

HRS DOCUMENTATION RECORD COVER SHEET

Name of Site: Northwest Odessa Groundwater

EPA ID No. TXN000607499

Contact Persons

Site Investigation:	Katie Delbecq, TCEQ Superfund Project Manager	(515) 239-2505
Documentation Record:	Michelle Delgado-Brown, USEPA Region 6 NPL Coordinator	(214) 665-3154

Pathways, Components, or Threats Not Scored

Surface Water Migration Pathway

The Surface Water Migration Pathway was not scored because its inclusion would not significantly affect the site score (Ref. 1, Section 2.2.3).

Soil Exposure and Subsurface Intrusion Pathway

The Soil Exposure and Subsurface Intrusion Pathway was not scored because its inclusion would not significantly affect the site score (Ref. 1, Section 2.2.3; Ref. 1a, Section 2.2.3). A lack of certainty regarding source and contamination route leaves open the possibility that this pathway may contain contamination not discovered during the Site Inspection (SI) and Expanded Site Inspection (ESI) sampling events.

Air Migration Pathway

The Air Migration Pathway was not scored because its inclusion would not significantly affect the site score (Ref. 1, Section 2.2.3). This pathway is not likely to be of concern.

HRS DOCUMENTATION RECORD

Name of Site: Northwest Odessa Groundwater Date Prepared: September 2020

EPA Region: 6

Street Address of Site*: Intersection of Andrews Highway and 54th Street

City, County, State, Zip Code: Odessa, Ector County, Texas 79762

General Location in the State: West Texas

Topographic Map: The following U.S. Geological Survey (USGS) 7.5-Minute Series topographic map was used to locate the site: Odessa NW Quadrangle Texas-Ector Co. (Ref. 4, p. 1).

Latitude: 31° 53' 40.00" North

Longitude: -102° 23' 20.00" West

Ref. 3, p. 1.

*The street address, coordinates, and contaminant locations presented in this HRS documentation record identify the general area the site is located. They represent one or more locations EPA considers to be part of the site based on the screening information EPA used to evaluate the site for NPL listing. EPA lists national priorities among the known "releases or threatened releases" of hazardous substances; thus, the focus is on the release, not precisely delineated boundaries. A site is defined as where a hazardous substance has been "deposited, stored, disposed, or placed, or has otherwise come to be located." Generally, HRS scoring and the subsequent listing of a release merely represent the initial determination that a certain area may need to be addressed under CERCLA. Accordingly, EPA contemplates that the preliminary description of facility boundaries at the time of scoring will be refined as more information is developed as to where the contamination has come to be located.

Scores

Air Pathway	NS
Ground Water Pathway ¹	100
Soil Exposure Pathway	NS
Surface Water Pathway	NS
HRS SITE SCORE	50.00

¹"Ground water" and "groundwater" are synonymous; the spelling is different due to "ground water" being codified as part of the HRS, while "groundwater" is the modern spelling.

WORKSHEET FOR COMPUTING HRS SITE SCORE

	<u>S</u>	<u>S²</u>
1. Groundwater Migration Pathway Score (S _{gw}) (from Table 3-1, line 13)	<u>100</u>	10000
2a. Surface Water Overland/Flood Migration Component (from Table 4-1, line 30)	<u>NS</u>	NS
2b. Groundwater to Surface Water Migration Component (from Table 4-25, line 28)	<u>NS</u>	NS
2c. Surface Water Migration Pathway Score (S _{sw}) Enter the larger of lines 2a and 2b as the pathway score.	<u>NS</u>	NS
3a. Soil Exposure Component Score (S _{se}) (from Table 5-1, line 22)	<u>NS</u>	NS
3b. Subsurface Intrusion Component Score (S _{ssi}) (from Table 5-11, line 12)	<u>NS</u>	NS
3c. Soil Exposure and Subsurface Intrusion Pathway Score (S _{sessi}) Enter the sum of lines 3a and 3b as the pathway score.	<u>NS</u>	NS
4. Air Migration Pathway Score (S _a) (from Table 6-1, line 12)	<u>NS</u>	NS
5. Total of S _{gw} ² + S _{sw} ² + S _{sessi} ² + S _a ²	100	<u>10000</u>
6. HRS Site Score Divide the value on line 5 by 4 and take the square root		<u>50.00</u>

HRS Table 3-1 –Groundwater Migration Pathway Scoresheet

Factor Categories and Factors	Maximum Value	Value Assigned
Likelihood of Release to an Aquifer:		
1. Observed Release	550	550
2. Potential to Release:		
2a. Containment	10	NS
2b. Net Precipitation	10	NS
2c. Depth to Aquifer	5	NS
2d. Travel Time	35	NS
2e. Potential to Release [(lines 2a x (2b + 2c + 2d)]	500	NS
3. Likelihood of Release (higher of lines 1 and 2e)	550	550
Waste Characteristics:		
4. Toxicity/Mobility	(a)	1,000
5. Hazardous Waste Quantity	(a)	100
6. Waste Characteristics	100	18
Targets:		
7. Nearest Well	50	50
8. Population:		
8a. Level I Concentrations	(b)	1,055
8b. Level II Concentrations	(b)	39.9
8c. Potential Contamination	(b)	13
8d. Population (lines 8a + 8b + 8c)	(b)	1,107.9
9. Resources	5	NS
10. Wellhead Protection Area	20	0
11. Targets (lines 7 + 8d + 9 + 10)	(b)	1,157.9
Groundwater Migration Score For An Aquifer:		
12. Aquifer Score [(lines 3 x 6 x 11)/82,500] ^c	100	100
Groundwater Migration Pathway Score:		
13. Pathway Score (S_{gw}), (highest value from line 12 for all aquifers evaluated) ^c	100	100

^aMaximum value applies to waste characteristics category.

^bMaximum value not applicable.

^cDo not round to nearest integer.

NS = Note Scored

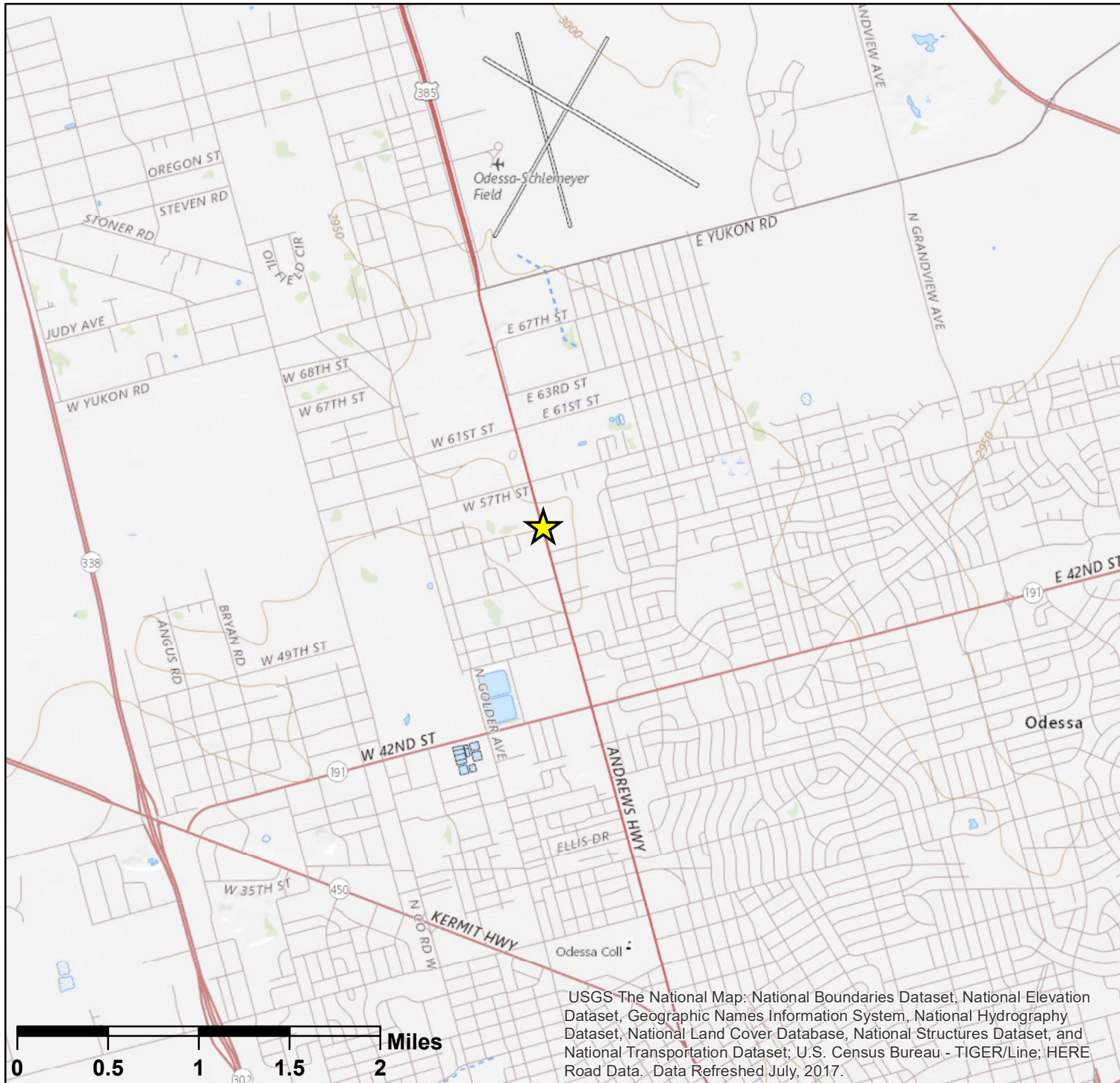


Figure 1.
Site Location Map

**Northwest Odessa
Groundwater**
Ector County, Texas
TXN000607499

★ Approximate Plume Center
Latitude: 31° 53' 40.00" North
Longitude: -102° 23' 20.00" West



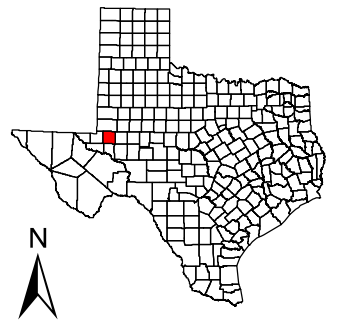
The base map is the National Map imagery and topographic map published by USGS. Projection: Web Mercator Auxiliary Sphere. Coordinate system: WGS 1984. This map was generated by the Remediation Division of the Texas Commission on Environmental Quality. This product is for informational purposes and may 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. For more information concerning this map, contact the Remediation Division at 800-633-9363. Map created in January 2020.



Figure 2.
Site Vicinity Map

**Northwest Odessa
Groundwater**
Ector County, Texas
TXN000607499

- ★ Approximate Plume Center
- Superfund Sites



The base map is USGS National Map orthoimagery published by USGS. Projection: Web Mercator Auxiliary Sphere. Coordinate system: WGS 1984. This map was generated by the Remediation Division of the Texas Commission on Environmental Quality. It is intended for 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. For more information concerning this map, contact the Remediation Division at 800-633-9363. Map created in January 2020.

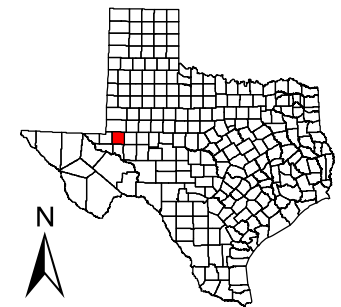




Figure 3.
Groundwater Plume Map

**Northwest Odessa
Groundwater**
Ector County, Texas
TXN000607499

- Background Wells
 - Observed Release Wells
 - Approximate Plume Location
 - ★ Approximate Plume Center
- *All concentrations are in units of µg/L



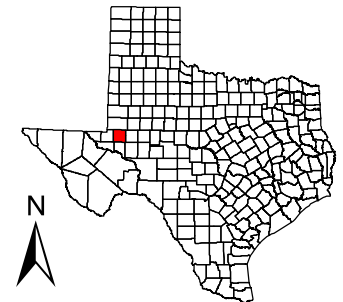
The base map is a USGS National Topo map published by USGS. Projection: Web Mercator Auxiliary Sphere. Coordinate system: WGS 1984. This map was generated by the Remediation Division of the Texas Commission on Environmental Quality. It is intended for illustrative or informational purposes only, and 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. For more information concerning this map, contact the Remediation Division at 800-633-9363. Map created in January 2020.



Figure 4. 4-Mile TDL Map

**Northwest Odessa
Groundwater
Ector County, Texas
TXN000607499**

- Approximate Plume Center
- Canyon Dam Mobile Home Park PWS
- Depot Water Store PWS
- Dollar Genral Yukon Rd. PWS
- Huber Garden Estates PWS
- Judy K S Kountry Kitchen PWS
- Northgate Mobile Home Park 1 PWS
- Sunset Country Club PWS
- Weatherford Artificial Lift System PWS
- Weatherford International NW Loop PWS
- Colorado River Municipal Water (Inactive)
- Private Water Wells (TWDB)



The base map is USGS National Map published by USGS. Well locations are from TCEQ and Texas Water Development Board databases. Projection: Web Mercator Auxiliary Sphere. Coordinate system: WGS 1984. This map was generated by the Remediation Division of the Texas Commission on Environmental Quality. It may not be 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. For more information concerning this map, contact the Remediation Division at 800-633-9363. Map created in January 2020.

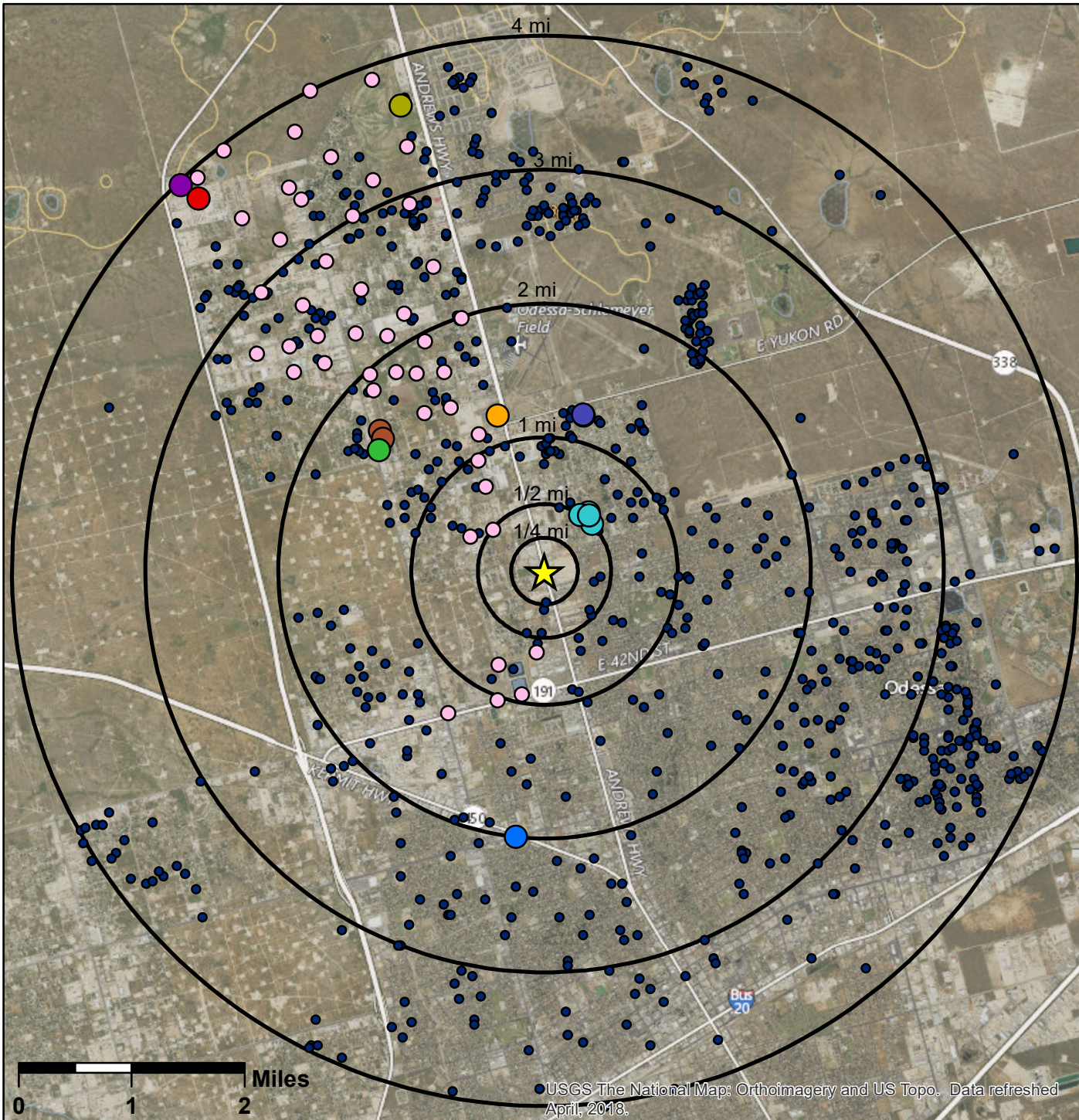


FIGURE REFERENCE SHEET

Figure 1: Site Location Map

Base Map Source*, USGS The National Map and US Topo, data refreshed July 2017.

*Map annotated by TCEQ on 8 January 2020 to depict site location coordinates based on approximate plume center located at the intersection of 54th Street and Andrews Highway (Ref. 3, p. 1).

Figure 2: Site Vicinity Map

Base Map Source* USGS The National Map and US Topo, data refreshed April 2018.

*Map annotated by TCEQ on 28 January 2020 to depict site features and other nearby sites (Ref. 33, pp. 61-64).

Figure 3: Groundwater Plume Map

Base Map Source* USGS The National Map and US Topo, data refreshed April 2018.

*Map annotated by TCEQ on 8 January 2020 to depict background well and observed release well locations (Table 8; Table 10; Ref. 32, pp. 15-18; Ref. 33, pp. 16-18, 24-25).

Figure 4: 4-Mile TDL Map

Base Map Source* USGS The National Map and US Topo, data refreshed April 2018.

*Map annotated by TCEQ on 8 January 2020 to depict site location, 4-mile Target Distance Limit, locations of public water supply wells using TCEQ-maintained Public Water Supply Wells layer which can be viewed at <https://tceq.maps.arcgis.com/apps/webappviewer/index.html?id=217028ea4a01485f87db4d22aec72755>. Locations of private water wells known from the Texas Water Development Board Water Data Interactive database. Well Information Reports for wells in the 4-mile TDL which include the well coordinates are mapped. Accessed August 20, 2019, at: <https://www3.twdb.texas.gov/apps/waterdatainteractive/groundwaterdataviewer>. (Ref. 22, pp. 1-34).

REFERENCES

- | Ref. No. | Description of the Reference |
|----------|--|
| 1. | United States Environmental Protection Agency (EPA). Hazard Ranking System, Title 40 Code of Federal Regulations (CFR) Part 300, Appendix A (55 Federal Register [FR] 51583, Dec. 14, 1990, as amended at 82 FR 2779, Jan. 9, 2017; 83 FR 38037, Aug. 3, 2018), as published in the Code of Federal Regulations on July 1, 2019, with two attachments. Attachment A: Federal Register Vol. 55, No. 241. December 14, 1990. Hazard Ranking System Preamble. Attachment B: Federal Register Vol. 82, No. 5, January 9, 2017. Addition of a Subsurface Intrusion Component to the Hazard Ranking System Preamble. Available at https://semspub.epa.gov/src/document/HQ/100002489 . 197 pages. |
| 2. | United States Environmental Protection Agency. Superfund Chemical Data Matrix. July 2020. Excerpt, 5 pages. |
| 3. | Google Earth. Latitude and Longitude of Approximate Plume Center, Northwest Odessa Groundwater Site. Accessed on January 8, 2020. 1 page. |
| 4. | United States Geological Survey. 2016. 7.5-Minute Topographic Series Maps: Odessa NW Quadrangle, Texas, Ector County. 1 page. |
| 5. | CB&I. Remedial Investigation Technical Memorandum Report, Process Instrumentation and Electrical (PIE) State Superfund Site. August 30, 2013. 177 pages. |
| 6. | United States Environmental Protection Agency Region 6 Laboratory. Contract Laboratory Program Data Review Memorandum – Northwest Odessa Groundwater #1 ESI. September 2, 2015. 203 pages. |
| 7. | United States Environmental Protection Agency Region 6. Superfund Site Strategy Recommendation – Pre-CERCLIS Screen. July 31, 2012. 2 pages. |
| 8. | United States Environmental Protection Agency Region 6. Superfund Site Strategy Recommendation – Preliminary Assessment. December 18, 2013. 2 pages. |
| 9. | United States Environmental Protection Agency Region 6. Superfund Site Strategy Recommendation – Site Inspection. October 20, 2014. 3 pages. |
| 10. | United States Environmental Protection Agency. Final Analytical Report, Northwest Odessa Groundwater #1 Site Inspection. July 10, 2014. 119 pages. |
| 11. | CB&I. SSDAP Letter Report- Groundwater Sampling November 2014 and April 2015- Northwest Odessa Groundwater Site. July 10, 2015. 324 pages. |
| 12. | Texas Commission on Environmental Quality. Field Notes - Northwest Odessa Groundwater #1 Expanded Site Inspection. March 4, 2015- October 5, 2015. 99 pages. |
| 13. | Yellowpages.com. Results for Huckabay Industries 5329 Andrews Highway, Odessa. Accessed on September 21, 2019, at: https://www.yellowpages.com/odessa-tx/huckabay-industries-11413586 . 2 pages. |

14. Texas Commission on Environmental Quality. Photographic Documentation - Northwest Odessa Groundwater #1 Pre-CERCLIS Site Visit. March 22, 2012. 6 pages.
15. Texas Commission on Environmental Quality. Photographic Documentation - Northwest Odessa Groundwater #1 PA Site Visit. October 22, 2013. 5 pages.
16. Texas Commission on Environmental Quality. Field Notes - Northwest Odessa Groundwater #1 Pre-CERCLIS Site Visit. March 19-22, 2012. 6 pages.
17. Texas Commission on Environmental Quality. Field Notes - Northwest Odessa Groundwater #1 PA Site Visit. October 22, 2013. 7 pages.
18. Texas Commission on Environmental Quality. Telephone Memorandum-Michael Cave and Bob Meadows, Bob's Truck & Auto. November 20, 2013. 1 page.
19. Beacon Environmental Services, Inc. Passive Soil Gas Survey – Analytical Report. August 6, 2015. 16 pages.
20. Texas Water Development Board. Aquifers of the Edwards Plateau, Report 360, Chapters 2, 3, and 5 excerpted. February 2004. 97 pages.
21. Knowles, D. B. Texas Board of Water Engineers Bulletin 5210 Ground-Water Resources of Ector County, Texas. December 1952. 118 pages.
22. Texas Water Development Board. Water Data Interactive 4-Mile TDL. Well Information Reports for nearby wells. Accessed August 28, 2018, at: <https://www3.twdb.texas.gov/apps/waterdatainteractive/groundwaterdataviewer>). 142 pages.
23. Texas Commission on Environmental Quality. Field Notes - Northwest Odessa Groundwater #1 Site Inspection. June 9-12, 2014. 45 pages.
24. Texas Commission on Environmental Quality. Photographic Documentation - Northwest Odessa Groundwater Expanded Site Inspection. June 15-18, 2015 and October 5, 2015. 105 pages.
25. Texas Commission on Environmental Quality. Central Registry Internal Reporting Query for SWR Nos. 81317, 31706, 32806, and 30874. Accessed from Central Registry Internal Database on August 27, 2018. 7 pages.
26. United States Environmental Protection Agency. Query of EnviroFacts database and EnviroMapper for the vicinity of the site. Accessed on April 11, 2019, at: <https://www3.epa.gov/enviro/facts/multisystem.html>. 53 pages.
27. Agency for Toxic Substances and Disease Registry. Toxicological profile for Tetrachloroethylene. June 2019. Accessed on January 15, 2020, at: <https://www.atsdr.cdc.gov/ToxProfiles/tp18.pdf>. 435 pages.
28. Agency for Toxic Substances and Disease Registry. Toxicological Profile for Trichloroethylene. June 2019. Accessed on July 8, 2020, at: <https://www.atsdr.cdc.gov/toxprofiles/tp19.pdf>. 511 pages.

29. Agency for Toxic Substances and Disease Registry. Toxicological profile for 1,1-Dichloroethene – Draft for Public Comment. December 2019. Accessed on January 15, 2020, at: <https://www.atsdr.cdc.gov/ToxProfiles/tp39.pdf>. 263 pages.
30. Agency for Toxic Substances and Disease Registry. Toxicological profile for 1,1-Dichloroethane. August 2015. Accessed on January 15, 2020, at: <https://www.atsdr.cdc.gov/ToxProfiles/tp133.pdf>. 168 pages.
31. Agency for Toxic Substances and Disease Registry. Toxicological profile for 1,2-Dichloroethane. September 2001. Accessed on January 15, 2020, at: <https://www.atsdr.cdc.gov/ToxProfiles/tp38.pdf>. 297 Pages.
32. Texas Commission on Environmental Quality. Northwest Odessa Groundwater #1 Site Inspection Report. March 2, 2015. 316 pages.
33. Texas Commission on Environmental Quality. Northwest Odessa Groundwater #1 Expanded Site Inspection Report. June 20, 2016. 115 pages.
34. Texas Commission on Environmental Quality. Mark Maglitto. Northwest Odessa Groundwater Site Inspection – Audit of Data Quality. October 14, 2014. 4 pages.
35. Texas Commission on Environmental Quality. Field Notes - Northwest Odessa Groundwater Superfund Site Discovery and Assessment Program Drinking Water Evaluation. November 17, 2014. 16 pages.
36. AECOM, prepared for Texas Commission on Environmental Quality. Final Remedial Investigation Technical Memorandum: Process Instrumentation and Electrical (PIE) State Superfund Site. August 30, 2019. 265 pages.
37. United States Environmental Protection Agency. Record of Decision East 67th Street Ground Water Plume Superfund Site Ector County, Texas. September 2011. 118 pages.
38. Texas Commission on Environmental Quality. Mark Maglitto. Northwest Odessa Groundwater #1 Expanded Site Inspection – Audit of Data Quality. December 14, 2015. 6 pages.
39. National Oilwell Varco. Affected Property Assessment Report for Waste Management Units 001, 002, 004, 005, 007, and 008, Former Phoenix Energy Property, 5621 Andrews Highway, Odessa, Texas. October 31, 2014. 97 pages.
40. Texas Commission on Environmental Quality. Notices of Registration for SWR Nos. 81317, 31706, 32806, and 30874. Accessed from PARIS Internal Database on August 27-28, 2018. 45 pages.
41. Texas Commission on Environmental Quality. Correspondence between TCEQ and Angela Miles of Talon/LPE regarding Request for Information for the Former National Oilwell Phoenix Energy Site. June 28, 2013. 60 pages.
42. SQ Environmental, LLC. Letter from Quinton McNulty to TCEQ regarding Response to TCEQ Conditional Approval Letter dated 26 June 2019 and Transmittal of Monitoring Well MW-9D Sampling Results for the Former Phoenix Energy Site. October 28, 2019. 24 pages.
43. Chemtech Consulting Group. SDG # F9P00 Laboratory Data Package. July 7, 2015. 634 pages.

44. Texas Commission on Environmental Quality. Notices of Registration for SWR Nos. 23599, 31441, 31706, 38419, 39662, 41146, 70868, 77570, and 79607. Accessed from PARIS Internal Database on April 11, 2019. 21 pages.
45. Barker, Rene A. and Ann F. Ardis. United States Geological Survey. Professional Paper 1421-B. Hydrogeologic Framework of the Edwards-Trinity Aquifer System, West Central Texas. 1996. 54 pages.
46. Texas Parks and Wildlife Department. Natural Subregions of Texas Map. January 31, 2011. 1 page.
47. Texas Board of Water Engineers, Bulletin 6107. A Summary of the Occurrence and Development of Ground Water in the Southern High Plains of Texas. Prepared by the United State Geologic Survey with the Cooperation of the Texas Board of Water Engineers. September 1961. 86 pages.
48. United States Environmental Protection Agency. Declaration for the Record of Decision, Odessa Chromium II Superfund Site. March 18, 1988. 77 pages.
49. Texas Water Development Board, Report No. 342. Water Quality Evaluation of the Ogallala Aquifer, Texas. August 1993. 40 pages.
50. Texas Water Development Board, Report No. 314. Hydrogeology of Lower Cretaceous Strata Under the Southern High Plains of Texas and New Mexico. J.A. Tony Fallin. March 1989. 43 pages.
51. United States Geological Survey. Water-Resources Investigation Report 94-4039. Geologic History and Hydrogeologic Setting of the Edwards-Trinity Aquifer System, West-Central Texas. Rene A. Barker, Peter W. Bush, and E.T. Barker, Jr. 1994. 52 pages.
52. United States Geological Survey. Texas Geology Map. Accessed on January 9, 2020, at: <https://txpub.usgs.gov/txgeology/>. 1 page.
53. Handbook of Texas Online. Odessa, Texas. By B. J. Klepper. April 30, 2019. Accessed on September 23, 2019, at: <https://tshaonline.org/handbook/online/articles/hdo01>. 4 pages.
54. United States Census Bureau. "Quick Facts for Odessa, Texas." Accessed on January 16, 2020, at: <https://www.census.gov/quickfacts/fact/table/ectorcountytexas,odessacitytexas/IPE120218>. 3 pages.
55. Texas Commission on Environmental Quality. Email from Katie Delbecq to Mr. Doug Going- Odessa Utilities Department Information. April 5, 2016. 1 page.
56. Texas Commission on Environmental Quality. Letter from Katie Delbecq to Mr. Doug Going- Water Well Sample Results- Longhorn Mobile Home Park. September 13, 2016. 2 pages.
57. Texas Commission on Environmental Quality. Telephone Memorandum-Rebecca Comeaux and John Grant, Colorado River MUD. September 23, 2015 and October 1, 2015. 1 page.
58. Texas Commission on Environmental Quality. Drinking Water Watch Database- Public Water System Files. Accessed on August 23, 2018, at: <http://dww2.tceq.texas.gov/DWW/>. 51 pages.
59. Texas Commission on Environmental Quality. Telephone Memorandum-Katie Delbecq and Caiti Word, Northgate Mobile Home Park PWS Manager. August 24, 2018. 1 page.

60. Texas Commission on Environmental Quality. Email from Sean Ables to Katie Delbecq regarding City of Odessa Wellhead Protection Area. August 5, 2019. 2 pages.
61. Google Earth. Distance from Site to Lake E.V. Spence and O.H. Ivie Lake. Accessed on August 5, 2019. 2 pages.
62. United States Environmental Protection Agency. Using Qualified Data to Document an Observed Release and Observed Contamination. November 1996. 18 pages.

SITE SUMMARY

The Northwest Odessa Groundwater site is a chlorinated solvent-contaminated groundwater plume of unknown origin with the site center located at the intersection of 54th Street and Andrews Highway in Odessa, Ector County, Texas, that released into the Edwards-Trinity Aquifer (Figure 1). Groundwater samples from 24 monitoring and private wells contain 1,1-dichloroethane (1,1-DCA), 1,2-dichloroethane (1,2-DCA), 1,1-dichloroethylene (1,1-DCE), tetrachloroethylene (PCE) and trichloroethylene (TCE). The groundwater samples that comprise the plume meet observed release criteria (Figure 3 and Section 3.1.1 of the HRS documentation record) and the wells withdraw from the Edwards-Trinity aquifer also referred to as the Trinity/Antlers aquifer in this HRS documentation record (Section 3.0.1 and Table 9 of the HRS documentation record). Actual contamination at Level I concentrations has been documented in five target wells (GW-15, GW-16, GW-45, GW-47, GW-48) and at Level II concentrations in eight target wells (GW-09, GW-11, GW-34, GW-59, GW-65, GW-79, GW-80, GW-81). Numerous wells are subject to potential contamination within 4 miles of the plume (Sections 3.3.2.2, 3.3.2.3, and 3.3.2.4 of the HRS documentation record), and the wells withdraw from the Edwards-Trinity Aquifer (also referred to as the Trinity/Antlers Aquifer in this HRS documentation record) (Section 3.0.1 and Table 9 of the HRS documentation record).

Groundwater contamination was first detected in December 2006 in a private well (the BTA well) located at a vehicle repair and towing company. This well was sampled routinely during the investigation of the nearby Process Instrumentation and Electrical (PIE) state superfund site, a former chrome plating operation responsible for contaminating groundwater with hexavalent and total chromium (Figure 2; Ref. 5, pp. 7-8). BTA well sample concentrations of 1,1-dichloroethylene (1,1-DCE)- a contaminant not associated with PIE operations- have ranged from 7.1 to 137 µg/L from 2006 to 2015 (Ref. 5, pp. 14, 61; Ref. 6, p. 49; Ref. 7, p. 1; Ref. 8, p. 1; Ref. 9, p. 1).

Because chlorinated solvents are not associated with PIE, the site was referred to the EPA Preliminary Assessment/Site Inspection (PA/SI) program, which directed the Texas Commission on Environmental Quality (TCEQ) to conduct a Pre-CERCLIS Screening Assessment in 2012. Ongoing concerns prompted the EPA to request a Preliminary Assessment (PA) report in 2013, and ultimately to request that a Site Inspection (SI) sampling event be conducted (Ref. 7, pp. 1-2; Ref. 8, pp. 1-2). The TCEQ performed an SI at the site in June 2014. Eighteen private wells were sampled to assess the groundwater migration pathway (Ref. 9, p. 2). Significant concentrations of 1,1-DCE, 1,1-dichloroethane (1,1-DCA), 1,2-dichloroethane (1,2-DCA), and tetrachloroethylene (PCE) were detected in groundwater (detections of chromium and hexavalent chromium in various wells were ignored as these contaminants are not associated with the site) (Ref. 10, pp. 26, 29, 35, 49-50, 52, 71, 75). The EPA issued a Superfund Site Strategy Recommendation (SSSR) directing that an Expanded Site Inspection (ESI) be conducted to collect samples from possible source areas and to determine if there were additional receptors (Ref. 9, pp. 1-2).

Prior to ESI sampling, the TCEQ Superfund Site Discovery and Assessment Program (SSDAP) conducted Drinking Water Evaluation sampling events in November 2014 and April 2015 to assess impacts to drinking water receptors in the vicinity of the site (Ref. 11, pp. 8-9). Samples from several wells contained significant concentrations of 1,1-DCE, trichloroethylene (TCE), and carbon tetrachloride (Ref. 11, pp. 20-21).

TCEQ staff conducted two ESI sampling events at the site in June and October 2015, during which 34 groundwater samples were obtained from 23 private wells at residences and businesses and from three pre-existing monitor wells (Ref. 12, pp. 17, 19, 21, 23, 25, 27, 29, 31, 33, 39, 41, 43, 45, 55, 57, 59, 61, 63, 65, 73, 75, 77, 81, 83, 87, 89, 91, 93, 95, 97, 99). Groundwater samples were analyzed for volatile organic compounds (VOCs) and metals. Samples from ten wells exceeded the Maximum Contaminant Level (MCL) for 1,1-DCE

(Ref. 2, p. 3; Ref. 6, pp. 9, 12-13, 16, 19, 21, 23, 44, 48-49). Samples from three wells equaled or exceeded the HRS cancer risk screening concentration benchmark for TCE (Ref. 2, p. 5; Ref. 6, pp. 12, 17, 173-174).

Fourteen soil samples were collected at two industrial properties during the June 2015 ESI and analyzed for metals and VOCs, but no definitive source of chlorinated solvents in soils was identified (Ref. 6, pp. 79-92, 157-161; Ref. 12, pp. 47-53, 67-71, 85). TCE and several non-chlorinated VOCs were detected at significant concentrations in one soil sample (SO-04) collected at a radiator repair shop, but this property is located approximately 0.4 miles southeast of the wells where the observed release of TCE to groundwater is documented, thus contamination cannot definitively be attributed to the facility (Figure 3; Ref. 6, p. 82; Ref. 13, p. 1). PCE and 1,1-DCE were not detected in any of the soil samples collected at the radiator repair shop (Ref. 6, pp. 79-92). TCEQ personnel had previously observed unlabeled drums, five-gallon buckets containing unknown oily waste, and auto parts strewn about the yard at the previously mentioned vehicle repair and towing company, however, chlorinated VOCs were not detected in soil samples obtained from this property during the ESI (Ref. 6, pp. 79-92; Ref. 14, pp. 1-6; Ref. 15, pp. 1-5; Ref. 16, p. 4; Ref. 17, p. 1; Ref. 18, p. 1). The ESI included sampling of three existing shallow monitor wells (GW-55, GW-56, and GW-57) located at the former National Oilwell/Phoenix Energy site at 5621 Andrews Highway; results confirmed significant concentrations of TCE, 1,1-DCA, 1,1-DCE, and other VOCs in the shallow perched groundwater (Ref. 6, pp. 19-21; Ref. 12, pp. 39-43). Passive soil gas sampling conducted in a residential neighborhood 200 feet north of the auto body shop detected low levels of 1,1-DCE in four samples (Ref. 12, pp. 17, 23, 35; Ref. 19, pp. 2, 7). To date, source sampling has not identified a source for the widespread chlorinated solvent-contaminated groundwater.

Based on available data from the SI and ESI sampling events, the current known extent of the plume is depicted in Figure 3. The approximate site center is the intersection of 54th Street and Andrews Highway. It extends approximately 0.3 mile southeast, 0.6 miles southwest, 0.2 miles north, and 0.75 miles northwest of the site center. The BTA well (designated GW-64/ GW-20 during the SI and ESI) is located along Andrews Highway on the southeast edge of the plume (Figures 2 and 3). TCE was detected in three private wells and two monitor wells (GW-45, 47, 53, 55, and 57) clustered on West 57th Street (Figure 3; Ref. 6, pp. 12, 17, 19-21, 173-174). Widespread low-level detections of PCE were found throughout the site area and may not be fully delineated to the northwest (Figure 3; Ref. 6, pp. 12, 23, 46, 174, 181-186; Ref. 10, pp. 26, 29, 35, 53 75). The highest concentrations of 1,1-DCE were found in wells near the intersection of Andrews Highway and 52nd Street (Figure 3; Ref. 6, pp. 12-13, 16-21, 46, 48-49, 173-174; Ref. 10, pp. 49-52). Wells exhibiting an observed release are listed in Table 2 of this HRS documentation record.

The target aquifer (aquifer of concern) is the Trinity/Antlers portion of the Edwards-Trinity Plateau Aquifer System. In the site area, the groundwater bearing unit is the Antlers Formation, also known as the Trinity Sands Formation. It is the primary source of groundwater for Ector County (Ref. 20, pp. 81, 84; Ref. 21, p. 10). Wells sampled during the SI and ESI are consistently screened or gravel-packed within a depth range of 98-200 feet below ground surface (bgs) (Ref. 12, p. 93; Ref. 22, pp. 35-41, 46-48; Ref. 23, pp. 4, 6, 8, 20, 22, 24, 28, 33; see also Section 3.1.1 of this HRS documentation record). Thirteen of the wells with observed releases of chlorinated solvents are target wells which are used for potable purposes by residents or workers (Tables 13 and 14). Of the target wells, GW-15, GW-16, GW-45, GW-47, and GW-48 had Level I concentrations of hazardous substances above the lowest HRS drinking water benchmarks (Table 13; Ref. 6, pp. 12-13, 49, 173; Ref. 10, pp. 50, 52). Detections in wells GW-09, GW-11, GW-34, GW-59, GW-65, GW-79, GW-80, and GW-81 met observed release criteria but had Level II concentrations of hazardous substances below the lowest HRS drinking water benchmarks (Table 14; Ref. 6, pp. 9, 23, 177, 181-186; Ref. 10, pp. 28-29, 34-35).

2.2 SOURCE CHARACTERIZATION

2.2.1 SOURCE IDENTIFICATION

Name of source: Northwest Odessa Groundwater

Number of source: 1

Source Type: Other- Groundwater Plume with No Identified Source

Description and Location of Source (with reference to a map of the site):

The VOC 1,1-DCE has been detected in samples from the BTA well since 2006 (designated GW-20/ GW-64 during the SI and ESI). Ongoing contamination prompted the EPA to direct a TCEQ-led SI in June 2014, and ESI in June and October 2015 to determine the extent and source of VOCs in the groundwater. The State of Texas, under the SSDAP Program, also conducted sampling events in November 2014 and April 2015 toward the same end (Ref. 5, p. 14; Ref. 9, p. 2; Ref. 11, p. 6; Ref. 12, p. 15; Ref. 16, p. 1). During site visits, unlabeled drums in poor condition and oily stains on soil and pavement were observed at an automotive repair shop and at a radiator repair shop, but no physical signs of a release of 1,1-DCE, 1,1-DCA, 1,2-DCA, TCE, or PCE were observed at these properties (Ref. 12, pp. 47, 49, 53; Ref. 14, pp. 3, 4, 6; Ref. 15, pp. 3, 4; Ref. 17, p. 1; Ref. 24, pp. 27-28, 32-35, 38-42, 46-57, 59). As part of the ESI, the TCEQ collected surface soil samples from these two possible sources which were closest to the highest detected groundwater contamination (as known at the time of the ESI), but neither could be confirmed by sampling as the source of the contamination in groundwater (Ref. 12, pp. 47-53, 65-71).

The TCEQ conducted site reconnaissance, interviewed staff, and performed record searches to exclude possible sources of 1,1-DCE, TCE, and PCE near the site (Figure 2; Ref. 15, pp. 1-5; Ref. 17, pp. 1-7; Ref. 18, p. 1; Ref. 25, pp. 1-6; Ref. 26, pp. 7, 11-12, 15, 19, 25-26). Although a variety of local businesses use VOCs, it was not possible to make a definitive link from any one source or sources to the contaminated groundwater plume. Therefore, the site source was characterized as a groundwater plume with no identified source, as described in Section 1.1 of the HRS, based on the following:

PCE (tetrachloroethene or perchloroethene) occurs in the environment primarily from its use as a dry-cleaning solvent, where it is released as fugitive emissions or as liquid waste. Additionally, it is released to the atmosphere from facilities used to manufacture the compound and as a byproduct of the production of other chlorinated hydrocarbons (Ref. 27, pp. 24, 288). In addition to being used as a dry-cleaning solvent, it also has uses as a metal degreasing solvent, and as a chemical intermediate (Ref. 27, pp. 23, 283). When released into the environment, PCE partitions primarily to the atmosphere, but when present in soil, it can leach and migrate to groundwater (Ref. 27, pp. 24, 288, 294). PCE can also break down into TCE, DCE, vinyl chloride, and ethene by reductive dechlorination chemical reactions (Ref. 27, pp. 24, 302).

TCE occurs in the environment as a result of facilities which use it as a solvent for vapor degreasing of metal parts, a practice common in the automotive and metals industries. TCE is used in the manufacture of other chemicals, especially as a feedstock for manufacturing the refrigerant HFC-134a (Ref. 28, pp. 324-325). It is also used as an extraction solvent for greases, oils, fats, waxes, and tars; by the textile processing industry; in dry cleaning operations; and as a general-purpose solvent in adhesives, lubricants, paints, varnishes, paint strippers, pesticides, and cold metal cleaners (Ref. 28, pp. 23, 31). TCE migrates readily through soil to groundwater and may occur as an original contaminant or as a result of the breakdown of PCE (Ref. 28, pp. 336, 339).

1,1-DCE occurs in the environment primarily as emissions resulting from polymer production/fabrication industries, and the storage, handling and transportation of monomers (Ref. 29, p. 103). However, it is also found in landfills as the result of breakdown of polyvinylidene chloride products and as the degradation products of other chemicals such as PCE, TCE, and 1,2-DCA in the environment by dehydrochlorination reactions (Ref. 29, pp. 99, 105). It is used for flame-retardant coatings, in piping, coating for steel pipes, in adhesive applications, and as a chemical intermediate to make other products, such as various plastic packaging materials and flexible films like plastic wrap (Ref. 29, pp. 11, 101). 1,1-DCE primarily exists in a vapor phase, although it migrates readily through soil and groundwater when found in these media (Ref. 29, pp. 106, 107).

1,1-DCA is used as an intermediate in the manufacture of 1,1,1-trichloroethane, and has limited use as a solvent, cleaning agent, and degreaser. Additional uses include fabric spreading, varnish and finish removers, organic synthesis, ore flotation, and as a fumigant and insecticide spray (Ref. 30, p. 83). 1,1-DCA occurs in the environment due to activities related to the production, storage, consumption, transport, and disposal of it as a chemical intermediate, solvent, finish remover and degreaser. Additionally, it occurs as a biodegradation product of 1,1,1-trichloroethane. Releases of the compound are primarily to the atmosphere, and releases to surface waters and soils are expected to partition rapidly to the atmosphere (Ref. 30, p. 85). 1,1-DCA that remains on soil surfaces migrates readily to groundwater (Ref. 30, p. 94).

1,2-DCA is most commonly used in the manufacture of vinyl chloride. It is also used as a chemical intermediate, as a solvent, and it was previously added to leaded gasoline as a lead scavenger and was a component of some cleaning solutions and pesticides, adhesives, and paint, varnish, and finish removers (Ref. 31, p. 21, 180). 1,2-DCA occurs in the environment by release to the air when it is made, packaged, shipped or used (Ref. 31, p. 22). Additionally, it can occur as a microbial degradation of other chlorinated alkanes (Ref. 31, p. 183). 1,2-DCA that is released into the environment partitions into the atmosphere, and that which is released onto soil or water is expected to volatilize quickly (Ref. 31, p. 186).

2.2.2 HAZARDOUS SUBSTANCES ASSOCIATED WITH THE SOURCE

The groundwater plume with no identified source, Source 1, contains measured levels of PCE, TCE, 1,1-DCA, 1,2-DCA, and 1,1-DCE significantly above background levels that were established within the Trinity/Antlers Aquifer (the aquifer being evaluated for the Groundwater Migration Pathway) as established in the analytical data Tables 1 and 2. All contaminants of concern (COCs) except 1,1-DCA were detected above HRS health-based benchmarks (EPA Maximum Concentration Levels or HRS cancer risk benchmarks) in multiple wells, as detailed in Table 2. All field work was conducted as outlined in the SI and ESI work plans, including the SI Site Inspection Health and Safety Plan (HASP), and the TCEQ/EPA-approved Quality Assurance Project Plans (QAPPs) for the TCEQ Preliminary Assessment/Site Inspection Program: Federal Grant Identification Number V-96665501-0 (Appendix A of References 32 and 33). All deviations from the work plans and/or QAPP were noted in the field notebooks and detailed in the SI and ESI Reports (References 12 and 23; Ref. 32, pp. 17, 19; Ref. 33, pp. 21-23, 27).

All groundwater samples obtained during the SI event were analyzed by method CLP OLM04.2-GC/MS and CLP ILMO5.3-ICP (Ref. 10, pp. 5-6; Ref. 34, p. 2). Groundwater samples obtained during the ESI were analyzed by CLP SOW SOM02.2, CLP ISM02.2 and CLP OLM04.2-GC/MS (Ref. 6, pp. 5, 39, 75, 103, 119, 173; Ref. 43, pp. 14-15).

- Background Concentrations:

Background groundwater samples were obtained from four private wells during the SI and ESI sampling events. Background sample GW-01 was obtained from a domestic well of unknown depth located 0.4 miles northeast of the approximate plume center during the June 2014 SI sampling event (Figure 3; Ref. 23, p. 39). Background sample GW-35 was collected June 15, 2015, from a private business well completed in the Trinity/Antlers aquifer located 0.25 miles north of the plume center (Figure 3; Ref. 12, p. 29). GW-38 was taken June 15, 2015, from a domestic well completed at approximately 100-120 ft bgs located 0.5 miles southeast of the plume center (Figure 3; Ref. 12, p. 73; Ref. 35, p. 9). Background sample GW-78 was collected October 5, 2015, from a private domestic well completed from 120-160 ft bgs in the Trinity/Antlers aquifer located 0.5 miles west-northwest of the plume center (Figure 3; Ref. 12, p. 97; Ref. 22, p. 52; Ref. 36, pp. 8, 37). The Trinity/Antlers is the primary fresh water producing aquifer within a mile of the site, providing an additional line of evidence for the similarity of the background and observed release samples (Ref. 37, p. 16; Ref. 48, pp. 6-7). The background samples were collected under similar meteorological conditions as the observed release samples in June 2014, June 2015, and October 2015 (Ref. 12, pp. 15, 29, 37, 63, 73, 87, 97; Ref. 23, pp. 37, 39). The same sampling procedures and analytical methods were followed for all background and observed release samples (Ref. 32, pp. 14, 17; Ref. 33, pp. 21-24).

Table 1 – Groundwater Background Samples							
Sample ID	Sample Type	Screened Interval/ Depth/ Surface Elevation ³	Date	Hazardous Substance	Hazardous Substance Concentration (µg/L)	Contract-Required Quantitation Limit/Sample Quantitation Limit	Reference
GW-01	GW-Private	Unknown ~2940ft	6/9/2014	1,1-DCE	U	0.5 µg/L ²	Ref. 10, pp. 1, 2, 5, 6-7, 106; Ref. 23, p. 39; Ref. 34, pp. 1-3
				1,1-DCA	U	0.5 µg/L ²	
				1,2-DCA	U	0.5 µg/L ²	
				PCE	U	0.5 µg/L ²	
				TCE	U	0.5 µg/L ²	
GW-35	GW-Private	Unknown Antlers Sand/ Trinity ~2947 ft	6/15/2015	1,1-DCE	0.5 U	0.5 µg/L ¹	Ref. 6, pp. 1, 4-5, 7-8, 10, 31; Ref. 12, p. 29; Ref. 22, p. 136; Ref. 38, pp. 1-4; Ref. 43, pp. 45-46
				1,1-DCA	0.5 U	0.5 µg/L ¹	
				1,2-DCA	0.5 U	0.5 µg/L ¹	
				PCE	0.5 U	0.5 µg/L ¹	
				TCE	0.5 U	0.5 µg/L ¹	
GW-38	GW-Private	Approx. 100-120 ft bgs ~2940 ft	6/17/2015	1,1-DCE	0.5 U	0.5 µg/L ¹	Ref. 6, pp. 1, 4-5, 7-8, 43, 58; Ref. 12, p. 73; Ref. 35, p. 9; Ref. 38, pp. 1-4
				1,1-DCA	0.5 U	0.5 µg/L ¹	
				1,2-DCA	0.5 U	0.5 µg/L ¹	
				PCE	0.5 U	0.5 µg/L ¹	
				TCE	0.5 U	0.5 µg/L ¹	
GW-78	GW-Private	120-160 ft bgs 2950 ft	10/5/2015	1,1-DCE	U	0.5 µg/L ²	Ref. 6, pp. 1, 4-5, 7-8 179-180, 202; Ref. 12, p. 97; Ref. 22, p. 52; Ref. 38, pp. 1-4
				1,1-DCA	U	0.5 µg/L ²	
				1,2-DCA	U	0.5 µg/L ²	
				PCE	U	0.5 µg/L ²	
				TCE	U	0.5 µg/L ²	

Notes:

“U” indicates undetected, not detected at reported quantitation limit (Ref. 6, pp. 42, 201; Ref. 10, p. 119).

¹ Original test reports for the samples collected during the June 2015 ESI provided adjusted contract-required quantitation limits (CRQLs) in place of HRS-defined sample quantitation limits (SQLs); because the samples were analyzed under the EPA Contract Laboratory Program, these values are used as the HRS-defined CRQL as described in HRS Table 2-3 (Ref. 1, Table 2-3; Ref. 6, pp. 7, 9-10, 43).

² Original test reports for the samples collected during the June 2014 SI and October 2015 ESI provided reporting limits (RLs) in place of sample quantitation limits; the values reported under the “Reporting Limit” column on the test reports are the sample quantitation limits (SQLs), i.e., the laboratory method reporting limits (RLs) adjusted for sample specific factors (Ref. 1, Table 2-3; Ref. 6, pp. 179-180; Ref. 34, p. 2; Ref. 38, p. 1).

³ All surface elevations are given in units of feet above mean sea level, interpolated from the USGS National Map topographic contours shown in Figure 3. The symbol “~” indicates that the value is approximated (between two mapped contour lines)

Source Samples:

Table 2 – Source 1 Samples							
Sample ID	Sample Type	Screened Interval/ Aquifer/ Surface Elevation ³	Date	Hazardous Substance	Hazardous Substance Concentration	Contract-Required Quantitation Limit/Sample Quantitation Limit	Reference
GW-07	GW-Private	Depth: 200 ft bgs ~2940 ft	6/10/2014	PCE	0.8 µg/L J-	0.5 µg/L ²	Ref. 10, p. 26, 108; Ref. 23, p. 4; Ref. 34, pp. 1-3
GW-09	GW-Private	Depth: 138 ft bgs ~2945 ft	6/10/2014	PCE	1.2 µg/L J-	0.5 µg/L ²	Ref. 10, p. 29, 108; Ref. 23, p. 6; Ref. 34, pp. 1-3
GW-11	GW-Private	Unknown ~2950 ft	6/10/2014	PCE	0.9 µg/L	0.5 µg/L ²	Ref. 10, p. 35, 109; Ref. 23, p. 10; Ref. 34, pp. 1-3
GW-15	GW-Private	Depth: 142 ft bgs ~2950 ft	6/11/2014	1,1-DCE	1.6 µg/L	0.5 µg/L ²	Ref. 10, pp. 49-50, 112; Ref. 23, p. 20; Ref. 34, pp. 1-3
				1,1-DCA	1.4 µg/L	0.5 µg/L ²	
				PCE	11.9 µg/L	0.5 µg/L ²	
GW-16	GW-Private	Depth: 148 ft bgs ~2950 ft	6/11/2014	1,1-DCE	9.4 µg/L	0.5 µg/L ²	Ref. 10, p. 52-53, 112; Ref. 23, p. 22; Ref. 34, pp. 1-3
				PCE	1.8 µg/L	0.5 µg/L ²	
GW-21	GW-Private	Depth: 134 ft bgs ~2945 ft	6/12/2014	PCE	2.1 µg/L	0.5 µg/L ²	Ref. 10, p. 75, 116; Ref. 23, p. 28; Ref. 34, pp. 1-3
GW-34	GW-Private	Unknown ~2950 ft	6/15/2015	1,2-DCA	0.76 µg/L	0.5 µg/L ¹	Ref. 12, p. 31; Ref. 6, pp. 1, 4-5, 7-9, 31; Ref. 38, pp. 1-4; Ref. 43, pp. 33-34
GW-45	GW-Private	Unknown 2950 ft	10/5/2015	1,1-DCE	17.8 µg/L	0.5 µg/L ²	Ref. 6, pp. 1, 4-5, 7-8, 173-174, 202; Ref. 12, pp. 23, 87-89; Ref. 38, pp. 1-4
				1,1-DCA	5.6 µg/L	0.5 µg/L ²	
				PCE	1.0 µg/L	0.5 µg/L ²	
				TCE	2.3 µg/L	0.5 µg/L ²	
GW-47	GW-Private	Screened 138-158 ft bgs 2950 ft	6/15/2015	1,1-DCE	11 µg/L	0.5 µg/L ¹	Ref. 6, pp. 1, 4-5, 7-8, 12, 31; Ref. 12, pp. 17-19; Ref. 22, pp. 35-36; Ref. 38, pp. 1-4; Ref. 43, pp. 67, 74
				1,1-DCA	3.4 µg/L	0.5 µg/L ¹	
				PCE	0.67 µg/L	0.5 µg/L ¹	
				TCE	1.4 µg/L	0.5 µg/L ¹	

Table 2 – Source 1 Samples

Sample ID	Sample Type	Screened Interval/ Aquifer/ Surface Elevation ³	Date	Hazardous Substance	Hazardous Substance Concentration	Contract-Required Quantitation Limit/Sample Quantitation Limit	Reference
GW-48	GW-Private	Screened 137-157 ft bgs 2950 ft	6/15/2015	1,1-DCE	7.9 µg/L	0.5 µg/L ¹	Ref. 6, pp. 1, 4-5, 7-8, 13, 31; Ref. 12, p. 21; Ref. 22, pp. 37-38; Ref. 38, pp. 1-4; Ref. 43, pp. 85-86
				1,1-DCA	1.9 µg/L	0.5 µg/L ¹	
GW-51	GW-Private	Unknown ~2950 ft	6/16/2015	1,1 -DCE	58 µg/L	0.5 µg/L ¹	Ref. 6, pp. 1, 4-5, 7-8, 44, 57; Ref. 12, p. 57; Ref. 38, pp. 1-4
				1,1-DCA	0.56 µg/L	0.5 µg/L ¹	
				1,2-DCA	1.4 µg/L	0.5 µg/L ¹	
GW-52	GW-Private	Unknown ~2950 ft	6/15/2015	1,1-DCE	11 µg/L	0.5 µg/L ¹	Ref. 6, pp. 1, 4-5, 7-8, 16, 31; Ref. 12, p. 33; Ref. 38, pp. 1-4; Ref. 43, p. 113
GW-53	GW-Private	Unknown 2950 ft	6/16/2015	1,1-DCE	5.1 µg/L	0.5 µg/L ¹	Ref. 6, pp. 1, 4-5, 7-8, 17, 32; Ref. 12, p. 59; Ref. 38, pp. 1-4; Ref. 43, pp. 189-190
				1,1-DCA	1.1 µg/L	0.5 µg/L ¹	
				TCE	1.1 µg/L	0.5 µg/L ¹	
GW-55	GW-monitor well	Screened 54-74 ft bgs ~2950 ft	6/16/2015	1,1-DCE	13 µg/L	0.5 µg/L ¹	Ref. 6, pp. 1, 4-5, 7-8, 19, 32; Ref. 12, p. 39; Ref. 39, pp. 93, 95; Ref. 38, pp. 1-4; Ref. 43, pp. 219, 222, 267
				1,1-DCA	57 µg/L	0.5 µg/L ¹	
				TCE	0.55 µg/L	0.5 µg/L ¹	
GW-56	GW-monitor well	Screened 57-69 ft bgs ~2950 ft	6/16/2015	1,1-DCA	1.7 µg/L	0.5 µg/L ¹	Ref. 6, pp. 1, 4-5, 7-8, 20, 32; Ref. 12, p. 41; Ref. 39, p. 89; Ref. 38, pp. 1-4; Ref. 43, pp. 301-302, 314
GW-57	GW-monitor well	Screened 57-69 ft bgs ~2950 ft	6/16/2015	1,1-DCE	15 µg/L	0.5 µg/L ¹	Ref. 6, pp. 1, 4-5, 7-8, 21, 32; Ref. 12, p. 43; Ref. 39, p. 83; Ref. 38, pp. 1-4; Ref. 43, pp. 327-328
				TCE	0.68 µg/L	0.5 µg/L ¹	
GW-59	GW-Private	Screened 125-155 ft bgs ~2947 ft	10/5/2015	1,1-DCE	2.2 µg/L	0.5 µg/L ²	Ref. 6, pp. 1, 4-5, 7-8, 177, 202; Ref. 12, pp. 27, 91; Ref. 22, pp. 40-41; Ref. 38, pp. 1-4

Table 2 – Source 1 Samples

Sample ID	Sample Type	Screened Interval/ Aquifer/ Surface Elevation ³	Date	Hazardous Substance	Hazardous Substance Concentration	Contract-Required Quantitation Limit/Sample Quantitation Limit	Reference
GW-60	GW-Private	Screened 140-160 ft bgs ~2947 ft	6/17/2015	1,1-DCE	1.9 µg/L	0.5 µg/L ¹	Ref. 6, pp. 1, 4-5, 7-8, 46, 58; Ref. 12, p. 75; Ref. 22, p. 42; Ref. 38, pp. 1-4
				1,1-DCA	0.82 µg/L	0.5 µg/L ¹	
				PCE	0.51 µg/L	0.5 µg/L ¹	
GW-62	GW-Private	Unknown ~2950 ft	6/17/2015	1,1-DCE	460 µg/L	50 µg/L ¹	Ref. 6, pp. 1, 4-5, 7-8, 48, 58; Ref. 12, p. 63; Ref. 38, pp. 1-4
				1,1-DCA	6.9 µg/L	0.5 µg/L ¹	
				1,2-DCA	1.4 µg/L	0.5 µg/L ¹	
GW-64 (GW-20)	GW-Private	Unknown 2950 ft	6/17/2015	1,1-DCE	33 µg/L	2.5 µg/L ¹	Ref. 6, pp. 1, 4-5, 7-8, 49, 58; Ref. 12, p. 65; - Ref. 38, pp. 1-4
GW-65	GW-Private	Unknown ~2950 ft	6/16/2015	PCE	1.5 µg/L	0.5 µg/L ¹	Ref. 6, pp. 1, 4-5, 7-8, 23, 32; Ref. 12, p. 61; Ref. 38, pp. 1-4; Ref. 43, pp. 368-369
GW-79	GW-Private	Unknown ~2948 ft	10/5/2015	PCE	3.4 µg/L	0.5 µg/L ²	Ref. 6, pp. 1, 4-5, 7-8, 181 – 182, 202-203; Ref. 12, p. 99; Ref. 38, pp. 1-4
GW-80	GW-Private	Screened 128-148 ft bgs ~2950 ft	10/5/2015	PCE	3.4 µg/L	0.5 µg/L ²	Ref. 6, pp. 1, 4-5, 7-8, 183-184, 203; Ref. 12, p. 95; Ref. 22, pp. 46-47; Ref. 38, pp. 1-4
GW-81	GW-Private	> 90 ft bgs; exact depth unknown ~2950 ft	10/5/2015	PCE	0.6 µg/L	0.5 µg/L ²	Ref. 6, pp. 1, 4-5, 7-8, 185-186, 203; Ref. 12, p. 93; Ref. 38, pp. 1-4

¹ Original test reports for the samples collected during the June 2015 ESI provided adjusted contract-required quantitation limits (ADJCRQLs) in place of HRS-defined sample quantitation limits (SQLs); because the samples were analyzed under the EPA Contract Laboratory Program, these values are used as the HRS-defined CRQL as described in HRS Table 2-3 (Ref. 1, Table 2-3; Ref. 6, pp. 7, 9-10, 43).

² Original test reports for the samples collected during the June 2014 SI and October 2015 ESI provided reporting limits (RLs) in place of sample quantitation limits; the values reported under the “RL” column on the test reports are the sample quantitation limits (SQLs), i.e., the laboratory method reporting limits (RLs) adjusted for sample specific factors (Ref. 1, Table 2-3; Ref. 6, pp. 179-180; Ref. 34, p. 2; Ref. 38, p. 1).

³ All surface elevations are given in units of feet above mean sea level, interpolated from the USGS National Map topographic contours shown in Figure 3. The symbol “~” indicates that the value is approximated (between two mapped contour lines).

J- Sample results that are estimated biased low are qualified with “J-”, as determined in the audit of data quality, an additional step of data validation (Ref. 34, p. 3). Sample results which are biased low can be used to establish an observed release for HRS; no adjustment is necessary for release samples associated with low bias (Ref. 62, pp. 5, 8).

List of Hazardous Substances Associated with Source

The following hazardous substances are associated with the source (see Section 3.1.1 of this HRS documentation record): TCE, PCE, 1,1-DCE, 1,1-DCA, and 1,2-DCA

2.2.3 HAZARDOUS SUBSTANCES AVAILABLE TO A PATHWAY

Table 3 – Hazardous Substances Available to a Pathway		
Containment Description	Containment Factor Value	References
Gas release to air: The air migration pathway was not evaluated; therefore, gas containment was not evaluated.	Not Scored	
Particulate release to air: The air migration pathway was not evaluated; therefore, particulate containment was not evaluated.	Not Scored	
Release to groundwater: The Containment Factor Value for the groundwater migration pathway was evaluated for “All Sources” for evidence of hazardous substance migration from source area (i.e., source area includes source and any associated containment structures). The applicable containment factor value was determined based on existing analytical evidence of hazardous substances in groundwater samples from private wells (documented releases are listed and referenced in Table 2).	10	Table 3-2 of the HRS (Ref. 1, Section 3.1.2.1)
Release via overland migration and/or flood: The surface water pathway was not evaluated; therefore, surface water overland/flood migration component containment was not evaluated.	Not Scored	

2.4.2 HAZARDOUS WASTE QUANTITY

2.4.2.1.1. Hazardous Constituent Quantity

Description

The total Hazardous Constituent Quantity for Source No. 1 could not be adequately determined according to the HRS requirements; that is, the total mass of all CERCLA hazardous substances in the source and releases from the source is not known and cannot be estimated with reasonable confidence (Ref. 1, Section 2.4.2.1.1). Insufficient historical and current data [manifests, potentially responsible party (PRP) records, State records, permits, waste concentration data, etc.] are available to adequately calculate the total mass of all CERCLA hazardous substances in the source and the associated releases from the source. Therefore, there is insufficient information to calculate a total or partial Hazardous Constituent Quantity estimate for Source No. 1 with reasonable confidence. Scoring proceeds to the evaluation of Tier B, hazardous wastestream quantity (Ref. 1, Section 2.4.2.1.1).

Hazardous Constituent Quantity Assigned Value: NS

2.4.2.1.2. Hazardous Wastestream Quantity

Description

The total Hazardous Wastestream Quantity for Source No. 1 could not be adequately determined according to the HRS requirements; that is, the total mass of all hazardous wastestreams and CERCLA pollutants and contaminants for the source and releases from the source is not known and cannot be estimated with reasonable confidence (Ref. 1, Section 2.4.2.1.2). Insufficient historical and current data (manifests, PRP records, State records, permits, waste concentration data, annual reports, etc.) are available to adequately calculate the total mass of all hazardous wastestreams and CERCLA pollutants and contaminants for the source and the associated releases from the source. Therefore, there is insufficient information to adequately calculate or extrapolate a total or partial Hazardous Wastestream Quantity for Source No. 1 with reasonable confidence. Scoring proceeds to the evaluation of Tier C, Volume (Ref. 1, Section 2.4.2.1.2).

Hazardous Wastestream Quantity Assigned Value: NS

2.4.2.1.3. Volume

Description

For the migration pathways, the source is assigned a value for volume using the appropriate Tier C equation from HRS Table 2-5 (Ref. 1, Section 2.4.2.1.3). The hazardous waste quantity for a plume site with no identified source can be determined by measuring the area within all observed release samples combined with the vertical extent of contamination to arrive at an estimate of the plume volume. However, the lack of the vertical extent of contaminant delineation prohibits a reasonable estimate of the volume. The presence of contaminated groundwater samples shows that the volume is greater than zero. Therefore, the volume of the groundwater plume is assigned a volume hazardous waste quantity value greater than ($>$) 0. The value of > 0 reflects that the volume is known to be greater than 0, but the exact amount is unknown.

Volume Assigned Value: unknown, but > 0

2.4.2.1.4. Area

Description

Tier D is not evaluated for source type “other” (Ref. 1, Section 2.4.2.1.4). Also, since the volume of greater than zero was assigned to the Tier C, the area (Tier D) is not to be evaluated and instead, assigned a value of 0 (Ref. 1, Section 2.4.2.1.3).

Area Assigned Value: 0

2.4.2.1.5. Source Hazardous Waste Quantity Value

As described in the HRS, the highest value assigned to a source from among the four tiers of hazardous constituent quantity (Tier A), hazardous waste stream quantity (Tier B), volume (Tier C), or area (Tier D) was selected as the source hazardous waste quantity value (Ref. 1, Section 2.4.2.1). Tier C was assigned the greatest value of unknown, but > 0 .

Highest assigned value assigned from Ref. 1, Table 2-5: unknown, but > 0

SUMMARY OF SOURCE DESCRIPTIONS

Table 4 – Summary of Source Descriptions

Source No.	Source Haz. Waste Quantity Value	Source Hazardous Constituent Quantity Complete? (Y/N)	Containment Factor Value by Pathway				
			Groundwater (GW) (Ref. 1, Table 3-2)	Surface Water (SW)		Air	
				Overland/flood (Ref. 1, Table 4-2)	GW to SW (Ref. 1, Table 3-2)	Gas (Ref. 1, Table 6-3)	Particulate (Ref. 1, Table 6-9)
1	> 0	N	10	NE	NE	NE	NE

NE= Not Evaluated

Description of Other Possible Sources:

The Former National Oilwell/Phoenix Energy facility is located at 5621 Andrews Highway and was utilized as an oilfield tool manufacturing facility by several owners/operators (Figure 2; Ref. 39, p. 9). The facility currently participates in the TCEQ Corrective Action program (TCEQ SWR No. 32806, RN102160686, EPA ID TXD057425662), with contaminants of concern including 1,1-DCE (Ref. 40, p. 20). National Oilwell/Phoenix Energy was registered as a large quantity generator of hazardous waste including: water soluble coolants and coolant sludge, alumina refractory dust, petroleum-contaminated solids, sandblasting wastes, chrome grinding mud, Tenaxol quench fluid, metal chips, hydraulic oil, compressor condensate, spent paint thinner, quenching oil, grinding mud, furnace slag, paint booth filters, kerosene, and non-chlorinated solvents during operations from 1984 to 2015 (Ref. 40, pp. 20-45). TCE and 1,1-DCE were detected above the screening level in samples obtained from two monitor wells at this facility in February 2013 (Ref. 41, pp. 1-4, 8, 11). These monitor wells are approximately 60 to 70 feet deep, and were installed to investigate 1,1-DCE, metals, and total petroleum hydrocarbon contamination in a thin perched unit that does not produce appreciable quantities of water (Ref. 39, pp. 5-14). These monitor wells were sampled during the ESI and results confirmed significant concentrations of TCE, 1,1-DCA, 1,1-DCE, 1,1,1-trichloroethane, 1,1,2-trichloroethane, ethylbenzene, isopropylbenzene, o-xylene, and m, p-xylenes (Ref. 6, pp. 19-21; Ref. 12, pp. 39-43). Investigations at the property have included the collection of approximately 260 soil samples and a soil boring from the thin aquiclude immediately below the perched unit which have not identified a source of 1,1-DCE at the property (Ref. 42, p. 2). A new monitor well was installed to a depth of 161 ft bgs (Trinity/Antlers Aquifer) approximately 160 ft to the south of the Former National Oilwell/Phoenix Energy property; analysis of groundwater samples from this well in 2018 and 2019 did not detect 1,1-DCE (Ref. 42, pp. 1-2, 5, 23-24). Based on this sampling the contamination was determined to be vertically delineated. This property cannot be ruled out as a possible source contributing to the concentrations of chlorinated VOCs in the Trinity/Antlers Aquifer.

Database searches revealed several other former facilities within one mile of the plume which historically used PCE or other solvents, including a metal coating facility, a fabricated metal manufacturer, and an electronics and maintenance company (Ref. 26, pp. 6-7, 10-12, 15, 18-19; Ref. 44, pp. 1-2, 18, 20-21). However, information was not sufficient to support the identification of these entities as a possible source causing the significant increase in the plume.

3.0 GROUNDWATER MIGRATION PATHWAY

3.0.1 GENERAL CONSIDERATIONS

Groundwater Migration Pathway Description

Regional Geology/Aquifer Description:

The aquifer of concern is the Edwards-Trinity Aquifer system. The aquifer is composed of Early Cretaceous sediments of the Trinity, Fredericksburg, and Lower Washita groups. The Fredericksburg and Washita groups form the Edwards portion of the aquifer, and the Trinity Group forms the Trinity portion. For the purposes of this report, only the Trinity portion of the aquifer will be discussed since the Edwards Group sediments do not occur in the site area (Ref. 20, p. 24; Ref. 45, p. 14). The Edwards-Trinity Aquifer system is also discussed in geographic subareas: The Trans-Pecos, The Edwards Plateau, the Hill County, and the Balcones Fault Zone. The site is located in the Edwards Plateau subarea (Ref. 45, pp. 6-7; Ref. 46, p. 1).

Other than in the Trans-Pecos region of the Plateau, the Trinity Group sediments are composed of the Basal Cretaceous Sand, the Glen Rose Limestone, and the Maxon Sand. In the northern Edwards Plateau area in the vicinity of the site, the Glen Rose is absent and the Basal Cretaceous and Maxon Sands are usually inclusively referred to as the Antlers Sand or Trinity Sands (Ref. 20, p. 32). The Trinity/Antlers Formation consists of white to purple, loosely-consolidated, fine to coarse grain well-sorted, unfossiliferous, quartz sandstone containing scattered lenses of quartz gravel (Ref. 47, p. 29).

There are numerous private wells in the site area which are completed in the Ogallala Formation and underlying Antler Sand with total depths typically ranging from 80 to 170 feet bgs (Ref. 36, p. 8). Within two miles of the plume area, the Ogallala Aquifer is present and its saturated thickness ranges widely from none to more than 150 feet in the region and is interconnected to the Edwards-Trinity (Ref. 5, pp. 111-146; Ref. 22, p. 142; Ref. 36, pp. 7-8). Well logs from within 0.5 miles of the approximate plume center indicate that groundwater in the Trinity/Antlers Aquifer starts between 80-130 feet bgs and ends often at the notable 'red beds' of the Dockum Aquifer System at 120-180 feet bgs (Ref. 22, pp. 39, 41-43, 47-48, 51-52, 56-57, 63, 65, 99-101, 103, 105, 108, 110, 114-115, 119, 122, 126, 128, 130).

Table 5 – Site Stratigraphy

System	Series	Group	Formation	Thickness (feet)	Water-bearing Characteristics
Quaternary	Pleistocene to Recent		Eolian sands (Blackwater Draw)	0-30	Yields small amounts of water (if saturated).
Tertiary	Late Miocene to Pliocene		Ogallala	20-40	Yields small amounts of water in Ector County and generally lies above the water table.

System	Series	Group	Formation	Thickness (feet)	Water-bearing Characteristics
Cretaceous	Comanche	Trinity	Antlers	55-70, variable	Yields small to moderate amounts of water. Principle source of water for Ector County.
Triassic		Upper Dockum	Chinle	600-1,600	May yield small amounts of highly mineralized water. Commonly known as the “red beds” that form the base of High Plains Aquifer.

(Ref. 20, p. 83; Ref. 21, p. 10; Ref. 36, p. 8; Ref. 48, pp. 6, 8)

During the late Paleozoic Era, tectonic collision formed the Ouachita Mountains that extended from the Marathon and Solitario uplifts in Texas to modern-day Oklahoma and Arkansas (Ref. 45, p. 22). The sedimentation patterns that occurred during and after this orogeny are significant to the creation of the Edwards-Trinity Aquifer system. (Ref. 20, pp. 30-32; Ref. 45, pp. 22-23).

During the early and middle Permian Period, limestone deposits built up in the central and west Texas sea that was bounded by the Ouachita Mountains. Deposition in west Texas was confined to undersea basins formed by faulting perpendicular to the Ouachita structural belt, forming the Permian Basin. Sedimentation in the shallow sea became increasingly saline during the middle of the Late Permian as orogenic uplift closed the sea off from the open ocean. This sedimentation is characterized by evaporites composed primarily of gypsum, anhydrite, halite, and potash. Eventual erosion of the uplifted area near the end of the Late Permian allowed the fresh open ocean water to come in contact with the basin sea water, further allowing for fine-grained clastic sedimentation in the form of a relatively thin red bed unit over the evaporites. The west Texas region eventually uplifted, and the sea withdrew at the end of the Paleozoic. This was followed by long periods of erosion and crustal warping through the middle Triassic. During the Late Triassic, Paleozoic rocks were eroded down and redeposited in the low-lying fluvial, deltaic, and lacustrine environments, forming the red beds of the Dockum Group. During the Jurassic, the Ouachita mountains became deeply eroded as the modern-day Gulf of Mexico opened, and the Cretaceous sea advanced. The topographic landscape tilted southeastward toward the Gulf, across the subsiding Ouachita structural belt. The Gulf continued to rift and subside into the Cretaceous, thereby creating a broad continental shelf on which the strata that would become the Edwards-Trinity Aquifer system formed. Trinity Group sediments were deposited in three cycles of transgression and regression of the Cretaceous sea. In the northern plateau region, Trinity Group sediments are composed of the Trinity/Antlers Sand (Ref. 20, pp. 30-32; Ref. 45, pp. 22-23).

Uplift and erosion were the dominant geologic processes following the Cretaceous in the current west-central Texas region. The upper Tertiary is represented in the region by the Ogallala Formation, which is part of a Cenozoic succession of overlapping deltaic deposits; the Ogallala unconformably overlies the Trinity (Ref. 45, p. 35). The Ogallala Formation is composed of coarse-grained fluvial sediments grading upward into thick fine-grained eolian sands and clays (Ref. 49, p. 10).

The Ogallala Formation is highly porous and permeable, recharged by direct and indirect infiltration of precipitation on the outcrop, interformational and upward leakage, and from percolation from playa lakes (Ref. 49, p. 12). The Trinity/Antlers Formation is similarly recharged via precipitation and lateral inflow. Regional groundwater flow is generally toward the southeast but has been found to be toward the west at the PIE state Superfund site approximately ½ mile south of the plume center (Figure 2; Ref. 20, p. 84; Ref. 36, pp. 7-8).

Site Geology/Aquifer Description:

The aquifer of concern at the site is the Edwards-Trinity Aquifer system, specifically, the Trinity/Antlers Sand Formation.

Stratigraphically, the Antlers lies below the Ogallala (Ref. 49, p. 11). The Ogallala Aquifer System occurs in portions of the site area to the southeast and is present within the 4-mile target distance limit (TDL) (Ref. 20, p. 84; Ref. 22, p. 142). The Antlers and the Ogallala Formations are similar in lithology and are not easily distinguished (Ref. 20, p. 84). The primary water-bearing formation in Ector County and principle source of well water is the Antlers. The well logs that indicate that water is drawn from the Trinity/ Antlers are within the same depth range as those that do not indicate a specific aquifer (Ref. 20, p. 84; Ref. 21, p. 10; Ref. 22, pp. 30-34, 39, 41-43, 47-48, 51-52, 56-57, 63, 65, 99-101, 103, 105-106, 108, 110, 114-115, 119, 122, 126, 128, 130). There is no continuous aquitard between the two formations; therefore, they are interconnected within two miles of the groundwater plume (Ref. 20, p. 83; Ref. 22, pp. 40-41; Ref. 36, pp. 8-9, 37; Ref. 48, pp. 6, 8). Downward migration of contaminants from the surface through caliche and into the Trinity/Antlers Aquifer has been documented at three Superfund sites located within two miles of the approximate plume center, demonstrating that downward migration of contaminants through the caliche occurs in the site area (Ref. 36, p. 10; Ref. 37, pp. 15-16, 20; Ref. 48, p. 4).

- Aquifer/Stratum 1 (uppermost): Eolian Sands (Quaternary)

Description

Regionally, the topographic surface of the area is a flat plateau with playas (shallow depressions) dotting its surface (Ref. 21, p. 8). The sediments that form this surface are Quaternary windblown sand and silt, alluvium, and playa lake deposits of silt and clay (Ref. 50, p. 13). These sediments, known as Eolian Sands or the Blackwater Draw Formation, are approximately 0 to 30 feet thick near the site (Ref. 36, pp. 7-8; Ref. 47, p. 40). The Eolian Sands yield small amounts of water locally to wells (Ref. 50, p. 13).

- Aquifer/Stratum 2: Ogallala Formation (Tertiary)

Description

The coarse sands and gravels of the Ogallala Formation fill the erosional channels atop the Trinity/Antlers Sands (basal Cretaceous sand) in the site area (Ref. 51, pp. 43-44). The Ogallala Formation consists of red and yellow clay, silt, fine to coarse gray and buff colored sand, gravel, and caliche (Ref. 47, p. 36). A layer of caliche is considered the “caprock” of the Ogallala (Ref. 37, p. 22). The caliche is calcium carbonate formed chemically in

place as a result of soil formation, groundwater precipitation, or both (Ref. 49, p. 10). The caliche layer is represented in nearly every well log within the plume area at depths ranging from 0 to 75 ft bgs, but it is unclear if this caliche belongs to the Ogallala or to the Quaternary material that overlies the Ogallala, as literature suggests that caliche can occur in both strata. In wells where it is mentioned, the caliche is reported from 0-75 feet bgs (Ref. 20, p. 83; Ref. 21, p. 10; Ref. 22, pp. 35, 37, 39, 43, 47-48, 52, 54-55, 57, 60, 63, 65, 74, 94, 97, 99-110, 112-115, 119, 122, 126, 128, 132, 134; Ref. 49, p. 10).

The Ogallala Formation, where present in Ector County, is less than 60 feet thick, and yields only small quantities of water to wells, but in general, it lies above the water table (Ref. 21, pp. 10, 14; Ref. 48, p. 7). In the site area, where the Ogallala sediments thin and are located above the water table, groundwater flows directly into the Edwards-Trinity aquifer (Ref. 20, p. 84). The Ogallala Aquifer is not present in northwestern portions of the site but occurs to the southeast of the site location within the 4-mile TDL (Ref. 22, p. 142). The Ogallala Formation contains a thin zone of perched groundwater immediately above the Trinity/Antlers in a portion of the site near the intersection of Andrews Highway and 57th Street (Ref. 48, p. 7). In areas where a sufficient saturated thickness of Ogallala Formation sediments overlies the Trinity, well screen interval is likely to encompass both formations, as is the case at the PIE State Superfund site located 0.3 miles south of the approximate plume center (Figure 2; Ref. 5, pp. 16, 82-83, 109, 112, 115, 118-119, 122-125, 129, 132, 136, 141-142). Since the sediment composition of the Ogallala is very similar to that of the underlying Trinity/Antlers Formation, it is difficult to distinguish the boundary between the two formations in individual well logs (Ref. 20, pp. 80, 84; Ref. 22, pp. 35, 37, 39, 41-43, 47-48, 51-52, 57, 60, 63; Ref. 36, p. 9; Ref. 37, p. 22).

- Aquifer/Stratum 3: Trinity/Antlers Formation (Cretaceous)

Description

The Trinity Group sediments are generally composed of the Basal Cretaceous Sand, the Glen Rose limestone, and the Maxon Sand. In the northern Plateau area in the vicinity of the site, the Glen Rose is absent and the Basal Cretaceous and Maxon sands are usually inclusively referred to as the Antlers Sand or Trinity Sands (Ref. 20, p. 32; Ref. 50, p. 24). The Trinity/Antlers Formation consists of white, yellow, brown to purple, loosely-consolidated, fine to coarse grain well-sorted, unfossiliferous, quartz sandstone containing scattered lenses of quartz gravel. The sandstone can be cemented to various degrees by silica and calcite (Ref. 47, p. 29; Ref. 50, p. 32). Lenses of red clay are scattered throughout (sometimes mistaken for the Upper Dockum-Triassic Red Beds), and a coarse conglomerate about 5 to 10 feet thick consisting of red and black pebbles of chert and other quartz varieties is generally present at the base of the sandstone (Ref. 36, pp. 7-9; Ref. 47, p. 29).

The Trinity/Antlers Formation is the primary source of well water in Ector County and the site area (Ref. 20, p. 84; Ref. 21, p. 10). The well logs from the plume and from within 0.25 mile of the plume are generally screened or gravel-packed from 98-174 feet bgs in sands or sandstone, ending in blue shale and/or the Dockum red beds (Ref. 22, pp. 35, 37, 39, 41-43, 48, 51-52, 57, 60, 63). Regional groundwater flow within the Trinity/Antlers Formation, which is generally toward the southeast following the surface slope, can be affected by eroded channels cut into the underlying Dockum Formation that funnel water locally in a sinuous east-southeast direction (Ref. 20, p. 84; Ref. 50, p. 32). Remedial investigations at nearby Superfund sites have found local groundwater flow directions within two miles of the approximate plume center ranging between to the east-northeast, to the southwest, west or northwest, and groundwater flow directions are likely influenced by pumping of private wells (Ref. 5, p. 16; Ref. 36, p. 8; Ref. 37, p. 16; Ref. 48, p. 7).

- Aquifer/Stratum 4 (deepest): Upper Dockum Group (Triassic)

Description

During the late Triassic, Paleozoic rocks were eroded from the surrounding high ground and redeposited in low-lying fluvial, deltaic, and lacustrine environments as the red bed of the Dockum Group (Ref. 49, p. 10). The Upper Dockum Group is comprised of the Tecovas, Santa Rosa, and Chinle formations (Ref. 47, p. 24). The Chinle Formation disconformably underlies the Trinity Group (Ref. 49, p. 10; Ref. 51, p. 29). The formation consists mainly of brick red to maroon and purple shale (Ref. 47, pp. 25-26). The mudstone sequences in the Upper Dockum Group are considered the lower confining layer to the Trinity Aquifer in the study area and do not yield large quantities of water (Ref. 37, p. 23; Ref. 50, pp. 13, 32).

At the site, the Dockum Group is represented in well logs as red beds varying in depth from 136-170 feet bgs, which forms the bottom of the screened interval in many wells (Ref. 22, pp. 35, 37, 39, 41-43, 48, 51-52, 57, 60, 63).

- Aquifer Interconnections/Distance from Source

Description

The Ogallala Aquifer is interconnected to the Trinity/Antlers Sand Aquifer within two miles of site (Ref. 22, p. 142; Ref. 36, pp. 8, 37). The Ogallala Formation is in direct hydrologic contact with the underlying Trinity Group near the site and has little to no saturated thickness (Ref. 48, p. 7). While caliche within the Ogallala Formation may inhibit groundwater infiltration if it is a massive and unfractured layer, the natural fractures in the caliche provide preferential pathways for recharge and vertical migration of contaminants through the caliche (Ref. 37, pp. 20, 22). Well logs within two miles of the approximate plume center show caliche at varying depths and thicknesses, but caliche is not present in private well GW-59, which had an observed release of 1,1-DCE, indicating that the caliche is not continuous throughout the two-mile radius (Figure 3; Ref. 6, p. 177; Ref. 12, pp. 27, 91; Ref. 22, pp. 40-41). Three monitoring wells (GW-55, GW-56, and GW-57) screened in the Ogallala sediments from 54-74 ft bgs contained perched groundwater that had observed releases of chlorinated solvents during the ESI (Ref. 6, pp. 19-21; Ref. 12, pp. 39, 41, 43; Ref. 39, pp. 57-60, 84-85, 88-89, 92-93, 95). In private wells GW-47 and GW-48, which had observed releases of several chlorinated solvents, caliche is present from 5-30 ft bgs, and both wells are screened in the Trinity/Antlers from 137-158 ft bgs, demonstrating that the presence of caliche did not prevent migration of contamination through the Ogallala and into the Trinity/Antlers (Ref. 6, pp. 12-13; Ref. 12, pp. 17-19, 21; Ref. 22, pp. 35-38). Downward migration of contaminants from the surface through caliche and into the Trinity/Antlers Aquifer has occurred at the PIE State Superfund site and at the Odessa Chromium II and East 67th Street National Priorities List Superfund sites, which are all located within two miles of the approximate plume center, confirming that downward migration of contaminants through the caliche occurs in the site area (Figure 3; Ref. 1, Section L, Ground Water Migration Pathway, of the preamble to the 1990 HRS; Ref. 36, p. 10; Ref. 37, pp. 15-16, 20; Ref. 48, p. 4). There are also wells within two miles of the site that may be screened across both the Ogallala and Trinity/Antlers Formations, and typical private well construction does not include a seal above the screened interval to prevent vertical infiltration of groundwater (Ref. 37, p. 20).

As described above, there is no documented continuous stratum of significantly lower hydraulic conductivity between the Ogallala and Trinity/Antlers aquifers to prevent the downward migration of contamination within the extent of both aquifers. Additionally, the lithology of the two aquifers are similar enough that the boundary between the two is often indistinguishable in well logs from the 4-mile TDL (Ref. 36, p. 8; Ref. 37, p. 22). The hydrogeologic literature and EPA Superfund investigations for the Ector County area generally agree that in this area the Ogallala is not a productive aquifer as it is situated near or above the water table (Ref. 20, pp. 83, 84; Ref. 21, p. 10; Ref. 22, pp. 35, 37, 39, 41-43, 48, 51-52, 57, 60, 63; Ref. 37, pp. 22-23; Ref. 48, pp. 6-7). Because the Ogallala Formation and Trinity/Antlers are not separated by any aquifer boundaries, they are considered interconnected and are combined into a single hydrologic unit for the purposes of this HRS (Ref. 1, Section 3.0.1.2).

- Aquifer Discontinuities within Target Distance Limit

Description

No aquifer discontinuities such as faults, intrusive formations, or surface water bodies that transect the Trinity/Antlers Aquifer have been observed within four miles of the approximate plume center (Ref. 52, p. 1). The Ogallala Formation is located above the regional water table in the northern portion of the 4-mile TDL, so is not technically an aquifer in areas where it is unsaturated; however, the Ogallala Formation is considered hydrologically interconnected to the underlying Trinity/Antlers Formation, allowing recharge through the fractured caliche of the Ogallala to the Trinity/Antlers (Ref. 22, p. 142; Ref. 37, p. 20).

SUMMARY OF AQUIFER(S) BEING EVALUATED

Table 6 – Summary of Aquifer Being Evaluated				
Aquifer No.	Aquifer Name	Is Aquifer Interconnected with Upper Aquifer within 2 miles? (Y/N/NA)	Is Aquifer Continuous within 4-mile TDL? (Y/N)	Is Aquifer Karst? (Y/N)
1	Trinity/Antlers Formation	Y	Y	N

3.1 LIKELIHOOD OF RELEASE

3.1.1 OBSERVED RELEASE

Aquifer Being Evaluated:

The Trinity/Antlers Aquifer is being evaluated for this HRS.

Chemical Analysis

An observed release by chemical analysis is established by showing that the hazardous substance in release samples is significantly greater in concentration than in the background samples and by documenting that at least part of the significant increase is attributed to a release from the site being evaluated. The significant increase can be documented in one of two ways for HRS purposes. If the background concentration is not detected (or is less than the detection limit), an observed release is established when the sample measurement equals or exceeds the appropriate quantitation or detection limit. If the background sample concentration equals or exceeds the quantitation or detection limit, an observed release is established when the sample measurement is three times or more above the background concentration and above the appropriate quantitation or detection limit (Ref. 1, Table 2-3).

Drinking water in Ector County is generally sourced from the Trinity/Antlers Formation Aquifer (Ref. 20, p. 84; Ref. 21, p. 10). Background VOC analyses in the Trinity/Antlers Formation Aquifer were collected from four private wells located outside the plume area at 320 57th Street (GW-01), 5700 Andrews Highway (GW-35), 307 E. 48th Street (GW-38), and 504 W. 57th Street (GW-78) (Figure 3; Ref. 12, pp. 29, 73, 97; Ref. 23, p. 39; Ref. 35, p. 9). No well log was found for GW-01. The exact depth and screened interval of GW-35 is unknown, but the well log states that it is in the Trinity/Antlers Aquifer (Ref. 22, p. 136). No well log was found for GW-38; however, the owner stated the well was between 100 to 120 feet deep (Ref. 35, p. 9). The well log for GW-78 states that it is screened from 120 to 160 feet bgs (Ref. 22, p. 52). The wells that were sampled during the SI and ESI are screened or gravel-packed at similar depths to the background wells, in a depth range of 98-174 feet bgs (Ref. 22, pp. 35, 37, 39, 41-43, 47-48, 51-52, 57, 60, 63). All groundwater samples obtained during the SI event were analyzed for VOCs by method CLP OLM04.2 (Ref. 10, pp. 5-6; Ref. 34, p. 2). Groundwater samples obtained during the ESI event were analyzed for VOCs by CLP SOW SOM02.2 and CLP OLM04.2 (Ref. 6, pp. 5, 39, 75, 103, 119, 173). Data review and validation were performed on the three datasets collected during the SI and ESI (Ref. 6, p. 1, 4, 5, 7, 8; Ref. 10, pp. 1, 2, 5; Ref. 32, p. 19; Ref. 33, p. 27; Ref. 34, pp. 1-3; Ref. 38, pp. 1-4).

There is no appreciable change in ground surface elevation at the site, and there are no other groundwater bearing units below the water table that overlie the Trinity/Antlers in the plume area (Figure 3, Ref. 21, pp. 10, 14; Ref. 22, pp. 30-34; Ref. 37, pp. 15-16; Ref. 48, pp. 6-7, 9).

- Background Well Details:

As described fully in Section 2.2.2 of this HRS documentation record, four background groundwater samples were obtained from private wells located to the northeast, north, west-northwest, southeast of the approximate plume center during the 2014 SI and 2015 ESI sampling events (Figure 3). While the regional groundwater flow is thought to be to the southeast, remedial investigations at several other sites within two miles of the approximate plume center have measured groundwater flow in the Trinity/Antlers to the east-northeast, to the southwest, to the west, and to the northwest, possibly influenced by pumping supply wells (Ref. 5, p. 16; Ref. 20, p. 84; Ref. 36, p. 8; Ref. 37, p. 16; Ref. 48, p. 7; Ref. 50, p. 32). The background wells are completed in the Trinity/Antlers

Formation with screened intervals ranging from 100-160 ft bgs (Ref. 22, pp. 52, 136; Ref. 35, p. 9). The Trinity/Antlers is the primary fresh water producing aquifer within one mile of the site, providing an additional line of evidence for the similarity of the background and observed release samples (Ref. 37, p. 16; Ref. 48, pp. 6-).

Table 7 – Background Wells				
Sample ID	Well Type	Screened Interval (feet bgs)	Sample Date	References
GW-01	Private domestic	Exact Interval Unknown	6/9/2014	Ref. 23, p. 39
GW-35	Private domestic	Exact Interval Unknown; In Trinity/Antlers Aquifer	6/15/2015	Ref. 12, p. 29; Ref. 22, p. 136
GW-38	Private domestic	Approximately 100 to 120	6/17/2015	Ref. 12, p. 73; Ref. 35, p. 9
GW-78	Private domestic	120 to 160	10/5/2015	Ref. 12, p. 97; Ref. 22, p. 52

Note: Elevations below ground surface are not presented here, as the site is relatively flat with elevations ranging from 2940-2950 feet above mean sea level, interpolated from the USGS National Map topographic contours shown in Figure 3. Estimated well surface elevations are detailed in Table 1 of this documentation record.

- Background Concentrations:

PCE, TCE, 1,1-DCE, 1,1-DCA, and 1,2-DCA are at non-detect concentrations in all background well samples. The background wells CRQL/SQL is 0.5 U µg/L for PCE, TCE, 1,1-DCE, 1,1-DCA, and 1,2-DCA (Table 8).

Table 8 – Background Concentrations in Groundwater				
Sample ID	Hazardous Substance	Concentration (µg/L)	Contract-Required Quantitation Limit/ Sample Quantitation Limit	References
GW-01	1,1-Dichloroethylene (1,1-DCE)	U	0.5 µg/L ²	Ref. 10, pp. 1-2, 5, 6-7, 106; Ref. 34, pp. 1-3
	1,1-Dichloroethane (1,1-DCA)	U	0.5 µg/L ²	
	1,2-Dichloroethane (1,2-DCA)	U	0.5 µg/L ²	
	Tetrachloroethylene (PCE)	U	0.5 µg/L ²	
	Trichloroethylene (TCE)	U	0.5 µg/L ²	

Table 8 – Background Concentrations in Groundwater

Sample ID	Hazardous Substance	Concentration (µg/L)	Contract-Required Quantitation Limit/ Sample Quantitation Limit	References
GW-35	1,1-Dichloroethylene (1,1-DCE)	0.5 U	0.5 µg/L ¹	Ref. 6, pp. 1, 4-5, 7-8, 10, 31; Ref. 38, pp. 1-4
	1,1-Dichloroethane (1,1-DCA)	0.5 U	0.5 µg/L ¹	
	1,2-Dichloroethane (1,2-DCA)	0.5 U	0.5 µg/L ¹	
	Tetrachloroethylene (PCE)	0.5 U	0.5 µg/L ¹	
	Trichloroethylene (TCE)	0.5 U	0.5 µg/L ¹	
GW-38	1,1-Dichloroethylene (1,1-DCE)	0.5 U	0.5 µg/L ¹	Ref. 6, pp. 1, 4-5, 7-8, 43, 58; Ref. 38, pp. 1-4
	1,1-Dichloroethane (1,1-DCA)	0.5 U	0.5 µg/L ¹	
	1,2-Dichloroethane (1,2-DCA)	0.5 U	0.5 µg/L ¹	
	Tetrachloroethylene (PCE)	0.5 U	0.5 µg/L ¹	
	Trichloroethylene (TCE)	0.5 U	0.5 µg/L ¹	
GW-78	1,1-Dichloroethylene (1,1-DCE)	U	0.5 µg/L ²	Ref. 6, pp. 1, 4-5, 7-8, 179-180, 202; Ref. 38, pp. 1-4
	1,1-Dichloroethane (1,1-DCA)	U	0.5 µg/L ²	
	1,2-Dichloroethane (1,2-DCA)	U	0.5 µg/L ²	
	Tetrachloroethylene (PCE)	U	0.5 µg/L ²	
	Trichloroethylene (TCE)	U	0.5 µg/L ²	

Notes:

“U” indicates undetected, not detected at reported quantitation limit (Ref. 6, pp. 42, 201; Ref. 10, p. 119).

¹ Original test reports for the samples collected during the June 2015 ESI provided adjusted contract-required quantitation limits (ADJCRQLs) in place of HRS-defined sample quantitation limits (SQLs); because the samples were analyzed under the EPA Contract Laboratory Program, these values are used as the HRS-defined CRQL as described in HRS Table 2-3 (Ref. 1, Table 2-3; Ref. 6, pp. 7, 9-10, 43).

² Original test reports for the samples collected during the June 2014 SI and October 2015 ESI provided reporting limits (RLs) in place of sample quantitation limits; the values reported under the “Reporting Limit” column on the test reports are the sample quantitation limits (SQLs), i.e., the laboratory method reporting limits (RLs) adjusted for sample specific factors (Ref. 1, Table 2-3; Ref. 6, pp. 179-180; Ref. 34, p. 2; Ref. 38, p. 1).

- Contaminated Well Details:

Table 9 – Contaminated Wells				
Sample ID	Screened Interval/ Depth (feet bgs)	Well Type	Date	References
GW-07	Depth: 200	Private domestic	6/10/2014	Ref. 23, p. 4
GW-09	Depth: 138	Private domestic	6/10/2014	Ref. 23, p. 6
GW-11	Unknown	Private domestic	6/10/2014	Ref. 23, p. 10
GW-15	Depth: 142	Private business	6/11/2014	Ref. 23, p. 20
GW-16	Depth: 148	Private business	6/11/2014	Ref. 23, p. 22
GW-21	Depth: 134	Private domestic	6/12/2014	Ref. 23, p. 28
GW-34	Unknown	Private business	6/15/2015	Ref. 12, p. 31
GW-45	Unknown	Private domestic	10/5/2015	Ref. 12, pp. 23, 87-89
GW-47	Screened 138-158	Private domestic	6/15/2015	Ref. 12, pp. 17-19; Ref. 22, pp. 35-36
GW-48	Screened 137-157	Private domestic	6/15/2015	Ref. 12, p. 21; Ref. 22, pp. 37-38
GW-51	Unknown	Private business	6/16/2015	Ref. 12, p. 57
GW-52	Unknown	Private domestic	6/15/2015	Ref. 12, p. 33
GW-53	Unknown	Private domestic	6/16/2015	Ref. 12, p. 59
GW-55	Screened 54-74	Monitor Well	6/16/2015	Ref. 12, p. 39; Ref. 39, pp. 93, 95
GW-56	Screened 57-69	Monitor Well	6/16/2015	Ref. 12, p. 41; Ref. 39, p. 89
GW-57	Screened 57-69	Monitor Well	6/16/2015	Ref. 12, p. 43; Ref. 39, p. 83
GW-59	Screened 125-155	Private domestic	10/5/2015	Ref. 12, pp. 27, 91; Ref. 22, pp. 40-41
GW-60	Screened 140-160	Private domestic	6/17/2015	Ref. 12, p. 75; Ref. 22, p. 42
GW-62	Unknown	Private domestic	6/17/2015	Ref. 12, p. 63

Table 9 – Contaminated Wells				
Sample ID	Screened Interval/ Depth (feet bgs)	Well Type	Date	References
GW-20/GW-64*	Unknown	Private business	6/12/2014/ 6/17/2015	Ref. 12, p. 65; Ref. 23, p. 34
GW-65	Unknown	Private business	6/16/2015	Ref. 12, p. 61
GW-79	Unknown	Private domestic	10/5/2015	Ref. 12, p. 99
GW-80	Screened 128-148	Private domestic	10/5/2015	Ref. 12, p. 95; Ref. 22, pp. 46-47
GW-81	Depth > 90; exact depth unknown	Private domestic	10/5/2015	Ref. 12, p. 93

Notes:

*GW-64 was collected at the same location as GW-20.

Elevations below ground surface are not presented here, as the site is relatively flat with elevations ranging from 2940-2950 feet above mean sea level, interpolated from the USGS National Map topographic contours shown in Figure 3. Estimated well surface elevations are detailed in Table 2 of this documentation record.

- Contaminated Samples:

All groundwater samples obtained during the SI event were analyzed for VOCs by method CLP OLM04.2 (Ref. 10, pp. 5-6; Ref. 34, p. 2). Groundwater samples obtained during the ESI event were analyzed for VOCs by CLP SOW SOM02.2 and CLP OLM04.2 (Ref. 6, pp. 5, 39, 75, 103, 119, 173). Groundwater samples listed in the table below contained concentrations of VOCs above background (Figure 3) (Ref. 12, pp. 17-95; Ref. 23, pp. 4-28). Observed release of PCE, TCE, 1,1-DCE, 1,1-DCA, and 1,2-DCA are documented in the contaminated groundwater plume (Table 10).

Table 10 – Contaminated Samples				
Sample ID	Hazardous Substance	Concentration (µg/L)	Contract-Required Quantitation Limit/ Sample Quantitation Limit	References
GW-07	Tetrachloroethylene (PCE)	0.8 J-	0.5 µg/L ²	Ref. 10, pp. 1-2, 5, 26, 108; Ref. 34, pp. 1-3
GW-09	Tetrachloroethylene (PCE)	1.2 J-	0.5 µg/L ²	Ref. 10, pp. 1-2, 5, 29, 108; Ref. 34, pp. 1-3

Table 10 – Contaminated Samples

Sample ID	Hazardous Substance	Concentration (µg/L)	Contract-Required Quantitation Limit/ Sample Quantitation Limit	References
GW-11	Tetrachloroethylene (PCE)	0.9	0.5 µg/L ²	Ref. 10, pp. 1-2, 5, 35, 109; Ref. 34, pp. 1-3
GW-15	1,1-Dichloroethylene (1,1-DCE)	1.6	0.5 µg/L ²	Ref. 10, pp. 1-2, 5, 49-50, 112; Ref. 34, pp. 1-3
	1,1-Dichloroethane (1,1-DCA)	1.4	0.5 µg/L ²	
	Tetrachloroethylene (PCE)	11.9	0.5 µg/L ²	
GW-16	1,1-Dichloroethylene (1,1-DCE)	9.4	0.5 µg/L ²	Ref. 10, pp. 1-2, 5, 52-53, 112; Ref. 34, pp. 1-3
	Tetrachloroethylene (PCE)	1.8	0.5 µg/L ²	
GW-21	Tetrachloroethylene (PCE)	2.1	0.5 µg/L ²	Ref. 10, pp. 1-2, 5, 75, 116; Ref. 34, pp. 1-3
GW-34	1,2-Dichloroethane (1,2-DCA)	0.76	0.5 µg/L ¹	Ref. 6, pp. 1, 4-5, 7-9, 31; Ref. 38, pp. 1-4; Ref. 43, pp. 33-34
GW-45	1,1-Dichloroethylene (1,1-DCE)	17.8	0.5 µg/L ²	Ref. 6, pp. 1, 4-5, 7-8, 173-174, 202; Ref. 38, pp. 1-4
	1,1-Dichloroethane (1,1-DCA)	5.6	0.5 µg/L ²	
	Tetrachloroethylene (PCE)	1.0	0.5 µg/L ²	
	Trichloroethylene (TCE)	2.3	0.5 µg/L ²	
GW-47	1,1-Dichloroethylene (1,1-DCE)	11	0.5 µg/L ¹	Ref. 6, pp. 1, 4-5, 7-8, 12, 31; Ref. 38, pp. 1-4; Ref. 43, pp. 67, 72, 74
	1,1-Dichloroethane (1,1-DCA)	3.4	0.5 µg/L ¹	
	Tetrachloroethylene (PCE)	0.67	0.5 µg/L ¹	
	Trichloroethylene (TCE)	1.4	0.5 µg/L ¹	
GW-48	1,1-Dichloroethylene (1,1-DCE)	7.9	0.5 µg/L ¹	Ref. 6, pp. 1, 4-5, 7-8, 13, 31; Ref. 38, pp. 1-4; Ref. 43, pp. 85-86
	1,1-Dichloroethane (1,1-DCA)	1.9	0.5 µg/L ¹	
GW-51	1,1-Dichloroethylene (1,1-DCE)	58	0.5 µg/L ¹	Ref. 6, pp. 1, 4-5, 7-8, 44, 57; Ref. 38, pp. 1-4
	1,1-Dichloroethane (1,1-DCA)	0.56	0.5 µg/L ¹	
	1,2-Dichloroethane (1,2-DCA)	1.4	0.5 µg/L ¹	
GW-52	1,1-Dichloroethylene (1,1-DCE)	11	0.5 µg/L ¹	Ref. 6, pp. 1, 4-5, 7-8, 16, 31; Ref. 38, 1-4; Ref. 43, pp. 108-109

Table 10 – Contaminated Samples

Sample ID	Hazardous Substance	Concentration (µg/L)	Contract-Required Quantitation Limit/ Sample Quantitation Limit	References
GW-53	1,1-Dichloroethylene (1,1-DCE)	5.1	0.5 µg/L ¹	Ref. 6, pp. 1, 4-5, 7-8, 17, 32; Ref. 38, pp. 1-4; Ref. 43, pp. 189-190
	1,1-Dichloroethane (1,1-DCA)	1.1	0.5 µg/L ¹	
	Trichloroethylene (TCE)	1.1	0.5 µg/L ¹	
GW-55	1,1-Dichloroethylene (1,1-DCE)	13	0.5 µg/L ¹	Ref. 6, pp. 1, 4-5, 7-8, 19, 32; Ref. 38, pp. 1-4; Ref. 43, pp. 220, 222, 267
	1,1-Dichloroethane (1,1-DCA)	57	0.5 µg/L ¹	
	Trichloroethylene (TCE)	0.55	0.5 µg/L ¹	
GW-56	1,1-Dichloroethane (1,1-DCA)	1.7	0.5 µg/L ¹	Ref. 6, pp. 1, 4-5, 7-8, 20, 32; Ref. 38, pp. 1-4; Ref. 43, pp. 301-302, 314
GW-57	1,1-Dichloroethylene (1,1-DCE)	15	0.5 µg/L ¹	Ref. 6, pp. 1, 4-5, 7-8, 21, 32; Ref. 38, pp. 1-4; Ref. 43, pp. 327-328
	Trichloroethylene (TCE)	0.68	0.5 µg/L ¹	
GW-59	1,1-Dichloroethylene (1,1-DCE)	2.2	0.5 µg/L ²	Ref. 6, pp. 1, 4-5, 7-8, 177, 202; Ref. 38, pp. 1-4
GW-60	1,1-Dichloroethylene (1,1-DCE)	1.9	0.5 µg/L ¹	Ref. 6, pp. 1, 4-5, 7-8, 46, 58; Ref. 38, pp. 1-4
	1,1-Dichloroethane (1,1-DCA)	0.82	0.5 µg/L ¹	
	Tetrachloroethylene (PCE)	0.51	0.5 µg/L ¹	
GW-62	1,1-Dichloroethylene (1,1-DCE)	460	50 µg/L ¹	Ref. 6, pp. 1, 4-5, 7-8, 48, 58; Ref. 38, pp. 1-4
	1,1-Dichloroethane (1,1-DCA)	6.9	0.5 µg/L ¹	
	1,2-Dichloroethane (1,2-DCA)	1.4	0.5 µg/L ¹	
GW-64/ GW-20*	1,1-Dichloroethylene (1,1-DCE)	33	2.5 µg/L ¹	Ref. 6, pp. 1, 4-5, 7-8, 49, 58; Ref. 38, pp. 1-4
GW-65	Tetrachloroethylene (PCE)	1.5	0.5 µg/L ¹	Ref. 6, pp. 1, 4-5, 7-8, 23, 32; Ref. 38, pp. 1-4; Ref. 43, pp. 368-369
GW-79	Tetrachloroethylene (PCE)	3.4	0.5 µg/L ²	Ref. 6, pp. 1, 4-5, 7-8, 181, 182, 202-203; Ref. 38, pp. 1-4

Table 10 – Contaminated Samples				
Sample ID	Hazardous Substance	Concentration (µg/L)	Contract-Required Quantitation Limit/ Sample Quantitation Limit	References
GW-80	Tetrachloroethylene (PCE)	3.4	0.5 µg/L ²	Ref. 6, pp. 1, 4-5, 7-8, 183-184, 203; Ref. 38, pp. 1-4
GW-81	Tetrachloroethylene (PCE)	0.6	0.5 µg/L ²	Ref. 6, pp. 1, 4-5, 7-8, 185-186, 203; Ref. 38, pp. 1-4

Notes:

*GW-20 was collected in 2014 at the same location as GW-64 in 2015; more recent data is used for this HRS.

¹ Original test reports for the samples collected during the June 2015 ESI provided adjusted contract-required quantitation limits (ADJCRQLs) in place of HRS-defined sample quantitation limits (SQLs); because the samples were analyzed under the EPA Contract Laboratory Program, these values are used as the HRS-defined CRQL as described in HRS Table 2-3 (Ref. 1, Table 2-3; Ref. 6, pp. 7, 9-10, 43).

² Original test reports for the samples collected during the June 2014 SI and October 2015 ESI provided reporting limits (RLs) in place of sample quantitation limits; the values reported under the “Reporting Limit” column on the test reports are the sample quantitation limits (SQLs), i.e., the laboratory method reporting limits (RLs) adjusted for sample specific factors (Ref. 1, Table 2-3; Ref. 6, pp. 179-180; Ref. 34, p. 2; Ref. 38, p. 1).

J- Sample results that are estimated biased low are qualified with “J-”, as determined in the audit of data quality, an additional step of data validation (Ref. 34, p. 3). Sample results which are biased low can be used to establish an observed release for HRS; no adjustment is necessary for release samples associated with low bias (Ref. 62, pp. 5, 8).

Attribution:

The Northwest Odessa Groundwater site is a contaminated groundwater plume originating from unknown source(s) where hazardous substances may have been released and seeped through the ground to the aquifer. (Ref. 1, Sec. 3.1.1).

The zone of greatest 1,1-DCE contamination in groundwater is located at GW-62 and GW-51, with sample concentrations of 460 µg/L and 58 µg/L, respectively, exceeding the MCL of 7 µg/L. The highest concentration of PCE was detected in GW-15 at 11.9 µg/L, above the MCL of 5 µg/L. The zone of greatest TCE contamination was at GW-45 and GW-47, with sample concentrations of 2.3 µg/L and 1.4 µg/L, respectively, exceeding the HRS cancer risk benchmark of 1.19 µg/L (Ref. 2, pp. 3-5; Ref. 6, pp. 12, 44, 48, 173-174; Ref. 10, pp. 49-50). Background groundwater samples were obtained from four private wells during the SI and ESI sampling events; GW-01, GW-35, GW-38 and GW-78 which are completed at depths ranging from 100-160 ft bgs, located respectively northeast, north, southeast, and west-northwest of the approximate plume center (Figure 3; Ref. 12, pp. 29, 73, 97; Ref. 22, p. 52; Ref. 23, p. 39; Ref. 35, p. 9; Ref. 36, pp. 8, 37). The regional gradient in the Trinity/Antlers aquifer is to the southeast; remedial investigations at several nearby sites have measured groundwater flow ranging between to the east-northeast, to the southwest, west or northwest; and groundwater flow directions are likely influenced by pumping of private wells (Ref. 5, p. 16; Ref. 20, p. 84; Ref. 36, p. 8; Ref. 37, p. 16; Ref. 48, p. 7; Ref. 50, p. 32).

During the SI and ESI, investigators attempted to locate, sample, and establish attribution for possible sources near the site, but were unable to attribute the significant increase to possible sources. The site is located in a mixed industrial and commercial area along main roads, while nearby side streets are predominantly residential (Figure 2; Ref. 16, pp. 2, 4-6; Ref. 17, pp. 1-7; Ref. 23, p. 36). Odessa is a center of the oil and gas industry of the Permian Basin; numerous oilfield services companies and petrochemical facilities have operated in the region since the 1920s (Ref. 53, pp. 1-2). Several facilities along Andrews Highway operated over several decades with VOC and chlorinated solvent wastestreams in the vicinity of the site (Ref. 26, pp. 6-7, 11-12, 14-15, 18-19; Ref. 40, pp. 15-16, 30-31, 36). Database searches revealed several other former facilities within one mile of the plume which historically used PCE or other solvents, including a metal coating facility, a fabricated metal manufacturer, and an electronics and maintenance company (Ref. 26, pp. 6-7, 10-12, 15, 18-19; Ref. 44, pp. 1-2, 18, 20-21). However, information was not sufficient to support the identification of these entities as a possible source causing the significant increase in the plume.

Fourteen soil samples were collected at two industrial properties during the June 2015 ESI and analyzed for metals and VOCs, but no definitive source of chlorinated solvents in soils was identified (Ref. 6, pp. 79-92, 157-161; Ref. 12, pp. 47-53, 67-71, 85). TCE and several non-chlorinated VOCs were detected at significant concentrations in one soil sample (SO-04) collected from a radiator repair shop, but this property is located approximately 0.4 miles southeast of the wells (GW-45, GW-47, and GW-53) where the observed release of TCE to groundwater is documented; therefore, the significant increase in the plume cannot be definitively attributed to the possible source at SO-04 (Figure 3; Ref. 6, p. 82; Ref. 13, p. 1). PCE and 1,1-DCE were not detected in any of the soil samples collected at the radiator repair shop (Ref. 6, pp. 79-92). Chlorinated VOCs were not detected in any of the soil samples (SO-07, SO-08, SO-09, SO-10, SO-11, and SO-14) collected at an auto body shop located at 5000 Andrews Highway (Ref. 6, pp. 79-92; Ref. 12, pp. 67-71). Passive soil gas sampling conducted approximately 200 feet north of the BTA well detected low levels of 1,1-DCE in four samples (Ref. 19, pp. 2, 7). To date, source sampling has not identified a source for which the significant increase in the widespread chlorinated solvent-contaminated groundwater can be attributed.

Therefore, despite an ESI level of effort, the plume could not be definitively attributed to any identified source.

Hazardous Substances Released

1,2-dichloroethane (1,2-DCA), 1,1-dichloroethane (1,1-DCA), 1,1-dichloroethylene (1,1-DCE), tetrachloroethylene (PCE), trichloroethylene (TCE)

Groundwater Observed Release Factor Value: 550

3.1.2 POTENTIAL TO RELEASE

As specified in the HRS, since an observed release was established to the Edwards-Trinity Aquifer, the potential to release was not evaluated (Ref. 1, Section 3.1.1).

3.2 WASTE CHARACTERISTICS

3.2.1 TOXICITY/MOBILITY

Table 11 – Toxicity and Mobility Waste Characteristics						
Hazardous Substance	Source No. (and/or Observed Release)	Toxicity Factor Value	Mobility Factor Value	Does Haz. Substance Meet Observed Release by chemical analysis? (Y/N)	Toxicity/Mobility (Ref. 1, Table 3-9)	References
1,1-Dichloroethane (1,1-DCA)	1, Observed Release	10	1	Y	10	Ref. 1, Sections 2.4.1.1, 3.2.1.2; Ref. 2, p. 1
1,2-Dichloroethane (1,2-DCA)	1, Observed Release	100	1	Y	100	Ref. 1, Sections 2.4.1.1, 3.2.1.2; Ref. 2, p. 2
1,1-Dichloroethylene (1,1-DCE)	1, Observed Release	10	1	Y	10	Ref. 1, Sections 2.4.1.1, 3.2.1.2; Ref. 2, p. 3
Tetrachloroethylene (PCE)	1, Observed Release	100	1	Y	100	Ref. 1, Sections 2.4.1.1, 3.2.1.2; Ref. 2, p. 4
Trichloroethylene (TCE)	1, Observed Release	1,000	1	Y	1,000	Ref. 1, Sections 2.4.1.1, 3.2.1.2; Ref. 2, p. 5

Toxicity/Mobility Factor Value: 1000
(Ref. 1, Table 3-9)

3.2.2 HAZARDOUS WASTE QUANTITY

Table 12 – Hazardous Waste Quantity			
Source No.	Source Type	Source Hazardous Waste Quantity	Source Hazardous Constituent Quantity Complete?
1	Other- GW Plume	>0	No

The hazardous constituent quantity data is not adequately determined for the source at this site. The targets for the Groundwater Migration Pathway are subject to Level I and II concentrations. According to Section 2.4.2.2 of the HRS, a pathway hazardous waste quantity factor value of 100 was assigned because the hazardous constituent quantity data is not adequately determined for one or more sources, and targets for the Groundwater Migration Pathway are subject to actual contamination. (Ref. 1, Section 2.4.2.2, Table 2-6)

Hazardous Waste Quantity Factor Value: 100

3.2.3 WASTE CHARACTERISTICS FACTOR CATEGORY VALUE

Toxicity/Mobility Factor Value: 1,000

Hazardous Waste Quantity Factor Value: 100

Toxicity/Mobility Factor Value x Hazardous Waste Quantity Factor Value: 100,000
(subject to a maximum product of 1×10^8) (Ref. 1, Section 2.4.3.1)

Waste Characteristics Factor Category Value: 18
(Ref. 1, Table 2-7)

3.3 TARGETS

Fourteen target wells with observed releases of chlorinated solvents are used for potable purposes by residents or workers. Of the target wells, GW-15, GW-16, GW-45, GW-47, GW-48, and GW-64/GW-20 had Level I concentrations of hazardous substances above the lowest HRS drinking water benchmarks (Ref. 6, pp. 12-13, 49, 173; Ref. 10, pp. 49-50, 52). Wells GW-09, GW-34, GW-59, GW-65, GW-79, GW-80, and GW-81 met observed release criteria but had Level II concentrations of hazardous substances below the lowest HRS drinking water benchmarks (Ref. 6, pp. 9, 23, 177, 181-186; Ref. 10, pp. 28-29, 34-35). Wells with Level I concentrations are not included in the Level II list in Table 14 even if they contained Level II concentrations of other COCs. In cases where a well was sampled multiple times during the site assessment process, the most recent groundwater sample result was used in determining Level I and Level II concentrations. The MCL is used for PCE and 1,1-DCE, and the HRS Cancer Risk benchmark is used for TCE and 1,2-DCA.

Level I Concentrations

Table 13 – Level I Concentrations					
Sample ID	Hazardous Substance	Hazardous Substance Concentration (µg/L)	Benchmark Concentration (mg/L)	Benchmark	References
GW-15	Tetrachloroethylene (PCE)	11.9	5 E-03 (5 µg/L)	MCL	Ref. 2, p. 4; Ref. 10, p. 50
	1,2-Dichloroethane (1,2-DCA)	1.4	8.56 E-04 (0.856 µg/L)	HRS Cancer Risk	Ref. 2, p. 2; Ref. 10, p. 49
GW-16	1,1-Dichloroethylene (1,1-DCE)	9.4	7 E-03 (7 µg/L)	MCL	Ref. 2, p. 3; Ref. 10, p. 52
GW-45	1,1-Dichloroethylene (1,1-DCE)	17.8	7 E-03 (7 µg/L)	MCL	Ref. 2, p. 3; Ref. 6, p. 173
	Trichloroethylene (TCE)	2.3	1.19 E-03 (1.19 µg/L)	HRS Cancer Risk	Ref. 2, p. 5; Ref. 6, p. 173
GW-47	1,1-Dichloroethylene (1,1-DCE)	11	7 E-03 (7 µg/L)	MCL	Ref. 2, p. 3; Ref. 6, p. 12
	Trichloroethylene (TCE)	1.4	1.19 E-03 (1.19 µg/L)	HRS Cancer Risk	Ref. 2, p. 5; Ref. 6, p. 12
GW-48	1,1-Dichloroethylene (1,1-DCE)	7.9	7 E-03 (7 µg/L)	MCL	Ref. 2, p. 3; Ref. 6, p. 13

Notes:

MCL = Maximum contaminant level

Cancer Risk = Cancer risk screening concentration

Level II Concentrations

Level II concentrations are established in target wells at this site meeting observed release criteria, but the concentrations of hazardous substances are below the lowest HRS drinking water benchmarks. The MCL is used for PCE and 1,1-DCE, and the HRS Cancer Risk benchmark is used for 1,2-DCA (Ref. 2, pp. 2-4).

Table 14 – Level II Concentrations					
Sample ID	Hazardous Substance	Hazardous Substance Concentration (µg/L)	Benchmark Concentration (mg/L)	Benchmark	References
GW-09	Tetrachloroethylene (PCE)	1.2 J-	5 E-03 (5 µg/L)	MCL	Ref. 2, p. 4; Ref. 10, pp. 28-29
GW-11	Tetrachloroethylene (PCE)	0.9	5 E-03 (5 µg/L)	MCL	Ref. 2, p. 4; Ref. 10, pp. 34-35
GW-34	1,2-Dichloroethane (1,2-DCA)	0.76	8.56 E-04 (0.85 µg/L)	HRS Cancer Risk	Ref. 2, p. 2; Ref. 6, p. 9
GW-59	1,1-Dichloroethylene (1,1-DCE)	2.2	7E-03 (7 µg/L)	MCL	Ref. 2, p. 3; Ref. 6, p. 177
GW-65	Tetrachloroethylene (PCE)	1.5	5E-03 (5 µg/L)	MCL	Ref. 2, p. 4; Ref. 6, p. 23
GW-79	Tetrachloroethylene (PCE)	3.4	5E-03 (5 µg/L)	MCL	Ref. 2, p. 4; Ref. 6, pp. 181-182
GW-80	Tetrachloroethylene (PCE)	3.4	5E-03 (5 µg/L)	MCL	Ref. 2, p. 4; Ref. 6, pp. 183-184
GW-81	Tetrachloroethylene (PCE)	0.6	5E-03 (5 µg/L)	MCL	Ref. 2, p. 4; Ref. 6, pp. 185-186

Notes:

MCL = Maximum contaminant level

Cancer Risk = Cancer risk screening concentration

J- Sample results that are estimated biased low are qualified with “J-”, as determined in the audit of data quality, an additional step of data validation (Ref. 34, p. 3). Sample results which are biased low can be used to establish an observed release for HRS; no adjustment is necessary for release samples associated with low bias (Ref. 62, pp. 5, 8).

3.3.1 NEAREST WELL

Well ID: GW-15, GW-16, GW-45, GW-47, GW-48, and GW-64/GW-20 are subject to Level I concentrations (see Section 3.1.1), thus a value of 50 has been assigned.

Level of Contamination (I, II, or potential): Level I

If potential contamination, distance from source in miles: N/A

Nearest Well Factor Value: 50
(Ref. 1, Table 3-11)

3.3.2 POPULATION

3.3.2.1 Level of Contamination

3.3.2.2 Level I Concentrations

Multiple chlorinated organic chemicals were detected at Level I and Level II concentrations. In cases where a well was sampled multiple times during the site assessment process, the most recent groundwater sample result was used in determining Level I and Level II concentrations.

Groundwater obtained from GW-15 and GW-16 is blended and serves as sole-source drinking water for approximately 30 employees at a construction business (Ref. 23, pp. 20, 22). GW-45 serves as sole-source drinking water for three people at a residence (Ref. 12, p. 23). GW-47 is a well that serves more than 10 mobile homes, with an estimated population of 29 persons based on average persons per household in Odessa of 2.90 obtained from the U.S. Census Bureau (Ref. 12, p. 19; Ref. 54, p. 1). GW-48 is a well that serves 15 mobile homes, with an estimated population of 43.5 persons based on average persons per household in Odessa of 2.90 obtained from the U.S. Census Bureau (Ref. 12, p. 21; Ref. 54, p. 1). Due to site contamination, wells GW-47 and GW-48 were temporally fitted with water filtration systems to remove VOCs, and the wells were no longer used for domestic purposes after May 27, 2016, when the owner obtained a municipal water connection for the mobile home park (Ref. 1, Section III.Q; Ref. 55, p. 1; Ref. 56, p. 1).

Level I Population Targets

Level I Well	Aquifer No.	Population	References
GW-15	1	15	Ref. 10, pp. 49-50; Ref. 23, p. 20
GW-16	1	15	Ref. 10, p. 52; Ref. 23, pp. 20, 22
GW-45	1	3	Ref. 6, p. 173; Ref. 12, p. 23
GW-47	1	29	Ref. 6, p. 12; Ref. 12, p. 19; Ref. 54, p. 1
GW-48	1	43.5	Ref. 6, p. 13; Ref. 12, p. 21; Ref. 54, p. 1

Sum of Population Served by Level I Wells: 105.5

Sum of Population Served by Level I Wells x 10: 1,055

Level I Concentrations Factor Value: 1,055

3.3.2.3 Level II Concentrations

Level II Population Targets

Multiple chlorinated organic chemicals were detected at Level II concentrations. Populations at target wells evaluated at Level I population are not evaluated as Level II population. The well GW-09 serves as sole-source drinking water for two residents (Ref. 23, p. 6). The well GW-11 serves as sole-source drinking water for two residents (Ref. 23, p. 10). The well GW-34 serves as sole-source drinking water for three employees at small business (Ref. 12, p. 31). The well GW-59 serves as sole-source drinking water for 20 residents in several trailers (Ref. 12, p. 91). The well GW-65 serves as sole-source drinking water for three employees at an auto repair shop (Ref. 12, p. 61). The well GW-79 serves as sole-source drinking water for two residents (Ref. 12, p. 99). The well GW-80 serves as sole-source drinking water for three auto shop employees and residents that live in one mobile home; the average persons per household was used to estimate the population associated with the mobile home (Ref. 12, p. 95; Ref. 54, p. 1). The well GW-81 serves as sole-source drinking water for two residents (Ref. 12, p. 93).

Table 16 – Level II Population Targets			
Level II Well	Aquifer No.	Population	References
GW-09	1	2	Ref. 10, pp. 28-29; Ref. 23, p. 6
GW-11	1	2	Ref. 10, pp. 34-35; Ref. 23, p. 10
GW-34	1	3	Ref. 6, p. 9; Ref. 12, p. 31
GW-59	1	20	Ref. 6, p. 177; Ref. 12, p. 91
GW-65	1	3	Ref. 6, p. 23; Ref. 12, p. 61
GW-79	1	2	Ref. 6, pp. 181-182; Ref. 12, p. 99
GW-80	1	5.9	Ref. 6, pp. 183-184; Ref. 12, p. 95; Ref. 54, p. 1
GW-81	1	2	Ref. 6, pp. 185-186; Ref. 12, p. 93

Sum of Population Served by Level II Wells: 39.9

Level II Concentrations Factor Value: 39.9

3.3.2.4 Potential Contamination

The potential contamination factor was evaluated and scored for public water supply wells. The wells were researched within a 4-mile radius of the site center (based on the approximate plume center) of 0 to 0.25, 0.25 to 0.5, 0.5 to 1, 1 to 2, 2 to 3, and 3 to 4 miles of the site (Ref. 1, Section 3.0.1.1; Figure 4). Drinking water target wells within the 4-mile TDL having Level I or Level II contamination are not presented below. Additionally, private domestic and business drinking water wells have not been considered since they do not affect the final score.

The potential contamination factor calculation includes 12 active public water supply (PWS) wells within the 4-mile TDL which are completed in the Trinity Aquifer (Figure 4; Ref. 22, pp. 67-68, 70-90, 93-97). The Colorado River Municipal Water District has 46 wells within the 4-mile TDL that are all inactive, so they were not included in the potential contamination factor calculation (Figure 4; Ref. 57, p. 1). Well logs from the 4-mile TDL confirm that all wells for which depth is known are completed in the Antlers/Trinity Aquifer or the overlying Ogallala Aquifer, which are considered a single aquifer for the purposes of this HRS documentation record (Ref. 22, pp. 2-34).

Potential Population Targets

Table 17 – Potential Population Targets			
Distance Category	Population	References	Distance-Weighted Population Value (Ref. 1, Table 3-12)
0 to 1/4 mile	0	Figure 4	0
>1/4 to 1/2 mile	0	Figure 4	0
>1/2 to 1 mile	31.5	Figure 4; Ref. 56, p. 1; Ref. 58, pp. 1, 5, 9-10	17
>1 to 2 miles	433	Figure 4; Ref. 58, pp. 12, 16, 20, 24, 27, 31, 37, 50-51	94
>2 to 3 miles	100	Figure 4; Ref. 58, p. 21	7
>3 to 4 miles	195	Figure 4; Ref. 58, pp. 40, 43, 46	13

Calculations:

0 to 0.25 mile

No active PWS wells were identified between 0 and 0.25 miles from the site center (Figure 4).

Distance-Weighted Population Value: 0

0.25 to 0.5 mile

No active PWS wells were identified between 0.25 and 0.5 miles from the site center (Figure 4).

Distance-Weighted Population Value: 0

0.5 to 1 mile

The Northgate Mobile Home Park #1 PWS operates 3 wells located at 409 E 57th Street which are blended with treated surface water purchased from the City of Odessa (Figure 4; Ref. 58, pp. 1-2). The wells provide approximately 25% of the PWS water needs for 126 residents; therefore, the three wells in this blended system serve 31.5 individuals (Ref. 58, p. 1; Ref. 59, p. 1).

Distance-Weighted Population Value: 17

1 to 2 miles

The Canyon Dam Mobile Home Park PWS operates two wells located at North Dixie Blvd. and Yukon Road which serve 108 individuals (Figure 4; Ref. 58, p. 12-13). Judy K’s Kountry Kitchen PWS operates one well located at 7010 N County Road W which serves 100 individuals (Figure 4; Ref. 58, p. 24). Huber Garden Estates PWS operates two wells located at 714 W Yukon Road which serve 200 individuals (Figure 4; Ref. 58, pp. 27-28). Dollar General Yukon Rd. operates one PWS well located at Yukon Road which serves 25 individuals (Ref. 58, pp. 50-52).

Distance-Weighted Population Value: 94

2 to 3 miles

The Depot Water Store PWS has one well located at 2701 Kermit Highway which serves 100 individuals (Figure 4; Ref. 58, p. 21).

Distance-Weighted Population Value: 7

3 to 4 miles

Three active PWS systems operate within the 3 to 4-mile radius (Figure 4). Sunset Country Club PWS operates one well located at 9301 Andrews Highway which serves 50 individuals (Ref. 58, p. 40). Weatherford Artificial Lift Systems PWS operates one well located at 8866 TX-338 Loop which serves 120 individuals (Ref. 58, p. 43). Weatherford International NW Loop 338 OD PWS operates one well located at 8870 TX-338 Loop which serves 25 individuals (Ref. 58, p. 46).

Distance-Weighted Population Value: 13

Sum of Distance-Weighted Population Values: 131

Sum of Distance-Weighted Population Values/10: 13.1

Potential Contamination Factor Value: 13

3.3.3 RESOURCES

Resources have not been evaluated at this time since drinking water wells score the site and evaluating resources would not affect the overall score.

Resources Factor Value: NS

3.3.4 WELLHEAD PROTECTION AREA

The site is not within a wellhead protection area. The City of Odessa has TCEQ-approved source water protection plans on file for two surface water reservoirs, E. V. Spence Reservoir and O.H. Ivie Lake, located 107 miles and 160 miles east of the site, respectively. Due to the great distance from the site, these source water protection plans are not applicable to the aquifer being evaluated at the site (Ref. 60, p. 1; Ref. 61, pp. 1-2).

Wellhead Protection Area Factor Value: 0