ft)	Description
0	**4"**	**Asphalt**
4"	**6**	**Br. Clay**
6	**8**	**Lt. Brown Silty Clay**
8	**38**	**Tan Silty Clay**
38	**40**	**Brown Silty Clay**

Casing:
BLANK PIPE & WELL SCREEN DATA

Dia. (in.)	New/Used	Type	Setting From/To (ft.)
2"	**N**	**PVC**	**Screen 40 - 10 .010**
2"	**N**	**PVC**	**Riser 10 - 0 Sch 40**

IMPORTANT NOTICE FOR PERSONS HAVING WELLS DRILLED CONCERNING CONFIDENTIALITY

TEX. OCC. CODE Title 12, Chapter 1901.251, authorizes the owner (owner or the person for whom the well was drilled) to keep information in Well Reports confidential. The Department shall hold the contents of the well log confidential and not a matter of public record if it receives, by certified mail, a written request to do so from the owner.

Please include the report's Tracking Number on your written request.

Texas Department of Licensing and Regulation
P.O. Box 12157
Austin, TX 78711
(512) 463-7880

STATE OF TEXAS WELL REPORT for Tracking #205089

Owner:	**JP Morgan Chase Bank**	Owner Well #:	**MW# 1,2**
Address:	**3150 S. Loop 12 Dallas, TX 75241**	Grid #:	**33-18-6**
		Latitude:	**32° 41' 26" N**
Well Location:	**3150 S. Loop 12 Dallas, TX 75241**	Longitude:	**096° 45' 32" W**
Well County:	**Dallas**	Elevation:	**No Data**
Type of Work:	**New Well**	Proposed Use:	**Monitor**

Drilling Start Date: **1/14/2010** Drilling End Date: **1/14/2010**

	Diameter (in.)	*Top Depth (ft.)*	*Bottom Depth (ft.)*
Borehole:	**8.25**	**0**	**40**

Drilling Method: **Hollow Stem Auger**

Borehole Completion: **Sand Packed**

Annular Seal Data:

Top Depth (ft.)	*Bottom Depth (ft.)*	*Description (number of sacks & material)*
0	**2**	**1 Cement**
2	**18**	**8 Bentonite**
18	**40**	**15 Sand**

Seal Method: **TCEQ Standards**

Sealed By: **Strata Core**

Distance to Property Line (ft.): **No Data**

Distance to Septic Field or other concentrated contamination (ft.): **No Data**

Distance to Septic Tank (ft.): **No Data**

Method of Verification: **No Data**

Surface Completion: **Surface Slab Installed**

Water Level: **No Data**

Packers: **No Data**

Type of Pump: **No Data**

Well Tests: **No Test Data Specified**

Water Quality:

Strata Depth (ft.)	Water Type
No Data	**No Data**

Chemical Analysis Made: **Unknown**

Did the driller knowingly penetrate any strata which contained injurious constituents?: **No**

Certification Data: The driller certified that the driller drilled this well (or the well was drilled under the driller's direct supervision) and that each and all of the statements herein are true and correct. The driller understood that failure to complete the required items will result in the report(s) being returned for completion and resubmittal.

Company Information: **Strata Core Drilling Co.**

5066 Brush Creek Rd.
Fort Worth, TX 76119

Driller Name: **Roddy Qualls** License Number: **3121**

Apprentice Name: **Shane Munro** Apprentice Number: **58033**

Comments: **No Data**

Lithology:
DESCRIPTION & COLOR OF FORMATION MATERIAL

From (ft)	To (ft)	Description
0	**6**	**0-6" Concrete**
6	**7**	**6"-7 Dk Brown Clay**
7	**36**	**7-36 Tan Silty Clay**
36	**40**	**36-40 Sand & Gravel**

Casing:
BLANK PIPE & WELL SCREEN DATA

Dia. (in.)	New/Used	Type	Setting From/To (ft.)
2	**N**	**PVC Screen 40**	**40 - 20 .010**
2	**N**	**PVC Riser 20**	**20 - 0 Sch 40**

IMPORTANT NOTICE FOR PERSONS HAVING WELLS DRILLED CONCERNING CONFIDENTIALITY

TEX. OCC. CODE Title 12, Chapter 1901.251, authorizes the owner (owner or the person for whom the well was drilled) to keep information in Well Reports confidential. The Department shall hold the contents of the well log confidential and not a matter of public record if it receives, by certified mail, a written request to do so from the owner.

Please include the report's Tracking Number on your written request.

Texas Department of Licensing and Regulation
P.O. Box 12157
Austin, TX 78711
(512) 463-7880

Texas Water Development Board

TWDB Groundwater Database Result

STATE WELL NUMBER : 3318601

Scanned Images

REPORTED WATER WELL DATA ON 3318601

No.	FIELD	VALUE	EXPLANATION
1	STATE WELL NUMBER	3318601	
2	COUNTY CODE	113	Dallas County, Texas
3	BASIN	8	Trinity River Basin
4	PREVIOUS WELL NUMBER		
5	LATITUDE	324020	DMS (in decimal degrees: 32.672221)
6	LAT DEC	32.6722210	
7	LONGITUDE	964648	DMS (in decimal degrees: -96.779999)
8	LONG DEC	-96.7799990	
9	OWNER 1	Community Water	
10	OWNER 2	Service	
11	DRILLER 1		
12	DRILLER 2		
13	SOURCE OF COORDINATES	2	
14	AQUIFER CODE	212WDBN	Woodbine Sand
15	AQUIFER ID1	29	Woodbine Aquifer
16	AQUIFER ID2		
17	AQUIFER ID3		
18	ELEVATION	545	feet
19	ELEVATION MEASUREMENT METHOD	M	Interpolated From Topo Map
20	ALPHA CODE	178458	COMMUNITY WATER SERVICE, INC.; MEADOWLAKE SYSTEM
21	DATE DRILLED		
22	WELL TYPE	W	Withdrawal of Water

No.	FIELD	VALUE	EXPLANATION
23	WELL DEPTH	1100	feet
24	SOURCE OF DEPTH	R	Person Other than Owner
25	TYPE OF LIFT	S	Submersible Pump
26	TYPE OF POWER	E	Electric Motor
27	HORSEPOWER	7.50	
28	PRIMARY WATER USE	P	Public Supply
29	SECONDARY WATER USE		
30	TERTIARY WATER USE		
31	WATER LEVEL AVAILABLE	N	
32	WATER QUALITY AVAILABLE	N	
33	WELL LOGS AVAILABLE		
34	OTHER DATA AVAILABLE		
35	DATE COLLECTED OR UPDATED	04231975	
36	REPORTING AGENCY	01	TWDB or Predecessor Agency
37	WELL SCHEDULE IN FILE		
38	CONTRUCTION METHOD		
39	COMPLETION		
40	CASING MATERIAL	S	Steel
41	SCREEN MATERIAL		
42	GMA	8	
43	RWPA	C	
44	DISTRICTID		

40 008

Texas Water Development Board

TWDB Groundwater Database Result

STATE WELL NUMBER : 3318601

Scanned Images

NO REPORTED INFREQUENT CONSTITUENT DATA ON 3318601

No.	STATE WELL NUMBER	MONTH	DAY	YEAR	SAMPLE NUMBER	STORET CODE	VALUE	PLUS MINUS

NO REPORTED WATER LEVEL DATA ON 3318601

No.	STATE WELL NUMBER	PUBLISHABLE/NON-PUBLISHABLE	DEPTH FROM LAND SURFACE	MONTH	DAY	YEAR	MEASUREMENT NUMBER	MEASURING AGENCY	METHOD OF MEASUREMENT	REMARK

NO REPORTED USGS 5 DAY WATER LEVEL DATA ON 3318601

No.	STATE WELL NUMBER	PUBLISHABLE/NON-PUBLISHABLE	DEPTH FROM LAND SURFACE	MONTH	DAY	YEAR	MEASUREMENT NUMBER	MEASURING AGENCY	METHOD OF MEASUREMENT	REMARK

REPORTED WELL CASING DATA ON 3318601

No.	STATE WELL NUMBER	CASING/SCREEN/OPEN HOLE INDICATOR	DIAMETER OF CASING OR SCREEN	TOP DEPTH	BOTTOM DEPTH
1	3318601	C - Casing	10		

NO REPORTED REMARKS DATA ON 3318601

No.	STATE WELL NUMBER	REMARKS 1	REMARKS 2

NO REPORTED WATER QUALITY DATA ON 3318601 (Column 1 - 19)

No.	STATE WELL NUMBER	MONTH	DAY/Year	YEAR	SAMPLE NUMBER	SAMPLE TIME	TEMPERATURE CELSIUS	TOP OF SAMPLED INTERVAL	BOTTOM OF SAMPLED INTERVAL	SAMPLED INTERVAL AQUIFER CODE	COLLECTION REMARKS	RELIABILITY REMARK	COLLECTING AGENCY	LAB CODE	BALANCED / UNBALANCED	SILICA MG/L	CALCIUM MG/L	MAGNESIUM MG/L

NO REPORTED WATER QUALITY DATA ON 3318601 (Column 20 - 39)

No.	STATE WELL NUMBER	SODIUM MG/L	POTASSIUM MG/L	STRONTIUM MG/L	CARBONATE MG/L	BICARBONATE MG/L	SULFATE MG/L	CHLORIDE MG/L	FLUORIDE MG/L	NITRATE MG/L	PH	TDS MG/L	PHENOLPHTHALEIN ALKALINITY	TOTAL ALKALINITY	TOTAL HARDNESS	PERECNT SODIUM	SAR	RSC	SPECIFIC CONDUCTANCE

GWDB DISCLAIMER: Except where noted, all of the information provided is believed to be accurate and reliable; however, the Texas Water Development Board (TWDB) assumes no responsibilities for any errors appearing in rules ot otherwise. Further, TWDB assumes no responsibility for the use of the information provided.
PLEASE NOTE that users of these data are responsible for checking the accuracy, completeness, currency, or suitability of all information themselves. TWDB makes no gurantees or warrabties as to the accuracy, completeness, currency, or suitability of the information provided via the GroundWater Database (GWDB). TWDB specificially disclaims any and all liability for any claims or damages that may result from providing GWDB data or the information it contains.

TWDB Groundwater Database Result

STATE WELL NUMBER : 3318601

Scanned Images

For additional information or answers to questions concerning the TWDB GWDB contact David Thorkildsen at (512) 936-0871 or Bryan Anderson at (512) 475-3302.

You can download Groundwater Database Reports in ASCII text files from this link. The files are organized by Texas counties.

Explanation of Groundwater Data

40 010

Texas Water Development Board
Well Schedule

State Well No. 33 18 601 **Previous Well No.** _____ **County** Dallas 113

River Basin _____ 08 **Zone** 1 **Lat.** 32 40 20 **Long.** 096 46 47 **Source of Coord.** 2

Owner's Well No. _____ **Location** ____ 1/4, ____ 1.4, **Section** ____, **Block** ____, **Survey** _____

Owner Community Water Service **Driller** _____

Address _____ **Tenant/Oper.** _____

Date Drilled __ __ __ __ __ __ **Depth** 1100 **Source of Depth Datum** R **Altitude** 545 **Source of Alt. Datum** M

Aquifer Woodbine 212WDBN **Well Type** W **User** 178458

Well Construction Const. Method _____ **Casing Material** steel S

Completion _____ **Screen Material** _____

Lift Data Pump Mfr. _____ Type SUb S No. Stages _____

Bowls Diam. _____ in. Setting _____ ft. Column Diam. _____ in.

Motor Mfr. _____ Fuel or Power Elec E Horsepower 7.50

Yield Flow _____ GPM Pump _____ GPM Meas.,Rept.,Est. _____ Date _____

Performance Test Date _____ Length of Test _____ Production _____ GPM

Static Level ____ ft. Pumping Level ____ ft. Drawdown ____ ft. Sp.Cap. ____ GPM/ft.

Quality (Remarks _____

Water Use Primary PS. P Secondary _____ Tertiary _____

Other Data Available Water Level N Water Quality N Logs _____ Other Data _____

Water Levels Date __ __ __ __ __ __ Meas. ____ . __ _____

Date __ __ __ __ __ __ Meas. ____ . __ _____

Date __ __ __ __ __ __ Meas. ____ . __ _____

Casing or Blank Pipe (C)
Well Screen or Slotted Zone (S)
Open Hole (O)
Cemented from ___ to ___

	Diam. (in.)	Setting (feet) From	To
1	C 10		
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			

(20 max)

Recorded By _____ **Date Record Collected or Updated** 04 23 1975 **Reporting Agency** 01

Remarks

Aquifer _____

Well No. ____ - ____ - ____

92-0023
9/3/91

40 011

TEXAS WATER DEVELOPMENT BOARD

WELL SCHEDULE

Aquifer Trinity — Field No. _____ — State Well No. 33-18-601

Owner's Well No. Lancaster — County Dallas

1. Location: ___ 1/4, ___ 1/4 Sec. _____, Block _____ Survey _____

2. Owner: Community Water Facility — Address: 2430 Lake June Rd.

Tenant: _____ — Address: _____

Driller: Allen — Address: _____

3. Elevation of _____ is 545 ft. above msl, determined by TOPO

4. Drilled: Nov 1 19 ___; Dug, Cable Tool, Rotary, _____

5. Depth: Rept. 1100 ft. Meas. _____ ft.

6. Completion: Open Hole, Straight Wall, Underreamed, Gravel Packed _____

7. Pump: Mfgr. _____ Type Turb.

No. Stages ___, Bowls Diam. ___ in., Setting _____ ft.

Column Diam. _____ in., Length Tailpipe _____ ft.

8. Motor: Fuel Elect. Make & Model _____ HP. 7½

9. Yield: Flow ___ gpm, Pump _____ gpm, Meas., Rept., Est. _____

10. Performance Test: Date _____ Length of Test ___ Made by _____

Static Level ___ ft. Pumping Level ___ ft. Drawdown ___ ft.

Production _____ gpm Specific Capacity _____ gpm/ft.

11. Water Level: 130 ft. rept. meas. 19 41 above below 420 which is ___ ft. above below surface.

1111 ft. rept. meas. 4-28 19 25 above below 410 which is ___ ft. above below surface.

_____ ft. rept. meas. _____ 19 ___ above below _____ which is ___ ft. above below surface.

_____ ft. rept. meas. _____ 19 ___ above below _____ which is ___ ft. above below surface.

12. Use: Dom., Stock, Public Supply, Ind., Irr., Waterflooding, Observation, Not Used, _____

13. Quality: (Remarks on taste, odor, color, etc.) _____

Temp. ___ °F, Date sampled for analysis _____ Laboratory _____

Temp. ___ °F, Date sampled for analysis _____ Laboratory _____

Temp. ___ °F, Date sampled for analysis _____ Laboratory _____

14. Other data available as circled: Driller's Log, Radioactivity Log, Electric Log,

Formation Samples, Pumping Test,

15. Record by: Irene Davis Date 4-28 19 25

Source of Data TBWE 2-1-208

16. Remarks: _____

CASING & BLANK PIPE

Cemented From ___ ft. to ___ ft.

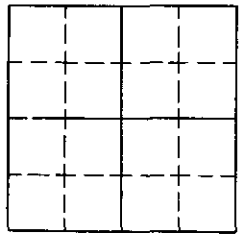
Diam. (in.)	Type	Setting, ft. from	to
10	Stl.		

WELL SCREEN

Screen Openings _____

Diam. (in.)	Type	Setting, ft. from	to

(Sketch)



TWDBE-GW-49

33-18-601

Form GW-1

TEXAS BOARD OF WATER ENGINEERS

GROUND-WATER DIVISION

WELL SCHEDULE

Date 4/15, 19 61 Field No. _____

Record by WS Office No. ~~H-65-1~~

Source of data Mr. Bell HR3318601

1. Location: County Dallas

Map Pall Mall & Plumsdale

Survey (Lucas)

2. Owner: Corpus Water Sew. Address 8430 Lake June Rd

Tenant (Lancaster) Address _____

Driller _____ Address _____

3. Topography: _____

4. Elevation: 551 E ft. above / below _____

5. Type: Dug, (Drilled), driven, bored, jetted _____ 19 ____

6. Depth: Rept. 1100 ft. Meas. _____ ft.

7. Casing: Diam. 10" in., to _____ in., Type ____

Depth _____ ft., Finish _____

8. Chief Aquifer: Kud From _____ ft. to _____ ft.

Others _____

9. Water level: _____ ft. rept. / meas. _____ 19 ____ above / below _____

_____ which is _____ ft. above / below surface

10. Pump: Type T. pump Capacity _____ gpm _____

Power: Kind E Horsepower 15

11. Yield: Flow _____ gpm, Pump 130 gpm, Meas., (Rept.) Est. 1961

Drawdown _____ ft. after _____ hours pumping _____ gpm

12. Use: Dom., Stock, (PS.) RR., Ind., Obs. Irr. _____

Adequacy, permanence _____

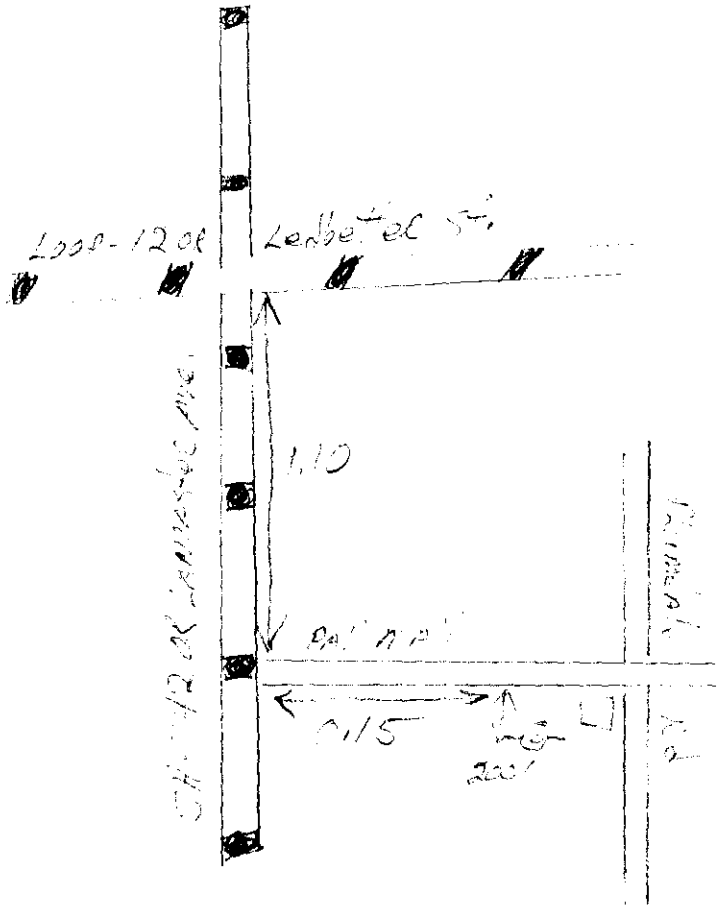
13. Quality: _____

Temp. _____ °F _____ Sample Yes / (No)

14. Log: Yes / (No)

15. Remarks: P.S. 495

40 013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115

Texas Water Development Board

TWDB Groundwater Database Result

STATE WELL NUMBER : 3319401

Scanned Images

REPORTED WATER WELL DATA ON 3319401

No.	FIELD	VALUE	EXPLANATION
1	STATE WELL NUMBER	3319401	
2	COUNTY CODE	113	Dallas County, Texas
3	BASIN	8	Trinity River Basin
4	PREVIOUS WELL NUMBER		
5	LATITUDE	324222	DMS (in decimal degrees: 32.706111)
6	LAT DEC	32.7061110	
7	LONGITUDE	964453	DMS (in decimal degrees: -96.748055)
8	LONG DEC	-96.7480550	
9	OWNER 1	Dallas County Buffalo	
10	OWNER 2	Soldiers Youth Group	
11	DRILLER 1	J.L. Myers Co.	
12	DRILLER 2		
13	SOURCE OF COORDINATES	2	
14	AQUIFER CODE	212WDBN	Woodbine Sand
15	AQUIFER ID1	29	Woodbine Aquifer
16	AQUIFER ID2		
17	AQUIFER ID3		
18	ELEVATION	410	feet
19	ELEVATION MEASUREMENT METHOD	M	Interpolated From Topo Map
20	ALPHA CODE		
21	DATE DRILLED	10101946	
22	WELL TYPE	W	Withdrawal of Water

No.	FIELD	VALUE	EXPLANATION
23	WELL DEPTH	1030	feet
24	SOURCE OF DEPTH	D	Driller's Log
25	TYPE OF LIFT	T	Turbine Pump
26	TYPE OF POWER	E	Electric Motor
27	HORSEPOWER	40.00	
28	PRIMARY WATER USE	N	Industrial
29	SECONDARY WATER USE		
30	TERTIARY WATER USE		
31	WATER LEVEL AVAILABLE	N	
32	WATER QUALITY AVAILABLE	N	
33	WELL LOGS AVAILABLE	DE	
34	OTHER DATA AVAILABLE		
35	DATE COLLECTED OR UPDATED	04231975	
36	REPORTING AGENCY	01	TWDB or Predecessor Agency
37	WELL SCHEDULE IN FILE		
38	CONTRUCTION METHOD	H	Hydraulic Rotary
39	COMPLETION	F	Gravel Pack w/Perforations
40	CASING MATERIAL	S	Steel
41	SCREEN MATERIAL	S	Steel
42	GMA	8	
43	RWPA	C	
44	DISTRICTID		

40 015

Texas Water Development Board

TWDB Groundwater Database Result

STATE WELL NUMBER : 3319401

Scanned Images

NO REPORTED INFREQUENT CONSTITUENT DATA ON 3319401

No.	STATE WELL NUMBER	MONTH	DAY	YEAR	SAMPLE NUMBER	STORET CODE	VALUE	PLUS MINUS

NO REPORTED WATER LEVEL DATA ON 3319401

No.	STATE WELL NUMBER	PUBLISHABLE/NON-PUBLISHABLE	DEPTH FROM LAND SURFACE	MONTH	DAY	YEAR	MEASUREMENT NUMBER	MEASURING AGENCY	METHOD OF MEASUREMENT	REMARK

NO REPORTED USGS 5 DAY WATER LEVEL DATA ON 3319401

No.	STATE WELL NUMBER	PUBLISHABLE/NON-PUBLISHABLE	DEPTH FROM LAND SURFACE	MONTH	DAY	YEAR	MEASUREMENT NUMBER	MEASURING AGENCY	METHOD OF MEASUREMENT	REMARK

REPORTED WELL CASING DATA ON 3319401

No.	STATE WELL NUMBER	CASING/SCREEN/OPEN HOLE INDICATOR	DIAMETER OF CASING OR SCREEN	TOP DEPTH	BOTTOM DEPTH
1	3319401	C - Casing	12	0	40
2	3319401	C - Casing	8	0	988
3	3319401	C - Casing	6	938	990
4	3319401	S - Screen (including all types of screens or other devices allowing water to enter the well)	6	990	1030

REPORTED REMARKS DATA ON 3319401

No.	STATE WELL NUMBER	REMARKS 1	REMARKS 2
1	3319401	Casing slotted. Pump set at 690	feet. Reported yield 160 gpm.
2	3319401	donated to non-profit (reptd 2009)	1630 W. Pleasant Run Dallas 75146

NO REPORTED WATER QUALITY DATA ON 3319401 (Column 1 - 19)

No.	STATE WELL NUMBER	MONTH	DAY/Year	YEAR	SAMPLE NUMBER	SAMPLE TIME	TEMPERATURE CELSIUS	TOP OF SAMPLED INTERVAL	BOTTOM OF SAMPLED INTERVAL	SAMPLED INTERVAL AQUIFER CODE	COLLECTION REMARKS	RELIABILITY REMARK	COLLECTING AGENCY	LAB CODE	BALANCED / UNBALANCED	SILICA MG/L	CALCIUM MG/L	MAGNESIUM MG/L

NO REPORTED WATER QUALITY DATA ON 3319401 (Column 20 - 39)

No.	STATE WELL NUMBER	SODIUM MG/L	POTASSIUM MG/L	STRONTIUM MG/L	CARBONATE MG/L	BICARBONATE MG/L	SULFATE MG/L	CHLORIDE MG/L	FLUORIDE MG/L	NITRATE MG/L	PH	TDS MG/L	PHENOLPHTHALEIN ALKALINITY	TOTAL ALKALINITY	TOTAL HARDNESS	PERECNT SODIUM	SAR	RSC	SPECIFIC CONDUCTANCE

40 016

TWDB Groundwater Database Result

STATE WELL NUMBER : 3319401

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Explanation of Groundwater Data

40 017

TEXAS WATER DEVELOPMENT BOARD

WELL SCHEDULE

Aquifer Woodbine Field No. _____ State Well No. 33-19-401

Owner's Well No. 1 County DALLAS

1. Location: ___ 1/4, ___ 1/4 Sec. _____, Block _____ Survey _____

2. Owner: Verson Co. Address: Box 35, Dallas, Texas

   Tenant: _____ Address: _____

   Driller: J. L. Myers Sons Address: Dallas, Texas

3. Elevation of _____ is 410 ft. above msl, determined by Topo

4. Drilled: 10-10 1946; Dug, Cable Tool, (Rotary)

5. Depth: Rept. 1030 ft. Meas. _____ ft.

6. Completion: Open Hole, Straight Wall, Underreamed, Gravel Packed _____

7. Pump: Mfgr. _____ Type Turbine

   No. Stages _____, Bowls Diam. ___ in., Setting 690 ft. Pump pulled 4-23-45

   Column Diam. _____ in., Length Tailpipe _____ ft.

8. Motor: Fuel Elect Make & Model _____ HP. 40

9. Yield: Flow ___ gpm, Pump 150 gpm, Meas., (Rept.), Est.

10. Performance Test: Date _____ Length of Test _____ Made by _____

    Static Level ___ ft. Pumping Level ___ ft. Drawdown ___ ft.

    Production _____ gpm Specific Capacity _____ gpm/ft.

CASING & BLANK PIPE

Cemented From _____ ft. to _____ ft.

Diam. (in.)	Type	Setting, ft. from	to
12 3/4	Steel	0	40
8 5/8	"	0	988
6 5/8	"	940	1030

11. Water Level: 1111 ft. rept. meas. 4-23 1945 above below No flow

    _____ ft. rept. meas. _____ 19___ above below _____ which is ___ ft. above below surface.

    _____ ft. rept. meas. _____ 19___ above below _____ which is ___ ft. above below surface.

    _____ ft. rept. meas. _____ 19___ above below _____ which is ___ ft. above below surface.

12. Use: Dom., Stock, Public Supply, (Ind.), Irr., Waterflooding, Observation, Not Used, _____

13. Quality: (Remarks on taste, odor, color, etc.) _____

    Temp. ___ °F, Date sampled for analysis _____ Laboratory _____

    Temp. ___ °F, Date sampled for analysis _____ Laboratory _____

    Temp. ___ °F, Date sampled for analysis _____ Laboratory _____

WELL SCREEN

Screen Openings Slotted

Diam. (in.)	Type	Setting, ft. from	to
6 5/8	Steel	940	1030

14. Other data available as circled: (Driller's Log), Radioactivity Log, (Electric Log), 3-19

    Formation Samples, Pumping Test, _____

15. Record by: Gene Davis Date 4-23 1945

    Source of Data TBWE + OGS

16. Remarks: _____

4-19

TWDBE-WD-2 (Sketch) 33-19-401

Texas Water Development Board
Well Schedule

State Well No. 33 19 401 **Previous Well No.** _____ **County** Dallas 113

River Basin _____ 08 **Zone** 1 **Lat.** 32 42 22 **Long.** 096 44 52 **Source of Coord.** 2

Owner's Well No. _____ **Location** ____ 1/4, ____ 1/4, **Section** ____, **Block** ____, **Survey** ____

Owner Verson Co. **Driller** J. L. Myers

Address _____ **Tenant/Oper.** _____

Date Drilled 10 10 1946 **Depth** 1030 **Source of Depth Datum** D **Altitude** 410 **Source of Alt. Datum** M

Aquifer Woodbine 21 2 WDBN **Well Type** W **User** _____

Well Construction Const. Method Rotary H Casing Material Steel S

Completion Slotted P Screen Material Steel S

Lift Data Pump Mfr. _____ Type Turbine T No. Stages _____

Bowls Diam. _____ in. Setting _____ ft. Column Diam. _____ in.

Motor Mfr. _____ Fuel or Power _____ E Horsepower 40.00

Yield Flow ____ GPM Pump ____ GPM Meas., Rept., Est. ____ Date ____

Performance Test Date ____ Length of Test ____ Production ____ GPM

Static Level ____ ft. Pumping Level ____ ft. Drawdown ____ ft. Sp.Cap. ____ GPM/ft.

Quality (Remarks _____

Water Use Primary Ind N Secondary _____ Tertiary _____

Other Data Available Water Level N Water Quality N Logs D E Other Data _____

Water Levels

	Date	Meas.

Casing or Blank Pipe (C)
Well Screen or Slotted Zone (S)
Open Hole (O)
Cemented from ___ to ___

	Diam. (in.)	Setting (feet) From	To
1	C 12	0	40
2	C 8	0	988
3	C 6	938	990
4	S 6	990	1030
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			

(20 max)

Recorded By _____ **Date Record Collected or Updated** 04 23 1975 **Reporting Agency** 01

Remarks 1 Casing slotted. Pump set at 690 ft.
2 Reported yield 160 gpm.
3
4
5
6

Aquifer _____

Well No. ____ - ____ - ____

92-0023
9/9/91

40 019

Form GW-1

TEXAS BOARD OF WATER ENGINEERS

GROUND-WATER DIVISION

WELL SCHEDULE

Date 4/1/61 3-23, 1960 Field No. _____

Record by RWH & ms Office No. AR3319401

Source of data Electric log; Mr. Rollo

1. Location: County Dallas

Map Just NNE of Intersec. of Hwy 75 & Loop 12

Survey on SE side of Dallas; just east of town

2. Owner: Verson Co. #1 Address _____

Tenant _____ Address _____

Driller J.L. Myers & Sons Address Dallas Texas

3. Topography: bottom land

4. Elevation: 410±2 ft. (above) below Sea level

5. Type: Dug (drilled), driven, bored, jetted 10-1-1946

6. Depth: Rept. 1030 ft. Meas. E/log 1030 ft.

7. Casing: Diam. 8 in., to _____ in., Type _____

Depth _____ ft., Finish _____

8. Chief Aquifer: Woodbine From 768 ft. to 1030 ft. T.D. E-log

Others _____

9. Water level: _____ ft. rept. meas. _____ 19____ above below _____

jet TM which is _____ ft. above below surface

10. Pump: Type T Capacity _____ gpm _____

Power: Kind E Horsepower ~~25~~ 25

11. Yield: Flow _____ gpm, Pump 160 gpm, Meas. (Rept.) Est. 1961

Drawdown _____ ft. after _____ hours pumping _____ gpm

12. Use: Dom., Stock, PS., RR., (Ind.), Obs. Irr. _____

Adequacy, permanence _____

13. Quality: _____

Temp. _____ °F _____ Sample Yes No

14. Log: (Yes) No E-log, Chuck Myers

15. Remarks: Well #1 70,000 gpd; 6 days a week; 12 months a year P.S. @ 650 (reported)

365 52 (Q-19) E-log

420000 420,000

1460 104 00 00

768,300,000 208 00,000

Q-19

Texas Water Development Board

TWDB Groundwater Database Result

STATE WELL NUMBER : 3319405

Scanned Images

REPORTED WATER WELL DATA ON 3319405

No.	FIELD	VALUE	EXPLANATION
1	STATE WELL NUMBER	3319405	
2	COUNTY CODE	113	Dallas County, Texas
3	BASIN	8	Trinity River Basin
4	PREVIOUS WELL NUMBER		
5	LATITUDE	324132	DMS (in decimal degrees: 32.692221)
6	LAT DEC	32.6922210	
7	LONGITUDE	964331	DMS (in decimal degrees: -96.725277)
8	LONG DEC	-96.7252770	
9	OWNER 1	F. Wullschleger	
10	OWNER 2		
11	DRILLER 1		
12	DRILLER 2		
13	SOURCE OF COORDINATES	3	
14	AQUIFER CODE	100ALVM	Alluvium
15	AQUIFER ID1	22	Other Aquifer
16	AQUIFER ID2		
17	AQUIFER ID3		
18	ELEVATION	392	feet
19	ELEVATION MEASUREMENT METHOD	M	Interpolated From Topo Map
20	ALPHA CODE		
21	DATE DRILLED		
22	WELL TYPE	W	Withdrawal of Water

No.	FIELD	VALUE	EXPLANATION
23	WELL DEPTH	20	feet
24	SOURCE OF DEPTH	S	Measured
25	TYPE OF LIFT	P	Piston
26	TYPE OF POWER	H	Hand
27	HORSEPOWER		
28	PRIMARY WATER USE	H	Domestic
29	SECONDARY WATER USE		
30	TERTIARY WATER USE		
31	WATER LEVEL AVAILABLE	M	
32	WATER QUALITY AVAILABLE	N	
33	WELL LOGS AVAILABLE		
34	OTHER DATA AVAILABLE		
35	DATE COLLECTED OR UPDATED	06191972	
36	REPORTING AGENCY	02	US GEOLOGICAL SURVEY
37	WELL SCHEDULE IN FILE		
38	CONTRUCTION METHOD		
39	COMPLETION		
40	CASING MATERIAL	S	Steel
41	SCREEN MATERIAL		
42	GMA	8	
43	RWPA	C	
44	DISTRICTID		

40 021

Texas Water Development Board

TWDB Groundwater Database Result

STATE WELL NUMBER : 3319405

Scanned Images

NO REPORTED INFREQUENT CONSTITUENT DATA ON 3319405

No.	STATE WELL NUMBER	MONTH	DAY	YEAR	SAMPLE NUMBER	STORET CODE	VALUE	PLUS MINUS

REPORTED WATER LEVEL DATA ON 3319405

No.	STATE WELL NUMBER	PUBLISHABLE/NON-PUBLISHABLE	DEPTH FROM LAND SURFACE	MONTH	DAY	YEAR	MEASUREMENT NUMBER	MEASURING AGENCY	METHOD OF MEASUREMENT	REMARK
1	3319405	P	-10.45	6	19	1972	01	04	1	

NO REPORTED USGS 5 DAY WATER LEVEL DATA ON 3319405

No.	STATE WELL NUMBER	PUBLISHABLE/NON-PUBLISHABLE	DEPTH FROM LAND SURFACE	MONTH	DAY	YEAR	MEASUREMENT NUMBER	MEASURING AGENCY	METHOD OF MEASUREMENT	REMARK

REPORTED WELL CASING DATA ON 3319405

No.	STATE WELL NUMBER	CASING/SCREEN/OPEN HOLE INDICATOR	DIAMETER OF CASING OR SCREEN	TOP DEPTH	BOTTOM DEPTH
1	3319405	C - Casing	4		

NO REPORTED REMARKS DATA ON 3319405

No.	STATE WELL NUMBER	REMARKS 1	REMARKS 2

NO REPORTED WATER QUALITY DATA ON 3319405 (Column 1 - 19)

No.	STATE WELL NUMBER	MONTH	DAY/Year	YEAR	SAMPLE NUMBER	SAMPLE TIME	TEMPERATURE CELSIUS	TOP OF SAMPLED INTERVAL	BOTTOM OF SAMPLED INTERVAL	SAMPLED INTERVAL AQUIFER CODE	COLLECTION REMARKS	RELIABILITY REMARK	COLLECTING AGENCY	LAB CODE	BALANCED / UNBALANCED	SILICA MG/L	CALCIUM MG/L	MAGNESIUM MG/L

NO REPORTED WATER QUALITY DATA ON 3319405 (Column 20 - 39)

No.	STATE WELL NUMBER	SODIUM MG/L	POTASSIUM MG/L	STRONTIUM MG/L	CARBONATE MG/L	BICARBONATE MG/L	SULFATE MG/L	CHLORIDE MG/L	FLUORIDE MG/L	NITRATE MG/L	PH	TDS MG/L	PHENOLPHTHALEIN ALKALINITY	TOTAL ALKALINITY	TOTAL HARDNESS	PERECNT SODIUM	SAR	RSC	SPECIFIC CONDUCTANCE

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You can download Groundwater Database Reports in ASCII text files from this link. The files are organized by Texas counties.

Explanation of Groundwater Data

Texas Water Development Board
Well Schedule

State Well No. 33 19 405 **Previous Well No.** _____ **County** Dallas 113

River Basin _____ 08 **Zone** 1 **Lat.** 32 41 32 **Long.** 096 43 30 **Source of Coord.** 3

Owner's Well No. _____ **Location** ____ 1/4, ____ 1.4, **Section** ____, **Block** ____, **Survey** ____

Owner F. Wullschleger **Driller** _____

Address _____ **Tenant/Oper.** _____

Date Drilled _____ 1940 **Depth** 20 **Source of Depth Datum** S **Altitude** 392 **Source of Alt. Datum** M

Aquifer Alluvium 100ALVM **Well Type** W **User** _____

Well Construction Const. Method _____ Casing Material Steel S

Completion _____ Screen Material _____

Lift Data Pump Mfr. _____ Type Pitcher Pump Piston P No. Stages ____

Bowls Diam. ____ in. Setting ____ ft. Column Diam. ____ in.

Motor Mfr. _____ Fuel or Power Hand H Horsepower ____

Yield Flow ____ GPM Pump ____ GPM Meas., Rept., Est. ____ Date ____

Performance Test Date ____ Length of Test ____ Production ____ GPM

Static Level ____ ft. Pumping Level ____ ft. Drawdown ____ ft. Sp.Cap. ____ GPM/ft.

Quality (Remarks _____

Water Use Primary Dom H Secondary _____ Tertiary _____

Other Data Available Water Level M Water Quality N Logs _____ Other Data _____

Water Levels

Date	06 19 1972	Meas. 10.45	by USGS w/ Tape 04 01
Date		Meas.	
Date		Meas.	

Casing or Blank Pipe (C)
Well Screen or Slotted Zone (S)
Open Hole (O)
Cemented from ___ to ___

	Diam. (in.)	Setting (feet) From	To
1	C 4		
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			

(20 max)

Recorded By _____ **Date Record Collected or Updated** 06 19 1972 **Reporting Agency** 02 USGS

Remarks

Aquifer _____

Well No. ____ - ____

92-0023
9/9/91

40 024

FORM 9-1642B
(DEC. 68)

Well No. R-33-19-405

WELL SCHEDULE

U. S. DEPT. OF THE INTERIOR GEOLOGICAL SURVEY WATER RESOURCES DIVISION

MASTER CARD F. WULLSCHLEGER 1:24,000

Record by W SANDEEN Source of data + OBSERVATION Date 6-20-72 Map HUTCHINS, 1958 PR '68

State TEXAS 49 County (or town) DALLAS HR

Latitude: deg min sec N S Longitude: degrees min sec Sequential number:

Lat-long accuracy: T. N S, R E W, Sec , , , B & M

Local well number: HR-33-19-405 Other number:

Local use: Owner or name: FRITZ WULLSCHLEGER

Owner or name: F WULLSCHLEGER Address: ROUTE 2 BOX 402 DALLAS, TEXAS 75216

Ownership: (C) County, (F) Fed Gov't, (M) City, (N) Corp or Co., (P) Private, (S) State Agency, (W) Water Dist P

Use of water: (A) Air cond, (B) Bottling, (C) Comm, (D) Dewater, (E) Power, (F) Fire, (H) Dom, (I) Irr, (M) Med, (N) Ind, (P) P S, (R) Rec, (S) Stock, (T) Instit, (U) Unused, (V) Repressure, (W) Recharge, (X) Desal-P S, (Y) Desal-other, (Z) Other I

Use of well: (A) Anode, (D) Drain, (G) Seismic, (H) Heat Res, (O) Obs, (P) Oil-gas, (R) Recharge, (T) Test, (U) Unused, (W) Withdraw, (X) Waste, (Z) Destroyed W

DATA AVAILABLE: Well data Freq. W/L meas.: Field aquifer char.

Hyd. lab. data:

Qual. water data; type:

Freq. sampling: Pumpage inventory: yes, period:

Aperture cards: yes

Log data:

WELL-DESCRIPTION CARD

SAME AS ON MASTER CARD Depth well: 20 ft 20 meas. rept accuracy

Depth cased; (first perf.) ft Casing type: STEEL; Diam. 4 in 4

Finish: (C) porous concrete, (F) gravel w. (perf.), (G) gravel w. (screen), (H) horiz. gallery, (O) open end, (P) perf., screen, sd. pt., (S) shored, (T) open hole, (W) other

Method Drilled: (A) air rot, (B) bored, (C) cable, (D) dug, (H) hyd rot., (J) jetted, (P) air percussion, (R) reverse rotary, (T) trenching, (V) driven, (W) drive wash, (Z) other

Date Drilled: 1940's 9 4 0 Pump intake setting: ft

Driller: name address

Lift (type): (A) air, (B) bucket, (C) cent, (J) jet, (L) multiple, (cent.), (M) multiple, (turb.), (N) none, (P) piston, (R) rot, submerg, (S) turb, (T) other Deep Shallow

Power (type): diesel, elec, gas, gasoline, hand, nat gas, LP gas, wind; H.P. PITCHER PUMP. Trans. or meter no.

Descrip. MP Top 4" CASING 1.0 ft above below LSD, Alt. MP

Alt. LSD: 392 3 9 2 Accuracy: (source) 4

Water Level 10.45 ft above below MP, Ft above below LSD 9 Accuracy: TAPE W-S A

Date meas: 6-19-72 6 7 2 Yield: gpm Method determined

Drawdown: ft Accuracy: Pumping period hrs

QUALITY OF WATER DATA: Iron ppm Sulfate ppm Chloride ppm Hard. ppm

Sp. Conduct K x 10^6 Temp. °F Date sampled

Tastes, color, etc.

16.00
5.55
10.45

Well No.

Pumping Test Data

TD ___ Casing ___ Diameter: ___

Water Levels: static ___ (before start)

Pumping ___

Pumpage: ___ (gpm)

Rated by: California ☐ Watch ☐

Other ☐

Miscellaneous: ___

FORM 9-1642B
(DEC. 68)

Well No. HR-33-19-405

WELL SCHEDULE

U. S. DEPT. OF THE INTERIOR — GEOLOGICAL SURVEY — WATER RESOURCES DIVISION

MASTER CARD

Record by W. Sarbeen Source of data Corps. Eng. Obs. Date 6-19-72 Map HUTCHINS

State Texas 4 9 County (or town) DALLAS

Latitude: deg min sec N S Longitude: 12 degrees 13 min sec 18 Sequential number:

Lat-long accuracy: T. ___ N S, R. ___ E W, Sec. ___, ___ ¼, ___ ¼, ___ ¼ ___ B & M

Local well number: H Other number: ___

Local use: Owner or name: ___

Owner or name: F W U L L S C H L E G E R Address: ___

Date of Test ___

MP + 1.0 (TOP 4" CASING AT BASE PITCHER PUMP)

Date	Hour	Hold	Cut	W. L.	Depth to Water (lsd)	Remarks
6-19-72		16 00	5.55	10.45	9.45	WMS TAPE

Date	Hour	Hold	Cut	W. L.	Depth to Water (lsd)	Remarks

40-020

Texas Water Development Board

TWDB Groundwater Database Result

STATE WELL NUMBER : 3318501

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REPORTED WATER WELL DATA ON 3318501

No.	FIELD	VALUE	EXPLANATION
1	STATE WELL NUMBER	3318501	
2	COUNTY CODE	113	Dallas County, Texas
3	BASIN	8	Trinity River Basin
4	PREVIOUS WELL NUMBER		
5	LATITUDE	324227	DMS (in decimal degrees: 32.707500)
6	LAT DEC	32.7075000	
7	LONGITUDE	964829	DMS (in decimal degrees: -96.808055)
8	LONG DEC	-96.8080550	
9	OWNER 1	City of Dallas	
10	OWNER 2		
11	DRILLER 1	B.J. Harper	
12	DRILLER 2		
13	SOURCE OF COORDINATES	3	
14	AQUIFER CODE	218TWMT	Twin Mountains Formation
15	AQUIFER ID1	28	Trinity Aquifer
16	AQUIFER ID2		
17	AQUIFER ID3		
18	ELEVATION	560	feet
19	ELEVATION MEASUREMENT METHOD	M	Interpolated From Topo Map
20	ALPHA CODE	206800	CITY OF DALLAS; C/O DENNIS ALLEN, OPNS. MGR.
21	DATE DRILLED		
22	WELL TYPE	W	Withdrawal of Water

No.	FIELD	VALUE	EXPLANATION
23	WELL DEPTH	2922	feet
24	SOURCE OF DEPTH	D	Driller's Log
25	TYPE OF LIFT	N	None
26	TYPE OF POWER		
27	HORSEPOWER		
28	PRIMARY WATER USE	U	Unused
29	SECONDARY WATER USE		
30	TERTIARY WATER USE		
31	WATER LEVEL AVAILABLE	N	
32	WATER QUALITY AVAILABLE	N	
33	WELL LOGS AVAILABLE	D	
34	OTHER DATA AVAILABLE		
35	DATE COLLECTED OR UPDATED	10191976	
36	REPORTING AGENCY	01	TWDB or Predecessor Agency
37	WELL SCHEDULE IN FILE		
38	CONTRUCTION METHOD		
39	COMPLETION		
40	CASING MATERIAL		
41	SCREEN MATERIAL		
42	GMA	8	
43	RWPA	C	
44	DISTRICTID		

40 027

Texas Water Development Board

TWDB Groundwater Database Result

STATE WELL NUMBER : 3318501

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NO REPORTED INFREQUENT CONSTITUENT DATA ON 3318501

No.	STATE WELL NUMBER	MONTH	DAY	YEAR	SAMPLE NUMBER	STORET CODE	VALUE	PLUS MINUS

NO REPORTED WATER LEVEL DATA ON 3318501

No.	STATE WELL NUMBER	PUBLISHABLE/NON-PUBLISHABLE	DEPTH FROM LAND SURFACE	MONTH	DAY	YEAR	MEASUREMENT NUMBER	MEASURING AGENCY	METHOD OF MEASUREMENT	REMARK

NO REPORTED USGS 5 DAY WATER LEVEL DATA ON 3318501

No.	STATE WELL NUMBER	PUBLISHABLE/NON-PUBLISHABLE	DEPTH FROM LAND SURFACE	MONTH	DAY	YEAR	MEASUREMENT NUMBER	MEASURING AGENCY	METHOD OF MEASUREMENT	REMARK

REPORTED WELL CASING DATA ON 3318501

No.	STATE WELL NUMBER	CASING/SCREEN/OPEN HOLE INDICATOR	DIAMETER OF CASING OR SCREEN	TOP DEPTH	BOTTOM DEPTH
1	3318501	C - Casing	18	0	588
2	3318501	C - Casing	8	588	2922

REPORTED REMARKS DATA ON 3318501

No.	STATE WELL NUMBER	REMARKS 1	REMARKS 2
1	3318501	Completion intervals not known.	

NO REPORTED WATER QUALITY DATA ON 3318501 (Column 1 - 19)

No.	STATE WELL NUMBER	MONTH	DAY/Year	YEAR	SAMPLE NUMBER	SAMPLE TIME	TEMPERATURE CELSIUS	TOP OF SAMPLED INTERVAL	BOTTOM OF SAMPLED INTERVAL	SAMPLED INTERVAL AQUIFER CODE	COLLECTION REMARKS	RELIABILITY REMARK	COLLECTING AGENCY	LAB CODE	BALANCED / UNBALANCED	SILICA MG/L	CALCIUM MG/L	MAGNESIUM MG/L

NO REPORTED WATER QUALITY DATA ON 3318501 (Column 20 - 39)

No.	STATE WELL NUMBER	SODIUM MG/L	POTASSIUM MG/L	STRONTIUM MG/L	CARBONATE MG/L	BICARBONATE MG/L	SULFATE MG/L	CHLORIDE MG/L	FLUORIDE MG/L	NITRATE MG/L	PH	TDS MG/L	PHENOLPHTHALEIN ALKALINITY	TOTAL ALKALINITY	TOTAL HARDNESS	PERECNT SODIUM	SAR	RSC	SPECIFIC CONDUCTANCE

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TWDB Groundwater Database Result

Scanned Images

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Explanation of Groundwater Data

Texas Water Development Board
Well Schedule

State Well No. 33 18 501 **Previous Well No.** _____ **County** Dallas 113

River Basin _____ 08 **Zone** 1 **Lat.** 32 42 27 **Long.** 096 48 28 **Source of Coord.** 3

Owner's Well No. _____ **Location** ____ 1/4, ____ 1.4, **Section** ____, **Block** ____, **Survey** ____

Owner City of Dallas **Driller** B. J. Harper

Address _____ **Tenant/Oper.** _____

Date Drilled ____ ____ 1930 **Depth** 2922 **Source of Depth Datum** D **Altitude** 560 **Source of Alt. Datum** M

Aquifer Twin Mts 218TWMT **Well Type** W **User** 206800

Well Construction Const. Method _____ Casing Material _____

Completion _____ Screen Material _____

Lift Data Pump Mfr. _____ Type _____ N No. Stages ____

Bowls Diam. _____ in. Setting _____ ft. Column Diam. _____ in.

Motor Mfr. _____ Fuel or Power _____ Horsepower ____.__

Yield Flow ____ GPM Pump ____ GPM Meas., Rept., Est. ____ Date ____

Performance Test Date ____ Length of Test ____ Production ____ GPM

Static Level ____ ft. Pumping Level ____ ft. Drawdown ____ ft. Sp.Cap. ____ GPM/ft.

Quality (Remarks _____

Water Use Primary Unused U Secondary ____ Tertiary ____

Other Data Available Water Level N Water Quality N Logs D Other Data

Water Levels Date ____ Meas. ____ . ____ _____

Date ____ Meas. ____ . ____ _____

Date ____ Meas. ____ . ____ _____

Casing or Blank Pipe (C)
Well Screen or Slotted Zone (S)
Open Hole (O)
Cemented from ___ to ___

	Diam. (in.)		Setting (feet) From		To	
1	C	18		0	588	
2	C	8	588	2922		
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						

(20 max)

Recorded By _____ **Date Record Collected or Updated** 10 19 1976 **Reporting Agency** 01

Remarks Completion intervals not known

Aquifer _____

Well No. ____ - ____ - ____

92-0023
9/9/91

40 030

TEXAS WATER DEVELOPMENT BOARD

WELL SCHEDULE

Aquifer KCTM Field No. 287 State Well No. 33-18-501

Owner's Well No. 37 County DALLAS

1. Location: ___ 1/4, ___ 1/4 Sec. ___, Block ___ Survey ___

2. Owner: City of Dallas Address: ___

Tenant: ___ Address: ___

Driller: B.J. Harper Address: ___

3. Elevation of LSD is 560 ft. above msl, determined by Topo

4. Drilled: ___ 19 30; Dug, Cable Tool, Rotary, ___

5. Depth: Rept. 2922 ft. Meas. ___ ft.

6. Completion: Open Hole, Straight Wall, Underreamed, Gravel Packed ___

7. Pump: Mfgr. ___ Type ___

No. Stages ___, Bowls Diam. ___ in., Setting ___ ft.

Column Diam. ___ in., Length Tailpipe ___ ft.

8. Motor: Fuel ___ Make & Model ___ HP. ___

9. Yield: Flow ___ gpm, Pump ___ gpm, Meas., Rept., Est. ___

10. Performance Test: Date ___ Length of Test ___ Made by ___

Static Level ___ ft. Pumping Level ___ ft. Drawdown ___ ft.

Production ___ gpm Specific Capacity ___ gpm/ft.

CASING & BLANK PIPE

Cemented From ___ ft. to ___ ft.

Diam. (in.)	Type	Setting, ft. from	to
18	steel	0	588
8	"	588	2922

11. Water Level: ___ ft. rept. meas. ___ 19 ___ above below ___ which is ___ ft. above below surface.

___ ft. rept. meas. ___ 19 ___ above below ___ which is ___ ft. above below surface.

___ ft. rept. meas. ___ 19 ___ above below ___ which is ___ ft. above below surface.

___ ft. rept. meas. ___ 19 ___ above below ___ which is ___ ft. above below surface.

12. Use: Dom., Stock, (Public Supply), Ind., Irr., Waterflooding, Observation, (Not Used) well never cleared up

13. Quality: (Remarks on taste, odor, color, etc.) ___

Temp. ___ °F, Date sampled for analyeis ___ Laboratory ___

Temp. ___ °F, Date sampled for analysis ___ Laboratory ___

Temp. ___ °F, Date sampled for analysis ___ Laboratory ___

14. Other data available as circled: (Driller's Log) Radioactivity Log, Electric Log,

Formation Samples, Pumping Test, ___

15. Record by: P. Nordstrom Date 10-19 19 76

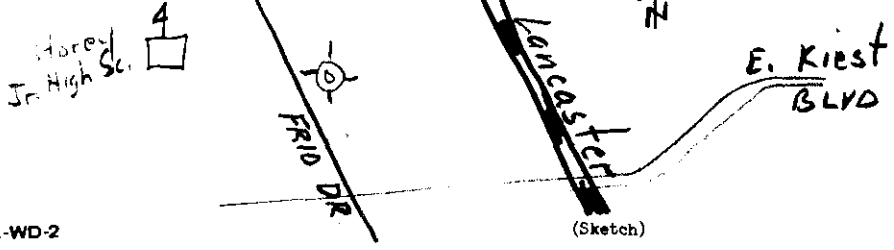
Source of Data Misc Unn 66, City

16. Remarks: ___

WELL SCREEN

Screen Openings ___

Diam. (in.)	Type	Setting, ft. from	to



(Sketch)

TWDBE-WD-2

33-18-501

Depth	Thickness	Formation
5	5	surf. soil
222	217	white rock
681	459	shale & shells
694	13	Sand
708	14	hard sand
713	5	sand
791	78	shale
823	32	sand
874	51	sandy shale
910	36	Sand
995	85	shale & rocks
1000	5	Sand & rocks
1030	30	hard shale & shells
1124	94	shale & Lmst.
1155	31	Bkn. Lmst. & marl
1263	108	Limestone
1276	13	shale
1323	47	Lmst.
1353	30	Limst. & marl
1424	71	Lmst.
1459	35	Lmst. & marl
1554	95	Lmst
1595	41	Lmst. & sand
1637	42	sand
1711	74	weter sand
1741	30	shale & rock
1783	42	Bkn Lmst & sand
1847	64	Lmst
1859	12	gumbo
1874	15	shale
1886	12	Lmst
1924	38	Sandy Lmst
1963	39	Lmst. & marl

Depth	Thick	Formation
1981	18	Limestone
1994	13	Lmst. & marl
2037	43	shell rock & sand
2040	3	Lmst.
2046	6	sand
2104	58	Lmst.
2146	42	Bkn sand & Lmst.
2183	37	Bkn. Limst.
2224	41	Bkn sand & Lmst.
2246	22	Bkn sand & shale
2282	36	Sdy Lmst and sand
2297	15	Lmst.
2336	39	Sdy Lmst., sand & marl
2389	53	shell & sand
2424	35	Sdy Lmst. & shell
2472	48	sdy Lmst., sand & marl
2480	8	red beds
2482	2	shale
2491	9	Sdy Lmst.
2495	4	marl
2501	6	shale and rock
2513	12	sdy Lmst.
2556	43	Sand
2588	32	Sand & redbeds
2606	18	redbeds
2616	10	Sand
2671	55	Bkn sand & redbeds
2834	163	Sand
2918	84	bkn. sand & redbeds
2921	3	shale
2922	1	hard rock.

TEXAS WATER DEVELOPMENT BOARD

WELL SCHEDULE

Aquifer Woodbine Field No. #129 State Well No. 33-18-502

Owner's Well No. 1 County Dallas

1. Location: ___ 1/4, ___ 1/4 Sec. ___, Block ___ Survey ___

2. Owner: Laurel Land Memorial Park Address: ___

Tenant: ___ Address: ___

Driller: R.H. Dearing and Sons Address: ___

3. Elevation of Ld is ± 590 ft. above msl, determined by Topo

4. Drilled: ___ 1923; Dug, Cable Tool, Rotary, ___

5. Depth: Rept. 853 ft. Meas. ___ ft.

6. Completion: Open Hole, Straight Wall, Underreamed, Gravel Packed ___

7. Pump: Mfgr. ___ Type T

No. Stages ___, Bowls Diam. ___ in., Setting ___ ft.

Column Diam. ___ in., Length Tailpipe ___ ft.

8. Motor: Fuel E Make & Model ___ HP. 10

9. Yield: Flow ___ gpm, Pump 72 gpm, Meas., (Rept.), Est. ___

10. Performance Test: Date ___ Length of Test ___ Made by ___

Static Level ___ ft. Pumping Level ___ ft. Drawdown ___ ft.

Production ___ gpm Specific Capacity ___ gpm/ft.

CASING & BLANK PIPE

Cemented From ___ ft. to ___ ft.

Diam. (in.)	Type	Setting, ft. from	to
6		0	850

11. Water Level: 230 ft. (rept.) meas. 1937 above below ___ which is ___ ft. above below surface.

230 ft. (rept.) meas. 1941 above below ___ which is ___ ft. above below surface.

___ ft. rept. meas. 19___ above below ___ which is ___ ft. above below surface.

___ ft. rept. meas. 19___ above below ___ which is ___ ft. above below surface.

12. Use: Dom., Stock, Public Supply, Ind., (Irr.), Waterflooding, Observation, Not Used, ___

13. Quality: (Remarks on taste, odor, color, etc.) ___

Temp. 83 °F, Date sampled for analysis 7-30-42 Laboratory USGS

Temp. ___ °F, Date sampled for analysis ___ Laboratory ___

Temp. ___ °F, Date sampled for analysis ___ Laboratory ___

WELL SCREEN

Screen Openings ___

Diam. (in.)	Type	Setting, ft. from	to

14. Other data available as circled: Driller's Log, Radioactivity Log, Electric Log, Formation Samples, Pumping Test, ___

15. Record by: Nordstrom Date 10-25 1976

Source of Data Misc UNW #66

16. Remarks: pumps 12 hrs/day in Summer (as of 1942)

-502

-503

TWDBE-WD-2

(Sketch)

40-033-33-18-502

Texas Water Development Board

TWDB Groundwater Database Result

STATE WELL NUMBER : 3318502

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REPORTED WATER WELL DATA ON 3318502

No.	FIELD	VALUE	EXPLANATION
1	STATE WELL NUMBER	3318502	
2	COUNTY CODE	113	Dallas County, Texas
3	BASIN	8	Trinity River Basin
4	PREVIOUS WELL NUMBER		
5	LATITUDE	324027	DMS (in decimal degrees: 32.674166)
6	LAT DEC	32.6741660	
7	LONGITUDE	964837	DMS (in decimal degrees: -96.810277)
8	LONG DEC	-96.8102770	
9	OWNER 1		
10	OWNER 2		
11	DRILLER 1		
12	DRILLER 2		
13	SOURCE OF COORDINATES	3	
14	AQUIFER CODE	212WDBN	Woodbine Sand
15	AQUIFER ID1	29	Woodbine Aquifer
16	AQUIFER ID2		
17	AQUIFER ID3		
18	ELEVATION	566	feet
19	ELEVATION MEASUREMENT METHOD	D	Digital Elevation Model -DEM
20	ALPHA CODE		
21	DATE DRILLED		
22	WELL TYPE	W	Withdrawal of Water

No.	FIELD	VALUE	EXPLANATION
23	WELL DEPTH	853	feet
24	SOURCE OF DEPTH	U	Unknown
25	TYPE OF LIFT		
26	TYPE OF POWER		
27	HORSEPOWER		
28	PRIMARY WATER USE	I	Irrigation
29	SECONDARY WATER USE		
30	TERTIARY WATER USE		
31	WATER LEVEL AVAILABLE	N	
32	WATER QUALITY AVAILABLE	Y	
33	WELL LOGS AVAILABLE		
34	OTHER DATA AVAILABLE		
35	DATE COLLECTED OR UPDATED		
36	REPORTING AGENCY		
37	WELL SCHEDULE IN FILE		
38	CONTRUCTION METHOD		
39	COMPLETION		
40	CASING MATERIAL		
41	SCREEN MATERIAL		
42	GMA	8	
43	RWPA	C	
44	DISTRICTID		

40 034

TWDB Groundwater Database Result

STATE WELL NUMBER : 3318502

Scanned Images

NO REPORTED INFREQUENT CONSTITUENT DATA ON 3318502

No.	STATE WELL NUMBER	MONTH	DAY	YEAR	SAMPLE NUMBER	STORET CODE	VALUE	PLUS MINUS

NO REPORTED WATER LEVEL DATA ON 3318502

No.	STATE WELL NUMBER	PUBLISHABLE/NON-PUBLISHABLE	DEPTH FROM LAND SURFACE	MONTH	DAY	YEAR	MEASUREMENT NUMBER	MEASURING AGENCY	METHOD OF MEASUREMENT	REMARK

NO REPORTED USGS 5 DAY WATER LEVEL DATA ON 3318502

No.	STATE WELL NUMBER	PUBLISHABLE/NON-PUBLISHABLE	DEPTH FROM LAND SURFACE	MONTH	DAY	YEAR	MEASUREMENT NUMBER	MEASURING AGENCY	METHOD OF MEASUREMENT	REMARK

NO REPORTED WELL CASING DATA ON 3318502

No.	STATE WELL NUMBER	CASING/SCREEN/OPEN HOLE INDICATOR	DIAMETER OF CASING OR SCREEN	TOP DEPTH	BOTTOM DEPTH

NO REPORTED REMARKS DATA ON 3318502

No.	STATE WELL NUMBER	REMARKS 1	REMARKS 2

REPORTED WATER QUALITY DATA ON 3318502 (Column 1 - 19)

No.	STATE WELL NUMBER	MONTH	DAY/Year	YEAR	SAMPLE NUMBER	SAMPLE TIME	TEMPERATURE CELSIUS	TOP OF SAMPLED INTERVAL	BOTTOM OF SAMPLED INTERVAL	SAMPLED INTERVAL AQUIFER CODE	COLLECTION REMARKS	RELIABILITY REMARK	COLLECTING AGENCY	LAB CODE	BALANCED / UNBALANCED	SILICA MG/L	CALCIUM MG/L	MAGNESIUM MG/L
1	3318502	7	30	1942	1	0000	28					99	06	13	B		4.00	1.50

REPORTED WATER QUALITY DATA ON 3318502 (Column 20 - 39)

No.	STATE WELL NUMBER	SODIUM MG/L	POTASSIUM MG/L	STRONTIUM MG/L	CARBONATE MG/L	BICARBONATE MG/L	SULFATE MG/L	CHLORIDE MG/L	FLUORIDE MG/L	NITRATE MG/L	PH	TDS MG/L	PHENOLPHTHALEIN ALKALINITY	TOTAL ALKALINITY	TOTAL HARDNESS	PERECNT SODIUM	SAR	RSC	SPECIFIC CONDUCTANCE
1	3318502	833.00			0.00	769.22	628.00	385.00		0.00		2229	0.00	630.33	16	99	84.92	12.28	

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Explanation of Groundwater Data

TEXAS WATER DEVELOPMENT BOARD

WELL SCHEDULE

Aquifer Woodbine Field No. _____ State Well No. 33-19-705

Owner's Well No. #1 County DALLAS

1. Location: ___ 1/4, ___ 1/4 Sec. _____, Block _____ Survey _____

2. Owner: Dallas County Convalescent Home Address: Hutchins, Texas

Tenant: _____ Address: _____

Driller: _____ Address: _____

3. Elevation of _____ is 460 ft. above msl, determined by _____

4. Drilled: Before 1910; Dug, Cable Tool, Rotary, _____

5. Depth: Rept. 1035 ft. Meas. _____ ft.

6. Completion: Open Hole, Straight Wall, Underreamed, Gravel Packed _____

7. Pump: Mfgr. _____ Type _____

No. Stages _____, Bowls Diam. ___ in., Setting _____ ft.

Column Diam. _____ in., Length Tailpipe _____ ft.

8. Motor: Fuel _____ Make & Model _____ HP. _____

9. Yield: Flow _____ gpm, Pump _____ gpm, Meas., Rept., Est. _____

10. Performance Test: Date _____ Length of Test _____ Made by _____

Static Level ___ ft. Pumping Level ___ ft. Drawdown ___ ft.

Production _____ gpm Specific Capacity _____ gpm/ft.

CASING & BLANK PIPE

Cemented From _____ ft. to _____ ft.

Diam. (in.)	Type	Setting, ft. from	to
5	Steel		

11. Water Level: 100.0 ft. (rept. meas.) 1942 (above below) G.L. which is ___ ft. (above below) surface.

_____ ft. rept. meas. _____ 19__ above below which is ___ ft. above below surface.

_____ ft. rept. meas. _____ 19__ above below which is ___ ft. above below surface.

_____ ft. rept. meas. _____ 19__ above below which is ___ ft. above below surface.

12. Use: Dom., Stock, (Public Supply) Ind., Irr., Waterflooding, Observation, Not Used, Destroyed

13. Quality: (Remarks on taste, odor, color, etc.) _____

Temp. ___ °F, Date sampled for analysis _____ Laboratory _____

Temp. ___ °F, Date sampled for analysis _____ Laboratory _____

Temp. ___ °F, Date sampled for analysis _____ Laboratory _____

WELL SCREEN

Screen Openings _____

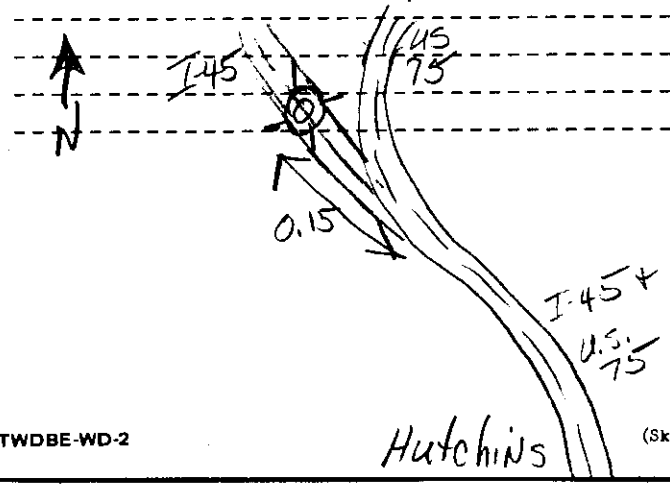
Diam. (in.)	Type	Setting, ft. from	to

14. Other data available as circled: Driller's Log, Radioactivity Log, Electric Log, Formation Samples, Pumping Test, _____

15. Record by: Steve DAVIS Date 8-9 1977

Source of Data Misc UNN66+065.

16. Remarks: Flowed Till 1910 + Pump 35 gpm IN 1942 — Destroyed



(Sketch)

TWDBE-WD-2

33-19-037 705

Texas Water Development Board

TWDB Groundwater Database Result

STATE WELL NUMBER : 3319705

Scanned Images

REPORTED WATER WELL DATA ON 3319705

No.	FIELD	VALUE	EXPLANATION
1	STATE WELL NUMBER	3319705	
2	COUNTY CODE	113	Dallas County, Texas
3	BASIN	8	Trinity River Basin
4	PREVIOUS WELL NUMBER		
5	LATITUDE	323929	DMS (in decimal degrees: 32.658055)
6	LAT DEC	32.6580550	
7	LONGITUDE	964318	DMS (in decimal degrees: -96.721666)
8	LONG DEC	-96.7216660	
9	OWNER 1	Dallas County	
10	OWNER 2	Convalescent Home	
11	DRILLER 1		
12	DRILLER 2		
13	SOURCE OF COORDINATES	3	
14	AQUIFER CODE	212WDBN	Woodbine Sand
15	AQUIFER ID1	29	Woodbine Aquifer
16	AQUIFER ID2		
17	AQUIFER ID3		
18	ELEVATION	460	feet
19	ELEVATION MEASUREMENT METHOD	M	Interpolated From Topo Map
20	ALPHA CODE		
21	DATE DRILLED		
22	WELL TYPE	W	Withdrawal of Water

No.	FIELD	VALUE	EXPLANATION
23	WELL DEPTH	1035	feet
24	SOURCE OF DEPTH	U	Unknown
25	TYPE OF LIFT		
26	TYPE OF POWER		
27	HORSEPOWER		
28	PRIMARY WATER USE	U	Unused
29	SECONDARY WATER USE		
30	TERTIARY WATER USE		
31	WATER LEVEL AVAILABLE	N	
32	WATER QUALITY AVAILABLE	N	
33	WELL LOGS AVAILABLE		
34	OTHER DATA AVAILABLE		
35	DATE COLLECTED OR UPDATED		
36	REPORTING AGENCY		
37	WELL SCHEDULE IN FILE		
38	CONTRUCTION METHOD		
39	COMPLETION		
40	CASING MATERIAL		
41	SCREEN MATERIAL		
42	GMA	8	
43	RWPA	C	
44	DISTRICTID		

Texas Water Development Board

TWDB Groundwater Database Result

STATE WELL NUMBER : 3319705

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NO REPORTED INFREQUENT CONSTITUENT DATA ON 3319705

No.	STATE WELL NUMBER	MONTH	DAY	YEAR	SAMPLE NUMBER	STORET CODE	VALUE	PLUS MINUS

NO REPORTED WATER LEVEL DATA ON 3319705

No.	STATE WELL NUMBER	PUBLISHABLE/NON-PUBLISHABLE	DEPTH FROM LAND SURFACE	MONTH	DAY	YEAR	MEASUREMENT NUMBER	MEASURING AGENCY	METHOD OF MEASUREMENT	REMARK

NO REPORTED USGS 5 DAY WATER LEVEL DATA ON 3319705

No.	STATE WELL NUMBER	PUBLISHABLE/NON-PUBLISHABLE	DEPTH FROM LAND SURFACE	MONTH	DAY	YEAR	MEASUREMENT NUMBER	MEASURING AGENCY	METHOD OF MEASUREMENT	REMARK

NO REPORTED WELL CASING DATA ON 3319705

No.	STATE WELL NUMBER	CASING/SCREEN/OPEN HOLE INDICATOR	DIAMETER OF CASING OR SCREEN	TOP DEPTH	BOTTOM DEPTH

NO REPORTED REMARKS DATA ON 3319705

No.	STATE WELL NUMBER	REMARKS 1	REMARKS 2

NO REPORTED WATER QUALITY DATA ON 3319705 (Column 1 - 19)

No.	STATE WELL NUMBER	MONTH	DAY/Year	YEAR	SAMPLE NUMBER	SAMPLE TIME	TEMPERATURE CELSIUS	TOP OF SAMPLED INTERVAL	BOTTOM OF SAMPLED INTERVAL	SAMPLED INTERVAL AQUIFER CODE	COLLECTION REMARKS	RELIABILITY REMARK	COLLECTING AGENCY	LAB CODE	BALANCED / UNBALANCED	SILICA MG/L	CALCIUM MG/L	MAGNESIUM MG/L

NO REPORTED WATER QUALITY DATA ON 3319705 (Column 20 - 39)

No.	STATE WELL NUMBER	SODIUM MG/L	POTASSIUM MG/L	STRONTIUM MG/L	CARBONATE MG/L	BICARBONATE MG/L	SULFATE MG/L	CHLORIDE MG/L	FLUORIDE MG/L	NITRATE MG/L	PH	TDS MG/L	PHENOLPHTHALEIN ALKALINITY	TOTAL ALKALINITY	TOTAL HARDNESS	PERECNT SODIUM	SAR	RSC	SPECIFIC CONDUCTANCE

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TWDB Groundwater Database Result

STATE WELL NUMBER : 3319705

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Explanation of Groundwater Data

Reference 41

Texas Drinking Water Watch
Release: 3.1

TCEQ Home Page

SDWIS - EPA

Generate CCR Report

For data questions or corrections please email:

PWSINVEN@tceq.texas.gov

For comments or concerns about SDWIS or Drinking Water Watch please email:

SDWIS@tceq.texas.gov

Public Water Supply System Search Parameters

Water System No.
Water System Name
Activity Status All
Principal County Served DALLAS
Water System Type All
Primary Source Water Type All

Sample Search Parameters

Sample Class
*Search will also use State Classification Code
Click to select a value...

State Classification Code All

Sample Collection Date Range
*The Sample Search defaults to the last 2 years unless you provide a specific date range.
3/29/2014 **To** 3/29/2016

Search For Water Systems | Search For Samples | Clear | Help

Click Here for the County Map of TEXAS

Texas Commission on Environmental Quality	Office of Water	Public Drinking Water Section
County Map of TX	Water System Search	Office of Compliance and Enforcement

Water System Detail			
Water System Facilities Source Water Assessment Results	Violations Enforcement Actions	TCR Sample Results	TTHM HAA5 Summaries
Sample Points	Assistance Actions	Recent Positive TCR Results	PBCU Summaries
Sample Schedules / FANLs / Plans	Compliance Schedules	Other Chemical Results	Chlorine Summaries
Site Visits Milestones	TOC/Alkalinity Results	Chemical Results: Sort by: Name Code	Turbidity Summaries
Operators All POC	LRAA (TTHM/HAA5)	Recent Non-TCR Sample Results	TCR Sample Summaries
Glossary			

Water System Detail Information			
Water System No.:	TX0570134	System Type:	NP
Water System Name:	COMMUNITY WATER SERVICE GRAND PRAIRIE	Primary Source Type:	SWP
Principal County Served:	DALLAS	System Status:	I
Principal City Served:		Activity Date:	09-13-2010
Population:	0	System Recognition:	NO DATA

Water System Contacts			
Type	Contact	Communication	
		Phone Type	Value
AC - Administrative Contact	HAWKINS, RAY PO BOX 850155 MESQUITE, TX 75185-0155	BUS - Business	972-286-8051
		BUS - Business	214-729-7748
		FAX - Facsimile	972-286-7992

Sources of Water			
Name	Type	Activity	Availability
SW FROM GRAND PRAIRIE	CC	A	P
SW FROM GRAND PRAIRIE	CC	A	P

Source Water Percentages			
Surface Water	0	Surface Water Purchased	0
Ground Water	0	Ground Water Purchased	0
Ground Water UDI	0	Ground Water UDI Purchased	0

Water Purchases	
Water System \ Treatment Status	
TX0570134 buys from CITY OF GRAND PRAIRIE - TX0570048 / who is providing Treated and Filtered Water	
	TX0570048 buys from CITY OF FORT WORTH - TX2200012 / who is providing Treated and Filtered Water
	TX0570048 buys from CITY OF MIDLOTHIAN - TX0700005 / who is providing Treated, not Filtered Water
	TX0570048 buys from DALLAS WATER UTILITY - TX0570004 / who is providing Treated and Filtered Water

Buyers of Water
Water System / Population / Availability (blank, (S)easonal, (E)mergency, (I)nterim, (P)ermanent, (O)ther
No Buyers

Total Population Served = 0
Total Population Served included ALL active connections, including emergency.

Annual Operating Period(s)					
Effective Begin Date	Effective End Date	Start Month/Day	End Month/Day	Type	Population

Service Connections			
Type	Count	Meter Type	Meter Size
RS	42	ME	0

Service Area	
Code	Name
R	RESIDENTIAL AREA

Regulating Agencies	
Name	Alias/Inspector

TX COMMISSION ON ENVIRONMENTAL QUALITY	TCEQ

Water System Historical Names
Historical Name(s)

System Certification Requirements		
Certification Name	Code	Begin Date

WS Flow Rates		
Type	Quantity	UOM

WS Measures		
Type	Quantity	UOM

WS Indicators		
Type	Value	Date
POWN - Previous Ownership Type Code. This is the WUD ownership code.	INV - Investor Owned	
PRFT - Status as a For or Non Profit Entitiy	FOR - For Profit	
SSWP - State Source Water Program	YES - Yes	08-31-1992
XCON - Cross Connection control Program Ranking	ADQTE - Adequate	

Texas Commission on Environmental Quality	Office of Water	Public Drinking Water Section
County Map of TX	Water System Search	Office of Compliance and Enforcement

Water System Detail			
Water System Facilities Source Water Assessment Results	Violations Enforcement Actions	TCR Sample Results	TTHM HAA5 Summaries
Sample Points	Assistance Actions	Recent Positive TCR Results	PBCU Summaries
Sample Schedules / FANLs / Plans	Compliance Schedules	Other Chemical Results	Chlorine Summaries
Site Visits Milestones	TOC/Alkalinity Results	Chemical Results: Sort by: Name Code	Turbidity Summaries
Operators All POC	LRAA (TTHM/HAA5)	Recent Non-TCR Sample Results	TCR Sample Summaries
Glossary			

Water System Detail Information			
Water System No.:	TX2200012	System Type:	C
Water System Name:	CITY OF FORT WORTH	Primary Source Type:	SW
Principal County Served:	TARRANT	System Status:	A
Principal City Served:		Activity Date:	01-01-1913
Population:	748450	System Recognition:	SUPERIOR

Water System Contacts			
Type	Contact	Communication	
AC - Administrative Contact	PRICE, BETSY 1000 THROCKMORTON ST FORT WORTH, TX 76102-6312	Electronic Type	Value
		Phone Type	Value
		BUS - Business	817-392-6118
		FAX - Facsimile	817-392-6187

Sources of Water			
Name	Type	Activity	Availability
INTAKE - RICHLAND-CHAMBERS	IN	A	P
	IN	A	P

INTAKE - EAGLE MOUNTAIN LAKE			
INTAKE - LAKE WORTH (NEW)	IN	A	P
INTAKE - CLEAR FORK TRINITY RIVER	IN	A	P
INTAKE - ? (NEED INFO)	IN	A	P
INTAKE - CEDAR CREEK RESERVOIR	IN	A	P
INTAKE - LAKE WORTH (OLD)	IN	A	P
INTAKE - ROLLING HILLS SOUTH	IN	I	O
INTAKE - ROLLING HILLS NORTH	IN	I	O

Source Water Percentages			
Surface Water	0	Surface Water Purchased	0
Ground Water	0	Ground Water Purchased	0
Ground Water UDI	0	Ground Water UDI Purchased	0

Water Purchases
Water System \ Treatment Status
No Water Purchases

Buyers of Water
Water System / Population / Availability (blank, (S)easonal, (E)mergency, (I)nterim, (P)ermanent, (O)ther
TX2200012sells to DALLAS FORT WORTH AIRPORT - TX0570136 / 203375 / P
TX0570136 sells to CITY OF GRAPEVINE - TX2200013 / 48751 / E
TX2200012sells to BETHESDA WSC - TX1260017 / 29763 / P
TX1260017 sells to GARDEN ACRES - TX1260092 / 66 / P
TX1260017 sells to TWIN CREEK SUBDIVISION - TX1260038 / 738 / E
TX1260017 sells to OAKVIEW FARMS SUBDIVISION - TX1260010 / 225 / E
TX1260010 sells to SHADY MEADOWS ESTATES - TX1260072 / 102 / E
TX1260017 sells to BETHANY SUD - TX1260016 / 3921 / E
TX1260017 sells to RIDGE CREST ADDITION & MISTY HOLLOW - TX1260035 / 444 / E
TX1260017 sells to SHADY HILLS ESTATES WATER SYSTEM - TX1260071 / 129 / E
TX2200012sells to TOWN OF NORTHLAKE - TX0610235 / 2970 / P
TX2200012sells to TOWN OF WESTOVER HILLS - TX2200078 / 682 / P
TX2200012sells to CITY OF SOUTHLAKE - TX2200075 / 27706 / P
TX2200075 sells to CITY OF GRAPEVINE - TX2200013 / 48751 / E
TX2200075 sells to SOUTH LAKE PARK SERVICE - TX2200159 / 111 / E
TX2200012sells to CITY OF NORTH RICHLAND HILLS - TX2200063 / 64780 / P
TX2200063 sells to CITY OF WATAUGA - TX2200328 / 24044 / P
TX2200012sells to CITY OF HASLET - TX2200052 / 1657 / P

- TX2200012sells to CITY OF NORTH RICHLAND HILLS - TX2200063 / 64780 / S
  - TX2200063 sells to CITY OF WATAUGA - TX2200328 / 24044 / P
- TX2200012sells to CITY OF WHITE SETTLEMENT - TX2200081 / 15483 / P
- TX2200012sells to CITY OF ALEDO - TX1840001 / 2750 / P
  - TX1840001 sells to ALEDO MOBILE HOME PARK - TX1840041 / 423 / E
- TX2200012sells to CITY OF KENNEDALE - TX2200017 / 6763 / P
- TX2200012sells to THE RESORT AT EAGLE MOUNTAIN LAKE - TX2200344 / 1020 / E
- TX2200012sells to CITY OF SANSOM PARK - TX2200071 / 4695 / E
- TX2200012sells to TOWN OF WESTLAKE - TX2200350 / 1010 / P
- TX2200012sells to CITY OF HURST - TX2200054 / 38448 / P
  - TX2200054 sells to CITY OF BEDFORD - TX2200003 / 49950 / E
  - TX2200054 sells to CITY OF COLLEYVILLE - TX2200043 / 23500 / E
    - TX2200043 sells to CITY OF GRAPEVINE - TX2200013 / 48751 / E
    - TX2200043 sells to CITY OF HURST - TX2200054 / 38448 / E
      - TX2200054 sells to CITY OF BEDFORD - TX2200003 / 49950 / E
      - TX2200054 sells to CITY OF COLLEYVILLE - TX2200043 / 23500 / E
        - TX2200043 sells to CITY OF GRAPEVINE - TX2200013 / 48751 / E
        - TX2200043 sells to CITY OF HURST - TX2200054 / 38448 / E
          - TX2200054 sells to CITY OF BEDFORD - TX2200003 / 49950 / E
          - TX2200054 sells to CITY OF COLLEYVILLE - TX2200043 / 23500 / E
            - TX2200043 sells to CITY OF GRAPEVINE - TX2200013 / 48751 / E
            - TX2200043 sells to CITY OF HURST - TX2200054 / 38448 / E
- TX2200012sells to CITY OF FOREST HILL - TX2200011 / 13743 / P
- TX2200012sells to CITY OF RIVER OAKS - TX2200069 / 7437 / E
- TX2200012sells to TOWN OF EDGECLIFF VILLAGE - TX2200048 / 2939 / E
- TX2200012sells to BENBROOK WATER AUTHORITY - TX2200029 / 21530 / E
- TX2200012sells to CITY OF CROWLEY - TX2200034 / 14102 / P
- TX2200012sells to CITY OF EVERMAN - TX2200010 / 6250 / E
- TX2200012sells to CITY OF HALTOM CITY - TX2200014 / 43475 / P
- TX2200012sells to CITY OF ROANOKE - TX0610008 / 5910 / P
- TX2200012sells to TROPHY CLUB MUD 1 - TX0610018 / 9411 / P
  - TX0610018 sells to TOWN OF TROPHY CLUB PUBLIC IMPROVEMENT D - TX0610273 / 4083 / P
- TX2200012sells to CITY OF DALWORTHINGTON GARDENS - TX2200047 / 2200 / P
- TX2200012sells to TOWN OF EDGECLIFF VILLAGE - TX2200048 / 2939 / P
- TX2200012sells to CITY OF WESTWORTH VILLAGE - TX2200131 / 2472 / P
- TX2200012sells to TRA TARRANT COUNTY WATER PROJECT - TX2200199 / 0 / E
  - TX2200199 sells to CITY OF NORTH RICHLAND HILLS - TX2200063 / 64780 / P
    - TX2200063 sells to CITY OF WATAUGA - TX2200328 / 24044 / P
  - TX2200199 sells to CITY OF COLLEYVILLE - TX2200043 / 23500 / P
    - TX2200043 sells to CITY OF GRAPEVINE - TX2200013 / 48751 / E

- TX2200043 sells to CITY OF HURST - TX2200054 / 38448 / E
  - TX2200054 sells to CITY OF BEDFORD - TX2200003 / 49950 / E
  - TX2200054 sells to CITY OF COLLEYVILLE - TX2200043 / 23500 / E
    - TX2200043 sells to CITY OF GRAPEVINE - TX2200013 / 48751 / E
    - TX2200043 sells to CITY OF HURST - TX2200054 / 38448 / E
      - TX2200054 sells to CITY OF BEDFORD - TX2200003 / 49950 / E
      - TX2200054 sells to CITY OF COLLEYVILLE - TX2200043 / 23500 / E
        - TX2200043 sells to CITY OF GRAPEVINE - TX2200013 / 48751 / E
        - TX2200043 sells to CITY OF HURST - TX2200054 / 38448 / E
          - TX2200054 sells to CITY OF BEDFORD - TX2200003 / 49950 / E
          - TX2200054 sells to CITY OF COLLEYVILLE - TX2200043 / 23500 / E
            - TX2200043 sells to CITY OF GRAPEVINE - TX2200013 / 48751 / E
            - TX2200043 sells to CITY OF HURST - TX2200054 / 38448 / E
- TX2200199 sells to CITY OF GRAPEVINE - TX2200013 / 48751 / P
- TX2200199 sells to CITY OF EULESS - TX2200031 / 52780 / P
  - TX2200031 sells to CITY OF GRAPEVINE - TX2200013 / 48751 / E
- TX2200199 sells to CITY OF HURST - TX2200054 / 38448 / E
  - TX2200054 sells to CITY OF BEDFORD - TX2200003 / 49950 / E
  - TX2200054 sells to CITY OF COLLEYVILLE - TX2200043 / 23500 / E
    - TX2200043 sells to CITY OF GRAPEVINE - TX2200013 / 48751 / E
    - TX2200043 sells to CITY OF HURST - TX2200054 / 38448 / E
      - TX2200054 sells to CITY OF BEDFORD - TX2200003 / 49950 / E
      - TX2200054 sells to CITY OF COLLEYVILLE - TX2200043 / 23500 / E
        - TX2200043 sells to CITY OF GRAPEVINE - TX2200013 / 48751 / E
        - TX2200043 sells to CITY OF HURST - TX2200054 / 38448 / E
          - TX2200054 sells to CITY OF BEDFORD - TX2200003 / 49950 / E
          - TX2200054 sells to CITY OF COLLEYVILLE - TX2200043 / 23500 / E
            - TX2200043 sells to CITY OF GRAPEVINE - TX2200013 / 48751 / E
            - TX2200043 sells to CITY OF HURST - TX2200054 / 38448 / E
              - TX2200054 sells to CITY OF BEDFORD - TX2200003 / 49950 / E
              - TX2200054 sells to CITY OF COLLEYVILLE - TX2200043 / 23500 / E
- TX2200199 sells to CITY OF BEDFORD - TX2200003 / 49950 / P
- TX2200199 sells to CITY OF ARLINGTON - TX2200001 / 365860 / P
  - TX2200001 sells to CITY OF GRAND PRAIRIE - TX0570048 / 183372 / E
  - TX2200001 sells to CITY OF MANSFIELD - TX2200018 / 59230 / E
    - TX2200018 sells to JOHNSON COUNTY SUD - TX1260018 / 43350 / P
      - TX1260018 sells to BELL MANOR SUBDIVISION - TX1260080 / 63 / P
      - TX1260018 sells to CITY OF ALVARADO - TX1260001 / 3870 / E
      - TX1260018 sells to BLUE WATER OAKS ESTATES - TX1260039 / 400 / P
      - TX1260018 sells to CITY OF RIO VISTA - TX1260022 / 873 / E
      - TX1260018 sells to WALNUT CREEK MOBILE HOME PARK - TX1260121 / 150 / P
      - TX1260018 sells to CITY OF GODLEY - TX1260007 / 1009 / E
      - TX1260018 sells to CITY OF KEENE - TX1260008 / 6426 / P

				TX1260018 sells to METROPLEX HOMESTEADS WATER SUPPLY - TX1260074 / 3138 / P
				TX1260018 sells to SUNDANCE ADDITION - TX1260025 / 753 / P
TX2200012sells to CITY OF WATAUGA - TX2200328 / 24044 / P				
TX2200012sells to NAVAL AIR STN JOINT RESERVE BASE - TX2200332 / 9000 / P				
TX2200012sells to CITY OF BURLESON - TX1260002 / 45594 / P				
TX2200012sells to CITY OF GRAND PRAIRIE - TX0570048 / 183372 / P				
TX2200012sells to SAINT FRANCIS VILLAGE - TX2200070 / 578 / E				
TX2200012sells to CITY OF RICHLAND HILLS - TX2200022 / 7801 / P				
TX2200012sells to CITY OF SAGINAW - TX2200023 / 20500 / P				
TX2200012sells to CITY OF LAKE WORTH - TX2200060 / 4780 / P				
TX2200012sells to CITY OF KELLER - TX2200096 / 42500 / P				

Total Population Served = 4627378
Total Population Served included ALL active connections, including emergency.

Annual Operating Period(s)					
Effective Begin Date	Effective End Date	Start Month/Day	End Month/Day	Type	Population
01-29-2013	No End Date	1/1	12/31	R	748450
01-29-2013	No End Date	1/1	12/31	W	190000

Service Connections			
Type	Count	Meter Type	Meter Size
RS	321539	MU	0
CB	206458	ME	0

Service Area	
Code	Name
O	DISPENSER
R	RESIDENTIAL AREA
O	WHOLESALER (SELLS WATER)

Regulating Agencies	
Name	Alias/Inspector
TX COMMISSION ON ENVIRONMENTAL QUALITY	TCEQ

Water System Historical Names
Historical Name(s)

System Certification Requirements		
Certification Name	**Code**	**Begin Date**

WS Flow Rates		
Type	**Quantity**	**UOM**

WS Measures		
Type	**Quantity**	**UOM**

WS Indicators		
Type	**Value**	**Date**
DBP2 - Stage2 DBPR Schedule Category	1 - 1	04-01-2012
POWN - Previous Ownership Type Code. This is the WUD ownership code.	MUN - Municipality	
PRFT - Status as a For or Non Profit Entitiy	NON - Non Profit	
SSWP - State Source Water Program	YES - Yes	08-31-2002
UCM3 - UCMR3 EPA Monitoring Required	YES - Yes	01-01-2013
XCON - Cross Connection control Program Ranking	ADQTE - Adequate	07-03-2014

Texas Commission on Environmental Quality	Office of Water	Public Drinking Water Section
County Map of TX	Water System Search	Office of Compliance and Enforcement

Water System Detail			
Water System Facilities Source Water Assessment Results	Violations Enforcement Actions	TCR Sample Results	TTHM HAA5 Summaries
Sample Points	Assistance Actions	Recent Positive TCR Results	PBCU Summaries
Sample Schedules / FANLs / Plans	Compliance Schedules	Other Chemical Results	Chlorine Summaries
Site Visits Milestones	TOC/Alkalinity Results	Chemical Results: Sort by: Name Code	Turbidity Summaries
Operators All POC	LRAA (TTHM/HAA5)	Recent Non-TCR Sample Results	TCR Sample Summaries
Glossary			

Water System Detail Information			
Water System No.:	TX0700005	System Type:	C
Water System Name:	CITY OF MIDLOTHIAN	Primary Source Type:	SW
Principal County Served:	ELLIS	System Status:	A
Principal City Served:		Activity Date:	01-01-1913
Population:	16608	System Recognition:	SUPERIOR

Water System Contacts			
Type	Contact	Communication	
		Phone Type	Value
AC - Administrative Contact	HOUSTON, BILL 104 W AVENUE E MIDLOTHIAN, TX 76065-2901	BUS - Business	972-775-3481
		BUS - Business	972-775-8099

Sources of Water			
Name	Type	Activity	Availability
RAW WATER FROM TARRANT REGIONAL WATER DI	CC	A	P
	CC	A	P

RAW WATER FROM TARRANT REGIONAL WATER DI			
JOE POOL LAKE / 5, 6, 7	IN	A	P
4 - 5TH / AVE D	WL	A	E
2 - PLUGGED	WL	I	P
1 - PLUGGED	WL	I	P
3 -	WL	I	O

Source Water Percentages			
Surface Water	100	Surface Water Purchased	0
Ground Water	0	Ground Water Purchased	0
Ground Water UDI	0	Ground Water UDI Purchased	0

Water Purchases
Water System \ Treatment Status
No Water Purchases

Buyers of Water
Water System / Population / Availability (blank, (S)easonal, (E)mergency, (I)nterim, (P)ermanent, (O)ther
TX0700005sells to ROCKETT SUD - TX0700033 / 37023 / P
TX0700033 sells to CITY OF FERRIS - TX0700002 / 2895 / P
TX0700033 sells to CITY OF RED OAK - TX0700031 / 7179 / P
TX0700031 sells to RED OAK COMMUNITY WATER SERVICE - TX0700056 / 270 / E
TX0700033 sells to CITY OF PALMER - TX0700007 / 2012 / P
TX0700033 sells to SARDIS LONE ELM WSC - TX0700034 / 15900 / P
TX0700005sells to SARDIS LONE ELM WSC - TX0700034 / 15900 / E
TX0700005sells to MOUNTAIN PEAK SUD - TX0700042 / 12819 / P
TX0700005sells to CITY OF VENUS - TX1260006 / 2800 / P
TX0700005sells to CITY OF GRAND PRAIRIE - TX0570048 / 183372 / P

Total Population Served = 296778
Total Population Served included ALL active connections, including emergency.

Annual Operating Period(s)					
Effective Begin Date	**Effective End Date**	**Start Month/Day**	**End Month/Day**	**Type**	**Population**
07-08-2014	No End Date	1/1	12/31	R	16608
07-08-2014	No End Date	1/1	12/31	W	3200

Service Connections			
Type	Count	Meter Type	Meter Size
RS	5536	MU	0
CB	4	MU	0

Service Area	
Code	Name
O	DISPENSER
R	RESIDENTIAL AREA
O	WHOLESALER (SELLS WATER)

Regulating Agencies	
Name	Alias/Inspector
TX COMMISSION ON ENVIRONMENTAL QUALITY	TCEQ

Water System Historical Names
Historical Name(s)

System Certification Requirements		
Certification Name	Code	Begin Date

WS Flow Rates		
Type	Quantity	UOM
TLDS - Total Design Capacity	75	MGD
MDD - Maximum Daily Demand	9.54	MGD
PPRC - Provided Production Capacity	18.197	MGD
PSPC - Provided Service Pump Capacity	34.57	MGD
ADU - Average Daily Usage	4.823	MGD

WS Measures		
Type	Quantity	UOM
TSTC - Total Storage Capacity	10	MG
PESC - Provided Elevated Storage Capacity	3	MG

WS Indicators		
Type	**Value**	**Date**
DBP2 - Stage2 DBPR Schedule Category	3 - 3	10-01-2013
MDDD - Maximum Daily Demand Date	MDDD - Maximum Daily Demand Date	07-11-2013
POWN - Previous Ownership Type Code. This is the WUD ownership code.	MUN - Municipality	
PRFT - Status as a For or Non Profit Entitiy	NON - Non Profit	
SSWP - State Source Water Program	YES - Yes	08-31-1992
UCM3 - UCMR3 EPA Monitoring Required	YES - Yes	01-01-2013
XCON - Cross Connection control Program Ranking	ADQTE - Adequate	07-22-2014

Texas Commission on Environmental Quality	Office of Water	Public Drinking Water Section
County Map of TX	Water System Search	Office of Compliance and Enforcement

Water System Detail			
Water System Facilities Source Water Assessment Results	Violations Enforcement Actions	TCR Sample Results	TTHM HAA5 Summaries
Sample Points	Assistance Actions	Recent Positive TCR Results	PBCU Summaries
Sample Schedules / FANLs / Plans	Compliance Schedules	Other Chemical Results	Chlorine Summaries
Site Visits Milestones	TOC/Alkalinity Results	Chemical Results: Sort by: Name Code	Turbidity Summaries
Operators All POC	LRAA (TTHM/HAA5)	Recent Non-TCR Sample Results	TCR Sample Summaries
Glossary			

Water System Detail Information			
Water System No.:	TX0570004	System Type:	C
Water System Name:	DALLAS WATER UTILITY	Primary Source Type:	SW
Principal County Served:	DALLAS	System Status:	A
Principal City Served:		Activity Date:	01-01-1913
Population:	1253000	System Recognition:	SUPERIOR

Water System Contacts			
Type	Contact	Communication	
		Phone Type	Value
AC - Administrative Contact	RAWLINGS, MIKE 1500 MARILLA ST STE 5EN DALLAS, TX 75201-6318	BUS - Business	214-671-8257
		BUS - Business	214-670-4054

Sources of Water			
Name	Type	Activity	Availability
INTAKE 1 - IRON BRIDGE (LAKE TAWAKONI)	IN	A	P
INTAKE 2 - RAY HUBBARD	IN	A	P

41 015

INTAKE 5 - LAKE FORK	IN	A	P
INTAKE 4 - ELM FORK TRINITY R / ELM FORK	IN	A	P
INTAKE 3 - ELM FORK TRINITY R / BACHMAN	IN	A	P
NORTH TEXAS MWD	CC	I	O

Source Water Percentages			
Surface Water	0	Surface Water Purchased	0
Ground Water	0	Ground Water Purchased	0
Ground Water UDI	0	Ground Water UDI Purchased	0

Water Purchases
Water System \ Treatment Status
No Water Purchases

Buyers of Water
Water System / Population / Availability (blank, (S)easonal, (E)mergency, (I)nterim, (P)ermanent, (O)ther
TX0570004sells to CITY OF DESOTO - TX0570006 / 50591 / P
TX0570004sells to CITY OF SEAGOVILLE - TX0570016 / 15240 / P
TX0570016 sells to COMBINE WSC - TX0570039 / 3150 / P
TX0570016 sells to FEDERAL CORRECTIONAL INSTITUTION SEAGOVI - TX0570128 / 2400 / P
TX0570004sells to CITY OF CARROLLTON - TX0570034 / 122280 / P
TX0570004sells to DALLAS FORT WORTH AIRPORT - TX0570136 / 203375 / P
TX0570136 sells to CITY OF GRAPEVINE - TX2200013 / 48751 / E
TX0570004sells to CITY OF OVILLA - TX0700067 / 3492 / P
TX0570004sells to DOCTORS HOSPITAL AT WHITE ROCK LAKE - TX0570179 / 618 / P
TX0570004sells to CITY OF DUNCANVILLE - TX0570007 / 39605 / P
TX0570004sells to CITY OF FARMERS BRANCH - TX0570047 / 29200 / P
TX0570004sells to CITY OF CEDAR HILL - TX0570036 / 41000 / P
TX0570004sells to DALLAS COUNTY PARK CITIES MUD - TX0570078 / 0 / E
TX0570078 sells to TOWN OF HIGHLAND PARK - TX0570049 / 8862 / P
TX0570078 sells to CITY OF UNIVERSITY PARK - TX0570061 / 23068 / P
TX0570004sells to CITY OF THE COLONY - TX0610081 / 40028 / P
TX0610081 sells to BEACH AND TENNIS CLUB HOA - TX0610266 / 25 / P
TX0570004sells to CITY OF LANCASTER - TX0570013 / 38124 / P
TX0570013 sells to LANCASTER MUD 1 - TX0570176 / 810 / P
TX0570004sells to CITY OF COCKRELL HILL - TX0570038 / 4205 / P
TX0570004sells to CITY OF LEWISVILLE - TX0610004 / 97140 / P
TX0610004 sells to DENTON COUNTY FWSD 1-A CASTLE HILLS - TX0610264 / 8916 / P

TX0570004sells to TOWN OF ADDISON - TX0570031 / 15457 / P
TX0570004sells to DALLAS COUNTY WCID 6 - TX0570032 / 23500 / P
TX0570004sells to DANIELDALE COMMUNITY WATER SERVICE - TX0570044 / 624 / P
TX0570004sells to CITY OF GLENN HEIGHTS - TX0570085 / 11763 / P
TX0570004sells to TOWN OF FLOWER MOUND - TX0610023 / 68609 / P
TX0610023 sells to RED ROCK WSC - TX0610113 / 156 / P
TX0570004sells to CITY OF RICHARDSON - TX0570015 / 99223 / E
TX0570004sells to CITY OF HUTCHINS - TX0570012 / 5200 / P
TX0570012 sells to CITY OF WILMER - TX0570018 / 3682 / P
TX0570004sells to CITY OF GRAND PRAIRIE - TX0570048 / 183372 / P
TX0570004sells to CITY OF OVILLA - TX0700067 / 3492 / E
TX0570004sells to TOWN OF HIGHLAND PARK - TX0570049 / 8862 / E
TX0570004sells to CITY OF COPPELL - TX0570040 / 39880 / P
TX0570004sells to CITY OF IRVING - TX0570050 / 227030 / P

Total Population Served = 2724730
Total Population Served included ALL active connections, including emergency.

Annual Operating Period(s)					
Effective Begin Date	Effective End Date	Start Month/Day	End Month/Day	Type	Population
01-25-2016	No End Date	1/1	12/31	R	1197816
01-25-2016	No End Date	1/1	12/31	W	1350150

Service Connections			
Type	Count	Meter Type	Meter Size
RS	330269	MU	0
CB	345950	ME	0

Service Area	
Code	Name
O	DISPENSER
R	RESIDENTIAL AREA
O	WHOLESALER (SELLS WATER)

Regulating Agencies	
Name	Alias/Inspector
TX COMMISSION ON ENVIRONMENTAL QUALITY	TCEQ

Water System Historical Names

Historical Name(s)

System Certification Requirements		
Certification Name	Code	Begin Date

WS Flow Rates		
Type	Quantity	UOM

WS Measures		
Type	Quantity	UOM

WS Indicators		
Type	Value	Date
DBP2 - Stage2 DBPR Schedule Category	1 - 1	04-01-2012
POWN - Previous Ownership Type Code. This is the WUD ownership code.	MUN - Municipality	
PRFT - Status as a For or Non Profit Entitiy	NON - Non Profit	
SSWP - State Source Water Program	YES - Yes	08-31-2006
UCM3 - UCMR3 EPA Monitoring Required	YES - Yes	01-01-2013
XCON - Cross Connection control Program Ranking	ADQTE - Adequate	

Reference 42

Rebecca Comeaux

From: Sean Ables
Sent: Wednesday, April 13, 2016 10:14 AM
To: Rebecca Comeaux
Subject: RE: wellhead protection area - Lane Plating Works, Inc. site in Dallas, TX

Follow Up Flag: Follow up
Flag Status: Flagged

Rebecca,

The location you provided is not located inside a wellhead protection area. Let me know if you have any other questions.

Thanks,

Sean Ables, P.G.
Special Assistant
Public Drinking Water Section
Texas Commission on Environmental Quality
PO Box 13087, MC-155
Austin, TX 78711-3087
(512) 239-1758
sean.ables@tceq.texas.gov

"Be the person your dog thinks you are."

Please click here and take a moment to let us know how we are doing.

From: Rebecca Comeaux
Sent: Wednesday, April 13, 2016 9:47 AM
To: Sean Ables
Cc: Adrienne Love; Stephen Ellis
Subject: RE: wellhead protection area - Lane Plating Works, Inc. site in Dallas, TX

Hi Sean,

Just a reminder – I'm trying to find out if the site referenced below is located in a wellhead protection area. Please let me know if you need any additional information, or if there is a way to look this up independently.

Thank you,
Rebecca

From: Rebecca Comeaux
Sent: Tuesday, March 29, 2016 4:18 PM
To: Sean Ables <Sean.Ables@tceq.texas.gov>
Cc: Adrienne Love <Adrienne.Love@tceq.texas.gov>; Stephen Ellis <Stephen.Ellis@tceq.texas.gov>
Subject: wellhead protection area - Lane Plating Works, Inc. site in Dallas, TX

Hello Sean,

Can you please tell me if my site is located in a wellhead protection area? The address is 5322 Bonnie View Rd., Dallas, Dallas County, TX. GPS location is 32.687889° N, -96.769484° W.

Thanks, and please let me know if you need anything else,

Rebecca Comeaux, P.G.
Superfund Section, MC-136
Remediation Division
Texas Commission on Environmental Quality
Phone: 512-239-2466
Email: Rebecca.Comeaux@tceq.texas.gov

Reference 43

U.S. Department of Commerce (//www.commerce.gov/) | Blogs (//www.census.gov/about/contact-us/social_media.html) | Index A-Z (//www.census.gov/about/index.html) | Glossa
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/www.census.gov/en.html)

U.S. Census Quick Facts

QuickFacts

Dallas **C**ounty**, T**exas

QuickFacts provides statistics for all states and counties, and for cities and towns with a population of 5,000 or more.

All Topics ▼	DALLA**S** COUNTY, TEXAS	UNITED STATES
People		
Population		
Population estimates, July 1, 2015, (V2015)	2,553,385	321,418,820
Population estimates, July 1, 2014, (V2014)	2,518,638	318,857,056
Population estimates base, April 1, 2010, (V2015)	2,367,643	308,758,105
Population estimates base, April 1, 2010, (V2014)	2,367,636	308,758,105
Population, percent change - April 1, 2010 (estimates base) to July 1, 2015, (V2015)	7.8%	4.1%
Population, percent change - April 1, 2010 (estimates base) to July 1, 2014, (V2014)	6.4%	3.3%
Population, Census, April 1, 2010	2,368,139	308,745,538
Age and Sex		
Persons under 5 years, percent, July 1, 2014, (V2014)	7.7%	6.2%
Persons under 5 years, percent, April 1, 2010	8.1%	6.5%
Persons under 18 years, percent, July 1, 2014, (V2014)	26.9%	23.1%
Persons under 18 years, percent, April 1, 2010	27.6%	24.0%
Persons 65 years and over, percent, July 1, 2014, (V2014)	9.7%	14.5%
Persons 65 years and over, percent, April 1, 2010	8.8%	13.0%
Female persons, percent, July 1, 2014, (V2014)	50.7%	50.8%
Female persons, percent, April 1, 2010	50.6%	50.8%
Race and Hispanic Origin		
White alone, percent, July 1, 2014, (V2014) (a)	68.0%	77.4%
White alone, percent, April 1, 2010 (a)	53.5%	72.4%
Black or African American alone, percent, July 1, 2014, (V2014) (a)	23.1%	13.2%
Black or African American alone, percent, April 1, 2010 (a)	22.3%	12.6%
American Indian and Alaska Native alone, percent, July 1, 2014, (V2014) (a)	1.1%	1.2%
American Indian and Alaska Native alone, percent, April 1, 2010 (a)	0.7%	0.9%
Asian alone, percent, July 1, 2014, (V2014) (a)	5.9%	5.4%
Asian alone, percent, April 1, 2010 (a)	5.0%	4.8%
Native Hawaiian and Other Pacific Islander alone, percent, July 1, 2014, (V2014) (a)	0.1%	0.2%
Native Hawaiian and Other Pacific Islander alone, percent, April 1, 2010 (a)	0.1%	0.2%
Two or More Races, percent, July 1, 2014, (V2014)	1.7%	2.5%
Two or More Races, percent, April 1, 2010	2.8%	2.9%
Hispanic or Latino, percent, July 1, 2014, (V2014) (b)	39.3%	17.4%
Hispanic or Latino, percent, April 1, 2010 (b)	38.3%	16.3%
White alone, not Hispanic or Latino, percent, July 1, 2014, (V2014)	31.1%	62.1%
White alone, not Hispanic or Latino, percent, April 1, 2010	33.1%	63.7%
Population Characteristics		
Veterans, 2010-2014	104,062	20,700,711
Foreign born persons, percent, 2010-2014	23.1%	13.1%
Housing		
Housing units, July 1, 2014, (V2014)	974,457	133,957,180
Housing units, April 1, 2010	943,257	131,704,730
Owner-occupied housing unit rate, 2010-2014	52.0%	64.4%
Median value of owner-occupied housing units, 2010-2014	$129,200	$175,700
Median selected monthly owner costs -with a mortgage, 2010-2014	$1,475	$1,522
Median selected monthly owner costs -without a mortgage, 2010-2014	$534	$457
Median gross rent, 2010-2014	$895	$920
Building permits, 2014	14,360	1,046,363
Families and Living Arrangements		
Households, 2010-2014	868,717	116,211,092
Persons per household, 2010-2014	2.78	2.63
Living in same house 1 year ago, percent of persons age 1 year+, 2010-		

2014	82.8%	85.0%
Language other than English spoken at home, percent of persons age 5 years+, 2010-2014	41.1%	20.9%
Education		
High school graduate or higher, percent of persons age 25 years+, 2010-2014	77.7%	86.3%
Bachelor's degree or higher, percent of persons age 25 years+, 2010-2014	28.7%	29.3%
Health		
With a disability, under age 65 years, percent, 2010-2014	6.7%	8.5%
Persons without health insurance, under age 65 years, percent	⚠ 29.4%	⚠ 12.0%
Economy		
In civilian labor force, total, percent of population age 16 years+, 2010-2014	68.6%	63.5%
In civilian labor force, female, percent of population age 16 years+, 2010-2014	61.4%	58.7%
Total accommodation and food services sales, 2012 ($1,000)	6,753,112	708,138,598
Total health care and social assistance receipts/revenue, 2012 ($1,000)	19,683,164	2,040,441,203
Total manufacturers shipments, 2012 ($1,000)	37,035,625	5,696,729,632
Total merchant wholesaler sales, 2012 ($1,000)	80,604,971	5,208,023,478
Total retail sales, 2012 ($1,000)	35,957,895	4,219,821,871
Total retail sales per capita, 2012	$14,654	$13,443
Transportation		
Mean travel time to work (minutes), workers age 16 years+, 2010-2014	26.2	25.7
Income and Poverty		
Median household income (in 2014 dollars), 2010-2014	$49,925	$53,482
Per capita income in past 12 months (in 2014 dollars), 2010-2014	$27,195	$28,555
Persons in poverty, percent	⚠ 19.3%	⚠ 14.8%
Businesses		
Total employer establishments, 2013	62,501	7,488,353
Total employment, 2013	1,322,022	118,266,253
Total annual payroll, 2013	74,896,211	5,621,697,325
Total employment, percent change, 2012-2013	2.4%	2.0%
Total nonemployer establishments, 2013	210,881	23,005,620
All firms, 2012	259,298	27,626,360
Men-owned firms, 2012	139,455	14,844,597
Women-owned firms, 2012	96,076	9,878,397
Minority-owned firms, 2012	127,961	7,952,386
Nonminority-owned firms, 2012	122,666	18,987,918
Veteran-owned firms, 2012	22,942	2,521,682
Nonveteran-owned firms, 2012	225,505	24,070,685
Geography		
Population per square mile, 2010	2,718.0	87.4
Land area in square miles, 2010	871.28	3,531,905.43
Metropolitan or Micropolitan Statistical Area	Dallas-Fort Worth-Arlington, TX Metro Area	
FIPS Code	48113	00

⚠ This geographic level of poverty and health estimates are not comparable to other geographic levels of these estimates

Some estimates presented here come from sample data, and thus have sampling errors that may render some apparent differences between geographies statistically indistinguishable. Click the Quick Info icon to the left of each row in TABLE view to learn about sampling error.

The vintage year (e.g., V2015) refers to the final year of the series (2010 thru 2015).
Different vintage years of estimates are not comparable.

(a) Includes persons reporting only one race
(b) Hispanics may be of any race, so also are included in applicable race categories
(c) Economic Census - Puerto Rico data are not comparable to U.S. Economic Census data

D Suppressed to avoid disclosure of confidential information
F Fewer than 25 firms
FN Footnote on this item in place of data
NA Not available
S Suppressed; does not meet publication standards
X Not applicable
Z Value greater than zero but less than half unit of measure shown

QuickFacts data are derived from: Population Estimates, American Community Survey, Census of Population and Housing, Current Population Survey, Small Area Health Insurance Estimates, Small Area Income and Poverty Estimates, State and County Housing Unit Estimates, County Business Patterns, Nonemployer Statistics, Economic Census, Survey of Business Owners, Building Permits.

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American FactFinder (//factfinder2.census.gov/)
Easy Stats (//www.census.gov/easystats/)
Population Finder (//www.census.gov/popfinder/)
2010 Census (//www.census.gov/2010census/)
Economic Census (//www.census.gov/econ/census/)
Interactive Maps (//www.census.gov/geography/interactive-maps.html)
Training & Workshops (//www.census.gov/mso/www/training/)
Data Tools (//www.census.gov/data/data-tools.html)
Developers (//www.census.gov/developers/)
Catalogs (//www.census.gov/mp/www/cat/)
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BUSINESS & INDUSTRY
Help With Your Forms (//bhs.econ.census.gov/bhs/)
Economic Indicators (//www.census.gov/economic-indicators/)
Economic Census (//www.census.gov/econ/census/)
E-Stats (//www.census.gov/econ/estats/)
International Trade (//www.census.gov/foreign-trade/)
Export Codes (//www.census.gov/foreign-trade/schedules/b/)
NAICS (//www.census.gov/eos/www/naics/)
Governments (//www.census.gov/govs/)
Local Employment Dynamics (//lehd.ces.census.gov/)
Survey of Business Owners (//www.census.gov/econ/sbo/)

PEOPLE & HOUSEHOLDS
2020 Census (//www.census.gov/2020census/)
2010 Census (//www.census.gov/2010census/)
American Community Survey (//www.census.gov/programs-surveys/acs/)
Income (//www.census.gov/hhes/www/income/)
Poverty (//www.census.gov/hhes/www/poverty/)
Population Estimates (//www.census.gov/popest/)
Population Projections (//www.census.gov/topics/population/projections.html)
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Advisors, Centers and Research Programs (//www.census.gov/about/partners.html)
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Tribal Resources (AIAN) (//www.census.gov/aian/)
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Statistical Abstract (//www.census.gov/library/publications/time-series/statistical_abstracts.html)
Special Census Program (//www.census.gov/programs-surveys/specialcensus.html)
Fraudulent Activity & Scams (//www.census.gov/programs-surveys/are-you-in-a-survey/fraudulent-activity-and-scams.html)
Recovery Act (//www.census.gov/recovery/)
USA.gov (http://www.usa.gov/)
BusinessUSA.gov (//business.usa.gov/)

NEWSROOM
News Releases (//www.census.gov/newsroom/press-releases.html)
Release Schedule (//www.calendarwiz.com/calendars/calendar.php?crd=cens1sample&cid[]=31793)
Facts for Features (//www.census.gov/newsroom/facts-for-features.html)
Stats for Stories (//www.census.gov/newsroom/stories.html)
Blogs (//www.census.gov/about/contact-us/social_media.html)

CONNECT WITH US
(//www.census.gov/about/contact-us/social_media.html)
(//twitter.com/uscensusbureau)
(//www.facebook.com/uscensusbureau) (//www.youtube.com/user/uscensusbureau)
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Accessibility (//www.census.gov/about/policies/privacy/privacy-policy.html#par_textimage_1) | Information Quality (//www.census.gov/quality/) | FOIA (//www.census.gov/foia/) | Data Protection and Privacy Policy (//www.census.gov/privacy/) | U.S. Department of Commerce (//www.commerce.gov/)

Reference 44

United States Department of Agriculture

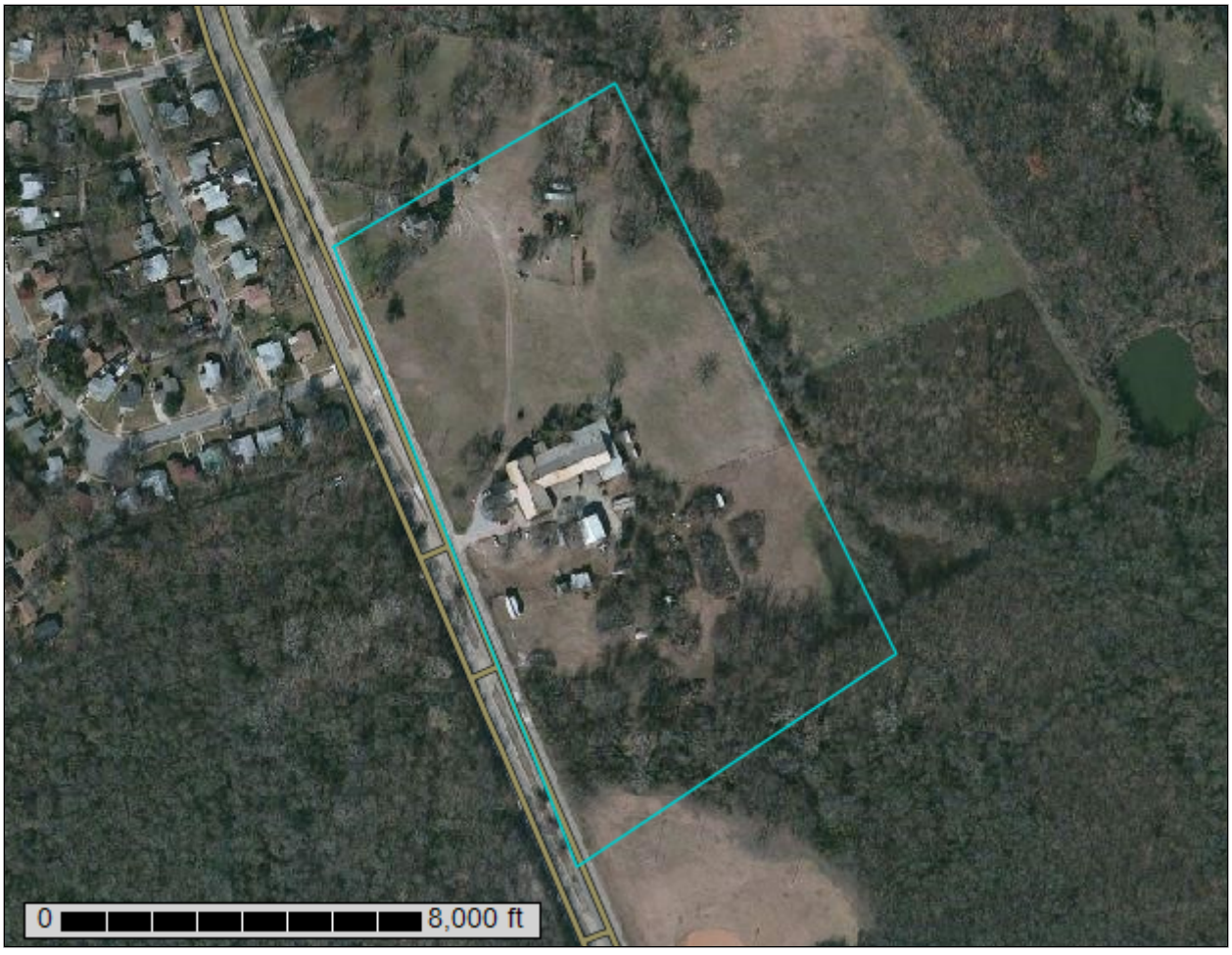
NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Dallas County, Texas

Lane Plating Works, Inc.



March 7, 2016

44 001

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (http://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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Contents

Preface.....2
How Soil Surveys Are Made.....5
Soil Map.....7
Soil Map.....8
Legend.....9
Map Unit Legend.....10
Map Unit Descriptions.....10
Dallas County, Texas.....12
37—Frio silty clay, 0 to 1 percent slopes,frequently flooded.....12
38—Frio-Urban land complex.....13
49—Lewisville-Urban land complex, 0 to 4 percent slopes.....14
50—Lewisville-Urban land complex, 4 to 8 percent slopes.....15
References.....17

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the

individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map

Map Scale: 1:2,690 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 35 70 140 210

Feet: 0 100 200 400 600

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 14N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Dallas County, Texas
Survey Area Data: Version 12, Sep 22, 2015

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Dec 13, 2010—Jan 6, 2011

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Dallas County, Texas (TX113)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
37	Frio silty clay, 0 to 1 percent slopes,frequently flooded	7.0	35.9%
38	Frio-Urban land complex	2.3	11.7%
49	Lewisville-Urban land complex, 0 to 4 percent slopes	6.1	31.3%
50	Lewisville-Urban land complex, 4 to 8 percent slopes	4.1	21.1%
Totals for Area of Interest		**19.5**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that

have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Dallas County, Texas

37—Frio silty clay, 0 to 1 percent slopes,frequently flooded

Map Unit Setting

National map unit symbol: 2wg92
Elevation: 330 to 770 feet
Mean annual precipitation: 37 to 42 inches
Mean annual air temperature: 64 to 65 degrees F
Frost-free period: 245 to 252 days
Farmland classification: Not prime farmland

Map Unit Composition

Frio, frequent, and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Frio, Frequent

Setting

Landform: Flood plains
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Calcareous clayey alluvium derived from mudstone and/or calcareous loamy alluvium derived from mudstone

Typical profile

Ap - 0 to 6 inches: silty clay
A - 6 to 50 inches: silty clay
Bk - 50 to 80 inches: silty clay

Properties and qualities

Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Frequent
Frequency of ponding: None
Calcium carbonate, maximum in profile: 40 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 3.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 2.0
Available water storage in profile: High (about 10.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 5w
Hydrologic Soil Group: C
Ecological site: Loamy Bottomland 28-40" PZ (R086AY203TX)

Minor Components

Tinn, frequent

Percent of map unit: 8 percent

Landform: Flood plains, flood plains
Landform position (three-dimensional): Tread
Microfeatures of landform position: Circular gilgai
Down-slope shape: Linear
Across-slope shape: Concave
Ecological site: Clayey Bottomland 28-40" PZ (R086AY198TX)

Gladewater, frequent
Percent of map unit: 2 percent
Landform: Flood plains, flood plains
Down-slope shape: Concave
Across-slope shape: Concave
Ecological site: Clayey Bottomland 28-40" PZ (R086AY198TX)

38—Frio-Urban land complex

Map Unit Setting
National map unit symbol: d7md
Elevation: 0 to 4,000 feet
Mean annual precipitation: 8 to 60 inches
Mean annual air temperature: 54 to 73 degrees F
Frost-free period: 180 to 310 days
Farmland classification: Not prime farmland

Map Unit Composition
Frio and similar soils: 70 percent
Urban land: 15 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Frio

Setting
Landform: Flood plains
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loamy alluvium of holocene age derived from mixed sources

Typical profile
H1 - 0 to 53 inches: silty clay
H2 - 53 to 74 inches: silty clay loam
H3 - 74 to 80 inches: silty clay loam

Properties and qualities
Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Frequent

Frequency of ponding: None
Calcium carbonate, maximum in profile: 40 percent
Sodium adsorption ratio, maximum in profile: 2.0
Available water storage in profile: High (about 10.2 inches)

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 5w
Hydrologic Soil Group: C

Description of Urban Land

Typical profile
H1 - 0 to 40 inches: variable

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8s
Hydrologic Soil Group: D

Minor Components

Unnamed
Percent of map unit: 15 percent

49—Lewisville-Urban land complex, 0 to 4 percent slopes

Map Unit Setting
National map unit symbol: d7ms
Elevation: 0 to 4,000 feet
Mean annual precipitation: 8 to 60 inches
Mean annual air temperature: 54 to 73 degrees F
Frost-free period: 180 to 310 days
Farmland classification: Not prime farmland

Map Unit Composition
Lewisville and similar soils: 55 percent
Urban land: 30 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Lewisville

Setting
Landform: Stream terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Alluvium of quaternary age derived from mixed sources

Typical profile

H1 - 0 to 17 inches: silty clay
H2 - 17 to 42 inches: silty clay
H3 - 42 to 75 inches: silty clay

Properties and qualities

Slope: 0 to 4 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 40 percent
Available water storage in profile: High (about 9.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: B

Description of Urban Land

Typical profile

H1 - 0 to 40 inches: variable

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8s
Hydrologic Soil Group: D

Minor Components

Unnamed

Percent of map unit: 15 percent

50—Lewisville-Urban land complex, 4 to 8 percent slopes

Map Unit Setting

National map unit symbol: d7mv
Elevation: 0 to 4,000 feet
Mean annual precipitation: 8 to 60 inches
Mean annual air temperature: 54 to 73 degrees F
Frost-free period: 180 to 310 days
Farmland classification: Not prime farmland

Map Unit Composition

Lewisville and similar soils: 60 percent
Urban land: 30 percent

Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Lewisville

Setting
Landform: Stream terraces
Landform position (three-dimensional): Riser
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Alluvium of quaternary age derived from mixed sources

Typical profile
H1 - 0 to 13 inches: silty clay
H2 - 13 to 47 inches: silty clay
H3 - 47 to 80 inches: silty clay

Properties and qualities
Slope: 4 to 8 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 40 percent
Available water storage in profile: High (about 9.8 inches)

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: B

Description of Urban Land

Typical profile
H1 - 0 to 40 inches: variable

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8s
Hydrologic Soil Group: D

Minor Components

Unnamed
Percent of map unit: 10 percent

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Reference 45

Geology of the Oak Cliff Quadrangle, Dallas County, Texas[1]

Wilson Bryan[2]

ABSTRACT

Consolidated marine rocks of the Oak Cliff Quadrangle belong to a portion of the Upper Cretaceous Austin formation. On the basis of lithology the formation is divided into a lower chalk and a middle marl. Buried channels, some 6 feet deep and 95 feet across, occur in the lower chalk. They result from submarine scouring, indicating that deposition was not a continuous process. Bentonite seams, some as much as 6 inches thick, occur at various horizons in the lower chalk, pointing to periodic volcanic activity. Numerous small normal faults in the Austin formation may have resulted from differential compaction of the underlying, incompetent, Eagle Ford shale.

Unconsolidated Quaternary alluvial deposits occur along the Trinity river, with terrace surfaces approximately 110, 65, and 25 feet above the floodplain. The terrace material consists of reworked chalk and marl, foraminiferal sands, silts, sands, and gravel.

Introduction

The Oak Cliff Quadrangle, as defined here, is a rectangular area including approximately 64 square miles of south-central Dallas County, Texas (Fig. 1). It is bounded by the parallels 32° 37′ 30″ and 32° 45′ 00″ and by meridians 96° 45′ 00° and 96° 52′ 30″. Physiographically, this area is part of the Black Prairie region of the Gulf Coastal Plain. Located on the gentle back slope of the White Rock cuesta, the area slants to the east in the same direction as the dip of the Austin formation. Topography of the entire area is one of low rolling hills, excepting a narrow portion in the north and northeast where the Trinity River has cut through the resistant lower Austin, leaving high bluffs flanking the river. The Trinity River flows across the northeast corner of the area and is a perennial stream. Five Mile Creek and most of the other tributaries are intermittent and do not flow during the dry summer months. The drainage is largely dendritic.

The bedrock consists of chalk and marl belonging to the Austin formation, of Upper Cretaceous age. Good exposures are abundant, occuring in beds and banks of creeks and almost all road-cuts. However, the Austin is concealed over wide areas by alluvium of Quaternary age. In addition to

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[1]Thesis submitted in partial fulfilment of the requirements for the degree of M.S. in Geology, Southern Methodist University, 1952.

[2]With grateful acknowledgments to Professors Claude C. Albritton, Jr. and Arthur Richards, for advice, direction, and criticism; and to Mr. Carl N. Roberts for help in mapping the area covered.

45 001

the alluvium of floodplains, there are terrace deposits at three levels that are approximately 110, 65, and 25 feet above the present floodplain.

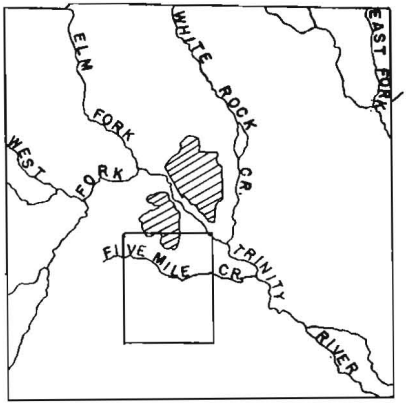

FIG. 1. Index Map of Dallas County, showing location of the Oak Cliff Quadrangle.

The work done in connection with this report is part of a broader project involving studies of areal geology in Dallas and adjacent counties, sponsored by the Department of Geology at Southern Methodist University. Primary emphasis has been placed upon the areal distribution of rock units exposed in the area (Plate I). The geology was mapped on aerial photographs of a scale approximately 3 inches to the mile. The base map was prepared from these photographs and reduced to a scale of 2 inches to one mile.

Austin Formation

The Austin formation underlies the entire area of the Oak Cliff Quadrangle. In Dallas County this formation is approximately 600 feet thick. It is divisible into four parts (Dallas Petroleum Geologists, 1941, p. 45) as follows:

Subdivisions of the Austin formation

		Thickness (feet)
4.	Chalk with interbedded thin layers of marl and calcareous shale	180
3.	Marl and calcareous shale with interbedded thin strata of chalk	220
2.	Chalk with interbedded thin layers of marl and calcareous shale	200
1.	Pebbly marl or chalk containing material reworked from the Eagle Ford. Maximum thickness observed	4
	Total	604

45 002

In the Oak Cliff Quadrangle, the second and third members, or the lower chalk and middle marl have been mapped.

Lower Chalk

This consists predominantly of massive, blue-gray rock that becomes hard and white upon weathering. The beds vary between one and five feet thick and are parted by a few inches of marl and calcareous shale.

According to Adkins (1932, 6. 446), the chalk in thin section consists of minute calcite crystals, foraminiferal tests, *Inoceramus* prisms, and shells of ostracods, with occasional sponge spicules and echinoid plates. According to Shuler (1918, p. 19) a typical chemical analysis of the chalk is as follows:

	Percent
Calcium carbonate	82.51
Silica and insoluble residue	11.43
Zinc oxide and alumina	3.61
Magnesia	1.18

The massive beds of chalk weather into flat or subconchoidal fragments with their longest dimensions paralleling the bedding. Undercutting of joint and fault-blocks along the stream margins causes large slabs of chalk to fall to the bed of creeks and disintegrate.

The partings of marl and calcareous shale contain more clay than the chalky beds. Because they weather more rapidly than the massive beds, eroded banks show alternating ledges and recesses.

Scour and Fill Structures.—Buried channels may be observed in the lower chalk at three localities (Plate I, locations numbered 5). Similar features in the lower chalk of Dallas County have been reported by the Dallas Petroleum Geologists in their bulletin of 1941. These ancient channels range up to 95 feet across and vary between 4 and 6 feet in original depth. They trend between 10° and 30° east of north. The best exposures are in the bed of Five Mile Creek, some 150 yards upstream from Five Mile Road bridge. The channels have smooth concave floors that cut across the surfaces of stratification between thick beds of massive chalk (Fig. 2). They are filled with thinly laminated, marly limestone beds alternating with shale and sandy layers made largely of foraminiferal tests. These layers are from a fraction of an inch to one inch thick. They conform to the contours of the channel in which they are set and so appear

45 003

as synclinal structures where exposed in cross section.

These channels indicate that the deposition of the Austin chalk was not a continuous process. Occasionally the bottoms of the Austin seas were channeled by submarine currents, and in the depressions that were formed, new sediment was later added until the floor of the sea was level again.

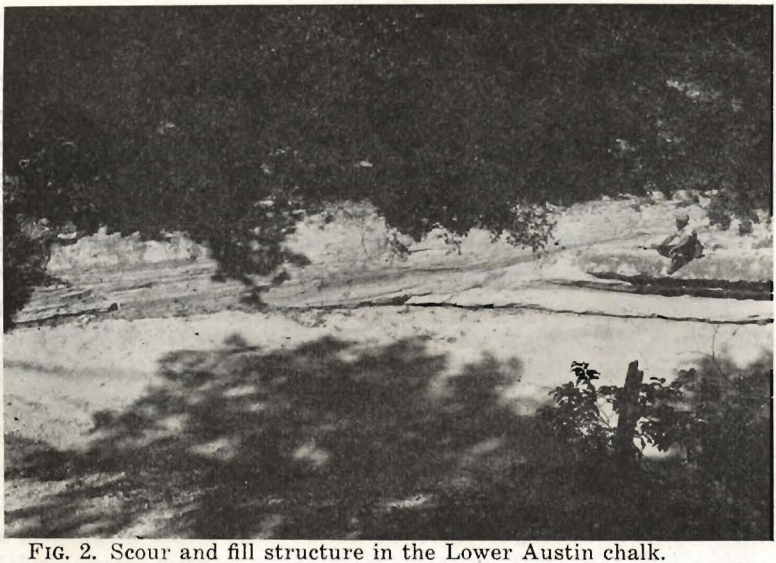

FIG. 2. Scour and fill structure in the Lower Austin chalk.

Bentonite.—Seams of bentonite are found at a number of horizons (Station 2) in the lower chalk. On fresh exposures the bentonite is blue-gray; upon weathering it becomes yellow or buff. The seams range from 2 to almost 6 inches in thickness. They are easily traced because they weather more rapidly than the chalk or the shaly partings and subsequently form recesses in eroded banks. Bentonite usually makes excellent marker beds; though in this area due to discontinuity of outcrops, I could not trace any bed for more than a few hundred yards.

Middle Marl

This unit, approximately 220 feet thick, covers roughly half of the Oak Cliff Quadrangle. The middle marl consists of powdery gray to buff calcareous rocks containing less calcium carbonate and more clay than the underlying chalk. It weathers rapidly to a clayey soil. Interbedded with the marl at various intervals are beds of chalk, some as much

45 004

as three feet thick. These closely resemble the chalk in the lower unit. A good exposure of the middle marl can be seen at the intersection of Kiest Boulevard and Bonnie View Road (Plate 1, Station 3).

There is a difference between the contours of the landscape in areas of marl as compared with areas underlain by chalk. This is the case despite the fact that the two members are inter-gradational and the contact between them correspondingly indefinite. In areas of massive chalk the streams flow in miniature canyons in places, leaving undercut bluffs as much as 100 feet high. As reported by Blakemore (1939) the streams in the chalk are usually guided in their headward erosion by faults and joints. This control of streams by fractures is not prevalent in the marl over which the streams tend to flow in dendritic patterns, between low and smoothly contoured hills.

Concretions.—Marcasite nodules are scattered throughout the middle marl as well as the lower chalk, where they are more common in the shaly partings. These range from less than an inch to three inches in their longest dimension. Most are irregularly shaped, but many tend to be ellipsoidal. They alter rapidly to limonite, and at places have left brown stains on the chalky beds. Although some of the concretions lie with their long axes parallel to the bedding planes, a great number of them have long axes at high angles with the bedding.

Cenozoic Rocks

The rocks representing the Cenozoic era consist of alluvium deposited by the Trinity and its tributaries. Alluvium of the terraces varies considerably from one level to the next, and even within short distances on the same level. The clastic material ranges in grade from clay to cobble gravel. Three terrace levels may be distinguished in the Oak Cliff area.

Marsalis Terrace Deposits.—Deposits representing the highest terrace are restricted to the area around Marsalis Zoo at levels approximately 110 feet above the Trinity floodplain. At the present time there are no good exposures of this terrace material. Kelsey (1935) states that this terrace soil ranges from black to a dark ashy-gray clay. He also states that this is underlain by chalk gravel, which at

45 005

places is as much as five feet thick and is locally cemented into a hard stratum by calcium carbonate.

Travis School Terrace Deposits.—Deposits of the middle terrace are rather widespread in the northeastern part of Oak Cliff, covering most of the area along and immediately north of Five Mile Creek. The surface averages approximately 65 feet above the Trinity floodplain. However, the surface elevation is quite variable and the terrace slopes 33 feet per mile from its western margin toward the river. There are patches of what is thought to be middle terrace deposits flanking Lancaster Road in the north, adjoining the higher terrace near Marsalis Zoo and Zangs Boulevard.

There is a wide variation in the composition of the middle terrace deposits. Along the flanks of Five Mile Creek the material is composed almost entirely of reworked Austin chalk and marl. It ranges from sandy gray calcareous clay to sands of reworked Austin foraminifera that are as much as 15 feet thick in places. Locally, there are beds of recemented calcareous materials, including chalk fragments, caliche nodules and fossil fragments.

Clastic material of the middle terrace in the northern section consists mostly of red or tan calcareous clay and foraminiferal sands.

Union Terminal Terrace Deposits.—The surface of the lowest terrace is approximately 25 feet above the floodplain and is best seen along U.S. Highway 75. Recent dissection in the northern section has left patches of this terrace as islands in the floodplain. The elevation of the islands average somewhat less than 25 feet above the floodplain. The lower terrace deposits consists of silty clay, sands and gravel.

Correlation of Terraces.—Without an accurate contour map it is difficult to trace terrace levels through heavily populated portions of the Oak Cliff area. The high terrace is not only dissected, but also mostly covered by buildings and roads. Shuler (1935) recognized three terraces along the Trinity River at Dallas, naming them, from highest to lowest, the Love Field, Travis School, and Union Terminal. Kelsey (1935) mapped the Marsalis in Oak Cliff and correlated it with the Love Field terrace. Carl N. Roberts has recently mapped the area adjacent to this area at the north and has proved that the Marsalis is higher than the Love

45 006

Field (oral communication). In the Carrollton area, Pattillo (1940, pp. 27-32) mapped three terraces, the Carrollton, Farmer's Branch, and the Bethel, from lowest to highest. In the order named, they are 10, 20, and 70 feet above the floodplain. Pattillo has traced the Bethel terrace south to Dallas, correlating it with the Love Field. Richards & Albritton (1948, p. 77) mapped three terraces in the Barnes Bridge Quadrangle. The terraces there are 30, 60 and 100 feet above the floodplain. They have correlated the highest terrace with the Marsalis terrace in Oak Cliff which is approximately 110 feet above the floodplain; and have tentatively correlated their middle terrace with the Love Field and Bethel terraces.

Probably the terraces in the Oak Cliff area represent Union Terminal, Travis School and the Marsalis and are so named on Plate I. This is somewhat contrary to previous interpretations, for Shuler (1935) mapped both Love Field and Travis School in the large terrace area immediately north of Five Mile Creek. However, the present author has run plane table traverses across the area along Ledbetter Road and Illinois Avenue to check the possibility of an intermediate level. Results indicate that this is one continuous gently sloping surface. Therefore, this terrace is tentatively called the Travis School. Patches of this terrace at approximately the same level are found bordering Lancaster Road in the north and along Cedar Creek. The highest terrace is called Marsalis, after Kelsey.

Outliers of terrace material along some of the creeks are difficult to correlate with one or another of the established benches. On the map these are shown as undifferentiated terrace deposits.

Floodplain Deposits.—These constructional features along the Trinity and its tributaries are the results of recent aggradation. Those along the river in the Oak Cliff area vary in width, being at places as much as one mile wide.

Deposits of the floodplains resemble those of the lower terraces, with most of the material consisting of clay with interbedded lenses of iron-stained sand and gravel.

Channel and Fill Structures.—Ham (1941) has described channel fillings of alluvium set in the Austin chalk around Dallas. These fillings seem to be restricted to the crests of divides and have been observed only in highway and rail-

45 007

road cuts. They usually have flat bottoms and steep sides that sharply truncate the bedrock. The fillings consist of unstratified, brownish clay, caliche nodules, shell fragments, and small fragments of chalk, marl and calcareous shale.

Ham has suggested that these channels were cut by streams that were entrenched in the middle marl. When the streams cut through the marl into the chalk their courses were modified to fit the pattern of joints and faults. Beheaded portions of streams were in time filled by slope-wash and slumped material. With later down cutting the channel fillings were preserved on divides.

Two such fillings were observed in the Oak Cliff Quadrangle. They are located approximately 200 and 500 yards east of Polk Street on Ledbetter Road (Station 4). These two fillings are approximately 25 and 150 yards long, respectively, and are filled with material closely resembling those already described by Ham, except that they show some stratification of the material in their upper portions.

Structure

The Austin formation of Dallas County strikes northeast and dips eastward at a low angle, estimated by Deussen (1924, pp. 25, 32) to average 40 to 50 feet per mile.

Many faults are present in the lower Austin chalk, but there are relatively few in the middle marl. All would be classified as small, for at no place was the throw found to be greater than five feet. The faults appear to be normal, with surfaces dipping between 50 and 75 degrees. As Shuler reported (1918, p. 22), the fault surfaces are commonly inclined in various directions so as to define small horsts and graben. The writer mapped the strike of 27 faults in the lower and middle Austin without discovering any dominant trend.

Along Cedar Creek, near the Marsalis Zoo, the faults seem more abundant than in adjoining areas. Here faulting has reversed the dip of the strata so that they are inclined toward the west. This reversal is only local and of minor character. Albritton (Dallas Petroleum Geologists, 1941, p. 68) has reported a poorly defined anticlinal flexure in the chalky beds on Cedar Creek. However, the dips along this arch do not exceed a few degrees.

The exact cause of the faulting has not been determined

45 008

but it has been suggested (Dallas Petroleum Geologists, 1941, p. 69) that differential compaction of the underlying incompetent Eagle Ford shale may be responsible. The small-scale faulting and warping would perhaps be the result of the competent Austin adjusting itself to the differential settling of the underlying shales. In places the faults trend toward a concentric pattern, and this might suggest adjustment to local differential settling. It is interesting to note that Shuler (1918, p. 22) tried to line up the strikes of the fault planes with the trend of the Balcones fault zone. However, as he reported, the strikes of the fault planes trend to almost all points of the compass, so it appears that the faulting in the Austin is not necessarily connected with the Balcones trend.

Jointing of two types is very prominent in the Austin. The first type, which is more common in the chalky beds, is characterized by smooth surfaces of fracture and the joints are either plane or curved. These cracks usually occur in systems, and within small areas show remarkable uniformity in their trend. The most prominent trend for scattered sets of joints within this area seems to be near N 35° E; but this varies from place to place.

A second type of jointing which is possibly only a superficial phenomenon (Dallas Petroleum Geologists, 1941, p. 70), has irregular surfaces that define blocks of rock loosened from the outcrop by weathering. These joints are due to drying and shrinkage of the rocks, especially in the middle marl.

Geologic History

The Upper Cretaceous Austin formation consists of fine clastic sediments deposited in relatively shallow marine waters. That the formation is of marine origin is well established, for the material contains many foraminiferal tests and other marine fossils. The literature abounds with information tentatively assigning the Austin to the infra-neritic zone which is the depth zone between 20 and 100 fathoms (Scott, 1940, p. 332).

Buried channels point to scouring action of strong ocean currents during the deposition of the lower chalk. Volcanoes were active during the deposition of the chalk, as attested by bentonite seams observed at numerous horizons.

45 009

Subsequently the Cretaceous seas withdrew to the southeast, leaving the consolidated rocks exposed to subaerial erosion. Consequent streams with numerous small tributaries soon developed on the sloping surface. The record of the Quaternary is one of alternate cutting and filling along the valley of the Trinity, with the stages of filling represented by the alluvial terraces. According to Stovall & McAnulty (1950), periodic glaciation and deglaciation lowered and raised sea level during this time. These changes in base level are recorded in different terrace levels over the area. Raising of sea level following the melting of the Wisconsin ice cap is probably responsible for the present floodplain.

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Reference 46

FIVEMILE CREEK (DALLAS COUNTY) | The Handbook of Texas Online

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FIVEMILE CREEK (Dallas County). Fivemile Creek rises in Duncanville about two miles from Redbird Airport in southwestern Dallas County (at 32°40' N, 96°54' W) and runs north-northeast for 3½ miles, then south-southeast, for a total length of about fifteen miles, before reaching its mouth on the Trinity River, a quarter mile north of Interstate Highway 20 (at 32°41' N, 96°42' W). The stream originally emptied into the Trinity about three miles south of its present mouth, but was diverted to feed what is now the Pin and Feather Club Lake, then later channeled into the Trinity at its present location when Interstate 20 was constructed. The stream passes through five city parks-Pecan Grove, Kiest, Glendale, Arden Terrace, and College. Where it has not been diverted into man-made channels, layers of Austin chalk and Eagle Ford shale lie under its basin. The soil in its drainage area consists of calcareous and clayey surface layers over chalky subsoils. Originally there were three vegetative zones within the creek's drainage basin: cedar brakes along the stream course and hillsides, riparian woodlands on the floodplains, and tall grasses on the upland prairies. Black bear, cougar, bobcat, white-tailed deer, and bison roamed the area. By the mid-1980s, most of the nearby terrain had been extensively developed for commercial and residential use, though the area around the creek's upper reaches remained relatively untouched.

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Reference 47

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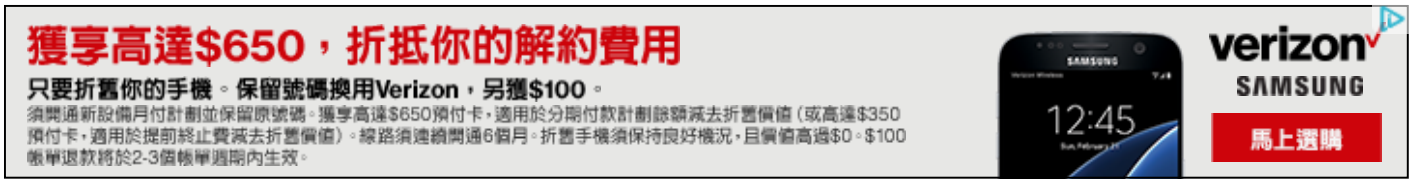

Five Mile Creek in Dallas a forgotten fishing hole

#9084929 - 06/30/13 04:57 PM

refidnasb
Outdoorsman

Registered: 09/06/12
Posts: 37

Had the chance to go out onto a body of water just about everyone has forgotten about, Five Mile Creek in Oak Cliff, part of Dallas, Texas. Big limestone cliffs, lots of 8 foot+ deep pools, loaded with fish the whole way. Lots of sunfish and the deeper pools most likely have a bunch of bass and catfish too.

Pretty sure no one fishes it. Maybe 40-50 years ago they did. Two guys I went with fished the creek in the early 1950s as kids. So for them it was like going home to their old fishing ground.

\

Lots of colorful fish in there. Since this is breeding season for Sunfish and Minnows, the males all look like tropical fish.

Some places the water was really cool and we could feel the underground springs piping in cold water to the creek.

Top

Re: Five Mile Creek in Dallas a forgotten fishing hole [Re: refidnasb]

#9085068 - 06/30/13 05:49 PM

Chuck7700

TFF Celebrity

Registered: 04/24/08
Posts: 7107

Nice video.

Top

Re: Five Mile Creek in Dallas a forgotten fishing hole [Re: Chuck7700]

#9085074 - 06/30/13 05:51 PM

banker-always fishing

TFF Guru

TFF TEAM MEMBER

Registered: 07/12/10
Posts: 33591
Loc: Universal City Tx.

> Originally Posted By: Chuck7700
>
> Nice video.

Plus #1.

_____

IGFA World Record Rio Grande Cichlid. Lake Dunlap.

John 3:16

Top

Re: Five Mile Creek in Dallas a forgotten fishing hole [Re:

#9088959 - 07/01/13 10:02 PM

Affiliates

- Coastal Conservation Association Texas
- J.P. Greeson's Weekly Fishing Report
- Big Billy Kinder Outdoors
- SHARELUNKER
- International Game Fish Association
- Barry Stokes' Southwest Outdoors Report

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10813258 Posts

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refidnasb]

catfish
Angler
Registered: 05/17/02
Posts: 489
Loc: Arlington, Texas USA

Well, if there is a bass in there he's got plenty to eat.

_____
it's all in the wrist

Top

Re: Five Mile Creek in Dallas a forgotten fishing hole [Re: refidnasb]
#9092958 - 07/03/13 03:47 AM

Findanothername1
Green Horn
Registered: 07/01/13
Posts: 7

What part do you fish?

Top

Re: Five Mile Creek in Dallas a forgotten fishing hole [Re: Findanothername1]
#9093593 - 07/03/13 09:56 AM

refidnasb
Outdoorsman
Registered: 09/06/12
Posts: 37

> Originally Posted By: Master-baiter
> What part do you fish?

The western sections seem to hold the better fishing spots, west of I-35. East of I-35 the creek was channelized in the 1960s-1970s and the fishing is not so great.

Upstream though, there are some great holes, better than White Rock Creek in North Dallas for sure.

Access is easy too since there are not any golf courses around and there is a small greenbelt park that extends along the banks for a good portion of it.

Top

Previous Topic | Index | Next Topic

Moderator: buda13, chickenman, don the angler, FattyMcButterpants, Fish Killer, J-2, Jerrybign, Jons3825, LoneStarCarper, NoconaBrian, RedSkeeter, Robbie Milam, Rockie Martin, Toontroller, Uncle Zeek, Weekender
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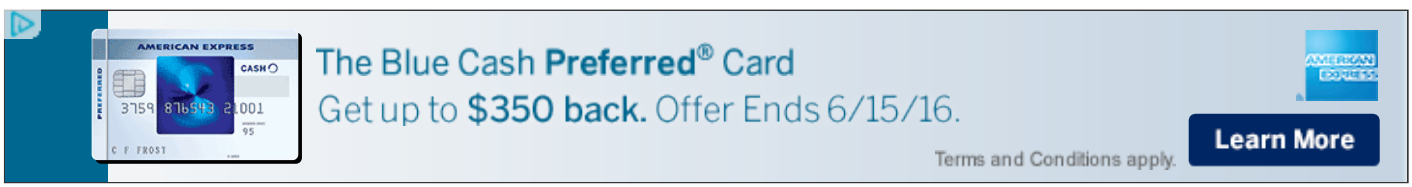

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ELEVATION REFERENCE MARKS

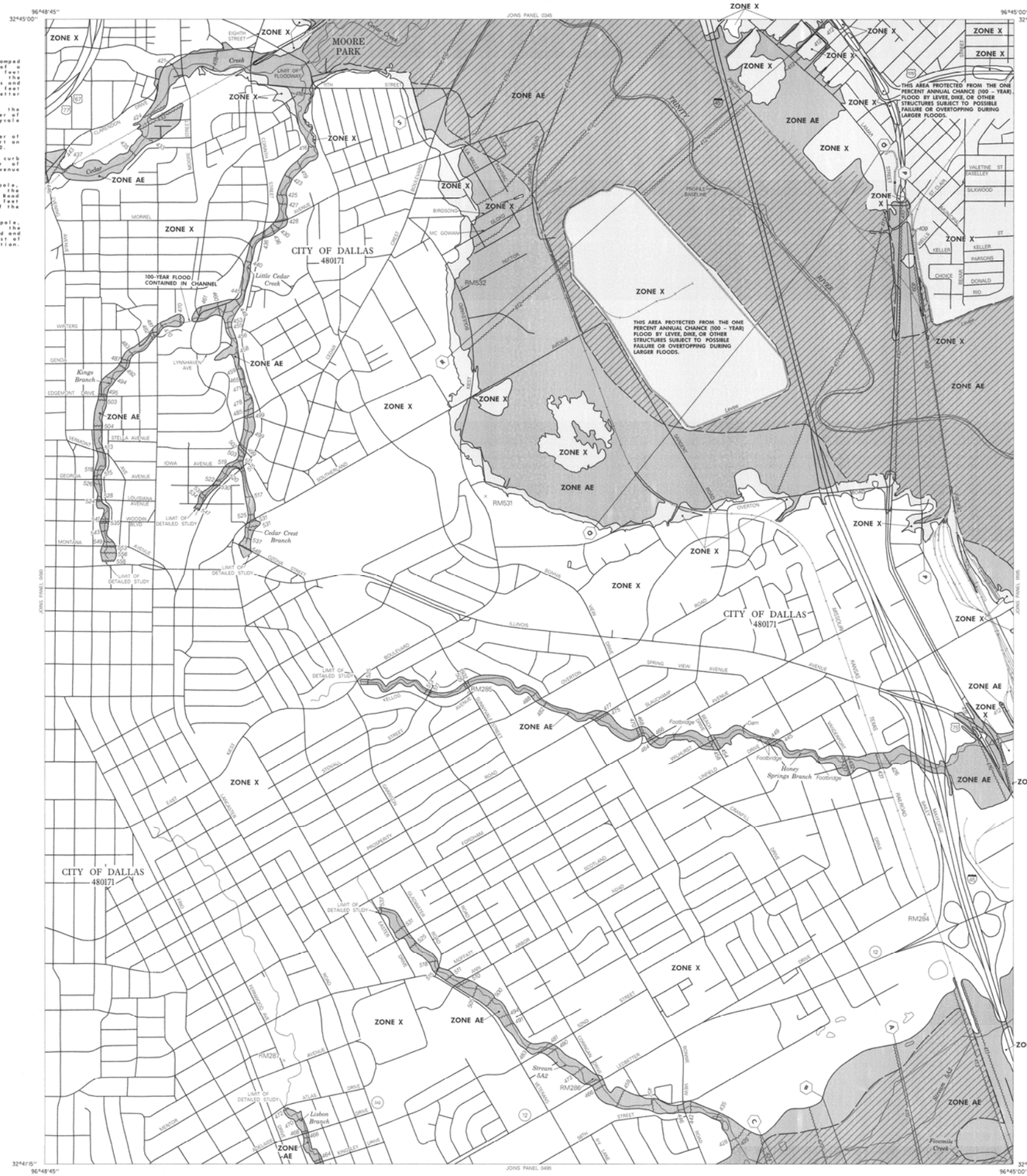
REFERENCE MARK	ELEVATION (FEET NGVD)	DESCRIPTION OF LOCATION
RM284	428.35	A standard USC&GS disk stamped 382 RESET 1947 set in the top of a concrete post faceted; 66.5 feet west of and 2.5 lower than the center of the Missouri, Kansas and Texas Railroad track and 47.7 feet south of the center of Ledbetter Drive.
RM285	506.09	A chiseled square on top of the curb radius at the south corner of the intersection of Sunnyvale Street and Kellog Avenue.
RM286	474.11	A chiseled square in the center of the north headwall of a culvert on Ledbetter Drive over Stream SA2.
RM287	485.42	A chiseled square on top of curb radius at the northeast corner of the intersection of Fernwood Avenue and Mentor Avenue.
RM531	519.26	Railroad spike set in utility pole, on the northwest corner at the intersection of Bonnie View Road and Van Cleave Drive, 50 feet northwest of the centerline of the intersection.
RM532	411.77	Railroad spike set in utility pole, on the northeast corner at the intersection of Kiest Boulevard and Rector Street, 60 feet northeast of the centerline of the intersection.

LEGEND

To obtain more detailed information in areas where Base Flood Elevations (BFEs)and /or floodways have been determined, users are encouraged to consult the Flood Profiles and Floodway Data tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations and therefore may not exactly reflect the flood elevation data presented in the FIS. BFEs shown on the FIRM are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS should be utilized in conjunction with the FIRM for purposes of construction and /or floodplain management.

ERM elevations listed on this map were obtained and/or developed to establish vertical control for determination of flood elevations and floodplain boundaries portrayed on this map. Users should be aware that these ERM elevations may have changed since the publication of this map. To obtain up-to-date elevation information on National Geodetic Survey (NGS) ERMs shown on this map, please contact the Information Services Branch of the NGS at (301) 713-3242 or visit their website at www.ngs.noaa.gov. Map users should seek verification of non-NGS ERM monument elevations when using these elevations for construction or floodplain management purposes.

Coastal BFE's shown on this map may apply only landward of 0.0 NGVD. Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study report for this community. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and /or floodplain management purposes when they are higher than the elevations shown on this FIRM.



LEGEND

SPECIAL FLOOD HAZARD AREAS INUNDATED BY 100-YEAR FLOOD

- **ZONE A** No base flood elevations determined.
- **ZONE AE** Base flood elevations determined.
- **ZONE AH** Flood depths of 1 to 3 feet (usually areas of ponding); base flood elevations determined.
- **ZONE AO** Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
- **ZONE A99** To be protected from 100-year flood by Federal flood protection system under construction ; no base flood elevations determined.
- **ZONE V** Coastal flood with velocity hazard (wave action); no base flood elevations determined.
- **ZONE VE** Coastal flood with velocity hazard (wave action); base flood elevations determined.

FLOODWAY AREAS IN ZONE AE

OTHER FLOOD AREAS

- **ZONE X** Areas of 500-year flood; areas of 100-year flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 100-year flood.

OTHER AREAS

- **ZONE X** Areas determined to be outside 500-year floodplain.
- **ZONE D** Areas in which flood hazards are undetermined.

UNDEVELOPED COASTAL BARRIERS

Identified 1983 | Identified 1990 | Otherwise Protected Areas

Coastal barrier areas are normally located within or adjacent to Special Flood Hazard Areas.

- Floodplain Boundary
- Floodway Boundary
- Zone D Boundary
- Boundary Dividing Special Flood Hazard Zones, and Boundary Dividing Areas of Different Coastal Base Flood Elevations Within Special Flood Hazard Zones.
- 513 Base Flood Elevation Line; Elevation in Feet. See Map Index for Elevation Datum.
- D–D Cross Section Line
- (EL 987) Base Flood Elevation in Feet Where Uniform Within Zone. See Map Index for Elevation Datum.
- RM7 × Elevation Reference Mark
- M2 River Mile
- 97°07'30", 32°22'30" Horizontal Coordinates Based on North American Datum of 1927 (NAD 27) Projection

NOTES

This map is for use in administering the National Flood Insurance Program; it does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size, or all planimetric features outside Special Flood Hazard Areas. The community map repository should be consulted for more detailed data on BFE's, and for any information on floodway delineations, prior to use of this map for property purchase or construction purposes.

Areas of Special Flood Hazard (100-year flood) include Zones A, AE, AH, AO, AH, AO, A99, V, VE and V1-V30.

Certain areas not in Special Flood Hazard Areas may be protected by flood control structures.

Boundaries of the floodways were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the Federal Emergency Management Agency.

Floodway widths in some areas may be too narrow to show to scale. Refer to Floodway Data Table where floodway width is shown at 120 inch.

Coastal base flood elevations apply only landward of 0.0 NGVD, and include the effects of wave action; these elevations may also differ significantly from those developed by the National Weather Service for hurricane evacuation planning.

Corporate limits shown are current as of the date of this map. The user should contact appropriate community officials to determine if corporate limits have changed subsequent to the issuance of this map.

This map may incorporate approximate boundaries of Coastal Barrier Resource System Units and /or Otherwise Protected Areas established under the Coastal Barrier Improvement Act of 1990 (PL 101-591).

For community map revision history prior to countywide mapping, see Section 6.0 of the Flood Insurance Study Report.

For adjoining map panels and base map source see separately printed Map Index.

MAP REPOSITORY
Refer to Repository Listing on Map Index

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP:
AUGUST 23, 2001

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL:

Refer to the FLOOD INSURANCE RATE MAP EFFECTIVE DATE shown on this map to determine when actuarial rates apply to structures in zones where elevations or depths have been established.

To determine if flood insurance is available, contact an insurance agent or call the National Flood Insurance Program at (800) 638-6620.

APPROXIMATE SCALE IN FEET
1000 0 1000

NATIONAL FLOOD INSURANCE PROGRAM

FIRM
FLOOD INSURANCE RATE MAP

DALLAS COUNTY, TEXAS AND INCORPORATED AREAS

PANEL 485 OF 725
(SEE MAP INDEX FOR PANELS NOT PRINTED)

CONTAINS: COMMUNITY	NUMBER	PANEL	SUFFIX
DALLAS, CITY OF	480171	0485	J

MAP NUMBER 48113C0485 J

EFFECTIVE DATE: AUGUST 23, 2001

Federal Emergency Management Agency

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) Report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS Report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coastal Base Flood Elevations shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD 88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study Report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study Report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study Report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was Texas State Plane North Central Zone (FIPS zone 4202). The **horizontal datum** was NAD 83, GRS 1980 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at **(301) 713- 3242**, or visit its website at http://www.ngs.noaa.gov.

Base Map information shown on this FIRM was provided in digital format by the North Central Texas Council of Governments (NCTCOG). This information was photogrammetrically compiled at a scale of at least 1:24,000 from aerial photography dated 2001.

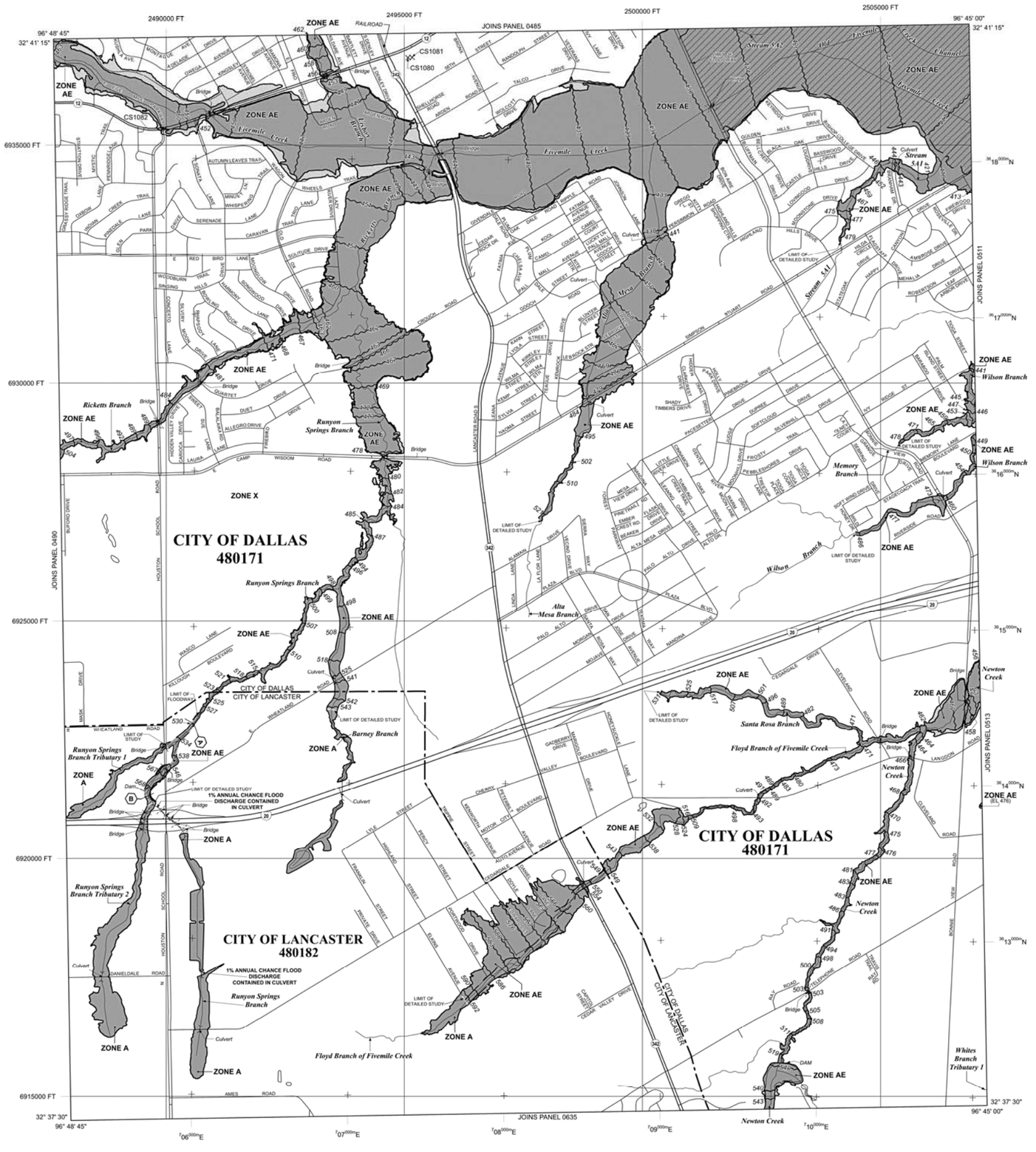
This map reflects more detailed and up-to-date **stream channel configurations** than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data tables for multiple streams in the Flood Insurance Study Report (which contains authoritative hydraulic data) may reflect stream channel distances that differ from what is shown on this map.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

For information on available products associated with this FIRM visit the **Map Service Center (MSC)** website at http://msc.fema.gov. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. Many of these products can be ordered or obtained directly from the MSC website.

If you have **questions about this map,** how to order products, or the National Flood Insurance Program in general, please call the **FEMA Map Information eXchange (FMIX)** at **1-877-FEMA-MAP** (1-877-336-2627) or visit the FEMA website at http://www.fema.gov/business/nfip.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JOINS PANEL 0485
JOINS PANEL 0490
JOINS PANEL 0511
JOINS PANEL 0513
JOINS PANEL 0635
ZONE AE
ZONE A
ZONE X
CITY OF DALLAS
480171
CITY OF LANCASTER
480182
CITY OF DALLAS
CITY OF LANCASTER
LIMIT OF DETAILED STUDY
LIMIT OF FLOODWAY
1% ANNUAL CHANCE FLOOD DISCHARGE CONTAINED IN CULVERT
Ricketts Branch
Runyon Springs Branch
Runyon Springs Branch Tributary 1
Runyon Springs Branch Tributary 2
Barney Branch
Alta Mesa Branch
Floyd Branch of Fivemile Creek
Santa Rosa Branch
Memory Branch
Wilson Branch
Whites Branch Tributary 1
Newton Creek
Fivemile Creek
Stream 542
Stream 541
Culvert
Bridge
DAM
RAILROAD
CS1081
CS1080
CS1082
3618'30"N
3617'00"N
3615'30"N
3614'00"N
3612'30"N
3611'00"N
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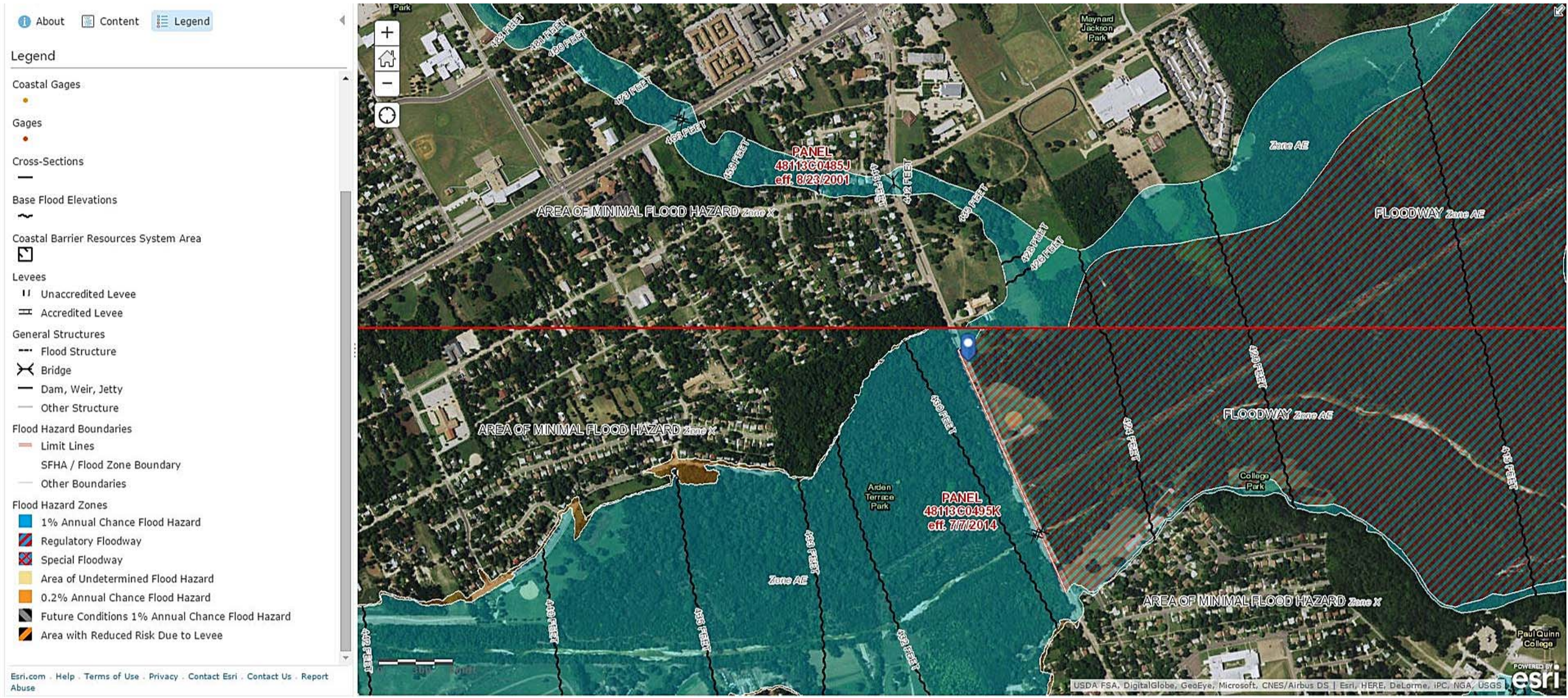

About
Content
Legend
Legend
Coastal Gages
Gages
Cross-Sections
Base Flood Elevations
Coastal Barrier Resources System Area
Levees
Unaccredited Levee
Accredited Levee
General Structures
Flood Structure
Bridge
Dam, Weir, Jetty
Other Structure
Flood Hazard Boundaries
Limit Lines
SFHA / Flood Zone Boundary
Other Boundaries
Flood Hazard Zones
1% Annual Chance Flood Hazard
Regulatory Floodway
Special Floodway
Area of Undetermined Flood Hazard
0.2% Annual Chance Flood Hazard
Future Conditions 1% Annual Chance Flood Hazard
Area with Reduced Risk Due to Levee
Esri.com . Help . Terms of Use . Privacy . Contact Esri . Contact Us . Report Abuse
Park
Maynard Jackson Park
PANEL 48113C0485J eff. 8/23/2001
AREA OF MINIMAL FLOOD HAZARD Zone X
Zone AE
FLOODWAY Zone AE
Arden Terrace Park
PANEL 48113C0495K eff. 7/7/2014
College Park
Paul Quinn College
USDA FSA, DigitalGlobe, GeoEye, Microsoft, CNES/Airbus DS | Esri, HERE, DeLorme, iPC, NGA, USGS
POWERED BY esri

Reference 49

G+1 0 More Next Blog» Create Blog Sign In

Dallas Trinity Trails

This practical guide takes readers to the best trails found in the Great Trinity Forest, all within easy reach of Downtown Dallas. Destinations include less traveled, low-traffic areas for hiking, mountain biking and horseback riding in the City of Dallas. Joppa Preserve, McCommas Bluff Preserve, Trinity River Wetlands, Texas Horse Park, Dallas Trinity Paddling Trail, Lower White Rock Creek, Sycamore Dixon, Texas Buckeye Trail, Dallas Whitewater Wave, Levee Trails, Rochester Park and more.

SUNDAY, JUNE 9, 2013

Massive Fish Kill In Great Trinity Forest -- Joppa Preserve

Thousands of bloated and decaying fish at West Pond in the Great Trinity Forest, Joppa Preserve, June 8, 2013

There was an old man from the Freedman's town of Joppa named Bad Leg Fred who once ran a private fishing concession here in the 70s and 80s. For a buck or two, he'd let you drown worms for an afternoon in the pond the locals called Bad Leg Fred Lake. Stocked with bass, crappie, perch, catfish and carp the place was popular with locals who wanted a cheap place to fish.

Old Fred has most likely passed away. Unfortunately so has his lake and the fish in it.

Bad Leg Fred Lake, West Pond, Joppa Preserve

POPULAR POSTS

"Garzilla" record sized Alligator Gar caught on Trinity River

One of the largest Alligator Gar ever caught in Texas was landed on the Trinity River south of Dallas by Joseph Williams on April 14th. Texa...

Lower White Rock Creek Valley Trails

White Rock Creek runs south from Dallas' best-known land form, White Rock Lake. But for all the popularity of the old city reservoir, t...

Dogwood Canyon and Cedar Ridge Preserve -- Hiking Into The Refugium

Climbing high in the tree tops of a century old Flowering Dogwood (Cornus florida) stand, Dogwood Canyon, Dallas County, Texas Mast...

Trinity Forest Golf Course Construction Visible in Google Earth

The Trinity Forest Golf Course as seen from Google Earth As details of the Trinity Forest Golf course slowly take shape, so does the ph...

Miller's Ferry, 3000 Years of Human History At

That old pond sits inside River Oaks Park, part of Joppa Preserve and one of the trailheads for the Trinity River concrete trail at 4800 River Oaks Road.

The Corps of Engineers calls the place West Pond. North of River Oaks Road and about 5 acres in size this body of water is most likely an old gravel pit excavated for dam construction and improvement of Lemmon Lake which sits due east. An archeological site was identified there in the 1940s and is noted on the inset map as 41DL78. The pond was most likely used in the 50s and 60s to draw water for cement manufacturing.

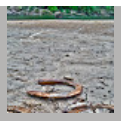
The pond has no true inlet or outlet. When the Trinity Forest Trail was constructed in 2008-2009 the design did not take into account the complex storm water runoff that feeds West Pond and Lemmon Lake. The resulting construction cutoff the water to both lakes. The small channelized creek that once fed the lakes now bypasses them heading due east for the Trinity River.

West Pond is most likely recharged via a shallow water table. It sits just high enough and far enough from the Trinity River that only the largest floods reach it. As a result the sport fish, the bass, perch and catfish that have been stocked here over the years all stay put. Makes for a great fishing lake that is free from many of the undesirable rough fish that fill other lakes.

Anhinga

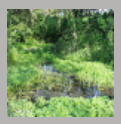
Decaying fish at West Pond

I wonder what went wrong here. The pond here has never seen a fish kill according to the fishermen who have angled here back to the Bad Leg Fred era. In 2011 when Dallas saw a record drought the pond held full all summer. This spring the periodic rains every few days have turned the woods around the Trinity River green and lush, the kind of rain that allows aquatic life to flourish.



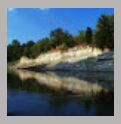
Your Feet

No spot concentrates more history into the size of a tennis court than Miller's Ferry in Dallas on the Trinity River. Exploration....



Natural Springs In Dallas – Radiocarbon Dating One Of Texas Last Surviving Natural Springs

One of the few natural springs left in Texas and one of just a handful on public property, Big Spring is quickly becoming a focal point o...

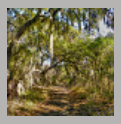


McCommas Bluff Preserve and Trails

McCommas Bluff Preserve on Trinity River Dallas, Texas The McCommas Bluff Preserve, in South Central Dallas County, is in a historical ...

Coombs Creek Trail Oak Cliff

Coombs Creek Trail along Kessler Parkway The handful of times I have ridden this trail it seems I am shadowed by house gawkers driv...



Goat Island Preserve, Sand Branch and Parson's Slough

This is an epic to the historic, and still fresh in the minds of people, the mystic and fearsome Bois d'Arc Is...

The Largest Wildflower Meadow in Dallas

Acres of marsh loving Clasping Coneflower (Rudbeckia amplexicaulis) as far as the eye can see in the Back Forty below Big Spring in the ...

Dead Largemouth Bass at Joppa Preserve

Clues to what might have caused the fish kill probably lie in the off-color of the water. The once green-blue water is now clear, stained a shade of light brown. It was a mass extinction event that killed all the fish, top to bottom, big to small. Surprised to see the larger carp die off. In the heat of the summers here, the carp are the very last fish species to die in the shallow water of drying lake beds. They can live in what amounts to a muddy pudding. To die in a large pond is a question that needs an answer.

Dead Bluegill at Joppa Preserve

Anatomy of a fish kill

It must have been from an extreme lack of oxygen in the water that killed off all the fish. One could only guess if it was natural or man made. One of the most common types of fish kills in ponds is caused by depletion of dissolved oxygen in the water. Oxygen must be present in the water at or above certain minimum concentrations for fish to survive. The symptoms of an oxygen depletion fish kill are as follows--the fish will be swimming near the surface, attempting to gulp air; large fish will be killed first, followed by smaller fish; the kill will occur at night or in the early morning hours; the majority of fish will be killed within a few hours time.

PREVIOUS POSTS

► 2015 (9)
► 2014 (28)
▼ 2013 (38)
► December (3)
► November (4)
► October (5)
► September (4)
► August (4)
► July (2)
▼ June (4)
The Rare Hexalectris Orchids of the Great Trinity ...
Supermoon Over Dallas -- Tracking the Moonrise
Hunting The Wetlands and Sloughs of the Trinity wi...
Massive Fish Kill In Great Trinity Forest -- Joppa...
► May (3)
► April (2)
► March (4)
► February (1)
► January (2)
► 2012 (43)
► 2011 (35)
► 2010 (1)

Dead Buffalofish at Joppa Preserve

Oxygen depletion fish kills are most commonly caused by a die-off of the microscopic green plants (phytoplankton) in the pond, or overturns in which oxygen deficient water from the deeper levels of the pond mixes with water in the upper levels. Phytoplankton imparts a green color to the water in a healthy pond. It is essential as part of the food chain and as a supplier of oxygen. A sudden die-off of these plants may occur when the plants use more oxygen than they supply to the pond. As the phytoplankton die and decompose, the remaining oxygen in the pond is consumed and within a short time, a fish kill occurs due to oxygen depletion.

I'm not sure what caused the die off to be honest. The absence of turtles, frogs and birds might suggest something man made. A nearby railroad line and a tractor trailer lot sit just to the west.

The Fallout

One of the only public fishing spots accessible to South Dallas residents, the pond here has been a haven for anglers without the means of transportation to other larger bodies of water. Some take DART. Some hitchhike. Some walk. Some walk miles to get here. I feel for those folks. Their refuge from the day to day grind has evaporated for the summer.

Leroy and Oliver at West Pond

Little Lemmon Lake went dry last summer and has only refilled due to spring rains. The customary winter rains that usually send the Trinity out of her banks did not flood the Great Trinity Forest, leaving Little Lemmon Lake without any fish. It's as barren as West Pond.

A historic grove of oaks sit adjacent to the pond. Since emancipation the oaks have served as a traditional gathering spot for Juneteenth events and many family reunions. A damn shame that the focal point of the park, the pond, is now devoid of fish.

The wildlife will need to find a new place to find food. Buffalo fish are a favorite meal of the resident River Otters. The fish kill will put them in a bind as they need to find a new place to hunt for food.

Downed lines in the River Oaks Parking Lot

How the lake gets restocked and whatever caused the problem in the first place will be something not likely to be fixed soon. Even 311 calls to get the downed powerlines that have been knocked out for over a month have not yielded results.

Posted by DallasTrinityTrails at 10:59 AM G+1 Recommend this on Google

11 COMMENTS:

Anonymous June 9, 2013 at 12:37 PM

The city seems serious about transferring public money to private hands through parks department projects like the horse park and the standing wave boondoggle. They do not seem serious about protecting public safety, or protecting and maintaining the public parks they have constructed in this part of town, however.

Reply

David McNeely June 10, 2013 at 10:08 AM

Has there been any investigation by either city or state personnel of the fish kill? If so, what conclusions have been reached? The odd color and the water clarity might be indicative of "golden algae":

http://www.tpwd.state.tx.us/landwater/water/environconcerns/hab/ga/faq.phtml

Golden algae blooms are most common in more saline drainages such as the Brazos, Pecos, Colorado, and Red Rivers, and in cooler months. However, the alga occurs throughout the state, blooms and kills have occurred in other states in drainages with salinity similar to the Trinity, and blooms and kills have occurred in Texas in summer. If the temperature at the lake was below 86 F, golden algae is a real possibility. I doubt that the temperature had reached that warm this early in the summer.

Reply

Replies

DallasTrinityTrails June 10, 2013 at 1:00 PM

The City of Dallas will not return my phone calls regarding the fish kill.

I called TPWD and reported it with them. Nothing will come of it unfortunately. I imagine maybe if we get a 500 year flood it might move some fish back in there. Otherwise it will stay devoid of fish from now on.

Reference 50

U.S. DEPARTMENT OF COMMERCE
LUTHER H. HODGES, Secretary

WEATHER BUREAU
F. W. REICHELDERFER, Chief

TECHNICAL PAPER NO. 40

RAINFALL FREQUENCY ATLAS OF THE UNITED STATES

for Durations from 30 Minutes to 24 Hours and Return Periods from 1 to 100 Years

Prepared by
DAVID M. HERSHFIELD
Cooperative Studies Section, Hydrologic Services Division
for
Engineering Division, Soil Conservation Service
U.S. Department of Agriculture

WASHINGTON, D.C.

May 1961

Repaginated and Reprinted January 1963

For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington 25, D.C. Price $1.25

U.S. DEPARTMENT OF COMMERCE WEATHER BUREAU

TECHNICAL PAPER NO. 40

RAINFALL FREQUENCY ATLAS OF THE UNITED STATES

for Durations from 30 Minutes to 24 Hours and Return Periods from 1 to 100 Years

WASHINGTON, D.C.

May 1961

Repaginated and Reprinted January 1963

Weather Bureau Technical Papers

*No. 1. Ten-year normals of pressure tendencies and hourly station pressures for the United States. Washington, D.C. 1943.
*Supplement: Normal 3-hourly pressure changes for the United States at the intermediate synoptic hours. Washington, D.C. 1945.
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PREFACE

This publication is intended as a convenient summary of empirical relationships, working guides, and maps, useful in practical problems requiring rainfall frequency data. It is an outgrowth of several previous Weather Bureau publications on this subject prepared under the direction of the author and contains an expansion and generalization of the ideas and results in earlier papers. This work has been supported and financed by the Soil Conservation Service, Department of Agriculture, to provide material for use in developing planning and design criteria for the Watershed Protection and Flood Prevention program (P.L. 566, 83d Congress and as amended).

The paper is divided into two parts. The first part presents the rainfall analyses. Included are measures of the quality of the various relationships, comparisons with previous works of a similar nature, numerical examples, discussions of the limitations of the results, transformation from point to areal frequency, and seasonal variation. The second part presents 49 rainfall frequency maps based on a comprehensive and integrated collection of up-to-date statistics, several related maps, and seasonal variation diagrams. The rainfall frequency (isopluvial) maps are for selected durations from 30 minutes to 24 hours and return periods from 1 to 100 years.

This study was prepared in the Cooperative Studies Section (Joseph L. H. Paulhus, Chief) of Hydrologic Services Division (William E. Hiatt, Chief). Coordination with the Soil Conservation Service, Department of Agriculture, was maintained through Harold O. Ogrosky, Chief, Hydrology Branch, Engineering Division. Assistance in the study was received from several people. In particular, the author wishes to acknowledge the help of William E. Miller who programmed the frequency and duration functions and supervised the processing of all the data; Normalee S. Foat who supervised the collection of the basic data; Howard Thompson who prepared the maps for analysis; Walter T. Wilson, a former colleague, who was associated with the development of a large portion of the material presented here; Max A. Kohler, A. L. Shands, and Leonard L. Weiss, of the Weather Bureau, and V. Mockus and R. G. Andrews, of the Soil Conservation Service, who reviewed the manuscript and made many helpful suggestions. Caroll W. Gardner performed the drafting.

CONTENTS

	Page
PREFACE	ii
INTRODUCTION	1
Historical review	1
General approach	1
PART I: ANALYSES	1
Basic data	1
Duration analysis	2
Frequency analysis	2
Isopluvial maps	4
Guides for estimating durations and/or return periods not presented on the maps	5
Comparisons with previous rainfall frequency studies	6
Probability considerations	6
Probable maximum precipitation (PMP)	6
Area-depth relationships	7
Seasonal variation	7
References	7
List of tables	
1. Sources of point rainfall data	1
2. Empirical factors for converting partial-duration series to annual series	3
3. Average relationship between 30-minute rainfall and shorter duration rainfall for the same return period	5
List of illustrations	
Figure 1.—Relation between 2-year 60-minute rainfall and 2-year clock-hour rainfall; relation between 2-year 1440-minute rainfall and 2-year observational-day rainfall	1
Figure 2.—Rainfall depth-duration diagram	2
Figure 3.—Relation between observed 2-year 2-hour rainfall and 2-year 2-hour rainfall computed from duration diagram	2
Figure 4.—Relation between observed 2-year 6-hour rainfall and 2-year 6-hour rainfall computed from duration diagram	2
Figure 5.—Relation between 2-year 30-minute rainfall and 2-year 60-minute rainfall	2
Figure 6.—Relation between partial-duration and annual series	2
Figure 7.—Rainfall depth versus return period	3
Figure 8.—Distribution of 1-hour stations	3
Figure 9.—Distribution of 24-hour stations	4
Figure 10.—Grid density used to construct additional maps	5
Figure 11.—Relation between means from 50-year and 10-year records (24-hour duration)	6
Figure 12.—Example of internal consistency check	6
Figure 13.—Example of extrapolating to long return periods	6
Figure 14.—Relationship between design return period, T years, design period, T_d, and probability of not being exceeded in T_d years	6
Figure 15.—Area-depth curves	6
PART II: CHARTS	
1.—1-year 30-minute rainfall	8
2.—2-year 30-minute rainfall	9
3.—5-year 30-minute rainfall	10
4.—10-year 30-minute rainfall	11
5.—25-year 30-minute rainfall	12
6.—50-year 30-minute rainfall	13
7.—100-year 30-minute rainfall	14
8.—1-year 1-hour rainfall	15
PARTS II: CHARTS—Continued	
9.—2-year 1-hour rainfall	16
10.—5-year 1-hour rainfall	17
11.—10-year 1-hour rainfall	18
12.—25-year 1-hour rainfall	19
13.—50-year 1-hour rainfall	20
14.—100-year 1-hour rainfall	21
15.—1-year 2-hour rainfall	22
16.—2-year 2-hour rainfall	23
17.—5-year 2-hour rainfall	24
18.—10-year 2-hour rainfall	25
19.—25-year 2-hour rainfall	26
20.—50-year 2-hour rainfall	27
21.—100-year 2-hour rainfall	28
22.—1-year 3-hour rainfall	29
23.—2-year 3-hour rainfall	30
24.—5-year 3-hour rainfall	31
25.—10-year 3-hour rainfall	32
26.—25-year 3-hour rainfall	33
27.—50-year 3-hour rainfall	34
28.—100-year 3-hour rainfall	35
29.—1-year 6-hour rainfall	36
30.—2-year 6-hour rainfall	37
31.—5-year 6-hour rainfall	38
32.—10-year 6-hour rainfall	39
33.—25-year 6-hour rainfall	40
34.—50-year 6-hour rainfall	41
35.—100-year 6-hour rainfall	42
36.—1-year 12-hour rainfall	43
37.—2-year 12-hour rainfall	44
38.—5-year 12-hour rainfall	45
39.—10-year 12-hour rainfall	46
40.—25-year 12-hour rainfall	47
41.—50-year 12-hour rainfall	48
42.—100-year 12-hour rainfall	49
43.—1-year 24-hour rainfall	50
44.—2-year 24-hour rainfall	51
45.—5-year 24-hour rainfall	52
46.—10-year 24-hour rainfall	53
47.—25-year 24-hour rainfall	54
48.—50-year 24-hour rainfall	55
49.—100-year 24-hour rainfall	56
50.—Probable maximum 6-hour precipitation for 10 square miles	57
51.—Ratio of probable maximum 6-hour precipitation for 10 square miles to 100-year 6-hour rainfall	58
52.—Seasonal probability of intense rainfall, 1-hour duration	59
53.—Seasonal probability of intense rainfall, 6-hour duration	60
54.—Seasonal probability of intense rainfall, 24-hour duration	61

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Area-depth relationships

General.—For drainage areas larger than a few square miles consideration must be given not only to point rainfall, but to the average depth over the entire drainage area. The average area-depth relationship, as a percent of the point values, has been determined for 20 dense networks up to 400 square miles from various regions in the United States [7].

The area-depth curves of figure 15 must be viewed operationally The operation is related to the purpose and application. In application the process is to select a point value from an isopluvial map. This point value is the average depth for the location concerned, for a given frequency and duration It is a composite. The area-depth curve relates this average point value, for a given duration and frequency and within a given area, to the average depth over that area for the corresponding duration and frequency.

The data used to develop the area-depth curves of figure 15 exhibited no systematic regional pattern [7]. Duration turned out to be the major parameter. None of the dense networks had sufficient length of record to evaluate the effect of magnitude (or return period) on the area-depth relationship. For areas up to 400 square miles, it is tentatively accepted that storm magnitude (or return period) is not a parameter in the area-depth relationship. The reliability of this relationship appears to be best for the longer durations.

EXAMPLE What is the average depth of 2-year 3-hour rainfall for a 200-square-mile drainage area in the vicinity of 37° N , 86° W.? From the 2-year 3-hour map, 2.0 inches is estimated as the average depth for points in the area. However, the average 3-hour depth over the drainage area would be less than 2 0 inches for the 2-year return period Referring to figure 15, it is seen that the 3-hour curve intersects the area scale at 200 square miles at ratio 0.8. Accordingly, the 2-year 3-hour average depth over 200 square miles is 0.8 times 2 0, or 1.6 inches.

Seasonal variation

Introduction.—To this point, the frequency analysis has followed the conventional procedures of using only the annual maxima or the n-maximum events for n years of record Obviously, some months contribute more events to these series than others and, in fact, some months might not contribute at all to these two series. Seasonal variation serves the purpose of showing how often these rainfall events occur during a specific month. For example, a practical problem concerned with seasonal variation may be illustrated by the fact that the 100-year 1-hour rain may come from a summer thunderstorm, with considerable infiltration, whereas the 100-year flood may come from a lesser storm occurring on frozen or snow-covered ground in the late winter or early spring.

Seasonal probability diagrams.—A total of 24 seasonal variation diagrams is presented in Charts 52, 53, and 54 for the 1-, 6-, and 24-hour durations for 8 subregions of the United States east of 105° W. The 15 diagrams covering the region east of 90° W. are identical to those presented previously in *Technical Paper No. 29* [7]. The smoothed isopleths of a diagram for a particular duration are based on the average relationship from approximately 15 stations in each subregion. Some variation exists from station to station, suggesting a slight subregional pattern, but no attempt was made to define it because there is no conclusive method of determining whether this pattern is a climatic fact or an accident of sampling. The slight regional discontinuities between curves of adjacent subregions can be smoothed locally for all practical purposes. No seasonal variation relationships are presented for the mountainous region west of 105° W. because of the influence of local climatic and topographic conditions. This would call for seasonal distribution curves constructed from each station's data instead of average and more reliable curves based on groups of stations.

Application to areal rainfall.—The analysis of a limited amount of areal rainfall data in the same manner as the point data gave seasonal variations which exhibited no substantial difference from those of the point data. This lends some confidence in using these diagrams as a guide for small areas.

EXAMPLE. Determine the probability of occurrence of a 10-year 1-hour rainfall for the months May through August for the point at 45° N., 85° W. From Chart 52, the probabilities for each month are interpolated to be 1, 2, 4, and 2 percent, respectively. In other words, the probability of occurrence of a 10-year 1-hour rainfall in May of any particular year is 1 percent; for June, 2 percent; and so forth. (Additional examples are given in all five parts of *Technical Paper No. 29.*)

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PART II

Charts 1–49: Isopluvial maps.
Charts 50–51: The 6-hour probable maximum precipitation and its relationship to the 100-year 6-hour rainfall.
Charts 52–54: Diagrams of seasonal probability of intense rainfall, for 1-, 6-, and 24-hour durations.

50 005

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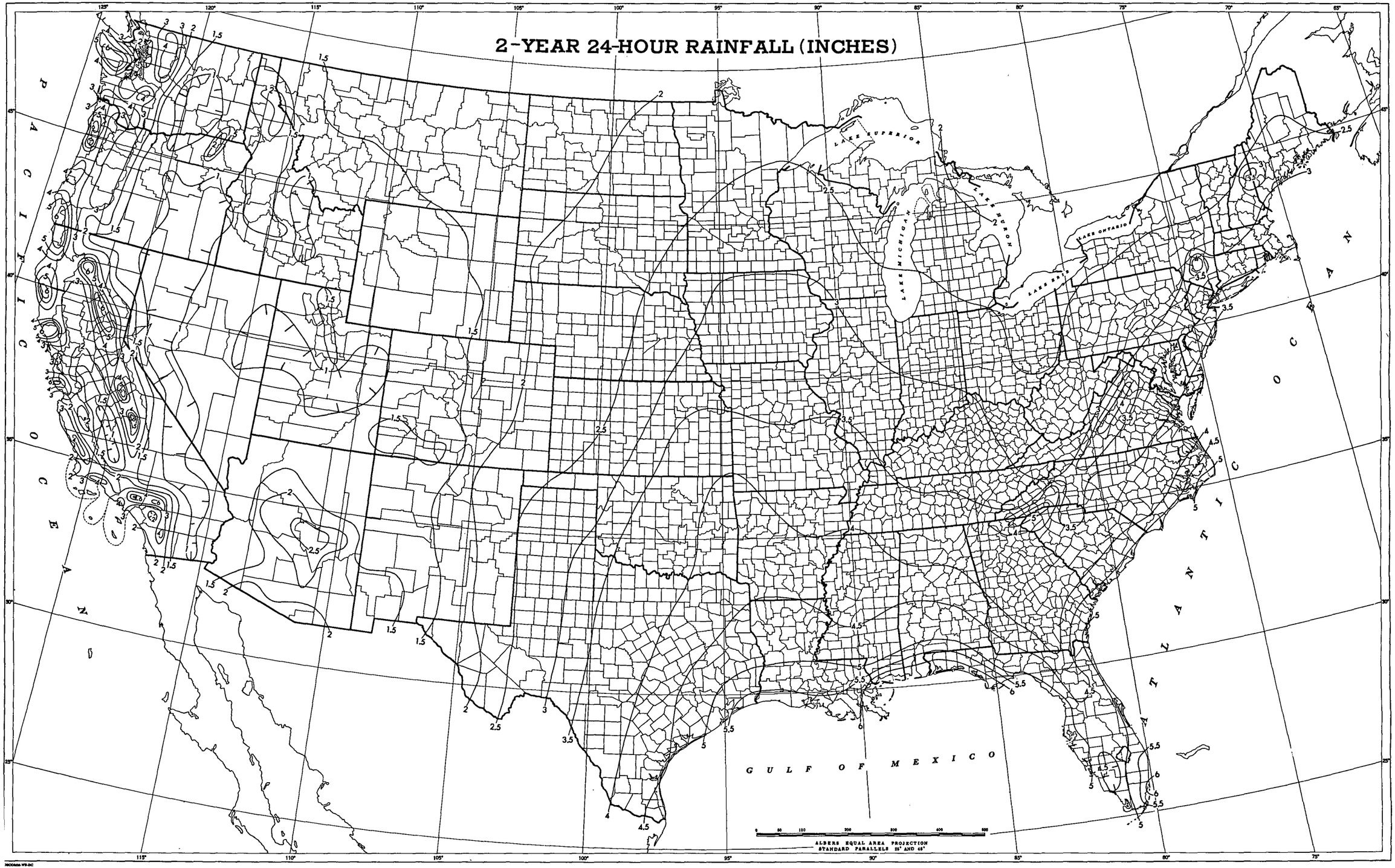

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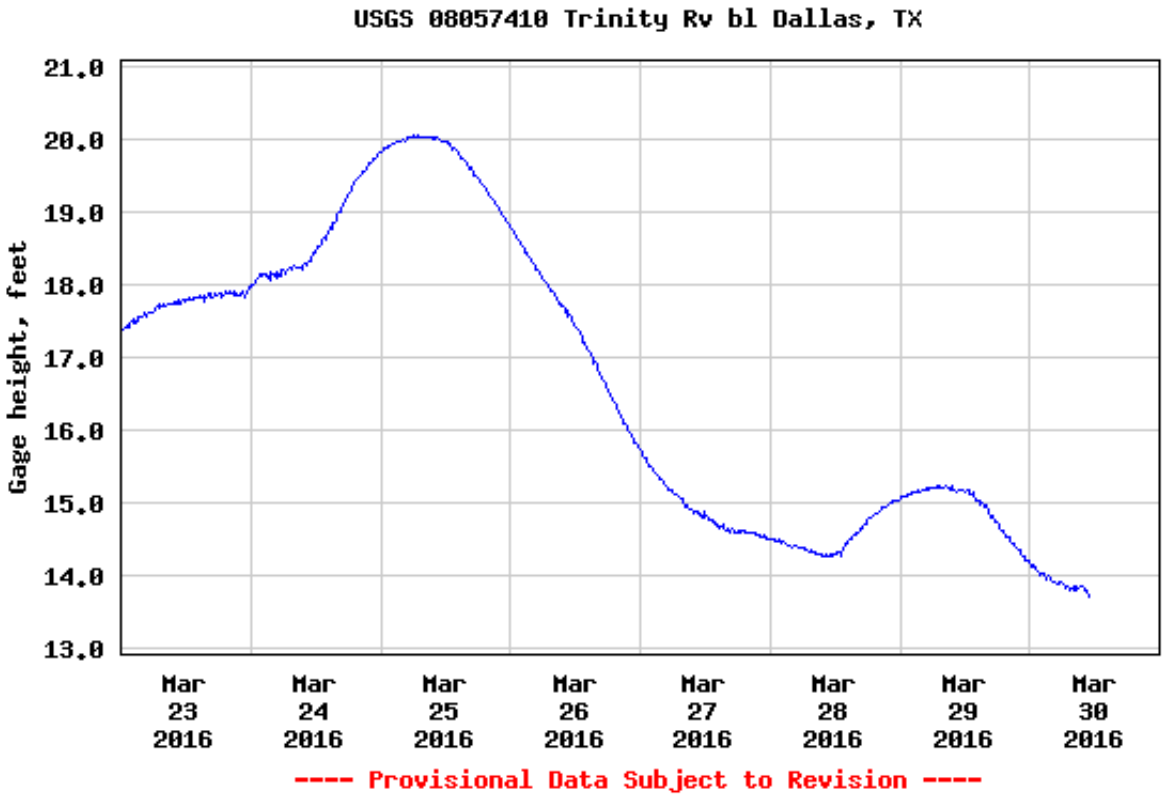

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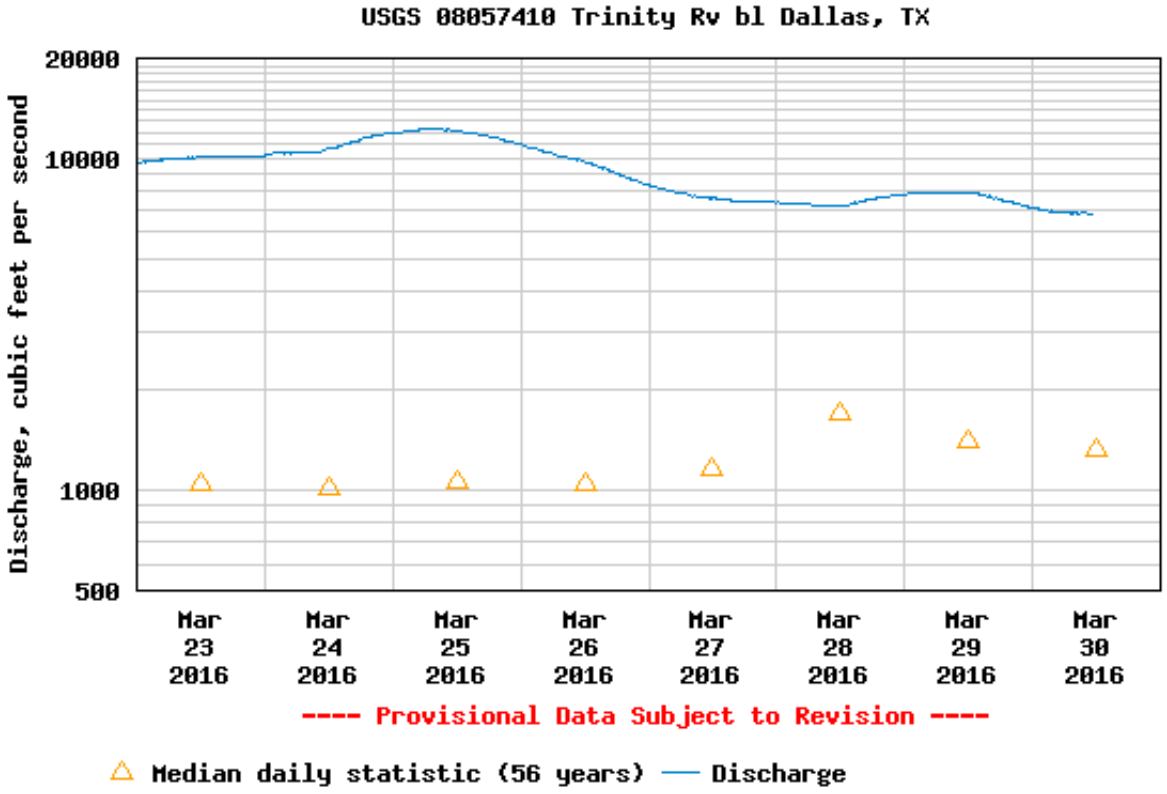

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Contributing drainage area 6,278 square miles
Gage datum 365.89 feet above NGVD29

Location of the site in Texas

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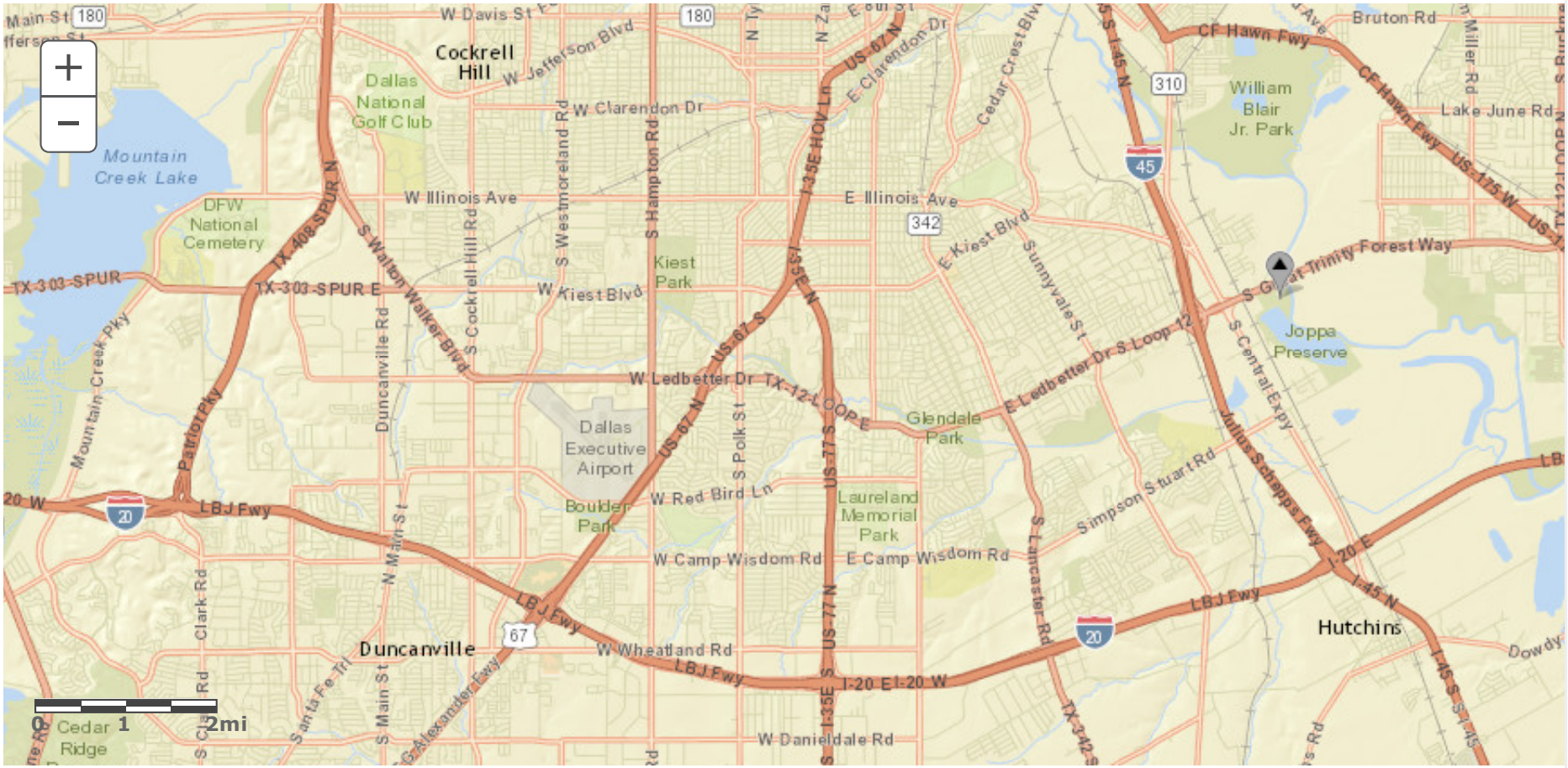

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Water Year	00060, Discharge, cubic feet per second
1958	2,797
1959	383.1
1960	1,341
1961	817.9
1962	1,278
1963	1,148
	51 008

1964	675.9
1965	2,454
1966	2,586
1967	741.7
1968	2,141
1969	2,488
1970	2,194
1971	621.2
1972	1,843
1973	2,204
1974	1,553
1975	4,184
1976	934.8
1977	2,009
1978	653.1
1979	1,595
1980	791.1
1981	1,262
1982	7,319
1983	1,115
1984	970.0
1985	2,104
1986	2,320
1987	2,633
1988	922.7
1989	4,573
1990	5,891
1991	1,456
1992	6,930
1993	3,515
1994	2,901
1995	4,562
1996	882.1
1997	4,568

51 009

1998	2,674
1999	1,580
2003	1,532
2004	2,897
2005	2,256
2006	1,275
2007	4,485
2008	2,420
2009	1,782
2010	4,603
2011	1,111
2012	1,972
2013	1,013
2014	997.7
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Site name contains string = Fivemile

State/Territory = Texas

Use the "Back" button on your browser to change your search criteria.

Return To Previous Page

51 011

Reference 52

ssessment Viewer v3.4

Search Buffer Identify PWS Measure Bookmark

Annotated by R. Comeaux 3/30/16

Approximate site location

Nearest downstream surface water intake

52 001

Reference 53

EPA United States Environmental Protection Agency

Waterbody Quality Assessment Report

Return to home page

On This Page

- Water Quality Assessment Status
- Causes of Impairment
- Probable Sources Contributing to Impairments
- TMDLs That Apply to This Waterbody

2010 Waterbody Report for Fivemile Creek (unclassified water body)

Click on the waterbody for an interactive map

State: Texas
Waterbody ID: TX-0805D_01
Location: Entire water body.
State Waterbody Type: Stream
EPA Waterbody Type: Rivers and Streams
Water Size: 17.02
Units: miles
Watershed Name: Upper Trinity

Water Quality Assessment Status for Reporting Year 2010

The overall status of this waterbody is Not_Assessed.

Description of this table

Designated Use	Designated Use Group	Status
Aquatic Life Use	Fish, Shellfish, And Wildlife Protection And Propagation	Not Assessed
Fish Consumption Use	Aquatic Life Harvesting	Not Assessed
General Use	Fish, Shellfish, And Wildlife Protection And Propagation	Not Assessed
Primary Recreation/Swimming	Recreation	Not Assessed

Causes of Impairment for Reporting Year 2010

No impairment data have been reported to EPA for this waterbody.

Probable Sources Contributing to Impairment for Reporting Year 2010

No probable source data have been reported to EPA for this waterbody.

TMDLs That Apply to this waterbody

No TMDL data have been recorded by EPA for this waterbody.

March 30, 2016

United States Environmental Protection Agency

Waterbody Quality Assessment Report

Return to home page

2010 Waterbody Report for Upper Trinity River

On This Page

- Water Quality Assessment Status
- Causes of Impairment
- Probable Sources Contributing to Impairments
- TMDLs That Apply to This Waterbody
- Previous Causes of Impairment Now Attaining All Uses

Click on the waterbody for an interactive map

State: Texas
Waterbody ID: TX-0805_03
Location: From the confluence of Fivemile Creek upstream to the confluence of Cedar Creek.
State Waterbody Type: Stream
EPA Waterbody Type: Rivers and Streams
Water Size: 10.57
Units: miles
Watershed

Name: Upper Trinity

Waterbody History Report

Data are also available for these years:
2014 2012 2006 2004 2002

Water Quality Assessment Status for Reporting Year 2010

The overall status of this waterbody is Impaired.

Description of this table

Designated Use	Designated Use Group	Status
Aquatic Life Use	Fish, Shellfish, And Wildlife Protection And Propagation	Good
Fish Consumption Use	Aquatic Life Harvesting	Impaired
General Use	Fish, Shellfish, And Wildlife Protection And Propagation	Good
Primary Recreation/Swimming	Recreation	Impaired

Causes of Impairment for Reporting Year 2010

Description of this table

Cause of Impairment	Cause of Impairment Group	Designated Use(s)	State TMDL Development Status
Bacteria	Pathogens	Primary Recreation/Swimming	TMDL needed
Dioxin (Including 2,3,7,8-TCDD)	Dioxins	Fish Consumption Use	TMDL needed
PCB(s) in Fish Tissue	Polychlorinated Biphenyls (PCBs)	Fish Consumption Use	TMDL needed

Probable Sources Contributing to Impairment for Reporting Year 2010

Description of this table

Probable Source	Probable Source Group	Cause(s) of Impairment
Municipal Point Source Discharges	Municipal Discharges/Sewage	Bacteria
Non-Point Source	Unspecified Nonpoint Source	Bacteria; Dioxin (Including 2,3,7,8-TCDD); PCB(s) in Fish Tissue
Source Unknown	Unknown	Dioxin (Including 2,3,7,8-TCDD); PCB(s) in Fish Tissue

TMDLs That Apply to this waterbody

Description of this table

TMDL Document Name	TMDL Date	TMDL Pollutant Description	TMDL Pollutant Source Type	Cause(s) of Impairment Addressed
Cedar Creek 0805_04 E. Coli Tmdl	Aug-03-2011	Escherichia Coli (E. Coli)	Point/Nonpoint Source	Bacteria
Fivemile Creek 0805_03 E. Coli Tmdl	Aug-03-2011	Escherichia Coli (E. Coli)	Point/Nonpoint Source	Bacteria

Previous Causes of Impairments Now Attaining All Uses

No causes of impairment are recorded as attaining all uses for this waterbody.

March 30, 2016

United States Environmental Protection Agency

TMDL Report

TMDL Document for FIVEMILE CREEK 0805_03 E. COLI TMDL

TMDL ID:	40796	**TMDL Name:**	FIVEMILE CREEK 0805_03 E. COLI TMDL
State/Tribe:	Texas	**TMDL Date:**	08/03/2011
EPA Action:	EPA Approved	**Comments:**	FUTURE GROWTH E. COLI = 18.96 BCFU/DAY

TMDL Documents

Click on the underlined Document Type to retrieve the actual document in PDF format.

Document Type	Comments
TMDL Document	

TMDL Pollutant: Escherichia Coli (E. Coli)

Total Waste Load Allocation:	2600	**Total Load Allocation:**	22890
Explicit Margin Of Safety:	137.8 BCFU/DAY	**Implicit Margin Of Safety:**	N
Units for Total Waste Load Allocation and Total Load Allocation:	BCFU/DAY	**TMDL Pollutant Source Type:**	Point/Nonpoint Source
TMDL End Point:	NUMERIC WQS		

NPDES Allocation for Pollutant: Escherichia Coli (E. Coli)

NPDES ID	Other Non PCS Identification	Waste Load Allocation	Units
TX0047830		477	BCFU/DAY
TXS000701		2123	BCFU/DAY

Listed Water Causes of Impairment for Escherichia Coli (E. Coli)

Click on the underlined Waterbody ID for a Waterbody

Report. Click on the underlined "Waterbody Map" literal for a map of the Assessment Unit.

Waterbody ID	Waterbody Name	Map	Cycles Listed	Cause(s) of Impairment Addressed
TX-0805_03	Upper Trinity River	Waterbody Map	1996, 1998, 2000, 2002, 2004, 2006, 2008, 2010	Bacteria

March 30, 2016

Waterbody Quality Assessment Report

Return to home page

2010 Waterbody Report for Upper Trinity River

On This Page

- Water Quality Assessment Status
- Causes of Impairment
- Probable Sources Contributing to Impairments
- TMDLs That Apply to This Waterbody
- Previous Causes of Impairment Now Attaining All Uses

Click on the waterbody for an interactive map

State: Texas
Waterbody ID: TX-0805_06
Location: From confluence of Tenmile Creek upstream to confluence of Fivemile Creek
State Waterbody Type: Stream
EPA Waterbody Type: Rivers and Streams
Water Size: 15.26
Units: miles
Watershed

Name: Upper Trinity

Waterbody History Report

Data are also available for these years:
2014 2012 2006 2004 2002

Water Quality Assessment Status for Reporting Year 2010

The overall status of this waterbody is Impaired.

Description of this table

Designated Use	Designated Use Group	Status
Aquatic Life Use	Fish, Shellfish, And Wildlife Protection And Propagation	Not Assessed
Fish Consumption Use	Aquatic Life Harvesting	Impaired
General Use	Fish, Shellfish, And Wildlife Protection And Propagation	Good
Primary Recreation/Swimming	Recreation	Good

Causes of Impairment for Reporting Year 2010

Description of this table

Cause of Impairment	Cause of Impairment Group	Designated Use(s)	State TMDL Development Status
Dioxin (Including 2,3,7,8-TCDD)	Dioxins	Fish Consumption Use	TMDL needed
PCB(s) in Fish Tissue	Polychlorinated Biphenyls (PCBs)	Fish Consumption Use	TMDL needed

Probable Sources Contributing to Impairment for Reporting Year 2010

Description of this table

Probable Source	Probable Source Group	Cause(s) of Impairment
Non-Point Source	Unspecified Nonpoint Source	Dioxin (Including 2,3,7,8-TCDD); PCB(s) in Fish Tissue
Source Unknown	Unknown	Dioxin (Including 2,3,7,8-TCDD); PCB(s) in Fish Tissue

TMDLs That Apply to this waterbody

No TMDL data have been recorded by EPA for this waterbody.

Previous Causes of Impairments Now Attaining All Uses

No causes of impairment are recorded as attaining all uses for this waterbody.

March 30, 2016

Reference 54

Home
Open Space Program
Cedar Mountain Preserve
Cedar Ridge Preserve
Cottonwood Creek Preserve
Elm Fork Preserve
Fish Creek Preserve
Grapevine Springs Preserve
Joppa Preserve
Lee F. Jackson Spring Creek Forest Preserve
Lester Lorch Park
Muddy Creek Preserve
McCommas Bluff Preserve
North Mesquite Creek Preserve
Palmetto Alligator Slough Preserve
Post Oak Preserve
Rowlett Creek Preserve
Spring Creek Park Preserve
Tenmile Creek Preserve
Trinity River Greenbelt Goat Island Preserve
Trinity River Greenbelt Riverbend Preserve
Trinity River Mountain Creek Preserve
Windmill Hill Preserve

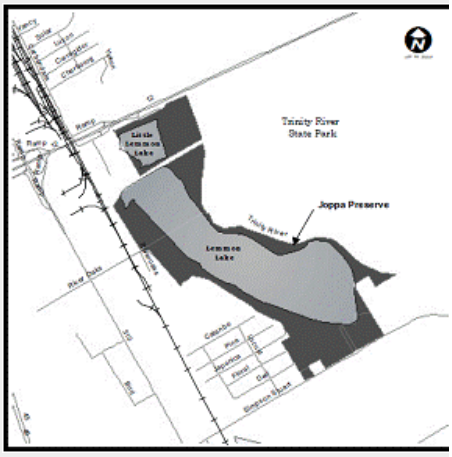
Joppa Preserve

Dallas, Texas 307 acres

Entrances: South of Loop 12, about 3/4-mile east of SH 310 before Trinity River

End of River Oaks, east of SH 310 (4911 River Oaks)

Mapsco: 57, Section "W"
67, Section "A"

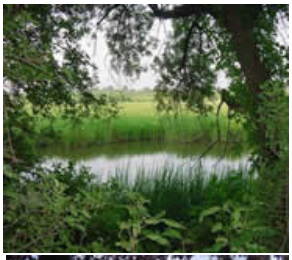


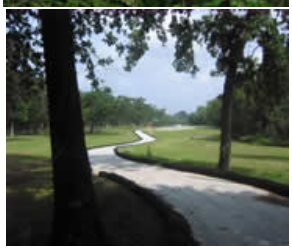
Preserve Features

This 307-acre Preserve contains a beautiful lake that is a major stopping point for migratory water birds, a smaller lake, woodlands, and open areas. It is also located on the five-mile-long Trinity Trail which is also connected to the Trinity River Audubon Center. The Preserve is popular with picnickers, bird-watchers, fishermen, hikers, and horseback-riders.

Preserve History

When the Preserve was first established in 1986, it was known as Lemmon Lake and contained 25(acres. In 1991, its name was changed to reflect "Joppa" which had been one of the firs "Freedmen's" communities created in the County after the Civil War and which had previously existe near the Preserve's main lake. The Preserve continues to be a popular location for family reunion and "Juneteenth" celebrations.





Preserve Amenities

Paved parking is available at both the Preserve's Loop 12 entrance and River Oaks entrance. The City of Dallas has also provided the Preserve with picnic pavilions, tables, and grills, and its hard surface Trinity Trail allows visitors to travel through the Great Trinity Forest, see the Trinity River, and reach the Trinity River Audubon Center.

Maintenance

Joppa Preserve is maintained by the City of Dallas. To report maintenance issues, please call the Dallas Parks and Recreation Department at (214) 671-0234.

Restricted Uses

The use of alcohol, motorized vehicles, fireworks, or weapons is not permitted within the Preserve. Hunting, swimming, and boating are also not permitted.

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GeoTrust SECURED 2016-03-30 UTC

Reference 55

EPA Approval Received: June 27, 2001

Nine Total Maximum Daily Loads for Legacy Pollutants in Streams and a Reservoir in Dallas and Tarrant Counties

For Segments 0805, 0841, and 0841A

Prepared by the:
Field Operations Division, Region 4
Strategic Assessment Division, TMDL Team

printed on
recycled paper

TEXAS NATURAL RESOURCE CONSERVATION COMMISSION

55 001

Nine Total Maximum Daily Loads for Legacy Pollutants in Streams and a Reservoir in Dallas and Tarrant Counties

Introduction

Section 303(d) of the Clean Water Act requires all states to identify waters that do not meet, or are not expected to meet, applicable water quality standards. For each listed water body that does not meet a standard, states must develop a total maximum daily load (TMDL) for each pollutant that has been identified as contributing to the impairment of water quality in that water body. The Texas Natural Resource Conservation Commission (TNRCC) is responsible for ensuring that TMDLs are developed for impaired surface waters in Texas.

In simple terms, a TMDL is a quantitative plan that determines the amount of a particular pollutant that a water body can receive and still meet its applicable water quality standards. In other words, TMDLs are the best possible estimates of the assimilative capacity of a water body for the pollutant under consideration. A TMDL is commonly expressed as a load, with units of mass per time period, but may also be expressed in other ways. TMDLs must also estimate how much the pollutant load needs to be reduced from current levels in order to achieve water quality standards.

The Total Maximum Daily Load Program, a major component of Texas' statewide watershed management approach, addresses impaired or threatened streams, reservoirs, lakes, bays, and estuaries (water bodies) in or bordering the state of Texas. The primary objective of the TMDL Program is to restore and maintain the beneficial uses (such as drinking water, recreation, support of aquatic life, or fishing) of impaired or threatened water bodies.

Section 303(d) of the Clean Water Act and the U.S. Environmental Protection Agency's (EPA) implementing regulations (40 Code of Federal Regulations, Section 130) describe the statutory and regulatory requirements for acceptable TMDLs. The TNRCC guidance document, *Developing Total Maximum Daily Load Projects in Texas* (GI-250, 1999), further refines the process for Texas. This TMDL document has been prepared in accordance with these guidelines, and is composed of the following six elements:

- Problem Definition
- Endpoint Identification
- Source Analysis
- Linkage Between Sources and Receiving Waters
- Margin of Safety
- Pollutant Load Allocation

This TMDL document was prepared by:

- Region 4 of the Field Operations Division of the Office of Compliance and Enforcement of the Texas Natural Resource Conservation Commission, and
- the TMDL Team in the Strategic Assessment Division of the Office of Environmental Policy, Analysis, and Assessment of the Texas Natural Resource Conservation Commission.

It was adopted by the Texas Natural Resource Conservation Commission on December 20, 2000. Upon adoption, the TMDL became part of the state Water Quality Management Plan. The Texas Natural Resource Conservation Commission will use this document in reviewing and making determinations on applications for storm water permits and in its nonpoint source pollution abatement programs.

Background Information

These TMDLs address the contamination of fish tissue by several legacy pollutants in water bodies in Dallas and Tarrant Counties, north-central Texas:

- portions of two classified segments of the Trinity River, and
- Mountain Creek Lake, an unclassified reservoir.

Legacy pollutant is a collective term used to describe substances whose use has been banned or severely restricted by the U.S. Environmental Protection Agency (EPA). Because of their slow rate of decomposition, these substances frequently remain at elevated levels in the environment for many years after their widespread use has ended. No additional loading of legacy pollutants is allowed or expected due to the EPA restrictions. Gradual declines in environmental legacy pollutant concentrations occur as a result of natural attenuation processes.

EPA guidance (*Draft Guidance for Water Quality-based Decisions: The TMDL Process, Second Edition, EPA 841-D-99-001, 1999*) on the development of TMDLs offers flexibility in addressing particular situations and unusual circumstances, allowing States the discretion to adopt different approaches where appropriate. The guidance states that the allowable pollutant load "must be expressed in a manner ... that represents attainment and maintenance of water quality standards." The guidance allows for the use of a surrogate target for situations where "no .... quantifiable pollutant load can be used to .... express the TMDL."

In preparing these TMDLs for legacy pollutants, the TNRCC has modified the typical loading allocation approach of a TMDL, which limits the amount of a pollutant that can be added to an impaired water body. Because these legacy pollutants are already restricted, and no significant additional loading is expected, these TMDLs do not specifically attempt to quantify allowable loads for these contaminants. The ultimate goal of these TMDLs is the reduction of fish tissue contaminant concentrations to levels that constitute an acceptable risk to consumers, allowing

TDH to remove the bans on fish consumption and the beneficial use to be restored to these water bodies.

Problem Definition

The water bodies covered by this TMDL document were included on the State of Texas 1998, 1999, and 2000 §303(d) lists (see corresponding *State of Texas Clean Water Act Section 303(d) List and Schedule of Development of Total Maximum Daily Loads, SFR-58*) as a result of the issuance of Aquatic Life Orders by the Texas Department of Health (TDH), which prohibit the consumption of fish. Consumption bans were issued following determinations of unacceptable human health risk due to elevated concentrations of one or more legacy pollutants in fish tissue (Table 1). The impacted water bodies lie largely within Dallas County, in the upper portion of the Trinity River Basin (Figure 1).

Table 1. Dallas County water bodies on the Texas 303(d) list due to concentrations of legacy pollutants in fish tissue that have resulted in the issuance of a fish consumption ban by the Texas Department of Health.

Segment Number	Segment Name (Portion Covered by TDH Fish Consumption Ban)	Fish Tissue Contaminants on the 303(d) List	TDH Ban Issued
0841	Lower West Fork Trinity River (entire segment from the confluence with Village Creek to the end of the segment at the confluence with the Elm Fork Trinity River)	Chlordane	01/1990
0805	Upper Trinity River (lower 19 miles of the segment from the Elm Fork Trinity River confluence in west-central Dallas County to Interstate 20 in southeast Dallas County)	Chlordane	01/1990
0841A	Mountain Creek Lake (entire lake)	Chlordane DDT, DDD, and DDE Dieldrin Heptachlor epoxide PCBs	04/1996

All or part of four classified segments of the Trinity River in Tarrant and Dallas Counties do not support the fish consumption use. The impacted portions of these segments extend from the Clear Fork Trinity River at 7th Street in Fort Worth, downstream to the Trinity River at Interstate 20 in southeast Dallas County. TDH issued Aquatic Life Order 2 on January 4, 1990, declaring the entire length a "prohibited area for the taking of finfish" due to elevated levels of chlordane in fish tissue. Trinity River segments addressed in this document are:

C

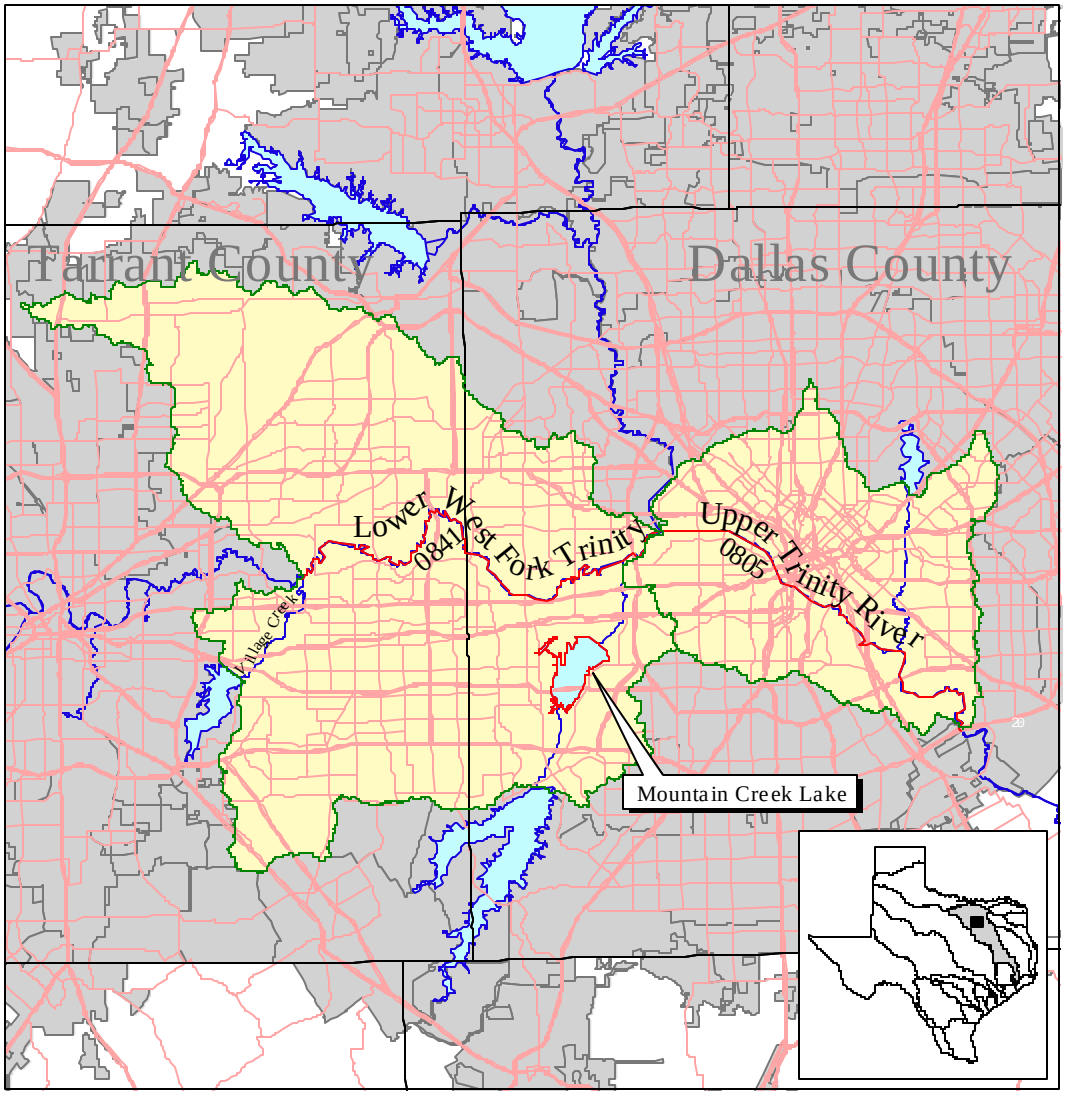

Figure 1. Location of Impaired Water Bodies

- Segment 0841 (Lower West Fork Trinity River) extends from a point immediately upstream of the confluence of Village Creek in east-central Tarrant County, downstream to a point immediately upstream of the confluence of the Elm Fork Trinity River in west-central Dallas County. The fish consumption use is not supported through the entire 27-mile segment.

- Segment 0805 (Upper Trinity River) extends from a point immediately upstream of the confluence of the Elm Fork Trinity River in west-central Dallas County, downstream to a point immediately upstream of the Cedar Creek Reservoir discharge canal in Henderson/Navarro County. The fish consumption use is not supported through the upper 19 miles of the segment, from the Elm Fork Trinity River confluence downstream to Interstate 20 in southeast Dallas County.

Segment 0841 and the impaired portion of Segment 0805 drain a combined watershed of 618,774 acres downstream from the dams on seven major reservoirs (Benbrook, Worth, Arlington, Mountain Creek, Grapevine, Lewisville, and White Rock). The watershed is approximately 71 percent urban and 24 percent agricultural/undeveloped land use (data compiled from *1999 Annual Water Quality Management Plan, North Central Texas Council of Governments, Arlington, Texas*). Three major regional wastewater treatment plants (WWTP) discharge into Segments 0841 and 0805 (City of Fort Worth Village Creek WWTP, Permit No. 10494-013; Trinity River Authority Central WWTP, Permit No. 10303-001; and City of Dallas Central WWTP, Permit No. 10060-001), with a current combined capacity of almost 500 million gallons per day. Flow in both segments is dominated by WWTP effluent during dry times of the year.

The fish consumption use is not supported in Mountain Creek Lake (Segment 0841A), a 2710-acre impoundment of Mountain Creek located in southwest Dallas County. Aquatic Life Order No. 12 was issued on 25 April 1996, declaring Mountain Creek Lake a "prohibited area for the possession of all fish species" due to elevated levels of chlordane, DDT, DDD, DDE, dieldrin, heptachlor epoxide, and PCBs in fish tissue.

Mountain Creek is a tributary of the West Fork Trinity River (Segment 0841). The lake was impounded in January 1937 as a cooling water reservoir for an adjacent power plant (Dowell and Breeding 1967). Heavy siltation reduced the lake storage capacity from the original 40,000 acre-feet to 25,720 acre-feet by 1963 (Dowell and Breeding 1967), and to a current capacity of approximately 20,200 acre-feet (Ulery *et al.* 1993). Mountain Creek Lake drains a 46,130-acre watershed downstream from the dam on Joe Pool Lake. Mountain Creek Lake received runoff predominately from undeveloped, rural, and agricultural areas between its impoundment in 1937 and the construction of Joe Pool Lake immediately upstream in 1985. Extensive development has occurred west of Mountain Creek Lake since 1985. The watershed is currently 60 percent urban and 35 percent agriculture/undeveloped land use. Three major industrial facilities are located adjacent to the lake:

- The Mountain Creek Steam Electric Station, currently owned by TXU Electric & Gas (TXU), is located on the northeast corner of the lake. The facility began operation in June 1938, when it was owned by the Dallas Power and Light Company. The plant is powered by natural gas, and uses the lake for cooling water, which is discharged back to the lake (Permit No. 01250).

- The U.S. Naval Weapons Industrial Reserve Plant (NWIRP) is located on 314 acres on the northwest corner of the lake. NWIRP was constructed in phases beginning in 1940. Ownership of NWIRP transferred to the U.S. Navy in 1947. Three-quarters of the site had been developed by the 1960s. The property is currently leased to the Northrop Grumman Corporation, which employs approximately 4000 people in the manufacture of commercial and military aircraft components and various weapons systems. Land cover at NWIRP is primarily industrial buildings and paved areas (Raines *et al.* 1997; EnSafe 2000b).

- The U.S. Naval Air Station Dallas (NASD) is located on 827 acres on the northwest corner of the lake, adjacent to NWIRP. Hensley Field was established at the site in 1929 as a training field for reserve pilots. The U.S. Navy established a naval reserve training base at the site in 1941. During World War II, the base also served as an aircraft engine repair station. In the early 1950s, a portion of Mountain Creek Lake was filled to extend the current NASD runway. The original discharge point of Cottonwood Creek, which was immediately southeast of NWIRP, was completely filled (EnSafe 2000b). A diversion channel was constructed to connect Mountain Creek Lake with Cottonwood Creek. NASD was officially closed in 1998, and is presently being redeveloped with various non-residential uses. The site is currently owned by the U.S. Navy (121 acres) and the City of Dallas (666 acres leased to the Navy and 40 acres leased to the Texas Army National Guard) (CH2M Hill 1999d). Land cover at NASD is primarily runways, hangers, office and commercial buildings, aircraft maintenance or automotive shops, barracks or high-density residential housing, and paved roads (Raines *et al.* 1997).

The U.S. Navy is conducting RCRA Facility Investigations at NWIRP and NASD to determine if waste management or disposal sites at either facility have released hazardous constituents to the environment. An associated study conducted by the U.S. Geological Survey (USGS) (Jones *et al.* 1997) detected the presence of several legacy pollutants in lake sediments and fish tissue. Evaluation of fish tissue data collected during the study led to issuance of the fish consumption ban.

The fish consumption use of a water body is not supported when TDH has issued an Aquatic Life Order prohibiting the consumption of aquatic life. The fish consumption bans on the water bodies addressed here are the result of contamination by one or more organochlorine insecticides, degradation products of organochlorine insecticides, and polychlorinated biphenyls (PCBs).

Organochlorine insecticides and PCBs were widely used in the U.S. prior to EPA restriction, and are common environmental contaminants (Moore and Ramamoorthy 1984; Schmitt *et al.* 1985, 1990; Smith *et al.* 1988; USGS 2000). These substances are a frequent cause of fish consumption advisories in the U.S. (EPA 1999b,c), and elevated concentrations of some of these contaminants are frequently found in game fish tissue (Kuehl *et al.* 1994). Fish consumption can be a primary route of human exposure to these contaminants (Schwartz *et al.* 1983; Humphrey 1987; Fiore *et al.* 1989), which can cause a variety of adverse health effects (Swain 1988; Longnecker *et al.* 1997). The Aquatic Life Orders for these water bodies were issued on the basis of an unacceptable carcinogenic risk of liver cancer and a noncarcinogenic risk of adverse liver effects due to fish tissue contaminant levels.

Endpoint Identification

The ultimate goal of these TMDLs is the reduction of fish tissue contaminant concentrations to levels that constitute an acceptable risk to fish consumers, allowing TDH to remove the bans on fish consumption. The allowable load of contaminant is based on fish tissue concentrations.

EPA (1997a) provides guidance for assessing contaminant data for risk assessment. This guidance and TDH assumptions were used to develop target values for tissue contaminant levels that result in an acceptable risk level. EPA (1997a) presents equations for calculating the maximum allowable fish consumption rate given consumer body weight, contaminant concentration, an acceptable cancer risk level, and the contaminant risk values for carcinogenic and noncarcinogenic risk. A cancer potency value (q_1*) is the risk value for carcinogens. The oral reference dose (RfD) is the risk value used to protect against chronic exposure by noncarcinogens.

The consumption rate and consumer body weight were set at the TDH constants of 30 grams of fish per day (0.03 kg/d) for a 70-kg adult, and at 15 grams of fish per day (0.015 kg/d) for a 15- and 35-kg child, both over a 30-year time period. TDH uses an acceptable cancer risk level of 1×10^{-4}, adjusted to 2.33×10^{-4} to account for the use of the 30-year time period. Cancer potency and chronic RfD values (Table 2) were obtained from EPA (1997a) and the EPA IRIS database.

Table 2. Maximum fish tissue concentrations (mg/kg) for individual contaminants that can be ingested by consumers of given body weights, within the acceptable cancer risk level (ARL) used by TDH, and without causing adverse noncarcinogenic health effects.

Carcinogenic (q_1*) and noncarcinogenic (RfD) risk values were obtained from EPA (1997a) and EPA IRIS database.

	Carcinogenic Risk ARL = 2.33 x 10^{-4}			**Noncarcinogenic Risk**		
	Maximum Fish Tissue Concentration (mg/kg)					
		Consumer Body Wt.			**Consumer Body Wt.**	
Contaminant	**q_1***	**15-kg**	**35-kg / 70-kg**	**RfD**	**15-kg**	**35-kg/70-kg**
Total Chlordane	0.35	0.67	1.55	5 x 10^{-4}	0.5	1.17
Total DDT[1]	0.34	0.68	1.6	5 x 10^{-4}	0.5	1.17
DDD	0.24	0.97	2.3	na	na	na
DDE	0.34	0.68	0.68	na	na	na
Dieldrin	16	0.015	0.034	5 x 10^{-5}	0.05	0.12
Heptachlor epoxide	9.1	0.03	0.06	1.3 x 10^{-5}	0.013	0.03
Total PCBs	2.0	0.12	0.27	2 x 10^{-5}	0.02	0.05

[1]Sum of 4,4'- and 2,4'- isomers of DDT, DDE, and DDD (EPA 1997a).
na = Separate RfDs not available for DDE and DDD.

Equations in EPA (1997a) were solved to calculate the maximum allowable concentration of contaminant in tissue (1) at a given cancer risk level, and (2) based on the noncarcinogenic health effects of a contaminant:

$$(1) \qquad C_m = (ARL)(BW) / (C_{lim})(q_1^*)$$

$$(2) \qquad C_m = (RfD)(BW) / (C_{lim})$$

where:

C_m = maximum allowable concentration of contaminant in tissue (mg/kg)
ARL = acceptable cancer risk level = 2.33 x 10^{-4}
BW = consumer body weight (kg)
C_{lim} = allowable fish consumption rate (kg/d)
q_1* = cancer slope factor for given contaminant (see Table 2)
RfD = oral reference dose for given contaminant (see Table 2).

Substituting adult and child consumption rates and body weights used by TDH, the maximum tissue contaminant concentrations that can be consumed within an acceptable level of risk were calculated (see Table 2).

The calculated contaminant concentrations are valid targets only for each contaminant individually. The chlordane target can be used for the Trinity River segments because the TDH risk assessment identified chlordane as the risk factor. The target concentration that will achieve an acceptable noncarcinogenic risk is less than that needed for an acceptable carcinogenic risk. The target concentration for a 15-kg child is less than that of a 35-kg child and 70-kg adult (see Table 2). The noncarcinogenic value for a 15-kg child is therefore most protective, and this value (0.5 mg/kg) becomes the endpoint target for chlordane in the Trinity River segments (Table 3).

Table 3. Most protective endpoint target for fish tissue contamination in each 303(d)-listed water body that will allow removal of the TDH fish consumption ban.

Segment	Primary Endpoint Target
Lower West Fork Trinity River (0841)	$\leq$ 1.17 mg/kg chlordane in fish tissue for adults $\leq$ 0.50 mg/kg chlordane in fish tissue for children
Upper Trinity River (0805)	$\leq$ 1.17 mg/kg chlordane in fish tissue for adults $\leq$ 0.50 mg/kg chlordane in fish tissue for children
Mountain Creek Lake (0841A)	additive cancer risk $\leq 2.33 \times 10^{-4}$ cumulative noncarcinogenic hazard index $\leq$ 1
All Water bodies	Removal of fish consumption bans

The situation is different in Mountain Creek Lake, where multiple contaminants were determined to be contributing to risk. TDH assumes that risk is additive when more than one contaminant is present at sufficient levels. The additive risk of all contaminants cannot exceed either the cancer risk level or a noncarcinogenic hazard index. When multiple contaminants are present, the concentration of one or more must be reduced so that the additive carcinogenic risk does not exceed 2.33×10^{-4}. The endpoint target for carcinogenic risk in this case is an additive risk that is no greater than the acceptable cancer risk level (Table 3).

The noncarcinogenic hazard index is the sum of the hazard ratios of each individual contaminant, and must be no greater than one for noncarcinogenic risk to be acceptable. The hazard ratio of a contaminant is the ratio of the actual noncarcinogenic exposure level to the oral reference dose (RfD). When multiple contaminants are present, the concentration of one or more must be reduced so that the additive hazard index does not exceed one. The endpoint target for noncarcinogenic risk is a hazard index that is no greater than one (Table 3).

The calculated target values are valid only under the assumed conditions. TDH has the authority and jurisdiction for the decision to issue or remove fish consumption bans. Subsequent risk assessments by TDH may result in no change to a ban, removal of the ban, or a shift to an advisory for certain groups at greater risk. The ultimate endpoint goal for the affected water bodies is the protection of all groups and complete removal of the fish consumption bans.

Source Analysis

Production and use of legacy pollutants has been banned or severely restricted by the EPA. Because of their past heavy and widespread use, strong affinities for sorption to sediment organic matter and tissue, and slow rates of decomposition, these substances and/or their degradation products frequently remain at elevated levels in the environment for many years after widespread use has ended (Moore and Ramamoorthy 1984; Smith *et al.* 1988; Jones and de Voogt 1999; USGS 2000).

- Chlordane was introduced in 1948, and was used extensively as a broad spectrum insecticide to control soil insects on agricultural crops, as a home lawn and garden insecticide, as a fumigating agent, and for termite control (EPA 1980b; Dick 1982; Dearth and Hites 1991). EPA suspended use of chlordane on food crops in 1978, and phased out other above-ground uses over the following five years (EPA 1997b; Mattina *et al.* 1999). All uses except underground application for termite control were banned in 1983 (Mattina *et al.* 1999). Manufacture and domestic sales were halted in 1987, and use of existing stores was allowed until April 1988 when sale and use were terminated (Dearth and Hites 1991; EPA 1997b; Mattina *et al.* 1999).

- DDT was initially used in World War II for control of disease-carrying insects, and was used extensively as a broad spectrum insecticide for the control of almost all agricultural and disease-carrying insects (EPA 1980c; NPTN 1999). It was used extensively in the 1950s and 1960s for mosquito control in urban areas. DDD is a metabolite of DDT, and was itself manufactured as a pesticide for several years. Most uses of DDT, and all uses of DDD, were banned by EPA in December 1972 (EPA 1980c). DDE is the major degradation product of DDT and DDD, and is among the most widely occurring pesticide residues (Schmitt *et al.* 1990; Kuehl *et al.* 1994).

- Dieldrin was used as a pesticide, and is a degradation product of the pesticide aldrin. Although aldrin was used in greater quantity, it is rapidly converted to the more persistent dieldrin in the environment (EPA 1980a; Dick 1982). Both pesticides were used primarily for the control of corn rootworm and cutworm, with some use in the citrus industry and for mosquito larvae and termite control (EPA 1980a; Dick 1982). All food crop uses of both compounds were canceled in May 1975, and only subsurface injection for termite control was allowed after that time. All remaining uses were canceled in 1987.

- Heptachlor epoxide is the principal metabolite of the pesticide heptachlor. Heptachlor was used as a broad spectrum insecticide for the control of insects on corn and other crops, cotton insects, alfalfa weevils, termites, and for fire ant control prior to the introduction of mirex in the 1950s (EPA 1980d; Dick 1982). Heptachlor was isolated from chlordane, and typically included various chlordane components (EPA 1980d). Chlordane residues may be present in locations where heptachlor was used. Both heptachlor and the hepatachlor component of chlordane are frequently converted to heptachlor epoxide in the environment (see Schmitt *et al.* 1985). EPA suspended the registration for all food crop and home use of heptachlor as of August 1976 (EPA 1980d). Commercial use on nonfood plants continued until July 1983, after which the only approved use was for underground application for termite control. Remaining uses were canceled in 1988 as part of the ban on chlordane and chlordane-containing products.

- Polychlorinated biphenyls (PCBs) are a group of synthetic organic chemicals containing 209 possible individual compounds, which vary in chemical and physical properties, toxicity, environmental persistence, and degree of bioaccumulation (EPA 1980e, 1999b). PCBs were manufactured as mixtures of different congeners, and generally sold under the trade name Aroclor. PCBs were most widely used as coolants and lubricants in transformers, capacitors, and other electrical equipment. In 1976 the Toxic Substances Control Act banned, with limited exceptions, the manufacture, processing, distribution in commerce, and use of PCBs (EPA 1994). TSCA also required the EPA to promulgate regulations for proper use, cleanup, and disposal. TSCA and subsequent EPA rules did not require PCB-containing materials to be removed from service, and many are still in use (EPA 1999b). A substantial portion of the PCBs manufactured before 1977 remain in service, although these are being phased out as equipment is replaced or decontaminated.

Organochlorine insecticides have entered aquatic systems as a result of direct application to a water body, drift from aerial spraying, urban and agricultural runoff, spills, industrial and municipal wastewater discharges, and erosion of contaminated soils (Dick 1982; Smith *et al.* 1988; Van Metre *et al.* 1998). PCBs can enter the environment via spills and leaks from sites where they are used, improper disposal methods, and leaching from landfills (Tanabe 1988).

Studies that have examined the relationship between land use and contamination by legacy pollutants suggest that problems can originate from both urban and agricultural land uses, although determination of a specific source can be very difficult (Tate and Heiny 1996; Munn and Gruber 1997; Webster *et al.* 1998). Numerous studies have associated organochlorine pesticide and PCB residues in tissue and sediment with urban land uses (Stamer *et al.* 1985; Arruda *et al*. 1987; Smith *et al.* 1988; Pereira *et al.* 1996; Mattina *et al.* 1999; Black *et al.* 2000).

Chlordane contamination in the Trinity River segments appears to have originated from urban areas, as the watershed for these segments is highly urbanized. Erosion as a result of extensive urban development over the past 10 to 15 years may have contributed contaminants attached to source soils. Ulery and Brown (1995) evaluated a number of available data sets from the Trinity River Basin, and found a significant correlation between sediment chlordane presence and urban land use. Irwin (1988) found concentrations of total chlordane in mosquitofish to be strongly associated with residential runoff from the area. Kleinsasser and Linam (1989) found elevated chlordane levels in fish collected within the area covered by TDH consumption ban, and suggested urban or suburban runoff as the source.

Recent household hazardous wastes received at the City of Fort Worth Environmental Collection Center have included chlordane, suggesting some recent or possible continued use in the area. Urban residents may have continued using existing stocks of chlordane since it was in use longer than some of the other legacy insecticides. Van Metre and Callender (1997) found the chlordane peak in sediment cores from White Rock Lake in Dallas to have occurred around 1990, reflecting its relatively recent urban use. Extensive sampling of storm water outfalls in the seven Phase I storm water cities in the Dallas-Fort Worth area in 1992-1993 (Baldys *et al.* 1998) detected low levels of chlordane (0.1-1.2 µg/L) in 22 percent of samples from residential areas, 21 percent from commercial areas, and ten percent from industrial areas.

Legacy pollutant contamination in Mountain Creek Lake probably originated from a variety of land use sources. Much of the current lake watershed is urban land use, and the above discussion concerning chlordane association with urban areas also applies to the Mountain Creek Lake watershed. The storm water outfall sampling performed in 1992-1993 (Baldys *et al.* 1998) also detected dieldrin and heptachlor in a small ($\leq$12 percent) number of samples draining residential areas. Agricultural runoff was a dominant contributor to Mountain Creek Lake prior to the construction of Joe Pool Lake and the subsequent extensive urbanization in the area. The past use of pesticides on cropland may also be a factor in the pesticide residues in Mountain Creek Lake. Subsequent erosion as a result of recent urban development west of the lake may have contributed contaminants attached to the source soils.

Baldys *et al.* (1998) detected small amounts (0.1-0.8 µg/L) of PCBs in storm water outfalls draining industrial land uses. No PCBs were detected in drainage from residential and commercial land uses. There have been no known PCB-oil spills or releases of PCBs to Mountain Creek Lake from the TXU power plant. TXU has replaced all PCB transformers at the facility as a part of an overall company phase-out of PCB-containing equipment. The RCRA Facility Investigations at the NASD and NWIRP facilities have discovered legacy pollutant contamination at some of the waste management units at these sites. Most of the storm water runoff from both facilities discharges to the lake (Raines *et al.* 1997; EnSafe 2000a); however, recent sampling of runoff from NWIRP and NASD did not detect any of 27 organochlorine insecticides and PCBs analyzed (Raines *et al.* 1997). Cleanup of legacy pollutant contamination at NWIRP and NASD is being addressed through the TNRCC Defense and State Memorandum of Agreement Program.

Naval Weapons Industrial Reserve Plant (NWIRP)

Storm water drainage, water from building foundation French drains, and groundwater infiltration enters storm sewers that discharge into two drainage lagoons at NWIRP. The lagoons discharge directly to the lake (EnSafe 2000b). The baseline environmental survey for the site (EnSafe 2000b) concluded that records concerning pesticide application are not known in sufficient detail to characterize historical usage; however, pesticides are not expected to be a problem requiring any significant remediation.

PCB-containing equipment used at NWIRP has included transformers, light ballasts, and machines with PCB oils. The only documented PCB release occurred in summer 1993, adjacent to a transformer station. The affected area was subsequently remediated (EnSafe 2000b). PCBs were also detected in a drainage ditch adjacent to a plant salvage yard that has been in use since 1986. The baseline survey concluded that the contaminated drainage ditch was adequately remediated (EnSafe 2000b). U.S. Navy policy was to eliminate PCB transformers, capacitors, and PCB-containing equipment from its facilities by 1998. NWIRP began a removal program in 1991, and Northrop Grumman reports that all PCB-containing equipment has since been removed from the site (EnSafe 2000b).

U.S. Naval Air Station Dallas (NASD)

Cleanup activities at NASD were initiated to comply with the requirements of the TNRCC Industrial Solid Waste Part B Permit (HW-50276) for the site, and the 1993 Defense Base Realignment and Closure Act (CH2M Hill 1999d). The permit requires that a RCRA Facility Investigation be conducted to characterize and remediate any past contamination from base solid waste management units (SWMU). Remediation must meet the TNRCC Risk Reduction Standards contained in Title 30 Texas Administrative Code, Chapter 335, Subchapter S.

Soil sampling at NASD detected the presence of chlordane isomers, DDT, DDE, dieldrin, heptachlor epoxide, and PCBs (Tetra Tech 1999, 2000). Corrective actions (soil excavation and removal and site restoration) have been implemented to address soil contamination (see Ch2M Hill 1999c). Pesticide residues were most commonly detected in former container storage areas, and do not appear to be a major problem.

The NASD facility investigation detected one significant site of PCB contamination, at SWMU 85 located west of the crash/rescue boat dock in the south-central portion of the facility. PCB transformers and capacitors were stored in this area between 1975 and 1982 (CH2M Hill 1999a,b,d). PCBs were found in a number of the transformer oils sampled in 1982, and soil sampling around leaking transformers found PCB levels of up to 151,500 mg/kg in a contaminated area of approximately 500 square feet (CH2M Hill 1999d). A total of 40 cubic yards of soil was removed from the area (CH2M Hill 1999b,d). Follow-up sampling revealed residual PCB contamination in two small areas of SWMU 85 (CH2M Hill 1999d). Further recommendations were made to excavate the contaminated soils, and to conduct sampling in an adjacent ditch and outside the SWMU 85 fence in the northwest corner to evaluate any lateral distribution (CH2M Hill 1999a). A work plan for the excavation and removal of remaining PCB-contaminated soils was developed (CH2M Hill 1999d), and the site has since been remediated.

Linkage Between Sources and Receiving Waters

The time required for the reduction of legacy pollutant tissue concentrations to endpoint levels is a function of their persistence and fate in the environment. Organochlorine insecticides and PCBs are extremely hydrophobic, and their affinity for sorption to soil and sediment, along with their tendency to partition into the lipid of aquatic organisms, determine their transport, fate, and distribution (Smith *et al.* 1988).

Numerous studies have documented the long-term persistence of organochlorine pesticides and their degradation products in soil. Pesticide residue concentrations in soils can span several orders of magnitude, and are a reflection of application history and loss rates (Lichtenstein *et al.* 1971; Harner *et al.* 1999). Heavily used pesticides will be present in higher concentrations years later. Degradation rates of organochlorine residues are highly variable, and soil half-lives of as much as 20 to 35 years have been reported (Nash and Woolson 1967; Dimond and Owen 1996; Mattina *et al.* 1999).

The primary method of transport of legacy pollutants into aquatic systems is by erosion of soil and attached contaminants (Munn and Gruber 1997). Sedimentation has been observed to be a major cause of legacy pollutant loss from the water column, particularly in lakes (Hamelink and Waybrant 1976; Schnoor 1981; Bierman and Swain 1982). Aquatic sediments act as a reservoir for hydrophobic pesticides and PCBs (Moore and Ramamoorthy 1984). Contaminants may be present in sediment at concentrations that are orders of magnitude higher than in the water column, where they are typically very low or undetectable (see Smith *et al.* 1988).

These contaminants degrade slowly, and may be present for long periods of time (Oliver *et al.* 1989; EPA 1999b). Van Metre *et al*. (1998) analyzed sediment core samples from 11 reservoirs, including White Rock Lake in Dallas, and determined mean sediment half-lives of 7.7 to 17 years for chlordane, 13 $\pm$ 5.8 years for total DDT, and 9.5 $\pm$ 2.2 years for PCBs. Field and laboratory studies of contaminated sediments have found that the greatest amount of PCB dechlorination occurs during a relatively short and rapid initial phase after contaminant input, but then slows or effectively ceases (Rhee *et al.* 1993; Sokol *et al.* 1998).

Sediments may act as long-term sources of contamination through desorption of contaminants, and as a result of the resuspension of sediment particles by disturbances (Oliver *et al.* 1989; Baker *et al.* 1991; Zaranko *et al.* 1997; Maher *et al.* 1999). Sediment-associated contaminants can be a long-term source of chronic toxicity to organisms that live or feed in contact with the sediments, and provide a source for the introduction of contaminants into the food web (Reynoldson 1987; Farrington 1991; Larsson 1986).

Organochlorine insecticides and PCBs are highly lipophilic and rapidly accumulate in the tissue of aquatic organisms. Contaminant concentrations are found in fish tissue at levels considerably higher than that of the water column and sediments (Smith *et al.* 1988; Rinella *et al.* 1993; EPA 1997a, 1999b). Fish tissue contaminant concentrations can vary within the same water body (Stow *et al*. 1995; Lamon and Stow 1999), and among different fish species, size classes

within a fish species, and various tissues within a fish (Swackhamer and Hites 1988; EPA 1997a).

A large number of factors have been found to influence contaminant uptake, accumulation, and elimination in fish and other aquatic organisms. Characteristics of fish species and their environments are very important to uptake and elimination processes (Swackhamer and Hites 1988). Fish characteristics include lipid content, age, length, weight, diet and feeding habits, reproductive status, contaminant transfer from females to young, growth dilution, metabolism, and other species-specific physiological factors. Environmental factors include contaminant levels in food items, trophic position and length of the food chain, habitat use and movement, seasonal variation in contaminant availability, water column contaminant concentration, and sediment contaminant concentration and bioavailability. The relative importance of these factors is much debated, and research has found the effects of many of them to be interrelated (Smith *et al.* 1988; Farrington 1991; Pritchard 1993; Jones and de Voogt 1999; Gobas and Morrison 2000; Sijm *et al.* 2000).

Characteristics of the contaminants also affect their tissue concentrations. These factors include differences in isomer and residue bioavailability, equilibrium time, and susceptibility to uptake, biotransformation, and elimination. Schmitt *et al.* (1985) found that changes in tissue concentrations over time vary with differences in chlordane and PCB isomers. Significant differences have been found in the accumulation rates of different PCB congeners, and in the degree of accumulation within different fish body tissues (Gruger *et al.* 1975; van der Oost *et al.* 1988; Zhou and Wong 2000).

The time necessary for a contaminant to reach equilibrium in tissue is variable, hard to determine, and generally very long. Stable organic compounds with low aqueous solubility, such as many legacy pollutants, generally exhibit the longest equilibrium times. Time to equilibrium is also a function of fish size, with larger fish accumulating contaminants at a slower rate (Smith *et al.* 1988).

Once equilibrium is reached, the time necessary for a contaminant to be eliminated from tissue is also long, often on the order of years, and variable, generally increasing with the hydrophobicity and lipophilicity of the compound (Larsson 1986). Contaminant elimination may occur through respiration, metabolism, egestion, growth dilution, and transfer to eggs or young (Sharpe and Mackay 2000). Elimination rates can also be affected by the form of the contaminant (Niimi and Oliver 1983; Sijm *et al.* 1992; de Boer *et al.* 1994), especially in the case of PCBs. Schnoor (1981) calculated a dieldrin decrease of 15 percent per year in reservoir fish tissue. Half-lives for DDT, DDE, and PCBs in lake trout have been estimated at 9 to 10 years (see Borgmann and Whittle 1992; Van Metre *et al.* 1998). Delorme *et al.* (1999) suggest that hydrophobic contaminants may not remobilize from fish tissue unless severe nutritional stress occurs.

In addition to generally excluding the effects of contaminated sediment and food, most studies of contaminant uptake and elimination are relatively short-term laboratory experiments (de Boer

et al. 1994; Sijm *et al*. 2000). Long-term field studies have generally found that elimination rates are considerably longer than in those measured in laboratory studies (de Boer *et al*. 1994; Delorme *et al*. 1999). The interval between bioconcentration and elimination may be too short in laboratory studies to allow equilibrium within all tissues, allowing elimination to proceed much faster than in a field situation. Published uptake and elimination rates derived from laboratory studies may not reflect field conditions, limiting their use for the prediction of contaminant behavior (Swackhamer and Hites 1988; de Boer *et al*. 1994).

Trinity River

Available Trinity River sediment and fish tissue data indicate that chlordane concentrations are decreasing as a result of natural attenuation processes. Davis and Bastian (1990) found evidence that sediment chlordane levels were decreasing in samples collected between 1974 and 1989 (Table 4). Declines were noted at three locations on Segments 0806 and 0841. A decrease was not evident in samples from the downstream third of the impaired portion of Segment 0805 in southeast Dallas. Subsequent data collected in 1992-1993 by Moring (1997) suggests that reductions have occurred in this area. The data suggest that sediment chlordane levels are decreasing in the affected area, thus removing a significant source of potentially bioavailable contamination.

Table 4. Chlordane concentrations (mg/kg) in Trinity River sediment.
Data for 1974 through 1989 are mean values reported by Davis and Bastian (1990). Data for 1992-1993 are the sum of five chlordane isomers and metabolites reported by Moring (1997).

Segment	Sample Location	1974-1979	1980-1985	1986-1989	1992-1993
0806	West Fork Trinity at Beach Street (Fort Worth)	0.050	0.018	0.006	0.013
0841	West Fork Trinity at Belt Line Road (Grand Prairie)	0.266	0.014	0.005	---
	West Fork Trinity at West Loop 12 (Dallas)	0.174	---	0.010	---
0805	Trinity River at South Loop 12 and Interstate 20 (Dallas)	0.098	---	0.150	0.011

Fish tissue data are available for several sample dates. Samples frequently consisted of a relatively small number of fish, and most often included largemouth bass and/or one or more of the bottom-feeding common carp, smallmouth buffalo, and blue catfish. Mean contaminant levels for each sample date and location were calculated using available fish fillet data, to see if any changes were apparent in tissue concentrations (see Table 5). The Segment 0806 location was included to provide additional data because it is in the downstream end of the segment, near the upstream end of Segment 0841.

There is some evidence of a decline in chlordane tissue concentrations along the Trinity River. Sample collections near Loop 820 in Segment 0806 in 1990 and 1996 show a decline in both the mean and maximum chlordane level. The only data available for Segment 0841 is the 1998 sample collected downstream from Belt Line Road, near the downstream end of the segment. The mean and maximum chlordane concentrations in Segment 0841 are similar to those of the 1996 sample collected at Loop 820 in Segment 0806, suggesting a general decline in tissue chlordane through both segments.

TABLE 5. Fish tissue chlordane means and ranges in Trinity River segments.
N = number of fish. na = not applicable. nd = less than detection limit.

Sample Month and Year		**08/1987**	**01-04/1988**	**10/1990**	**07/1996**	**11/1998**
Segment/Sample Location		**Fish Tissue (Fillets) Concentration (mg/kg)**				
0806 - West Fork Trinity at Loop 820 (Fort Worth)	N Mean Range	---	---	5 0.13 nd-0.28	3 0.03 nd-0.06	---
0841 - West Fork Trinity two miles downstream Belt Line Road (Grand Prairie)	N Mean Range	---	---	---	---	10 0.04 nd-0.13
0805 - Trinity River at Elm Fork Trinity (Irving/Dallas)	N Mean Range	---	---	---	---	10 0.24 nd-0.84
0805 - Trinity River at Sylvan Avenue (Dallas)	N Mean Range	---	---	4 0.39 nd-0.98	---	---
0805 - Trinity River at Commerce Street (Dallas)	N Mean Range	---	4 0.71 0.50-0.84	---	3 0.14 0.02-0.29	---
0805 - Trinity River at South Loop 12 (Dallas)	N Mean Range	1 0.50 na	---	---	3 0.18 0.04-0.26	---

Sources of Data:

Kleinsasser and Linam (1989)
Texas Department of Health (*Fish Tissue Sampling Data 1970-1997* and unpublished 11/1998 data)
Texas Parks & Wildlife Department (unpublished 10/1990 and 07/1996 data)

Samples were collected at the upstream end of Segment 0805, at the confluence with the Elm Fork Trinity River, in late 1998. Earlier samples were collected just downstream at Sylvan Avenue in 1990, and at Commerce Street in 1988 and 1996. These locations are relatively close, and taken together, the data suggest a general decline in tissue chlordane concentrations through time (see Table 5). Fish were collected downstream at South Loop 12 in 1987 and

1996. A decline is also suggested; however, sample sizes in this area of the segment were very small.

Mountain Creek Lake

Sediment and fish tissue samples were collected in Mountain Creek Lake in 1994-1996 as part of a two-phase USGS study (Jones *et al.* 1997) conducted for the U.S. Navy in conjuction with the facility investigations at NWIRP and NASD. Phase I sediment samples were collected from a variety of locations in the lake (see Table 6). Pesticide residue levels were generally less than 0.01 mg/kg. Surface sediment PCB concentrations were greater in Cottonwood Bay (up to 0.8 mg/kg) and adjacent to NASD (up to 0.099 mg/kg) relative to other locations. Sediment core samples collected in Cottonwood Bay contained PCB concentrations of up to 4.0 mg/kg. Sediment samples collected from drainage areas on NASD property contained low levels of some pesticide residues, and PCB concentrations as high as 3.2 mg/kg at one location.

Phase II sediment sampling (Jones *et al.* 1997) focused on Cottonwood Bay and the lake adjacent to NASD (Table 6). Pesticide residues were again relatively low. PCBs were analyzed as three separate congeners. The greatest concentrations, 0.680 mg/kg near NASD and 0.420 mg/kg in Cottonwood Bay, were the Aroclor 1260 form.

Table 6. Summary of Legacy Pollutant Concentrations (Mg/kg) in Mountain Creek Lake surface sediment.
Data summarized from Jones *et al.* (1997). nd = less than detection limit.

	Range of Sediment Concentrations (mg/kg)						
Sample Location Phase I	**Chlordane**	**DDT**	**DDD**	**DDE**	**Dieldrin**	**Heptachlor epoxide**	**PCBs**
Upstream end of lake	nd	nd	0.0003	0.0008	nd	nd	0.002
Mid-lake	nd	nd	nd	0.0004	nd	nd	0.003
Downstream end of lake	nd	nd	nd	0.0004	nd	nd	0.002
Adjacent to TXU plant	0.001	nd	nd	0.0004	nd	nd	0.003
Inlet to lake from Cottonwood Bay	0.005	nd	0.0005 - 0.0017	0.0004	0.0005	nd nd	0.006 - 0.007
Adjacent to NASD and NWIRP	nd - 0.007	nd	nd - 0.0056	0.0004 - 0.0023	nd - 0.0002	nd	0.007 - 0.099
Cottonwood Bay	0.003 - 0.016	nd - 0.0001	0.0005 - 0.0018	0.0003 - 0.0017	nd - 0.0024	nd	0.006 - 0.800
Phase II							
Cottonwood Bay and lake adjacent to NASD	nd - 0.022	nd - 0.0035	0.0002 - 0.011	0.0002- 0.0064	nd - 0.0006	nd	**nd - 0.680

**Analyzed as three separate congeners (Aroclor 1242, 1254, and 1260).

The greatest legacy pollutant concentrations in Mountain Creek Lake surface sediments are PCBs in Cottonwood Bay and adjacent to NASD. No subsequent sediment data is currently available to determine if any changes have occurred in PCB concentrations. Remediation of the NASD should eliminate any significant remaining PCB sources to Mountain Creek Lake. Natural attenuation will continue to reduce contaminant concentrations, while on-going sedimentation will continue to bury any remaining contaminated sediment. This appears to be occurring in three small urban lakes in Fort Worth that are also on the §303(d) list for legacy pollutants in fish tissue. Samples of recent sediment deposits were collected from these lakes in May 1999 by the Trinity River Authority and the City of Fort Worth. Pesticide residue and PCB concentrations were less than the detection limits (0.0007 mg/kg and 0.02 mg/kg, respectively) in all three lakes, suggesting that there have been no recent contaminant inputs to the lakes, and that any remaining contaminated sediments are being buried, thus reducing their bioavailability.

Phase I fish samples were collected at the upstream end of the lake, in the northwest corner adjacent to NASD, and in Cottonwood Bay (see Table 7). Contaminants were more commonly found in whole fish, and concentrations in whole fish were greater than those in fillets, as would be expected. PCBs and DDE were detected in both whole fish and fillets at all three locations. PCB concentrations were generally elevated at the NASD and Cottonwood Bay sites relative to the upstream lake location. Chlordane was detected in both whole fish and fillets near NASD. Dieldrin, DDT, and heptachlor epoxide were not detected in any of the samples.

Table 7. Concentrations of legacy pollutants (mg/kg) detected in Mountain Creek Lake fish tissue (Phase I samples).
Data summarized from Jones *et al.* (1997). All results are composites of 4-5 fish (whole-body common carp or largemouth bass fillets). nd = less than detection limit.

	Sample Location					
	Upstream end of lake		**Adjacent to NASD**		**Cottonwood Bay**	
Pollutant	whole carp	bass fillets	whole carp	bass fillets	whole carp	bass fillets
Chlordane[1]	0.11	nd	0.068	0.024	0.076	nd
DDD	0.013-0.018	nd	0.006-0.011	nd	0.065-0.070	nd
DDE	0.140	0.009-0.014	0.029-0.034	0.009-0.014	0.088	0.014-0.02
PCBs	0.590	0.063	1.60	0.580	4.20	0.30

[1]Sum of *cis*-chlordane, *trans*-chlordane, *cis*-nonachlor, *trans*-nonachlor, and oxychlordane concentrations.

Phase II fish samples consisted of fillets (both skin-on and skin-off) from individual largemouth bass, channel catfish, and common carp, and eviscerated whole-body channel catfish (Jones *et*

al. 1997). Fish from Mountain Creek Lake are cooked and consumed in all of these conditions (TDH 1996). Samples were collected in the same general areas sampled in Phase I, as well as along the northeast lake shoreline. Chlordane, DDE, and PCBs (Aroclors 1254 and 1260) were the most commonly detected legacy pollutants. The other pesticide residues were generally at concentrations less than the detection limit, and at very low concentrations when detected. TDH assessment of the data determined that there was no significant difference in carcinogenic risk between fillets with the skin on and those with the skin off. Carcinogenic risk was determined to be significantly higher for eviscerated whole fish (TDH 1996).

Tissue concentration ranges were compiled for the most commonly detected Phase II contaminants using data from Jones *et al.* (1997) (see Table 8). The greatest fillet values for chlordane and DDE were found at the upstream end of the lake. The greatest fillet values for PCBs were found adjacent to NASD, in Cottonwood Bay, and at the upstream end of the lake. The greatest whole fish values for chlordane, DDE, and PCBs were from the upstream location, Cottonwood Bay, and the northeast portion of the lake.

Table 8. Phase II concentrations ranges (mg/kg) of most common legacy pollutants in Mountain Creek Lake fish tissue.
Data summarized from Jones *et al.* (1997). Fillet data includes individual fish of three species (largemouth bass, channel catfish, and common carp), with both skin on and skin off. Whole fish are eviscerated channel catfish. N = number of fish. nd = less than detection limit.

	Fillet Tissue Concentration (mg/kg)			
Sample Area (Size)	**Chlordane**	**DDE**	**PCB 1254**	**PCB 1260**
Upstream end of lake (N = 8)	nd - 0.580	0.0089 - 0.150	nd - 0.410	0.005 - 1.7
Northeast shoreline (N = 11)	nd - 0.029	nd - 0.081	nd - 0.021	nd - 0.073
Cottonwood Bay (N = 13)	nd - 0.087	nd - 0.030	0.015 - 0.110	0.053 - 0.420
Adjacent to NASD (N = 21)	nd - 0.120	nd - 0.065	nd - 0.470	0.022 - 1.67
	Whole-body Tissue Concentration (mg/kg)			
	Chlordane	**DDE**	**PCB 1254**	**PCB 1260**
Upstream end of lake (N = 1)	0.220	0.160	0.074	1.0
Northeast shoreline (N = 2)	0.031 - 0.207	0.022 - 0.134	0.027 - 0.140	0.081 - 0.860
Cottonwood Bay (N = 5)	0.074 - 0.290	0.025 - 0.110	0.064 - 0.420	0.180 - 2.2
Adjacent to NASD (N = 1)	0.017	0.023	0.044	0.091

The presence of the larger contaminant concentrations in several areas of the lake is probably a reflection of both the widespread use of legacy substances and the movement of fish throughout the lake. Higher contaminant levels are generally more apparent in fish collected in Cotton-

wood Bay and adjacent to NASD. No subsequent fish tissue data is currently available, so no evaluation of any changes can be made at this time. With the exception of PCBs in one lake, fish tissue collected from the three Fort Worth urban lakes between 1988 and 1990 exhibited an average decline in maximum legacy pollutant concentrations of 75 percent. This suggests that contaminant levels will also decline in Mountain Creek Lake fish as a result of remediation of pollutant sources at NASD and natural attenuation processes in the lake.

Margin of Safety

A margin of safety is required in a TMDL in order to account for any uncertainty about the pollutant load and its association with water quality. The margin of safety may be an explicit component that leaves a portion of the potential assimilative capacity of a water body unallocated, or an implicit component established through the use of conservative analytical assumptions (EPA 1999a).

These TMDLs use an implicit margin of safety. EPA (1997a) guidance on the assessment of contaminant data for use in fish advisories contains an extensive discussion of the assumptions and uncertainties present in the calculation of fish consumption limits. Conservative assumptions and calculations are used throughout the guidance to provide a margin of safety for the various uncertainties. Strict criteria exist concerning the types of studies and the data required to support assumptions and calculations. Numeric adjustments are made for the extrapolation of study results from animals or humans to the general population, and to provide a conservative upper bound on cancer risk values and a conservative RfD for noncarcinogens. Adjustments are designed to provide a safe margin between observed toxicity and potential toxicity in a sensitive human.

EPA assumes no safe threshold for exposure to carcinogens. Any exposure is assumed to pose some cancer risk. Noncarcinogenic effects occur with chronic exposure over a significant period of time. The oral reference dose (RfD) is defined in EPA (1997a) as "an estimate (with uncertainty perhaps spanning an order of magnitude) of a daily exposure to the human population (including sensitive subgroups) that is likely to be without an appreciable risk of deleterious effects during a lifetime." Calculated RfDs reflect the assumption that, for noncarcinogens, a threshold exists below which exposure does not cause adverse health effects. RfD calculations use modifying and uncertainty factors to account for variables such as the variability of responses in human populations, differences in responses between animal study species and humans, and gaps in available data. The RfD is calculated so there is little probability of an adverse health effect due to chronic exposure to concentrations below the RfD (EPA 1997a).

The flexibility provided by having numerous combinations of contaminants and concentration reductions that can produce acceptable carcinogenic and noncarcinogenic risk when multiple contaminants are present provides an inherent margin of safety that the goal of acceptable risk will be met. Use of the most protective target concentration for single contaminants provides additional assurance that protection from both carcinogenic and noncarcinogenic effects will be achieved. Because the goal of this TMDL is removal of fish consumption bans through

reduction of the consumption risk, the margin of safety inherent in the EPA guidance, combined with the conservative use of endpoint targets, will provide an adequate margin of safety for the protection of human health. The decline of tissue contaminant concentrations to within an acceptable level of risk will allow TDH to remove the fish consumption bans, which will effectively restore the fish consumption use to these water bodies.

Pollutant Load Allocation

Restrictions on the use of legacy pollutants generally have resulted in a slow but steady decline in environmental residues (Smith *et al.* 1988). Contaminant levels in lake sediment cores have shown good agreement with production and usage histories of the parent compounds, with peak concentrations appearing at the times of peak use (Ricci *et al.* 1983; Oliver *et al.* 1989; Van Meter and Callender 1997; Van Metre *et al.* 1998). Higher concentrations generally appeared deeper in the cores, indicating that input and accumulation were decreasing with time. Although residues continue to persist in deeper parts of the cores, burial by more recently deposited sediments may result in effective exclusion of the contaminants from bioavailability to aquatic life (Ricci *et al.* 1983).

Decreases in fish and human tissue concentrations of organochlorine insecticides and PCBs have been observed where no major additional inputs are occurring (see Moore and Ramamoorthy 1984; Brown *et al.* 1985; Hovinga *et al.* 1992; Bremle and Larsson 1998). Reviews of tissue data collected from a variety of water bodies in northern Europe between 1967 and 1995 have found a significant decrease in organochlorine concentrations over time (Skåre *et al.* 1985; Bignert *et al.* 1998). Fish tissue concentrations of total DDT, chlordane, and dieldrin have declined across the U.S. since uses of these substances were discontinued (Schmitt *et al.* 1990; USGS 2000). The DDE component of total DDT has increased as a result of continued degradation. Declining tissue DDT and PCB concentrations have been reported in various locations and fish species in the Great Lakes (Scheider *et al.* 1998). Less consistent trends in tissue PCB levels may be a reflection of the congener-specific nature of PCB metabolism and degradation. In addition, strong oscillations in PCB levels influenced by food web interactions can be superimposed over a gradual declining trend (see Borgmann and Whittle 1992).

Continuing decreases in environmental legacy pollutant levels are expected, although the necessary time frame is subject to debate. Within the context of these TMDLs, legacy pollutants are considered background sources that reflect the site-specific application history and loss rates of the subject area. Continuing sources of pollutant loadings occur from nonpoint source runoff , leaching, or erosion of the various sinks that may exist within the watersheds. Any residual contamination at the NASD may be a source to Mountain Creek Lake while site remediation continues. No authorized point source discharges of these pollutants are allowed by law. Therefore, any contribution from point source discharges would be the result of illegal disposal of these contaminants by customers of the treatment systems.

Available evidence suggests that chlordane is generally declining in both the surface sediments and the fish tissue of the Trinity River. Continuing natural attenuation is expected via degradation and metabolism of the contaminant, and scouring and redistribution of sediments. Remediation of any remaining contamination at the NWIRP and NASD facilities through the TNRCC Defense and State Memorandum of Agreement Program will eliminate a significant source of PCBs to Mountain Creek Lake. Continuing natural attenuation in the lake is

expected via degradation and metabolism of pesticide residues and PCBs, and the burial of contaminated sediments.

Natural attenuation is generally a preferred option for the elimination of legacy pollutants. More drastic alternatives, such as sediment removal by dredging, can result in considerable habitat disturbance and destruction, and sediments resuspended during dredging further expose aquatic life to contaminants and the potential for additional uptake, cause abrasive damage to gills and sensory organs of fish and invertebrates, and interfere with fish prey selection (O'Brien 1990; Waters 1995). Alternatives such as dredging or eradication of contaminated fish communities and restocking (O'Meara *et al.* 2000) are generally better justified at sites heavily contaminated by point source discharges and major spills.

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Reference 56

2014 Texas Integrated Report - Texas 303(d) List (Category 5)

As required under Sections 303(d) and 305(b) of the federal Clean Water Act, this list identifies the water bodies in or bordering Texas for which effluent limitations are not stringent enough to implement water quality standards, and for which the associated pollutants are suitable for measurement by maximum daily load.

In addition, the TCEQ also develops a schedule identifying Total Maximum Daily Loads (TMDLs) that will be initiated in the next two years for priority impaired waters. Issuance of permits to discharge into 303(d)-listed water bodies is described in the TCEQ regulatory guidance document *Procedures to Implement the Texas Surface Water Quality Standards* (June 2010, RG-194).

Impairments are limited to the geographic area described by the Assessment Unit and identified with a six or seven-digit AU_ID. A management strategy will be assigned to each impairment. Specific strategies may inlcude TMDL development, water quality standards evaluation, or additional monitoring.

Explanation of Column Headings

SegID and Name:	The unique identifier (SegID), segment name, and location of the water body. Items may be one of three types of numbers for SegID. The first type is a classified segment number (4 digits, e.g. 0218), as defined in the Texas Surface Water Quality Standards. The second type is an unclassified water body (e.g. 0218A), not defined in the Standards and associated with a classified water body because it is in the same watershed. The third type includes special Segments for Oyster Water Use (e.g. 2421OW) and Beach Watch Use (e.g. 2481CB) special areas. The segment name and description follow SegID.
AU_ID:	Identifies the assessment unit (AU_ID, six or seven digits, *e.g.*, 0101A_01) and describes the location of the specific area within a classified or unclassified water body for which one or more water quality standards are not met.
Parameter(s):	Pollutants or water quality conditions that assessment procedures indicate do not meet assigned water quality standards.
Category:	One of three subcategories assigned to each impaired parameter to provide information about water quality status and management activities on that water body. The categories are defined below: Category 5: The water body does not meet applicable water quality standards or is threatened for one or more designated uses by one or more pollutants. *Category 5a* - TMDLs are underway, scheduled, or will be scheduled for one or more parameters. *Category 5b* - A review of the standards for one or more parameters will be conducted before a management strategy is selected, including the possible revision to the TSWQS. *Category 5c* - Additional data or information will be collected and/or evaluated for one or more parameters before a management strategy is selected.
Year Segment First Listed	The initial assessment year the pollutant or water quality condition in this water body (Segment, not specifically the year for each AU_ID) did not meet water quality standards.

SegID: 0804G Catfish Creek
Twenty mile stretch of Catfish Creek running upstream from US 287 in Anderson Co., to Catfish Creek Ranch Lake just upstream of SH 19 in Henderson Co.

Parameter(s)	*Category*	*Year Segment First Listed*
depressed dissolved oxygen	**5b**	**2006**

0804G_01 Entire Segment

SegID: 0804H Upper Keechi Creek
From confluence with segment 0804 Trinity River to the upper end of NHD stream Upper Keechi Creek (NHD RC 12030201001075)

Parameter(s)	*Category*	*Year Segment First Listed*
depressed dissolved oxygen	**5b**	**2010**

0804H_01 From the confluence with segment 0804 Trinity River up to confluence with Twin Branch (NHD RC 12030201027099)

SegID: 0805 Upper Trinity River
From a point immediately upstream of the confluence of the Cedar Creek Reservoir discharge canal in Henderson/Navarro County to a point immediately upstream of the confluence of Elm Fork Trinity River in Dallas County

Parameter(s)	*Category*	*Year Segment First Listed*
dioxin in edible tissue	**5a**	**2010**

0805_01 From confluence of the Cedar Creek Reservoir discharge canal upstream to confluence of Smith Creek.
0805_02 From confluence of Smith Creek upstream to confluence of Tenmile Creek.
0805_03 From the confluence of Fivemile Creek upstream to the confluence of Cedar Creek.
0805_04 From confluence of Cedar Creek upstream to confluence of Elm Fork Trinity River
0805_06 From confluence of Tenmile Creek upstream to confluence of Fivemile Creek

Parameter(s)	*Category*	*Year Segment First Listed*
PCBs in edible tissue	**5a**	**2002**

0805_01 From confluence of the Cedar Creek Reservoir discharge canal upstream to confluence of Smith Creek.
0805_02 From confluence of Smith Creek upstream to confluence of Tenmile Creek.
0805_03 From the confluence of Fivemile Creek upstream to the confluence of Cedar Creek.
0805_04 From confluence of Cedar Creek upstream to confluence of Elm Fork Trinity River
0805_06 From confluence of Tenmile Creek upstream to confluence of Fivemile Creek

Reference 57

Home
Open Space Program
Cedar Mountain Preserve
Cedar Ridge Preserve
Cottonwood Creek Preserve
Elm Fork Preserve
Fish Creek Preserve
Grapevine Springs Preserve
Joppa Preserve
Lee F. Jackson Spring Creek Forest Preserve
Lester Lorch Park
Muddy Creek Preserve
McCommas Bluff Preserve
North Mesquite Creek Preserve
Palmetto Alligator Slough Preserve
Post Oak Preserve
Rowlett Creek Preserve
Spring Creek Park Preserve
Tenmile Creek Preserve
Trinity River Greenbelt Goat Island Preserve
Trinity River Greenbelt Riverbend Preserve
Trinity River Mountain Creek Preserve
Windmill Hill Preserve

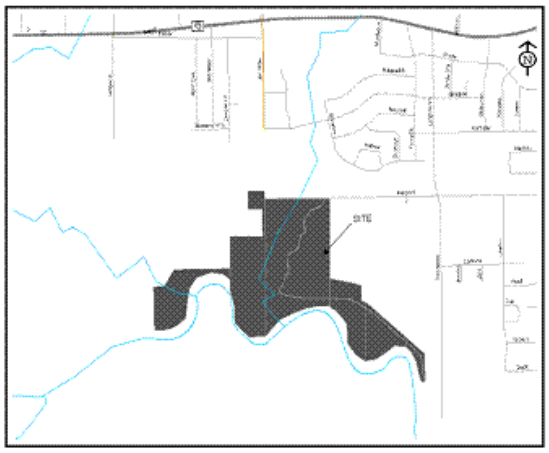
McCommas Bluff Preserve

Dallas, Texas 111 acres

Entrance: West end of Fairport off of Murdock Road

Mapsco: 58, Section "X"
68, Sections "A" and "B"

Preserve Features



This 111-acre wooded preserve lies along a winding segment of the Trinity River in the southeastern portion of Dallas. The river in this area has numerous serpentine bends, and over the years, it has undercut its chalk banks and has created a small-scale canyon.

Visitors may find the preserve best-suited for hiking, nature study, fishing, and informal picnicking.

The preserve is also located just across Elam Creek from the Trinity River Audubon Center. This Center, which contains 120 acres, offers educational programs, on-hands exhibits, and five miles of trail.

Preserve History

The remains of a lock and dam that were part of a never-completed 1890 Trinity River navigation system can be seen from this property.

The *Sallie Haynes,* a river boat, made several trips along this stretch of the river before it became obvious that the river was not friendly to paddle-wheel boats.

1880s outlaws Belle Starr and the Daltons camped at a spring that is located on property adjacent to the preserve.

Preserve Amenities

A 2–mile natural surface ranch road connects Riverwood and Fairport Roads and provides a pleasant walk.

Informal on-street parking is available at the end of Riverwood and Fairport Roads.

Maintenance

McCommas Bluff Preserve is maintained by the City of Dallas. To report maintenance issues, please call the City of Dallas Parks and Recreation Department at (214) 671-0234.

Restricted Uses

Hunting and the use of alcohol, motorized vehicles, fireworks, or weapons are not permitted within the Preserve.

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Reference 58

TEXAS Department of State Health Services

DSHS Issues Lake Livingston and Trinity River Fish Advisory

Updates Three Additional Advisories

News Release
Dec. 18, 2015

The Texas Department of State Health Services today issued a fish consumption advisory for Lake Livingston and portions of the Trinity River after laboratory testing of fish samples found elevated levels of dioxins and polychlorinated biphenyls or PCBs.

The Lake Livingston advisory is for seven types of fish – blue catfish, flathead catfish, freshwater drum, gar, smallmouth buffalo, striped bass and white bass. The advisory is in effect for the Trinity River Basin which includes Lake Livingston and the Trinity River from U.S. 287 downstream to U.S. 90.

Regular or long-term consumption of fish from these waters may increase the likelihood of long-term health risks. People can still fish in the area, though they should not consume or should limit their consumption of fish from this area and are advised to follow the specific age and species recommendations in this chart:

Species	Women of childbearing age & children under 12	Women past childbearing age and males 12 and older
Blue catfish	DO NOT EAT	1 meal per month
Flathead catfish	DO NOT EAT	1 meal per month
Freshwater drum	DO NOT EAT	2 meals per month
Gar (all species)	DO NOT EAT	DO NOT EAT
Smallmouth buffalo	DO NOT EAT	1 meal per month
Striped bass	1 meal per month	3 meals per month
White Bass	1 meal per month	3 meals per month

The department today also issued revised fish consumption advisories for three bodies of water due to updated evidence of the levels of contaminants in fish. The three affected bodies of water are

- The Arroyo Colorado upstream of the Port of Harlingen, including Llano Grande Lake and the Main Floodway.
- The Houston Ship Channel north of the Fred Hartman Bridge, including the San Jacinto River below the Lake Houston Dam.
- Echo Lake in Fort Worth.

Sampling shows that concentrations of pesticides in fish in the **Arroyo Colorado** (Cameron and Hidalgo counties) are no longer a health concern. However, concentrations of mercury and PCBs in some fish still exceed safe levels. For that reason, DSHS now advises no one eat longnose gar from the Arroyo Colorado. Health officials also continue to advise women of childbearing age and children under 12 not eat smallmouth buffalo and everyone else limit consumption of

smallmouth buffalo to no more than two 8-ounce meals per month.

Pesticide levels have also dropped in the **Houston Ship Channel**, but concentrations of dioxins and PCBs still pose a threat to human health. Women of childbearing age and children under 12 should not eat any fish or blue crab from the Houston Ship Channel, and others should limit their consumption to one 8-ounce meal per month.

A new advisory for **Echo Lake** (Tarrant County) is based on concentrations of pesticides, dioxins and PCBs in common carp and largemouth bass that are high enough to pose a risk to human health. DSHS recommends no one eat common carp caught in Echo Lake and that women of childbearing age and children under 12 not eat largemouth bass. Everyone else should limit their consumption of largemouth bass to one 8-ounce meal per month. The consumption advisory replaces a possession ban that previously made it illegal to harvest or possess fish from Echo Lake.

Environmental pollutants like PCBs, mercury and dioxins can build up in the bodies of fish over time and lead to a variety of health consequences in people who eat contaminated fish. DSHS's Seafood and Aquatic Life Group tests fish in public bodies of water where there are concerns that pollutants may have made fish unsafe to eat. Laboratory analysis shows the concentration of contaminants and allows health experts to make recommendations on whether people should avoid or limit consumption of certain species

A summary of the three updated recommendations follows.

Body of water	Contaminants of Concern	Species	Women of childbearing age & children under 12	Women past childbearing age and males 12 and older
Arroyo Colorado	Mercury & PCBs	Longnose gar	DO NOT EAT	DO NOT EAT
		Smallmouth buffalo	DO NOT EAT	2 meals per month
Houston Ship Channel	Dioxins & PCBs	All fish and blue crab	DO NOT EAT	1 meal per month
Echo Lake	Dieldrin, dioxins and PCBs	Common carp	DO NOT EAT	DO NOT EAT
		Largemouth bass	DO NOT EAT	1 meal per month

-30-

*(**News Media Contact:** Carrie Williams, DSHS Director of Media Relations, 512-776-7119)*

DSHS Press Office on **Twitter**

Last updated January 11, 2016

Reference 59

Last Revision: 2/10/2016 5:15:00 PM

DALLAS COUNTY

BIRDS

		Federal Status	State Status
American Peregrine Falcon	*Falco peregrinus anatum*	DL	T

year-round resident and local breeder in west Texas, nests in tall cliff eyries; also, migrant across state from more northern breeding areas in US and Canada, winters along coast and farther south; occupies wide range of habitats during migration, including urban, concentrations along coast and barrier islands; low-altitude migrant, stopovers at leading landscape edges such as lake shores, coastlines, and barrier islands.

Arctic Peregrine Falcon	*Falco peregrinus tundrius*	DL	

migrant throughout state from subspecies' far northern breeding range, winters along coast and farther south; occupies wide range of habitats during migration, including urban, concentrations along coast and barrier islands; low-altitude migrant, stopovers at leading landscape edges such as lake shores, coastlines, and barrier islands.

Bald Eagle	*Haliaeetus leucocephalus*	DL	T

found primarily near rivers and large lakes; nests in tall trees or on cliffs near water; communally roosts, especially in winter; hunts live prey, scavenges, and pirates food from other birds

Black-capped Vireo	*Vireo atricapilla*	LE	E

oak-juniper woodlands with distinctive patchy, two-layered aspect; shrub and tree layer with open, grassy spaces; requires foliage reaching to ground level for nesting cover; return to same territory, or one nearby, year after year; deciduous and broad-leaved shrubs and trees provide insects for feeding; species composition less important than presence of adequate broad-leaved shrubs, foliage to ground level, and required structure; nesting season March-late summer

Golden-cheeked Warbler	*Setophaga chrysoparia*	LE	E

juniper-oak woodlands; dependent on Ashe juniper (also known as cedar) for long fine bark strips, only available from mature trees, used in nest construction; nests are placed in various trees other than Ashe juniper; only a few mature junipers or nearby cedar brakes can provide the necessary nest material; forage for insects in broad-leaved trees and shrubs; nesting late March-early summer

Henslow's Sparrow	*Ammodramus henslowii*		

wintering individuals (not flocks) found in weedy fields or cut-over areas where lots of bunch grasses occur along with vines and brambles; a key component is bare ground for running/walking

Interior Least Tern	*Sterna antillarum athalassos*	LE	E

subspecies is listed only when inland (more than 50 miles from a coastline); nests along sand and gravel bars within braided streams, rivers; also know to nest on man-made structures (inland beaches, wastewater treatment plants, gravel mines, etc); eats small fish and crustaceans, when breeding forages within a few hundred feet of colony

Peregrine Falcon	*Falco peregrinus*	DL	T

both subspecies migrate across the state from more northern breeding areas in US and Canada to winter along coast and farther south; subspecies (F. p. anatum) is also a resident breeder in west Texas; the two subspecies' listing statuses differ, F.p. tundrius is no longer listed in Texas; but because the subspecies are not easily distinguishable at a distance, reference is generally made only to the species level; see subspecies for habitat.

DALLAS COUNTY

BIRDS

		Federal Status	State Status
Piping Plover	*Charadrius melodus*	LT	T

wintering migrant along the Texas Gulf Coast; beaches and bayside mud or salt flats

Red Knot	*Calidris canutus rufa*	T

Red knots migrate long distances in flocks northward through the contiguous United States mainly April-June, southward July-October. A small plump-bodied, short-necked shorebird that in breeding plumage, typically held from May through August, is a distinctive and unique pottery orange color. Its bill is dark, straight and, relative to other shorebirds, short-to-medium in length. After molting in late summer, this species is in a drab gray-and-white non-breeding plumage, typically held from September through April. In the non-breeding plumage, the knot might be confused with the omnipresent Sanderling. During this plumage, look for the knot's prominent pale eyebrow and whitish flanks with dark barring. The Red Knot prefers the shoreline of coast and bays and also uses mudflats during rare inland encounters. Primary prey items include coquina clam (Donax spp.) on beaches and dwarf surf clam (Mulinia lateralis) in bays, at least in the Laguna Madre. Wintering Range includes- Aransas, Brazoria, Calhoun, Cameron, Chambers, Galveston, Jefferson, Kennedy, Kleberg, Matagorda, Nueces, San Patricio, and Willacy. Habitat: Primarily seacoasts on tidal flats and beaches, herbaceous wetland, and Tidal flat/shore.

Sprague's Pipit	*Anthus spragueii*	C

only in Texas during migration and winter, mid September to early April; short to medium distance, diurnal migrant; strongly tied to native upland prairie, can be locally common in coastal grasslands, uncommon to rare further west; sensitive to patch size and avoids edges.

Western Burrowing Owl	*Athene cunicularia hypugaea*

open grasslands, especially prairie, plains, and savanna, sometimes in open areas such as vacant lots near human habitation or airports; nests and roosts in abandoned burrows

White-faced Ibis	*Plegadis chihi*	T

prefers freshwater marshes, sloughs, and irrigated rice fields, but will attend brackish and saltwater habitats; nests in marshes, in low trees, on the ground in bulrushes or reeds, or on floating mats

Whooping Crane	*Grus americana*	LE	E

potential migrant via plains throughout most of state to coast; winters in coastal marshes of Aransas, Calhoun, and Refugio counties

Wood Stork	*Mycteria americana*	T

forages in prairie ponds, flooded pastures or fields, ditches, and other shallow standing water, including salt-water; usually roosts communally in tall snags, sometimes in association with other wading birds (i.e. active heronries); breeds in Mexico and birds move into Gulf States in search of mud flats and other wetlands, even those associated with forested areas; formerly nested in Texas, but no breeding records since 1960

INSECTS

		Federal Status	State Status
Black Lordithon rove beetle	*Lordithon niger*		

historically known from Texas

DALLAS COUNTY

MAMMALS

		Federal Status	State Status

Cave myotis bat *Myotis velifer*

colonial and cave-dwelling; also roosts in rock crevices, old buildings, carports, under bridges, and even in abandoned Cliff Swallow (Hirundo pyrrhonota) nests; roosts in clusters of up to thousands of individuals; hibernates in limestone caves of Edwards Plateau and gypsum cave of Panhandle during winter; opportunistic insectivore

Plains spotted skunk *Spilogale putorius interrupta*

catholic; open fields, prairies, croplands, fence rows, farmyards, forest edges, and woodlands; prefers wooded, brushy areas and tallgrass prairie

MOLLUSKS

		Federal Status	State Status

Louisiana pigtoe *Pleurobema riddellii* T

streams and moderate-size rivers, usually flowing water on substrates of mud, sand, and gravel; not generally known from impoundments; Sabine, Neches, and Trinity (historic) River basins

Sandbank pocketbook *Lampsilis satura* T

small to large rivers with moderate flows and swift current on gravel, gravel-sand, and sand bottoms; east Texas, Sulfur south through San Jacinto River basins; Neches River

Texas heelsplitter *Potamilus amphichaenus* T

quiet waters in mud or sand and also in reservoirs. Sabine, Neches, and Trinity River basins

Texas pigtoe *Fusconaia askewi* T

rivers with mixed mud, sand, and fine gravel in protected areas associated with fallen trees or other structures; east Texas River basins, Sabine through Trinity rivers as well as San Jacinto River

REPTILES

		Federal Status	State Status

Alligator snapping turtle *Macrochelys temminckii* T

perennial water bodies; deep water of rivers, canals, lakes, and oxbows; also swamps, bayous, and ponds near deep running water; sometimes enters brackish coastal waters; usually in water with mud bottom and abundant aquatic vegetation; may migrate several miles along rivers; active March-October; breeds April-October

Texas garter snake *Thamnophis sirtalis annectens*

wet or moist microhabitats are conducive to the species occurrence, but is not necessarily restricted to them; hibernates underground or in or under surface cover; breeds March-August

Texas horned lizard *Phrynosoma cornutum* T

open, arid and semi-arid regions with sparse vegetation, including grass, cactus, scattered brush or scrubby trees; soil may vary in texture from sandy to rocky; burrows into soil, enters rodent burrows, or hides under rock when inactive; breeds March-September

DALLAS COUNTY

REPTILES

		Federal Status	State Status
Timber rattlesnake	*Crotalus horridus*		T

swamps, floodplains, upland pine and deciduous woodlands, riparian zones, abandoned farmland; limestone bluffs, sandy soil or black clay; prefers dense ground cover, i.e. grapevines or palmetto

PLANTS

		Federal Status	State Status

Glass Mountains coral-root *Hexalectris nitida*

GLOBAL RANK: G3; Apparently rare in mixed woodlands in canyons in the mountains of the Brewster County, but encountered with regularity, albeit in small numbers, under Juniperus ashei in woodlands over limestone on the Edwards Plateau, Callahan Divide and Lampasas Cutplain; Perennial; Flowering June-Sept; Fruiting July-Sept

Glen Rose yucca *Yucca necopina*

Texas endemic; grasslands on sandy soils and limestone outcrops; flowering April-June

Hall's prairie clover *Dalea hallii*

GLOBAL RANK: G3; In grasslands on eroded limestone or chalk and in oak scrub on rocky hillsides; Perennial; Flowering May-Sept; Fruiting June-Sept

Osage Plains false foxglove *Agalinis densiflora*

GLOBAL RANK: G3; Most records are from grasslands on shallow, gravelly, well drained, calcareous soils; Prairies, dry limestone soils; Annual; Flowering Aug-Oct

Plateau milkvine *Matelea edwardsensis*

GLOBAL RANK: G3 ; Occurs in various types of juniper-oak and oak-juniper woodlands; Perennial; Flowering March-Oct; Fruiting May-June

Texas milk vetch *Astragalus reflexus*

GLOBAL RANK: G3; Grasslands, prairies, and roadsides on calcareous and clay substrates; Annual; Flowering Feb-June; Fruiting April-June

Tree dodder *Cuscuta exaltata*

GLOBAL RANK: G3; Parasitic on various Quercus, Juglans, Rhus, Vitis, Ulmus, and Diospyros species as well as Acacia berlandieri and other woody plants; Annual; Flowering May-Oct; Fruiting July-Oct

Warnock's coral-root *Hexalectris warnockii*

in leaf litter and humus in oak-juniper woodlands on shaded slopes and intermittent, rocky creekbeds in canyons; in the Trans Pecos in oak-pinyon-juniper woodlands in higher mesic canyons (to 2000 m [6550 ft]), primarily on igneous substrates; in Terrell County under Quercus fusiformis mottes on terrraces of spring-fed perennial streams, draining an otherwise rather xeric limestone landscape; on the Callahan Divide (Taylor County), the White Rock Escarpment (Dallas County), and the Edwards Plateau in oak-juniper woodlands on limestone slopes; in Gillespie County on igneous substrates of the Llano Uplift; flowering June-September; individual plants do not usually bloom in successive years

Reference 60

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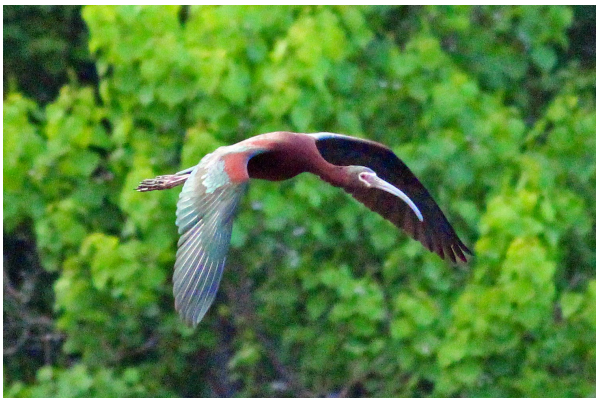
Dallas Trinity Trails

This practical guide takes readers to the best trails found in the Great Trinity Forest, all within easy reach of Downtown Dallas. Destinations include less traveled, low-traffic areas for hiking, mountain biking and horseback riding in the City of Dallas. Joppa Preserve, McCommas Bluff Preserve, Trinity River Wetlands, Texas Horse Park, Dallas Trinity Paddling Trail, Lower White Rock Creek, Sycamore Dixon, Texas Buckeye Trail, Dallas Whitewater Wave, Levee Trails, Rochester Park and more.

SUNDAY, MAY 25, 2014

White Faced Ibis and Migrating Wading Birds at Joppa Preserve



The Texas White Faced Ibis a State Threatened Species in Dallas, Texas May 23, 2014

Certain shorebird and wading bird species are the first push of migratory Central and South American birds through the Great Trinity Forest every year. They are only seen for a brief time as flock after flock stop to refuel for a day or even just an evening in the small ponds and wetland habitat along the Trinity River.

White Faced Ibis silhouette in the fading sunset light May 23, 2014

The birds in many cases have flown the entirety across the Gulf of Mexico over water from the Yucatan to the mouth of Trinity Bay, non-stop. Others have flown across the Andes and the Sierra Madre working their way up the tidal pools and mud flats of the Pacific. Here they are, for a brief moment in time, in Dallas.

POPULAR POSTS

"Garzilla" record sized Alligator Gar caught on Trinity River

One of the largest Alligator Gar ever caught in Texas was landed on the Trinity River south of Dallas by Joseph Williams on April 14th. Texa...

Lower White Rock Creek Valley Trails

White Rock Creek runs south from Dallas' best-known land form, White Rock Lake. But for all the popularity of the old city reservoir, t...

Dogwood Canyon and Cedar Ridge Preserve – Hiking Into The Refugium

Climbing high in the tree tops of a century old Flowering Dogwood (Cornus florida) stand, Dogwood Canyon, Dallas County, Texas Mast...

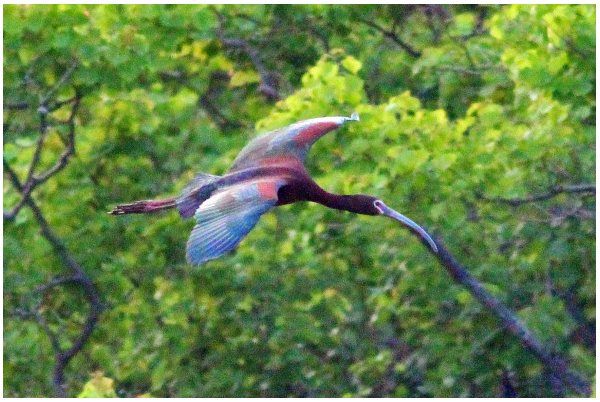
Trinity Forest Golf Course Construction Visible in Google Earth

The Trinity Forest Golf Course as seen from Google Earth As details of the Trinity Forest Golf course slowly take shape, so does the ph...

Miller's Ferry, 3000 Years of Human History At

Little Lemmon Lake full of shorebirds

The drier than normal spring in 2014 has been harsh on many aquatic species and waterfowl. What is poor for some species is great for others. The mudflats of the half empty ponds and small lakes like Little Lemmon Lake in Joppa Preserve provide near perfect habitat for these birds.



White-Faced Ibis in full breeding plumage Dallas, Texas May 23, 2014

Rare birds call this place a brief home, a roadstop motel of a place.

One such species, listed in Texas as a Threatened Species, the White Faced Ibis is a very rare sight to Texans.

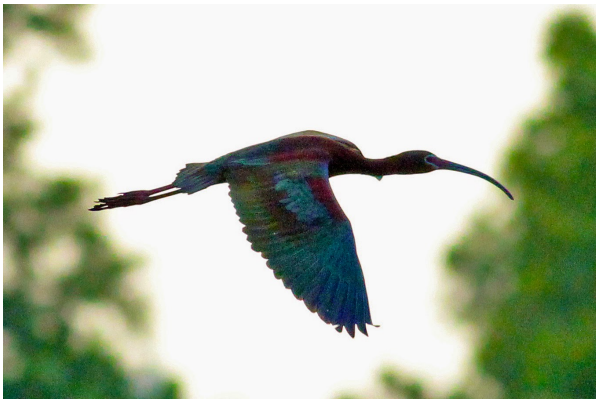
The White-Faced Ibis is a long-legged wading bird with reddish eyes and a long, slender, decurved bill. Plumage is chestnut colored with green and purple iridescent. During the breeding season, a white feather border can be seen around the base of the bill along with red lores and legs. Juveniles lack the white on the face and the red legs.

To Dallasites the bird is very rarely if ever seen. A "life bird" for many who keep a checklist, seeing one in the wild would be a year's highlight for many birding types.

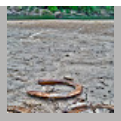
The White-Faced Ibis is threatened due to habitat loss. It needs wetland areas exactly like those in the Great Trinity Forest to thrive.

The shallow wading pools in short grasses, flooded marsh and lowland areas are their prime habitat. Very few of these places still exist. It's a real gem to have places like that here in Dallas.

Appreciated by few humans but adored by wildlife, the next year or two will tell the tale whether or not changes to the Trinity Forest will be impacted by construction plans.

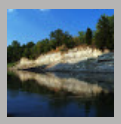


American Avocet Recurvirostra americana



Your Feet

No spot concentrates more history into the size of a tennis court than Miller's Ferry in Dallas on the Trinity River. Exploration....

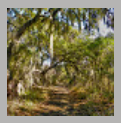


McCommas Bluff Preserve and Trails

McCommas Bluff Preserve on Trinity River Dallas, Texas The McCommas Bluff Preserve, in South Central Dallas County, is in a historical ...

Natural Springs In Dallas – Radiocarbon Dating One Of Texas Last Surviving Natural Springs

One of the few natural springs left in Texas and one of just a handful on public property, Big Spring is quickly becoming a focal point o...



Goat Island Preserve, Sand Branch and Parson's Slough

This is an epic to the historic, and still fresh in the minds of people, the mystic and fearsome Bois d'Arc Is...

Coombs Creek Trail Oak Cliff

Coombs Creek Trail along Kessler Parkway The handful of times I have ridden this trail it seems I am shadowed by house gawkers driv...

The Largest Wildflower Meadow in Dallas

Acres of marsh loving Clasping Coneflower (Rudbeckia amplexicaulis) as far as the eye can see in the Back Forty below Big Spring in the ...

With its unique coloration, long legs and elegant profile, the American Avocet is striking among North American birds. The Avocet is a migratory shorebird that is characterized by a long, thin upcurved bill with distinctive black and white markings on its back and sides

The American Avocet or Recurvirostra americana is a long legged shorebird in the stilt family. It is considered a large shorebird at eighteen inches in length. The Avocet is charecterized by a long, thin bill that curves upward, more so in the female.

Year round it has a distinctive and signature black and white stripped pattern on its wings and back. During the breeding season the head and neck are a pinkish-tan. During the winter they turn more white.

PREVIOUS POSTS

► 2015 (9)

▼ 2014 (28)

► December (2)

► November (2)

► October (2)

► August (1)

► July (4)

► June (4)

▼ May (4)

I-20 Dowdy Ferry Gateway Park and Horse Trail

White Faced Ibis and Migrating Wading Birds at Jop...

Paint The Trinity a Bloody Red With Indian Paintbr...

Texas Bluebonnets and Early Spring Wildflowers In ...

► April (1)

► March (2)

► February (3)

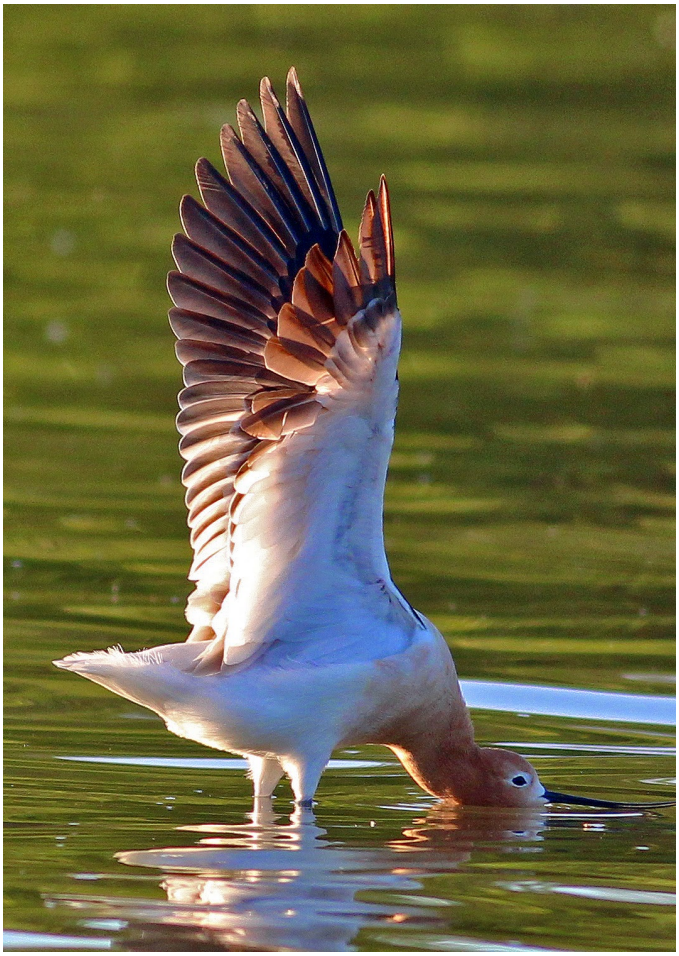
► January (3)

► 2013 (38)

► 2012 (43)

► 2011 (35)

► 2010 (1)



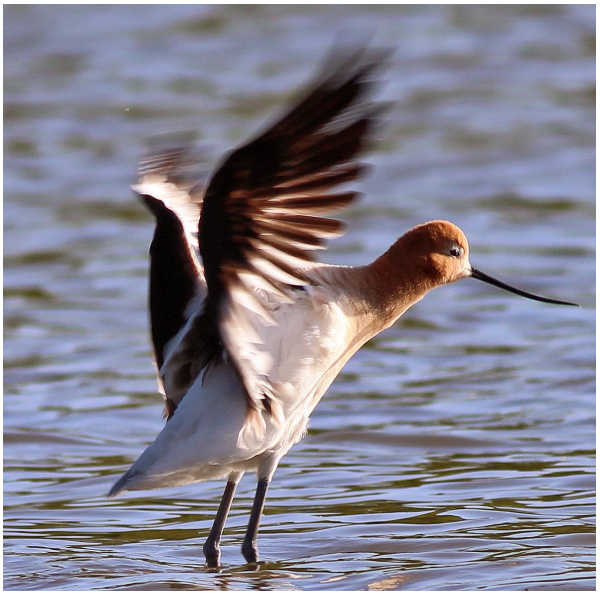
American avocets prefer open water and marshy summer habitats such as lakes and ponds throughout the central plains of the United States, including the Rocky Mountain region and Canada.

During the winter avocets migrate to saltwater or brackish areas of the central and southern California coast, Baja California and the southeastern Atlantic coast as well as throughout Mexico and the Caribbean. Year round populations can be found along the South Texas coast and the southern California coast.

American Avocets forage while wading in shallow water by sweeping their curved bills back and forth along the surface of the water, or they can use their bills to probe into mud for insects or crustaceans. They may feed in flocks, and may dabble for food in deeper water.

Avocets are important members of their ecosystem; because of their food habits they likely have a regulatory influence on insect and crustacean populations, and they are an important food source for their predators. They also have an influence on the plants they eat as they often broadcast seeds into new areas.

Currently protected by the US Migratory Bird Act, American Avocets are making a comeback after over-hunting in the 19th and early 20th centuries. The main threats to American Avocets today are habitat loss and degredation.



Foraging With Migrating Shorebirds

Wilson's Phalarope in foreground and Lesser Yellowlegs in background

Often called the "Father of American Ornithology", Alexander Wilson 1766-1813 was instrumental in the early scientific study of birds in what is now the Southern United States. His sketches and plates were some of the first that featured the American

Plate by Alexander Wilson circa 1807

Avocet, Lesser Yellowlegs, Roseate Spoonbill and various small shorebirds.

A number of bird species now carry the "Wilson's" name as an honor to the man who first studied them at length.

Wilson authored the nine-volume American Ornithology (1808–1814). Of the 268 species of birds illustrated there, 26 had not previously been described.

Lesser Yellowlegs Tringa flavipes

In winter, the Lesser Yellowlegs is found along the coasts of Mexico, Central America, South America, and the Caribbean. The largest concentration of wintering birds occurs in Suriname and along the Gulf of Mexico.

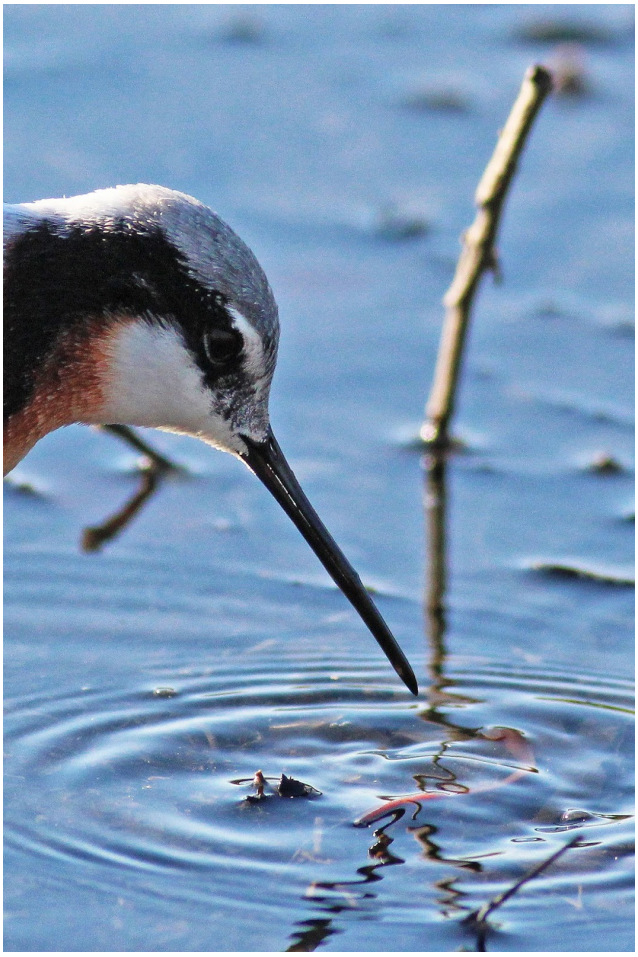
Lesser Yellowlegs breed in interior Alaska and northern Canada. They breed between 51 and 69 degrees north latitude in suitable habitat. They breed farther north than their close relative, Greater Yellowlegs (Tringa melanoleuca), where they co-occur. Historically, some populations of Lesser Yellowlegs might have bred farther south then they do currently.

Wilson's Phalarope Phalaropus tricolor

Wilson's Phalaropes are a relatively small, long-legged shorebird. They are unique among Texas birds in that they are one of only a few species in which the female is much more brightly colored than the male.

The Wilson's Phalarope can be distinguished from most other shorebirds by the bright coloration on their neck and head. Additionally, unlike other shorebirds, Wilson's Phalaropes often feed while floating on the water, sometimes spinning like tops to stir up aquatic invertebrates.

The relatively long, thin bill, and bold blackish stripe on the neck and face distinguish the Wilson's Phalarope from the red-necked phalarope (Phalaropus lobatus), which is a migrant in Texas.



In Texas, Wilson's Phalaropes are most frequently found in wet prairie, flooded plains and other grass or sedge dominated wetlands. The presence of short vegetation in or adjacent to shallow pools of open water is an important microhabitat feature. Human-altered habitats, particularly flooded pastures and municipal wastewater treatment ponds, may also provide suitable habitat.

Because microhabitat conditions are very important to the Wilson's Phalarope, water conditions greatly influence habitat use. The shallow wetlands on which this species depends are very sensitive to alteration, especially drainage and degradation resulting from human activities. When water levels are low, wetlands may be avoided due to the lack of standing water. Wetlands dominated by shrubs are also avoided by the Phalarope due to the increase risk of predators.

Artificial habitats, such as flooded agricultural fallow fields, may be utilized by Wilson's Phalaropes because they provide necessary conditions lacking in native habitats.

Wilson's Phalarope with a worm in the recently flooded leaf detrius after a spring rain in 2014

Killdeer Charadrius vociferus

The killdeer is Texas most well-known member of the plover family, although many people know the killdeer without understanding its family affiliation. The killdeer can be common around human developments, frequently seen on playing fields, parking lots, and other unnatural habitats. Its “broken-wing” display is famous and known by many.

The killdeer often forms flocks after breeding in late summer. It feeds in fields and in a variety of wet areas, and in general, it is not prevalent on mudflats. It is noisy! Breeding residents to North Texas they are a common site.

Spotted Sandpiper Actitis macularius

Spotted Sandpipers are the most widespread sandpipers in the United States, having colonized their broad breeding and winter ranges by using almost all habitats near water. These include the shorelines of large rivers and lakes to urban and farm ponds.

Spotted Sandpipers (Actitis macularius) are found throughout North and Central America, including the western Caribbean islands. Their breeding range extends from the northern Arctic to the southern United States. Their wintering grounds range from the extreme southern United States to southern South America, along with all the Caribbean islands. Spotted Sandpipers live year-round along the western coast of the United States and in parts

of California.

The Spotted Sandpiper is a common migrant throughout the Lone Star State from late March to early May. The fall migration period extends from early July to mid-October. Absent in the hottest of summer months, they are quite common in the Great Trinity Forest ponds in the late summer and early fall.

These sandpipers are winter residents in Texas with abundance varying from common to rare depending on latitude and climate.

Posted by DallasTrinityTrails at 9:58 AM

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2 COMMENTS:

Anonymous May 25, 2014 at 6:11 PM

Wow, Ben. What a marvelous set of photos. Dave McNeely

Reply

Anonymous May 25, 2014 at 6:46 PM

Yeah, I agree. There are some really great photos in this set!

-CJ

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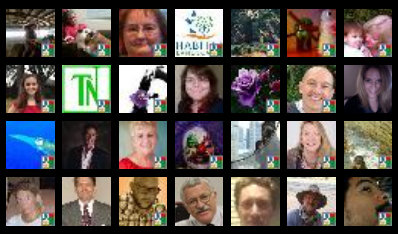

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Reference 61

Dec 03 2014

What is the Great Trinity Forest?

Journal

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The Great Trinity Forest—many have heard of it, but how many of us really know what it is?

In the simplest terms, the Great Trinity Forest is roughly six thousand acres of mostly bottomland woods that follow the Trinity River and White Rock Creek as they flow through South Dallas. It is claimed to be the largest urban hardwood forest in the country, and the City of Dallas wants to develop it for your recreational use.

Transforming this long forgotten and often abused parcel of land into a place suitable for real outdoor recreational activities—while at the same time preserving the park's unique natural heritage—will be a massive undertaking. It will require the participation and cooperation of many different institutions and organizations, and will likely take years or decades of work to come to fruition.

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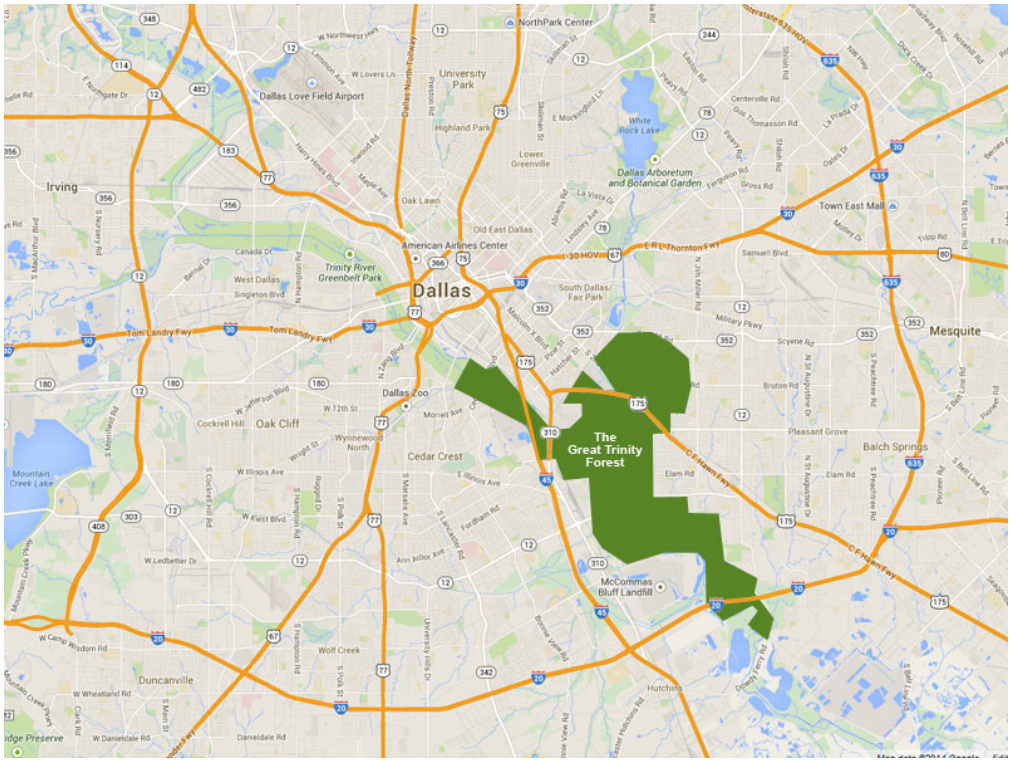

It is hard to pin down a comprehensive list of just which entities are involved in the development and marketing of the Great Trinity Forest. Here are some of the names I have heard to date: Trinity River Authority, US Army Corps of Engineers, Utility Companies, Dallas Parks and Recreation, Dallas County Open Spaces Program, Trinity Watershed Management Department, and, of course, the City of Dallas itself.

Other organizations involved include Groundwork Dallas—one of many groundwork trusts across the country started by the Environmental Protection Agency (EPA) and the U.S. National Park Service, Dallas Off-Road Bicycle Association (DORBA), and the Audubon Society which manages the Trinity River Audubon Center.

There is much more to the Great Trinity Forest than just the sum of all its composite acres. Written in these woods is the history of this area all the way back to prehistoric times. Important archeological sites are scattered about the map in a way that makes it abundantly clear just how vital this part of the Texas has been

Journal – Raptor Release

Dateline – February 3, 2013

Wildlife rehabilitation is a labor of love for which the rewards are not always tangible. Heroic efforts are often required [...]

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White-tailed Deer – Grand Park Video

White-tailed Deer videoed with a Scouting Camera in Grand Park, Frisco, Texas. The deer in the first video were recorded on the east side [...]

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Great Horned Owl – VCDB Nest

Across a swamp, high in a tree, and nestled in the middle of a Great Blue Heron rookery is a nest that is a little [...]

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15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

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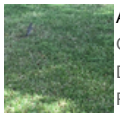
iNaturalist.org

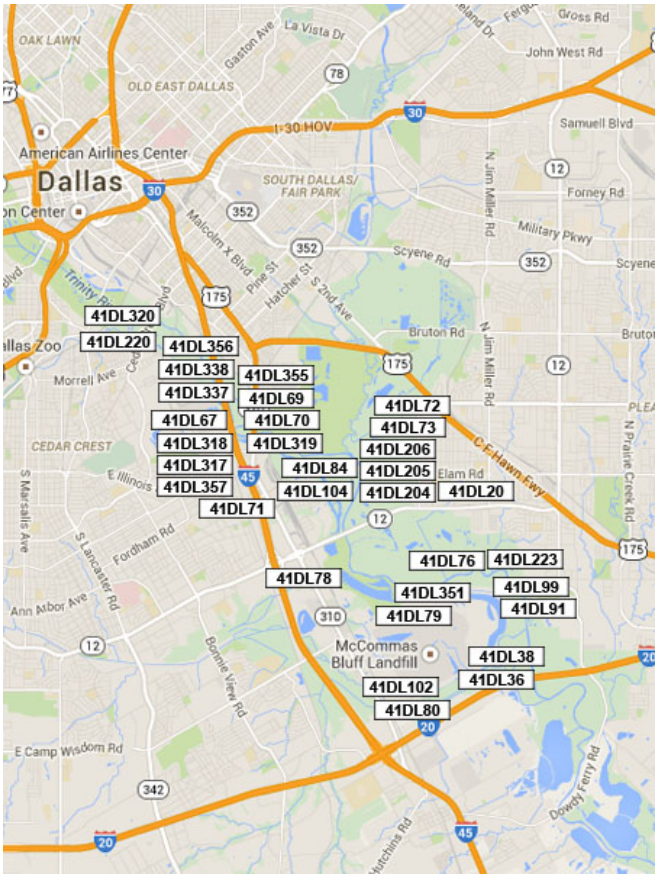
American Robin
Observer: bpthatruth
Date: Mar 31 2016
Place: 3000 Cockrell Ave, Fort Worth, TX, US



American Robin
Observer: bpthatruth
Date: Mar 31 2016
Place: Texas Christian University, Fort Worth, TX,

to people throughout the region's history.

There is a certain mystique about these woods that makes the Great Trinity Forest stand out from all the other natural areas in and around the metroplex. The essence of its compelling aura is hard to put a finger on, but it surely has something to do with the exotic nature of the park itself.



Archaeological sites in the Great Trinity Forest.

Unique by its very urban nature, the Great Trinity Forest is also home to some of the most fascinating species of wildlife that North Texas has to offer. White-tailed Deer, River Otters, American Alligators, Bald Eagles, Feral Hogs, Crested Caracaras, Wood Storks, ibises, Roseate Spoonbills, Ospreys, Bald Eagles, and Swallow-tailed Kites can all be found here.

Also extraordinary is the amazing topography of the region. Hidden lakes, impenetrable swamps, bubbling springs, a mighty river, meandering creeks, and vista views are all located within the park's boundaries. Like a powerful magnet, these compelling features create an irresistible draw to those of us who are inclined to outdoor adventure.

But, just like a magnet the Great Trinity Forest also has a repulsive side. In these woods there is the ever present feeling that something is just not quite right—a sense that there is trouble to be found here.

Evidence abounds in these woods of a discouraging amount of past abuse and neglect that the area been forced to endure. Landfill and mining operations—some legal, and some not. Unbridled pollution, evidence of marijuana farms, poaching, and other illegal behaviors can still be be found in various places about the park. The Great Trinity Forest is a place with a lot of potential, but it's not yet an enchanted forest.

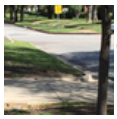
Good or bad, one thing is certain—the Great Trinity Forest makes a big impression on those who come to visit it. Here are a few first impressions recorded over the last several years from other metroplex writers:

- D Magazine – Great Trinity Forest to Change the Way We Regard Dallas
- Dallas Observer – The Great Trinity Forest Ain't So Great
- CBSDFW – The Best-Kept Secret In Texas… The Great Trinity Forest

Any talk about what the Great Trinity Forest is cannot be considered complete until what the Great Trinity

US

Mourning Dove
Observer: codyfrazier
Date: Mar 31 2016
Place: Texas Christian University, Fort Worth, TX, US



Fox Squirrel
Observer: coordwiseman
Date: Mar 31 2016
Place: 2829 W Cantey St, Fort Worth, TX, US

Great Blue Heron
Observer: dwboston
Date: Mar 31 2016
Place: County Road 916, Godley, Johnson County, Texas, United States

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Scott Kurtz (Paperback - Sep 12, 20...
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Local Weather

Dallas, Texas
March 31, 2016, 2:26 pm

Partly sunny
71°F
6 m/s
real feel: 74°F
current pressure: 30 in
humidity: 34%
wind speed: 6 m/s NW
wind gusts: 6 m/s
sunrise: 7:16 am
sunset: 7:46 pm
© 2016 AccuWeather, Inc.
Forecast March 31, 2016
day

Mostly sunny

Forest could be is also discussed. A few years ago the Dallas Urban Forest Advisory Committee put together a few recommendations for the management of the Great Trinity Forest. that document can be found here:

- Dallas Urban Forest Advisory Committee – Great Trinity River Forest Management Plan Recommendations

And here is the city's management plan document that followed about a six months later:

- Great Trinity Forest Management Plan Update August 19, 2008

Constitution of The Great Trinity Forest

The Great Trinity Forest is comprised of many different areas—some are named and some are not. The most important of the named places are noted on the map below, and each is addressed in more detail later in this article.

Trails of The Great Trinity Forest

A trails system, similar to the one illustrated below is planned to tie the many disparate parts of the Great Trinity Forest together. A good number of these trails already exist or are currently being built. The connectors leading out of the forest and into the city in the north being the major exceptions. There is also a fairly extensive system of unofficial soft surface trails and passable utility right of ways cutting through the blank spaces on this map.

76°F
wind speed: 5 m/s NNW
wind gusts: 8 m/s
night

Mostly clear
50°F
wind speed: 3 m/s NNE
wind gusts: 6 m/s

As you can see, long stretches of the trail system have been built through heavily wooded and isolated areas. In the past the trails have not been well maintained, and even wide concrete paths have begun to be overgrown in places. Some of the soft surface trails have been neglected to the point where extensive repairs will be needed to bring them back to their original condition. Unauthorized vehicular traffic have damaged others.

At the present time, none of these trails are regularly patrolled by law enforcement and are they seldom used by the public. All too often the trails are instead being used to facilitate dumping, poaching, and other illegal activities.

- Dallas Morning News – Dallas OKs Trail Project Near Environmentally Sensitive Great Trinity Forest

Big Spring

Conservationists and preservationists have been working hard for the better part of the last two years to protect historic Big Spring from clumsy horse park and golf course construction and over zealous trail building plans.

This is a place steeped in Texas and Dallas History. The founding families of Dallas called the lands around the spring home. Some of their descendants still do today.

Five Mile Island

Protected by a moat of murky water, Five Mile Island is one of the most remote and wild areas in the Great Trinity Forest. The channelized Trinity River forms a daunting barrier on the east, while the remnants of the old river following its original path wrap around the north and west sides of the island. Five Mile Creek cuts across the southern end of the property and blocks an approach from that direction.

People rarely visit this part of the Great Trinity Forest simply because it is all but unreachable, except by the most determined explorers. The result of all this isolation is that wildlife abounds here.

A small herd of White-tailed Deer in the shadows of downtown Dallas.

Feral Hogs grow confident and large in the safety of the isolation here.

Coyotes do not expect to encounter people in this part of the forest.

Great Trinity Forest Overlooks

Some of the highest elevations and grandest views the Great Trinity Forest has to offer can be found in this part of the park. A series of six overlooks mark the vistas, with each providing a commanding view of Dallas and the expansive woods in between.

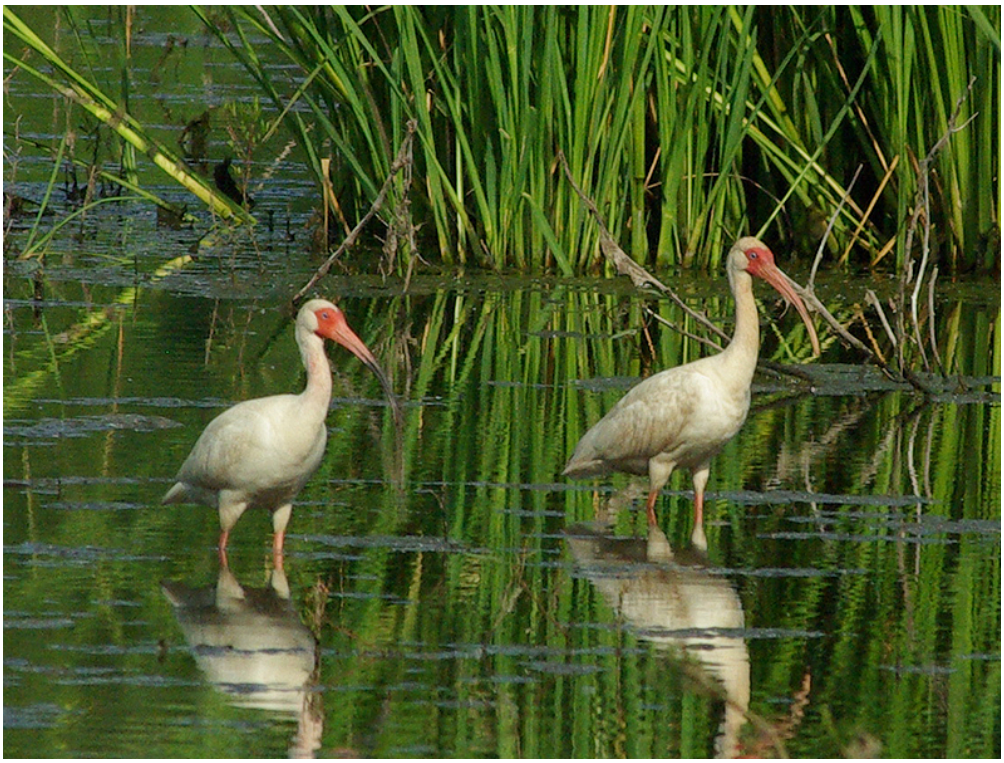
Joppa Preserve

When Lemmon Lake is holding water this place is the crown jewel of the Great Trinity Forest. There are sights to be seen here that are unique to any place in Texas—even our most remote wildernesses.

Unfortunately, Lemmon Lake is drought dry, and has been since the summer of 2012. Little Lemon Lake to the north was also bone dry the last time I stopped by. Without water, the exotic wildlife that normally calls this preserve home has been forced to seek out new haunts. Hopefully, the animals will return when the water is restored.

The Joppa Preserve is part of the Dallas County Open Space Program. You can find more information here: Dallas County Open Space Program – Joppa Preserve

A sounder of Feral Hogs at Lemmon Lake



White Ibis

Roseate Spoonbill

A rare Wood Stork

Below is a video montage made up of footage recorded at Lemmon Lake just days before it dried up in the summer of 2012. All night long Feral Hog were came to the last pools of water to feed on the stranded fish they contained.

The Lower Chain of Wetland Cells was built on top of the Sleepy Hollow Golf Course. The old golf course was prone to flooding and reportedly suffered from odors wafting in from the nearby water treatment plant. Nonetheless, the previous owner was reluctant to part with the property and it was ultimately taken over by eminent domain. Here is an article from 2003 that chronicles that last days of Sleepy Hollow:

- Dallas Morning News – Trinity swallows Sleepy Hollow

Unfortunately, vehicular access has not been restricted in the Lower Chain of Wetland Cells and it has become a favorite place for mud trucks and illegal dumping. Big four wheelers have done serious damage to the land and to native vegetation mitigation put in place by Lewisville Aquatic Ecosystem Research Facility (LAERF) and the Corps of Engineers. Poaching and other forms of general lawlessness have been reported here as well.

McCommas Bluff Preserve

The McCommas Bluff Preserve is another natural area setup by the Dallas County Open Space Program. More information can be found here: Dallas County Open Space Program – McCommas Bluff Preserve

From a historical context, this preserve is one of the more interesting places in all of the Great Trinity Forest. On this property is the site of the planned Trinity City, a town intended to become northern most port city on a navigable Trinity River.

Of course, making the Trinity passable for barge traffic is a dream that never was realized—there were just too many obstacles and impossibilities. Nonetheless, several efforts have been made to give it a go. Lock and Dam Number One was built around the time of the First World War and the remains of an even older lock and dam dating back to the late 1800s still sit in the river at this spot as testaments to failed aspirations.

I have spent a good deal of time in this part of the Great Trinity Forest. Here is an account of one such visit which includes an overview of the area's history: Jornal – McCommas

The limestone cliffs of McCommas Bluff.

A closeup look at the remains of the 1893 lock and dam. Notice the iron rods still in place after all these years.

The 1893 lock and dam and the 1916 Lock and Dam in context.

Lock and Dam Number One is regularly clogged with snags, dead-falls, and other debris.

While the McCommas Bluff Preserve has great appeal, there is also a dark side to this part of the Great Trinity Forest. Abandoned marijuana farms are hidden in the woods, and this is a popular spot to dump stolen cars. Evidence of poaching has been found near some of the informal trails along the north side of the river. Caution is warranted when you visit this place.

A stolen car burned to a crisp in the McCommas Bluff Preserve.

Rochester Park

Rochester is a big park—comprised of over 980 mostly wooded acres. Within its boundaries are the Buckeye Trail, the confluence of White Rock Creek and the Trinity River, and a large pond known affectionately as Bart Simpson Lake (turn your head to the side when you look at the map below).

Also known as William Blair Park. City of Dallas Parks and Recreation Department information can be found here: Dallas Parks and Recreation – William Blair Jr. Park

Roosevelt Heights

Construction on the new course is well under way, but all has not gone as smoothly as hoped. There have been a number of environmentally insensitive missteps resulting from the construction effort. Several have been concerning enough to make the local news:

- Dallas Morning News – Digging and Draining Raise Concerns About City's Care of Great Trinity Forest
- Dallas Morning News – Editorial: Drained Trinity Pond Drains Confidence
- Dallas Observer – Dallas Broke Its Own Rules to Get Dirt for Its Golf Course. Now, It Wants a Free Pass.
- Dallas Observer – Trinity Forest Lovers Get Tossed into City Hall's Wood Mulcher
- Dallas Observer – One Drained Pond, a Few Chopped Trees Aside, Trinity Project Doing Great, Carolyn Davis Says
- Dallas Morning News – Sounding Off: Best Southwest, Oak Cliff and Grand Prairie Readers Tell Us What Should be Done About Great Trinity Forest Wetland Destruction
- Dallas Morning News – Dallas Officials Grilled on Pond Draining in Trinity Forest

Trinity River

Of course the center piece to the whole Great Trinity Forest is the mighty Trinity River itself. I love this river. It has been abused and polluted for decades, but it is still holding its own. It is a dark slow moving river that exudes power and beauty, but it also elicits a not-so-subtle sense malevolence.

There is much adventure to be found along this river which is why I keep returning time and time again. You can read an account of one such foray here: Journal – Trinity River Adventure

The Trinity River at Dawn.

This location is the site of Miller Ferry. This site was important all throughout the second half of the 1800's. Notice the fishermen in the background. That's the South Central Expressway bridge in the distance.

Limestone seeps and the MKT Trestle.

Downtown Dallas near the Dallas Standing Wave.

Trinity River Audubon Center

For those looking for a more packaged outdoor experience there is the Trinity River Audubon Center. Completed in 2008, the Audubon Center has been facilitating a variety of nature related activities ever since. Sponsored activities include academic programs, adult programs, children and family programs, and citizen science efforts.

The Trinity River Audubon Center (also know as the TRAC) is probably the best way to introduce yourself to what the Great Trinity Forest has to offer. In spite of this, and after several years in operation, the Audubon Center still seems to be struggling to find a marketable identity:

- Dallas Morning News – Dallas' 4-year-old Trinity River Audubon Center Struggles to Draw Visitors

Using the TRAC as a base of operations for sponsored tours of the Joppa Preserve, the McCommas Bluff Preserve, the Trinity River, and other special areas in the Great Trinity Forest might help to broaden its appeal.

Upper Chain of Wetland Cells

The Upper Chain of Wetland Cells are being developed in conjunction with the planned Lamar Levee near downtown Dallas. Three news cells (or small lakes) are currently in the early stages of construction. When completed the Upper Chain of Wetlands Cells will provide flood control and wildlife habitat just two miles from Dallas City Hall.

You can view the US Army Corps of Engineers fact sheet for this project here: USACAE – Upper Chain of Wetlands Fact Sheet

In general I think the answer to this question is no. A lot will depend on where you go and what you try to do while you are there. It is not difficult to make your way into an isolated and rugged area where an incapacitating injury could leave you stranded for hours or longer—and that assumes you have a cell phone to call for help.

There is also a criminal element that pervades these woods. The isolation provides cover for nefarious acts of varying degrees of villainy. Your best policy if you decide to visit, is to go with a group and stay alert. Keep your cell phones handy and be careful. Do not wander too far from the well traveled paths.

The situation may be improving soon. The City of Dallas and the Dallas police Department have finally acknowledged that, if they are going to invite citizens into these woods, then they have a responsibility to provide for a reasonable amount of public safety. There is still a lot of work to be done though:

- Dallas Morning News – Holy Trinity, Batman! Dallas Police Trying to Come up With a Plan for Keeping the Trinity River Corridor Safe
- Dallas Morning News – As Dallas PD Looks for Ways to Keep Trinity River Safe, It Might Want to Consult 5-year-old Design Guidelines

Closing Thoughts

Is there anything really unique about another golf course? A horse park? A network of isolated concrete trails? Isn't there any other way to make the Great trinity Forest something truly special and original?

I cannot offer expert opinion on the Great Trinity Forest with regard to what it is or what it should become. All I know for sure is what I like and what I prefer.

I am tempted to imagine what things might be like if we considered setting the Great Trinity Forest aside as a real nature preserve. A place that would serve as a largely undisturbed natural area providing an appealing accent to all of the urban sprawl. Trails and a select few parks could be built along the perimeter of the woods in places that could actually be kept safe. In addition to recreation, these pathways could be used for regular patrols by law enforcement to help illuminate unwarranted access into the interior and to ensure public safety.

A concerted effort to clean up the river and the woods would be required to undo decades of neglect. Serious access control would need to be installed around the entire perimeter in order to limit unauthorized vehicular access and illegal dumping.

The current plan for concrete trails through isolated areas does not seem to be a well thought out idea. It will be difficult to provide for public safety through most all of the areas the trails will run through. As I noted earlier, if vehicular access is not effectively restricted then the trails will most likely be used to facilitate illegal dumping and other criminal activities.

After cleaning the river and the forests and securing the perimeter, the interior could then be left to the wildlife in the woods and canoeists on the river. The rest of us could enjoy the view of a large and uniquely undisturbed natural area right here in the heart of one of the largest metropolitan area in the United States.

The horse park is not the Great Trinity Forest. Nor is the new golf course. Nor is the standing wave. Not even the Audubon Center is the Great Trinity Forest. These are just places that have chipped away at what these woods really are and really can be. Trees had to be bulldozed in order to put these places on the map, and bulldozed trees do not make a forest—Great Trinity or otherwise. If they keep developing the forest for this or that attraction, then eventually there will be nothing left. Hopefully that outcome can be avoided.

For those who are interested, the best way to help protect the Great Trinity Forest is by simply staying as well informed as is possible—the behavior of all of the entities involved changes for the better when they know people are watching. As always, the best place to stay current on all things Great Trinity Forest is via Dallas Trinity Trails, the excellent blog by Ben Sandifer. Be sure and check it out.

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Aug 24 2013

Wood Stork – More Nostalgia

Birds, Wood Stork

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These are pictures from my archives. They were taken at Lemmon Lake in the Joppa Preserve last summer when it still held water. Lemmon Lake dried completely just a few weeks after these pictures were taken, and it has not refilled in the interim.

When filled with water Lemmon Lake attracts a number of rare birds that are difficult to find in other places, regardless of if you look in the city or out. These are Woods Storks congregating in the low light of predawn in Dallas, Texas.

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M	T	W	T	F	S	S
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	

« Jul Sep »

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Monthly Archives

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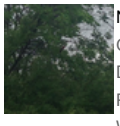
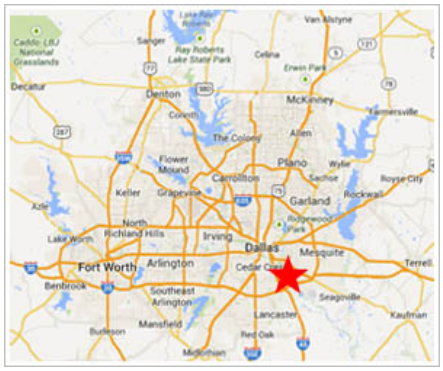


Northern Cardinal
Observer: katiesmith
Date: Apr 20 2016
Place: Tandy Hills Park, Fort Worth, TX, US

Leaf Beetles
Observer: katiesmith
Date: Apr 20 2016
Place: Tandy Hills Park, Fort

Observations Details

County–Dallas
City–Dallas
Date–Jul 15, 2012
Time of Day–Dawn
Temperature–Hot (greater than 89°F/32°C)
Weather–Partly Cloudy
Habitat–Recreation-Park
Type of Behavior–Congregating
Gender–Mixed
Maturity–Adult
Observer–Chris Jackson
Main Article–Wood Stork



Observation Location

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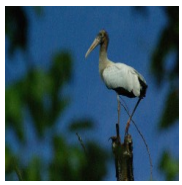
Wood Stork – Discovered

Wood Stork – A First

Mourning Dove – White Rock Lake

American White Pelicans –

Posted by CGJ at 6:00 am

Tagged with: Congregating, Dallas, Wood Stork

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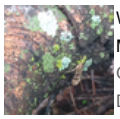
Your Comment

Worth, TX, US

Wasp Moths, Handmaiden Moths
Observer: katiesmith
Date: Apr 20 2016
Place: Tandy Hills Park, Fort Worth, TX, US


Wasp Moths, Handmaiden Moths
Observer: katiesmith
Date: Apr 20 2016
Place: Tandy Hills Park, Fort Worth, TX, US

Bumble Bees
Observer: katiesmith
Date: Apr 20 2016
Place: Tandy Hills Park, Fort Worth, TX, US

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Books by C.G. Jackson

In Your Backyard: Discovering...
C.G. Jackson (Paperback - Aug 4, 20...
$39.95

Nightmare
C.G. Jackson (Paperback - Jul 7, 2009)
$8.99

Operation Neptune Spear: The...
C.G. Jackson (Paperback - Feb 25, 20...
$21.99

Captain Amazing
Scott Kurtz (Paperback - Sep 12, 20...
$8.99

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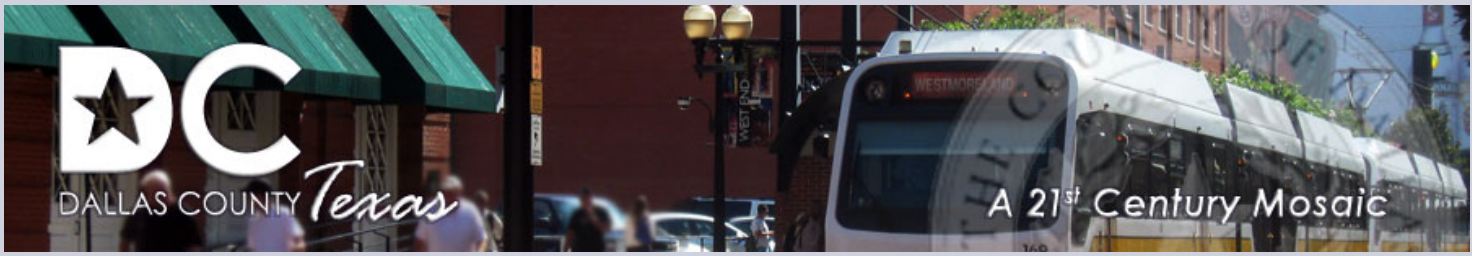
Local Weather

Dallas, Texas
April 20, 2016, 2:49 pm

Cloudy
69°F
3 m/s
real feel: 74°F
current pressure: 30 in
humidity: 67%
wind speed: 3 m/s NNW
wind gusts: 3 m/s
sunrise: 6:51 am
sunset: 8:01 pm
© 2016 AccuWeather, Inc.
Forecast April 20, 2016
day

Mostly cloudy

Reference 62



Home
Open Space Program
Cedar Mountain Preserve
Cedar Ridge Preserve
Cottonwood Creek Preserve
Elm Fork Preserve
Fish Creek Preserve
Grapevine Springs Preserve
Joppa Preserve
Lee F. Jackson Spring Creek Forest Preserve
Lester Lorch Park
Muddy Creek Preserve
McCommas Bluff Preserve
North Mesquite Creek Preserve
Palmetto Alligator Slough Preserve
Post Oak Preserve
Rowlett Creek Preserve
Spring Creek Park Preserve
Tenmile Creek Preserve
Trinity River Greenbelt Goat Island Preserve
Trinity River Greenbelt Riverbend Preserve
Trinity River Mountain Creek Preserve
Windmill Hill Preserve

Goat Island Preserve
Trinity River Greenbelt

Unincorporated Southeastern Dallas County 348 acres

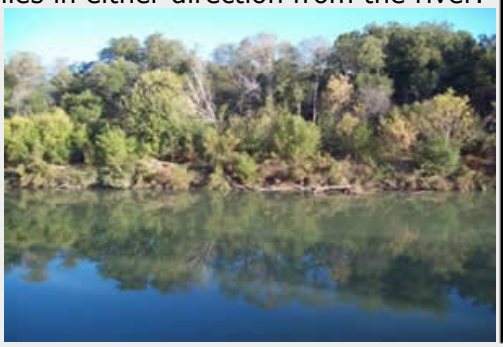
Entrances: Post Oak at Fulghum Road (2800 Post Oak)

Northwestern corner of intersection of Trinity River and Beltline Road

Mapsco: 79, Sections "E" and "J"
79A, Section "T"

Preserve Features

Visitors to Goat Island Preserve can enjoy beautiful views of the Trinity River and experience the woods and wildlife that once extended several miles in either direction from the river.



Preserve History

Goat Island is named for one of two islands located in the Trinity River.

The remnants of a lock and dam that were part of an effort to make the Trinity River navigatible are visible at the Preserve's south end. This effort, which was never completed, was begun by the U.S. Corps of Engineers at about 1910 and was discontinued because of World War I.

Containing 348 acres, Goat Island is the second-largest preserve in the County's open space system and is part of the County's goal to create a continuous public open space corridor along the unincorporated Trinity River. When combined with the County's 518-acre Riverbend Preserve which is located just south of Goat Island, there are now eight miles of almost continuous river-front property that is accessible to the public.

Preserve Amenities

Paved parking is available at the north end of the Preserve at Post Oak/Fulghum Road. Thanks to the Dallas Off-Road Bicycle Association (DORBA), the Preserve currently possesses about eight miles of natural surface trails that can be used for off-road cycling, hiking, or running.

Maintenance

Goat Island Preserve is maintained by the County. To report maintenance issues, please call the County's Open Space Program at (214) 653-6653.

Restricted Uses

Hunting and the use of alcohol, motorized vehicles, fireworks, or weapons are not permitted within the Preserve.

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Home | Government | Online Services | Departments
Contact Us | Help | Privacy Policy | ADA Statement

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Reference 63

Home
County Trail System
Individual Trails
Rules of the Road
City Trail Plans
Upcoming Projects
City Links
News Articles

Trinity River Trail

City of Dallas

The Trinity River Trail, which connects Dallas County's Joppa Preserve/Lemmon Lake and the Trinity River Audubon Center, currently has a length of about of about 4.5 miles. This twelve-foot-wide trail is the beginning of what is to become an extensive trail system along the Trinity River and already offers scenic views of the river as well as Little Lemmon Lake and Lemmon Lake which are popular stopping points for migratory birds.

Download larger map

Parking areas are available at the Little Lemmon Lake entrance off of Loop 12, at the main Joppa entrance off of River Oaks, and the Trinity River Audubon Center off of Loop 12/6500 Great Forest Way.

Trinity River Trail

DALLAS COUNTY TRAIL SYSTEM

DALLAS

This map has been prepared courtesy of **VIRGINIA COOK, REALTORS.**

The Trinity River Trail, which is located near both Dallas County's Joppa Preserve/Lemmon Lake and the Trinity River Audubon Center, currently has a length of about 4.5 miles. This twelve-foot-wide trail is the beginning of what is anticipated to be an extensive trail system along the Trinity River. The trail already offers scenic views of both Little Lemmon Lake and Lemmon Lake which are popular stopping points for migratory birds. Parking areas are available at the Little Lemmon Lake entrance off of Loop 12, at the main Joppa entrance off of River Oaks, and at the Trinity River Audubon Center at 6500 Great Forest Way.

P **Parking**

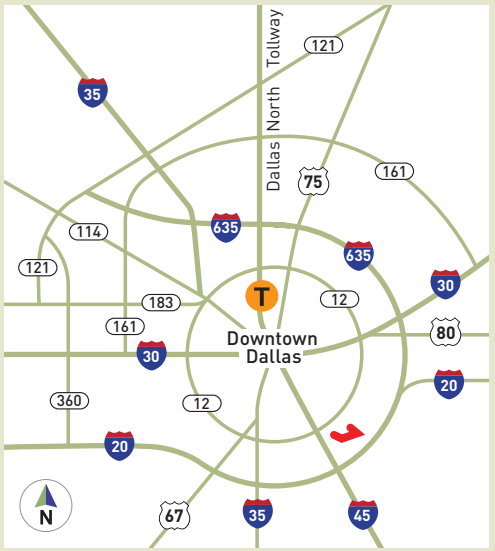
1 **Points of Interest**

1. Joppa Preserve
2. Trinity River Audubon Center
3. McCommas Bluff Preserve

N

Scale: 1" = 0.3 Mile

This map is for informational purposes and only represents the approximate relative locations of the labeled features. This map was published in January 2014.



General trail location shown in **red** above.

63 002

Reference 64

Trinity River Audubon Center

Photo: Sean Fitzgerald

Trinity River Audubon Center, located just ten miles south of downtown Dallas, is your gateway to explore the amazing resources of the 6,000-acre Great Trinity Forest. As the largest urban hardwood forest in the United States, this forest supports a diverse community of plant and animal species and contains a unique mixture of bottomland hardwoods, wetlands and grasslands. A part of the City of Dallas-Trinity River Corridor Project, the center's 120 acres sit on a former illegal dump site, now a reclaimed haven for a vast array of birds and other wildlife in an increasingly urbanized metropolitan area. Five miles of trails lead visitors through hardwood forests, pond, wetland, and prairie ecosystems, and along the Trinity River.

From its inception in 2008, as one of the National Audubon Society's flagship environmental education center in the Central Flyway, Trinity River Audubon Center has been welcoming visitors to its sanctuaries and inviting them to participate in nature education programs. This innovative approach—

preserving open space not just to protect wildlife and native habitat from people, but to actively engage people in its conservation through learning and exploration —served as a model for Audubon and other nature education centers nationwide and influenced the development of place-based experiential learning as a highly effective pedagogical practice.

The center itself, designed by 2006 AIA Gold Medalist architect Antoine Predock, is the first LEED-certified building constructed by the City of Dallas Park and Recreation Department. Its green features include a vegetated roof, rainwater collection system, energy efficient systems, and recycled materials.

Visitors have the opportunity to explore hands-on exhibits, five miles of nature viewing trails, our butterfly garden, and a great nature store with unique gifts and nature related items. Academic programs at the center are designed to address the need for students to improve and strengthen their science and critical thinking skills while introducing them to the wonders of nature.

The Trinity River Audubon Center offers everyone the opportunity to connect to nature and to experience the outdoors year around. Come discover for yourself – you will not be disappointed.

More About Our Center

Birds

Priority Birds

Birds we restore and protect habitat for.

Photo: Sean Fitzgerald

These species are given priority owing to status as a Species of Greatest Conservation Need for Texas (as listed in TCAP) and/or Climate Threatened or Climate Endangered status based on the National Audubon's Climate Initiative

work.

Little Blue Heron

Egretta caerulea

Northern Harrier

Circus cyaneus

American Kestrel

Falco sparverius

Pileated Woodpecker

Dryocopus pileatus

Scissor-tailed Flycatcher

Tyrannus forficatus

Harris's Sparrow

Zonotrichia querula

Painted Bunting

Passerina ciris

How you can help, right now

Support Our Center

Conservation and outdoor education along the Great Trinity Forest and the Trinity River.

Reference 65

National Wetlands Inventory

Ecological Services

NWI Menu

NWI Home

Wetlands Data »

Status and Trends »

Wetlands Layer »

Other Topics »

National Wetlands Inventory

Contact Information »

Help and Contacts

FAQ
Frequently Asked Questions

Contact Us

Wetlands Mapper

The Wetlands Mapper integrates digital map data with other resource information to produce timely and relevant management and decision support tools. We recommend looking at the following prior to launching a map:

1. Please read the Disclaimer, Data Limitations, Exclusions and Precautions, and the Wetlands Geodatabase User Caution.

2. Refer to the following links for documentation and answers to frequently asked questions:

- Wetlands Mapper Documentation and Instructions Manual (PDF)
- Frequently Asked Questions: Wetlands Mapper (PDF)
- Frequently Asked Questions web page Printing maps with the Wetlands Mapper (PDF)
- Mapper Introduction
- VIDEO: How to find and use the U.S Fish and Wildlife Service's Wetlands Mapper

New: Wetland Mapping Projects Mapper!

Click below to open the Mapper.

3.

Click Here to Open the Wetlands Mapper*

(data last modified on October 1, 2015;
best viewed by maximizing your browser window)

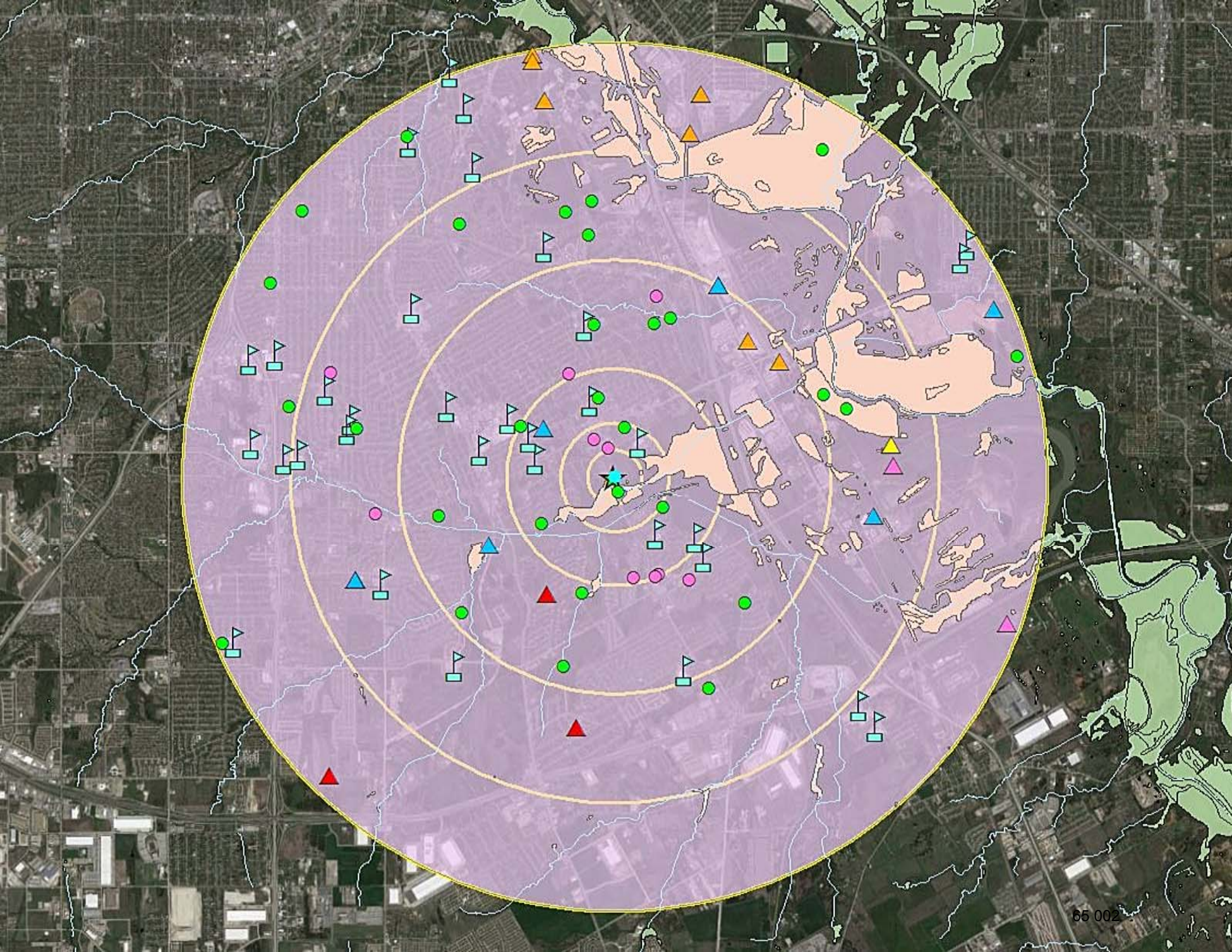
To beta test our new HTML5 (non-Flash) mapper on your desktop, click here (FAQs).

Please note:

- When in the wetlands mapper, you can change major geographic regions by using the "Zoom to: select" pull down menu located at the upper right side corner.
- For help with the new mobile mapper location function, please read this FAQ.
- Adobe Flash™ is required to access the Wetlands Mapper. Please visit the Adobe Flash Player website (http://www.adobe.com/products/flashplayer/) to download the latest version of the player. Adobe Flash is a trademark from Adobe Systems Incorporated.

* If you have trouble viewing or printing the mapper data, please see this FAQ.

Last updated: January 20, 2016

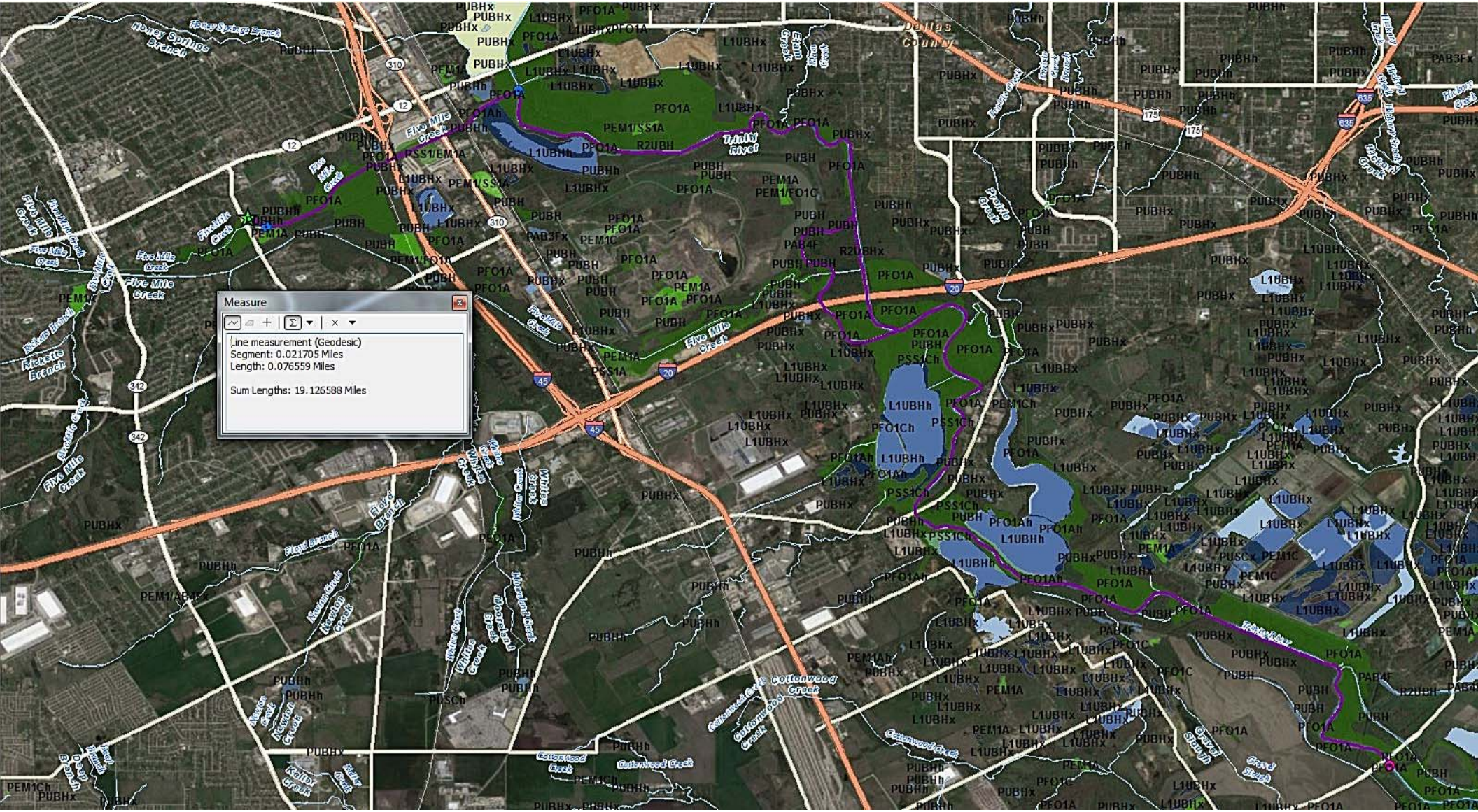

65 002

OBJECTID	ATTRIBUTE	WETLAND_TY	HRS Wetland?	ACRES	SHAPE_Leng	SHAPE_Area
1	PUBHx	Freshwater Pond	POSSIBLY	0.06180594647	74.12250000240	250.11979187300
2	PEM1/AB4Fx	Freshwater Emergent Wetland	YES	0.85844589837	216.10405291700	3474.00730367000
3	PUBHh	Freshwater Pond	POSSIBLY	0.68033204046	229.47402558500	2753.20609251000
4	PUBHh	Freshwater Pond	POSSIBLY	0.57984621229	217.86607508400	2346.55437265000
5	PUBHh	Freshwater Pond	POSSIBLY	0.12286813866	81.07333492500	497.22971696700
6	PUBHh	Freshwater Pond	POSSIBLY	0.61440347618	219.72376565400	2486.40265822000
7	PFO1A	Freshwater Forested/Shrub Wetland	YES	7.68226426952	1449.99665149000	31089.02055640000
8	PUBHx	Freshwater Pond	POSSIBLY	0.08289548194	65.29851748980	335.46611410100
9	PUBHh	Freshwater Pond	POSSIBLY	0.15800206853	94.82222173860	639.41168700700
10	PUBHh	Freshwater Pond	POSSIBLY	0.21142315818	107.42256305400	855.59916713500
11	PUBHh	Freshwater Pond	POSSIBLY	1.06021199677	305.46849838100	4290.52573633000
12	PUBHh	Freshwater Pond	POSSIBLY	0.38034150931	152.03748952000	1539.18748258000
13	PFO1A	Freshwater Forested/Shrub Wetland	YES	7.62154735522	988.60096392900	30843.30792140000
14	PEM1A	Freshwater Emergent Wetland	YES	18.14668058070	1233.65674784000	73437.01099200000
15	PUBH	Freshwater Pond	POSSIBLY	0.42414734496	231.44415703000	1716.46341024000
16	PUBH	Freshwater Pond	POSSIBLY	1.10221867023	520.13167339200	4460.52071296000
17	PEM1A	Freshwater Emergent Wetland	YES	9.94188962902	857.20737235100	40233.39997210000
18	PUBH	Freshwater Pond	POSSIBLY	5.38572470314	2136.87903132000	21795.25464540000
19	PFO1A	Freshwater Forested/Shrub Wetland	YES	48.77456550280	2829.48696738000	197383.66402800000
20	PUBHh	Freshwater Pond	POSSIBLY	0.21477317345	117.48942900300	869.15619796300
21	PUBHh	Freshwater Pond	POSSIBLY	0.80748193780	205.79383871200	3267.76347214000
22	PUBHx	Freshwater Pond	POSSIBLY	0.64707259239	223.53203338700	2618.60988122000
23	PFO1A	Freshwater Forested/Shrub Wetland	YES	3.72289342096	476.59615674300	15066.01517900000
24	PUBHx	Freshwater Pond	POSSIBLY	3.76962520261	498.91811158700	15255.13199010000
25	PFO1A	Freshwater Forested/Shrub Wetland	YES	3.05786742912	495.17464722100	12374.75046780000
26	PUBHh	Freshwater Pond	POSSIBLY	0.24049600583	118.71835464700	973.25280760000
27	PUBHh	Freshwater Pond	POSSIBLY	0.77499576689	265.48612539100	3136.29660250000
28	PUBH	Freshwater Pond	POSSIBLY	0.62962754608	215.12544094100	2548.01228341000
29	PAB4Fx	Freshwater Pond	NO	0.15722656862	90.08187716830	636.27335020900
30	PEM1C	Freshwater Emergent Wetland	YES	0.46580675546	163.30742346700	1885.05306351000
31	PUBF	Freshwater Pond	POSSIBLY	0.62507292945	217.02976467600	2529.58040380000
32	PEM1C	Freshwater Emergent Wetland	YES	0.30766088621	130.41792555000	1245.05943563000
33	L1UBHx	Lake	NO	7.82955581630	1671.46341932000	31685.08829960000
34	PEM1A	Freshwater Emergent Wetland	YES	10.66524357460	1075.38369513000	43160.70953800000
35	PFO1A	Freshwater Forested/Shrub Wetland	YES	16.61200413210	1923.17421730000	67226.39573800000
36	PAB4Fx	Freshwater Pond	NO	0.95072543561	297.73355146300	3847.44934233000
37	L1UBHx	Lake	NO	6.58894127925	892.73922410600	26664.49938310000
38	L1UBHx	Lake	NO	4.71997866378	819.14368031300	19101.07600520000
39	PEM1A	Freshwater Emergent Wetland	YES	4.43329515070	746.81128608300	17940.90898690000
40	PEM1A	Freshwater Emergent Wetland	YES	6.19882193969	934.19823933500	25085.74242540000
41	PEM1A	Freshwater Emergent Wetland	YES	2.09592281129	433.08630968300	8481.89870577000
42	L1UBHx	Lake	NO	43.26946525150	1969.09148477000	175105.31367800000
43	PUBHx	Freshwater Pond	POSSIBLY	6.70128004635	703.17400939600	27119.11824520000
44	L1UBHx	Lake	NO	1.17216802276	283.57698843300	4743.59570000000
45	PFO1A	Freshwater Forested/Shrub Wetland	YES	22.31045357900	2013.35007777000	90287.20252360000
46	PEM1Cx	Freshwater Emergent Wetland	YES	3.40580987412	566.18368911500	13782.82358860000
47	PUBHx	Freshwater Pond	POSSIBLY	2.08216993379	378.61839734900	8426.24278502000
48	PFO1A	Freshwater Forested/Shrub Wetland	YES	52.49034614170	2433.11771861000	212420.89479900000
49	PUBF	Freshwater Pond	POSSIBLY	0.96683459813	240.98400260400	3912.64081022000
50	PEM1A	Freshwater Emergent Wetland	YES	51.37981188340	3236.91774313000	207926.72209500000
51	PUBH	Freshwater Pond	POSSIBLY	0.23697404642	112.10339526700	958.99994352600
52	PUBHx	Freshwater Pond	POSSIBLY	1.66740019979	324.09159441900	6747.72921998000
53	PUBH	Freshwater Pond	POSSIBLY	2.84009067099	590.22200918700	11493.43919380000
54	PFO1A	Freshwater Forested/Shrub Wetland	YES	1.99273733922	484.30679537300	8064.32191461000
55	PEM1A	Freshwater Emergent Wetland	YES	9.44218094351	909.24591762500	38211.15066500000
56	PFO1A	Freshwater Forested/Shrub Wetland	YES	58.77502764700	2566.83907770000	237854.09856000000
57	PUBH	Freshwater Pond	POSSIBLY	1.46092463701	385.61600671600	5912.15226109000
58	PFO1A	Freshwater Forested/Shrub Wetland	YES	22.17179387410	2336.74802144000	89726.06660510000
59	PEM1A	Freshwater Emergent Wetland	YES	14.49525051590	987.52701424900	58660.19775540000
60	PFO1A	Freshwater Forested/Shrub Wetland	YES	189.77568729500	5876.42949878000	767994.96039700000
61	PUBHx	Freshwater Pond	POSSIBLY	3.54577600547	526.30582108200	14349.24642720000
62	PUBHx	Freshwater Pond	POSSIBLY	0.09400686382	90.46281249450	380.43228130600
63	PUBH	Freshwater Pond	POSSIBLY	0.18905773589	123.35812499600	765.08951413600
64	PUBHh	Freshwater Pond	POSSIBLY	0.34627572064	152.08237972800	1401.32812665000
65	PUBHx	Freshwater Pond	POSSIBLY	0.14891318327	87.33270396450	602.63027322700
66	PFO1A	Freshwater Forested/Shrub Wetland	YES	16.28546308830	1999.69667978000	65904.93101530000
67	PFO1A	Freshwater Forested/Shrub Wetland	YES	2.51541352310	411.52195964700	10179.51739020000
68	PEM1A	Freshwater Emergent Wetland	YES	3.09586581644	480.62748068700	12528.52448580000
69	PUBHx	Freshwater Pond	POSSIBLY	0.16467629863	93.48807712370	666.42133798900
70	PSS1A	Freshwater Forested/Shrub Wetland	YES	9.48204740534	1509.06610048000	38372.48451229990
71	PEM1F	Freshwater Emergent Wetland	YES	0.77513958451	207.21147993900	3136.87861175000
72	PUBHx	Freshwater Pond	POSSIBLY	0.23191776666	112.24086398900	938.53790526800
73	PUBHx	Freshwater Pond	POSSIBLY	0.22352784124	113.57450651500	904.58508160300

OBJECTID	ATTRIBUTE	WETLAND_TY	HRS Wetland?	ACRES	SHAPE_Leng	SHAPE_Area
74	PUBHx	Freshwater Pond	POSSIBLY	0.15007852568	92.70080493260	607.34624665000
75	PEM1A	Freshwater Emergent Wetland	YES	9.06295816416	1174.70231607000	36676.49052190000
76	PUBHx	Freshwater Pond	POSSIBLY	0.13788577711	88.67367687860	558.00394371700
77	PUBHx	Freshwater Pond	POSSIBLY	0.35775807712	161.97859468000	1447.79557479000
78	L1UBHx	Lake	NO	0.28379116473	121.08326707500	1148.46209978000
79	L1UBHx	Lake	NO	0.66526792498	328.67199309500	2692.24377993000
80	PUBH	Freshwater Pond	POSSIBLY	0.98833037244	356.17984137800	3999.63112270000
81	PUBH	Freshwater Pond	POSSIBLY	1.73434702370	651.41555100000	7018.65340481000
82	L1UBHx	Lake	NO	2.13900575206	481.46074191000	8656.24918163000
83	PFO1A	Freshwater Forested/Shrub Wetland	YES	5.09938258966	812.63376000800	20636.46922230000
84	PEM1C	Freshwater Emergent Wetland	YES	0.77246341649	227.40236576100	3126.04854400000
85	PFO1A	Freshwater Forested/Shrub Wetland	YES	9.64034492852	2046.51301506000	39013.09186190000
86	PFO1A	Freshwater Forested/Shrub Wetland	YES	7.79010857833	1115.63261894000	31525.45099100000
87	PUBH	Freshwater Pond	POSSIBLY	0.39200867545	162.46431474100	1586.40282889000
88	PUBH	Freshwater Pond	POSSIBLY	0.18199613597	105.87888648700	736.51223310600
89	PUBH	Freshwater Pond	POSSIBLY	4.16317628993	749.37327527300	16847.77673830000
90	PEM1C	Freshwater Emergent Wetland	YES	0.77349683173	218.66539701400	3130.23062712000
91	PUBH	Freshwater Pond	POSSIBLY	3.02677688711	883.42225317000	12248.93150790000
92	PUBHx	Freshwater Pond	POSSIBLY	3.88034944762	482.17888706500	15703.21711290000
93	PUBH	Freshwater Pond	POSSIBLY	0.12182891560	79.58884708220	493.02413047400
94	PFO1A	Freshwater Forested/Shrub Wetland	YES	7.08941964104	875.48710312500	28689.86345970000
95	PFO1A	Freshwater Forested/Shrub Wetland	YES	2.15568966801	499.34575589200	8723.76659420000
96	PEM1A	Freshwater Emergent Wetland	YES	31.44108167970	2720.53588358000	127237.54356300000
97	PUBH	Freshwater Pond	POSSIBLY	3.97458388805	825.01720053800	16084.57036410000
98	PUBHx	Freshwater Pond	POSSIBLY	7.94838605717	752.60342471300	32165.97722400000
99	PFO1A	Freshwater Forested/Shrub Wetland	YES	5.81509229494	1231.93674696000	23532.84364510000
100	PFO1A	Freshwater Forested/Shrub Wetland	YES	6.63577272918	1141.51220180000	26854.01953740000
101	PUBH	Freshwater Pond	POSSIBLY	0.26682480414	143.11859666400	1079.80167431000
102	PUBH	Freshwater Pond	POSSIBLY	1.51610770101	491.81163851500	6135.47019846000
103	PUBH	Freshwater Pond	POSSIBLY	0.26913775854	128.93965430300	1089.16186871000
104	PUBH	Freshwater Pond	POSSIBLY	0.40879567041	172.02314246900	1654.33738736000
105	PFO1A	Freshwater Forested/Shrub Wetland	YES	14.89935669410	1791.87127600000	60295.55744110000
106	PEM1C	Freshwater Emergent Wetland	YES	0.85752412350	240.79106196900	3470.27701309000
107	PAB3Fx	Freshwater Pond	NO	0.34651718334	136.87806713200	1402.30529150000
108	PUBH	Freshwater Pond	POSSIBLY	0.13239178099	88.64415720750	535.77053018700
109	PFO1A	Freshwater Forested/Shrub Wetland	YES	3.15326815790	822.27232412800	12760.82352050000
110	PFO1A	Freshwater Forested/Shrub Wetland	YES	11.93412532050	826.81194362900	48295.69179030000
111	PUBH	Freshwater Pond	POSSIBLY	3.25578327888	733.70079808500	13175.68749700000
112	PUBHx	Freshwater Pond	POSSIBLY	4.16051700526	575.36416633400	16837.01499510000
113	PUBH	Freshwater Pond	POSSIBLY	0.16728994745	93.59464056570	676.99839953100
114	L1UBHx	Lake	NO	2.07492126651	427.05936808700	8396.90846921000
115	PEM1C	Freshwater Emergent Wetland	YES	7.63696321672	953.17480557700	30905.69369970000
116	PFO1A	Freshwater Forested/Shrub Wetland	YES	1.11311001173	347.98106344200	4504.59640833000
117	PUBH	Freshwater Pond	POSSIBLY	0.14302726588	86.92379824020	578.81081058000
118	PFO1A	Freshwater Forested/Shrub Wetland	YES	7.19717363663	918.45378636200	29125.92840960000
119	PUBH	Freshwater Pond	POSSIBLY	0.88259137286	250.99417775300	3571.72057236000
120	L1UBHx	Lake	NO	1.67755295567	664.58779248400	6788.81596539000
121	L1UBHx	Lake	NO	1.30719247079	433.78982823100	5290.02025572000
122	L1UBHx	Lake	NO	0.79823391261	250.09117598200	3230.33804192000
123	L1UBHx	Lake	NO	38.36066280260	2317.63877499000	155240.09492400000
124	PEM1A	Freshwater Emergent Wetland	YES	0.38755506222	158.34849866500	1568.37969555000
125	PEM1A	Freshwater Emergent Wetland	YES	0.77908834459	304.25387532900	3152.85867687000
126	PEM1A	Freshwater Emergent Wetland	YES	7.40826344434	1058.33985906000	29980.17855520000
127	PUBH	Freshwater Pond	POSSIBLY	0.52582141525	192.69352808800	2127.92377535000
128	L1UBHx	Lake	NO	6.13193337233	647.12255284300	24815.05399650000
129	PFO1A	Freshwater Forested/Shrub Wetland	YES	12.65023549530	1224.97513636000	51193.68685590000
130	PUBHh	Freshwater Pond	POSSIBLY	1.51485143056	296.92443213200	6130.38625233000
131	PEM1/SS1A	Freshwater Emergent Wetland	YES	19.31822269360	1267.39017414000	78178.07372490000
132	L1UBHx	Lake	NO	3.83494223963	939.79411757300	15519.46066130000
133	PUBH	Freshwater Pond	POSSIBLY	0.23100214824	109.33846327600	934.83252894100
134	PUBH	Freshwater Pond	POSSIBLY	1.62216338482	583.12771708300	6564.66232447000
135	PFO1A	Freshwater Forested/Shrub Wetland	YES	2.46766135284	559.48395053500	9986.27121291000
136	PSS1/EM1A	Freshwater Forested/Shrub Wetland	YES	30.94904584940	1586.57821491000	125246.34519900000
137	PUBHh	Freshwater Pond	POSSIBLY	0.10966581226	75.47486479770	443.80179751200
138	PFO1A	Freshwater Forested/Shrub Wetland	YES	11.73917261040	1352.05901737000	47506.74616170000
139	PEM1/SS1A	Freshwater Emergent Wetland	YES	8.47557566337	921.66289932300	34299.43787170000
140	PUBHh	Freshwater Pond	POSSIBLY	4.09048636939	563.60647778400	16553.61106600000
141	PFO1Ah	Freshwater Forested/Shrub Wetland	YES	0.58450258224	190.96084958600	2365.39803332000
142	PFO1Ah	Freshwater Forested/Shrub Wetland	YES	0.96772789711	232.34925808400	3916.25586296000

OBJECTID	ATTRIBUTE	WETLAND_TY	HRS Wetland?	ACRES	SHAPE_Leng	SHAPE_Area
143	L1UBHx	Lake	NO	1.53284869891	374.47612559500	6203.21861348000
144	L1UBHx	Lake	NO	0.94672195212	250.08229717300	3831.24781939000
145	L1UBHh	Lake	NO	149.20916424200	4360.22293144000	603828.06573500000
146	PEM1Ch	Freshwater Emergent Wetland	YES	1.33106347503	329.65227337400	5386.62278274000
147	L1UBHx	Lake	NO	1.18475670704	352.26632597300	4794.54029794000
148	L1UBHx	Lake	NO	0.28586737665	152.35649198700	1156.86423134000
149	L1UBHx	Lake	NO	2.02448801963	395.04558015600	8192.81235980000
150	PUBHh	Freshwater Pond	POSSIBLY	14.28661492140	1061.95036201000	57815.87945830000
151	L1UBHx	Lake	NO	1.23749407332	378.48322412600	5007.96084778000
152	L1UBHx	Lake	NO	4.83616324259	994.11407723600	19571.25831510000
153	L1UBHx	Lake	NO	0.31009454175	134.15774510200	1254.90809021000
154	PEM1A	Freshwater Emergent Wetland	YES	1.37779277377	295.99808819300	5575.72954581000
155	L1UBHx	Lake	NO	0.59449108195	200.17307507200	2405.82005760000
156	L1UBHx	Lake	NO	0.87150797803	277.56759113900	3526.86766474000
157	PFO1A	Freshwater Forested/Shrub Wetland	YES	37.24866935490	1963.29511978000	150740.01709000000
158	L1UBHx	Lake	NO	0.53451326728	190.13488329400	2163.09845264000
159	PUBHx	Freshwater Pond	POSSIBLY	0.42126820119	152.43907895400	1704.81192875000
160	PUBHx	Freshwater Pond	POSSIBLY	0.34946511833	145.13322871000	1414.23516121000
161	PEM1A	Freshwater Emergent Wetland	YES	7.48126330210	1145.37195085000	30275.59849900000
162	L1UBHx	Lake	NO	0.23401796718	110.60719137700	947.03711523400
163	PFO1A	Freshwater Forested/Shrub Wetland	YES	0.83317370909	304.60426592200	3371.73438198000
164	L1UBHx	Lake	NO	1.16589607870	321.92858176900	4718.21404286000
165	L1UBHx	Lake	NO	1.26457198986	292.97045082100	5117.54128841000
166	L1UBHx	Lake	NO	0.15434766062	88.95540884950	624.62282284900
167	L1UBHx	Lake	NO	4.63234095502	656.16870249400	18746.41878000000
168	L1UBHx	Lake	NO	2.29377238211	412.02475406300	9282.56751360000
169	PUBHx	Freshwater Pond	POSSIBLY	0.68511842703	250.57054469300	2772.57591177000
170	L1UBHx	Lake	NO	3.06925634166	623.98619760100	12420.83976170000
171	L1UBHx	Lake	NO	0.79177995067	268.46678223600	3204.21978454000
172	PFO1A	Freshwater Forested/Shrub Wetland	YES	21.95480689110	1383.85996134000	88847.95143760000
173	PUBHx	Freshwater Pond	POSSIBLY	0.28412749855	121.85567785400	1149.82319447000
174	PUBHx	Freshwater Pond	POSSIBLY	1.37450952828	296.32212788600	5562.44272267000
175	L1UBHx	Lake	NO	1.18855328465	283.45543024600	4809.90450246000
176	PUBHx	Freshwater Pond	POSSIBLY	0.92346934494	304.48654330600	3737.14785652000
177	PUBHx	Freshwater Pond	POSSIBLY	1.72265305166	573.58235197300	6971.32957884000
178	PFO1A	Freshwater Forested/Shrub Wetland	YES	25.19922968540	1352.28648241000	101977.66468500000
179	PUBHx	Freshwater Pond	POSSIBLY	0.53806200889	185.49172015500	2177.45970045000
180	PUBHx	Freshwater Pond	POSSIBLY	0.80804760547	262.12034600100	3270.05264797000
181	PUBHx	Freshwater Pond	POSSIBLY	4.32602214159	948.22078814600	17506.79052020000
182	PUBHx	Freshwater Pond	POSSIBLY	0.91949102544	257.07724582400	3721.04816866000
183	PUBHx	Freshwater Pond	POSSIBLY	0.57357589817	175.24533747900	2321.17931162000
184	PUBHx	Freshwater Pond	POSSIBLY	0.80719642109	285.73811885600	3266.60802699000
185	PUBHx	Freshwater Pond	POSSIBLY	0.51650268270	195.59279084300	2090.21220262000
186	PUBHx	Freshwater Pond	POSSIBLY	1.44082047364	518.67794297700	5830.79359829000
187	L1UBHx	Lake	NO	1.73258173812	569.15490333100	7011.50954748000
188	PUBHx	Freshwater Pond	POSSIBLY	1.51488305156	540.45513828800	6130.51421799000
189	PUBHx	Freshwater Pond	POSSIBLY	1.40648215983	319.77153285900	5691.83137225000
190	PUBHx	Freshwater Pond	POSSIBLY	1.99042901051	470.44055328300	8054.98043973000
191	PUBHx	Freshwater Pond	POSSIBLY	3.01392928314	694.31353097500	12196.93909920000
192	L1UBHx	Lake	NO	10.43869360930	1290.65810236000	42243.89435400000
193	PFO1A	Freshwater Forested/Shrub Wetland	YES	64.38641590980	4350.55832787000	260562.58123300000
194	PUBH	Freshwater Pond	POSSIBLY	2.76466510241	587.97055650800	11188.20274660000
195	PUBHx	Freshwater Pond	POSSIBLY	0.34160471131	132.92406826700	1382.42522251000
196	PUBHx	Freshwater Pond	POSSIBLY	4.55824219107	660.19226145400	18446.55172070000
197	PUBHx	Freshwater Pond	POSSIBLY	0.79769214183	233.53666873800	3228.14557335000
198	PEM1A	Freshwater Emergent Wetland	YES	5.16757058991	570.85648112900	20912.41626950000
199	PFO1A	Freshwater Forested/Shrub Wetland	YES	1.39383475536	293.32855950900	5640.64914216000
200	PEM1A	Freshwater Emergent Wetland	YES	4.70381772484	806.25548431900	19035.67500560000
201	L1UBH	Lake	NO	21.39386618330	1985.93221730000	86577.90492760000
202	PUBHx	Freshwater Pond	POSSIBLY	3.93413277230	572.85176476500	15920.87050630000
203	PEM1/FO1A	Freshwater Emergent Wetland	YES	27.33088839980	1726.08302027000	110604.18146000000
204	PFO1A	Freshwater Forested/Shrub Wetland	YES	93.33092201640	7136.27487567000	377696.84188500000
205	PFO1A	Freshwater Forested/Shrub Wetland	YES	147.22647810100	6251.02451235000	595804.41957700000
206	PFO1A	Freshwater Forested/Shrub Wetland	YES	181.27719810700	14936.01381890000	733602.79478300000
207	PFO1A	Freshwater Forested/Shrub Wetland	YES	521.11724576700	10211.16535830000	2108886.67684000000
208	PUBHx	Freshwater Pond	POSSIBLY	1.51378205288	378.96708561900	6126.05863439000
209	PEM1A	Freshwater Emergent Wetland	YES	44.93316150550	2947.55148052000	181838.05356100000
210	PFO1A	Freshwater Forested/Shrub Wetland	YES	778.60871541900	22384.75175980000	3150917.68649000000
211	PUBHx	Freshwater Pond	POSSIBLY	0.14203389587	88.67986449840	574.79078478400
212	PUBHx	Freshwater Pond	POSSIBLY	0.92769114772	248.11173789000	3754.23288627000
213	R2UBH	Riverine	NO	431.55787201400	108864.42287200000	1746452.74930000000
			Total Acreage of Wetlands in TDL:	**2,931.38**		

Measure
Line measurement (Geodesic)
Length: 0.267807 Miles
Sum Lengths: 0.541783 Miles
Perimeter of wetland area before PPE
Annotated by R. Comeaux on 4/6/16
Five Mile Creek
Bonnie View Rd
Highland Woods Dr
Ridgeroad Cir
Keyridge Dr
Bishop College Dr


Measure
Line measurement (Geodesic)
Segment: 0.021705 Miles
Length: 0.076559 Miles
Sum Lengths: 19.126588 Miles
Five Mile Creek
Trinity River
Dallas County
Cottonwood Creek
Honey Springs Branch
Pecan Creek
Floyd Branch
Mountain Creek
Kiest Branch
Keller Creek
Gravel Slough
Elam Creek
Ten Mile Creek
Hickory Creek
Indian Creek
Rocky Creek
Pond Creek
Fivemile Creek
Five Mile Creek
Ricketts Branch
Five Mile Creek
Five Mile Creek
Five Mile Creek

Measure
Line measurement (Geodesic)
Segment: 0.02118 Miles
Length: 0.649122 Miles
Sum Lengths: 2.207726 Miles
PUBH
R2UBH
PUBHx
PEM1C
PAB4F
PFO1A
L1UBHx
476
20
Trinity River
Dallas County
Langdon Rd

OBJECTID	FID_TX_Wet	ATTRIBUTE	WETLAND_TY	HRS Wetland?	ACRES	SHAPE_Leng
1	837556	PFO1A	Freshwater Forested/Shrub Wetland	YES	292.72474008900	310.91137912700
2	897068	PEM1A	Freshwater Emergent Wetland	YES	9.94188962902	25.46621418410
3	897115	PFO1A	Freshwater Forested/Shrub Wetland	YES	189.77568729500	1594.94415217000
4	897198	PFO1A	Freshwater Forested/Shrub Wetland	YES	12.79822672320	16.64860172100
5	897205	PFO1A	Freshwater Forested/Shrub Wetland	YES	3.46098303915	189.90980924200
6	897246	PFO1Ah	Freshwater Forested/Shrub Wetland	YES	48.39165531960	230.14687412200
7	897255	PFO1Ah	Freshwater Forested/Shrub Wetland	YES	53.90911741770	368.66692939900
8	897345	PFO1A	Freshwater Forested/Shrub Wetland	YES	7.70577788225	182.33902003800
9	897404	PFO1A	Freshwater Forested/Shrub Wetland	YES	238.83170541600	559.70175229300
10	897406	PFO1A	Freshwater Forested/Shrub Wetland	YES	111.42579165600	247.95170974600
11	897470	R2UBHx	Riverine	NO	21.63230315950	1680.26818537000
12	897512	PFO1A	Freshwater Forested/Shrub Wetland	YES	2.46766135284	25.69155492310
13	897514	PFO1A	Freshwater Forested/Shrub Wetland	YES	10.88105750150	29.04945499580
14	897515	PSS1/EM1A	Freshwater Forested/Shrub Wetland	YES	30.94904584940	278.74987977200
15	897521	PFO1A	Freshwater Forested/Shrub Wetland	YES	15.22637261270	202.44213548300
16	897522	PFO1A	Freshwater Forested/Shrub Wetland	YES	11.73917261040	272.70248143600
17	897532	L1UBHh	Lake	NO	149.20916424200	125.46806670800
18	897555	PFO1A	Freshwater Forested/Shrub Wetland	YES	37.24866935490	302.57114766300
19	897555	PFO1A	Freshwater Forested/Shrub Wetland	YES	37.24866935490	7.59913000794
20	1336612	R2UBH	Riverine	NO	431.55787201400	7.59913000794
21	908425	PFO1A	Freshwater Forested/Shrub Wetland	YES	102.60115127900	305.62978438200
22	908429	PFO1A	Freshwater Forested/Shrub Wetland	YES	521.11724576700	516.66876201700
23	1336612	R2UBH	Riverine	NO	431.55787201400	0.09567719646
24	897521	PFO1A	Freshwater Forested/Shrub Wetland	YES	15.22637261270	0.09567719646
25	1336612	R2UBH	Riverine	NO	431.55787201400	3804.51247213000
26	1336613	R2UBH	Riverine	NO	1227.50393534000	8483.83231001000
1	897404	PFO1A	Freshwater Forested/Shrub Wetland	YES	238.83170541600	42.74833410070
2	897453	PUBH	Freshwater Pond	Possibly	3.33629953993	418.24006855800
3	897455	PAB4F	Freshwater Pond	NO	0.35819279108	54.58979642220
4	897462	PUBH	Freshwater Pond	Possibly	2.82107985911	324.91711854300
5	897463	PAB4F	Freshwater Pond	NO	0.82704020522	87.36549025840
6	897471	PUBH	Freshwater Pond	Possibly	1.22186838347	190.16665980200
7	908428	PFO1A	Freshwater Forested/Shrub Wetland	YES	181.27719810700	98.59075300200
8	1336612	R2UBH	Riverine	NO	431.55787201400	7.66777150568
9	1336613	R2UBH	Riverine	NO	1227.50393534000	1578.37861509000

Reference 66

Free Dallas Preschool

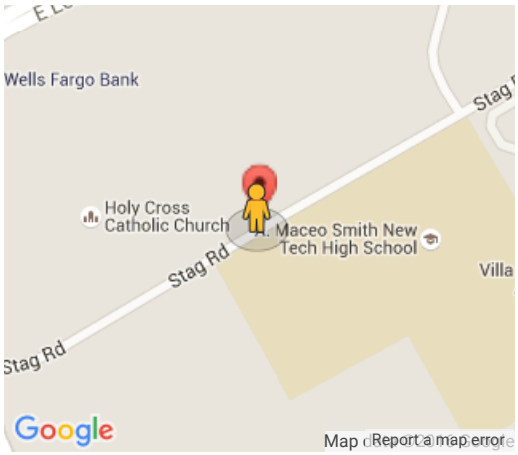
For qualifying students. Learn more & download an application today!

Information for Sunnyview Head Start, a Licensed Center - Child Care Program in Dallas TX:

Name: Sunnyview Head Start
Address: 2927 Stag Road, Dallas TX 75241
Contact Phone: (214) 372-3051

Free Dallas Preschool

For qualifying students. Learn more & download an application today!



Website: http://www.hsgd.org/
Description: Head Start of Greater Dallas, Inc. provides children with the foundation of skills and knowledge they need to be successful in school and life and fosters self-reliant families and communities.
License Number: 517205
Capacity: 180
Age Range: Pre-Kindergarten
Days of Operation: Monday - Friday
Normal Open Hours: Mon - Fri: 7:30 am - 5:30 pm
Enrolled in Subsidized Child Care Program: No
Type of Care: Child Care Program
Additional Information: Initial License Date: 4/1/1996.
District Office: Dallas
District Office Phone: (214) 951-7902 *(Note: This is not the facility phone number.)*

Free Dallas Preschool

For qualifying students. Learn more & download an application today!

Information for Burning Bush Academy, a Licensed Center - Child Care Program in Dallas TX:

Name: Burning Bush Academy
Address: 4943 Bonnie View Rd., Dallas TX 75241
Contact Phone: (214) 375-5056

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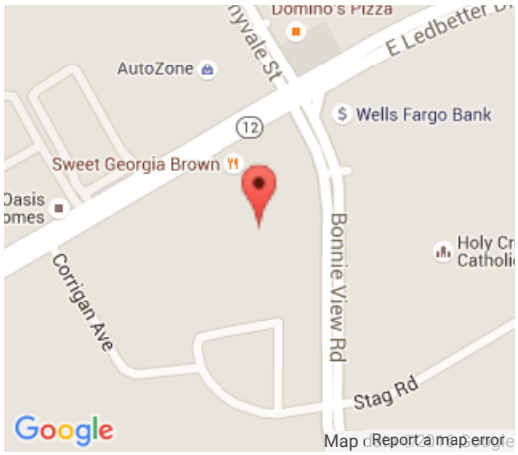


Description: Burning Bush Academy is a Licensed Center - Child Care Program in Dallas TX. It has maximum capacity of 103 children. The center accepts children ages of: Infant, Toddler, Pre-Kindergarten, School. The provider may also participate in the subsidized child care program.
License Number: 820204
Capacity: 103
Age Range: Infant, Toddler, Pre-Kindergarten, School
Days of Operation: Monday - Friday
Enrolled in Subsidized Child Care Program: Yes
Type of Care: Child Care Program
Additional Information: Initial License Date: 4/1/2003.
District Office: Dallas
District Office Phone: (214) 951-7902 *(Note: This is not the facility phone number.)*

AdChoices

► Daycare Academy
► Pre K Preschool
► Academy School

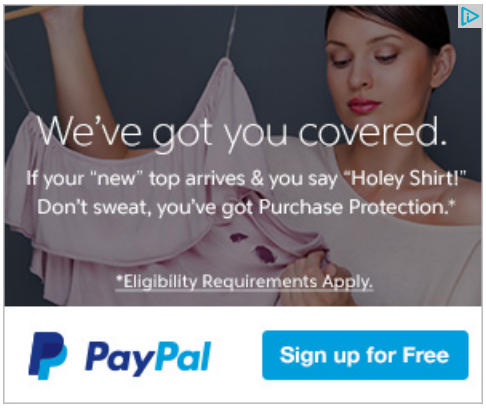
Reviews: Be the first to review this childcare provider. Write a review about Burning Bush Academy. Let other families know what's great, or what could be improved. Please read our brief review guidelines to make your review as helpful as possible.

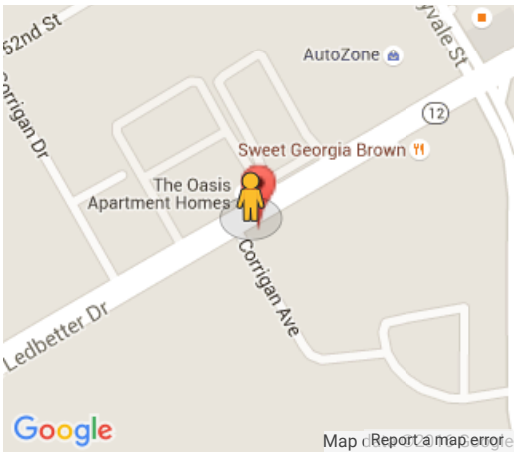
Free Dallas Preschool

For qualifying students. Learn more & download an application today!

Information for Aishas Learning Center Inc., a Licensed Center - Child Care Program in Dallas TX:

Name: Aishas Learning Center Inc.
Address: 2750 E LEDBETTER, DALLAS TX 75216
Contact Phone: (214) 375-2750





Description: Aishas Learning Center Inc. is a Licensed Center - Child Care Program in DALLAS TX. It has maximum capacity of 85 children. The center accepts children ages of: Infant, Toddler, Pre-Kindergarten, School.
License Number: 190471
Capacity: 85
Age Range: Infant, Toddler, Pre-Kindergarten, School
Days of Operation: Monday - Friday
Enrolled in Subsidized Child Care Program: No
Type of Care: Child Care Program
Additional Information: Initial License Date: 3/6/1987.
District Office: Dallas
District Office Phone: (214) 951-7902 *(Note: This is not the facility phone number.)*

Reference 67

2015-16 School Profile
A. MACEO SMITH NEW TECH HIGH SCHOOL (TEA # 3)

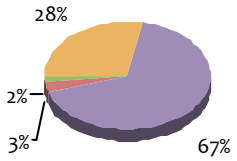
Dallas Independent School District

3030 S STAG RD DALLAS, TX 75241 www.dallasisd.org/newtech

Principal: LISA DEVEAUX (LDEVEAUX@DALLASISD.ORG) Phone: 214-932-7600

High school with grades 9–12. Magnet or choice school requiring application for admission.

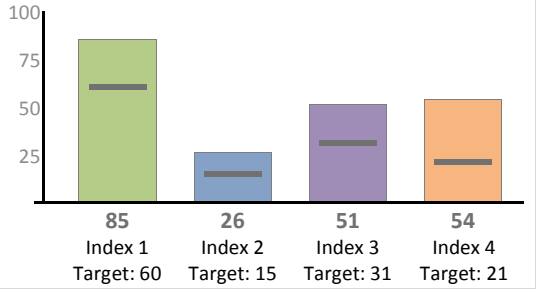
Grd	Attendance Target: 95%		Enrollment N	Enrollment % Sch	% of Grade Level Afr. Am.	Hispanic	White	Other
9	98.0%	✓	114	26%	28%	71%	1%	-
10	98.1%	✓	116	27%	28%	67%	2%	3%
11	97.7%	✓	102	24%	27%	64%	7%	2%
12	96.3%	✓	100	23%	26%	66%	5%	3%
ALL	97.6%	✓	432	–	28%	67%	3%	2%



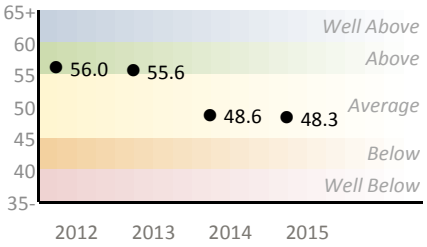
Student Group Enrollment		% of School
At Risk	222	51.7%
ELL	59	13.8%
Low SES	386	90.0%
SPED	14	3.3%
TAG	100	23.3%

Graduation / Attendance / Retention		2012-13		2013-14		2014-15	TARGET	
Students	Percentage of students who graduated in four years (one-year lag)	--		--		--	90.0%	☐
	Percentage of first-time ninth-graders on track to graduate	88.6%	↓	88.5%	↓	84.4%	90.0%	✗
	Average student attendance rate	97.2%	↓	97.1%	↑	97.6%		
	Percentage of students absent fewer than 10% of days enrolled at campus	97.7%	↓	96.3%	↑	98.4%		
Teachers	Average number of absences	7.9	→	7.9	↓	6.5		
	Percentage of teachers who returned to campus from prior year	75.0%	↓	59.1%	↑	71.4%		

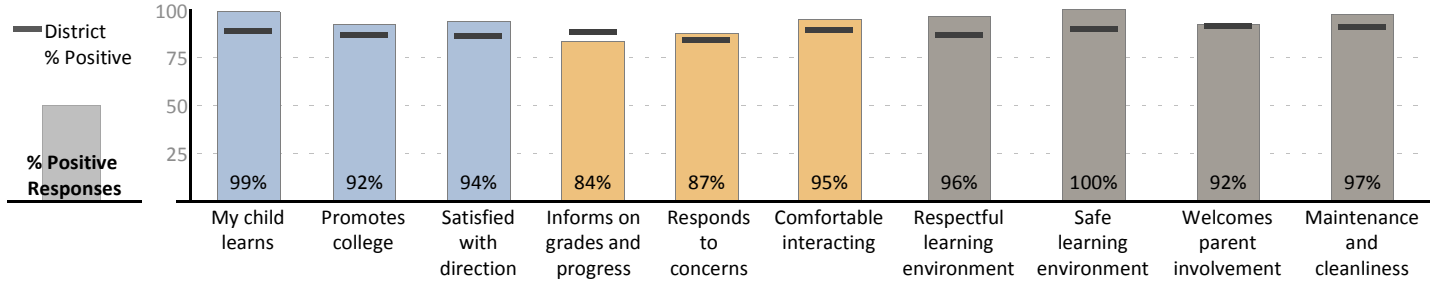
State Acct.	Met Standard
Index Definitions	1: Student Achievement 2: Student Progress 3: Closing Performance Gaps 4: Postsecondary Readiness
Distinctions	- Achievement in social studies



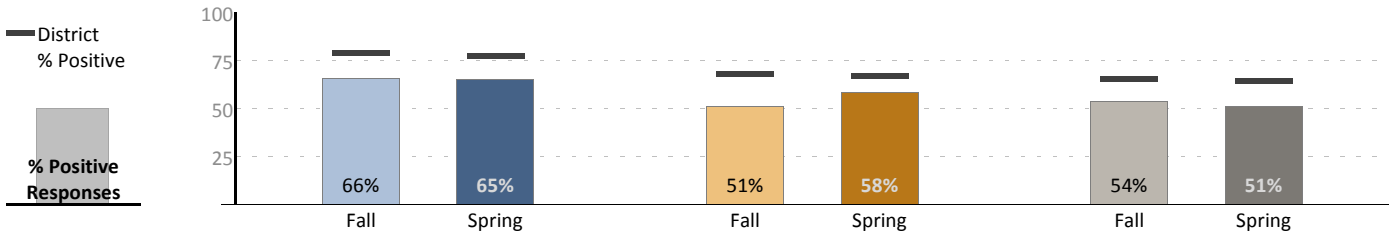
School Effectiveness Index



Parent Survey



Staff Climate Survey

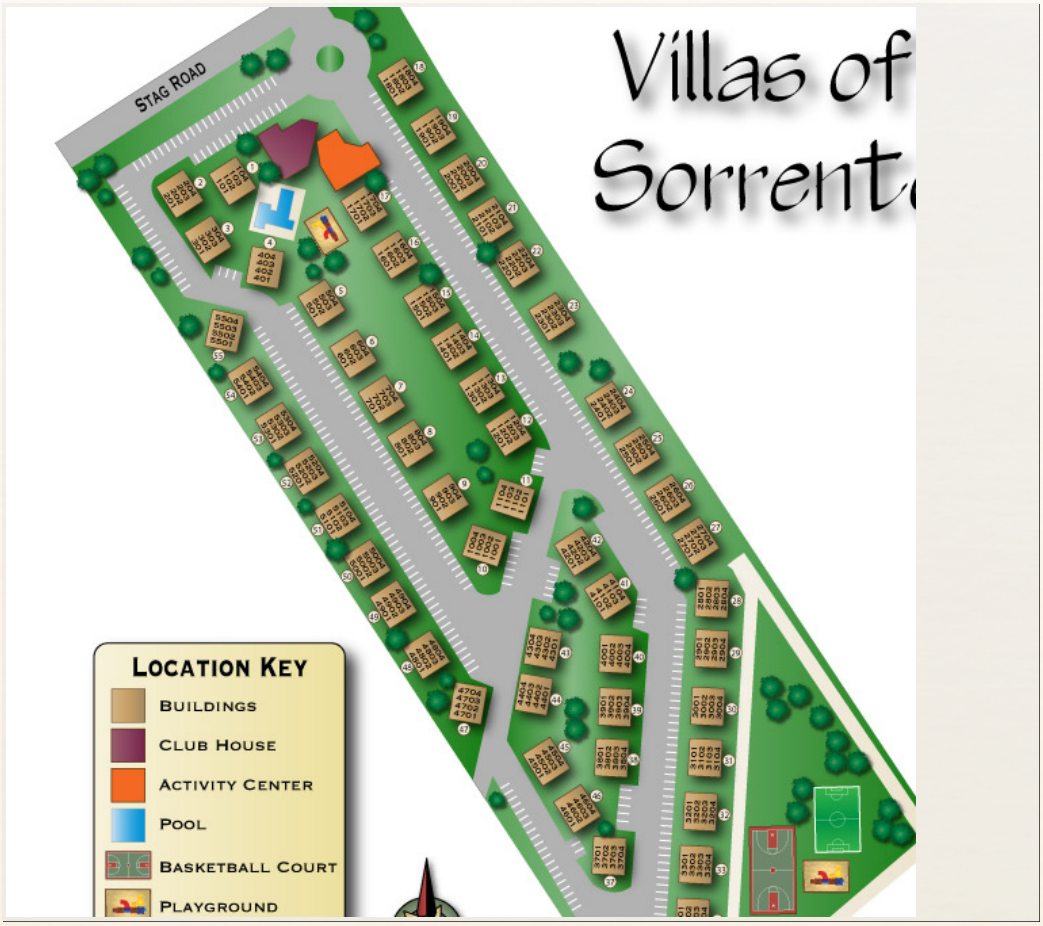


Reference 68

nd management! Upgrades coming soon! $500 OFF THE FIRST FULL MONTH'S RENT ON 3BEDROOMS. CONTACT

www.VillasOfSorrentoApartments.com
3130 Stag Road | Dallas, TX 75241
Phone: 214-290-9000 | Fax: 214-290-9010

SITE MAP



Reference 69

Dallas Parks, TX - Official Website

1. Dallas Park & Recreation
   1500 Marilla St.
   Room 6FN
   Dallas, TX 75201

1. Ph: 214-670-4100
   Fx: 214-670-3205

Facilities

College Park

Features

- Football Field
- Grill
- Outdoor Basketball Court
- Parking
- Pavilion
- Picnic Tables
- Playground
- Softball Field
- Tennis Court

College Park

33000 Highland Woods
Dallas, TX 75201

College is a 17.2 acre community park, established in 1962.

Availability

today ◄ March 28 — April 3, 2016 ► month week day

Mon 3/28	Tue 3/29	Wed 3/30	Thu 3/31	Fri 4/1	Sat 4/2	Sun