HAZARD RANKING SYSTEM (HRS) DOCUMENTATION RECORD COVER SHEET

Name of Site:	Spring Park Municipal Well Field
EPA ID No.:	MNN 000 502 963

Contact Persons

Documentation Record:	Patrick Hamblin, National Priorities List Coordinator U.S. Environmental Protection Agency, Region 5 77 West Jackson Boulevard Chicago, Illinois 60606 (312) 886-6312
	Sandy Anagnostopoulos, Environmental Scientist Tetra Tech, Inc. 1 South Wacker Drive, 37th Floor Chicago, Illinois 60606 (312) 201-7723

Pathways, Components, or Threats Not Scored

The surface water migration, soil exposure and subsurface intrusion, and air migration pathways were not scored in this Hazard Ranking System documentation record because the ground water migration pathway is sufficient to qualify the site for the National Priorities List (NPL). These pathways are of concern to the U.S. Environmental Protection Agency (EPA) and may be considered during future evaluation. Currently the only known site-related contamination exists in groundwater. At the time of the listing, the site score is sufficient without the pathways mentioned above.

HAZARD RANKING SYSTEM (HRS) DOCUMENTATION RECORD

Name of Site:	Spring Park Municipal Well Field
EPA Region:	5
Date Prepared:	January 2018
Street Address of Site*:	4333 Warren Avenue
City, County, State, Zip:	Spring Park, Hennepin County, Minnesota 55384
General Location in the State:	East-central portion of state
Topographic Map:	Spring Park, MN 1993
Latitude:	44° 56' 09.4" North
Longitude:	93° 37' 59.9" West

The coordinates above for the Spring Park Municipal Well Field site are based on the address and latitude and longitude of the Spring Park Water Treatment Plant acquired from EPA's Superfund Site Information database (Refs. 4; 27, pp. 1, 2).

* 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.

Pathway	**Pathway Score**
Ground Water[1] Migration	100.00
Surface Water Migration	NS
Soil Exposure and Subsurface Intrusion	NS
Air Migration	NS
HRS SITE SCORE	**50.00**

Notes:

HRS	Hazard Ranking System
NS	Not scored

[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

	S Pathway	**S^2 Pathway**
Ground Water Migration Pathway Score (S_{GW})	100.00	10,000
Surface Water Migration Pathway Score (S_{SW})	NS	NS
Soil Exposure and Subsurface Intrusion Pathway Score (S_{SESSI})	NS	NS
Air Migration Pathway Score (S_A)	NS	NS
$S^2_{GW} + S^2_{SW} + S^2_{SESSI} + S^2_A$		10,000
$(S^2_{GW} + S^2_{SW} + S^2_{SESSI} + S^2_A) / 4$		2,500
$\sqrt{(S^2_{GW} + S^2_{SW} + S^2_{SESSI} + S^2_A) / 4}$		**50.00**

Note:

NS = Not scored

Table 3-1 --Ground Water Migration Pathway Scoresheet
Aquifer Evaluated: Carbonate Bedrock

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(2b + 2c + 2d)]	500	NS	
3. Likelihood of Release (higher of lines 1 and 2e)		550		550
Waste Characteristics:				
4. Toxicity/Mobility		(a)	10,000	
5. Hazardous Waste Quantity		(a)	100	
6. Waste Characteristics		100		32
Targets:				
7. Nearest Well		50	50	
8. Population:				
	8a. Level I Concentrations	(b)	12,393.9	
	8b. Level II Concentrations	(b)	NS	
	8c. Potential Contamination	(b)	NS	
	8d. Population (lines 8a + 8b + 8c)	(b)	12,393.9	
9. Resources		5	NS	
10. Wellhead Protection Area		20	20	
11. Targets (lines 7 + 8d + 9 + 10)		(b)		12,463.9
Ground Water Migration Score for an Aquifer:				
12. Aquifer Score [(lines 3 x 6 x 11)/82,500][c]		100		100.00
Ground Water Migration Pathway Score:				
13. Pathway Score (S_{gw}), (highest value from line 12 for all aquifers evaluated)[c]		100		100.00

Notes:

NS = Not scored
[a] = Maximum value applies to waste characteristics category
[b] = Maximum value not applicable
[c] = Do not round to nearest integer

Reference Map

Ref. 4

Note: The source of this map image is Esri, used by the EPA with Esri's permission.

Source: USGS 7.5-Minute Topographic Quadrangle Map: Spring Park, MN 1993

Spring Park Municipal Well Field
4333 Warren Avenue
Spring Park, Hennepin County, Minnesota

Figure 1
Site Location Map

TETRA TECH

Prepared For: EPA

Prepared By: Tetra Tech Inc.

File Path: G:\G\G9026-START IV\Other States\Spring Park Municipal Well Field - MN\mxd\2017-07\Fig1-SiteLocation.mxd maggie.banh

Date Saved: 7/25/2017

EPA Contract No.: EP-S5-13-01

TDD No.: S05-0002-1410-011

Coordinate System: WGS 1984 Web Mercator Auxiliary Sphere
Projection: Mercator Auxiliary Sphere
Datum: WGS 1984

Reference Map

Legend

- New Treatment Building
- Treatment Plant #1 (Location of Source 1)
- City of Spring Park Property

Refs. 4; 5, p. 68

Note: The source of this map image is Esri, used by the EPA with Esri's permission.

Source: USGS 7.5-Minute Topographic Quadrangle Map: Spring Park, MN 1993

Spring Park Municipal Well Field
4333 Warren Avenue
Spring Park, Hennepin County, Minnesota

Figure 2
Site Layout And Source 1 Location Map

TETRA TECH

Prepared For: EPA	Prepared By: Tetra Tech Inc.

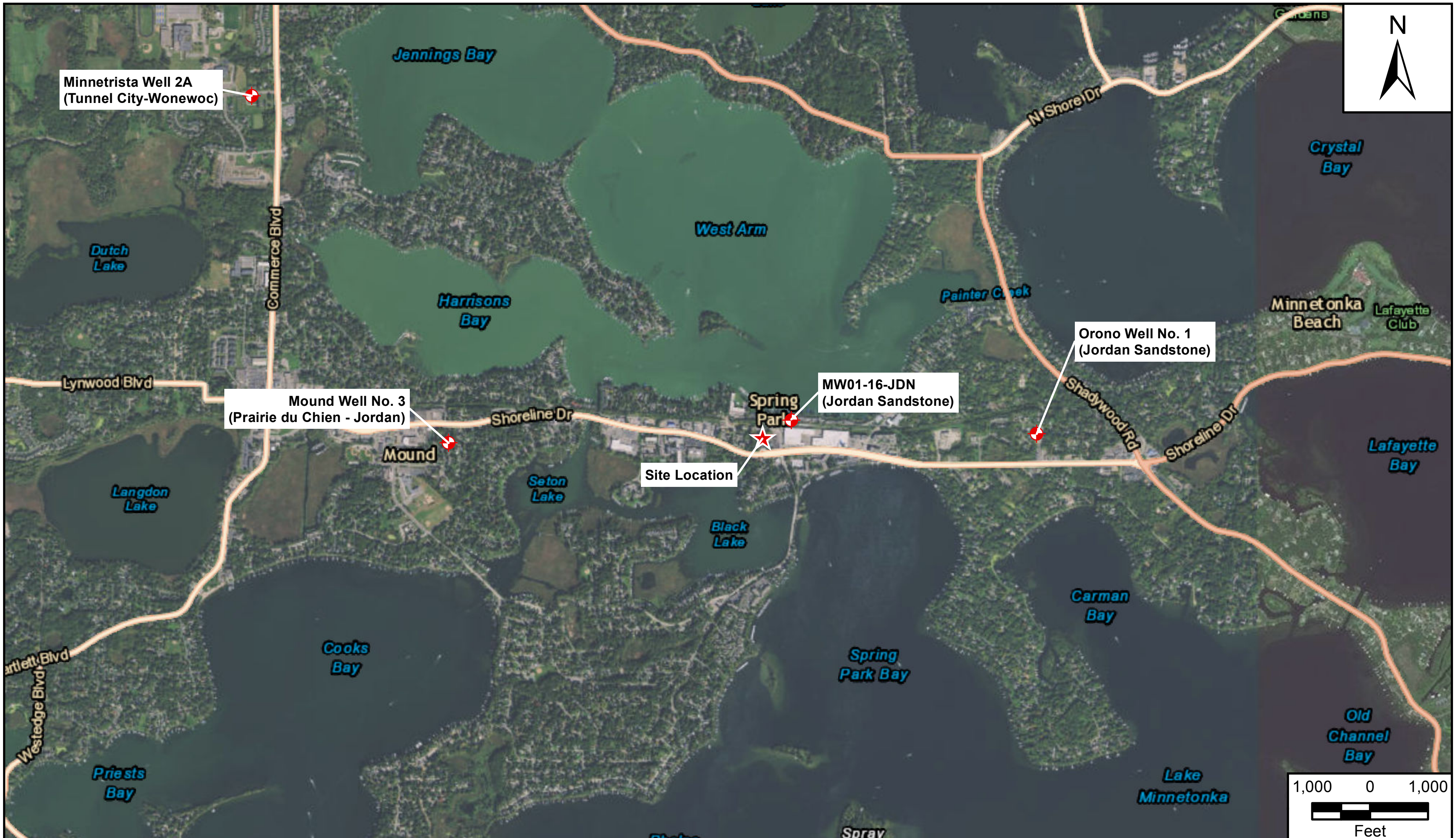
File Path: G:\G\G9026-START IV\Other States\Spring Park Municipal Well Field - MN\mxd\2017-07\Fig2-SiteLayout.mxd maggie.banh

Date Saved: 11/14/2017

EPA Contract No.: EP-S5-13-01

TDD No.: S05-0002-1410-011

Coordinate System: WGS 1984 Web Mercator Auxiliary Sphere
Projection: Mercator Auxiliary Sphere
Datum: WGS 1984



Reference Map

Refs. 4; 5, pp. 67 through 69

Note: The source of this map image is Esri, used by the EPA with Esri's permission.

Source: Esri Data Maps, World Imagery, 2015; Esri Data Maps, World Transportation, 2016; USGS, Map Viewer, 2016

Spring Park Municipal Well Field
4333 Warren Avenue
Spring Park, Hennepin County, Minnesota

Figure 3
Background Ground Water Wells

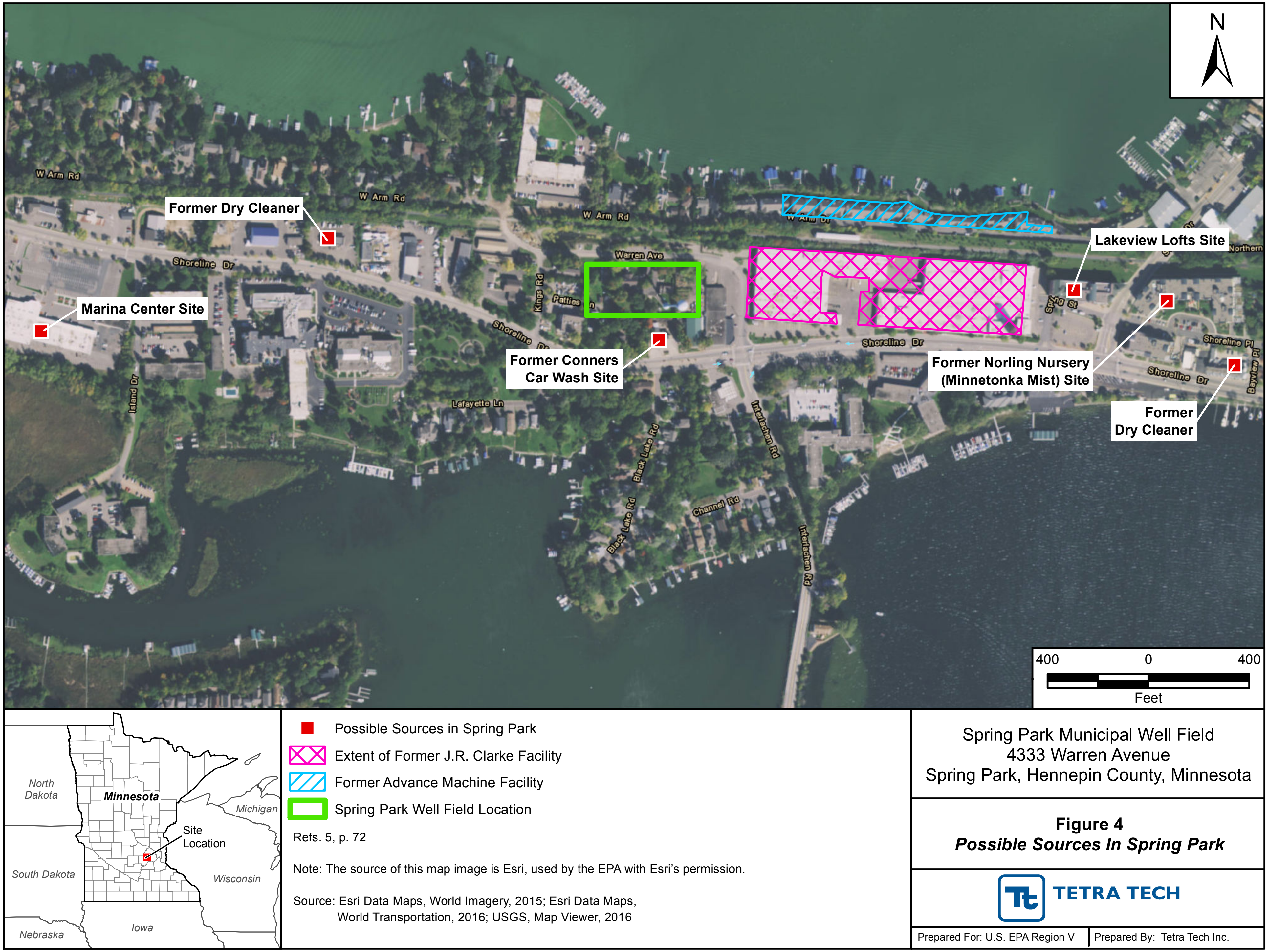
TETRA TECH

Prepared For: EPA | Prepared By: Tetra Tech Inc.

File Path: G:\G\G9026-START IV\Other States\Spring Park Municipal Well Field - MN\mxd\2017-07\Fig3-BackgroundGroundWaterWells.mxd maggie.banh

Date Saved: 11/14/2017 EPA Contract No.: EP-S5-13-01 TDD No.: S05-0002-1410-011

Coordinate System: WGS 1984 Web Mercator Auxiliary Sphere
Projection: Mercator Auxiliary Sphere
Datum: WGS 1984



G:\G\G9026-START IV\Other States\Spring Park Municipal Well Field - MN\mxd\2017-09\Fig4-EnvironmentalSites.mxd

Date Saved: 10/13/2017

EPA Contract No.: EP-S5-13-01

TDD No.: S05-0002-1410-011

Coordinate System: WGS 1984 Web Mercator Auxiliary Sphere
Projection: Mercator Auxiliary Sphere
Datum: WGS 1984

REFERENCES

1. U.S. Environmental Protection Agency (EPA). Hazard Ranking System, Title 40 *Code of Federal Regulations* Part 300, 55 Federal Register 51532. December 14, 1990. Available on-line at https://semspub.epa.gov/src/document/HQ/174028. 138 Pages.

1a. EPA. Addition of a Subsurface Intrusion Component to the Hazard Ranking System, 40 Code of Federal Regulations Part 300, 82 Federal Register 2760. January 9, 2017. 48 Pages. Available on-line at https://www.regulations.gov/document?D=EPA-HQ-SFUND-2010-1086-0104.

2. EPA. Superfund Chemical Data Matrix (SCDM) Query. Accessed on-line at: https://www.epa.gov/superfund/superfund-chemical-data-matrix-scdm-query. Data Extracted on August 30, 2017. 9 Pages.

3. Tetra Tech EM Inc. (Tetra Tech). 4-Mile Radius. U.S. Geological Survey (USGS) 7.5 Minute Series Topographic Quadrangle Maps of Minnesota: Chanhassen 1993, Independence 1993, Minnetonka Beach 1993, Minnetrista 1993, Mound 1993, Shorewood 1993, Spring Park 1993, Tonka Bay 1993, and Victoria 1993. 1 Map. Modified by Tetra Tech to show site location and distance rings.

4. EPA. Superfund Site Information. Spring Park Municipal Well Field. Accessed on-line at: https://cumulis.epa.gov/supercpad/CurSites/csitinfo.cfm?id=0502963. Accessed on November 27, 2017. 1 Page.

5. Minnesota Pollution Control Agency (MPCA). Expanded Site Inspection Report. Spring Park Municipal Wells Site. May 15, 2017. 1,042 Pages.

6. University of Minnesota and Minnesota Geological Survey. Surficial Geologic Map of the Mound Quadrangle, Carver and Hennepin, Minnesota. By Lusardi, B. A. Map M-94. Downloaded from: http://conservancy.umn.edu/handle/11299/975. 1999. 1 Map. Modified by Tetra Tech to show site location.

7. Minnesota Department of Health. Health Consultation, Minnetonka Lakeshore-Advance Machine Superfund Site. Spring Park, Hennepin County, Minnesota. October 22, 2013. Addendum January 29, 2014. 53 Pages.

8. Minnesota Department of Health, Wellhead Protection Plan, Part I. February 2010. 43 Pages.

9. U.S. Geological Survey (USGS). Hydrologic Investigations Atlas 730-J. Ground Water Atlas of the United States. Segment 9, Iowa, Michigan, Minnesota, Wisconsin. 1992. 33 Pages.

10. United States Census Bureau. Community Facts Search for City of Spring Park, Minnesota. Accessed on on-line at: https://factfinder.census.gov/faces/nav/jsf/pages/community_facts.xhtml# Accessed on July 11, 2017. 1 Page.

11. City of Spring Park, Minnesota, Water & Sewer. Accessed on-line at: http://www.ci.spring-park.mn.us/index.asp?SEC=E6A89B02-373C-437D-8B91-865150901FF3&Type=B_BASIC. Accessed on March 15, 2017. 1 Page.

12. City of Spring Park, Minnesota, Historic TCE Levels in Spring Park since 1995. Accessed on-line at: http://www.ci.spring-park.mn.us/index.asp?SEC=3066522B-DB6D-4945-9C4A-23F38904A9E7&DE=F8DA5EBE-1C49-4C4C-8A8D-B86497A8DF6D&Type=B_BASIC. Accessed on March 16, 2017. 1 Page.

13. Spring Park, Minnesota. Code of Ordinances. Section 18-302. - Sanitary Sewer and Municipal Water. Accessed on-line at https://library.municode.com/mn/spring_park/codes/code_of_ordinances?nodeId=COOR_CH18EN_ARTVIFLMAOR_DIV7PUUTRAROBR. Accessed on July 24, 2017. 1 Page.

14. AECOM, Limited Environmental Site Assessment, Spring Park Wells Site Assessment Project, Spring Park, Minnesota. June 19, 2014. 68 Pages.

15. MPCA. State Superfund Site Summary. Spring Park: Municipal Wells Site. Accessed on-line at: https://www.pca.state.mn.us/featured/spring-park-municipal-wells-site. Accessed on July 24, 2017. 4 Pages.

16. MPCA, Remediation Division. Preliminary Assessment Report, Spring Park Municipal Wells Site. December 29, 2014. Approved by EPA on January 5, 2015. 178 Pages.

17. MPCA, Remediation Division. Site Inspection Report, Spring Park Municipal Wells Site. December 2015. Approved by EPA on December 28, 2015. 203 Pages.

18. Mossler, J.H. Bedrock Geology of the Twin Cities Ten-County Metropolitan Area, Minnesota: Minnesota Geological Survey Miscellaneous Map Series M-194. Modified by Tetra Tech to show approximate site location. Accessed on-line at: http://hdl.handle.net/11299/154925. 2013. 1 Map.

19. MPCA. Spring Park Municipal Wells Site. Proposed Addition to Minnesota's Permanent List of Priorities. G-27-27. Accessed on-line at: https://www.pca.state.mn.us/sites/default/files/g-27-27.pdf. July 2014. 3 Pages.

20. University of Minnesota and Minnesota Geological Survey. Quaternary Hydrogeology, Geologic Atlas of Hennepin County, Minnesota. By Kanivetsky, R. County Atlas Series, Atlas C-4, Plate 5 of 9. Downloaded from: http://conservancy.umn.edu/bitstream/handle/11299/58491/plate5_quat_hydro.pdf?sequence=97&isAllowed=y. 1989. 1 Map.

21. University of Minnesota and Minnesota Geological Survey. Bedrock Hydrogeology, Geologic Atlas of Hennepin County, Minnesota. By Kanivetsky, R. County Atlas Series, Atlas C-4, Plate 6 of 9. Downloaded from: http://conservancy.umn.edu/bitstream/handle/11299/58491/plate6_bdrk_hydro.pdf?sequence=96&isAllowed=y. 1989. 1 Map. Modified by Tetra Tech to show approximate site location.

22. Tetra Tech. Electronic Mail Correspondence between Sandy Anagnostopoulos, Environmental Scientist and Paul Moyer, Manager, Environmental Laboratory Section, MDH. Regarding: Definition of Reporting Limit. September 6, 2017. 2 Pages.

23. Wenck Associates, Inc. Remedial Investigation/Feasibility Study, Former Advance Machine Company, 4080 Sunset Drive, Spring Park, Minnesota. 2002. 864 Pages.

24. University of Minnesota and Minnesota Geological Survey. Hydrogeologic Properties of the St. Lawrence Aquitard, Southeastern Minnesota. Minnesota Geological Survey Open File Report 14-4. By Runkel, A.C.; Tipping, R.R.; Green, J.A.; Jones, P.M.; Meyer, J.R.; Parker, B.L.; Steenberg, J.R.; and Retzler, A.J. Downloaded from the University of Minnesota Digital Conservancy, at: http://hdl.handle.net/11299/165299. 2014. 119 Pages.

25. EPA, Office of Research and Development. Technical Protocol for Evaluating Natural Attenuation of Chlorinated Solvents in Ground Water. September 1998. 248 Pages.

26. MDH. Final Laboratory Results for City of Spring Park. April 24, 2017. 10 Pages.

27. Tetra Tech. Project Note to File. Subject: Latitude and Longitude Coordinates of Spring Park Municipal Well Field Site. November 27, 2017. 2 Pages.

28. Wenck Associates, Inc. Remedial Groundwater Assessment Report, Former Advance Machine Site. Wenck File #0912-06. July 2014 (Revised November 2014). 2014. 328 Pages.

29. Wenck Associates, Inc. 2015 Annual Report Former Advance Machine Site. Prepared for Nilfisk, Inc. Wenck File #0912-06. March 2016. 1,173 Pages.

30. MPCA. Expanded Site Inspection Work Plan for Spring Park Municipal Wells Site. December 2015. 41 Pages.

31. Minnesota Administrative Rules. 4720.5100. Accessed on-line at https://www.revisor.mn.gov/rules/?id=4720.5100. Accessed on April 5, 2017. 3 Pages.

32. Minnesota Department of Agriculture. Wellhead Protection Area Map. Source Water Protection Areas Search Accessed at https://app.gisdata.mn.gov/mda-source/. Accessed on July 10, 2017. 1 Map. Modified by Tetra Tech to show site location.

33. Congressional Research Service. Safe Drinking Water Act (SDWA): A Summary of the Act and Its Major Requirements. By: Mary Tiemann, Specialist in Environmental Policy. CRS Report RL31243. March 1, 2017. 27 Pages.

34. Agency for Toxic Substances and Disease Registry. 2006. Vinyl Chloride - ToxFAQs™. July. 2 Pages.

35. New Hampshire Department of Environmental Services. Environmental Fact Sheets. Health Information Summaries. 2012. Trichloroethylene, 1,2-Dichloroethene, and Vinyl Chloride: Accessed on-line at: http://des.nh.gov/organization/commissioner/pip/factsheets/ard/index.htm. Accessed on July 13, 2017. 8 Pages.

36. MPCA. Site Assessment Program Quality Assurance Project Plan. Prepared by AECOM for MPCA. September 2014. 218 Pages.

37. Dan Tolsma, City Administrator, City of Spring Park. Letter to Eric Pederson, MPCA, Regarding Well #3 Usage. April 5, 2017. 1 Page.

38. MDH. Laboratory Results for Samples Collected from Spring Park Wells 1, 2, and 3. Work Order Number 14E1984. From Myra Kunas, Public Health Laboratory, Operations Unit Supervisor. May 28, 2014. 23 pages.

39. Tetra Tech. Data Validation Checklist – Stage 2A with Attachment. Site Name: Spring Park Municipal Well Field. TDD No. S05-0002-1701-005. Laboratory: Minnesota Department of Health/St. Paul, Minnesota. Laboratory Report Number: 14E1984. Sample Collection Date: May 14, 2014. Attachment: Hand Qualified Analytical Data Sheets. July 17, 2017. 13 Pages.

40. Tetra Tech. Project Note with Attachments. Subject: MPCA Groundwater Collection Records for Spring Park Municipal Wells, June 2017. Attachments: Groundwater Sample Collection Records. September 2, 2017. 5 Pages.

41. MDH. Laboratory Results for Samples Collected from Spring Park Wells 1, 2, and 3. Work Order Number 17F1238. From Paul Moyer, Public Health Laboratory, Environmental Laboratory Manager. July 13, 2017. 29 pages.

42. Tetra Tech. Data Validation Checklist – Stage 2A with Attachment. Site Name: Spring Park Municipal Well Field. TDD No. S05-0002-1701-005. Laboratory: Minnesota Department of

Health/St. Paul, Minnesota. Laboratory Report Number: 17F1238. Sample Collection Date: June 20, 2017. Attachment: Hand Qualified Analytical Data Sheets. July 17, 2017. 19 Pages.

43. EPA. Office of Solid Waste and Emergency Response. Using Qualified Data to Document an Observed Release and Observed Contamination. EPA 540-F-94-028. OSWER 9285.7-14FS. PB94-963311. November 1996. 18 Pages.

44. Tetra Tech. Project Note to File. Subject: Spring Park Municipal Well Field Pumping Volumes from 2003 through 2016. July 20, 2017. 16 Pages.

45. University of Minnesota and Minnesota Geological Survey. Bedrock Geology. Geologic Atlas of Hennepin County, Minnesota. By Olsen, Bruce M., and Bloomgren, Bruce A. County Atlas Series, Atlas C-4, Plate 2 of 9. Downloaded from: https://conservancy.umn.edu/bitstream/handle/11299/58491/plate2_bedrock.pdf?sequence=100&isAllowed=y. 1989. 1 Map. Modified by Tetra Tech to show approximate site location.

46. University of Minnesota and Minnesota Geological Survey. Depth to Bedrock and Bedrock Topography. Geologic Atlas of Hennepin County, Minnesota. By Olsen, Bruce M., Cleland, Jane M., and Bloomgren, Bruce A. County Atlas Series, Atlas C-4, Plate 4 of 9. Downloaded from: https://conservancy.umn.edu/bitstream/handle/11299/58491/plate4_d2bdrk.pdf?sequence=98&isAllowed=y 1989. 1 Map. Modified by Tetra Tech to show approximate site location.

47. EPA. Contract Laboratory Program, Statement of Work for Organic Superfund Methods, Multi-Media, Multi-Concentration, SOM02.3. Available on-line at: https://www.epa.gov/clp/contract-laboratory-program-analytical-statements-work-sows. September 2015. 136 Pages.

48. EPA. Guidance for Labeling Externally Validated Laboratory Analytical Data for Superfund Use. EPA 540-R-08-005. January 13, 2009. 29 Pages.

49. EPA. National Functional Guidelines for Organic Superfund Methods Data Review. EPA-540-R-2017-002. January 2017. 262 Pages.

50. Tetra Tech. Project Note to File with Attachment. Subject: Summary of J-Qualified Data. Attachment: J-Qualified Data Summary Table. September 1, 2017. 2 Pages.

51. The Javelin Group, Inc. Supplemental Phase II Environmental Investigation, Final Report. Lakeview Lofts Development, Spring Park, Minnesota. February 14, 2005. 116 Pages.

52. Richard Hansen, Senior Consultant, Braun Intertec Corporation, Letter with Attachments to Karlene French, Project Manager, MPCA VIC Unit. Subject Additional Phase II ESA Investigation, Minnetonka Mist./Norling Property Project. Attachments: Results Tables, Sampling Location Maps, Boring Logs, and Analytical Results. March 4, 2005. 153 Pages.

53. Richard Hansen, Senior Consultant, Braun Intertec Corporation, Letter with Attachments to Karlene French, Project Manager, MPCA VIC Unit. Subject Addendum to Additional Phase II ESA Investigation, Minnetonka Mist./Norling Property Project. Attachments: Results Tables, Area of Concern and Soil Boring Location Map, and Analytical Results. March 17, 2005. 30 Pages.

54. Dallas Roggeman, Public Works Superintendent, City of Spring Park. Letter with Attachments to Richard Jolley, Remediation Division, MPCA. Subject: Status of City of Spring Park Wells. Attachments: Well Maintenance Records and Analytical Results. June 29, 2017. 20 Pages.

55. Braun Intertec Corporation. Limited Phase II Environmental Site Assessment (ESA), Lake View Lofts, LLC, Spring Park, Minnesota. August 25, 2004. 85 Pages.

56. Vieau Associates, Inc. Additional Phase II Subsurface Investigation, Marina Center, Spring Park, Minnesota. Figure 1 modified by Tetra Tech to show approximate site location. July 26, 2002. 55 Pages.

57. Tetra Tech. Project Note to File with Attachments. Subject: SEMS and RCRAInfo Queries for Spring Park, Hennepin County, Minnesota. Attachments: SEMS and RCRAInfo Queries. 25 Pages. September 7, 2017.

58. EPA and Tetra Tech. Project Note to File. Subject: Contract Laboratory Program Form 1s and Universal Supersets for Case Numbers 46247 and 46738, Spring Park Municipal Well Field. October 23, 2017. 296 Pages.

59. MDH. Trichloroethylene (TCE) and Drinking Water. Available on-line at: http://www.health.state.mn.us/divs/eh/risk/guidance/gw/tceinfosheet.pdf. May 2013. 2 Pages.

SITE DESCRIPTION

The Spring Park Municipal Well Field site is a trichloroethylene (TCE)-, *cis*-1,2-dichloroethylene (DCE)- and vinyl chloride-contaminated groundwater plume originating from one or more unknown sources located in the City of Spring Park, Minnesota (References [Ref.] 5, pp. 1, 3, 54, 55; 39, pp. 6, 7, 9, 10). The City of Spring Park operates three primary wells: Well 1 (Unique No. 224642), completed in the Tunnel City-Wonewoc and upper Mt. Simon bedrock aquifers; Well 2 (Unique No. 224643), completed in the Jordan aquifer; and Well 3 (Unique No. 165595), completed at a deeper depth within the Mt. Simon aquifer (Ref. 5, pp. 7, 22, 88-90). Groundwater from the three wells is blended together at the Spring Park water treatment plant for distribution to residents (Refs. 5, p. 41; 37).

The Spring Park Municipal Well Field site is composed of Spring Park Wells 1 and 2. Spring Park Well 1 is about 640 feet deep and withdraws water from the Tunnel City-Wonewoc and about the top 20 feet of the Mt. Simon aquifers at depths ranging from 418 to 640 feet below ground surface (bgs) (Ref. 8, pp. 3, 27). Spring Park Well 2 is about 391 feet deep and withdraws water from the Jordan aquifer at depths ranging from 341 to 391 feet bgs (Ref. 8, pp. 3, 28). The City of Spring Park operates a third primary well, Spring Park Well 3, which is not included as part of the Spring Park Municipal Well Field site (Ref. 5, p. 7). Well 3 is about 790 feet deep and withdraws water from the Mt. Simon aquifer at depths ranging from 660 to 790 feet bgs (Ref. 8, pp. 3, 29).

The site is located in the City of Spring Park in Hennepin County near Lake Minnetonka (see Figure 1 of this HRS documentation record). The location of the site is identified by the address of the Spring Park treatment plant where Spring Park Wells 1 and 2 are located, 4333 Warren Avenue (see Section 2.2.1, Source No. 1, and Figures 1 and 2 of this HRS documentation record). The geographic coordinates of the site are based on the water treatment plant address and coordinates acquired from EPA's Superfund Site Information database. More specifically, the geographic coordinates are latitude 44° 56' 09.4" north and longitude 93° 37' 59.9" west (Ref. 4; 27, pp. 1, 2). The EPA identification number is MNN 000502963 (Ref. 4). Land use surrounding the site is mixed residential, commercial, and industrial (Refs. 3; 17, p. 71; 27, p. 2).

Groundwater pumped from the individual Spring Park municipal wells is currently treated by chlorination, followed by a gravity-fed iron filtration system. This finished water is provided to the public water distribution system (Ref. 5, p. 7). TCE was first detected in finished water compliance samples collected from the Spring Park treatment plant in 2004 (Ref. 5, p. 8). Since then, TCE, *cis*-1,2-DCE and vinyl chloride have been detected in groundwater samples collected from two of the three municipal wells operated by the City of Spring Park for municipal water supply, namely, Spring Park Wells 1 and 2 (Refs. 5, p. 395, 399, 405, 456, 458; 39, pp. 6, 7, 9, 10; 42, pp. 6, 7, 9, 10, 15, 16). Currently, the extent of the plume is defined by Expanded Site Inspection (ESI) and Minnesota Department of Health (MDH) samples collected from Spring Park Well 1 (14E1984-01, E5FN8, E5FP1, E5FQ0, 17F1238-01, and 17F1238-04) and Spring Park Well 2 (14E1984-02, E5FP0, E5FQ1, and 17F1238-02) (see Tables 8 and 9 of this HRS documentation record). [The analytical data sheets contained in References 5, 38, 39, 41, and 42 use the terms *cis*-1,2-dichloroethene and trichloroethene, which are other terms for *cis*-1,2-dichloroethylene (DCE) and trichloroethylene (TCE) (Ref. 25, p. xiv).]

The site incorporates the TCE, *cis*-1,2-DCE, and vinyl chloride releases in Spring Park Wells 1 and 2, which withdraw water from the Jordan, Tunnel City-Wonewoc, and upper 20 feet of the Mt. Simon aquifers (Refs. 5, pp. 3, 54, 55, 56; 8, pp. 3, 27, 28; 39, pp. 6, 7, 9, 10). To date, no private drinking water wells have been identified in the Spring Park area and volatile organic compounds (VOCs) have not been identified in two nearby community water supply wells sampled in 2015 during the Minnesota Pollution Control Agency's (MPCA) Site Inspection (SI) activities: City of Mound Well 3 and City of Orono Well 1 (Refs. 5, p. 2; 17, pp. 43, 51). Actual contamination has been documented in municipal water wells at Level I concentrations (see Section 3.1.1, Observed Release, and Tables 8, 9, and 12 of this HRS documentation record).

The MPCA has made significant efforts to identify specific source/sources of groundwater contamination through numerous sampling events and by conducting an extensive search of MPCA records (Refs. 16, pp. 7-9; 17, p. 25); however, no source of the groundwater contamination in the Jordan, Tunnel City-Wonewoc, and upper Mt. Simon aquifers has been confirmed. See the Site History discussion, below, and Attribution section of this HRS documentation record for more details regarding efforts to identify the source of groundwater contamination. As a result, the site is being scored as a groundwater plume with no identified source.

SITE HISTORY

TCE and *cis*-1,2-DCE were first detected in finished water samples collected by the Minnesota Department of Health (MDH) in 2004. The sample contained TCE at 0.9 micrograms per liter (µg/L) and *cis*-1,2-DCE at 1.4 µg/L (Ref. 5, p. 54). Subsequent sampling by MDH indicates continued contamination in the finished water samples, TCE at concentrations up to 2.4 µg/L in June 2012 and *cis*-1,2-DCE at concentrations up to 3.1 µg/L in August 2012 (Refs. 5, pp. 8, 54; 12, p. 1).

Samples collected from the finished water did not exceed the U.S. EPA maximum contaminant levels (MCL) for TCE or *cis*-1,2-DCE, 5 µg/L and 70 µg/L, respectively (Ref. 2, pp. 1, 4). However, the water has regularly exceeded the MDH health based value (HBV) for TCE of 0.4 µg/L (Refs. 19, p. 1; 59, p. 1). The exceedance of the TCE HBV triggered the MDH to issue a Health Advisory on February 28, 2014 (Ref. 19, p. 1).

In addition to collecting finished water samples, MDH began collecting drinking water samples from Spring Park Wells 1, 2, and 3. Drinking water sample results for Well 1 collected in May 2014 showed TCE at 3.0 J- (estimated, potential low bias) µg/L, *cis*-1,2-DCE at 4.0 J- µg/L, and vinyl chloride at 0.26 J- µg/L (Ref. 39, pp. 6, 7). Drinking water sample results for Well 2 collected in May 2014 showed TCE at 5.0 J- µg/L, *cis*-1,2-DCE at 5.9 J- µg/L, and vinyl chloride at 0.40 J- µg/L (Ref. 39, pp. 9, 10). No VOCs have been detected in finished or drinking water samples from Spring Park Well 3. This well is completed in the Mt. Simon Aquifer and draws water from a deeper depth than Wells 1 and 2 (Refs. 8, pp. 1, 3, 27-29; 39, pp. 12, 13).

Beginning in August 2014, the City of Spring Park solely used Spring Park Well 3 to provide municipal water (Ref. 37). At this time, Spring Park Wells 1 and 2 were maintained in reserve as emergency backup wells (Ref. 54, p.1). In order to provide residents water that met the MDH HBV for TCE, MPCA installed an air stripper to address the contamination in Wells 1 and 2 (Ref. 15, p. 2). Construction of the air stripper system to treat groundwater withdrawn from Wells 1 and 2 was completed in April 2017 (Ref. 15, p. 3). The City now uses all three wells to provide municipal water to residents (Refs. 15, p. 3).

Although the finished water meets state drinking water requirements, raw water samples collected in June 2017 show that TCE, *cis*-1,2-DCE, and vinyl chloride concentrations are still present in Spring Park Wells 1 and 2. Drinking water sample results for Well 1 showed TCE at 6.8 µg/L, *cis*-1,2-DCE at 8.5 µg/L, and vinyl chloride at 0.52 µg/L (Ref. 42, pp. 6, 7). Drinking water sample results for Well 2 showed TCE at 5.7 µg/L, *cis*-1,2-DCE at 7.6 µg/L, and vinyl chloride at 0.43 µg/L (Ref. 42, pp. 9, 10).

In addition, to MDH sampling activities, all three Spring Park wells were also sampled in association with an MPCA Petroleum Remediation Program (PRP) investigation in 2008 and 2009. The MPCA was investigating nearby leaking underground petroleum tanks (Ref. 5, p. 8). Analysis of samples collected during the PRP investigation detected TCE and *cis*-1,2-DCE in Wells 1 and 2. (Ref. 5, pp. 55-57). Following the PRP investigation, MPCA continued to sample the Spring Park wells.

MPCA has made significant efforts to identify specific sources of groundwater contamination through numerous sampling events (Ref. 5, pp. 13-20). In 2013, the MPCA initiated a Site Assessment Program investigation with the initial goal to identify possible sources for the TCE contamination in the two Spring Park municipal wells (Ref. 5, p. 9). The following year, in August 2014, the Spring Park

Municipal Well Field site was listed on the state's Permanent List of Priorities (PLP), enabling access to funding to investigate and remediate the Site (Ref. 15, p. 2). Below is a brief description of key MPCA investigations conducted to date.

Limited Site Assessment: MPCA conducted a limited environmental site assessment, which included a review of environmental databases, aerial photographs, historical fire insurance maps, city directories, City and MPCA files, and a Site reconnaissance (Ref. 14, p. 3). Multiple environmental sites were identified within 0.5 mile of the Spring Park municipal wells (Ref. 14, p. 1).

Preliminary Assessment (PA): MPCA prepared a PA report in December 2014 (Ref 16, p. I). The PA provided an overview of the area geology and a summary of the historical VOC sampling results from the finished Spring Park municipal water supply and from the individual municipal wells, discussed potential TCE sources, and provided a preliminary exposure pathway assessment (Ref. 16, pp. 2, 3, 6, 7-9, 10-12, 19, 20).

SI: During the SI, MPCA reviewed several other potential or known solvent release sites in the Spring Park area. Groundwater samples were collected from wells located about 0.2 mile east and 0.1 mile southeast of the Site. The wells withdraw water from the quaternary buried artesian aquifer which is hydraulically connected to the underlying aquifer (Ref. 8, p. 3). Sample results did not indicate the presence of TCE, *cis*-1,2-DCE, or vinyl chloride (Ref. 17, pp. 43, 51, 56). MPCA noted that the Minnetonka Lakeshore-Advance Machine (MLAM) State Superfund site is considered the most likely source for the contamination in the Spring Park wells (Ref. 17, p. 36); however, attribution cannot be verified based on available data. See the attribution section of this HRS documentation record for additional information on the MLAM State Superfund site and other possible sources of the site contamination.

ESI: In 2016, the MPCA conducted extensive field activities as part of an expanded site inspection (ESI). Field activities included sampling raw and finished water from Spring Park Wells 1, 2, and 3; installing and sampling water table background well; and installing and sampling a Jordan Sandstone monitoring well located between the Spring Park municipal well field and the MLAM site (Ref. 5, pp. 20, 23, 67). TCE was not detected in the Jordan Sandstone monitoring well (Ref. 5, pp. 32, 58, 59, 392, 393, 453, 454, 474, 494-496). In addition, MPCA completed geophysical and video logging of Spring Park Wells 1 and 3 (Ref. 5, p. 20).

Table 1 lists sampling events at the Spring Park Well Field site since 2004, including hazardous substances detected in groundwater samples collected.

TABLE 1: SPRING PARK MUNICIPAL WELL SAMPLING EVENTS				
Agency or Investigation	**Sampling Year**	**Samples Collected**	**Hazardous Substances Detected**	**Reference**
MDH	2004, 2005, 2007, 2008, 2009, 2010, 2012, 2013, 2016	Spring Park Treatment Plant finished water	TCE c*is*-1,2-DCE	5, p. 54
PRP Investigation	2008, 2009	Raw water from each of the three Spring Park municipal wells	TCE c*is*-1,2-DCE	5, pp. 55-57
MDH, MPCA	2013, 2014, 2015, 2016, 2017	Raw water from each of the three Spring Park municipal wells	TCE c*is*-1,2-DCE Vinyl chloride	5, pp. 55-56; 38, pp. 2, 3, 7, 8, 10, 11, 16, 17; 41, pp. 2, 3, 7, 8, 10, 11
MPCA SI	2015	Raw water from each of the three municipal wells	TCE *cis*-1,2-DCE Vinyl chloride	5, pp. 55-57
MPCA SI	2015	Spring Park Treatment Plant finished water	TCE c*is*-1,2-DCE	5, p. 54
MDH	2015, 2016	Spring Park Treatment Plant finished water	TCE *cis*-1,2-DCE	5, p. 54
MPCA ESI	2016	Spring Park Treatment Plant finished water	TCE *cis*-1,2-DCE	5, p. 54
MPCA ESI	2016	Raw water from each of the three Spring Park municipal wells	TCE c*is*-1,2-DCE Vinyl chloride	5, pp. 55-57

Notes:

DCE	Dichloroethylene
ESI	Expanded Site Inspection
MDH	Minnesota Department of Health
MPCA	Minnesota Pollution Control Agency
PRP	Petroleum Remediation Program
SI	Site Inspection
TCE	Trichloroethylene

2.2 SOURCE CHARACTERIZATION

2.2.1 SOURCE IDENTIFICATION

Number of source: 1

Name of source: Contaminated Groundwater Plume

Source Type: Other – Groundwater Plume with No Identified Source

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

The Spring Park Municipal Well Field site consists of a contaminated groundwater plume with no identified source in the Jordan, Tunnel City-Wonewoc, and upper 20 feet of the Mt. Simon aquifers underlying a portion of the City of Spring Park (Refs. 5, pp. 22, 88, 89, 395, 399, 405, 456, 458; 8, pp. 3, 27, 28; 39, pp. 6, 7, 9, 10; 42, pp. 6, 7, 9, 10, 15, 16) (see Figure 1 of this HRS documentation record). Currently, the groundwater plume is defined by the following groundwater samples collected from Spring Park Wells 1 and 2 located at the Spring Park water treatment plant: 14E1984-01, 14E1984-02, E5FN8, E5FP1, E5FQ0, E5FP0, E5FQ1, 17F1238-01, 17F1238-04, and 17F1238-02 (see Figure 2 and Table 2 of this HRS documentation record).

The City of Spring Park operates three municipal water supply wells: Spring Park Well 1, Spring Park Well 2, and Spring Park Well 3 (Refs. 5, pp. 88, 89, 90; 8, pp. 27, 28, 29). Spring Park Well 1 is 640 feet deep and is completed as an open hole in the Tunnel City-Wonewoc and Mt. Simon aquifers, Spring Park Well 2 is about 391 feet deep and has a 50-foot screen that withdraws water from the Jordan aquifer (Refs. 5, pp. 22, 88, 89; 8, pp. 27, 28).

Since 2004, VOCs including *cis*-1,2-DCE, TCE, and vinyl chloride have been consistently detected in samples collected from Spring Park Wells 1 and 2 (Refs. 5, pp. 54 through 57; 12; 19, p. 1; 37). VOCs have not been detected in Spring Park Well 3; therefore, it is not included in Source No. 1 (Refs. 5, p. 57; 37).

Groundwater samples used to evaluate Source No. 1 were collected by MDH in May 2014, and MPCA in June 2016 and June 2017 (Refs. 5, pp. 416, 487; 38, pp, 2, 3; 41, p. 3). Groundwater samples collected from Source No. 1 in May 2014 contained *cis*-1,2-DCE up to 5.9J- (estimated, low bias) µg/L, TCE up to 5.0J- (estimated) µg/L, and vinyl chloride up to 0.40J- µg/L (Ref. 39, pp. 4, 9, 10). Based on the presence of TCE, in August 2014, the City of Spring Park began using Wells 1 and 2 as emergency wells (Refs. 37; 54, p. 1). During that time, Wells 1 and 2 were regularly maintained (Ref. 54). During the June 2016 MPCA ESI, groundwater samples collected from Source No. 1 showed continued releases of *cis*-1,2-DCE (up to 8.4 µg/L) and TCE (up to 5.9 µg/L) (Ref. 5, pp. 395, 399, 405, 456, 458). From April 2016 to April 2017, MPCA built a new treatment plant with a treatment system to address the contamination as an interim measure (Ref. 15, p. 3). The new treatment plant and treatment system were brought on-line in April 2017, which allowed Spring Park to resume using Wells 1 and 2 (along with Well 3) for its municipal water supply (Ref. 15, p. 3). In June 2017, MPCA collected groundwater samples from Source No. 1 (Spring Park Wells 1 and 2), which showed concentrations of *cis*-1,2-DCE (up to 8.5 µg/L), TCE (up to 6.8 µg/L), and vinyl chloride (at 0.52 µg/L) (Ref. 42, pp. 6, 7, 9, 10, 15, 16).

The presence of *cis*-1,2-DCE, TCE, and vinyl chloride in June 2017 indicates the need for a long-term solution to address VOC contamination in Source No. 1 (Spring Park Wells 1 and 2) (Refs. 15, p. 2; 42, pp. 6, 7, 9, 10, 15, 16). See Section 3.1.1, Observed Release, of this HRS documentation, for a summary of observed releases documented in Spring Park Wells 1 and 2 (Source No. 1).

2.2.2 HAZARDOUS SUBSTANCES ASSOCIATED WITH THE SOURCE

Groundwater samples have been collected from Spring Park Wells 1 and 2 by MDH and during investigations conducted by MPCA (Ref. 5, p. 8, 9, 10). Table 2 presents samples collected from the municipal water wells and hazardous substances associated with Source No. 1, a groundwater plume with no identified source. For more detailed analytical results documenting the groundwater plume, see Section 3.1.1 of this HRS documentation record.

The samples contained in Table 2 are presented to give an overall picture of the contaminants detected in Source No. 1, while the City of Spring Park altered its well usage and installed a treatment system to minimize contaminants present in finished municipal water. The May 2014 samples were collected while Wells 1 and 2 were still used to provide municipal water. The June 2016 samples were collected during the period of August 2014 to April 2017 when the City of Spring Park pumped water solely from Well 3. Finally, the June 2017 samples were collected after the City of Spring Park had installed a water treatment system and again began using Wells 1 and 2 to supply drinking water (Refs. 5, p. 7; 37; 15, p. 3).

TABLE 2: Source No. 1 Groundwater Wells and Associated Hazardous Substances

Location Description/ Location Code	Sample No.	Hazardous Substances	References
MDH – May 2014			
Spring Park Well 1/ NA	14E1984-01	TCE *cis*-1,2-DCE Vinyl chloride[1]	38, pp. 2, 3, 7, 8; 39, pp. 1, 4, 6, 7
Spring Park Well 2/ NA	14E1984-02	TCE *cis*-1,2-DCE Vinyl chloride[1]	38, pp. 2, 3, 10, 11; 39, pp. 1, 4, 9, 10
ESI – June 2016			
Spring Park Well 1/ SPW-1	E5FN8	TCE *cis*-1,2-DCE	5, pp. 395, 416
Spring Park Well 1 (Duplicate)/ DUP-A	E5FP1	TCE *cis*-1,2-DCE	5, pp. 28, 58, 405, 416
Spring Park Well 1/ SPW-1	E5FQ0	TCE *cis*-1,2-DCE	5, pp. 456, 487
Spring Park Well 2/ SPW-2	E5FP0	TCE[1] *cis*-1,2-DCE	5, pp. 399, 417
Spring Park Well 2/ SPW-2	E5FQ1	TCE *cis*-1,2-DCE	5, p. 458, 487
MPCA – June 2017			
Spring Park Well 1/ NA	17F1238-01	TCE *cis*-1,2-DCE Vinyl chloride	40, pp. 1, 5; 41, pp. 2, 3, 7, 8; 42, pp. 1, 4, 6, 7
Spring Park Well 1 (Duplicate)/ NA	17F1238-04	TCE *cis*-1,2-DCE Vinyl chloride[1]	40, pp. 1, 5; 41, pp. 2, 3, 16, 17; 42, pp. 1, 4, 15, 16
Spring Park Well 2/ NA	17F1238-02	TCE *cis*-1,2-DCE Vinyl chloride[1]	40, p. 3; 41, pp. 2, 3, 10, 11; 42, pp. 1, 4, 9, 10

Notes:

DCE	Dichloroethylene
DUP	Duplicate
NA	Not applicable
No.	Number
SPW	Spring Park well
TCE	Trichloroethylene
[1]	Substance was detected in sample but sample concentration does not meet observed release criteria.

2.2.3 HAZARDOUS SUBSTANCES AVAILABLE TO A PATHWAY

Samples collected from Source No. 1 contained TCE, *cis*-1,2-DCE, and vinyl chloride (see Section 2.2.2 of this HRS documentation record). Source No. 1 consists of a contaminated groundwater plume located in Spring Park, Minnesota (Refs. 4; 5, pp. 3, 8, 9) (see Figure 2 of this HRS documentation record). Offsite possible sources exist; however, a transport pathway to the impacted aquifers has not been verified (Ref. 5, pp. 8-19, 42) (see Figure 4 of this HRS documentation record). Analytical results for groundwater samples collected from municipal water wells indicate that a release of hazardous substances has occurred to the groundwater migration pathway, as documented in Section 3.1.1 of this HRS documentation record. No liners were observed during MPCA ESI well installation or gamma logging activities (Ref. 5, pp. 33, 34). In addition, an observed release by chemical analysis has been documented demonstrating that hazardous substances have migrated to the regional aquifer, therefore, a containment factor value of 10, as indicated below, was assigned for the ground water migration pathway (Ref. 1, Section 3.1.2.1, Table 3-2; see also Section 3.1.1 of this HRS documentation record).

TABLE 3: Containment Factors for Source No. 1

Containment Description	Containment Factor Value	References
Gas release to air	NS	NA
Particulate release to air	NS	NA
Release to groundwater: No liner	10	1, Section 3.1.2.1, Table 3-2; 5, pp. 33, 34; see also Section 3.1.1 of this HRS documentation record
Release via overland migration and/or flood	NS	NA

Notes:

NA Not applicable
NS Not scored

2.4.2.1 HAZARDOUS WASTE QUANTITY

2.4.2.1.1 Hazardous Constituent Quantity

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 records, state records, permits, and waste concentration data] are available to adequately calculate the total or partial 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: Not Evaluated

2.4.2.1.2 Hazardous Wastestream Quantity

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, potentially responsible party records, state records, permits, waste concentration data, and annual reports) are available to adequately calculate the total mass of all hazardous wastestreams and CERCLA pollutants and contaminants or the source and the associated releases from the source. There is insufficient information to adequately calculate the total or partial mass of the wastestream plus the mass of all CERCLA pollutants and contaminants in the source and the associated release from the source. Therefore, there is insufficient information to evaluate the associated releases from the source to calculate the 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: Not Evaluated

2.4.2.1.3 Volume

For migration pathways, the source is assigned a value using the appropriate Tier C equation from HRS Table 2-5 (Ref. 1, Section 2.4.2.1.3). The hazardous waste quantity (HWQ) for Source No. 1 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, Source No. 1 is delineated by Spring Park Wells 1 and 2, limiting the ability to calculate an area. In addition, the lack of vertical extent of contaminant delineation prohibits a reasonable volume calculation. 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 HWQ value greater than zero. The value of greater than zero reflects that the volume is known to be greater than zero, but the exact amount is unknown.

Volume Assigned Value: unknown but >0

2.4.2.1.4 Area

Tier D is not evaluated for source type “other” (Ref. 1, Table 2-5).

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 Wastestream Quantity (Tier B), volume (Tier C), or Area (Tier D) was selected as the source HWQ value (Ref. 1, Section 2.4.2.1.5). Tier C was assigned the greatest value of unknown but greater than zero.

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

SUMMARY OF SOURCE DESCRIPTIONS

TABLE 4: Summary of Source Descriptions						
			Containment Factor Value by Pathway			
					Air	
Source No.	Source Hazardous Waste Quantity Value	Source Hazardous Constituent Quantity Complete? (Yes/No)	Ground Water (Ref. 1, Table 3-2)	Surface Water Overland/ Flood (Ref. 1, Table 4-2)	Gas (Ref. 1, Table 6-3)	Particulate (Ref. 1, Table 6-9)
1	>0	No	10	NS	NS	NS

Notes:

> Greater than
NS Not scored

Total Source Hazardous Waste Quantity Value: >0.

Other Possible Sources –

No other possible sources have been identified.

3.0 GROUND WATER MIGRATION PATHWAY

3.0.1 GENERAL CONSIDERATIONS

Ground Water Migration Pathway Description

Regional Geology

The Spring Park Municipal Well Field site is located in Spring Park, Hennepin County, Minnesota, which is situated on the western shores of Lake Minnetonka (see Figure 1 of this HRS documentation record). The elevation of the site, as determined by Spring Park Wells 1 and 2, is 957 feet above mean sea level (msl) (Ref. 8, pp. 27, 28).

Hennepin County is underlain in descending stratigraphic order by all or some of the following units: glacial deposits, St. Peter Sandstone, Prairie du Chien Group, Jordan Sandstone, St. Lawrence Formation, Tunnel City Group, Wonewoc Sandstone, Eau Claire Formation, and Mt. Simon Sandstone (Refs. 5, p. 64; 6; 18; 45).

Regional geology references refer to the Tunnel City Group as the Franconia Formation and the Wonewoc Sandstone as the Ironton-Galesville Sandstones (Refs. 5, p. 64; 18; 45). In this HRS documentation record, the most recent nomenclature (Tunnel City Group and Wonewoc Sandstone) will be used.

The glacial deposits (high relief till) consist of sediment deposited by the northwest-source Des Moines-lobe ice. The deposits contain sediment consisting of abundant pebbles, common cobbles, and rare boulders in a loamy matrix; pockets of silt, sand, and gravel are present in places. The average composition of the very coarse sand fraction includes crystalline rocks (46 percent), carbonate rocks (25 percent), and shale fragments (29 percent) (Ref. 6). Bedrock in the Spring Park area is encountered at about 700 feet above msl; therefore, the glacial deposits are about 275 feet thick (Refs. 8, pp. 27, 28; 46).

Underlying the glacial deposits is the St. Peter Sandstone, which varies in thickness from 145 to 155 feet (Refs. 5, p. 64; 18). The upper part is characterized by thick beds of white to light gray, medium- to fine-grained quartzose sandstone. The basal part is light to medium gray, fine- to coarse-grained, and poorly sorted quartzose sandstone with interbedded shale and feldspathic siltstone of varied colors (Ref. 18). The basal contact of the formation with the underlying Prairie du Chien Group is generally regarded as unconformable and represents a significant gap (Ref. 18).

The Prairie du Chien Group consists of grayish-orange to yellowish-gray, dolostone, sandy dolostone, and sandstone in the upper portion and yellowish-gray to pale brown dolostone in the basal portion. The Group is generally 125 to 140 feet thick where covered by St. Peter Sandstone. At some locations the Prairie du Chien Group is missing and the St. Peter Sandstone lies directly on the underlying sandstone (Ref. 18).

The Jordan Sandstone underlies the Prairie du Chien Group and is generally 85 to 100 feet thick where un-eroded (Ref. 18). The sandstone is a dominantly light gray sandstone characterized by coarsening-upward sequences consisting of two interlayered facies (Ref. 18). The facies are fine- to coarse-grained, cross stratified, generally friable, quartz sandstone and very fine-grained, commonly bioturbated, feldspathic sandstone (Ref. 18).

The St. Lawrence Formation underlies the Jordan Sandstone, is about 38 to 59 feet thick, and consists of light gray to yellowish-gray and pale yellowish-green, dolomitic, feldspathic siltstone with interbedded very fine-grained sandstone and shale (Ref. 18). Lenses and layers of light gray, finely crystalline, sandy dolostone and light gray to green shale may be present in the lower part of the formation (Ref. 18).

Underlying the St. Lawrence Formation is the Tunnel City Group (formerly named the Franconia Formation), which is divided into two formations: the upper Mazomanie and the lower Lone Rock (Ref. 18). The upper part (the Mazomanie Formation) is about 60 to 80 feet thick and generally is white to yellowish gray, fine- to medium-grained, cross stratified, generally friable, quartz sandstone. The Mazomanie Formation is generally not found in Hennepin County (Ref. 18). The lower part (Lone Rock Formation) is about 100 to 140 feet thick and is divided into several members, including (1) the Reno Member, a pale yellowish-green, very fine- to fine-grained glauconitic, feldspathic sandstone with thin, greenish-gray shale partings; (2) the Tomah Member, a thin unit composed of interbedded grayish-yellow-green, feldspathic siltstone, very fine-grained sandstone, and pale green shale; and (3) the Birkmose Member, a grayish-yellow-green, fine-grained sandstone that is cemented by dolomite (Ref. 18).

The Wonewoc Sandstone (formerly the Ironton-Galesville Sandstone) underlies the Tunnel City Group and consists of fine- to coarse-grained, moderately to well sorted, light gray to yellowish-gray, quartz sandstone. The upper part is coarse grained and the lower part is finer-grained, better sorted, and progressively finer-grained toward its base (Ref. 18). The Wonewoc Sandstone ranges from 50 to 110 feet in thickness (Ref. 18).

Underlying the Wonewoc Sandstone is the Eau Claire Formation consisting of yellowish-gray to pale olive-gray, very fine- to fine-grained, feldspathic sandstone, siltstone, and shale (Ref. 18). The upper part is predominately shale and siltstone and the lower part is mostly glauconitic sandstone and siltstone. The Formation ranges from 60 to 90 feet in thickness. The contact with the underlying Mt. Simon Sandstone is conformable and transitional (Ref. 18).

The Mt. Simon Sandstone generally is about 200 feet thick and consists of pale yellowish-brown to grayish-orange-pink to light gray, medium- to coarse-grained, quartz sandstone containing interbedded siltstone and very fine-grained, feldspathic sandstone, particularly in its upper half to one third (Ref. 18).

Regional Aquifer Description

The following aquifers underlie all or portions of Hennepin County: the water table aquifer, the buried artesian aquifer (buried sand and gravel aquifer, buried glacial aquifer), the Prairie du Chien-Jordan aquifer, the Tunnel City-Wonewoc bedrock aquifer, and the Mt. Simon-Hinckley bedrock aquifer (Refs. 8, pp. 2, 3; 20; 21).

The water table aquifer in Hennepin County is exposed at land surface in the form of permanent wetlands, lakes, and rivers, or occurs within unconsolidated deposits and bedrock, depending on local geology (Ref. 20). The water table aquifer is not uniform in thickness and its hydrologic connection to bedrock aquifers is not clearly known everywhere. The aquifer is not a major source of groundwater; it supplies water chiefly to domestic wells (Ref. 20). In Spring Park, the water table aquifer is encountered at about 35 to 56 feet below ground surface (bgs) (about 913 to 884 feet above msl) (Ref. 23, pp. 46, 56, 83).

Underlying the water table aquifer is the buried artesian aquifer (Refs. 8, p. 2-3; 20; 21). The quaternary buried artesian aquifer is located within fine- to coarse-grained sand and gravel deposits underlying tills deposited by glacial processes (Refs. 8, p. 3; 20). The aquifer regularly transmits groundwater and is used for both domestic and municipal purposes (Ref. 8, p. 3). A well record indicates that about 1,000 feet to the east-northeast of the site a buried artesian aquifer is encountered at 196 feet bgs (761 feet above msl, assuming an elevation of 957 feet above msl) and is hydraulically connected to the underlying aquifers (Refs. 5, pp. 30, 67, 94; 8, p. 3).

The Prairie Du Chien-Jordan aquifer consists of the Prairie du Chien Group and the Jordan Sandstone (Ref. 21). The aquifer is composed primarily of dolomite and contains fractures, joints, and solution cavities that control the flow of water through it. The Jordan Sandstone portion of the aquifer consists of fairly uniform quartzose sandstone and is highly permeable. Flow through it is primarily intergranular. The Prairie du Chien Group and the Jordan Sandstone function as a single aquifer because no regional confining bed or other layer of significantly lower hydraulic conductivity (i.e., lower by greater than two orders of magnitude) separates them (Ref. 21).

Underlying the Prairie Du Chien-Jordan aquifer is the St. Lawrence aquitard (confining layer) composed of dolomitic shale and siltstone (Refs. 21; 24, p. 39). Recent studies have shown that the fine clastic-dominated strata of the lower Jordan Sandstone should be grouped together with the underlying St. Lawrence Formation in delineating the upper aquitard boundary (Ref. 24, p. 39). The protection of lower aquifers by overlying aquitards can be variable due to several factors, including (1) large vertical gradients created by local pumping centers in the Twin Cities Metropolitan Area increases the rate of leakage across aquitards, leading to localized recharge of recent and more contaminated water in deeper aquifers; (2) multi-aquifer wells constructed prior to modern regulatory codes can provide direct vertical connection across aquitards; and (3) faults with sufficient displacement can provide “windows” where groundwater can pass through an aquitard vertically (Ref. 24, p. 41). The vertical integrity of the lower Jordan-St. Lawrence aquitard in shallow bedrock conditions must be viewed as at least locally very poor, and likely highly variable. Underlying aquifers in these settings, and the aquitard itself, is more susceptible to contamination than in deeply buried settings (Ref. 24, p. 42).

The Tunnel City-Wonewoc bedrock aquifer consists of three parts, (1) the upper 105 to 190 feet of the Tunnel City Group consisting of glauconitic sandstone with some shale and dolomite and (2) the mid-25 to 30 feet of Ironton Sandstone, and (3) the basal 30 to 35 feet of Galesville Sandstone (Ref. 21). All three bedrock units are hydraulically connected (Refs. 18; 21). Generally, the Tunnel City-Wonewoc bedrock aquifer is little used where the Prairie du Chien-Jordan aquifer is present (Refs. 18; 21).

The Eau Claire confining layer separates the Tunnel City-Wonewoc bedrock aquifer from the Mt. Simon-Hinckley bedrock aquifer (Ref. 21). This confining layer consists of siltstone, shale, and silty sandstone and is about 60 to 125 feet thick (Refs. 18; 21).

The Mt. Simon-Hinckley aquifer is composed of two sandstone formations, the Mt. Simon Sandstone and the Hinckley Sandstone. The Mt. Simon Sandstone ranges from 125 to 270 feet in thickness. The Hinckley Sandstone is absent in most places, but occurs in remnants several tens of feet thick (Ref. 21). The Mt. Simon sandstone and the Hinckley sandstone are generally not differentiated from one another for hydrogeologic purposes and are considered to function as a single aquifer (Ref. 8, p.3). The aquifer is continuous throughout Hennepin County and the aquifer has little to no hydraulic connection with the shallow groundwater system and the major streams. Water that flows into the cone of depression probably is derived from leakage through the overlying hydrologic system (Ref. 21).

Groundwater flow in the Prairie du Chien-Jordan aquifer and the Tunnel City-Wonewoc aquifers is to the southeast and groundwater flow in the Mt. Simon-Hinckley aquifer is to the east-southeast (Refs. 5, p. 6; 8, p. 3).

Site Geology/Hydrogeology

Well logs are available for Spring Park Wells 1 and 2. Well 1 is 640 feet deep (317 feet above msl) and Well 2 is 391 feet deep (566 feet above msl) (Ref. 8, pp. 27, 28).

The well log for Spring Park Well 1 indicates that the site is underlain by 275 feet of glacial drift (957 to 682 feet above msl), three feet of white shale (682 to 679 feet above msl), 10 feet of shaley sandstone (679 to 669 feet above msl), two feet of white shale (669 to 667 feet above msl), four feet of sandstone (667 to 663 feet above msl), three feet of shale (663 to 660 feet above msl), five feet of sandstone (660 to 655 feet above msl), three feet of shale (655 to 652 feet above msl), 17 feet of sandstone and shale lenses (652 to 635 feet above msl), 73 feet of sandstone (635 feet to 562 feet above msl), 15 feet of shaley sandstone (562 to 547 feet above msl), five feet of sandstone (547 to 542 feet above msl), 154 feet of shale and sandstone lenses (542 to 388 feet above msl), 36 feet of sandstone with shale lenses (388 to 352 feet above msl), 28 feet of shale and sandstone (352 to 324 feet above msl), 5 feet of sandstone (324 to 319 feet above msl), and two feet of shale (319 to 317 feet above msl) (Ref. 8, p. 27). Water was first encountered at 58 feet bgs (899 feet above msl) and the well is completed as an open hole from 418 to 640 feet bgs (539 to 317 feet above msl) (Ref. 8, p. 27). Spring Park Well 1 withdraws water from the Tunnel City-Wonewoc and the Mt. Simon aquifers (Refs. 5, p. 88; 8, pp. 3, 27).

The well log for Spring Park Well 2 indicates that the site is underlain by 273 feet of glacial drift (957 to 684 feet above msl), 24 feet of dirty sandstone (684 to 660 feet above msl), 19 feet of clean sandstone (660 to 641 feet above msl), 15 feet of sandstone and shale (641 to 626 feet above msl), 53 feet of clean sandstone (626 to 573 feet above msl), and seven feet of shaley sandstone (573 to 566 feet above msl) (Ref. 8, p. 28). Water was first encountered at 58 feet bgs; the well is completely cased and has a 50-foot screen from 341 to 391 feet bgs (616 to 566 feet above msl) (Refs. 5, p. 89; 8, p. 28). Spring Park Well 2 withdraws water from the Jordan aquifer (Refs. 5, p. 89; 8, pp. 3, 28).

According to the gamma log for Spring Park Well 1, the following geologic units were encountered: glacial drift from 0 to 275 feet bgs (957 to 682 feet above msl), St. Peter Sandstone from 275 to 330 feet bgs (682 to 627 feet above msl), Jordan Sandstone from 330 to 418 feet bgs (627 to 539 feet above msl), St. Lawrence Formation from 418 to 450 feet bgs (539 to 507 feet above msl), and the Tunnel City Group from 450 to 566 feet bgs (507 to 391 feet above msl) (Refs. 5, p. 64; 8, p. 27).

Aquifer Discontinuity

Aquifer discontinuities within 4 miles of the groundwater plume have not been identified and would not impact the site score; only the two contaminated site wells and associated targets are considered in the scoring of this site.

Aquifer Interconnection

Gamma ray logs of Spring Park Wells 1 and 3 and a newly installed Jordan Sandstone well MW01-16-JDN were consulted by the Minnesota Geological Survey (MGS) to identify formation contacts. The St. Lawrence Formation was encountered at 591 feet above msl in MW01-16-JDN, at 538.5 feet above msl in Spring Park Well 1, and at 606 feet above msl in Spring Park Well 3 (Ref. 5, p. 64). MGS personnel interpreted the 52 foot difference as evidence that Spring Park Wells 1 and 2 are located on a downthrown faulted graben with bedrock formations approximately 50 to 60 feet lower than corresponding bedrock elevations at Spring Park Well 3 (Ref. 5, pp. 34, 78, 79).

Spring Park Well 1 obtains water from the Tunnel City-Wonewoc bedrock aquifer and the top of the Mt. Simon bedrock aquifer (Refs. 7, p. 8; 8, p. 27). Spring Park Well 1 is cased from the top of the well through the St. Lawrence Formation and is completed as an open hole within the Tunnel City-Wonewoc and Mt. Simon bedrock aquifers. Therefore, Spring Park Well No. 1 withdraws water from the Tunnel City-Wonewoc and Mt. Simon bedrock aquifers (Refs. 5, pp. 64, 81; 8, p. 27). Spring Park Well 2 is screened and withdraws water from the Jordan aquifer (Refs. 7, p. 8; 8, p. 28).

Groundwater contamination has been shown in both Spring Park Well 2, which withdraws water from the Jordan aquifer, and Spring Park Well 1, which withdraws water from the Tunnel City-Wonewoc and upper 20 feet of the Mt. Simon bedrock aquifers at the site, as documented in Section 3.1.1 Observed Release (Refs. 5, pp. 395, 399, 405, 456, 458; 8, p. 3) (see Table 9 of this HRS documentation record). Because the site contamination has been found in Spring Park Wells 1 and 2, which withdraw water from the Jordan aquifer and the Tunnel City-Wonewoc and upper 20 feet of the Mt. Simon bedrock aquifers, respectively, and because the Spring Park Wells 1 and 2 are located on a downthrown faulted graben, the aquifers are considered interconnected.

SUMMARY OF AQUIFERS BEING EVALUATED

TABLE 5: Summary of Aquifers Being Evaluated

Aquifer Name	Is Aquifer Interconnected with Upper Aquifer within 2 Miles? (Yes/No/NA)	Is Aquifer Continuous within 4-mile TDL? (Yes/No)	Is Aquifer Karst? (Yes/No)	References
Water Table	NA	Unknown	No	8, p. 2; 20
Artesian	No	Yes	No	5, p. 94; 8, pp. 3, 29; 20
Jordan	Yes	Yes	No	8, p. 3; 9, p. 22; 21
Tunnel City-Wonewoc	Yes	Yes	No	5, pp. 395, 399, 405, 456, 458; 8, pp. 3, 27; 9, p. 22; 21
Mt. Simon	Yes	Yes	No	5, pp. 395, 399, 405, 456, 458; 8, pp. 3, 27; 9, p. 22; 21

Notes:

NA Not applicable
TDL Target distance limit

3.1 LIKELIHOOD OF RELEASE

3.1.1 OBSERVED RELEASE

Aquifers Being Evaluated: Jordan, Tunnel City-Wonewoc, and Mt. Simon

Hazardous Substances in Release: TCE, *cis*-1,2-DCE, and vinyl chloride

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 limit. If the background sample concentration equals or exceeds the detection limit, an observed release is established when the sample measurement is 3 times or more above the background concentration and above the appropriate quantitation limit (Ref. 1, Table 2-3). An observed release of TCE, *cis*-1,2-DCE, and vinyl chloride is documented in the following sections by comparing the hazardous substance concentrations in similar background and observed release municipal well water samples (see Tables 6, 7, 8 and 9 in this section).

The samples documenting this observed release were collected by the MDH in May 2014, by the MPCA during ESI sampling events conducted in June and December 2016, and by the MPCA in June 2017 (Refs. 5, pp. 21, 22; 38, pp. 2, 3; 41, pp. 2, 3). A total of 15 municipal water well samples contained TCE, *cis*-1,2-DCE, and vinyl chloride at concentrations establishing an observed release. The MDH samples collected in May 2014 were collected while Spring Park Wells 1 and 2 were still used to provide water to the City of Spring Park. The ESI samples were collected in June and December 2016 when the City of Spring Park pumped water solely from Spring Park Well 3 and Spring Park Wells 1 and 2 were used as emergency wells. The MPCA samples collected in June 2017 were collected after MPCA had installed a water treatment system and the City of Spring Park began using Spring Park Wells 1 and 2 to supply city drinking water again (Refs. 5, pp. 7, 21, 22; 15, p. 3; 37; 38, pp. 2, 3; 41, pp. 2, 3; 54, p. 1).

TCE, found in the contaminated municipal water wells, is a manufactured chemical, is not thought to occur naturally, and was not detected in any background well samples (collected in 2016); therefore, TCE is neither naturally occurring nor is it ubiquitous in the vicinity of the site (Refs. 5, pp. 21, 69; 35, p. 1) (see Tables 6, 7, and 12 of this HRS documentation record). Chlorinated solvents (such as TCE) are man-made compounds commonly used in commercial/industrial operations, such as metal degreasing, while other contaminants, such as *cis*-1,2-DCE and vinyl chloride, are common breakdown products of TCE (Refs. 34; 35, pp. 1, 4, 6).

Background Samples

2016 MPCA ESI

In 2016, MPCA collected groundwater samples from three municipal water wells (Ref. 5, p. 21). The three municipal well samples were evaluated to identify similar background groundwater samples for comparison to release groundwater samples collected from the City of Spring Park municipal water wells (Ref. 5, pp. 21, 67, 69) (see Figure 3 and Tables 6 and 8 of this HRS documentation record). One of these municipal wells (MDW-3) is located about 1 mile west and upgradient of the site; one municipal well (ORW-1) is located about 1 mile east and side-gradient of the site; and the third municipal well (MTRSA-2A) is located approximately 2 miles northwest and upgradient of the site (Ref. 5, pp. 21, 59, 67, 69). Groundwater samples collected from these three municipal water wells did not exhibit detectable concentrations of TCE, *cis*-1,2-DCE, or vinyl chloride (Ref. 5, pp. 423, 424, 429, 430, 444, 445, 545, 546, 560). In addition to the municipal wells, MPCA installed and sampled permanent monitoring well MW01-16-JDN that also was used as a background groundwater well (Ref. 5, pp. 23, 25, 28, 32, 67, 95, 217). Background monitoring well MW01-16-JDN is located about 500 feet northeast and sidegradient of Spring Park Wells 1 and 2 (Refs. 5, pp. 6, 67; 8, p. 3) (see Figure 3 of this HRS documentation record).

The results for these four background samples are compared with observed release municipal water well samples collected in May 2014, June 2016, and June 2017 (see Tables 6, 7, 8, and 9 of this HRS documentation record).

The background monitoring and municipal wells and the release municipal well samples were collected from wells that withdraw water from aquifers within the Prairie du Chien-Jordan, Tunnel City-Wonewoc, and Mt. Simon aquifers. More specifically, background municipal and monitoring wells MDW-3, ORW-1, and MW01-16-JDN are completed in the Prairie du Chien-Jordan aquifer and withdraw water at depths ranging from 831 to 574 feet above msl and are compared to release Spring Park Well 2 that withdraws water from 616 to 566 feet above msl in the Jordan aquifer (Refs. 5, pp. 89, 91, 92, 95; 8, p. 28). Background municipal well MTRSA-2A is completed in the Tunnel City-Wonewoc aquifer and withdraws water at depths ranging from 589 to 476 feet above msl and is compared to Spring Park Well 1 that withdraws water at depths ranging from 539 to 317 feet above msl in the Tunnel City-Wonewoc and upper Mt. Simons aquifers (Refs. 5, pp. 22, 88, 93; 8, p. 27). The background and release municipal water wells were used for drinking water at the time of sampling (excluding monitoring well MW01-16-JDN) (Refs. 5, pp. 2, 7, 21; 54, p. 1).

The background and release samples collected by MPCA were collected in accordance with the ESI work plan dated December 2015 and approved by MPCA and EPA in January 2016, as well as the MPCA Site Assessment Program (SA) quality assurance project plans (QAPP) dated February 2012 and September 2014 (Refs. 5, pp. 1, 20; 30, pp. i, ii, 1; 36, p. 1). Samples were analyzed either under the EPA Contract Laboratory Program (CLP) or the MDH (Refs. 5, pp. 20, 28; 30, p. 15; 38, pp, 1, 2, 3; 41, pp. 1, 2, 3). The background and release samples were collected, by similar sampling techniques, and were analyzed using similar methods as the release samples (Refs. 5, pp. 1, 2, 20, 21; 30, pp. 7 through 9; 38, pp. 1, 2, 3; 40, pp. 1 through 5).

The locations of the background samples listed in Table 6 of this HRS documentation record are provided in Reference 5, pages 67 and 69 (see Figure 3 of this HRS documentation record). Chain-of-custody forms (which provide the sample identification number and the date and time of sampling) for the background groundwater samples are provided in Reference 5, pages 416, 444, 487, and 560 (see Table 6 of this HRS documentation record).

TABLE 6: Background Groundwater Samples – MPCA ESI - 2016						
Location Description/ Location Code	**Sample No.**	**Aquifer[1]**	**Well Depth/ Screened Interval (ft amsl)**	**Date Sampled**	**Location**	**Reference**
Mound Well 3/ MDW-3 and DUP-B	E5FP5 E5FP8	Prairie du Chien-Jordan	678/ 831 to 678[2]	6/13/2016	About 1 mile west of site (upgradient)	5, pp. 21, 28, 69, 91, 221, 444
Orono Well 1/ ORW-1	E5FP4	Jordan	574/ 645 to 574	6/13/2016	About 1 mile east of site (down- to side-gradient)	5, pp. 21, 28, 69, 92, 220, 444
MW01-16-JDN and DUP-C	E5FN7	Jordan	590/ 598 to 590	6/8/2016	500 feet east-northeast of the site (sidegradient)	5, pp. 6, 23, 28, 32, 64, 67, 95, 217, 416; 8, p. 3
	E5FP9 E5FQ7			6/21/2016	500 feet east-northeast of the site (sidegradient)	5, pp. 6, 23, 27, 28, 32, 64, 67, 95, 224, 487; 8, p. 3
Minnetrista Well 2A/ MTRSA-2A and DUP-G	E5FR5 E5FR6	Tunnel City-Wonewoc	476/ 589 to 476[2]	12/20/2016	About 2 miles west-northwest of site (upgradient)	5, pp. 21, 28, 29, 69, 93, 560

Notes:

1 Because the site contamination has been found in Spring Park Wells 1 and 2, which withdraw water from the Jordan aquifer and the Tunnel City-Wonewoc and upper 20 feet of the Mt. Simon bedrock aquifers, respectively, and because the Spring Park Wells 1 and 2 are located on a downthrown faulted graben (Ref. 5, pp. 34, 78, 79), the aquifers are considered interconnected.

2 Well completed as an open hole from the bottom of the casing to the total well depth.

DUP Duplicate sample
ESI Expanded site inspection
ft amsl Feet above mean sea level
JDN Jordan Sandstone aquifer
MDW Mound well
MPCA Minnesota Pollution Control Agency
MTRSA Minnetrista
MW Monitoring well
No. Number
ORW Orono well

Background Concentrations

2016 MPCA ESI

The background groundwater samples listed in Table 7 of this HRS documentation record were analyzed for trace VOCs under the EPA CLP in accordance with the CLP Statement of Work (SOW) for Organic Superfund Methods, SOM02.3 and were reviewed according to the National Functional Guidelines (NFG) for SOM02.2 (including changes from SOM02.2 to SOM02.3) and the Environmental Services Assistance Team (ESAT) standard operating procedures (SOP) for Organic CLP Data Validation (Ref. 5, pp. 20, 28, 386 through 392, 418 through 422, 446 through 553, 539 through 544). The contract-required quantitation limits (CRQL) are provided on the analytical data sheets contained in Reference 58 and in Appendix L of Reference 5 (Refs. 5, pp. 393, 422, 423, 429, 435, 454, 474, 545, 551; 47, p. 129; 58, pp. 1-39).

TABLE 7: Analytical Results for Background Samples – 2016				
Location Description/ Location Code/ Sample No.	**Hazardous Substance**	**Hazardous Substance Concentration (μg/L)**	**CRQL (μg/L)**	**References**
Samples Collected 6/13/2016				
Mound Well 3/ MDW-3/ E5FP5	TCE Vinyl chloride	0.50 U 0.50 U	0.5 0.5	5, pp. 422, 429, 444; 47, p. 129; 58, pp. 13, 14, 146-148
Mound Well 3/ DUP-B/ E5FP8	TCE Vinyl chloride	0.50 U 0.50 U	0.5 0.5	5, pp. 28, 422, 435, 444; 47, p. 129; 58, pp. 15, 16, 158-160
Orono Well 1/ ORW-1/ E5FP4	TCE Vinyl chloride	0.50 U 0.50 U	0.5 0.5	5, pp. 422, 423, 444; 47, p. 129; 58, pp. 12, 13, 136-138
Samples Collected 6/8/2016				
Jordan Sandstone Monitoring Well/ MW-01-16/ E5FN7	TCE *cis*-1,2-DCE Vinyl chloride	0.50 U 0.50 U 0.50 U	0.5 0.5 0.5	5, pp. 392, 393, 416; 47, p. 129; 58, pp. 4, 5, 63-65
Samples Collected 6/21/2016				
Jordan Sandstone Monitoring Well/ MW-01-16/ E5FP9	TCE *cis*-1,2-DCE Vinyl chloride	0.50 U 0.50 U 0.50 U	0.5 0.5 0.5	5, pp. 453, 454, 487; 47, p. 129; 58, pp. 23, 24, 198-200
Jordan Sandstone Monitoring Well/ DUP-C/ E5FQ7	TCE *cis*-1,2-DCE Vinyl chloride	0.50 U 0.50 U 0.50 U	0.5 0.5 0.5	5, pp. 28, 453, 474, 487; 47, p. 129; 58, pp. 27, 28, 240-242
Samples Collected 12/20/2016				
Minnetrista Well 2A/ MTRSA-2A/ E5FR5	TCE *cis*-1,2-DCE Vinyl chloride	0.50 U 0.50 U 0.50 U	0.5 0.5 0.5	5, pp. 544, 545, 560; 47, p. 129; 58, pp. 34, 35, 277-279

TABLE 7: Analytical Results for Background Samples – 2016				
Location Description/ Location Code/ Sample No.	**Hazardous Substance**	**Hazardous Substance Concentration (µg/L)**	**CRQL (µg/L)**	**References**
Minnetrista Well 2A/ DUP-G/ E5FR6	TCE *cis*-1,2-DCE Vinyl chloride	0.50 U 0.50 U 0.50 U	0.5 0.5 0.5	5, pp. 28, 544, 551, 560; 47, p. 129; 58, p. 35, 36, 284-286

Notes:

CRQL Contract-required quantitation limit
DCE Dichloroethene
DUP Duplicate
µg/L Micrograms per liter
MDW Mound well
MTRSA Minnetrista
MW Monitoring well
No. Number
TCE Trichloroethylene
U The analyte was analyzed for, but was not detected above the reported sample quantitation limit (Ref. 5, pp. 422, 453, 544).

Release Samples

The release groundwater samples listed in Table 8 of this HRS documentation record were collected from the City of Spring Park municipal water Wells 1 and 2 (Refs. 5, pp. 416, 487; 38, p. 3; 41, pp. 3, 5). The results for these release groundwater samples are compared with background groundwater samples collected in 2016 (see Tables 6 and 7 of this HRS documentation record). The background and release groundwater samples were collected from permanent monitoring and municipal wells that withdraw water from the Prairie du Chien-Jordan, Tunnel City-Wonewoc, and Mt. Simon aquifers (Ref. 5, pp. 88, 89, 91, 92, 93, 95). The approximate location of the release groundwater samples (which comprise Source No. 1) are provided in Reference 5, pages 67 and 68 (see Figure 2 of this HRS documentation record). Spring Park Wells 1 and 2 were used for drinking water at the time of sampling (Refs. 15, p. 3; 37).

<u>May 2014 and June 2017</u>

In May 2014 and June 2017, MDH and MPCA collected groundwater samples from the City of Spring Park municipal water Wells 1 and 2 (Refs. 38, pp. 2, 3; 41, pp. 2, 3). Spring Park Well 1 is completed in the Tunnel City-Wonewoc and upper 20 feet of the Mt. Simon aquifers and withdraws water at depths ranging from 539 to 317 feet above msl (Refs. 5, pp. 22, 88; 8, p. 27). The depth at which Spring Park Well 1 withdraws water is similar to that of background municipal water well MTRSA-2A, which withdraws water from the Tunnel City-Wonewoc aquifer at depths ranging from 589 to 476 feet above msl (Ref. 5, p. 93). Spring Park Well 2 is completed in the Jordan aquifer and withdraws water at depths ranging from 616 to 566 feet above msl (Refs. 5, p. 89; 8, p. 28). The depth at which Spring Park Well 2 withdraws water is similar to that of Mound Well 3 (831 to 678 feet above msl from the Prairie du Chien-Jordan), Orono Well 1 (645 to 574 feet above msl from the Jordan aquifer), and monitoring well MW01-16-JDN (589 to 476 feet above msl from the Tunnel City-Wonewoc aquifer) (Refs. 5, pp. 64, 91, 92 95). The release groundwater samples were collected in accordance with the MPCA SA QAPPs dated February 2012 and September 2014 (Refs. 5, p. 20; 36, pp. 1, 7).

The groundwater sample collection forms for the June 2017 samples are provided in Reference 40. Laboratory receipt forms and chain-of-custody records (June 2017) are provided in Reference 41.

<u>June 2016</u>

During the June 2016 ESI, MPCA collected groundwater samples from the City of Spring Park municipal water Wells 1 and 2 (Ref. 5, pp. 22, 58, 59, 416, 487). As indicated above, Spring Park Wells 1 and 2 are completed in similar aquifers (Jordan, Tunnel City-Wonewoc, and Mt. Simon) and withdraw water from similar depths as the background groundwater samples (Refs. 5, pp. 88, 89, 91, 92, 93, 95; 8, pp. 27, 28) (see Tables 6 and 8 of this HRS documentation record). The release groundwater samples were collected in accordance with the ESI work plan dated December 2015 and approved by MPCA and EPA in January 2016, as well as the MPCA SA QAPP dated September 2014 (Refs. 5, p. 1; 30, pp. 1, 2; 36, p. 7).

Groundwater sample collection sheets are provided in Reference 5, pages 218, 219, 225, 226. Chain-of-custody forms (which provide the sample identification number and the date and time of sampling) for the release samples are provided in Reference 5, pages 416 and 487 (see Table 8 of this HRS documentation record).

TABLE 8: Release Groundwater Samples Sampling Location: Spring Park Water Treatment Plant					
Location Description/ Location Code	**Sample No.**	**Aquifer[1]**	**Well Depth/ Screened Interval[2] (ft amsl)**	**Date Sampled**	**Reference**
May 2014					
Spring Park Well 1/ NA	14E1984-01	Tunnel City-Wonewoc and Mt. Simon	317/ 539 to 317[2]	5/14/2014	5, pp. 22, 88; 8, p. 27; 38, pp. 2, 3
Spring Park Well 2/ NA	14E1984-02	Jordan	566/ 616 to 566	5/14/2014	5, p. 89; 8, p. 28; 38, pp. 2, 3
June 2016					
Spring Park Well 1/ SPW-1	E5FN8	Tunnel City-Wonewoc and Mt. Simon	317/ 539 to 317[2]	6/8/2016	5, pp. 22, 88, 218, 395, 416; 8, p. 27
Spring Park Well 1 (Duplicate)/ DUP-A	E5FP1	Tunnel City-Wonewoc and Mt. Simon	317/ 539 to 317[2]	6/8/2016	5, pp. 22, 88, 405, 416; 8, p. 27
Spring Park Well 1/ SPW-1	E5FQ0	Tunnel City-Wonewoc and Mt. Simon	317/ 539 to 317[2]	6/21/2016	5, pp. 22, 88, 225, 456, 487; 8, p. 27
Spring Park Well 2/ SPW-2	E5FP0	Jordan	566/ 616 to 566	6/8/2016	5, pp. 22, 89, 219, 399, 416; 8, p. 28
Spring Park Well 2/ SPW-2	E5FQ1	Jordan	566 616 to 566	6/21/2016	5, pp. 22, 89, 226, 458, 487; 8, p. 28
June 2017					
Spring Park Well 1/ NA	17F1238-01	Tunnel City-Wonewoc and Mt. Simon	317/ 539 to 317[2]	6/20/2017	5, pp. 22, 88; 8, p. 27; 40, p. 2; 41, pp. 2, 3
Spring Park Well 1 (Duplicate)/ NA	17F1238-04	Tunnel City-Wonewoc and Mt. Simon	317/ 539 to 317[2]	6/20/2017	5, p. 22, 88; 8, p. 27; 40, p. 1, 5; 41, pp. 2, 3
Spring Park Well 2/ NA	17F1238-02	Jordan	566/ 616 to 566	6/20/2017	5, p. 89; 8, p. 28; 40, p. 3; 41, pp. 2, 3

Notes:

1 Because the site contamination has been found in Spring Park Wells 1 and 2, which withdraw water from the Jordan aquifer and the Tunnel City-Wonewoc and upper 20 feet of the Mt. Simon bedrock aquifers, respectively, as documented in Table 9 of this HRS documentation record, and because the Spring Park Wells 1 and 2 are located on a downthrown faulted graben (Ref. 5, pp. 34, 78, 79), the aquifers are considered interconnected.

2 Well completed as an open hole from the bottom of the casing to the total well depth.

DUP	Duplicate
ft amsl	Feet above mean sea level
ID	Identification number
NA	Not applicable
No.	Number
SPW	Spring Park well

Sample No. E5FP1 is a duplicate of E5FN8 (Ref. 5, pp. 28, 58)

Release Concentrations

May 2014 and June 2017

The May 2014 and June 2017 release municipal water well samples listed in Table 9 of this HRS documentation record were collected by MDH and MPCA and analyzed for VOCs by the MDH, Public Health Laboratory, Environmental Laboratory Section using EPA Method 524.2 (Refs. 38, pp. 1, 3, 6 through 11; 39, pp. 1, 5 through 13; 41, pp. 1, 6 through 20; 42, pp. 1, 4 through 19). The analytical data were reviewed and the data elements in the data package were compared against the EPA Guidance for Labeling Externally Validated Laboratory Analytical Data for Superfund Use and the EPA CLP NFGs for Organic Superfund Methods Data Review. The data validation effort shows that the data can be used as qualified (Ref. 39, pp. 1, 4 through 13; 42, pp. 1, 4 through 19; 48; 49). The reporting limits (RL) are listed on the analytical data sheets contained in References 38, 39, 40, and 41. The RLs are equivalent to sample quantitation limits (SQL) as defined in Section 1.1, Definitions, of the HRS (Refs. 1, Section 1.1; 39; 22).

June 2016

The June 2016 release municipal water well samples listed in Table 9 of this HRS documentation record were collected during the MPCA ESI and were analyzed for trace VOCs by under the EPA CLP using CLP SOM02.3 and reviewed according to the NFG for SOM02.2 (including changes from SOM02.2 to SOM02.3) and the ESAT SOP for Organic CLP Data Validation (Ref. 5, pp. 20, 28, 386 through 392, and 446 through 453. The CRQLs are provided in Reference 58 (Ref. 5, pp. 395, 399, 405, 456, and 458; 58, pp. 1-39).

TABLE 9: Analytical Results for Release Samples

Location Description/ Location Code	Sample No.	Hazardous Substance	Hazardous Substance Concentration (µg/L)	CRQL/RL (µg/L)	References
May 2014					
Spring Park Well 1/ NA	14E1984-01	TCE *cis*-1,2-DCE	3.0 J- (3.0) 4.0 J- (4.0)	0.10 0.20	22; 38, pp. 7, 8; 39, pp. 1, 4, 6, 7; 43, p. 8; 50, pp. 1, 2
Spring Park Well 2/ NA	14E1984-02	TCE *cis*-1,2-DCE	5.0 J- (5.0) 5.9 J- (5.9)	0.10 0.20	22; 38, pp. 10, 11; 39, pp. 1, 4, 9, 10; 43, p. 8; 50, pp. 1, 2
June 2016					
Spring Park Well 1/ SPW-1	E5FN8	TCE *cis*-1,2-DCE	5 6.6	0.5 0.5	5, p. 395; 47, p. 129; 58 p. 5, 6, 67-69
Spring Park Well 1/ DUP-A	E5FP1	TCE *cis*-1,2-DCE	4.9 6.7	0.5 0.5	5, p. 405; 47, p. 129; 58, 2, 3, 85-87
Spring Park Well 1/ SPW-1	E5FQ0	TCE *cis*-1,2-DCE	5.9 8.4	0.5 0.5	5, p. 456; 47, p. 129; 58, p. 24, 25, 202-204
Spring Park Well 2/ SPW-2	E5FP0	*cis*-1,2-DCE	4.8	0.5	5, p. 399; 47, p. 129; 58, p. 6, 75-77
Spring Park Well 2/ SPW-2	E5FQ1	TCE *cis*-1,2-DCE	1.3 2.3	0.5 0.5	5, p. 458; 47, p. 129; 58, p. 25, 206-208

TABLE 9: Analytical Results for Release Samples					
Location Description/ Location Code	**Sample No.**	**Hazardous Substance**	**Hazardous Substance Concentration (µg/L)**	**CRQL/RL (µg/L)**	**References**
June 2017					
Spring Park Well 1/ NA	17F1238-01	TCE *cis*-1,2-DCE Vinyl chloride	6.8 8.5 0.52	0.10 0.20 0.20	22; 41, pp. 7, 8; 42, pp. 1, 4, 6, 7
Spring Park Well 1 (Duplicate)/ NA	17F1238-04	TCE *cis*-1,2-DCE	6.0 7.6	0.10 0.20	22; 41, pp. 16, 17; 42, pp. 1, 4, 15, 16
Spring Park Well 2/ NA	17F1238-02	TCE *cis*-1,2-DCE	5.7 7.6	0.10 0.20	22; 41, pp. 10, 11; 42, pp. 1, 4, 9, 10

Notes:

( ) Concentration was adjusted in accordance with References 43 and 50.
CRQL Contract-required quantitation limit
DCE Dichloroethylene
DUP Duplicate sample
J- The analyte was positively identified; the associated value is the approximate concentration of the analyte in the sample and may be biased low (Ref. 39, p. 4).
NA Not applicable
No. Number
µg/L Micrograms per liter
RL Reporting limit; the RLs are equivalent to sample quantitation limits, as defined in Section 1.1, Definitions of the HRS (Refs. 1, Section 1.1; 22).
SPW Spring Park well
TCE Trichloroethylene

Sample No. E5FP1 is a duplicate of E5FN8 (Ref. 5, pp. 28, 58).

Attribution

The Spring Park Municipal Well Field site is a contaminated groundwater plume with no identified source where releases of *cis*-1,2-DCE, TCE, and vinyl chloride have been documented in the City of Spring Park municipal Wells 1 and 2 (see Section 3.1.1 and Tables 8 and 9 of this HRS documentation record).

The compounds found in the Spring Park municipal wells are manufactured chemicals, not thought to occur naturally, and were not detected in any background wells; therefore, they are not ubiquitous throughout the Spring Park and Hennepin County area (Refs. 5, pp. 58 through 62, 91, 92, 93, 423, 429, 545; 34; 35, pp. 1, 4, 6) (see Tables 6 and 7 of this HRS documentation record). Chlorinated solvents (such as TCE) are man-made compounds commonly used in commercial and industrial operations, such as metal degreasing, while other contaminants, such as *cis*-1,2-DCE and vinyl chloride, are common breakdown products of TCE (Refs. 34; 35, pp. 1, 4, 6). The Spring Park Municipal Well Field site is located in a mixed industrial, commercial, and residential area where past industrial and commercial activities could have resulted in the groundwater contamination (Ref. 5, p. 83).

From 2004 to 2016, samples of the finished water collected from the Spring Park municipal wells have contained *cis*-1,2-DCE at concentrations ranging from 0.2 µg/L to 3.1 µg/L and TCE at concentrations ranging from 0.13J µg/L to 2.4 µg/L (Refs. 5, pp. 54; 12). Samples collected from the raw water between 2008 and 2016 contained concentrations of *cis*-1,2-DCE ranging from 0.76 µg/L to 8.4 µg/L, TCE ranging from 0.13 µg/L to 6.7 µg/L, and vinyl chloride ranging from 0.2 µg/L to 0.48 µg/L (Refs. 5, pp. 55-63, 395, 399, 405, 456, 458, 897, 898). Based on the presence of TCE at concentrations above levels considered safe, in August 2014, the City of Spring Park began using Wells 1 and 2 as emergency wells (Refs. 15, pp. 1-2; 37; 54, p. 1). During that time, the wells were regularly maintained while the City of Spring Park primarily relied on Well 3 for the primary municipal water supply (Refs. 15, p. 2; 37; 54, p. 1). From April 2016 to April 2017, MPCA built a new treatment system to address the contamination as an interim measure (Ref. 15, p. 3). The new treatment system was brought on-line in April 2017, which allowed Spring Park to resume using Wells 1 and 2 (along with Well 3) for its municipal water supply (Ref. 15, p. 3). In April 2017, a sample of the finished water contained *cis*-1,2-DCE at 0.30 µg/L (Ref. 26, p. 2). In June 2017, MPCA collected groundwater samples of the unfinished municipal water from Spring Park Wells 1 and 2 (Source No. 1) that contained concentrations of *cis*-1,2-DCE (up to 8.5 µg/L), TCE (up to 6.8 µg/L), and vinyl chloride (at 0.52 µg/L) (Ref. 42, pp. 6, 7, 9, 10, 15, 16).

Efforts to identify specific sources of groundwater contamination have been conducted through sampling events and an extensive search of MPCA and EPA records (Refs. 5, pp. 10, 11, 13 through 20; 57). Despite multiple soil and groundwater sampling investigations, no specific source or sources could be found in the vicinity of the plume to which the groundwater contamination could reasonably be attributed. The paragraphs that follow present a summary of the facilities investigated as possible sources of site VOC contamination.

MPCA evaluated 8 facilities as possible sources, including the MLAM State Superfund site, the former J.R. Clarke Company, Lakeview Lofts, Norling Nursery, the former Connors Car Wash, the Marina Center brownfield site, and two dry cleaner facilities (Ref. 5, p. 13, 18, 19). The MLAM site is located about 600 feet northeast of the Spring Park Municipal Well Field site (Ref. 5, p. 72). A TCE plume is associated with the MLAM site and multiple investigations have been conducted in an effort to delineate the extent of the plume (Refs. 5, p. 15; 28, pp. 1, 5, 6; 29, pp. 1, 6, 7). In 2013, analysis of MLAM plume samples detected TCE at concentrations ranging from 879 to 5,090 micrograms per liter (µg/L) in the shallow aquifer between 39 and 62 feet below ground surface (Ref. 5, pp. 16-17). The areal extent of known TCE releases from the MLAM site extends within the 10-year travel time area estimated in the Spring Park Well Head Protection Plan (Ref. 5 p. 13; 8, pp. 5, 17). However, the full extent of the TCE plume at the MLAM site, particularly the portion extending to the north beneath West Arm Bay, has not yet been delineated (Ref. 5, p. 13).

The former J.R. Clarke Company, located about 300 feet east the site, manufactured ironing boards and metal carts (Ref. 5, p. 18) (see Figure 4 of this HRS documentation record). Between the 1940s and 1970s, Sanborn Fire Insurance maps identified machine shops and paint booths, and historical photographs identified exterior drum storage on the facility. The facility has been redeveloped as the Tonka Business Center, which is composed of a variety of commercial and industrial businesses. No known releases of VOCs associated with the former J.R. Clarke Company have occurred (Ref. 5, p. 18).

Lakeview Lofts, located about 1,600 feet east of the site, was redeveloped in 2005 as loft condominiums (Refs. 5, pp. 18, 72; 51, pp. 4, 20) (see Figure 4 of this HRS documentation record). Soil samples collected during redevelopment contained polycyclic aromatic hydrocarbons (PAH) and metals associated with leaking petroleum fuel tanks (Refs. 5, p. 18; 51, pp. 12, 26). Groundwater samples contained TCE that was attributed to the adjacent MLAM site (Refs. 5, p. 18; 51, pp. 16, 64; 55, pp. 14).

The Norling Nursery property, located about 2,000 feet east of the site, was previously used as railroad buildings, warehouses, service stations, auto repair, and a landscape nursery (Ref. 5, pp. 18, 72) (see Figure 4 of this HRS documentation record). In 2005, the property was redeveloped as the Minnetonka Mist condominiums (Ref. 5, p. 18). During redevelopment, soil samples contained PAHs and groundwater samples contained TCE (Refs. 52, p. 1; 53, pp. 1 through 6). The MPCA issued a No Action Determination for the releases of TCE and PAHs following soil removal and the installation of passive vapor mitigation systems. The TCE contamination in groundwater was considered to be the result of past incidental solvent use at the former service stations or auto repair businesses (Ref. 5, p. 18). Because the Norling Nursery site is downgradient from the Spring Park Municipal Well Field site and the limited extent of the shallow releases, the MPCA does not believe that the TCE release contributed to the Spring Park municipal well contamination (Ref. 5, p. 18).

The former Connors Car Wash brownfields site, located about 200 feet south of the site, was redeveloped as Lake Minnetonka Landscapes, Inc. (Ref. 5, pp. 18, 72) (see Figure 4 of this HRS documentation record). A photograph from 1999 revealed the presence of a drum storage area. Prior to purchasing the property, the prospective buyer conducted an investigation of leaking underground storage tanks (USTs) located on the property. The prospective buyer received a No Association Determination for a minor *cis*-1,2-DCE release that was likely a petroleum fuel additive (Ref. 5, p. 19). In 2007, the owner installed a 173-foot groundwater well for commercial irrigation of the nursery stock. In February 2016, the MPCA sampled the well and the only VOC detected was chloromethane. Based on the absence of TCE in the groundwater underlying the property, it is unlikely that this site is the source of the TCE in the Spring Park municipal wells (Ref. 5, p. 19).

A tetrachloroethene (PCE) release was documented at a former dry cleaner located in a strip mall, the Marina Center, about 2,200 feet west and upgradient of the Spring Park Municipal Well Field site (Refs. 5, p. 19; 56, pp. 3, 17). Dry cleaning activities were reportedly active at this location from at least 1977 to the mid-1990s (Refs. 5, p. 19; 56, p. 12). In 2002, during a property transfer, a limited site investigation was conducted (Ref. 56, p. 3). Soil samples contained detections of PCE, TCE, and *cis*-1,2-DCE; groundwater samples contained detections of PCE, TCE, 1,1-dichloroethane (DCA), *cis*-1,2-DCE, and *trans*-1,2-DCE (Ref. 56, pp. 10, 11). The MPCA issued a No Association Determination to the prospective purchasers of the property (Ref. 5, p. 19). PCE contamination did not appear to extend laterally beyond the property boundary; however, the vertical extent of contamination was not determined during the investigation (Refs. 5, p.19; 56, p. 14). Because of its upgradient location and documented release of PCE and TCE to groundwater, the MPCA cannot rule out this site as a possible source of TCE contamination in the Spring Park municipal wells (Ref. 5, p. 19).

Two other former dry cleaners were located about 1,300 feet west and about 2,000 feet east of the Spring Park Municipal Well Field site (see Figure 4 of this HRS documentation record). No subsurface investigations are known to have been conducted at either location; therefore, these dry cleaners cannot be ruled out as possible sources of the TCE contamination in the Spring Park municipal wells (Ref. 5, p. 19).

A review of the EPA SEMS database revealed that the Spring Park Municipal Well Field site is the only site listed in Spring Park for Hennepin County (Ref. 57, pp. 2-4). In addition to the facilities discussed above, the EPA and Resource Conservation and Recovery Act (RCRA) Information database was reviewed for facilities that might use solvents (Ref. 57, p. 6). Seven additional commercial businesses that might be of concern were identified (Ref. 57, pp. 6, 8-25). Of the seven facilities, three of them (Blue Lagoon Marine, Regal Cleaning Center, and Rockvam Boat Yard, Inc.) generate waste solvents including TCE (Ref. 57, pp. 8 to 25). All three of these facilities are listed as conditionally exempt small quantity generators (Ref. 57, pp. 10, 18, 20).

As documented in Table 9 of this HRS documentation record, a contaminated groundwater plume with an observed release to Spring Park Wells 1 and 2, evaluated as Source No. 1, which draw water from the Jordan, Tunnel City-Wonewoc, and Mt. Simon aquifers, has occurred (Refs. 5, pp. 88, 89, 395, 399, 456, 458; 39, pp. 6, 7, 9, 10; 42, pp. 6, 7, 9, 10, 15, 16) (see Section 3.1.1 and Table 9 of this HRS documentation record). The operation of the new Spring Park water treatment plant and treatment system is an interim measure to address the groundwater contamination in the municipal wells (Ref. 15, p. 3). Analytical results collected after the new system was brought online indicate the presence of *cis*-1,2-DCE, TCE, and vinyl chloride in the untreated water, and *cis*-1,2-DCE in the treated water (Refs. 41, p. 3; 42, pp. 6, 7, 9, 10, 15, 16; 26, p. 2).

<u>Hazardous Substances in the Release</u>

TCE
cis-1,2-DCE
Vinyl chloride

Groundwater Observed Release Factor Value: 550
(Ref. 1, Section 3.1.1, Table 3-1)

3.1.2 POTENTIAL TO RELEASE

As specified in the HRS, potential to release was not evaluated because an observed release was established to Spring Park Wells 1 and 2, which draw water from the Jordan, Tunnel City-Wonewoc and Mt. Simon aquifers (Ref. 1, Section 3.1.1).

3.2 WASTE CHARACTERISTICS

3.2.1 TOXICITY/MOBILITY

The toxicity and mobility factor values for the hazardous substances detected in the source samples with containment factor values of greater than 0 are summarized in Table 10 of this HRS documentation record. The combined toxicity and mobility factor values are assigned in accordance with Reference 1, Section 3.2.1 and Reference 1a, Section 2.4.1.1). Hazardous substances detected in the observed release to groundwater are assigned a mobility factor value of 1 (Ref. 1, Section 3.2.1.2).

TABLE 10: Groundwater Toxicity/Mobility

Hazardous Substance	Source No.	Toxicity Factor Value	Mobility Factor Value[1]	Does Hazardous Substance Meet Observed Release? (Yes/No)	Toxicity/ Mobility (Ref. 1, Table 3-9)	Reference
cis-1,2-DCE	1	1,000	1	Yes	1,000	2, p. 1
TCE	1	1,000	1	Yes	1,000	2, p. 4
Vinyl chloride	1	10,000	1	Yes	10,000	2, p. 7

Notes:

1 A mobility factor value of 1 is also assigned because the hazardous substances were detected at observed release concentrations (Ref. 1, Section 3.2.1.2).
DCE Dichloroethene
No. Number
TCE Trichloroethylene

Toxicity/Mobility Factor Value: 10,000
(Ref. 1, Section 3.2.1.3, Table 3-9)

3.2.2 HAZARDOUS WASTE QUANTITY

TABLE 11: Hazardous Waste Quantity		
Source No.	**Source Type**	**Source Hazardous Waste Quantity**
1	Other – Groundwater plume with no identified source	Undetermined, but greater than zero

The hazardous constituent quantity for Source No. 1 is not adequately determined. The HWQ is undetermined, but greater than zero. Because site-related Level I contamination is present in municipal water wells, the HWQ receives a minimum factor value of 100 for the ground water migration pathway (Ref. 1, Section 2.4.2.2).

Hazardous Waste Quantity Factor Value: 100
(Ref. 1, Section 2.4.2.2, Table 2-6)

3.2.3 WASTE CHARACTERISTICS FACTOR CATEGORY VALUE

The waste characteristics factor category was obtained by multiplying the toxicity/mobility and HWQ factor values, subject to a maximum product of 1×10^8 (Ref. 1, Section 3.2.3). Based on this product, a value was assigned in accordance with Reference 1, Table 2-7. Vinyl chloride has the highest toxicity/mobility factor value of 10,000 (Ref. 2, pp. 1, 4, 7).

Toxicity/Mobility Factor Value: 10,000
Hazardous Waste Quantity Factor Value: 100

Toxicity/Mobility Factor Value ×Hazardous Waste Quantity Factor Value: 1,000,000 (1×10^6)

Waste Characteristics Factor Category Value: 32
(Ref. 1, Table 2-7)

3.3 TARGETS

Municipal water is available to all residents of the City of Spring Park and private wells are prohibited (Refs. 10; 11; 13). The City of Spring Park maintains three municipal wells (Wells 1, 2, and 3) that provide municipal water to about 1,669 residents (Refs. 10; 11; 13; 15, p. 3). Spring Park Well 1 is about 640 feet deep (317 feet above msl) and withdraws water from the interconnected Tunnel City-Wonewoc and Mt. Simon aquifers at depths ranging from 418 to 640 feet bgs (539 to 317 feet above msl (Refs. 5, p. 22, 88; 8, p. 27). Spring Park Well 2 is about 391 feet deep (566 feet above msl) and withdraws water from the Jordan aquifer at depths ranging from 341 to 391 feet bgs (616 to 566 feet above msl) (Refs. 5, p. 89; 8, p. 28). Spring Park Well 3 is about 790 feet deep (170 feet above msl) and withdraws water from the Mt. Simon aquifer at depths ranging from 660 to 790 feet bgs (300 to 170 feet above msl (Refs. 5, p. 90; 8, p. 29). Based on average annual pumping data from 2003 to 2013 obtained from the City of Spring Park, the percent of the total water supply provided by each municipal drinking water well is as follows: Spring Park Well 1, 31.59 percent; Spring Park Well 2, 42.67 percent; and Spring Park Well 3, 25.73 percent (Ref. 44, pp. 1 through 13) (also see Table 13 of this HRS documentation record). In accordance with Section 3.3.2 of the HRS Rule, the population is apportioned based on each well's contribution to the blended system because Spring Park Well 2 supplies more than 40 percent of the total water supply (Ref. 1, Section 3.3.2) (see Table 13 of this HRS documentation record).

Using the percent of the water supplied by each well, the drinking water population for the City of Spring Park is apportioned as follows:

- Spring Park Well 1: 1,669 people × 31.59% = 527.2371 people
- Spring Park Well 2: 1,669 people × 42.67% = 712.1623 people
- Spring Park Well 3: 1,669 people × 25.73% = 429.4337 people
  (Refs. 10; 15, p. 3; 44, pp. 1 through 13 (see Table 13 of this HRS documentation record)).

Since 2004, VOCs including *cis*-1,2-DCE, TCE, and vinyl chloride consistently have been detected in Spring Park Wells 1 and 2 (Refs. 5, pp. 54 through 57; 12; 19, p. 1; 37) (also see Table 9 of this HRS documentation record). VOCs have not been detected in Spring Park Well 3 (Ref. 5, p. 57). From August 2014 to April 2017, the City of Spring Park put Wells 1 and 2 on reserve or emergency backup status and relied primarily on Well 3 for the municipal water supply (Refs. 37; 54, p. 1). During that time, MPCA built a new water treatment plant and treatment system, which were brought online in April 2017 (Ref. 15, p. 3). The operation of the new treatment plant and treatment system allows the City of Spring Park to resume using all three wells for their municipal water supply (Ref. 15, p. 3). In June 2017, MPCA collected samples from the three Spring Park Wells 1, 2, and 3 (Refs. 40, pp. 1 through 5; 41, p. 3). Analytical results showed *cis*-1,2-DCE (up to 8.5 µg/L), TCE (up to 6.8 µg/L), and vinyl chloride (up to 0.52 µg/L) in Wells 1 and 2 (Ref. 42, pp. 6, 7, 9, 10). Well 3 did not contain VOCs at concentrations above their respective RLs (Refs. 42, pp. 12, 13).

3.3.1 NEAREST WELL

As documented in Table 12 of this HRS documentation record, two municipal wells (Wells 1 and 2) that serve the community of Spring Park are subject to actual contamination at Level I concentrations. TCE and vinyl chloride have been detected in Spring Park Wells 1 and 2 above their respective EPA MCLs and cancer risk screening concentrations (see Tables 9 and 12 of this HRS documentation record). Because actual contamination at Level I concentrations has been documented, a nearest well factor value of 50 is assigned (Ref. 1, Section 3.3.1, Table 3-11).

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

Nearest Well Factor Value: 50
(Ref. 1, Section 3.3.1, Table 3-11)

3.3.2 POPULATION

3.3.2.1 Level of Contamination

3.3.2.2 Level I Concentrations

Level I Samples

From 2014 to 2017, analytical results of samples collected by MPCA and MDH from Spring Park Wells 1 and 2 have indicated the presence of TCE (up to 6.8 µg/L) and vinyl chloride (up to 0.52 µg/L) at concentrations above HRS benchmarks (Refs. 2, pp. 1, 4, 7; 42, pp. 6, 7, 9, 10) (see Tables 9 and 12 of this HRS documentation record). Wells 1 and 2 were used as emergency backup wells from August 2014 to April 2017 (Ref. 54, p. 1). As of April 2017, the City of Spring Park operates a new treatment system, installed by MPCA, and treatment plant that allows Spring Park to use all three of its municipal wells (Wells 1, 2, and 3) for the municipal water supply (Ref. 15, p. 3). In June 2017, MPCA collected groundwater samples from Spring Park Wells 1 and 2 after they were reinstated as regular supply wells; the samples contained TCE above its MCL and cancer risk screening concentration and vinyl chloride above its cancer risk screening concentration (Refs. 2, pp. 4, 7; 15, p. 3; 42, pp. 6, 7, 9, 10) (also see Tables 9 and 13 of this HRS documentation record). Spring Park Wells 1 and 2 withdraw water from the interconnected Jordan and Tunnel City-Wonewoc aquifers and the upper 20 feet of the Mt. Simon aquifer (Refs. 5, pp. 88, 89; 8, pp. 27, 28; 17, p. 7) (also see Table 8 of this HRS documentation record).

TABLE 12: LEVEL I SAMPLES						
Location Description/ Location Code	**Sample No.**	**Hazardous Substance**	**Concentration (µg/L)**	**Sample Date**	**Benchmark Exceeded (µg/L)**	**References**
Spring Park Well 1/ NA	14E1984-01	TCE	3.0 J- (3.0)	5/14/14	CR–1.1	2, p. 4; 38, p. 8; 39, p. 1, 4, 7; 43, p. 8; 50, pp. 1, 2
Spring Park Well 2/ NA	14E1984-02	TCE	5.0 J- (5.0)	5/14/14	MCL–5 CR–1.1	2, p. 4; 38, p. 11; 39, pp. 1, 4, 10; 43, p. 8; 50, pp. 1, 2
Spring Park Well 1/ SPW-1	E5FN8	TCE	5	6/8/2016	MCL–5 CR–1.1	2, p. 4; 5, p. 395
Spring Park Well 1/ DUP-A	E5FP1	TCE	4.9	6/8/2016	CR–1.1	2, p. 4; 5, p. 405
Spring Park Well 1/ SPW-1	E5FQ0	TCE	5.9	6/21/2016	CR–1.1	2, p. 4; 5, p. 456
Spring Park Well 2/ SPW-2	E5FQ1	TCE	1.3	6/21/2016	CR–1.1	2, p. 4; 5, p. 458
Spring Park Well 1/ NA	17F1238-01	TCE	6.8	6/20/2017	MCL–5 CR–1.1	2, p. 4; 41, p. 8; 42, p. 7
Spring Park Well 1/ NA	17F1238-01	Vinyl chloride	0.52	6/20/2017	CR–0.021	2, p. 7; 41, p. 8; 42, p. 7
Spring Park Well 1 (Duplicate) / NA	17F1238-04	TCE	6.0	6/20/2017	MCL–5 CR–1.1	2, p. 4; 41, p. 17; 42, p. 1, 16
Spring Park Well 2/ NA	17F1238-02	TCE	5.7	6/20/2017	MCL–5.0 CR–1.1	2, p. 4; 41, p. 11; 42, p. 10

Notes:

( ) Concentration was adjusted in accordance with References 43 and 50.
CR Cancer risk
DCE Dichloroethene
DUP Duplicate
J- The analyte was positively identified; the associated value is the approximate concentration of the analyte in the sample and may be biased low (Ref. 39, p. 4).
MCL Maximum Contaminant Level
µg/L Micrograms per liter
NA Not applicable
No. Number
SPW Spring Park well
TCE Trichloroethylene
Sample No. E5FP1 is a duplicate of E5FN8 (Ref. 5, pp. 28, 58).

To appropriately apportion the population served by each of the Spring Park municipal wells, the volume of water pumped from the three Spring Park wells was evaluated for the period from 2003 to 2013 because the pumping volumes from each well varied from month to month and year to year (Ref. 44, pp. 1 through 16; also see Table 13 of this HRS documentation record). The average annual volume of water pumped from each well was used to calculate the average annual percentage of the total water supply produced by each well (Ref. 44, pp. 3 through 13). It should be noted that Spring Park Wells 1 and 2 were used as emergency backup during the period of August 2014 through mid-April 2017. During that time, municipal water was supplied by Spring Park Well 3 (Refs. 15, p. 3; 54, p. 1). Therefore, the population will be apportioned based on the average annual pumping volumes for the period of 2003 to 2013 before Spring Park Wells 1 and 2 were used as emergency backup wells (Ref. 1, Section 3.3.2). Spring Park currently uses all three municipal wells for drinking water (Ref. 15, p. 3); however, pumping data for the three municipal wells for the entire year of 2017 is not included because all three wells were not in use for the entire year (Refs. 15, p. 3; 44, pp. 3 through 16).

Based on the data presented in Reference 44 and in Table 13 of the HRS documentation record, from 2003 to 2013, the population served by the City of Spring Park municipal drinking water wells was apportioned based on the percent of the total water supplied by each well (Ref. 44, pp. 3 through 13). Therefore, the population served by the City of Spring Park wells is as follows: Spring Park Well 1, 527.2371 people; Spring Park Well 2, 712.1623 people; and Spring Park Well 3, 429.4337 people (Refs. 10; 44, pp. 3 through 13) (see Section 3.3 and Table 13 of this HRS documentation record).

TABLE 13: PUMPING VOLUMES AND PERCENTAGES

Year	Units	Spring Park Well 1	Spring Park Well 2	Spring Park Well 3	Total Volume Pumped	Reference
2003	**Gal**	29,381,100	34,705,100	21,879,100	85,965,300	44, pp.1, 2, 3
		34.17%	40.37%	25.45%	100.00%	
2004	**Gal**	29,336,000	34,619,900	10,096,340	74,052,240	44, pp.1, 2, 4
		39.61%	46.75%	13.63%	100.00%	
2005	**Gal**	29,007,500	34,035,100	18,845,350	81,887,950	44, pp.1, 2, 5
		35.42%	41.56%	23.01%	100.00%	
2006	**Gal**	31,145,000	36,966,700	5,974,800	74,086,500	44, pp.1, 2, 6
		42.03%	49.89%	8.06%	100.00%	
2007	**Gal**	25,989,600	31,152,400	20,445,100	77,587,100	44, pp.1, 2, 7
		33.49%	40.15%	26.35%	100.00%	
2008	**Gal**	30,913,930	37,725,300	9,166,200	77,805,430	44, pp.1, 2, 8
		39.73%	48.48%	11.78%	100.00%	
2009	**Gal**	23,873,900	30,987,700	13,206,100	68,067,700	44, pp.1, 2, 9
		35.07%	45.52%	19.40%	100.00%	
2010	**Gal**	21,149,900	31,712,400	24,574,490	77,436,790	44, pp.1, 2, 10
		27.31%	40.95%	31.73%	100.00%	
2011	**Gal**	17,799,568	31,465,000	24,871,863	74,136,431	44, pp.1, 2, 11
		24.00%	42.44%	33.54%	100.00%	
2012	**Gal**	16,454,173	33,139,475	32,931,872	82,525,520	44, pp.1, 2, 12
		19.93%	40.15%	39.90%	100.00%	
2013	**Gal**	11,983,100	24,119,600	35,461,000	71,563,700	44, pp.1, 2, 13
		16.74%	33.70%	49.55%	100.00%	
Total Pumped 2003 to 2013	**Gal**	267,033,771	360,628,675	217,452,215	845,114,661	

TABLE 13: PUMPING VOLUMES AND PERCENTAGES						
Year	**Units**	**Spring Park Well 1**	**Spring Park Well 2**	**Spring Park Well 3**	**Total Volume Pumped**	**Reference**
Average Pumped 2003 to 2013	**Gal**	24,275,797	32,784,425	19,768,383	76,828,605	
Average Percent Pumped 2003 to 2013		31.59%	42.67%	25.73%	100.00%	

Notes:

% Percent
gal gallons

A calculated value of 1,239.39 people served by Spring Park Wells 1 and 2 are subject to actual contamination at Level I concentrations (Refs. 10; 15, p. 3; 44, pp. 3 through 13) (see Section 3.1.1, Observed Release and Table 13 of this HRS documentation record). Groundwater samples collected from Spring Park Wells 1 and 2 that meet Level I concentrations are summarized in Table 12 of this HRS documentation record.

Sum of Population Served by Level I Wells: 1,239.39 Individuals
Sum of Population Served by Level I Wells × 10: 1,239.39 × 10 = 12,393.9 Individuals (Refs. 10; 15, p. 3; 44, pp. 3 through 13).

Level I Concentrations Factor Value: 12,393.9

3.3.2.3 Level II Concentrations

Level II concentration targets are not scored.

Level II Concentrations Factor Value: Not Scored

3.3.2.4 Potential Contamination

Potential contamination targets are not scored.

Potential Contamination Factor Value: Not Scored

3.3.2.5 CALCULATION OF POPULATION FACTOR VALUE

A value of 12,393.9 (Level I) is assigned for the population factor value (Ref. 1, Section 3.3.2.5).

Total Population Factor Value: 12,393.9

3.3.3 RESOURCES

Resources are not scored.

Resources Factor Value: Not Scored

3.3.4 WELLHEAD PROTECTION AREA

The Wellhead Protection Program is a pollution prevention and management program that is designed to protect underground sources of drinking water from contamination (Refs. 31, p. 3; 33, pp. 13-14). The federal Safe Drinking Water Act, as amended in 1986, established an elective state program to develop wellhead protection areas around municipal water system wells (Ref. 33, p. 14).

HRS Section 3.3.4 states that a wellhead protection area factor value of 20 should be used if either a source having a groundwater containment factor value greater than 0 lies either partially or fully within or above a designated Wellhead Protection Area or if observed groundwater contamination attributable to the source lies either partially or fully within the designated Wellhead Protection Area. Table 3 of the HRS documentation record identifies the groundwater containment factor as 10. The City of Spring Park delineated a wellhead protection area around Spring Park Wells 1, 2, and 3 in 2010 (Ref. 8, pp. ii, 1, 24). The wellhead protection area was designated to help ensure an adequate and safe municipal water supply for the City of Spring Park (Ref. 8, p. ii). The Spring Park Municipal Well Field site lies completely within the wellhead protection area (Refs. 8, p. 24; 32). Therefore, the Wellhead Protection Area factor value of 20 is supported (Ref. 1, Section 3.3.4).

Wellhead Protection Area Factor Value: 20