Focused Remedial Investigation Report

Freeway Landfill and Freeway Dump

Prepared for
Minnesota Pollution Control Agency

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Certifications

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Name	Date
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Acronyms

Acronym	Description
µg/L	Micrograms per Liter
ASTM	American Society for Testing and Materials
B(a)P	Benzo(a)pyrene
Bgs	Below Ground Surface
BTU/lb	British Thermal Units per Pound
CD	Construction Debris
CDM	Camp Dresser & McKee
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CLP	Closed Landfill Program
CRA	Conestoga-Rovers & Associates
DDT	Dichlorodiphenyltrichloroethane
DRO	Diesel Range Organics
FEMA	Federal Emergency Management Agency
FES	Fuller Engineering Services
FFS	Focused Feasibility Study
ft/d	Feet per Day
ft/ft	Feet per Feet
GPS	Global Positioning System
GRO	Gasoline Range Organics
HERC	Hennepin Energy Recovery Center
HIG	Historic Information Gatherers
IDW	Investigation Derived Waste
ISV	Intrusion Screening Values
LIDAR	Light Detection and Ranging
MCL	Maximum Contaminant Limit
MDH	Minnesota Department of Health
MDNR	Minnesota Department of Natural Resources
mg/L	Milligrams per Liter
MGS	Minnesota Geologic Survey
MnDOT	Minnesota Department of Transportation
MPCA	Minnesota Pollution Control Agency
MSL	Mean Sea Level

Acronyms (cont.)

Acronym	Description
MSW	Municipal Solid Waste
MVTL	Minnesota Valley Testing Laboratories, Inc.
NAD	North American Datum
NAVD	North American Vertical Datum
NWS	National Weather Service
PA	Preliminary Assessment
PAH	Polycyclic Aromatic Hydrocarbon
PCB	Polychlorinated Biphenyl
PCE	Tetrachloroethane
PE	Professional Engineer
PFAS	Per- and Polyfluoroalkyl Substances
PFHxS	Perfluorohexane Sulfonate
PFOA	Perfluorooctanoic Acid
PFOS	Perfluorooctanesulfonate
PID	Photoionization Detector
PLP	Permanent List of Priorities
PVC	Polyvinyl Chloride
QAPP	Quality Assurance Project Plan
RQD	Rock Quality Designation
RI	Remedial Investigation
SLV	Soil Leaching Value
SRV	Soil Reference Value
SVOC	Semi-volatile Organic Compound
TCE	Trichloroethylene
US EPA	United States Environmental Protection Agency
USACE	United States Army Corps of Engineers
USFWS	United States Fish and Wildlife Service
UTM	Universal Transverse Mercator
VC	Vinyl Chloride
VOC	Volatile Organic Compound

1.0 Introduction

1.1 Purpose

This focused remedial investigation (RI) report has been prepared by Barr Engineering Co. (Barr) on behalf of the Minnesota Pollution Control Agency's (MPCA) Closed Landfill Program (CLP). This report provides a summary of investigation findings and results at the Freeway Dump and Freeway Landfill (the Site) located in Burnsville, Dakota County, Minnesota (Figure 1).

The purpose of the investigation is to characterize Site conditions in support of future remedial design. Improved waste containment or removal of the waste from the Site will be an important component of the future remedial design. Therefore, the focus of this RI report is the condition of waste material at the Site and its associated potential receptors and risk pathways. In addition to the evaluation of the waste material, cover soil and groundwater investigation activities were conducted and are summarized and discussed in this report. Potential risks associated with current or future groundwater conditions is beyond the scope of the focused RI. It is assumed that additional groundwater investigation activities will be conducted and will be addressed in a follow-up supplemental RI report.

The initial phase (Phase A) of the investigation was conducted in the spring of 2018 and generally followed the conceptual *Investigation & Sampling Plan*, written by MPCA (MPCA, 2017). The MPCA plan was informed by findings from previous investigations at both the Freeway Landfill and Freeway Dump and outlined a work scope that included sampling of soil, waste material, and groundwater, as well as screening of landfill gas. The results of Phase A were summarized in *Phase A Investigation Report* (Barr, 2018) and several data gaps were identified in the report. Investigation activities were conducted in the spring of 2019 (Phase B) to address these data gaps and included evaluations of waste extent, cover soil, and groundwater.

1.2 Organization of Report

The report is organized as follows:

1.0 **Introduction**: describes the content and objectives of this report

2.0 **Site Background**: provides general Site background information including a description of the setting, topography, geology, and brief operating history of each project area.

3.0 **Regulatory History and Previous Investigation**: provides historical background of the Site from a regulatory perspective through brief summaries of previous investigations.

4.0 **Waste Material Investigations**: includes a discussion of the activities completed to evaluate the extent of waste material as well as solid media quality. Describes the results of the investigation, including a description subsurface conditions as well as solid media analytical results.

5.0 **Cover Soil Investigation:** includes a discussion of the activities conducted to further characterize the cover soil present at the Site for potential reuse as part of a remedial action. Describes analytical results.

6.0 **Groundwater Investigation:** includes a discussion of the activities completed to evaluate the groundwater conditions at the Site. Describes the results of the investigation, including groundwater sampling analytical results.

7.0 **Conceptual Site Model:** provides a summary of the current understanding of the Site subsurface conditions.

8.0 **Potential Receptors / Risk Assessment:** identifies potential receptors and evaluates the risk to human health and the environment.

9.0 **Conclusions:** provides a recommendation for additional action based on the findings of the investigations

10.0 **References:** includes a summary of references cited in the report.

2.0 Site Background

The Site comprises two project areas (Figure 1), referred to in this report as the Freeway Dump (Dump) and the Freeway Landfill (Landfill). Multiple parcels are associated with the Site and are controlled by various ownership entities, including the R.B. McGowan Company, Inc., Freeway Transfer, Inc., Quarry Property, LLC, and Michael B. McGowan. For the remainder of this report, those various entities will be referred to as the Site Owner. Property boundaries and ownership in the vicinity of the Site are shown on Figures 1 to 5.

The limits of waste associated with both the Dump and Landfill extend beyond parcels owned by the Site Owner and onto adjacent properties, as shown on Figures 2 and 3. The following sections describe the two project areas.

2.1 Site Location and Setting

Freeway Dump

The Dump is an unlined, soil-covered, inactive waste disposal area located at 11937 Highway 35 W (Parcel ID: 02-03410-38-010), Burnsville, at the north end of the east service road for Highway 35W, north of the Cliff Road interchange. The Dump encompasses approximately 28 acres and has recently been used as a golf driving range. Two trailers and one small building are located on the Property. Based on review of historical aerial photographs and the recent investigation, the extent of waste at the Dump is believed to extend onto several adjacent properties as shown on Figure 1, including:

- Allstate Self Storage facility owned by Burnsville Storage Company (Burnsville Storage) – MN LP, located south of the Dump. A Subaru auto dealership is located south of Burnsville Storage.
- Interstate 35W (I-35W) right of way, located west of the Dump. Edward Kraemer and Sons quarry (Kraemer Quarry) is located west of I-35W.
- Vacant land/wetlands owned by Northern States Power Company (Xcel Energy) and US Fish and Wildlife Service (USFWS), located north and east of the Dump.

The area of waste associated with the Dump (including waste present on neighboring properties) is approximately 34 acres and includes approximately 760,000 cubic yards. The inferred waste extent of the Dump is presented on in Figure 4.

Freeway Landfill

The Landfill consists of several parcels, totaling approximately 189 acres, 131 of which were used for placement of waste during landfill operation and approximately 58 of which include a quarry and undeveloped land (Liesch, 1993). The Landfill is located primarily on the following property parcels: 037-02-15600-00-010; 037-02-15600-00-060; 037-02-15600-00-020, 037-02-15600-02-010; 037-02-15600-00-030; 037-02-15600-00-040; and 037-02-15600-00-050.

The Landfill is an unlined, soil-covered, inactive waste disposal area located just south of the Minnesota River (Figure 1). Within the Landfill area is the Freeway Transfer Station which is located at 11501 Embassy

Road (parcel ID: 02-15600-01010), Burnsville. The Transfer Station is located on the east side of the Landfill property, approximately 1,500 feet south of the Minnesota River, and currently operates as a waste processing, recycling, and hauling facility. An inactive quarry to the west is also owned by the Site Owner and the western edge of the Landfill extends into this parcel. Other commercial activities on the Landfill properties appear to be a gravel crushing operation in the quarry located to the west of the Landfill and a dumpster storage operation that within the footprint of the Landfill itself.

The surrounding properties include Kraemer Quarry, located to the south, I-35W to the east, and a salt storage and barge unloading facility (U.S. Salt) owned by Port Marilyn LLC, located north of the Landfill. Based on review of historical aerial photographs and recent investigations, the extent of waste at the north end of the Landfill extends onto the U.S. Salt property.

The area of waste associated with the Landfill (including waste present on neighboring properties) is approximately 141 acres and includes approximately 5,310,000 cubic yards. The inferred waste extent of the Landfill is presented on Figure 5.

Minnesota River

The average water level for the Minnesota River located north of the Landfill is approximately 692 feet above mean sea level (feet MSL) (calculated from 2015-present elevation data provide from US Army Corps of Engineers). The 100-year flood elevation is 716 feet MSL (FEMA, 2011), and the recorded historical river level extremes at the nearby Savage river gage are 719.40 feet on April 15, 1965 and 687.05 feet on October 29, 1976 (NWS, 2018). It is recognized that river elevation sources are based on different vertical datum (i.e., 1912 Mean Sea Level Datum, North American Vertical Datum (NAVD) 1929, and NAVD 1988). However, the difference between those data for the Minnesota River elevation is only 0.54 feet.

Kraemer Quarry

The Kraemer Mining and Materials quarry is located approximately 1,000 feet west of the Dump and immediately south and southwest of the Landfill. The resource being mined in the quarry is the Prairie du Chien Group dolostone. Dewatering in the quarry likely captures groundwater in the Prairie du Chien aquifer beneath the Site, significantly depressing the water table from what it would be under natural conditions. Except for near the northern edge, waste is generally not in contact with groundwater at the Landfill, but models predict that condition will change when Kraemer Quarry operations and pumping end (Barr, 2015).

2.2 Topography

Freeway Dump

The majority of the Dump is a generally flat-top mound that sits above the surrounding wetland at elevations ranging from approximately 720 feet to 725 feet MSL. The tee-box area of the driving range sits a little higher at approximately 730 feet MSL. The raised elevation of the Dump extends beyond the north and east boundaries of the Dump property. The surrounding wetland is located at an elevation ranging from approximately 700 feet MSL along the north perimeter to about 710 feet MSL to the southeast of the Dump.

Freeway Landfill

Prior to waste disposal operations commencing, the topography of the Landfill area likely varied from 696 to 705 feet MSL (Liesch, 1991). According to current Lidar survey data (Fugro and MDNR, 2011), the maximum elevation of the Landfill is approximately 750 feet MSL at its peak near the center of the property. The ground surface slopes downward in all directions to an elevation of approximately 700 feet MSL at the property limits. This slope is relatively gentle, generally ranging from 2% to 4%, with the exception of the east and south edges, where steeper 20-30 foot long slopes up to approximately 30% are present. The ridge on the east side of the Landfill is adjacent to an intermittent surface water channel that runs north to the river, between the Landfill and Highway 35W.

Topographically, the Transfer Station is located in a topographically depressed area at approximately 710 feet MSL. Surrounding the Transfer Station to the north, south, and east is a berm feature that rises to approximately 745 feet MSL, and to the west is the access road that rises out from the station to Landfill grade of approximately 735 feet MSL.

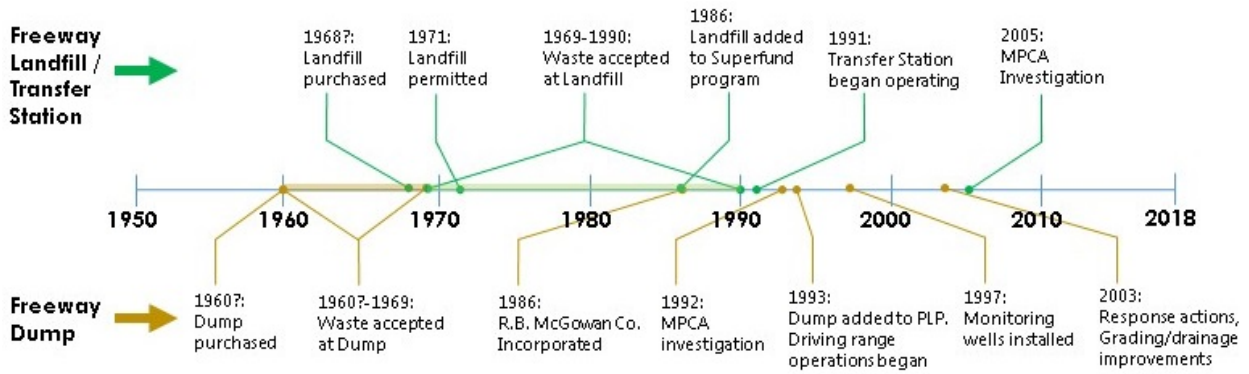
2.3 Geology

The surficial geology of the area is generally characterized by glaciofluvial sediments associated with the Minnesota River Valley. Peat and organic silts and clays are found in adjacent bottomland areas (MPCA, 1992). The Landfill and Dump areas consist of waste material (municipal solid waste/construction debris/ash) dumped on former wetlands and overlain by cover soil fill (Liesch, 1991).

The upper bedrock unit is the karsted dolostone of the Prairie du Chien group. The surface of the Prairie du Chien is typically weathered and friable and dips north toward the Minnesota River. The Jordan Sandstone underlies the Prairie du Chien. The St. Lawrence Formation, a dolomitic shale and siltstone unit, underlies the Jordan Sandstone (MPCA, 1992).

2.4 Site Ownership and Operating History

A background review was conducted that included reviewing historical landfill records and files and reviewing historical aerial imagery. The MPCA provided Barr with a list of archived project files available for the both the Dump and Landfill. Hundreds of files were available for review dating back to the early 1960's. In addition, historical aerial imagery was obtained from Historic Information Gathers (HIG). These aerial images were used to evaluate historical disturbance limits and approximate operational dates for the Landfill (aerial photos are found in Appendix A of the *Phase A Investigation Report*, Barr, 2018). The disturbance limits shown on the aerial photography were evaluated to identify historical dumping as well as current waste limits. Based on historical landfill records, files provided by the MPCA, and historical aerial imagery the following approximate chronology of significant milestones has been developed for the Site (Barr, 2018).



Pre-Operations History

From the Black Dog Preserve 1984 Resource Inventory (MDNR, 1984)

Up until the year 1853 the area around Black Dog Lake was inhabited by about 250 Dakota native people and their chief, Black Dog. The Dakota were hunter gatherers and left no discernible impact upon the land. Following European settlement of the area in the mid-1800's, ownership of the land began and bottomland meadows were used to provide hay for domesticated animals. Row crops were planted in the area and north-south drainage ditches were placed on the far southern portion of Site. Agricultural use in the general area continued until the early 1960's when light industrial and commercial development of the area commenced.

Freeway Dump

The Dump property was purchased by Richard McGowan and his business partner Jim Vallez sometime around 1960. Although it is not certain exactly when the Dump became active and started receiving waste, some reports indicate that dumping began as early as 1960. A review of historical aerial photographs indicate that the Dump was active between 1960 and 1969. The Dump initially accepted ash from a nearby power plant and later accepted other refuse including municipal solid waste and construction waste (MPCA, 2017). After the Dump ceased operating in 1969, the property remained unused until 1993, when the driving range operations began. Based on a review of aerial photographs, the storage facility buildings south of the dump were constructed between 1970 and 1979, and the storage facility buildings at the southeast corner of the dump were constructed between 1984 and 1990.

Freeway Landfill

The Landfill property is comprised of multiple parcels that were purchased from several different owners sometime in 1968 by Richard McGowan. Prior to the Landfill operating, the area was mostly wetland and undeveloped, with the exception of farming activities visible in the 1937 aerial photo and a few small structures located north of the frontage road on the south bank of the Minnesota River, visible in the 1966 aerial photo.

The Landfill began accepting waste in July 1969 under a conditional use permit issued by the City of Burnsville. In October 1971, the MPCA issued the Landfill a solid waste permit (No. SW 57). From a review of historical aerial photos, it appears that Landfill operations began in the northeast corner of the property and then expanded to the south. In the late 1970s and 1980s, environmental regulations were significantly

updated in response to evolving knowledge about environmental contaminants and associated risks to human health and the environment. Landfill regulations were updated to require engineered liners and caps for new landfills. Based on concerns at the Site, the Landfill was added to the Superfund National Priorities List in 1986 (MPCA, 2015). Under the new regulations, landfill owners were requested to either make necessary upgrades to their facilities or to stop accepting waste. In 1990, Freeway Landfill stopped accepting waste. It is estimated that approximately 5 million cubic yards of waste were deposited in the 131 acre area of the Landfill.

The Transfer Station was constructed sometime in the late 1980s and operates on a 12 acre parcel bounded by the Freeway Landfill to the north, south, and west. The Transfer Station is currently in operation and has been since 1991 (Liesch, 1993).

3.0 Regulatory History and Previous Investigations

Previous investigations have been conducted at the Freeway Dump and Freeway Landfill properties. The following section provides a brief summary of previous investigations limited to details that are pertinent to this report.

3.1 Freeway Dump

Relevant previous investigation activities at the Dump are briefly summarized below. Previous investigations at the Dump were generally limited in scope and were conducted at the edges of the Dump, therefore prior to the recent investigation little was known of the conditions of waste material within the Dump itself.

3.1.1 1987 Preliminary Assessment

A Preliminary Assessment (PA) was conducted in 1987 by the MPCA (MPCA, 1987). The PA was prompted by concerns from the USFWS, whose property abuts the Dump to the east. USFWS had observed stressed vegetation, erosion, and waste materials at the eastern edge of the landfill. MPCA identified dichlorodiphenyltrichloroethane (DDT) and polycyclic aromatic hydrocarbons (PAHs) in soil samples collected from the perimeter of the Dump and concluded there were exposure risks from the Dump, including the groundwater and surface water migration pathways. Following the Preliminary Assessment, the Dump was placed on the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) inventory of potentially hazardous waste sites.

3.1.2 1992 Screening Site Inspection Report

A subsequent investigation was conducted in early 1992, as documented in the Screening Site Inspection Report (MPCA, 1992), to evaluate the Freeway Dump as a potential candidate for the National Priorities List. The investigation included completion of four soil borings, installation of two monitoring wells (including existing well OFMW-1), and analysis of soil, surface water, and groundwater samples. Tetrachloroethane (PCE), acetone, and phthalates were detected in soil and metals such as arsenic, cadmium, chromium, and selenium were detected in soil, surface water, and groundwater. Additional investigation was recommended.

3.1.3 1997 Groundwater Investigation

An additional investigation was conducted in 1997 and 1998 by the MPCA. Nine monitoring wells were installed around the perimeter of the Dump (existing wells MW-97-1 to MW-97-9). Groundwater sample results indicated the presence of arsenic, boron, manganese and low levels of volatile organic compounds (VOC) and polychlorinated biphenyls (PCB). In the fall of 2003, response actions including grading and drainage improvements were completed as noted in a correspondence between the MPCA and the Site Owner (MPCA, 2004).

3.2 Freeway Landfill

Previous investigations have been conducted at the Landfill, including remedial investigations conducted on behalf of the Site Owner and environmental assessments conducted on behalf of the MPCA. Relevant investigation activities at the Landfill are briefly summarized below.

3.2.1 1978 Impact of Seepage Study

In 1978, Barr prepared a report in response to a request from the MPCA to assess the impact of the landfill on the quality of the Minnesota River and to investigate the necessity of a new water monitoring system. Five new monitoring wells were constructed for the investigation. Sampling activities included soil sampling of the monitoring well borings, three groundwater sampling events, and five surface water sampling events. The recommended continued monitoring program for the landfill included quarterly groundwater and surface water sampling (Barr, 1978).

3.2.2 1988 Remedial Investigation

Conestoga-Rovers & Associates (CRA) was retained by R.B. McGowan Company in 1988 to conduct a RI of the Site for the MPCA in accordance with a Request for Response Action. Four new monitoring wells were constructed as part of the investigation. Investigation activities included well installation, water level measurement, slug testing, and water quality sampling. Sampling activities included two sampling events at seven groundwater locations and one surface water location for metals and VOCs. Additional wells and surface water locations were identified in the plan but could not be sampled due to insufficient water volume due to dewatering activities at the adjacent quarry. CRA recommended that no remedial action was warranted and the Site be delisted from the National Priorities List (CRA, 1988).

3.2.3 1991 Supplemental RI

A Supplemental RI was conducted in 1991. Bruce A. Liesch Associates (Liesch) was retained by R.B. McGowan Company to complete additional RI activities required by MPCA after review of the initial 1988 RI Report. The purpose of Supplemental RI investigation was to further define the extent and magnitude of landfill impacts and hydrogeological conditions. Four new monitoring wells were constructed as part of the investigation. Investigation activities included well installation, water level measurement, slug testing, and water quality sampling. Sampling activities included two sampling events at ten groundwater locations and three surface water locations for metals and VOCs. One sampling round was conducted while the quarry well was in operation and the second was conducted when the well was not in use. A post-RI monitoring plan was outlined, which included three sampling events per year and annual reporting (Leisch, 1991).

3.2.4 1993 Closure Report

In 1993, a closure report was prepared by Leisch on behalf of R.B. McGowan Company to provide documentation of landfill closure activities for certification of overall final closure by the MPCA. The landfill closure was required by a Court Order issued by the Dakota County District Court. Final closure activities included completion of additional final cover soil permeability testing, final cover modeling, installation of eight landfill gas monitoring probes, maintenance of the final cover, and surveying (Leisch,

1993). Additionally, Camp Dresser & McKee (CDM) submitted a Final Human Health and Ecological Risk Assessment to the MPCA. CDM conducted the human health and ecological assessments using approaches outlined in United States Environmental Protection Agency (US EPA) guidance documents for superfund sites. The study found landfill gas exposure risks to workers and nearby residents below threshold risks and the ecological risk of leachate contact was considered unlikely (CDM, 1993).

3.2.5 1998 Gas extraction system conceptual design

Woodward-Clyde Consultants were retained by the MCPA to prepare cover system and gas extraction system conceptual design in 1998. A pre-design field investigation was conducted in 1997 that included a topographic survey, an existing cover evaluation, a waste thickness evaluation, and landfill gas monitoring. Twenty-four soil borings were advanced through the landfill cover, five of which were further advanced to refusal to determine the vertical extent of waste. Four landfill gas monitoring probes were installed in the borings that were advanced through the waste column with measured methane concentrations between 25.7% and 64.2%. (Woodward-Clyde, 1998).

3.2.6 2005 Subsurface Investigation

In 2005, a subsurface investigation was conducted by Fuller Engineering Services (FES) on behalf of the MPCA throughout the Landfill to evaluate the extent of cover soil and waste. The investigation included 74 soil borings, landfill gas monitoring, and detailed surveying to assess the topography and subsurface conditions (FES, 2005). The results of the Fuller study are the primary basis for volume calculations utilized in the Focused Feasibility Study (Barr, 2019).

3.2.7 2015 Groundwater Investigation

More recently, in 2015, the MPCA conducted groundwater investigations and Barr conducted groundwater modeling to estimate future groundwater conditions that are anticipated when the Kraemer Quarry ceases operation and discontinues dewatering pumping. MCPA installed eight monitoring wells into the waste and two monitoring wells into the bedrock. Groundwater samples were collected at these new monitoring wells. Barr used the analytical results and previous groundwater models for the Landfill Site to model the groundwater conditions and contaminant transport (Barr, 2015b). The finding of the modeling effort are summarized as part of the risk evaluation in Section 8.4.2.

4.0 Waste Material Investigation

Waste material investigation activities were conducted in 2018 and 2019 to further characterize the Site geology and to evaluate the extent and nature of waste material. The results of the investigations have improved the understanding of Site risks and will inform the evaluation of potential Site remedies.

4.1 Summary of Investigation Activities

Several previous investigations, most significantly the Fuller study (FES, 2005), provided data with respect to the presence of waste material at the Landfill; however, there were data gaps related to the extent of waste, including the presence of waste along the north edge of the Landfill property and in the vicinity of the Transfer Station area. Additionally, there were limited data available regarding the extent and nature of the waste material present at the Dump. These data gaps were the focus of Phase A of the investigation, which occurred during the spring of 2018 and included:

- Thirty-five soil borings completed at the Dump
- Eight soil borings completed at the Transfer Station
- Fourteen test excavations completed at the Dump
- Nine test excavations completed at the Landfill

Following the Phase A investigation, data gaps concerning the extent of waste material to the north of the Landfill and to the south of the Dump remained. In order to address these data gaps, the following additional investigation activities were conducted as part of Phase B during the spring of 2019:

- Eight soil borings completed at the Burnsville Storage property (south of the Dump)
- Two test excavations completed at the U.S. Salt property (north of the Landfill)

4.1.1 Soil borings

Soil borings were advanced with a direct-push, tracked drill rig and soil samples were collected with a dual-tube or macro-core sampler. Continuous sampling was conducted at all soil boring locations. These samples were described in the field by a Barr geologist or environmental scientist in accordance with the Unified Soil Classification System. Samples were screened in the field for volatile organic vapors using an MPCA-provided photoionization detector (PID) fitted with a 10.6 eV lamp. Additionally, the samples were inspected by Barr for other evidence of contamination such as staining, odors, discoloration, and/or sheen and the observations were documented on the geologic log of each boring. Borings were sealed in accordance with Minnesota Department of Health rules. A soil boring matrix is provided as Table 2. Boring logs are included in Appendix A. There were no major deviations from the planned work. Soil borings completed at the Site are described below:

Phase A

Dump – Thirty-five soil borings were completed at the Dump. The Dump soil borings were generally spaced over an approximate 180-foot by 180-foot grid. Locations of the soil borings at the Dump are shown on Figure 2.

Landfill – Eight soil borings were completed at the Transfer Station located in the Landfill property. The purpose of the borings at the Transfer Station was to assess the subsurface material directly under and adjacent to the operations building. For this purpose, two of the borings were completed within the building footprint and the remaining six borings were located surrounding the building. Locations of the soil borings at the Transfer Station are shown on Figure 3.

Phase B

Dump – Eight soil borings were completed at the Burnsville Storage property located south of the Dump. The borings were generally spaced across the Burnsville Storage property for the purpose of identifying the extent of waste material south of the Dump. Two of the boring locations were placed near buildings that are used as residences, and soil-gas samples were collected for laboratory analysis from these locations. Locations of the soil borings at the Burnsville Storage property are shown on Figure 2.

Soil Gas Screening

Soil gas was measured by Barr at most boring locations using a multi-gas meter capable of measuring methane, carbon dioxide, and oxygen. Upon completion of a soil boring, soil gas was screened at a depth of approximately three feet below ground surface (bgs). A tube was fitted to the multi-gas meter and lowered down the hole. The hole around the tube was then backfilled, the meter allowed to equilibrate, and the readings was logged.

4.1.2 Test Excavations

Test excavations were completed at several locations at both the Dump and Landfill. The purpose of the majority of test excavations was to identify the edge of the waste boundary or to determine if waste appeared to extend beyond the property boundaries. Therefore, most of these test excavations were completed just inside the property boundary. In additional to identifying the extent of waste, the added benefit of exposing larger areas of the subsurface was to further classify the types of waste material present.

Test excavations were completed with an excavator in 1 to 2 foot lifts to depths of up to 15 feet bgs or to groundwater, whichever was encountered first. As the excavation proceeded, the operator segregated the soil and/or waste material by depth so that upon completion the leftover soil and/or waste material could be replaced back in the excavation in the order and approximate position from which it was removed. As the soil was replaced the excavator bucket was used to tamp in approximate one-foot lifts to re-compact the soil.

A test excavation matrix is provided as Table 3. Excavation field logs are included in Appendix B. Test excavations completed at the Site are described below:

Phase A

Dump – Fourteen test excavations were completed at the Dump. Ten of the test excavations were completed along the property boundaries and four excavations were completed in the interior of the Dump. The interior borings were completed adjacent to previously completed boring locations to better classify the waste material overserved during the soil boring investigation. Locations of the test excavations are shown on Figure 2. There were no major deviations from the planned work.

Landfill – Nine test excavations were completed at the Landfill. Eight of the test excavations were completed along the northeast property boundary and one was completed at the southeast corner of the property. Locations of the test excavations are shown on Figure 3.

Phase B

Landfill – Two test excavations were completed at the U.S. Salt property located north of the Landfill.

4.1.3 Sample Analysis

Selected samples collected during this RI were submitted to laboratories for analysis. The sample analytical parameter lists are provided in Table 1. Laboratories were selected by MPCA from a list of state-contract laboratories or other state agency laboratories. A summary of samples collected is provided in Tables 2 and 3. Samples were analyzed at Pace Analytical Services, Inc. (Pace) of Minneapolis, Minnesota for all of the parameters listed, with the following exceptions:

- Groundwater analysis of volatile organic compounds (VOCs), Per- and Polyfluoroalkyl Substances (PFAS), and 1,4 Dioxane was performed by Minnesota Department of Health (MDH) laboratories.
- A select group of waste sample parameters were analyzed at Minnesota Valley Testing Laboratories, Inc. (MVTL) of New Ulm, Minnesota and Beta Analytical Testing Laboratory (Beta) of Miami, Florida.
- PFAS analysis of crushed bedrock samples was performed by SGS AXYS Analytical Services Ltd. in Sidney, British Columbia.

Phase A

During the Phase A investigation, soil, waste, and groundwater samples from borings and test pits were collected for laboratory analysis by a field representative of the MPCA laboratory contractor, Pace. A detailed summary of sample collection activities is presented in Section 3.2.3 of the *Phase A Investigation Report*.

Phase B

Sample collection was conducted as part of the Phase B Waste Investigation as follows:

- Soil Gas – Soil gas samples were collected from two of the boring locations on the Burnsville Storage property. Barr and MPCA collaborated to inform the Pace representative at what intervals samples would be collected. Pace collected the samples in accordance with the Quality Assurance Project Plan (QAPP) (Barr, 2019).

- Waste – Samples of waste material were also collected from the cover soil boring locations (Section 5.0) and the monitoring well borings (Section 6.0).

- Bedrock – Samples of bedrock were collected from the borings advanced prior to monitoring well MW-9D and MW-10D. These samples were crushed by the laboratory prior to analysis.

Upon receipt of the laboratory analytical data, Barr performed a data quality review. A summary of the data quality review is included in Appendix E. The review concluded that all data met the data quality objectives of the project and are deemed acceptable for the purposes of this project, as qualified in the tables.

4.1.4 Surveying

Final locations of all soil borings and test excavations were surveyed using a hand-held global positioning system (GPS) device. Elevations were approximated based off of existing topographic information (LIDAR; Fugro and MDNR, 2011).

4.2 Summary of Subsurface Conditions

This section describes the subsurface conditions observed during the Phase A and Phase B investigations, including descriptions of the different solid media encountered and their distribution across the Site. Unconsolidated materials (including waste material, fill, and native sediments) and bedrock were described in the field by Barr. Materials were described using methods included in American Society for Testing and Materials (ASTM) D-2488, Standard Practice for Description and Identification of Soils.

A discussion of the extent and thickness of the waste material across the Dump and Landfill is included in Section 4.3.

4.2.1 Solid Media Definitions

General descriptions of the primary unconsolidated materials and bedrock encountered at the Site are provided below.

Cover Soil Fill

Fill material used as cover soil was observed at nearly all investigation locations during both phases of the investigation. Fill material generally consisted of a few inches of root zone material (topsoil with a fine sandy loam texture) underlain by sand to silty sand with varying percentages of coarse-grained sediment. Layers of finer grained sediments (clays and silts) were also observed in some locations.

Waste Material

For the purposes of this investigation, waste material was divided into two classifications: (1) municipal solid waste/construction debris (MSW/CD) and (2) ash, as described in the following paragraphs.

Municipal Solid Waste/Construction Debris – MSW/CD was encountered across most of the Site during both phases of the Investigation. Municipal solid waste consisted of paper, plastics, glass, wood, metal, and rubber and was sometimes mixed with fill material. Construction debris varied,

typically including bricks, concrete, wood, shingles, pipes, and insulation. The level of decomposition varied as well, with some areas appearing relatively dry and containing readable lines of newspaper, whereas other pockets of waste material were well-degraded and had a noticeable odor of decomposition.

Ash – Ash was observed only at investigation locations at the Dump, and was observed during both phases of the Investigation. Ash is generally described as gray, or black, non-plastic, silt to fine grained sand-size material and was differentiated from native sediments by strength and texture comparisons. The ash encountered at the Dump was mostly fine-grained and non-cemented, making it appear as a possible native gray silt except that it often was intermixed with waste material. The ash was generally observed either above and/or below the waste material.

Native Material Beneath Waste

Native sediments encountered during the investigation included alluvial or glacial sediment deposits. In general, native sediments were encountered below the waste material. The most commonly observed native sediment was a dark brown fibrous peat, but lean to fat clays, organic clays, silts, and sandy soils were also present in some locations.

Bedrock

The uppermost bedrock encountered during the Investigation is a sandy dolostone of the Prairie du Chien Group. The Prairie du Chein group is present in southern Minnesota, northeastern Iowa, and southern Wisconsin. The upper unit of the bedrock observed at the Site was generally described as brown, tan, and/or gray, very weak, and moderately weathered. The Prairie du Chien is heavily fractured near the surface with fracture density generally decreasing with depth. Discrete intervals with greater fracture density, vuggy porosity, and dissolution voids are present at depth and were observed during rock coring conducted in advance of installation of wells MW-9D and MW-10D (Section 6.2).

4.2.2 Freeway Dump

The summary of subsurface conditions at the Dump is based on the soil borings and test excavations that were completed during Phase A of the Investigation, and the soil borings and monitoring well installations that were completed during Phase B of the Investigation. Boring logs and monitoring well logs from Phase B are provided in Appendix A. Boring logs and test excavation logs from Phase A are provided in the Phase A Investigation Report (Barr, 2018). Subsurface conditions at the Freeway Dump generally consist of non-native fill material overlaying waste material (MSW/CD and ash), which overlay native sediments and/or bedrock. Cross section locations are displayed on Figure 6, and four cross sections of the Dump are included as Figure 6A, Figure 6B, Figure 6C, and Figure 6D. Observations from both phases of the Investigation are summarized below.

Cover Soil Fill

Cover soil fill was observed at all 61 Investigation locations, at thicknesses ranging from 0.5 to 12.5 feet. Typically, the observed thickness of cover soil ranged from 2 to 5 feet. In general, the greatest fill soil thicknesses were observed along the west side of the Dump, where soil borings were positioned along a landscaped Berm.

Field screening of the cover soil did not identify evidence of contamination such as staining, odors, discoloration, and/ or sheen. Soil headspace readings ranged between 0.0 and 6.9 parts per million (ppm). Field screening results are included in the boring logs.

Waste Material

Waste material encountered at the Dump consisted of a combination of MSW/CD and ash. MSW/CD thicknesses vary throughout the Dump, but generally ranged from 10 to 20 feet thick. The greatest thickness of MSW/CD was approximately 30 feet at boring FD-SB-A3 in the north-central portion of the Dump. The thinnest intervals of MSW/CD were identified at the westernmost borings (FD-SB-A1 through FD-SB-G1), where thicknesses averaged less than 2.5 feet.

MSW/CD that was encountered south of the perimeter of the Dump was observed in the westernmost borings (SB-01 and SB-04), and was not observed in the borings located east of boring SB-03. Inferred waste extents and waste thicknesses are presented on Figure 4. A more detailed discussion in regards to waste extent is provided in Section 7.1.

Decomposition, chemical-like, and/or petroleum odors were encountered in varying degrees in the MSW/CD. Sheens were also observed, ranging from trace to heavy rainbow sheen. Soil headspace readings were generally elevated (above 10 ppm), and ranged from 0.0 to 343 ppm. Headspace readings above 100 ppm were observed at seven borings and two test excavations, all of which were generally located in the eastern portion of the Dump. Field screening results are presented in the boring logs (Appendix A).

Ash was observed both above and below the MSW/CD ranging in thickness from 0 to 13 feet. In general, ash is more commonly observed above the MSW/CD on the east half of the property and below the MSW/CD on the west half of the property. Ash was occasionally encountered mixed with a minor amount of debris/plastic sheeting.

Field screening of the ash did not identify evidence of contamination such as staining, discoloration, odor, and/ or sheen. Headspace readings ranged between 0.0 and 4.5 ppm. Field screening results are presented in the boring logs (Appendix A).

Native Sediment

Native soil was observed at 31 (of 47) soil boring locations. Native soil generally consists of alluvial deposits of peat overlaying a thin layer of organic silt/fat clay. Peat was widespread throughout the main portion of the Dump, but was not observed in borings completed near the southern limit and at Burnsville Storage. Peat thickness ranged from 1 to 10 feet. Generally, peat layers were observed to be between two and five feet thick. The silts and clays underlying the peat were generally no thicker than one foot. Poorly graded sand and clayey sand is present beneath the waste material only at locations in the northeast portion of the Dump.

Bedrock

The uppermost bedrock beneath the Dump is a sandy dolostone of the Prairie du Chien Group. Generally, borings were advanced to the top of bedrock. The depth to bedrock encountered during the investigations varied from 9.5 to 40 feet bgs. Bedrock was encountered at higher elevation (approximately 705 feet MSL) in the southern portion of the Dump, and generally slopes downward to the north edge of the property (approximately 690 feet MSL) towards the wetland.

4.2.3 Freeway Landfill

The subsurface conditions at the Landfill discussed below are based on historical investigation data as well as the recent investigations which include the test excavations and soil borings that were completed during Phase A of the Investigation, and the monitoring well installations, soil borings, and test excavations that were completed during Phase B of the Investigation. Boring logs and monitoring well logs are provided in Appendix A. Test excavation logs are provided in Appendix B. Subsurface conditions at the Landfill generally consist of non-native fill material overlaying waste material (MSW/CD and ash), which overlay native sediments and/or bedrock. Cross section locations are displayed on Figure 6, and four cross sections of the Landfill are included as Figure 6E and Figure 6F.

Cover Soil Fill

Fill soil covering the waste material was encountered at all monitoring well, soil boring, and test trench locations. Fill soil ranged in thickness from approximately 0.5 feet to 25 feet, with an average thickness of approximately 10 feet. In general, fill soil was observed at greater thicknesses near the center of the Landfill, with thinner cover soil intervals around the perimeter of the Landfill. The fill soil typically included a topsoil cover overlaying brown or gray silty sand and/or sandy lean clay. These observations are consistent with those from previous investigations completed by others. Cover soil thickness contours are presented in Figure 7.

Field screening in the fill material did not identify evidence of contamination such as staining, odors, discoloration, and/or sheen, with the exception of trace sheen and moderate odor being observed in borings TS-SB-02 and TS-SB-05 (Phase A, Transfer Station). PID soil headspace readings ranged from 0.1 to 5.4 ppm.

Waste Material

Waste material observations made during the investigation were consistent with those from historical investigations. Where observed, waste material ranged in thickness from approximately 6 to 25 feet. A more detailed discussion of waste material thickness and extent is provided in Section 7.1.

Light to moderate decomposition and waste odors were observed throughout the waste material at the Landfill. Sheens were also encountered, ranging from trace to heavy rainbow. PID headspace readings in the waste material varied greatly, ranging from 1.0 ppm to 203 ppm. The highest PID reading was 203 ppm, observed at in a sample from 19 feet bgs in well MW-10. Field screening results are presented in the soil boring and test excavation logs.

Native Sediment

Native sediment was observed beneath the waste material throughout the Landfill. Native sediments were observed in 46 of the 78 boring locations completed in 2005 (FES, 2005). At the remaining borings, either waste was observed directly on top of bedrock or the borings were located outside of the footprint of the waste. Native sediment consisted of poorly graded sand, silty sand, clayey silt, and sandy lean clay.

Field screening of native sediment in of soil borings completed at the Transfer Station did not identify evidence of contamination such as staining, odors, discoloration, and/or sheen; and PID headspace readings were below 1.9 ppm. At the borings completed on the north side of the property, field screening identified a moderate rainbow sheen in well MW-13, and a light sheen in well MW-12 in native sediments directly beneath waste materials. No odor or discoloration was noted in this layer, and PID headspace readings were below 1.2 ppm.

Bedrock

The sandy dolostone of the Prairie du Chien Group was observed at both deep monitoring well locations (MW-9D and MW-10D). The Prairie du Chien Group was encountered between 22 and 24 feet bgs. Field screening did not identify evidence of contamination on the bedrock. The thickness of the Prairie du Chien ranges from 134 to 165 feet below the Landfill (Liesch, 1991). The bedrock surface was observed at higher elevation (approximately 700 feet MSL) in the southern portion of the Landfill, and generally slopes downward to the north.

4.2.4 Landfill Gas Monitoring

Landfill gas monitoring was conducted with a multi-gas meter during Phase A of the investigation at the Dump and during the 2005 Fuller investigation at the Landfill. Landfill gas concentrations are presented in Table 4.

Dump – Measurements indicated methane concentrations ranged from 0.0% to 36.9% across the Dump. Carbon dioxide concentrations ranged from 0.0% to 28.6% and oxygen concentrations ranged from 0.0% to 22.3%. As would be expected, the concentrations of methane and carbon dioxide generally had an inverse relationship compared with the concentration of oxygen.

Landfill – Measurements indicated methane concentrations ranged from 0.0% to 70.0% across the Landfill, with an average concentration of 36.2%. Carbon dioxide concentrations ranged from 0.0% to 42.0% and oxygen concentrations ranged from 0.0% to 20.3%.

4.3 Waste Extent

The extent of waste present at the Dump and Landfill was determined based on a number of methods, primarily from review of historical investigation results, review of historical aerial photography, and completion of investigation activities. The following sections describe the extent of waste and the information utilized to determine the extent at both the Dump and Landfill.

4.3.1 Freeway Dump

The extent of waste material at the Dump appears to extend beyond the property boundaries in all directions. Test excavations were completed along the edges of the property during Phase A of the investigation; however, waste material and/or ash were encountered at each of these locations extending to the property line, as described in the following paragraphs.

West – Interstate 35W is located west of the Dump. Three test excavations were placed along the west edge of the property and although no MSW/CD was present, ash was observed at all three locations. The Minnesota Department of Transportation (MnDOT) conducted a Phase II investigation in 2014 (MnDOT, 2015) and a supplemental investigation in 2018 (MnDOT, 2018) along the right-of-way corridor adjacent to the property. The logs from borings conducted between the Dump and the Interstate indicated the presence of a greyish silt with fine-grained sand, which is similar to the description of the ash encountered during this investigation. Additionally, historical aerial photographs from 1964 and 1967 indicate that operations were occurring close to the edge of the highway. Although MSW/CD do not seem to extend beyond the Dump property boundary, it is assumed that ash may extend into the right-of-way of Interstate 35W.

North – Along the north and east edges of the property, the presence of waste material beyond the property boundary was anticipated as the elevated ground surface of the Dump above the adjacent wetland can be observed. The elevated ground surface extends approximately 100 feet north of the property boundary. Boring logs from three monitoring wells (MW-97-7, MW-97-8, and MW-97-9) indicate no waste present, therefore the northern extent of the waste can be assumed to be located somewhere between the toe of the slope and these wells.

East – Along the east edge of the elevated Dump surface, the slope is more gradual and where it contacts the wetland less easily identified. At one test excavation (FD-TT-06), completed along the east edge of the property near what appeared to be the bottom of the slope, waste material was observed extending below the groundwater elevation. Additionally, the boring log for OFMW-1, located farther to the east, indicate ash was encountered in the boring. The extent of waste is inferred to continue along the toe of the slope until reaching the Burnsville Storage property to the south.

Southeast – Neighboring the property to the south and southeast is the Burnsville Storage property. It is assumed that the extent of waste is to the property boundary in the south east corner of the property. Although the area to the southeast of the property corner appears disturbed historical photos and a nearby test excavation (FD-TT-08) contained waste material, during the Phase B waste extent investigation no waste material was observed in the borings in this area.

South – Test excavations along the south property boundary encountered waste material. Additionally, the boring log from monitoring well MW-97-6, located just south of the property boundary indicated the presence of waste material. During the Phase B waste extent investigation, waste was observed in three borings (FD-SB-01, FD-SB-04, and FD-SB-08) on the west side of the Burnsville Storage property.

A historical dump site referred to as the "Astleford Dump" was located south of the Freeway Dump along the east side of the frontage road. While the exact dates of the Astleford dump activity is unknown, based on aerial photos, the dump was potentially active in the 1950s and 1960s (Figure 12). Waste was observed in investigation locations south of the Site as part of the RI. Based on the location of those observations, combined with historical photograph review of the Freeway Dump operations, the delineation of the extent of waste between the two dumps is not determined. The waste extent is not defined to the south of the Site.

4.3.2 Freeway Landfill

An assumed waste footprint was presented in the Investigation & Sampling Plan (MPCA, 2017) based on data from previous investigations. Along the west edge of the Landfill, the 2005 soil boring investigation (FES, 2005) delineated the extent of waste material with a line of borings (No. 1 – 8) where no waste was observed. Along the south edge of the Landfill, the extent of waste material is defined by the bottom of the slope running along the property boundary. The extent of waste is also defined by the bottom of the slope along the east edge of the Landfill. This is supported in historical aerial imagery, where there does not appear to be disturbance beyond landfill slopes as they exist today.

During the investigation, test excavations were conducted along the north edge of the Landfill and in the southeast corner to gain a better understanding of the extent of waste in these areas (Figure 5). In the southeast corner, waste material was observed in FL-TT-08, which was located on the slope due to soft ground conditions beyond the toe of the slope. No waste material was identified in borings WT-7 or DP-8, located beyond the toe of the slope. Historical aerial photos do not show any disturbance in this corner of the Landfill, with the exception of an access road in the 1990s. It is likely that the waste material extends no further than the bottom of the slope, but the exact location of the extent has yet to be identified.

During Phase A of the investigation, test excavations were completed along the northern property boundary of the Landfill and waste material was observed. The waste included both MSW and CD and field screening noted chemical and petroleum odors within the waste material. Two additional test excavations were conducted on the U.S. Salt property north of the Landfill. Waste was observed in the eastern excavation (FL-TT-09) and was described as inert construction debris (asphalt, concrete, rebar), while no waste was observed in the western excavation. It is assumed that there is some waste that extends onto the U.S. Salt property, but that it is mostly CD missed with fill.

At the Transfer Station, no waste material was observed at locations TS-SB-02 and TS-SB-07, which were completed inside the operations building. Waste material was observed at every other boring location surrounding the operations building that was completed during the 2018 investigation. Therefore, it appears likely that waste material extends throughout the Transfer Station area, with the exception of directly under the buildings and, possibly, the weighing stations.

4.4 Summary of Analytical Results

The majority of analytical sampling as part of the waste material investigation was conducted during Phase A in the spring of 2018. One sample of solid media was collected from nearly all of the soil boring

and test excavation locations during the Phase A investigation. This included 48 MSW/CD samples, 7 ash samples, 6 native sediment samples, and 3 cover soil fill samples.

For the purpose of providing context to the data, solid media results were compared to the MPCA's soil reference values (SRVs) and soil leaching values (SLVs). The SRVs are conservative, risk-based criteria that are dependent on land use scenarios. Concentrations from solid media samples were compared to both Recreational and Industrial SRVs. The SLVs provide a conservative estimate of the potential for contaminants detected in soil to leach to the groundwater. For the purpose of results discussion in the subsequent sections, diesel range organics (DRO) and gasoline range organics (GRO) concentrations were compared to the criteria (100 mg/kg) included in the MPCA's *Best Management Practice for Off-Site Reuse of Unregulated Fill* (Unregulated Fill: MPCA, 2012). It is acknowledged that comparison of waste samples to these criteria is likely overly conservative; however, it is useful in developing an understanding of the overall nature and magnitude of contaminants associated with the waste material.

As discussed in Section 4.2.2 of the *Phase A Investigation Report*, previous investigations in the surrounding area have concluded that the background concentrations of arsenic, iron, manganese, and vanadium often exceed SRVs and SLVs. Therefore the range of background concentrations will be taken into account when discussing exceedances in the following sections. A comparison of criteria to background concentrations is provided in the following table:

Parameter	Criteria (mg/kg)			Dakota County Background Range*			
	SLV	Industrial SRV	Recreational SRV	Soil (0.2 – 0.5 m)		Soil Parent Material (1 – 2 m)	
Arsenic	5.8	20	11	7	12	12	17
Iron	NA	75,000	12,000	17,000	30,000	34,000	90,000
Manganese	130	8,100	5,000	498	1,284	NA	NA
Vanadium	4	250	40	72	93	93	115

*Data range from summary maps: OFR09-02, Minnesota Soil, Till, and Ground-Water Geochemical Data. Lively, R.S.; Thorleifson, L.Harvey (Minnesota Geological Survey, 2009) http://conservancy.umn.edu/handle/11299/117364

An abbreviated summary of the analytical results from the Phase A solid media sampling is provided below. For a more detailed discussion, please refer to *Phase A Investigation Report* (Barr, 2018). Tables 5a to 5c provide a summary of exceedances of the above-referenced criteria.

MSW/CD – Concentrations of metals, semi-volatile organic compounds (SVOCs), volatile organic compounds (VOCs), PCBs, and total petroleum hydrocarbons (TPHs) that exceeded the comparison criteria listed above were detected in samples of MSW/CD throughout the Landfill and Dump.

Parameter	Samples Analyzed	Number of Phase A Sample Locations with SRV Exceedances			
		MPCA Unregulated Fill*	MPCA Tier 2 Recreational SRV	MPCA Tier 2 Industrial SRV	MPCA Screening SLV
Metals	48	-	42	13	47
VOCs	48	-	2	1	24
PCBs	48	-	20	8	35
B(a)P equivalent	48	-	15	12	19
Other SVOCs	48	-	2	2	15
DRO	48	41	-	-	-
GRO	48	8	-	-	-

MPCA unregulated fill criteria regarding only DRO and GRO

Ash – Ash was observed only in the Dump during the investigation. Concentrations of vanadium were detected above the recreational SRV at all locations and above industrial SRVs at one sample location. Concentrations of vanadium were detected above background concentrations in five of the seven samples. Industrial SRVs, as well as background concentrations, were exceeded for arsenic in five of the seven samples. Manganese concentrations were detected above SLVs at all locations, but were below or within the background range at all locations. Iron concentrations were detected above Recreational SRV at all locations, but were also below or within the background range at all locations. DRO was detected at a concentration of 33.7 mg/kg in one sample. The benzo(a)pyrene (B(a)P)-equivalent concentration exceeded the Industrial SRV criteria at one location.

Native Sediment – Six samples of native sediment were collected during Phase A for laboratory analysis – two from the Landfill and four from the Dump (Table 5c). Arsenic, iron, manganese, and vanadium were detected above SLVs or SRVs at most locations, but the concentrations were below or within their background ranges. Boron was detected above SLVs at four locations. Benzene was detected above SLVs at three locations, while Bis(2-ethylhexyl)phthalate and PCBs were each detected above their SLV in one location and B(a)P equivalent was detected above its SLV and Recreational SRV at a different location. DRO concentrations were detected above 100 mg/kg at two locations. The four locations where concentrations exceeded criteria were all located at the Dump and were from native soils sitting below waste material. Criteria were not exceed in native sediment samples collected from the Landfill, which were all collected from locations outside of the waste footprint.

4.4.1 Analytical Results – Waste to Energy

Waste samples were collected during Phase B of the investigation for laboratory analysis of parameters associated with evaluating waste-to-energy potential. Three composite samples were collected. A composite sample of material from the entire waste interval was collected from each of the borings at MW-9D and MW-10D. The third sample was composited from material collected at eight of the cover soil evaluation boring locations (Table 2). The waste samples caloric value ranged from 580 to 1265 British thermal units per pound (BTUs/lb.), significantly lower than typical garbage being accepted for incineration. For example, typical "fresh" garbage heating values for MSW recently processed at Hennepin

Energy Recovery Center (HERC) have a caloric value ranging from 5,860 to 6,646 (BTU/lb) (see Barr Focused Feasibility Study).

4.4.2 Analytical Results – Crushed Bedrock

Bedrock samples were collected for laboratory analysis from wells MW-9D and MW-10D and the sample intervals were generally within 10 feet of the bedrock surface. Samples were delivered to the laboratory and crushed for the purpose of analysis. The reported manganese concentration of 1,500 mg/kg at location MW-10D exceeded the SLV and is slightly higher that the upper background range value of 1,284 mg/kg. The reported concentration of manganese from MW-9D and vanadium at both locations exceeded the SLV criteria but are within the background range.

4.4.3 Analytical Results – Soil Gas

Two soil gas samples were collected from boring locations at the Burnsville Storage property south of the Dump. The samples were submitted for laboratory analysis of VOCs. Several VOCs, including benzene, ethylbenzene, PCE, and trichloroethylene (TCE), were detected; however the concentrations were less than the MPCA's 33x Residential Intrusion Screening Values (ISVs). See Table 6.

5.0 Cover Soil Investigation

This section summarizes activities conducted to further characterize the cover soil present at the Site. The primary objective in collecting cover soil samples was to evaluate their potential for reuse as part of a remedial action.

5.1 Summary of Investigation Activities

Cover soil investigation boring locations were selected based on previous investigation activities. They were completed near previous locations in order to (a) verify the observations from previous borings and (b) target locations with adequate thickness. The locations were chosen to be spread across both the Landfill and Dump and to represent a range of cover soil thicknesses.

5.1.1 Soil Borings

Cover soil investigation borings were advanced with a direct-push, tracked drill rig, and soil samples were collected with a dual-tube or macro-core sampler. Soil borings were generally advanced to the top of waste. Soil borings were advanced at continuous vertical intervals from all locations. These samples were described in the field by a Barr geologist or environmental scientist in accordance with the Unified Soil Classification System. The samples were inspected by Barr for evidence of contamination such as staining, odors, discoloration, and/or sheen, and the observations were documented on the geologic log of each boring. Borings were sealed in accordance with Minnesota Department of Health rules. Locations of the borings are shown on Figure 7 and boring logs are presented in Appendix A. A summary of the cover soil borings is provided below:

Dump – Five soil borings were completed at the Dump. The borings were conducted near the locations of Phase A investigation locations FD-SB-A4, FD-SB-B1, FD-SB-C3, FD-SB-F2, FD-SB-G5 and were similarly named.

Landfill – Fourteen soil borings were completed at the Landfill. The borings were conducted near 2005 investigation (FES, 2005) locations so the approximate depth to waste was known. The borings at eight of the fourteen locations were advanced five to ten feet beyond the top of waste to facilitate collection of waste material samples (See Section 4.1.3).

5.1.2 Sample Collection

Soil samples from cover soil borings were collected and analyzed by Pace for the parameters listed in Table 1. Upon receipt of the laboratory analytical data, Barr performed a data quality review. A summary of the data quality review is included in Appendix E. The review concluded that all data met the data quality objectives of the project and are deemed acceptable for the purposes of this project, as qualified in the tables.

5.2 Summary of Investigation Results

The following subsections detail the results of the cover soil investigation conducted in the spring of 2019. A description of the cover soil fill material observed at the Dump and Landfill is included in Section 4.2.1.1.

Soil boring details are presented in the Soil Boring Matrix (Table 2).The four cover soil samples (FD-SB-G1, TS-SB-02, TS-SB-03, TS-SB-07) collected during Phase A are also included in this discussion of results.

5.2.1 Field Screening Results

As discussed above in Sections 4.2.2 and 4.2.3, field screening of the cover soil did not identify evidence such as staining, odors, discoloration, and/or sheen, with the exception of trace sheen and moderate odor observed in borings TS-SB-02 and TS-SB-05 (Transfer Station). Headspace readings were below 10.0 ppm.

5.2.2 Potential Reuse Criteria

The primary purpose of the cover soil investigation was to evaluate the cover soil's potential for reuse within the proposed remedial design. The appropriate criteria for comparison with analytical results will be dependent on the design alternatives and details. For the purpose of providing context and a potential set of criteria for comparison, the results of the soil cover investigation were compared to the MPCA *Best Management Practices for the Off-Site Reuse of Unregulated Fill* (Unregulated Fill: MPCA, 2012) and Dakota County Ordinance 110, Solid Waste Management. These criteria, which are likely more conservative than would be required based on future land use scenarios, are listed below:

- free from solid waste, debris, asbestos-containing material, visual staining, and chemical odor
- organic vapors less than 10 parts per million, as measured by a PID
- for petroleum-impacted soil, less than 100 mg/kg DRO/ GRO
- for contaminants detected in soil, less than the MPCA's SRVs and Tier 1 SLVs
    - Dakota County Ordinance 110 modifies the Lead criteria to less than 100 mg/kg

In addition to the Unregulated Fill and Dakota County criteria, analytical results are also compared to the MPCA Industrial and Recreational SRVs, as a potentially more appropriate criteria for future land use scenarios.

5.2.3 Analytical Results

Soil quality results are presented with comparison to the above-described criteria in Table 7. Generally, concentrations did not exceed any of the criteria with the following exceptions:

- The arsenic concentration of 75.1 mg/kg exceeded the Residential and Industrial SRVs (11 mg/kg and 20 mg/kg, respectively) at location FD-SB-C3. Arsenic concentrations also exceeded SLV at three locations (FD-SB-G5; FL-SB-02; FL-SB-08); however, these detections were below or within their background range as discussed in Section 4.3.
- The BaP-equivalent concentration exceeded the SLVs in samples collected from three locations (TS-SB-03, FD-SB-C3; FL-SB-07)
- Benzene concentrations exceeded the SLVs at one location (FL-SB-13)

- DRO was detected at every location; however, DRO concentrations exceeded 100 mg/kg (the Unregulated Fill guidance) at only 4 of the 23 locations (TS-SB-03, FD-SB-F2; FL-SB-03; FL-SB-13). DRO concentrations ranged from 3 to 458 mg/kg, and the mean concentration was 72 mg/kg.
- Lead was detected above 100 mg/kg at one location (TS-SB-03).

One or more reuse criteria were exceeded at 6 of the 23 sample locations. These sample locations were not grouped within a particular area of the Site, but, rather, appeared to be randomly distributed.

6.0 Groundwater Investigation

Groundwater monitoring has been periodically conducted at the Site dating back to the 1970s. Over that time, the well network, sampling details, and sample parameters have evolved. The purpose of this section is to summarize the current monitoring well network (which consists of wells conducted as part of this investigation as well as those installed historically), discuss the recent investigation activities, and summarize the results of the recent investigation activities. Previous groundwater monitoring results help inform the understanding of the Site, but the results are not included in the discussion in this section.

6.1 Monitoring Well Network

The monitoring well network consists of a total of 40 wells (including the wells installed during the Phase B investigation). The Monitoring Well Network Matrix (Table 8) provides construction details for the well network. The monitoring well locations are shown in Figure 8. For the purpose of discussion and interpretation, the wells are organized into the following three groupings:

Perched – These wells are screened at depths where water or leachate was encountered above the groundwater table. Typically the bottom of the well screens sit on the top of the bedrock surface or at the bottom of waste. These wells vary somewhat, but generally have low well volumes and recharge capacity.

Water Table – These wells within the monitoring well network are screened across the groundwater table with the exception of WT-9 and WT-10. Typically the water table at the Site is in fractured Prairie du Chien bedrock and therefore most of the water table wells were constructed as open borehole bedrock monitoring wells (some were constructed with screen and sandpack due to hole collapse). The newly installed wells (MW-11, MW-12, and MW-13) located at the northern portion of the Landfill were constructed with a screen and sandpack as the water table is present in unconsolidated material in this area.

Jordan – There are three wells on the Landfill that are constructed as open borehole bedrock monitoring wells in the Jordan formation which underlies the Prairie du Chien. The open-hole sections of these wells are generally at depths of approximately 160 to 220 feet below ground surface.

Although the monitoring wells are separated into three different groups for the purpose of discussion and comparison of results, it is important to note that these are not separate aquifer units. The Prairie du Chien and Jordan formations are hydraulically interconnected, as are the perched zones with the water table. The only continuous confining layer identified in the area is the St. Lawrence Formation, which underlies the Jordan and has not been studied as part of monitoring activities conducted at the Site.

6.1.1 Existing Monitoring Wells

Thirty of the forty monitoring wells that comprise the network were installed prior to Phase B, as summarized below. The following paragraphs reference wells that are no longer present; however, only

the wells that remain on-Site are included in the total count of wells and in the well construction summary (Table 8).

Landfill – From 1977 to 1983, eight water table monitoring wells (WT-1 through WT-8) and one bedrock monitoring well (J-1) were installed at the Landfill. Of these wells, only WT-6 and J-1 remain. WT-6 was modified when the Transfer Station was built (the riser pipe was raised approximately 10 feet). Around 1986 it was observed that WT-7 and WT-8 (located on the south property edge) were dry, likely due to drawdown from increased pumping at Kraemer Quarry. An additional four wells (WT-9 to WT-12B) were subsequently installed in 1987 and then in 1990 four additional wells (WT-13 and WT-14, J-13 and J-14) were installed. Additionally, in 1993 landfill gas wells were installed. One of these wells (MP-8) is located near the nested pair WT-13 and J-13. Although this well was constructed dry and for the purpose of landfill gas monitoring, it has since been observed to accumulate perched groundwater. Because the log indicates its construction is the same as a typical monitoring well would be, it is included here as part of the monitoring well network.

In 2015 the MPCA installed an additional 10 monitoring wells at the Landfill. Eight of these wells MW-1 to MW-8) are screened in the perched groundwater/leachate, while the other two (MW-4D and MW-8D) are screened across the water table in the Prairie du Chien.

Dump – Two monitoring wells were installed in 1990, of which only OFMW-1 remains. This well is screened across the water table in unconsolidated native material. An additional nine monitoring wells (MW-97-1 to MW-97-9) were installed by the MPCA in 1997. These wells are all Prairie du Chien water table wells. All are constructed as open borehole monitoring wells, with the exception of MW-97-8 which needed to be constructed with a 2-inch screen due to borehole collapse. The nine monitoring wells were located around the perimeter of the Dump.

6.2 Summary of Investigation Activities

Previous investigations at the Landfill and Dump provided data with respect to the groundwater characterization; however, most of these investigations were conducted over twenty years ago and were somewhat limited in scope. Additional monitoring wells were installed as part of the investigation to add to the monitoring well network and gain a more complete understanding of the current groundwater conditions. Recent groundwater investigation activities occurred during the spring of 2019 and included:

- Installation of four shallow monitoring wells at the Dump
- Installation of four shallow monitoring wells at the Landfill (one as a nested pair with a bedrock monitoring well)
- Installation of two bedrock monitoring wells at the Landfill
- Collection of one round of samples from monitoring wells
- Completion of two synoptic groundwater elevation measurement events

- Collection of other physical and geophysical data, as described in Section 6.2.2 and 6.2.3

6.2.1 Monitoring Well Installation

Monitoring wells were installed using several different methods, depending on the geology in which the well was to be set. The following paragraphs provide the well installation details for each method.

Direct-Push / Hollow Stem Auger

Soil borings were first advanced with a direct-push, tracked drill rig, and soil samples were collected with a dual-tube or macro-core sampler to log the lithology prior to the installation of shallow monitoring wells. Soil samples were collected from continuous vertical intervals. These samples were logged in the field by a Barr geologist or environmental scientist as described in Section 4.1.1. Boring logs are provided in Appendix A. Monitoring wells were then installed via hollow-stemmed auger drilling and were constructed using 2 inch diameter, Schedule 40 polyvinyl chloride (PVC) well screens (No. 10 slotted) and risers. Wells were constructed in accordance with MDH Groundwater Monitoring Well Requirements. Well construction details are provided in Table 8. Shallow monitoring wells installed at the Site are described below:

Dump – Four monitoring wells were installed via hollow-stem auger on the north side of the Dump (Figure 2). Two of the locations are on the property owned by the Site Owner, while the other two are located on a neighboring property owned by Northern States Power Company. Because of flood conditions occurring during installation, two of the wells (MW-19-03 and MW-19-04) were completed with 20 feet well screens rather than the planned 10 foot well screens. The 20 foot screens were installed to comply with MDH monitoring well installation requirements that do not allow for threaded riser pipe connections below the observed groundwater level.

Landfill - Three monitoring wells (MW-11 to MW-13) were installed via hollow-stem auger on the north side of the Landfill (Figure 3).

One other shallow monitoring well (MW-9) was installed via hollow-stem auger on the south side of the Landfill as a nested pair with a bedrock monitoring well (MW-9D, discussed below). Another shallow monitoring well was planned as a nested pair with bedrock monitoring well MW-10D; however, this well was not installed because there was no evidence of perched water during the drilling of MW-10D.

Rotasonic and Diamond Core

Two soil/rock borings were advanced and monitoring wells (MW-9D and MW-10D) were installed at the Landfill. Borings were advanced using Rotasonic (sonic) drilling technology to provide continuous soil samples for the planned bedrock monitoring wells. Sonic drilling uses dual line threaded drill pipe with an inner core barrel and an outer sonic drill casing. The sample is extruded from the core barrel in to plastic sleeves where it can be logged, field screened, and analyzed. From ground surface to the top of competent bedrock, continuous soil core samples were collected in accordance with ASTM D-6914-04e1 *Standard Practice for Sonic Drilling for Site Characterization*.

From top of competent bedrock to the bottom of the borehole, diamond core drilling was conducted with 2.5-inch inner diameter core barrels. The rock cores were continuously recovered and logged for geologic classification and fracture density using rock quality designation (RQD) (ASTM D6032 - 08). Core recovery and RQD were calculated by summing the total core recovery, the solid core recovery and the modified core recovery as described in ASTM D6032-08. The rock type, field strength, color, texture, structure, decomposition, disintegration, fracture density and stratigraphic contacts were described for the core. Fractures were described noting the depth, type, apparent dip angle, aperture, healing, infilling, unevenness and moisture. Drillers provided any observations related to rod drops, water loss and relative coring rate to enhance the field geologist's notes as related to the potential presence of fractures. Boring logs are included as Appendix A. All cores were photographed with depth and boring location identification.

MW-9D – The borehole was advanced to 31 feet bgs by rotasonic boring with diamond core drilling from 31 to 78 feet bgs. RQD values range from very poor to good within the diamond cored interval, though generally the RQD values were fair. The casing is set to a depth of 45 feet bgs and the open borehole extends to a depth of 83 feet bgs (the borehole was advanced by rotasonic from 78 to 83 feet bgs).

MW-10D – The borehole was advanced to 31 feet bgs by rotasonic boring with diamond core drilling from 31 to 88 feet bgs. RQD values range from poor to excellent within the diamond cored interval, though generally the RQD values were fair to good. The casing is set to a depth of 66.5 feet bgs and the open borehole extends to a depth of 88 feet bgs.

Well Development

The new monitoring wells were developed after a minimum of 24 hours following grout installation in accordance with the Minnesota Well Code. Well development was conducted by surging and over-pumping. For the bedrock monitoring wells and some of the shallow wells, the development process continued until a nearly sediment-free well was obtained. Monitoring well MW-9 was observed to have very little water (less than 1 foot) and was not developed.

6.2.2 Physical Site Data Collection

The following section includes descriptions of the surveying data, groundwater level measurements, and river level measurements.

6.2.2.1 Surveying

Final locations of all soil borings, test excavations, monitoring wells, and any other important features noted during the field investigation were surveyed using a hand-held GPS device. The horizontal coordinates of each investigation location were surveyed by GPS to the nearest 1 foot, and referenced to the Universal Transverse Mercator (UTM) coordinate grid system North American Datum (NAD)-83.

Due to the delayed schedule of the investigation and complications with flooded river conditions, an elevation survey has not yet be completed. The elevations of newly installed and some existing monitoring wells will be surveyed to an accuracy of 0.1 feet and will be referenced to the NAVD of 1988.

The elevation survey of the monitoring well network will be conducted by a licensed surveyor contracted by the MPCA.

For the purpose of this report, the ground surface elevations of well locations that have not yet been surveyed are approximated based off of existing topographic information (Light Detection and Ranging, LIDAR) and the riser elevations are approximated based on LIDAR and well construction log detail. In addition, the ground surface elevation of soil boring and test excavation locations will not be surveyed but are approximated based off of LIDAR.

6.2.2.2 Groundwater Level Measurements

Groundwater levels were measured in monitoring wells during the spring of 2019. A summary of groundwater level measurements is provided in Tables 9a and 9b. Two synoptic rounds of groundwater level measurements were conducted on April 9, 2019 and June 17, 2019. The Minnesota River stage (at Savage MN, approximately 1 mile upstream) was approximately 708 feet MSL which is between the minor flood stage (702 feet MSL) and moderate flood stage (710 feet MSL) during the April 9 measurement and therefore a number of wells were inaccessible. During the June 17 measurement, the Minnesota River Stage at Savage, MN was approximately 699 feet MSL which is between the action stage (697 feet MSL) and the minor flood stage. Only one well (J-1) was inaccessible on June 17. Groundwater levels were also recorded by Pace when samples were collected for laboratory analysis. Groundwater levels from the synoptic measurements are presented on the groundwater contour figures (Figures 9 to 11)

6.2.2.3 River Level Measurements

The nearest measurement gauge on the Minnesota River is located in Savage, MN approximately 1.5 miles upstream from the northwest corner of the Landfill. River elevation data was obtained from the US Army Corps of Engineers, St. Paul Division and is presented in Appendix F along with monthly precipitation data. Precipitation data was obtained from the Minnesota State Climatology Office website.

6.2.3 Geophysical Surveys

Minnesota Geologic Survey (MGS) conducted geophysical surveys at several wells at the Landfill. The surveys generally consisted of video, gamma, caliper, and multi-tool logging. MGS performed the downhole surveys at monitoring wells WT-11B, WT-13, J-13, WT-14, and J-14. MGS performed the surveys for their own purposes and Barr reviewed the logs to assess if discrete fracture zones that distorted groundwater flow could be easily identified that might warrant discrete interval sampling in the open borehole wells. It was decided that discrete interval sampling would not be pursued, however further analysis of the survey data will be conducted as part of the ongoing groundwater investigation.

6.2.4 Sample Collection

Groundwater samples were collected for laboratory analysis by (Pace. The sample parameter lists are included in Table 1. Samples were analyzed at Pace for all of the parameters listed, with the exception of a select group of groundwater sample parameters that were analyzed at MDHs laboratory. Laboratories were selected by MPCA from a list of state-contract laboratories or other state agency laboratories.

Upon receipt of the laboratory analytical data, Barr performed a data quality review. A summary of the data quality review is included in Appendix E. The review concluded that all data met the data quality objectives of the project and are deemed acceptable for the purposes of this project, as qualified in the tables.

Phase A – During Phase A of the investigation (2018) groundwater samples were collect from temporary wells in select borings and also from test excavations were groundwater was observed. Groundwater samples were collected from the borings using 1" PVC screen and riser. New screens and risers were used at each sample location. A peristaltic pump was used to recover the sample from the temporary wells. Purging was not conducted prior to sample collection due to the limited volume and recharge observe. Samples were generally turbid due to this lack of purging. If water was encountered in a test excavation, a sample was collected using surface water sampling techniques, which generally included filling a laboratory-cleaned container by lowering it into the water that had infiltrated the excavation. The sample was then transferred into the appropriate laboratory-provided sample container.

Phase B – During Phase B (2019) of the investigation groundwater samples were collected from the existing and newly installed monitoring wells at the Site. Due to flood conditions, sampling was not conducted at three locations (J-1, WT-9, and WT-10), and at multiple locations sampling was delayed to allow for flood waters to recede sufficiently. No sample was collected from WT-12B because the sampling crew was unable to locate the well (the well was eventually located during the water level measuring event on June 17). Wells were sampled in accordance with procedures detailed in the QAPP.

In addition to samples collected from the monitoring wells, a groundwater sample was also collected from a seep located downgradient from the Landfill at Kraemer Quarry. A sample was also collected on the discharge water from the quarry's pumping operations.

6.2.5 Investigation Derived Waste

Investigation derived waste (IDW), including soil cuttings from well construction activities and purge water from well development and sampling, was containerized in 55-gallon steel drums. Solid and liquid waste streams were containerized separately. The waste was profiled as similar to the IDW disposed of during the 2015 well installation at the Landfill. Clean Harbors collected IDW generated as part of the Phase B investigation and hauled it off Site for disposal on June 24, 2019.

6.3 Summary of Analytical Results

As discussed above, groundwater samples were collected during Phase A from temporary wells and test excavations and during Phase B from monitoring wells and the groundwater seep. Groundwater samples were compared to drinking water and surface water standards as there is potential risk for migration to both well receptors and surface water receptors. MPCA surface water standards for both chronic and acute exposure were used for comparison. These standards are dependent on the hardness of the receiving surface water body, therefore a hardness value of 360 mg/L was estimated for the Minnesota River. Drinking water standards used for comparison were the EPA's maximum contaminant levels (MCLs)

and the MDH health risk limits (HRLs). The following discussion of analytical results is separated into three groups; perched, water table, and Jordan, similar to the monitoring well network (Table 8).

During Phase A of the investigation, the analytical parameter list covered a large range and, as would be expected from groundwater in contact with waste material, concentrations of a number of parameters were above drinking water and surface water criteria. The parameter list selected for Phase B of the investigation was reduced to only include parameters that exceeded relevant criteria during Phase A. Results from Phase A of the investigation are summarized in the *Phase A Investigation Report* (Barr, 2018) and exceedances are presented in Table 10 of this report for reference. Because data collected from permanent monitoring wells is typically more reliable than data collected from temporary wells or test excavations, the majority of this section is focused on the results from Phase B of the investigation. The exceedances above drinking water and surface water criteria for groundwater samples collected from the monitoring well network are presented in Table 11.

Perched – Sample locations and monitoring wells included in the perched group include the Phase A temporary well locations at the Dump and Landfill; test excavation locations at the Dump; 2015 MPCA-installed monitoring wells (MW-1 to MW-8), and former landfill gas monitoring well MP-8 at the Landfill; and the newly installed monitoring wells (MW-19-01 to MW-19-04) at the Dump.

Generally the results from perched wells installed during Phase B were similar to the results collected during Phase A. Analytical results from the perched groundwater samples collected during Phase B are summarized below:

General Parameters – Concentrations of nitrogen (ammonia, as N) were observed in 6 of 7 perched wells (MW-3 and MW-9 were not sampled for ammonia due to insufficient sample volume) at the Landfill ranging from 0.47 to 621 milligrams per liter (mg/l) and at all four perched wells at the Dump ranging from 0.4 to 20.2 mg/l, exceeding the chronic surface water standard of 0.04 mg/l. Concentrations of chloride exceeding the chronic surface water standard of 230 mg/l were not detected in wells at the Dump, but were detected in 4 of 8 wells (MW-9 was not sampled for chloride due to insufficient sample volume)at the Landfill ranging from 1,070 to 1,240 mg/l. Cyanide concentrations exceeded the chronic surface water standard of 5.2 µg/l at one Landfill well and two Dump wells.

Metals –More than ten metals exceeded drinking water and/or surface water criteria in the 2019 sample collected from MW-1. At the remaining wells, concentrations of metals above criteria were widespread, but the specific metals were generally sporadic. Boron and manganese were most commonly detected at concentrations above drinking water standards. Cobalt concentrations were detected above surface water standards at four wells at the Landfill, but none at the Dump. Hexavalent chromium concentrations were also detected above surface water standards at one Dump and five Landfill locations, with two locations at the Landfill exceeding drinking water standards.

VOCs –Fifteen VOC analyte concentrations were detected above drinking water and/or surface water standards at MW-1. Other than detections at MW-1, benzene concentrations were detected above

surface water and/or drinking water standards at two Dump and six Landfill locations. Vinyl chloride (VC) concentrations were detected both drinking water and chronic surface water standards at one well at both the Dump and Landfill. TCE concentrations were detected above the HRL at one location at the Dump.

1,4 Dioxane - Concentrations of 1,4 Dioxane were observed in 5 of 7 perched wells at the Landfill ranging from 4.2 to 110 µg/l and 3 of the 4 perched wells at the Dump ranging from 3.4 to 13 µg/l, exceeding the chronic surface water standard of 1.0 µg/l.

PFAS- Per- and polyfluoroalkyl substances (PFAS) concentrations were detected at all perched well locations at the Dump and Landfill, with the exception of MP-8. The most common compounds with exceedances were Perfluorohexane sulfonate (PFHxS), Perfluorooctanesulfonate (PFOS), and Perfluorooctanoic acid (PFOA). With the exception of MP-8, the concentrations of these compounds were one to two orders of magnitude higher than the MDH human health based drinking water standard.

Water Table – Sample locations and monitoring wells included in the water table group include the Phase A test excavation locations at the Landfill; newly installed bedrock wells (MW-9D and 10D), 2015 MPCA installed monitoring wells (MW-4D and MW-8D), and existing wells WT-6 to WT-14 at the Landfill; the seep sample collected from Kraemer Quarry; and the existing monitoring wells (MW-97-1 to MW-97-9; OFMW-1) at the Dump. Analytical results from the water table groundwater samples collected during Phase B are summarized below:

General Parameters – Concentrations of nitrogen (ammonia, as N) were observed in all 11 water table wells at the Landfill ranging from 0.14 to 84.9 mg/l and at 7 of 9 water table wells at the Dump ranging from 0.12 to 5.3 mg/l, exceeding the chronic surface water standard of 0.04 mg/l. Concentrations of chloride exceeding the chronic surface water standard of 230 mg/l were detected in 3 of 11 wells at the Landfill ranging from 240 to 501 mg/l and at 3 of 4 wells at the Dump ranging from 272 to 291 mg/l. Cyanide concentrations exceeded the chronic surface water standard of 5.2 µg/l at two Landfill wells.

Metals – Similar to the perched wells, metals concentrations in excess of criteria in samples collected from water table wells of metals above criteria were widespread, but the specific metals were generally sporadic. Boron and manganese were most commonly detected at concentrations above drinking water standards. Cobalt concentrations were detected above surface water standards at eight wells at the Landfill, and five wells at the Dump.

VOCs – No VOC concentrations from samples collected at water table wells were detected above drinking water and/or surface water standards with the exception of vinyl chloride detected above the EPA maximum contaminant level (MCL) at MW-8D.

1,4-Dioxane - Concentrations of 1,4-Dioxane were observed in 8 of 11 water table wells at the Landfill ranging from 1.2 to 40 µg/l exceeding the chronic surface water standard of 1.0 µg/l. The

concentration of 1,4 Dioxane detected in the seep samples was 19 µg/l. No concentrations exceeded criteria at the Dump wells.

PFAS - PFAS concentrations were detected at nearly all water table well locations at the Dump and Landfill (and the seep sample), with the exception of MW-97-2, MW-97-3, and MW-97-4. Similar to the perched wells, the most common compounds with exceedances were, PFOS, and PFOA. Generally the concentrations of these compounds were one order of magnitude higher or less than the MDH human health based drinking water standard.

Jordan – There are three monitoring wells located at the Landfill that have open borehole screens in the Jordan formation. Due to flood conditions, J-1 was unable to be sampled in 2019. Concentrations from samples collected at J-13 and J-14 that exceeded surface water and/or drinking water criteria were limited to nitrogen (ammonia, as N), ranging from 0.21 to 0.30 mg/l at both locations and 1,4 Dioxane at J-14 (3.3 µg/l).

7.0 Conceptual Site Model

A generalized conceptual site model is presented in the following paragraphs. Because the investigations completed to date have been focused, the conceptual site model that has been developed is similarly focused. The following paragraphs discuss the extent of waste as well as the geologic and hydrogeologic conditions at the Site.

7.1 Waste Material Type and Extent

The approximate extent of waste is depicted on Figures 4 and 5. The delineation of waste is detailed in Section 4.3. The following paragraphs provide a brief overview of the type and extent of waste associated with the Dump and Landfill.

7.1.1 Freeway Dump

The extent of waste material associated with the Dump appears to extend beyond the property boundaries in all directions, as detailed in Section 4.3. Waste material at the Dump, which includes MSW/CD and ash, was observed to be between 10 and 30 feet thick within the Dump boundary, and between 5 and 10 feet thick in locations where waste material was identified south of the perimeter of the Dump in Phase B of the Investigation (Figure 4).

7.1.2 Freeway Landfill

At the Landfill, waste appears to be generally contained to property owned by the Site Owner, except for some waste material that extends off-Site to the north. Waste material that extends off-Site to the north appeared to more similar to construction debris than MSW.

Generally, waste material encountered at the Landfill consisted of MSW/CD, with a slightly higher percentage of construction debris compared to the Dump. Waste material encountered during Phase B of this investigation was observed from 6 to 15 feet thick, with an average waste thickness of about 13 feet. Data from a 2005 investigation indicate that waste material was commonly observed between 15 and 25 feet thick in the center portion of the landfill, and was observed to be as much as 49 feet thick (FES, 2005).

At the Transfer Station, no waste material was observed at borings completed through the floor of the operations building. Waste material was observed at every other boring location surrounding the operations building that was completed during the 2018 investigation. Therefore, it appears likely that waste material extends throughout the Transfer Station area, with the exception of directly under the buildings and, possibly, the weighing stations.

7.2 Geology

Subsurface conditions at the Dump and Landfill generally consist of a thin layer of top soil overlaying non-native fill material overlaying waste, overlaying native sediments and/or bedrock. A description of these layers and detailed investigation observations are included in Section 4.2.

7.2.1 Freeway Dump

Fill materials were observed on top of waste material. The waste material overlays native sediment and/or bedrock. Bedrock generally slopes downward to the north edge of the property towards the Minnesota River, as shown on Figures 6A and 6D. Available information indicates no liner is present under the waste material.

7.2.2 Freeway Landfill

Fill materials were observed on top of waste material. The waste material overlays native sediment and/or bedrock. The uppermost bedrock beneath the Landfill is a sandy dolostone of the Prairie du Chien Group. The bedrock elevation is generally higher in the south, and sloping down to the north towards the Minnesota River, as displayed in Figures 6E and 6F.

7.3 Hydrogeology

The hydrogeologic setting at the Site is unique in that the current condition is heavily influenced by industrial pumping in the area, which has a significant impact on current and future risks. The following paragraphs provide a discussion of current and anticipated future conditions (after dewatering ceases).

7.3.1 Current Conditions

The Site is located in close proximity to the Minnesota River channel. The Minnesota River is a regional groundwater discharge zone. Wetlands are adjacent to the north and east sides of the Dump. The Black Dog Preserve Calcareous Fen is to the east of the Dump. The water table in the vicinity of the Site is generally present in unconsolidated materials above the bedrock or in the uppermost bedrock. The waste in the dump is in contact with the bedrock and water table in some areas.

The uppermost bedrock beneath the Site is the Prairie du Chien Group. Immediately below the Prairie du Chien is the Jordan Sandstone. The Prairie du Chien and Jordan are hydraulically interconnected and are the two most utilized and productive aquifers in the Twin Cities metropolitan area. Groundwater flow in the Prairie du Chien Group is dominated by secondary porosity features (fractures and dissolution voids). Previous investigations indicate that hydraulic conductivities range from approximately 16 feet per day (ft/d) to 1,530 ft/d within the upper Prairie du Chien (Leisch, 1991). Rock coring and downhole geophysical survey observations did not identify discrete fracture zones that distorted groundwater flow. Groundwater flow is through secondary porosity features; however, at the scale of 10's of feet or greater, groundwater flow behaves as equivalent porous media with higher conductivity zones representative of higher fracture density and lower conductivity zones representative of lower fracture density.

Under natural conditions, groundwater in the Prairie du Chien and Jordan would discharge to the Minnesota River. However the flow patterns are influenced currently by dewatering operations at the Kraemer Quarry located approximately 1,000 feet west of the Dump and immediately south and southwest of the Landfill. Groundwater pumping at the quarry produces a cone of depression causing the local flow to generally move toward the quarry sump away from the river.

This is most apparent at the Landfill where the groundwater table in the Prairie du Chien under the Landfill flows directly southwest toward the quarry sump with an approximate hydraulic gradient of 0.25 feet per feet (ft/ft). It is possible that to the north of the Landfill near the river there is a groundwater divide. The newly installed monitoring wells (MW-11, MW-12, and MW-13) were measured with water levels higher than the river elevation. However water levels measured directly after the wells' installation in 2019 were during flood conditions and therefore additional monitoring is warranted.

At the Dump the groundwater flow appears less influenced by the dewatering at the quarry. Flow direction appears to be to the northwest based on the June 2019 groundwater level measurements with an approximate hydraulic gradient of 0.01 ft/ft.

7.3.2 Future Conditions

In 2015, Barr conducted groundwater model simulations to estimate future groundwater conditions near the Landfill that are anticipated when the quarry ceases operation and discontinues dewatering pumping. In general, the previous modeling effort indicated that groundwater elevations will rise creating a quarry lake after the Kraemer Quarry operations cease and that the shallow water table will intercept the waste in the Landfill in some areas. The model predicted that flow under the Landfill would flow in multiple directions, both toward the Minnesota River and the future quarry lake. The implications of the predicted future groundwater condition are discussed in Section 8.2.

8.0 Potential Receptors and Pathways

The presence of waste in unlined facilities has the potential for negative impacts on human health and the environment. The following paragraphs provide a preliminary summary of some of the receptors and pathways that may be affected by the presence of the waste materials, both under current and predicted future scenarios.

8.1 Direct Contact

Freeway Dump currently operates as a recreational facility (golf driving range). On the south end is a gravel parking lot. The majority of the land surface is vegetated by grass. Along the east, north and west edges the vegetation includes scrubs and the south edge is wooded. Cover soil is present over the waste material, but was observed in some locations at thicknesses of less than one foot. A metal chain link fence runs along Interstate 35W and between the Dump and Burnsville Storage to the south. The Dump is accessible to pedestrian and vehicular traffic.

Freeway Landfill is similarly vegetated with grasses over the majority of the land surface and the edges of the property having scrubs or wooded vegetative cover. The Landfill is no longer operational, however the Transfer Station is operational and access roads through the Landfill are utilized as well as lay-down areas in the northern portion of the Landfill. Cover soil is present over the waste material and was observed at thickness of 2 feet or greater. The Landfill is also accessible to pedestrian and vehicular traffic.

8.2 Vapor

Elevated methane concentrations were detected throughout all portions of the Site. Any current buildings, including the Transfer Station and the driving range office, may be exposed to methane or other landfill gases. Similarly, future buildings located near the Dump or Landfill may be potentially be exposed to elevated concentrations of landfill gases.

A limited sample set of soil gas samples was collected beyond the waste extent boundary on the Burnsville Storage property. These samples were collected within 20 feet of buried waste material and did not exceed the attenuated 33X ISV reference standards. Additional sampling may be required for future buildings constructed beyond but near the waste extend boundary.

8.3 Groundwater

Because of a lack of liner at both facilities, waste is directly in contact with perched groundwater in portions of both the Dump and Landfill. Perched groundwater samples collected during the 2018 and 2019 investigations exhibited concentrations of various constituents that exceed drinking water and surface criteria as discussed in Section 6.3.

The newly installed wells at the Dump, assumed to be screened in the perched groundwater, have only been monitored during flood conditions and their connection to the water table is still being evaluated; however, it is assumed that there would be somewhat disrupted downward gradient between the two. This is also true of the water table wells at the Landfill, where the connection is evident from the results of

groundwater samples, where similar constituents, such as PFAS, metals, and 1,4 Dioxane have concentrations in both groups of wells exceeding comparison criteria. The City of Burnsville utilizes a surface water feature within the Kraemer Quarry as a drinking water supply. The City also operates water supply wells that are open to the Jordan Sandstone and are located approximately one-third of a mile to the southeast of the Dump. With the current pumping at the quarry influencing the groundwater flow the current risk of contaminant migration to these receptors is low.

8.4 Surface Water

Freeway Dump is bounded to the north and east by a wetland which lies between the Dump and the Minnesota River. The Minnesota River is directly north of the Landfill. An intermittent water course that flows to the river runs along the east side of the Landfill. A majority of the Dump is elevated above the 100-year flood plain of the Minnesota River. The same is true of the Landfill with the exception of the northern area.

There is potential risk of seepage from the Dump to the north into the wetland and from the Landfill to the north into the Minnesota River. The newly installed monitoring wells on the north side of the Landfill are defined as water table wells and show groundwater in direct contact with waste. Sampling results from this group have yet to be received. Because the new wells were installed and sampled during a flood event (similar to the new wells at the Dump), it is too early to make conclusions about the hydrogeolgoic conditions and connection with surface water in this area.

8.5 Anticipated Future Conditions - Post Quarry Operations

In 2015, Barr conducted groundwater model simulations to estimate future groundwater conditions near the Landfill that are anticipated when the quarry ceases operation and dewatering is discontinued. In general, the previous modeling effort indicated that groundwater elevations will rise creating a quarry lake after the Kraemer Quarry operations cease and that the shallow water table will intercept the waste in the Landfill in some areas. Modeling of contamination migration indicated that there is potential risk to impact the surface water receptor of the Minnesota River and future quarry lake.

The first model (Barr, 2015a) evaluated the percent of waste area in the Landfill that would be saturated with varying water levels in the quarry lake. For all these simulations, the water table rises above the bottom of the waste somewhere within the footprint of waste at the Landfill. At the lowest simulated pit lake stage (672.6 feet MSL) the water table rises into the waste for between 9 and 12 percent of the waste (by area) even though the pit lake stage is lower than the minimum recorded river stage. At the highest simulated pit lake stage (698.8 feet MSL) the water table rises into the waste for between 75 and 85 percent of the waste (by area).

Additional modeling was conducted by Barr in the fall of 2015 (Barr, 2015b) after MPCA had installed the shallow groundwater wells at the Landfill (MW-1 to MW-8), which were screened in the perched zone and represented source concentration of contamination in groundwater. The modeling involves simulations of contaminant transport associated with contaminants leaching from waste to shallow groundwater and

migrating towards the Minnesota River and a future pit-lake that will form when dewatering ceases at the Kraemer Quarry.

Contaminants of concern evaluated in the transport simulations included selected metals and PFOA during the average condition with the pit-lake stage at an elevation of 690 feet MSL and during a 100-year flood. The results of the model showed that groundwater discharging to either the pit-lake or river exceeds water quality standards for chromium, cobalt, chloride, antimony, arsenic, cadmium, iron, lead, manganese, mercury, nickel, zinc, and PFOA.

9.0 Conclusions and Recommendations

The focused RI was completed to characterize the waste material at the Site and to evaluate potential risk to current or likely future receptors. The focused RI was completed in support of potential future remedial design. The focused RI included a review of Site background information and the results of the recent investigation on the Site and its surrounding properties.

9.1 Waste Material Investigation

The delineation of the extent of waste material present at the Site has been refined through the recent investigation activities. Neither the Dump nor Landfill were constructed as lined facilities and the waste material directly overlays native sediments or bedrock. The waste was observed in direct contact with perched groundwater. Concentrations of several contaminants, notably PFAS, 1,4 Dioxane, and metals were detected above drinking water or surface water standards in perched groundwater samples. Exceedances of these contaminants was likewise observed in results from samples collected in water table wells, demonstrating potential for contamination migration.

Based on the existing and anticipated conditions outlined above, the MPCA has determined that additional waste management efforts are needed for the Freeway Landfill and Dump. A Focused Feasibility Study is being developed to assess a range of alternatives to address containment and/or treatment of the waste. The focused RI's purpose was primarily to inform the development of a remedial design. At this time no future waste material investigation tasks are recommended.

9.2 Groundwater Investigation

Potential wider concerns for current or future groundwater conditions are beyond the scope of the focused RI, but it is recognized that improved waste containment or removal from the Site will be an important source control/removal component when wider risk pathways are evaluated and addressed. Groundwater investigation activities were conducted during this focused RI, however additional tasks are recommended. These tasks include:

- Elevation survey of newly installed monitoring wells (and select existing monitoring wells without current elevation data) conducted by Minnesota Department of Natural Resources (MDNR).
- At least one additional round of groundwater samples collected from the entire monitoring well network.
- Multiple synoptic rounds of groundwater level measurements from the entire monitoring well network.

Following the completion of the recommended tasks, a supplemental RI report may be needed to further evaluate the current and future groundwater conditions at the Site.

10.0 References

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Tables

Table 1

LABORATORY ANALYTICAL PARAMETER LIST
Focused Remedial Investigation Report
Freeway Landfill and Dump
Burnsville, Minnesota

Parameter	Method	Phase A Investigation	Phase B		
			Ground water	Cover Soil	Crushed Rock
GROUNDWATER					
General Parameters					
Biochemical Oxygen Demand (5-day)	HACH 10360	X			
Bromate, Chlorite	EPA 300.1	X			
Chloride	EPA 300.00	X	X		
Chlorine dioxide	SM4500ClO2	X			
Cyanide, Total	SM 4500CNE	X	X		
Cyanide, Free	SM 4500C1G	X	X		
Fluoride	EPA 300.0	X			
Hardness, as CaCO3	SM 2340B	X	X		
Nitrogen, ammonia, as N	EPA 350.1	X	X		
Nitrogen: nitrate + nitrite, as N; nitrate, as N; nitrite, as N	EPA 353.2	X			
Nitrogen, unionized ammonia, as N	EPA 350.1 Calc	X	X		
Oil and Grease	EPA 1664A OG	X			
pH	SM 4500H+B	X			
Phosphorus, total, as P	SM 4500PE	X			
Solids, total suspended	SM 2540D	X			
Turbidity	EPA 180.1	X			
Metals					
Full list	EPA 200.7	X	X		
Full list	EPA 200.8	X	X		
Chromium, trivalent	calculated	X			
Chromium, hexavalent	SM3500CRB	X	X		
Mercury	EPA 245.1	X			
SVOCs	EPA 8270D	X	X		
VOCs	EPA 8260 LL/SIM	X	X		
1,4-Dioxane	EPA 8270 SIM	X	X		
DBCP & EDB	EPA 8011	X			
Acrylamide	EPA 8316	X			
Ethylene glycol, Methyl alcohol	EPA 8015 PII	X			
Formaldehyde	EPA 8315 A	X			
Trihalomethanes, total (TTHMMss)	EPA 524.2	X			
Haloacetic Acids	EPA 552.3	X			
Herbicides / Pesticides					
Organochlorine Pesticides	EPA 8081B	X			
Herbicides, 10 Compounds	EPA 8151 MDA List II	X	X		
Pesticides, 17 Compounds	MDA List 1 (8270 Pest)	X	X		
Diquat	EPA 549.2	X			
Aldicarb, Carbofuran	EPA 531.1	X			
Endothall	EPA 548.1	X			
PCBs	EPA 8082A	X	X		
Dioxins / Furans	EPA 1613B	X			

Table 1

LABORATORY ANALYTICAL PARAMETER LIST
Focused Remedial Investigation Report
Freeway Landfill and Dump
Burnsville, Minnesota

Parameter	Method	Phase A Investigation	Phase B		
			Ground water	Cover Soil	Crushed Rock
GROUNDWATER					
PFCs	EPA 537	X	X		
Radiochemical					
Gross Alpha, Gross Beta	EPA 900.0	X	X		
Glyphosate	EPA 547	X			
Radium 226	EPA 903.1	X			
Radium 228	EPA 904.0	X			
Radium, total	EPA 903.0	X			
SOLID MATERIAL					
Metals					
Full list	EPA 6010	X		X	X
Full list	EPA 6020	X		X	X
Chromium VI	EPA 7196A	X			X
Copper Cyanide Test as Total Cyanide	EPA 9012	X			
Fluoride, test as Total Fluoride	EPA 9056A	X			
Mercury	EPA 7471	X		X	
Methyl Mercury	EPA 1630	X			
Dioxins 2,3,7,8 TCDD*	EPA 8290	X			
Pesticides (DDT, DDE, DDD, etc)	EPA 8081B	X			
Herbicides	MDA List II	X			
PCBs	EPA 8082A	X			X
PAHs (standard list)	EPA 8270D SIM	X		X	
SVOCs	EPA 8270D	X			X
VOCs	EPA 8260B	X		X	X
1,4-Dioxane	EPA 8260SIM				X
GRO	WI GRO	X		X	
DRO	WI DRO	X		X	
Total Organic Carbon	EPA 9060			X	
Grain Size Distribution	ASTM D422			X	
PFAS					X
Gross Alpha and Gross Beta	EPA 9310				X
Nitrogen, ammonia	EPA 350.1				X
Cyanide, Total	EPA 9012B				X
Chloride	EPA 9056A				X

-- Analysis by MDH Laboratory

Table 2

SOIL BORING MATRIX
Focused Remedial Investigation Report
Freeway Landfill and Dump
Burnsville, Minnesota

Location ID	Phase A or Phase B	Sample Collected			Approximate Thickness (feet)			Depth to Top of Bedrock (feet)	Depth to Bottom	Ground Surface Elevation (feet, MSL)*	Coordinates (meters, UTM Z15N)	
		Solid Media (type)	Water	Soil Gas	Cover Soil (fill)	Waste Material (Ash/MSW/CD)	Native Soils				Easting	Northing
Dump												
FD-SB-A1	A	Ash	--	--	1	10.5	1.5	13	13	714	477228.0088	4959649.943
FD-SB-A2	A	Ash	Yes	--	4	22	N.O.	26	26	725	477280.6395	4959645.42
FD-SB-A3	A	Native	Yes	--	3.6	29.4	2	35	35	724	477345.063	4959648.941
FD-SB-A4	A	Native	Yes	--	5	21	EOB	--	38	727	477388.4567	4959649.765
FD-SB-A5	A	Waste	Yes	--	11.5	14	EOB	--	33	724	477442.5056	4959648.285
FD-SB-B1	A	Waste	--	--	6	16.5	2	24.5	24.5	725	477220.2857	4959595.631
FD-SB-B2	A	Waste	--	--	2	23	N.O.	25	25	724	477280.6487	4959597.862
FD-SB-B3	A	Waste	Yes	--	0.5	26.5	EOB	--	30	726	477337.1082	4959595.385
FD-SB-B4	A	Waste	Yes	--	2	24.3	EOB	--	35	724	477387.912	4959594.523
FD-SB-B5	A	Native	Yes	--	2	19.5	EOB	--	35	725	477435.7543	4959595.345
FD-SB-C1	A	Waste	--	--	5	12.5	2	19.5	19.5	721	477228.6978	4959542.747
FD-SB-C2	A	Waste	--	--	2.5	13.5	5	21	21	723	477282.676	4959537.967
FD-SB-C3	A	Waste	--	--	4.5	11.5	6	22	22	727	477336.7354	4959539.675
FD-SB-C4	A	Waste	--	--	1.5	23.5	--	25	25	728	477388.1041	4959545.138
FD-SB-C5	A	Waste	--	--	2.5	20	EOB	--	30	727	477441.8857	4959541.842
FD-SB-D1	A	Waste	--	--	11	12	2	25	25	726	477223.4839	4959487.867
FD-SB-D2	A	Waste	--	--	4	16.5	N.O.	20.5	20.5	724	477282.1168	4959489.374
FD-SB-D3	A	Waste	--	--	4	16	2	22	22	726	477334.0118	4959490.852
FD-SB-D4	A	Waste	Yes	--	3.5	16.5	1	21	21	727	477392.6327	4959491.983
FD-SB-D5	A	Waste	Yes	--	2	18.5	N.O.	20.5	20.5	729	477440.97	4959490.67
FD-SB-E1	A	Waste	--	--	8	14	1.5	23.5	23.5	725	477224.8548	4959442.725
FD-SB-E2	A	Ash	--	--	3	19	N.O.	22	22	726	477283.6936	4959434.995
FD-SB-E3	A	Ash	--	--	1	23	N.O.	24	24	728	477334.0974	4959432.864
FD-SB-E4	A	Waste	--	--	3	20	N.O.	23	23	728	477389.3674	4959439.703
FD-SB-E5	A	Waste	Yes	--	1.5	19.5	N.O.	21	21	728	477442.9641	4959445.53
FD-SB-F1	A	Ash	--	--	5	9.5	1	15.5	15.5	722	477229.6261	4959384.109
FD-SB-F2	A	Waste	--	--	4.5	17.5	1.5	23.5	23.5	728	477282.735	4959375.135
FD-SB-F3	A	Waste	--	--	1	20	1.5	22.5	22.5	728	477335.344	4959377.367
FD-SB-F4	A	Waste	--	--	2.5	12.5	N.O.	15	15	729	477385.9395	4959384.681
FD-SB-F5	A	Waste	--	--	1	13	N.O.	14	14	728	477440.7939	4959389.466
FD-SB-G1	A	Fill	--	--	11	8	2	21	21	726	477227.4422	4959329.617
FD-SB-G2	A	Waste	--	--	3	14	1	18	18	726	477284.823	4959314.193
FD-SB-G3	A	Waste	--	--	3	17	N.O.	20	20	730	477338.4521	4959336.563
FD-SB-G4	A	Native	--	--	1.5	14	1.5	17	17	727	477388.4639	4959302.264
FD-SB-G5	A	Waste	--	--	4	10	N.O.	14	14	729	477443.476	4959341.95
FD-SB-01	B	--	--	--	0.5	9.5	N.O.	10	10	720	477298.734	4959232.848
FD-SB-02	B	--	--	--	5	N.O.	13	18	18	721	477363.3886	4959222.999

Table 2

SOIL BORING MATRIX
Focused Remedial Investigation Report
Freeway Landfill and Dump
Burnsville, Minnesota

Location ID	Phase A or Phase B	Sample Collected			Approximate Thickness (feet)			Depth to Top of Bedrock (feet)	Depth to Bottom	Ground Surface Elevation (feet, MSL)*	Coordinates (meters, UTM Z15N)	
		Solid Media (type)	Water	Soil Gas	Cover Soil (fill)	Waste Material (Ash/MSW/CD)	Native Soils				Easting	Northing
Dump												
FD-SB-03	B	--	--	--	5	N.O.	5	10	10	719	477449.7056	4959225.998
FD-SB-04	B	--	--	--	5	5	N.O.	10	10	719	477232.2676	4959257.994
FD-SB-05	B	--	--	--	10.5	N.O.	N.O.	10.5	10.5	719	477508.8484	4959249.176
FD-SB-06	B	--	--	--	10	N.O.	2	12	12	719	477537.5253	4959316.851
FD-SB-07	B	--	--	Yes	8.5	N.O.	1	9.5	9.5	718	477478.1224	4959296.5
FD-SB-08	B	--	--	Yes	0.5	7.5	4.5	12.5	12.5	720	477269.8909	4959267.94
FD-SB-A4 (19)	B	Fill	--	--	3	EOB	--	--	5	727	477388.4567	4959649.765
FD-SB-B1 (19)	B	Fill	--	--	7.5	EOB	--	--	10	725	477220.2857	4959595.631
FD-SB-C3 (19)	B	Fill	--	--	4.5	EOB	--	--	10	727	477336.7354	4959539.675
FD-SB-F2 (19)	B	Fill	--	--	6	EOB	--	--	10	728	477282.735	4959375.135
FD-SB-G5 (19)	B	Fill	--	--	6	EOB	--	--	10	729	477443.476	4959341.95
Landfill												
TS-SB-01	A	Waste	--	--	2.5	14.5	6	23	23	712	476966.3097	4960152.756
TS-SB-02	A	Fill	Yes	--	25.5	N.O.	N.O.	25.5	25.5	713	477006.6878	4960110.853
TS-SB-03	A	Fill	--	--	1.5	8.5	4	14	14	707	477037.0003	4960096.446
TS-SB-04	A	Waste	--	--	7	9	N.O.	16	16	712	477010.7023	4960095.736
TS-SB-05	A	Native	Yes	--	5	6.5	12	23.5	23.5	710	477003.4062	4960183.746
TS-SB-06	A	Waste	--	--	3	9.5	5.5	18	18	709	476939.9061	4960177.95
TS-SB-07	A	Fill	Yes	--	26	N.O.	N.O.	26	26	712	476981.2764	4960146.303
TS-SB-08	A	Waste	Yes	--	3	25	N.O.	28	28	727	476934.6655	4960113.988
FL-SB-01	B	Fill	--	--	14	EOB	--	--	15	729	476490.0984	4959852.948
FL-SB-02	B	Fill	--	--	6.5	EOB	--	--	7	735	476723.9051	4959852.229
FL-SB-03	B	Fill	--	--	6.5	EOB	--	--	8	732	476932.3339	4959848.521
FL-SB-04	B	Fill	--	--	2.5	--	--	--	2.5	725	477053.5679	4959973.61
FL-SB-05	B	Fill/Waste**	--	--	6.5	EOB	--	--	15	733	476821.3797	4960093.155
FL-SB-06	B	Fill/Waste**	--	--	4.5	EOB	--	--	15	746	476953.0654	4960247.897
FL-SB-07	B	Fill/Waste**	--	--	7	EOB	--	--	15	726	476829.5298	4960340.349
FL-SB-08	B	Fill/Waste**	--	--	10	EOB	--	--	15	713	476948.4261	4960520.597
FL-SB-09	B	Fill/Waste**	--	--	17	EOB	--	--	20	735	476615.6906	4960220.658
FL-SB-10	B	Fill	--	--	25	--	--	--	25	750	476679.9978	4960100.812
FL-SB-11	B	Fill/Waste**	--	--	20	EOB	--	--	25	745	476615.7764	4959978.483
FL-SB-12	B	Fill/Waste**	--	--	10	EOB	--	--	15	731	476495.7995	4960100.822
FL-SB-13	B	Fill/Waste**	--	--	6.5	EOB	--	--	14	718	476378.648	4960224.179
FL-SB-14	B	Fill	--	--	10	--	--	--	10	730	476373.3914	4960037.175

N.O. - Not Observed

EOB - Boring ended in material

* Ground surface elevations were estimated based on LIDAR data

** Waste was composited from these locations to create one waste to energy sample WASTE-03 (see Section 4.3.1)

Table 3

TEST EXCAVATION MATRIX
Focused Remedial Investigation Report
Freeway Landfill and Dump
Burnsville, Minnesota

Location ID	Phase A or Phase B	Sample Collected			Approximate Thickness (feet)			Depth to Top of Bedrock (feet)	Depth to Bottom	Ground Surface Elevation* (feet, MSL)	Coordinates (meters, UTM Z15N)	
		Solid Media (type)	Water	Soil Gas	Cover Soil (fill)	Waste Material (Ash/MSW/CD)	Native Soils				Easting	Northing
Landfill												
FL-TT-01	A	Waste	--	--	2	9	EOE	--	12	711	476966.3097	4960152.756
FL-TT-02	A	Waste	Yes	--	2	EOE	--	--	10.5	709	477006.6878	4960110.853
FL-TT-02a	A	--	--	--	2	EOE	--	--	10	707	476644.2776	4960505.585
FL-TT-03	A	Waste	Yes	--	2	8	EOE	--	12	706	477037.0003	4960096.446
FL-TT-04	A	Waste	Yes	--	2	12	EOE	--	15	707	477010.7023	4960095.736
FL-TT-05	A	Waste	Yes	--	5	9.5	EOE	--	15	708	477003.4062	4960183.746
FL-TT-06	A	Native	--	--	N.O.	N.O.	EOE	--	13	699	476939.9061	4960177.95
FL-TT-07	A	Native	Yes	--	1	N.O.	EOE	--	10	695	476981.2764	4960146.303
FL-TT-08	A	Waste	Yes	--	1	6	EOE	--	8	705	476934.6655	4960113.988
FL-TT-09	B		--	--						709	476934.1114	4960652.58
FL-TT-10	B		--	--						708	476678.175	4960544.013
Dump												
FD-TT-01	A	Waste	--	--	3	EOE	--	--	12	725	477388.6068	4959670.092
FD-TT-02	A	Waste	--	--	0.5	EOE	--	--	12	722	477266.6976	4959669.704
FD-TT-03	A	Ash	--	--	2	3	EOE	--	10	712	477201.8254	4959599.414
FD-TT-04	A	--	--	--	2	8	EOE	--	12	714	477205.3006	4959476.861
FD-TT-05	A	Ash	--	--	4	5	3	12	12	716	477205.7935	4959368.201
FD-TT-06	A	Waste	Yes	--	1.5	EOE	--	--	5	709	477473.619	4959610.165
FD-TT-07	A	Waste	--	--	4	EOE	--	--	12	726	477473.6863	4959501.322
FD-TT-08	A	Waste	--	--	2	EOE	--	--	12	723	477470.5894	4959388.401
FD-TT-09	A	Waste	--	--	4	EOE	--	--	12	727	477376.4485	4959282.212
FD-TT-10	A	Waste	Yes	--	2	EOE	--	--	10.5	724	477269.377	4959278.217
FD-TT-11	A	Waste	--	--	2	EOE	--	--	12	724	477300.0688	4959562.474
FD-TT-12	A	Waste	--	--	1.5	EOE	--	--	12	725	477384.0675	4959584.992
FD-TT-13	A	Waste	--	--	1.5	EOE	--	--	12	727	477335.8057	4959426.521
FD-TT-14	A	Waste	--	--	1.5	EOE	--	--	12	728	477443.5469	4959440.224

N.O. - Not Observed

EOE - Excavation ended in material

* Ground surface elevations were estimated based on LIDAR data

Table 4

LANDFILL GAS SCREENING RESULTS
Focused Remedial Investigation Report
Freeway Landfill and Dump
Burnsville, Minnesota

	DUMP																		
Location ID	FD-SB-A1	FD-SB-A2	FD-SB-A3	FD-SB-A4	FD-SB-A5	FD-SB-B1	FD-SB-B2	FD-SB-B3	FD-SB-B4	FD-SB-B5	FD-SB-C1	FD-SB-C2	FD-SB-C3	FD-SB-C4	FD-SB-C5	FD-SB-D1	FD-SB-D2	FD-SB-D3	FD-SB-D4
Date	4/11/2018	3/27/2018	3/23/2018	3/22/2018	3/20/2018	4/11/2018	3/27/2018	3/23/2018	3/22/2018	3/21/2018	4/11/2018	3/27/2018	3/23/2018	3/22/2018	3/21/2018	4/11/2018	3/27/2018	3/26/2018	3/22/2018
Depth (feet, BGS)	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CH_4 %	0.0	4.4	14.5	24.9	14.9	0.0	7.1	34.9	36.9	3.8	0.0	24.5	20.2	5.4	4.8	0.0	9.9	15.3	34.6
CO_2 %	0.1	4.9	18.7	21.1	22.9	0.0	13.2	24.9	28.6	6.9	0.1	0.4	22.3	3.2	13.0	0.0	5.0	10.6	20.3
O_2 %	20.8	7.6	0.1	0.0	0.0	21.6	1.9	0.0	0.0	15.8	21.0	19.8	0.3	16.9	5.0	21.5	10.6	7.0	4.8

	DUMP																		
Location ID	FD-SB-D5	FD-SB-E1	FD-SB-E2	FD-SB-E3	FD-SB-E4	FD-SB-E5	FD-SB-F1	FD-SB-F2	FD-SB-F3	FD-SB-F4	FD-SB-F5	FD-SB-G1	FD-SB-G2	FD-SB-G3	FD-SB-G4	FD-SB-G5	FD-SB-04	FD-SB-06	MW-19-01
Date	3/21/2018	4/11/2018	3/27/2018	3/26/2018	3/22/2018	3/21/2018	4/12/2018	3/27/2018	3/26/2018	3/21/2018	3/21/2018	4/12/2018	3/26/2018	3/26/2018	3/26/2018	3/21/2018	3/29/2019	4/1/2019	3/28/2019
Depth (feet, BGS)	3	3	3	3	3	3	3	3	3	3	3	3	3	3	2	3	1.5	2	1.5
CH_4 %	24.4	0.0	32.3	23.6	18.5	19.6	0.0	34.0	34.5	28.2	10.0	0.0	9.0	30.8	21.2	18.4	1.4	0.0	0.0
CO_2 %	16.9	0.0	15.3	13.5	17.0	18.7	0.0	13.3	19.6	17.8	6.4	0.0	10.3	23.8	18.0	13.0	3.7	1.7	0.0
O_2 %	3.1	21.5	0.0	7.5	3.6	2.9	21.3	0.2	0.1	2.5	12.3	21.2	NM	0.0	2.5	3.4	4.9	5.2	21.3

	DUMP			LANDFILL															
Location ID	MW-19-02	MW-19-03	MW-19-04	TS-SB-01	TS-SB-02	TS-SB-03	TS-SB-05	TS-SB-06	TS-SB-07	TS-SB-08	2	3	4	5	9	10	11	13	14
Date	3/26/2019	3/26/2019	3/27/2019	4/12/2018	4/12/2018	4/12/2018	4/13/2018	4/13/2018	4/13/2018	4/13/2018	5/4/2005	5/4/2005	5/4/2005	5/11/2005	5/4/2005	5/4/2005	5/4/2005	5/5/2005	5/5/2005
Depth (feet, BGS)	1.5	1.5	1	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CH_4 %	0.0	4.2	0.2	0.0	0.3	0.0	0.0	65.6	24.6	60.9	0	10	68	14	0	64	66	62	65
CO_2 %	0.0	14.4	0	0.0	0.8	0.0	0.0	28.3	7.1	35.9	0	3	32	4	1	37	35	42	39
O_2 %	21.0	0	22.3	20.1	16.9	20.2	21.6	0.9	4.2	3.2	20.3	16	0	13.1	17	0	0	0	1.5

	LANDFILL																		
Location ID	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	35
Date	5/5/2005	5/3/2005	5/4/2005	5/11/2005	5/11/2005	5/11/2005	5/11/2005	5/11/2005	5/10/2005	5/3/2005	5/3/2005	5/10/2005	5/10/2005	5/11/2005	5/10/2005	5/10/2005	5/10/2005	5/10/2005	5/3/2005
Depth (feet, BGS)	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CH_4 %	66	2	16	0.1	0.1	0.1	0.1	0.1	54	9	54	0.2	55	0.1	1.7	58	39	65	0
CO_2 %	39	3	4	0.1	0.1	0.1	0.1	0.1	31	9	27	0.1	29	0.1	1.1	26	22	35	0
O_2 %	1.5	17	15	20	20.1	20.1	20.1	20.2	3	14	0	21	2.1	20	19.6	2.7	8.1	0	19.3

Table 4

LANDFILL GAS SCREENING RESULTS
Focused Remedial Investigation Report
Freeway Landfill and Dump
Burnsville, Minnesota

	LANDFILL																		
Location ID	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	54	55
Date	5/3/2005	5/10/2005	5/10/2005	5/9/2005	5/9/2005	5/9/2005	5/11/2005	4/28/2005	4/29/2005	4/29/2005	5/2/2005	5/2/2005	5/11/2005	4/27/2005	5/3/2005	5/3/2005	5/9/2005	5/9/2005	4/28/2005
Depth (feet, BGS)	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CH_4 %	5	65	0.2	0.1	66	68	37	70	67	65	66	26	59	41	9.1	42	46	66	65
CO_2 %	9	36	0.1	0.3	34	34	25	32	33	36	32	9	32	22	8.2	23	25	33	35
O_2 %	16	0	20.2	20.2	0	0	7.1	0	0	0	0	13	1.4	7	0	0	2	0	0

	LANDFILL																		
Location ID	56	57	58	59	60B	61	62	63	64	65	66	67	68	69	74	75	76	77	78
Date	4/28/2005	4/29/2005	4/29/2005	4/27/2005	4/25/2005	4/26/2005	4/25/2005	4/25/2005	4/26/2005	4/25/2005	4/25/2005	4/26/2005	4/27/2005	4/27/2005	5/12/2005	4/27/2005	5/12/2005	5/11/2005	5/11/2005
Depth (feet, BGS)	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CH_4 %	68	22	67	58	6.3	19.9	1	65	69	41	65	49	68	54	16	59	64	6.1	60
CO_2 %	32	14	34	30	10	10.7	0.4	34	35	21	29	21	36	32	8	30	36	3	40
O_2 %	0	8	0	0	8.4	12	19.2	0	0	7	0	6	0	0	14.2	2	0	16.4	0

Table 5a

Summary of Exceedances
Municipal Soil Waste / Construction Debris
Focused Remedial Investigation Report
Freeway Landfill and Dump
Burnsville, Minnesota

						LANDFILL												DUMP								
					Location	FL-TT-01	FL-TT-02	FL-TT-03	FL-TT-04	FL-TT-05	FL-TT-08	TS-SB-01	TS-SB-03	TS-SB-04	TS-SB-05	TS-SB-06	TS-SB-08	FD-SB-A5	FD-SB-B1	FD-SB-B2	FD-SB-B3	FD-SB-B4	FD-SB-C1	FD-SB-C2	FD-SB-C3	FD-SB-C4
					Date	4/18/2018	4/18/2018	4/19/2018	4/19/2018	4/19/2018	4/20/2018	4/12/2018	4/12/2018	4/13/2018	4/13/2018	4/13/2018	4/13/2018	3/20/2018	4/11/2018	3/27/2018	3/23/2018	3/22/2018	4/11/2018	3/27/2018	3/23/2018	3/22/2018
					Depth	3 - 11 ft	2 - 10.5 ft	2 - 10 ft	2 - 14 ft	5 - 15 ft	1 - 7 ft	5 - 8 ft	1.5 - 3 ft	7 - 15 ft	5 - 7.5 ft	8 - 12 ft	10 - 20 ft	15 - 17 ft	11 - 13 ft	12 - 21 ft	5 - 26 ft	3 - 20 ft	5 - 8 ft	5 - 17 ft	5 - 20 ft	5 - 20 ft
					Sample Description	Waste	Waste	Waste	Waste	Waste	Waste	Waste	Waste	Waste	Waste	Waste	Waste	Waste	Waste	Waste	Waste	Waste	Waste	Waste	Waste	Waste
Parameter	Analysis Location	Units	MPCA Screening Soil Leaching Values	MPCA Tier 2 Industrial Soil Reference Values	MPCA Tier 2 Recreational Soil Reference Values																					
Effective Date			06/01/2013	06/22/2009	06/22/2009																					
Exceedance Key			**Bold**	Underline	*Italic*																					
Metals																										
Antimony	Lab	mg/kg	**5.4**	100	*16*	--	**6.4**	--	--	--	--	--	--	--	--	--	--	***41.0 ****	--	--	--	--	--	--	--	--
Arsenic	Lab	mg/kg	**5.8**	20	*11*	--	***26.8***	***11.9***	**8.9**	**8.1**	--	--	--	--	***11.4***	--	--	***19.0***	--	***14.8***	***16.1***	***12.2***	**6.0**	***15.9***	**7.9**	**6.5**
Barium	Lab	mg/kg	1700	18000	*1100*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Beryllium	Lab	mg/kg	**2.7**	230	*75*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Boron	Lab	mg/kg	**62**	47000	*8000*	--	**234**	**109 ***	--	**73.4**	--	--	--	--	--	--	--	**238 ***	--	**196**	**216**	**112**	--	**85.7**	**75.4**	**87.4**
Cadmium	Lab	mg/kg	**8.8**	200	*35*	--	--	***38.6***	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	***46.2***
Cobalt	Lab	mg/kg	**27**	2600	800	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Copper	Lab	mg/kg	**700**	9000	*100*	--	*280*	*448 **	*102*	*175*	--	--	--	--	--	*341*	--	*137 **	--	--	--	*474*	--	--	*119*	--
Iron	Lab	mg/kg		75000	*12000*	--	*107000*	*166000*	*26700*	*22000*	*22500*	*12500*	--	--	*27600*	--	--	*99500 **	--	*27900*	*40200*	*32100*	*16800*	*66500*	*47000*	*42300*
Lead	Lab	mg/kg	**2700**	700	*300*	--	*611*	*691 **	--	--	--	--	--	--	*579*	*436*	--	*453 **	--	--	--	*575*	--	*557*	--	*989*
Manganese	Lab	mg/kg	**130**	8100	5000	**402**	**994**	**596 ***	**531**	**522**	**470**	**455**	**282**	**318**	**723**	**247**	--	**3260 ***	**238**	**250**	**141**	**270**	**264**	**520**	**951**	**645**
Mercury	Lab	mg/kg	**3.3 MC**	1.5	*1.2 MC*	--	--	--	--	--	--	--	--	--	--	--	--	***9.4***	--	--	--	--	--	--	--	***8.6***
Nickel	Lab	mg/kg	**180**	2500	*800*	--	--	--	--	--	--	--	--	--	--	--	--	***1480 ****	--	--	--	--	--	--	--	--
Selenium	Lab	mg/kg	**2.6**	1300	200	--	**2.8**	--	--	--	--	--	--	--	--	--	--	--	--	**3.9**	**5.3**	**3.5**	--	--	--	--
Silver	Lab	mg/kg	**7.9**			--	--	**26.3**	--	--	--	--	--	--	--	--	--									
Vanadium	Lab	mg/kg	**4.0**	250	*40*	**24.8**	***44.3***	***40.2***	**38.0**	**30.7**	**34.2**	**19.1**	**18.3**	**19.3**	**19.5**	**13.1**	--	**22.6**	**29.8**	***135***	***239***	***44.6***	**28.8**	***54.5***	**30.5**	**16.5**
Zinc	Lab	mg/kg	**3000**	75000	*12000*	--	--	--	--	--	--	--	--	--	--	--	--	**3030 ***	--	--	--	--	--	--	--	--
Semivolatile Organic Compounds																										
3,4-Methylphenol (m,p cresols)	Lab	ug/kg	**42 MP**	59000 MP	11000 MP	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	**1120**	--	--	--	--	--
Bis(2-ethylhexyl)phthalate	Lab	ug/kg	**29000**	2100000	690000	--	--	--	--	--	--	--	--	--	--	--	**100000**	**483000 ***	--	--	--	--	--	--	--	--
Butyl benzyl phthalate	Lab	ug/kg	**29000**	3700000	*623000*	--	--	***4230000***	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Naphthalene	Lab	ug/kg	**4500**	28000	*24000*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Semivolatile Organic Compounds by Selected Ion Monitoring																										
B(a)P Equivalent, non-detects at 0, 2002 PEFs	Barr Calculation	ug/kg	**1400 T**	3000 T	*2000 T*	***15000***	--	--	--	--	--	--	***2900***	--	--	***4400***	**1900**	--	--	--	***3900***	***3500***	--	***21000***	--	--
B(a)P Equivalent, non-detects at 1/2, 2002 PEFs	Barr Calculation	ug/kg	**1400 T**	3000 T	*2000 T*	***15000***	--	--	--	--	--	--	***2900***	--	--	***4400***	**1900**	--	--	--	***4100***	***3500***	--	***21000***	--	--
B(a)P Equivalent, non-detects at 1x, 2002 PEFs	Barr Calculation	ug/kg	**1400 T**	3000 T	*2000 T*	***15000***	--	--	--	--	--	--	***2900***	--	--	***4400***	**1900**	--	--	--	***4200***	***3500***	--	***21000***	--	--
Naphthalene	Lab	ug/kg	**4500**	28000	*24000*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Volatile Organic Compounds																										
1,1,2,2-Tetrachloroethane	Lab	ug/kg	**12**			--	--	--	--	--	--	--	--	--	**138**	--	--	--	--	--	--	--	--	--	--	--
1,2,4-Trichlorobenzene	Lab	ug/kg	**230**	985000	290000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,4-Trimethylbenzene	Lab	ug/kg	**2700**	25000	20000	--	--	--	--	--	--	--	--	--	--	--	--	**4970**	--	--	--	**6930**	--	--	--	**5820**
1,2-Dichlorobenzene	Lab	ug/kg	**11000**	75000	*63000*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichloroethylene, cis	Lab	ug/kg	**210**	22000	19000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,3,5-Trimethylbenzene	Lab	ug/kg	**2700**	10000	8000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,4-Dichlorobenzene	Lab	ug/kg	**170**	50000	72000	--	**255**	**175**	--	**443**	**415**	--	--	--	--	--	**512**	**1690**	--	--	--	**810**	--	--	--	**590**
Benzene	Lab	ug/kg	**17**	10000	14000	--	**54.0**	--	--	--	--	--	--	--	**58.1**	--	--	**981**	--	--	--	--	--	--	--	**70.9**
Chlorobenzene	Lab	ug/kg	**1200**	32000	*23000*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Ethyl benzene	Lab	ug/kg	**1000**	200000	200000	--	--	--	--	--	--	--	--	--	--	--	--	**6520**	--	--	--	**1380**	--	--	--	**3310**
Naphthalene	Lab	ug/kg	**4500**	28000	*24000*	--	--	--	--	--	--	--	--	--	--	--	**4880**	**7650**	--	--	--	--	--	--	--	**5570**
Tetrachloroethylene	Lab	ug/kg	**42**	131000	145000	--	--	**178 ***	--	--	--	--	--	--	--	--	--	**741**	--	--	--	--	--	--	--	--
Toluene	Lab	ug/kg	**2500**	305000	260000	--	--	--	--	--	--	--	--	--	--	--	--	**3680**	--	--	--	--	--	--	--	--
Trichloroethylene (TCE)	Lab	ug/kg	**2.3**	46000	82000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Xylene, total	Lab	ug/kg	**5400 M**	130000 M	110000 M	--	--	--	--	--	--	--	--	--	--	--	--	**7840**	--	--	--	--	--	--	--	**6550**
Polychlorinated Biphenyls																										
Polychlorinated biphenyls	Lab	ug/kg	**130**	8000	*1400*	--	***4990***	***11300***	**633**	**1230**	--	--	--	**150**	--	--	--	**686**	--	--	**551**	***4220***	***1410***	**178**	**144**	***45200***
Herbicides																										
Pentachlorophenol	Lab	mg/kg	**0.023**	120	80	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	**0.085**
Total Petroleum Hydrocarbons																										
Gasoline Range Organics, C6-C10	Lab	mg/kg				< 13.1	40.2	< 33.6	< 14.2	74.1	< 29.9	53.6	< 11.7	< 11.9	38.9	< 14.4	47.7	187	17.7	< 16.7	< 35.5	243	< 13.1	75.7	< 15.5	104
Total Petroleum Hydrocarbons C10-C28	Lab	mg/kg				889	2300	3370	171	395	781	1480	674	371	1150	3820	2810	4400	186	139	23.3	1570	200	413	222	1160

Table 5a

Summary of Exceedances
Municipal Soil Waste / Construction Debris
Focused Remedial Investigation Report
Freeway Landfill and Dump
Burnsville, Minnesota

						DUMP														
					Location	FD-SB-C5	FD-SB-D1	FD-SB-D2	FD-SB-D3	FD-SB-D4	FD-SB-D5	FD-SB-E1	FD-SB-E4	FD-SB-E5	FD-SB-F2	FD-SB-F3	FD-SB-F4	FD-SB-F5	FD-SB-G2	FD-SB-G3	FD-SB-G5
					Date	3/21/2018	4/11/2018	3/27/2018	3/26/2018	3/22/2018	3/21/2018	4/11/2018	3/22/2018	3/21/2018	3/27/2018	3/26/2018	3/21/2018	3/21/2018	3/26/2018	3/26/2018	3/21/2018
					Depth	15 - 17.5 ft	11 - 16 ft	3 - 12 ft	4 - 16 ft	5 - 20 ft	5 - 16 ft	10 - 15 ft	3 - 21 ft	5 - 10 ft	7 - 13 ft	3 - 11 ft	5 - 10 ft	3 - 11 ft	10 - 12 ft	7 - 16 ft	5 - 14 ft
					Sample Description	Waste	Waste	Waste	Waste	Waste	Waste	Waste	Waste	Waste	Waste	Waste	Waste	Waste	Waste	Waste	Waste
Parameter	Analysis Location	Units	MPCA Screening Soil Leaching Values	MPCA Tier 2 Industrial Soil Reference Values	MPCA Tier 2 Recreational Soil Reference Values																
Effective Date			06/01/2013	06/22/2009	06/22/2009																
Exceedance Key			**Bold**	Underline	*Italic*																
Metals																					
Antimony	Lab	mg/kg	**5.4**	100	*16*	--	--	--	--	--	--	--	--	--	***17.1***	--	--	--	--	--	--
Arsenic	Lab	mg/kg	**5.8**	20	*11*	***14.3***	**10.1**	--	--	***15.1***	***11.6***	--	**9.7**	***11.3***	***20.9***	***20.6***	***12.1***	***21.9***	***28.4***	***13.8***	--
Barium	Lab	mg/kg	1700	18000	*1100*	--	--	--	--	--	--	--	*1510*	--	--	--	--	--	--	--	--
Beryllium	Lab	mg/kg	**2.7**	230	75	--	--	--	--	--	--	--	--	--	--	--	--	**2.7**	**3.0**	--	--
Boron	Lab	mg/kg	**62**	47000	8000	--	--	--	--	**62.7**	--	--	**99.3**	**89.4**	**157**	**163**	**128**	**120**	**1930**	**163**	**114**
Cadmium	Lab	mg/kg	**8.8**	200	*35*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cobalt	Lab	mg/kg	**27**	2600	800	**37.4 ***	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Copper	Lab	mg/kg	**700**	9000	*100*	*228*	--	--	--	--	--	--	*207*	--	--	--	*334*	--	--	--	*244*
Iron	Lab	mg/kg		75000	*12000*	*15900 **	*19200*	--	*23000*	*65700*	*17600*	*24800*	*28800*	*48700*	*37700*	*43500*	*162000*	*31000*	*39400*	*42300*	*168000*
Lead	Lab	mg/kg	**2700**	700	*300*	*724 **	--	--	--	--	*369*	--	--	*1010*	--	*352*	*424*	--	--	*311*	--
Manganese	Lab	mg/kg	**130**	8100	5000	**249**	**594**	**277**	**353**	**532**	**263**	**360**	**1640**	**521**	**330**	**230**	**1060**	**174**	**188**	**225**	**804**
Mercury	Lab	mg/kg	**3.3 MC**	1.5	*1.2 MC*	--	--	--	--	--	--	--	--	--	--	--	*1.5*	--	--	--	*1.5*
Nickel	Lab	mg/kg	**180**	2500	*800*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Selenium	Lab	mg/kg	**2.6**	1300	200	--	--	--	--	**2.6**	--	--	--	--	**4.9**	**4.2**	--	**6.2**	**7.4**	**3.5**	--
Silver	Lab	mg/kg	**7.9**																		
Vanadium	Lab	mg/kg	**4.0**	250	*40*	**27.4**	**37.5**	**19.2**	**28.5**	***64.1***	**25.7**	**24.4**	***50.3***	**39.0**	***121***	***76.5***	**14.9**	***83.8***	***120***	***54.0***	**20.2**
Zinc	Lab	mg/kg	**3000**	75000	*12000*	***86700 ****	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Semivolatile Organic Compounds																					
3,4-Methylphenol (m,p cresols)	Lab	ug/kg	**42 MP**	59000 MP	11000 MP	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-ethylhexyl)phthalate	Lab	ug/kg	**29000**	2100000	690000	**247000**	--	--	**40000**	--	--	--	--	--	**118000**	--	--	--	--	--	--
Butyl benzyl phthalate	Lab	ug/kg	**29000**	3700000	*623000*	--	--	--	--	--	--	--	--	--	--	--	**468000**	--	--	--	--
Naphthalene	Lab	ug/kg	**4500**	28000	*24000*	--	--	--	--	--	**7710**	--	--	**10800**	--	--	--	--	--	***66500***	--
Semivolatile Organic Compounds by Selected Ion Monitoring																					
B(a)P Equivalent, non-detects at 0, 2002 PEFs	Barr Calculation	ug/kg	**1400 T**	3000 T	*2000 T*	***2200***	***5500***	**1400**	--	***5600***	--	--	--	***20000***	--	**1400**	***3200***	--	--	***110000***	--
B(a)P Equivalent, non-detects at 1/2, 2002 PEFs	Barr Calculation	ug/kg	**1400 T**	3000 T	*2000 T*	***2400***	***5500***	**1400**	--	***6000***	--	--	--	***20000***	--	**1400**	***3700***	--	--	***110000***	--
B(a)P Equivalent, non-detects at 1x, 2002 PEFs	Barr Calculation	ug/kg	**1400 T**	3000 T	*2000 T*	***2600***	***5500***	**1400**	--	***6400***	--	--	--	***20000***	--	**1400**	***4200***	--	--	***110000***	--
Naphthalene	Lab	ug/kg	**4500**	28000	*24000*	--	--	--	--	**8120**	--	--	--	**19600**	--	--	--	--	--	***42700***	--
Volatile Organic Compounds																					
1,1,2,2-Tetrachloroethane	Lab	ug/kg	**12**			--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,4-Trichlorobenzene	Lab	ug/kg	**230**	985000	290000	--	--	--	**298**	--	--	--	--	--	--	**4380**	--	**470**	--	--	--
1,2,4-Trimethylbenzene	Lab	ug/kg	**2700**	25000	20000	--	--	--	**5000**	**5480**	--	--	--	--	--	**17000**	--	**3200**	--	--	--
1,2-Dichlorobenzene	Lab	ug/kg	**11000**	75000	*63000*	--	--	--	--	--	--	--	--	--	--	***79700***	--	--	--	--	--
1,2-Dichloroethylene, cis	Lab	ug/kg	**210**	22000	19000	--	--	--	--	--	--	--	--	--	--	--	--	--	**263**	--	--
1,3,5-Trimethylbenzene	Lab	ug/kg	**2700**	10000	8000	--	--	--	--	--	--	--	--	--	--	**5920**	--	--	--	--	--
1,4-Dichlorobenzene	Lab	ug/kg	**170**	50000	72000	**469**	--	--	**17100**	**262**	--	--	**192**	**433**	--	**32700**	--	**547**	--	--	--
Benzene	Lab	ug/kg	**17**	10000	14000	--	--	--	**199**	--	--	--	**211**	--	--	**142**	--	--	--	--	--
Chlorobenzene	Lab	ug/kg	**1200**	32000	*23000*	--	--	--	***26400***	--	--	--	--	--	--	--	--	--	--	--	--
Ethyl benzene	Lab	ug/kg	**1000**	200000	200000	--	--	--	**1210**	--	--	--	--	--	--	**12200**	--	--	--	--	--
Naphthalene	Lab	ug/kg	**4500**	28000	*24000*	--	--	**8480**	--	--	--	--	--	--	--	***41000***	--	**11200**	--	--	--
Tetrachloroethylene	Lab	ug/kg	**42**	131000	145000	--	--	--	--	--	--	--	**125**	--	--	**5880**	--	--	**363**	--	--
Toluene	Lab	ug/kg	**2500**	305000	260000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Trichloroethylene (TCE)	Lab	ug/kg	**2.3**	46000	82000	--	--	--	--	--	--	--	**82.5 ***	--	--	--	--	--	--	--	--
Xylene, total	Lab	ug/kg	**5400 M**	130000 M	110000 M	--	--	--	--	**14900**	--	--	--	--	--	**13700**	--	--	--	--	--
Polychlorinated Biphenyls																					
Polychlorinated biphenyls	Lab	ug/kg	**130**	8000	*1400*	***2350***	--	--	***2190***	**398**	**1160**	**231**	**421**	***17900***	***1740***	***2200***	***2570***	***8510***	**134**	***1750***	***15200***
Herbicides																					
Pentachlorophenol	Lab	mg/kg	**0.023**	120	80	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Petroleum Hydrocarbons																					
Gasoline Range Organics, C6-C10	Lab	mg/kg				122	< 15.6	16.9	512	257	40.9	< 16.0	90.2	35.5	14.6	734	28.4	135	69.0	< 24.0	< 11.5
Total Petroleum Hydrocarbons C10-C28	Lab	mg/kg				4630	57.5	3710	3830	383	1730	1520	745	29.5	61.7	229	6590	4600	287	83.8	40.3

Summary of Exceedances
Municipal Soil Waste / Construction Debris
Focused Remedial Investigation Report
Freeway Landfill and Dump
Burnsville, Minnesota

						DUMP										
					Location	FD-TT-01	FD-TT-02	FD-TT-06	FD-TT-07	FD-TT-08	FD-TT-09	FD-TT-10	FD-TT-11	FD-TT-12	FD-TT-13	FD-TT-14
					Date	4/11/2018	4/11/2018	4/12/2018	4/12/2018	4/12/2018	4/17/2018	4/17/2018	4/17/2018	4/17/2018	4/17/2018	4/18/2018
					Depth	10 - 12 ft	7 - 9 ft	2 - 5 ft	6 - 11 ft	5 - 12 ft	4 - 12 ft	2 - 10 ft	4 - 12 ft	3 - 12 ft	3 - 12 ft	2 - 12 ft
					Sample Description	Waste	Waste	Waste	Waste	Waste	Waste	Waste	Waste	Waste	Waste	Waste
Parameter	Analysis Location	Units	MPCA Screening Soil Leaching Values	MPCA Tier 2 Industrial Soil Reference Values	MPCA Tier 2 Recreational Soil Reference Values											
Effective Date			06/01/2013	06/22/2009	06/22/2009											
Exceedance Key			**Bold**	Underline	*Italic*											
Metals																
Antimony	Lab	mg/kg	**5.4**	100	*16*	--	**13.3**	--	--	--	--	--	--	--	--	--
Arsenic	Lab	mg/kg	**5.8**	20	*11*	***11.6***	***22.8***	***18.3***	***12.6***	***37.0***	***12.7***	***13.6***	***13.6***	***17.3***	**5.8**	***12.7***
Barium	Lab	mg/kg	1700	18000	*1100*	--	--	--	--	--	--	--	--	--	--	--
Beryllium	Lab	mg/kg	**2.7**	230	75	--	--	--	--	--	--	--	--	**2.9**	--	--
Boron	Lab	mg/kg	**62**	47000	8000	**134**	**114**	**192**	**95.1**	**138**	**75.3**	**74.9**	**65.4**	**198**	**167**	**99.2**
Cadmium	Lab	mg/kg	**8.8**	200	*35*	--	--	--	--	**13.7**	--	--	--	--	--	--
Cobalt	Lab	mg/kg	**27**	2600	800	--	--	--	--	--	--	--	--	--	--	--
Copper	Lab	mg/kg	**700**	9000	*100*	--	*166*	***1660***	*507*	*193*	--	--	--	--	--	--
Iron	Lab	mg/kg		75000	*12000*	*36800*	*116000*	*31800*	*61000*	*53400*	*33200*	*22800*	*27800*	*38800*	*72600*	*31700*
Lead	Lab	mg/kg	**2700**	700	*300*	--	*578*	--	*338*	*558*	--	--	***6520***	--	--	--
Manganese	Lab	mg/kg	**130**	8100	5000	**291**	**868**	**251**	**447**	**382**	**328**	**293**	**238**	**145**	**806**	**408**
Mercury	Lab	mg/kg	**3.3 MC**	1.5	*1.2 MC*	--	--	*1.7*	--	--	--	--	--	--	--	--
Nickel	Lab	mg/kg	**180**	2500	*800*	--	--	**489**	--	--	--	--	--	--	--	--
Selenium	Lab	mg/kg	**2.6**	1300	200	**2.9**	--	**3.7**	--	**4.5**	--	--	--	**5.4**	--	**2.8**
Silver	Lab	mg/kg	**7.9**													
Vanadium	Lab	mg/kg	**4.0**	250	*40*	***132***	***44.9***	***69.5***	***41.4***	***96.5***	***42.0***	***63.3***	***49.0***	***81.3***	**22.1**	***63.1***
Zinc	Lab	mg/kg	**3000**	75000	*12000*	--	--	--	--	--	--	--	--	--	--	--
Semivolatile Organic Compounds																
3,4-Methylphenol (m,p cresols)	Lab	ug/kg	**42 MP**	59000 MP	11000 MP	--	--	--	--	--	--	--	--	--	--	--
Bis(2-ethylhexyl)phthalate	Lab	ug/kg	**29000**	2100000	690000	--	--	--	--	--	--	--	--	--	**125000**	--
Butyl benzyl phthalate	Lab	ug/kg	**29000**	3700000	*623000*	--	--	--	--	--	--	--	--	--	--	--
Naphthalene	Lab	ug/kg	**4500**	28000	*24000*	--	--	--	--	--	--	--	--	--	--	**12200**
Semivolatile Organic Compounds by Selected Ion Monitoring																
B(a)P Equivalent, non-detects at 0, 2002 PEFs	Barr Calculation	ug/kg	**1400 T**	3000 T	*2000 T*	--	--	--	**1700**	--	--	***2200***	***4300***	--	--	***36000***
B(a)P Equivalent, non-detects at 1/2, 2002 PEFs	Barr Calculation	ug/kg	**1400 T**	3000 T	*2000 T*	--	--	--	**1700**	--	--	***2200***	***4300***	--	--	***36000***
B(a)P Equivalent, non-detects at 1x, 2002 PEFs	Barr Calculation	ug/kg	**1400 T**	3000 T	*2000 T*	--	--	--	**1700**	--	--	***2200***	***4300***	--	--	***36000***
Naphthalene	Lab	ug/kg	**4500**	28000	*24000*	--	--	--	--	--	--	--	--	--	--	**14700**
Volatile Organic Compounds																
1,1,2,2-Tetrachloroethane	Lab	ug/kg	**12**			--	--	--	--	--	--	--	--	--	--	--
1,2,4-Trichlorobenzene	Lab	ug/kg	**230**	985000	290000	--	--	--	--	--	--	--	--	--	--	--
1,2,4-Trimethylbenzene	Lab	ug/kg	**2700**	25000	20000	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichlorobenzene	Lab	ug/kg	**11000**	75000	*63000*	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichloroethylene, cis	Lab	ug/kg	**210**	22000	19000	--	--	--	--	--	--	--	--	--	--	--
1,3,5-Trimethylbenzene	Lab	ug/kg	**2700**	10000	8000	--	--	--	--	--	--	--	--	--	--	--
1,4-Dichlorobenzene	Lab	ug/kg	**170**	50000	72000	--	--	--	--	--	--	--	--	--	--	**194**
Benzene	Lab	ug/kg	**17**	10000	14000	--	--	--	--	**818**	--	**37.4**	--	**73.8**	--	--
Chlorobenzene	Lab	ug/kg	**1200**	32000	*23000*	--	--	--	--	--	--	--	--	--	--	--
Ethyl benzene	Lab	ug/kg	**1000**	200000	200000	--	--	--	--	--	--	--	--	--	--	--
Naphthalene	Lab	ug/kg	**4500**	28000	*24000*	--	--	--	--	--	--	--	--	--	--	**6210**
Tetrachloroethylene	Lab	ug/kg	**42**	131000	145000	**98.0**	**122**	--	--	--	--	**422**	--	--	--	--
Toluene	Lab	ug/kg	**2500**	305000	260000	--	--	--	--	--	--	--	--	--	--	--
Trichloroethylene (TCE)	Lab	ug/kg	**2.3**	46000	82000	--	--	--	--	--	--	--	--	--	--	--
Xylene, total	Lab	ug/kg	**5400 M**	130000 M	110000 M	--	--	--	--	--	--	--	--	--	--	--
Polychlorinated Biphenyls																
Polychlorinated biphenyls	Lab	ug/kg	**130**	8000	*1400*	**864**	***9040***	--	***3780***	***2880***	**545**	--	***61100***	**759**	***44200***	***3290***
Herbicides																
Pentachlorophenol	Lab	mg/kg	**0.023**	120	80	--	--	--	--	--	--	--	--	--	--	--
Total Petroleum Hydrocarbons																
Gasoline Range Organics, C6-C10	Lab	mg/kg				22.8	< 20.4	< 17.4	< 14.3	< 15.6	< 14.1	< 17.4	< 15.7	37.5	854	98.5
Total Petroleum Hydrocarbons C10-C28	Lab	mg/kg				1420	155	119	497	825	65.0	159	485	222	3790	1420

Table 5b

Summary of Exceedances
Ash
Focused Remedial Investigation Report
Freeway Landfill and Dump
Burnsville, Minnesota

							DUMP						
						Location	FD-SB-A1	FD-SB-A2	FD-SB-E2	FD-SB-E3	FD-SB-F1	FD-TT-03	FD-TT-05
						Date	4/11/2018	3/27/2018	3/27/2018	3/26/2018	4/12/2018	4/11/2018	4/12/2018
						Depth	3 - 6 ft	10 - 20 ft	11 - 21 ft	11 - 15.5 ft	10 - 14.5 ft	2 - 5 ft	4 - 9 ft
						Sample Description	Ash	Ash	Ash	Ash	Ash	Ash	Ash
Parameter	Analysis Location	Units	MPCA Screening Soil Leaching Values	MPCA Tier 2 Industrial Soil Reference Values	MPCA Tier 2 Recreational Soil Reference Values	Dakota County Background Range							
Effective Date			06/01/2013	06/22/2009	06/22/2009	2009							
Exceedance Key			**Bold**	Underline	*Italic*	shaded							
Metals													
Arsenic	Lab	mg/kg	**5.8**	20	*11*	7 - 17	***21.7***	***23.3***	***21.1***	***16.9***	***22.5***	***24.9***	***14.8***
Beryllium	Lab	mg/kg	**2.7**	230	75		**3.1**	**3.1**	--	**2.9**	**3.2**	**3.6**	--
Boron	Lab	mg/kg	**62**	47000	8000		**265**	**238**	**439**	**188**	**802**	**145**	**106**
Iron	Lab	mg/kg		75000	*12000*	17000 - 90000	*23000*	*35100*	*31500*	*36000*	*34200*	*35900*	*26400*
Manganese	Lab	mg/kg	**130**	8100	5000	500 - 1300	**159**	**161**	**173**	**146**	**185**	**194**	**365**
Selenium	Lab	mg/kg	**2.6**	1300	200		--	**5.4**	**5.1**	**5.6**	**5.7**	--	--
Vanadium	Lab	mg/kg	**4.0**	250	*40*	72 - 115	***224***	***124***	***301***	***86.8***	***117***	***121***	***76.5***
Semivolatile Organic Compounds by Selected Ion Monitoring													
B(a)P Equivalent, non-detects at 0, 2002 PEFs	Barr Calculation	ug/kg	**1400 T**	3000 T	*2000 T*		--	***17000***	--	--	--	--	--
B(a)P Equivalent, non-detects at 1/2, 2002 PEFs	Barr Calculation	ug/kg	**1400 T**	3000 T	*2000 T*		--	***17000***	--	--	--	--	--
B(a)P Equivalent, non-detects at 1x, 2002 PEFs	Barr Calculation	ug/kg	**1400 T**	3000 T	*2000 T*		--	***17000***	--	--	--	--	--
Herbicides													
Pentachlorophenol	Lab	mg/kg	**0.023**	120	80		--	**0.30**	--	--	--	--	--
Total Petroleum Hydrocarbons													
Gasoline Range Organics, C6-C10	Lab	mg/kg					< 15.1	< 14.0	< 14.9	< 14.2	< 14.8	< 16.9	< 15.4
Total Petroleum Hydrocarbons C10-C28	Lab	mg/kg					< 12.3	< 11.5	< 12.7	< 11.6	< 12.7	< 14.4	33.7

Summary of Exceedances
Native Sediment
Focused Remedial Investigation Report
Freeway Landfill and Dump
Burnsville, Minnesota

							LANDFILL		DUMP			
						Location	FL-TT-06	FL-TT-07	FD-SB-A3	FD-SB-A4	FD-SB-B5	FD-SB-G4
						Date	4/19/2018	4/19/2018	3/23/2018	3/22/2018	3/20/2018	3/26/2018
						Depth	0 - 10 ft	1 - 5 ft	30 - 35 ft	26 - 32.5 ft	11.5 - 23 ft	15.5 - 17.5 ft
						Sample Description	Native Soil	Native Soil	Native Soil	Native Soil	Native Soil	Native Soil
Parameter	Analysis Location	Units	MPCA Screening Soil Leaching Values	MPCA Tier 2 Industrial Soil Reference Values	MPCA Tier 2 Recreational Soil Reference Values	Dakota County Background Range						
Effective Date			06/01/2013	06/22/2009	06/22/2009	2009						
Exceedance Key			**Bold**	Underline	*Italic*	shaded						
Metals												
Arsenic	Lab	mg/kg	**5.8**	20	11	7 - 17	--	**6.3**	--	--	**9.7**	--
Boron	Lab	mg/kg	**62**	47000	8000		--	--	**524**	**742**	**296**	**124**
Iron	Lab	mg/kg		75000	*12000*	17000 - 90000	--	*23300*	*15500 **	--	*13600*	--
Lead	Lab	mg/kg	**2700**	700	*300*		--	--	*308 **	--	--	--
Manganese	Lab	mg/kg	**130**	8100	5000	500 - 1300	**498**	**999**	**423**	**310**	**435**	**834**
Vanadium	Lab	mg/kg	**4.0**	250	40	72 - 115	**30.3**	**29.8**	**15.0**	**7.1**	**19.2**	**12.0**
Semivolatile Organic Compounds												
Bis(2-ethylhexyl)phthalate	Lab	ug/kg	**29000**	2100000	690000		--	--	--	--	--	**45300**
Semivolatile Organic Compounds by Selected Ion Monitoring												
B(a)P Equivalent, non-detects at 0, 2002 PEFs	Barr Calculation	ug/kg	**1400 T**	3000 T	*2000 T*		--	--	--	--	***2100***	--
B(a)P Equivalent, non-detects at 1/2, 2002 PEFs	Barr Calculation	ug/kg	**1400 T**	3000 T	*2000 T*		--	--	--	--	***2100***	--
B(a)P Equivalent, non-detects at 1x, 2002 PEFs	Barr Calculation	ug/kg	**1400 T**	3000 T	*2000 T*		--	--	--	--	***2200***	--
Volatile Organic Compounds												
Benzene	Lab	ug/kg	**17**	10000	14000		--	--	**256**	**1370**	**277**	--
Polychlorinated Biphenyls												
Polychlorinated biphenyls	Lab	ug/kg	**130**	8000	*1400*		--	--	--	--	--	**1020**
Total Petroleum Hydrocarbons												
Gasoline Range Organics, C6-C10	Lab	mg/kg					< 13.4	< 18.5	< 92.6	< 90.7	< 52.1	31.0
Total Petroleum Hydrocarbons C10-C28	Lab	mg/kg					< 8.3	< 14.7	< 67.6	166	71.0	409

Data Footnotes and Qualifiers

Barr Standard Footnotes and Qualifiers

--	Sample analyzed; result does not exceed criteria for this parameter
*	Estimated value, QA/QC criteria not met.

MPCA Screening Soil Leaching Values

CR6	Value represents the criteria for Chromium, hexavalent.
M	Value represents the criteria for mixed Xylenes.
MC	Mercury as Mercuric Chloride.
MP	Value represents the criteria for p-cresol.
T	Value represents a criteria for the total carcinogenic PAHs as BaP.

MPCA Tier 2 Industrial Soil Reference Values

CR6	Value represents the criteria for Chromium, hexavalent.
M	Value represents the criteria for mixed Xylenes.
MP	Value represents the criteria for p-cresol.
T	Value represents a criteria for the total carcinogenic PAHs as BaP.

MPCA Tier 2 Recreational Soil Reference Values

CR6	Value represents the criteria for Chromium, hexavalent.
M	Value represents the criteria for mixed Xylenes.
MC	Mercury as Mercuric Chloride.
MP	Value represents the criteria for p-cresol.
T	Value represents a criteria for the total carcinogenic PAHs as BaP.

Table 6

SUMMARY OF ANALYTICAL RESULTS - SOIL GAS
Focused Remedial Investigation Report
Freeway Landfill and Dump
Burnsville, Minnesota

			Location	**FD-SB-07**	**FD-SB-08**
			Date	**4/01/2019**	**4/01/2019**
Parameter	Units	MPCA Residential Intrusion Screening Values (ISVs) for Vapor Intrusion Risk Evaluation	MPCA Residential 33X Intrusion Screening Values (ISVs) for Vapor Intrusion Risk Evaluation		
Effective Date		05/29/2019	05/29/2019		
Exceedance Key		**Bold Shaded**	No Exceed		
Volatile Organic Compounds					
1,1,1-Trichloroethane	ug/m3	5200	170000	< 2.0	< 1.9
1,1,2,2-Tetrachloroethane	ug/m3	NA	NA	< 1.3	< 1.2
1,1,2-Trichloroethane	ug/m3	0.21	7.0	< 1.0	< 0.97
1,1-Dichloroethane	ug/m3	NA	NA	< 1.5	< 1.4
1,1-Dichloroethylene	ug/m3	210	7000	< 1.5	< 1.4
1,2,4-Trichlorobenzene	ug/m3	2.1	70	< 13.8	< 13.2
1,2,4-Trimethylbenzene	ug/m3	63	2100	6.8	7.7
1,2-Dibromoethane (EDB)	ug/m3	0.017	0.57	< 1.4	< 1.4
1,2-Dichlorobenzene	ug/m3	NA	NA	< 2.2	< 2.1
1,2-Dichloroethane	ug/m3	0.39	13	< 0.75	< 0.72
1,2-Dichloroethylene, cis	ug/m3	NA	NA	< 1.5	16.1
1,2-Dichloroethylene, trans	ug/m3	NA	NA	< 1.5	< 1.4
1,2-Dichloropropane	ug/m3	2.7	90	< 1.7	< 1.6
1,2-Dichlorotetrafluoroethane (Freon 114)	ug/m3	NA	NA	15.8	77.1
1,3,5-Trimethylbenzene	ug/m3	63	2100	< 1.8	2.1
1,3-Butadiene	ug/m3	0.28	9.3	< 0.82	< 0.79
1,3-Dichlorobenzene	ug/m3	NA	NA	5.1	3.2
1,3-Dichloropropene, cis	ug/m3	2.5 (2)	83 (2)	< 1.7	< 1.6
1,3-Dichloropropene, trans	ug/m3	2.5 (2)	83 (2)	< 1.7	< 1.6
1,4-Dichlorobenzene	ug/m3	63	2100	< 5.6	< 5.4
2-Hexanone	ug/m3	31	1000	< 7.6	< 7.3
4-Ethyltoluene	ug/m3	NA	NA	< 4.6	< 4.4
Acetone	ug/m3	32000	1100000	300	159
Benzene	ug/m3	**4.6**	150	1.9	**5.2**
Benzyl chloride	ug/m3	0.21	7.0	< 4.8	< 4.6
Bromodichloromethane	ug/m3	21 (1)	700 (1)	< 2.5	< 2.4
Bromoform	ug/m3	NA	NA	< 9.6	< 9.2
Bromomethane	ug/m3	5.2	170	< 1.4	< 1.4
Carbon disulfide	ug/m3	830	28000	< 1.2	34.6
Carbon tetrachloride	ug/m3	1.7	57	< 2.3	< 2.2
Chlorobenzene	ug/m3	52	1700	< 1.7	< 1.6
Chlorodibromomethane	ug/m3	NA	NA	< 3.2	< 3.0
Chloroethane	ug/m3	4200 (1)	140000 (1)	< 0.98	< 0.94
Chloroform	ug/m3	100	3300	< 0.91	< 0.87
Chloromethane	ug/m3	94	3100	< 0.77	6.1
Cyclohexane	ug/m3	6300	210000	< 3.2	< 3.1
Dichlorodifluoromethane (Freon-12)	ug/m3	NA	NA	10.1	65.8
Ethyl acetate	ug/m3	73	2400	< 1.3	< 1.3
Ethyl alcohol	ug/m3	NA	NA	33.5	7.1
Ethyl benzene	ug/m3	**4.1**	140	**4.4**	**4.4**
Heptane	ug/m3	420	14000	3.5	66.3
Hexachlorobutadiene	ug/m3	NA	NA	< 9.9	< 9.5
Hexane (C6)	ug/m3	730	24000	3.4	180
Isopropyl alcohol	ug/m3	210	7000	6.7	< 4.4
Methane (CH4)	ppmv			45.3	< 36.6
Methyl ethyl ketone (2-butanone)	ug/m3	5200	170000	16.2	< 5.2
Methyl isobutyl ketone (MIBK)	ug/m3	3100	100000	< 7.6	< 7.3
Methyl tertiary butyl ether (MTBE)	ug/m3	39	1300	< 6.7	< 6.4
Methylene chloride	ug/m3	630	21000	< 6.5	< 6.2
Naphthalene	ug/m3	9.4	310	< 4.9	< 4.7
Propylene	ug/m3	3100	100000	10.9	310 e
Styrene	ug/m3	940	31000	< 1.6	< 1.5
Tetrachloroethylene	ug/m3	**3.4**	110	**18.8**	**34.9**
Tetrahydrofuran	ug/m3	2100	70000	< 1.1	< 1.0
Toluene	ug/m3	4200	140000	16.3	17.0
Trichloroethylene (TCE)	ug/m3	**2.1 (3)**	70 (3)	< 1.0	**35.5**
Trichlorofluoromethane (Freon-11)	ug/m3	1000 (1)	33000 (1)	11.5	< 2.0
Trichlorotrifluoroethane (Freon 113)	ug/m3	5200	170000	< 2.9	< 2.7
Vinyl acetate	ug/m3	210	7000	< 1.3	< 1.3
Vinyl chloride	ug/m3	1.7 (4)	57 (4)	< 0.48	1.2
Xylene, m & p	ug/m3	100 (5)	3300 (5)	17.5	15.7
Xylene, o	ug/m3	100 (5)	3300 (5)	6.0	5.5

Data Footnotes and Qualifiers

Barr Standard Footnotes and Qualifiers

e	Estimated value, exceeded the instrument calibration range.

MPCA Residential 33X Intrusion Screening Values (ISVs) for Vapor Intrusion Risk Evaluation

(1)	Based on subchronic RfC.
(2)	Based on ,3-Dichloropropene cas# 542-75-6.
(3)	If a woman is pregnant or may become pregnant is present, expedited action may be needed TCE exceeds the ISVs and/or 33X ISVs (rather than EISVs/33X EISVs).
(4)	The vinyl chloride commericial/industrial ISV is not protective if children are present, see ISV Technical Support Document.
(5)	Based on total xylenes cas# 1330-20-7.
NA	No appropriate toxicity data available to support development of an ISV.

MPCA Residential Intrusion Screening Values (ISVs) for Vapor Intrusion Risk Evaluation

(5)	Based on total xylenes cas# 1330-20-7.
(1)	Based on subchronic RfC.
(2)	Based on ,3-Dichloropropene cas# 542-75-6.
(3)	If a woman is pregnant or may become pregnant is present, expedited action may be needed TCE exceeds the ISVs and/or 33X ISVs (rather than EISVs/33X EISVs).
(4)	The vinyl chloride commericial/industrial ISV is not protective if children are present, see ISV Technical Support Document.
(5)	Based on total xylenes cas# 1330-20-7.
NA	No appropriate toxicity data available to support development of an ISV.

Table 7

SUMMARY OF DETECTIONS - COVER SOIL
Focused Remedial Investigation Report
Freeway Landfill and Dump
Burnsville, Minnesota

							DUMP					LANDFILL				
						Location	FD-SB-A4	FD-SB-B1	FD-SB-C3	FD-SB-F2	FD-SB-G5	FL-SB-01	FL-SB-02	FL-SB-03	FL-SB-04	FL-SB-05
						Date	3/29/2019	3/29/2019	3/29/2019	3/29/2019	3/29/2019	4/02/2019	4/02/2019	4/02/2019	4/02/2019	4/02/2019
						Depth	0 - 3 ft	0 - 7.5 ft	0 - 4.5 ft	0 - 6 ft	0 - 6 ft	0 - 10 ft	0 - 6 ft	0 - 6.5 ft	0 - 2 ft	0 - 6 ft
Parameter	Analysis Location	Units	MPCA Screening Soil Leaching Values	MPCA Criteria for Unregulated Fill	MPCA Tier 2 Industrial Soil Reference Values	MPCA Tier 2 Recreational Soil Reference Values										
Effective Date			06/01/2013	06/22/2009	06/22/2009	06/22/2009										
Exceedance Key			**Bold**	Underline	*Italic*	Shade										
General Parameters																
Carbon, total	Lab	mg/kg					--	--	--	--	--	--	--	--	--	--
Moisture	Lab	%					14.7	11.7	13.0	13.3	13.2	14.3	22.2	22.6	22.7	18.0
Metals																
Arsenic	Lab	mg/kg	**5.8**	5.8	*20*	11	4.5	4.8	***75.1***	3.6	**6.1**	3.6	**7.0**	4.9	3.7	3.1
Barium	Lab	mg/kg	1700	1100	18000	1100	57.6	48.7	51.7	57.4	54.2	63.7 *	102	100	66.0	57.2
Cadmium	Lab	mg/kg	8.8	8.8	200	35	0.18	0.14	0.22	0.11	0.52	0.21	0.24	0.24	0.23	0.084 j
Chromium	Lab	mg/kg	36 CR6	36	650 CR6	120 CR6	11.3	17.7	13.0	18.9	30.4	13.6	15.2	18.1	12.8	12.5
Lead	Lab	mg/kg	2700	300	700	300	26.8	18.1	130	16.7	44.4	25.7	9.5	24.8	20.9	8.1
Mercury	Lab	mg/kg	3.3 MC	0.5	1.5	1.2 MC	0.031	0.024	0.14	0.030	0.023	0.025	0.028	0.22	0.030	0.027
Selenium	Lab	mg/kg	2.6	2.6	1300	200	0.57	1.0	0.57	0.56	1.1	0.85	1.2	1.4	1.2	0.53 j
Silver	Lab	mg/kg	7.9	7.9	1300	200	--	--	--	--	--	--	--	--	0.046 j	--
Semivolatile Organic Compounds																
Benz(a)anthracene	Lab	ug/kg	T		T	T	211	335	868	86.5	73.1	546	--	271	756	12.0 j
Benzo(a)pyrene	Lab	ug/kg	T		T	T	199	351	981	110	81.8	506	--	257	692	14.7
Benzo(b)fluoranthene	Lab	ug/kg	T		T	T	220	451	1250	144	95.6	623	--	267	873	17.5
Benzo(k)fluoranthene	Lab	ug/kg	T		T	T	99.8	194	439	58.7	--	375	--	158	368	--
Chrysene	Lab	ug/kg	T		T	T	184	328	948	119	79.3	565	--	237	754	14.8
Dibenz(a,h)anthracene	Lab	ug/kg	T		T	T	--	68.5	231	--	--	94.8	--	49.0	134	--
Indeno(1,2,3-cd)pyrene	Lab	ug/kg	T		T	T	136	234	541	71.7	--	302	--	152	404	--
B(a)P Equivalent, non-detects at 0, 2002 PEFs	Barr Calculation	ug/kg	**1400 T**	1400	3000 T	2000 T	270	510	**1400**	150	99	750	--	370	1000	18 a
B(a)P Equivalent, non-detects at 1/2, 2002 PEFs	Barr Calculation	ug/kg	**1400 T**	1400	3000 T	2000 T	270	510	**1400**	150	100	750	0.81	370	1000	18 a
B(a)P Equivalent, non-detects at 1x, 2002 PEFs	Barr Calculation	ug/kg	**1400 T**	1400	3000 T	2000 T	270	510	**1400**	150	100	750	1.6	370	1000	18 a
Acenaphthene	Lab	ug/kg	81000	81000	5260000	1860000	--	--	--	--	--	55.2 j	--	52.0	153	--
Acenaphthylene	Lab	ug/kg	NA				--	89.3	457	--	--	53.8 j	--	18.4	--	--
Anthracene	Lab	ug/kg	1300000	1300000	45400000	10000000	114	128	373	--	--	259	--	174	442	--
Benzo(e)pyrene	Lab	ug/kg					133 *	238 *	765 *	102 *	72.8 *	340 *	--	159 *	438 *	--
Benzo(g,h,i)perylene	Lab	ug/kg	NA				149	243	609	108	79.6	298	--	174	464	--
Fluoranthene	Lab	ug/kg	670000	670000	6800000	1290000	416	673	1150	181	150	1450	--	668	2220	25.8
Fluorene	Lab	ug/kg	110000	110000	4120000	1200000	--	--	63.1	--	--	58.7	--	83.1	163	--
Naphthalene	Lab	ug/kg	4500	4500	28000	24000	--	--	--	--	--	17.1 j	--	49.2	25.4 j	--
Phenanthrene	Lab	ug/kg	NA				352	306	135	121	70.3	1060	--	503	1610	--
Pyrene	Lab	ug/kg	440000	440000	5800000	1060000	427	556	1440	204	148	996	--	508	1410	21.9
Volatile Organic Compounds																
1,2,4-Trimethylbenzene	Lab	ug/kg	2700	2700	25000	20000	--	--	--	--	--	--	--	--	--	--
Benzene	Lab	ug/kg	**17**	17	10000	14000	--	--	--	--	5.1 j	4.1 j	--	4.8 j	3.8 j	--
Cumene (isopropyl benzene)	Lab	ug/kg	9500	9500	87000	74000	--	--	--	--	--	--	--	--	--	--
Ethyl benzene	Lab	ug/kg	1000	1000	200000	200000	--	--	--	--	--	--	--	--	--	--
Naphthalene	Lab	ug/kg	4500	4500	28000	24000	--	--	--	--	--	--	--	--	--	--
Propylbenzene	Lab	ug/kg	NA	30000	93000	70000	--	--	--	--	--	--	--	--	--	--
Xylene, total	Lab	ug/kg	5400 M	5400	130000 M	110000 M	--	--	--	--	--	--	--	--	--	--
Total Petroleum Hydrocarbons																
Diesel Range Organics, C10-C28	Lab	mg/kg		100			47.5	16.7	21.9	135	90.9	53.7	3.0 j	183	94.9	8.0 j
Gasoline Range Organics, C6-C10	Lab	mg/kg		100			--	2.0 j	2.9 j	3.1 j	2.9 j	--	--	7.0 j	--	--

Table 7

SUMMARY OF DETECTIONS - COVER SOIL
Focused Remedial Investigation Report
Freeway Landfill and Dump
Burnsville, Minnesota

							LANDFILL								
						Location	FL-SB-06	FL-SB-07	FL-SB-08	FL-SB-09	FL-SB-10	FL-SB-11	FL-SB-12	FL-SB-13	FL-SB-14
						Date	4/02/2019	4/02/2019	4/02/2019	4/02/2019	4/02/2019	4/02/2019	4/02/2019	4/02/2019	4/02/2019
						Depth	0 - 4.5 ft	0 - 4.5 ft	0 - 5 ft	0 - 8 ft	0 - 25 ft	0 - 20 ft	0 - 10 ft	0 - 6 ft	0 - 10 ft
Parameter	Analysis Location	Units	MPCA Screening Soil Leaching Values	MPCA Criteria for Unregulated Fill	MPCA Tier 2 Industrial Soil Reference Values	MPCA Tier 2 Recreational Soil Reference Values									
Effective Date			06/01/2013	06/22/2009	06/22/2009	06/22/2009									
Exceedance Key			**Bold**	Underline	*Italic*	Shade									
General Parameters															
Carbon, total	Lab	mg/kg					--	--	--	--	9300	15600	13200	20700	22700
Moisture	Lab	%					13.8	16.4	21.1	12.6	10.9	13.9	15.4	9.5	20.5
Metals															
Arsenic	Lab	mg/kg	**5.8**	5.8	*20*	11	3.4	4.5	**6.5**	3.6	4.1	3.9	4.8	3.1	4.2
Barium	Lab	mg/kg	1700	1100	18000	1100	63.2	67.1	93.5	61.2	50.1	47.8	110	48.7	78.0
Cadmium	Lab	mg/kg	8.8	8.8	200	35	0.21	0.81	5.2	0.19	0.11	0.14	0.40	0.19	0.27
Chromium	Lab	mg/kg	36 CR6	36	650 CR6	120 CR6	9.7	14.7	20.3	12.4	14.0	15.2	16.4	10.7	17.0
Lead	Lab	mg/kg	2700	300	700	300	7.0	26.2	29.9	19.2	13.9	16.0	12.1	34.7	19.9
Mercury	Lab	mg/kg	3.3 MC	0.5	1.5	1.2 MC	0.020 j	0.036	0.056	0.031	0.013 j	0.017 j	0.015 j	0.018 j	0.047
Selenium	Lab	mg/kg	2.6	2.6	1300	200	1.0	1.3	1.8	0.92	0.89	0.98	1.7	0.72	1.4
Silver	Lab	mg/kg	7.9	7.9	1300	200	--	--	0.061 j	--	--	--	--	--	--
Semivolatile Organic Compounds															
Benz(a)anthracene	Lab	ug/kg	T		T	T	18.5	953	55.7	807	1040	108	53.3	485	163
Benzo(a)pyrene	Lab	ug/kg	T		T	T	21.3	1100	88.3	797	842	78.6	58.6	479	201
Benzo(b)fluoranthene	Lab	ug/kg	T		T	T	27.0	1230	99.8	829	965	89.5	66.0	481	236
Benzo(k)fluoranthene	Lab	ug/kg	T		T	T	16.1	507	58.2	437	570	50.7 j	39.3	296	115
Chrysene	Lab	ug/kg	T		T	T	22.5	989	79.9	718	893	118	59.9	507	173
Dibenz(a,h)anthracene	Lab	ug/kg	T		T	T	--	228	--	182	180	--	--	--	--
Indeno(1,2,3-cd)pyrene	Lab	ug/kg	T		T	T	12.4	645	51.5	427	472	--	33.9	234	131
B(a)P Equivalent, non-detects at 0, 2002 PEFs	Barr Calculation	ug/kg	**1400 T**	1400	3000 T	2000 T	29	**1600**	120	1200	1300	100 a	78	630	270
B(a)P Equivalent, non-detects at 1/2, 2002 PEFs	Barr Calculation	ug/kg	**1400 T**	1400	3000 T	2000 T	29	**1600**	120	1200	1300	110 a	79	640	270
B(a)P Equivalent, non-detects at 1x, 2002 PEFs	Barr Calculation	ug/kg	**1400 T**	1400	3000 T	2000 T	29	**1600**	120	1200	1300	110 a	79	640	270
Acenaphthene	Lab	ug/kg	81000	81000	5260000	1860000	--	--	--	96.0	83.3	359	--	--	--
Acenaphthylene	Lab	ug/kg	NA				--	--	--	188	277	--	--	--	--
Anthracene	Lab	ug/kg	1300000	1300000	45400000	10000000	--	175	14.4	361	655	334	31.7	209	--
Benzo(e)pyrene	Lab	ug/kg					14.6 *	779 *	69.4 *	485 *	526 *	55.2 j*	41.6 *	335 *	129 *
Benzo(g,h,i)perylene	Lab	ug/kg	NA				17.3	858	75.8	499	503	55.0 j	52.6	375	157
Fluoranthene	Lab	ug/kg	670000	670000	6800000	1290000	41.2	1420	145	1640	2920	523	153	1030	316
Fluorene	Lab	ug/kg	110000	110000	4120000	1200000	2.5 j	--	--	165	415	278	14.0	118	--
Naphthalene	Lab	ug/kg	4500	4500	28000	24000	--	--	--	--	107	170	--	--	--
Phenanthrene	Lab	ug/kg	NA				19.6	514	50.9	673	2170	876	106	762	101
Pyrene	Lab	ug/kg	440000	440000	5800000	1060000	34.4	1220	120	1100	1680	340	110	864	250
Volatile Organic Compounds															
1,2,4-Trimethylbenzene	Lab	ug/kg	2700	2700	25000	20000	--	--	--	--	--	--	--	15.8 j	--
Benzene	Lab	ug/kg	**17**	17	10000	14000	--	--	--	--	--	--	--	**32.9**	--
Cumene (isopropyl benzene)	Lab	ug/kg	9500	9500	87000	74000	--	--	--	--	--	--	--	23.3 j	--
Ethyl benzene	Lab	ug/kg	1000	1000	200000	200000	--	--	--	--	--	--	--	7.2 j	--
Naphthalene	Lab	ug/kg	4500	4500	28000	24000	--	--	--	62.1 j	115 j	1320	--	133 j	--
Propylbenzene	Lab	ug/kg	NA	30000	93000	70000	--	--	--	--	--	--	--	14.4 j	--
Xylene, total	Lab	ug/kg	5400 M	5400	130000 M	110000 M	--	--	--	--	--	--	--	128 j	--
Total Petroleum Hydrocarbons															
Diesel Range Organics, C10-C28	Lab	mg/kg		100			18.8	35.4	27.9	53.1	56.4	28.9	10.9	458	19.6
Gasoline Range Organics, C6-C10	Lab	mg/kg		100			--	2.7 j	--	--	--	--	--	--	--

Data Footnotes and Qualifiers

Barr Standard Footnotes and Qualifiers

--	Not analyzed/Not detected.
N	Sample Type: Normal
NA	NA (not applicable) indicates that a fractional portion of the sample is not part of the analytical testing or field collection procedures.
*	Estimated value, QA/QC criteria not met.
a	Estimated value, calculated using some or all values that are estimates.
j	Estimated detected value. The reported value is less than the stated laboratory quantitation limit but greater than the laboratory method detection limit.

MPCA Screening Soil Leaching Values

CR6	Value represents the criteria for Chromium, hexavalent.
M	Value represents the criteria for mixed Xylenes.
MC	Mercury as Mercuric Chloride.
NA	Criterion value is not available for this analyte.
T	Value represents a criteria for the total carcinogenic PAHs as B(a)P.

MPCA Criteria for Unregulated Fill

Criteria shown in this column are the minimum of the MPCA Tier 1 Residential Soil Reference Value and the MPCA Soil Leaching Value. Field screening criteria are not shown.

MPCA Tier 2 Industrial Soil Reference Values

CR6	Value represents the criteria for Chromium, hexavalent.
M	Value represents the criteria for mixed Xylenes.
T	Value represents a criteria for the total carcinogenic PAHs as B(a)P.

MPCA Tier 2 Recreational Soil Reference Values

CR6	Value represents the criteria for Chromium, hexavalent.
M	Value represents the criteria for mixed Xylenes.
MC	Mercury as Mercuric Chloride.
T	Value represents a criteria for the total carcinogenic PAHs as B(a)P.

Table 8

MONITORING WELL NETWORK MATRIX
Focused Remedial Investigation Report
Freeway Landfill and Dump
Burnsville, Minnesota

Well Name	Unique Number	Date Installed	Unit	Total Depth (feet, bgs)	Screen or Open Borehole	Screen / Open Borehole Interval (feet, bgs)		Elevations (feet, MSL) *		Coordinates (meters, UTM Z15N)	
						Depth to Top	Depth to Bottom	Ground Surface	Top of Riser	Easting	Northing
MW-1	813761	6/4/2015	Perched	38	Screen	28	38	*733.0*	735.13	476723.106	4959817.822
MW-2	813762	5/28/2015	Perched	46	Screen	36	46	*740.5*	741.97	476580.54	4959939.57
MW-3	813763	5/27/2015	Perched	52	Screen	42	52	*750.5*	753.29	476689.87	4960078.91
MW-4	813764	6/4/2015	Perched	48	Screen	38	48	*738.0*	740.07	476822.656	4959969.66
MW-4D	813740	6/4/2015	Water Table	64	Screen	54	64	*737.5*	739.94	476825.11	4959969.492
MW-5	813765	6/4/2015	Perched	41	Screen	21	41	*745.5*	748.10	477011.92	4960008.139
MW-6	813766	6/1/2015	Perched	37	Screen	27	37	*725.0*	726.61	476931.665	4960343.586
MW-7	813767	6/1/2015	Perched	36	Screen	26	36	*720.5*	722.66	476866.966	4960416.67
MW-8	813768	5/29/2015	Perched	37	Screen	27	37	*722.5*	724.60	476717.616	4960398.452
MW-8D	813741	6/15/2015	Water Table	45.5	Screen	40.5	45.5	*722.5*	724.13	476715.487	4960398.193
MW-9	834659	5/21/2019	Perched	26	Screen	16	26	*726.5*	*729.5*	476611.2744	4959741.311
MW-9D	837777	4/4/2019	Water Table	83	Open Hole	45	83	*726.5*	*729.5*	476611.2744	4959741.311
MW-10D	837776	4/1/2019	Water Table	88	Open Hole	66.5	88	*721.0*	*724*	476391.9139	4959741.246
MW-11	834655	5/21/2019	Water Table	18	Screen	8	18	*708.0*	*710.5*	476631.1973	4960480.334
MW-12	834656	5/20/2019	Water Table	18	Screen	8	18	*709.0*	*711.5*	476782.9982	4960532.702
MW-13	834657	5/20/2019	Water Table	18	Screen	8	18	*709.0*	*711.5*	476920.5905	4960585.354
WT-6	240816	5/21/1982	Water Table	27	Screen	17	27	705.7	707.54	477090.3023	4960083.125
MP-8 **	--	9/28/1993	Perched	17	Screen	7	17	709.9	712.87		
WT-9	434012	4/29/1987	Water Table	66	Open Hole	61	66	703.1	704.14	476979.9069	4960682.233
WT-10	434010	4/28/1987	Water Table	50	Open Hole	45	50	708	707.96	476481.7578	4960444.397
WT-11B	434011	5/7/1987	Water Table	110	Open Hole	45	110	716	718.31	476448.1228	4959709.052
WT-12B	434013	5/6/1987	Water Table	94	Open Hole	49	94	712	712.25	476356.3694	4960088.115
WT-13	462523	5/21/1990	Water Table	85	Open Hole	55	85	710.3	712.16	476738.1237	4959697.259
WT-14	462522	5/25/1990	Water Table	80	Open Hole	55	80	702.3	704.02	476337.88	4959799.664
J-1	268045	10/7/1983	Jordan	220	Open Hole	194	220	697.9	700.12	477039	4959767
J-13	462520	5/21/1990	Jordan	199	Open Hole	189	199	711	712.97	476734.7724	4959697.272
J-14	462521	5/25/1990	Jordan	180	Open Hole	160	180	702	703.37	476336.9541	4959796.621

* Ground surface elevations in italics were estimated based on LIDAR data. TOR elevations in italics are from wells not surveyed and this elevation is estimated based on LIDAR elevations and well construction information. (MSL - mean sea level)

** MP-8 was not installed as a monitoring well

Table 8

MONITORING WELL NETWORK MATRIX
Focused Remedial Investigation Report
Freeway Landfill and Dump
Burnsville, Minnesota

Well Name	Unique Number	Date Installed	Unit	Total Depth (feet, bgs)	Screen or Open Borehole	Screen / Open Borehole Interval (feet, bgs)		Elevations (feet, MSL) *		Coordinates (meters, UTM Z15N)	
						Depth to Top	Depth to Bottom	Ground Surface	Top of Riser	Easting	Northing
OFMW-1	472759	9/18/1990	Water Table	21	Screen	11	21	*705*	*708*	477494.1855	4959585.243
MW-97-1	603281	11/10/1997	Water Table	31	Open Hole	16	31	719	721.46	477218.4561	4959349.892
MW-97-2	603282	11/10/1997	Water Table	31	Open Hole	16	31	*717*	*719.5*	477211.8912	4959463.56
MW-97-3	603283	11/17/1997	Water Table	30	Open Hole	16	30	*714*	*716.5*	477207.4566	4959576.61
MW-97-4	603287	11/18/1997	Water Table	28	Open Hole	11	28	*719*	*721.5*	477476.2928	4959371.739
MW-97-5	603288	11/18/1997	Water Table	28	Open Hole	13	30	717.8	720.88	477477.8076	4959291.3
MW-97-6	603289	11/18/1997	Water Table	29	Open Hole	16	29	*720*	*722.5*	477327.2135	4959269.036
MW-97-7	603284	11/19/1997	Water Table	18	Open Hole	8.5	18	703.9	707	477211.5752	4959695.416
MW-97-8	603285	11/18/1997	Water Table	20	Screen	15	20	*702*	*705*	477350.0159	4959726.258
MW-97-9	603286	11/18/1997	Water Table	21	Open Hole	10	20	704.9	708.11	477475.1732	4959710.232
MW-19-01	834660	3/28/2019	Perched?	17	Screen	7	17	*716*	*719.5*	477235.8417	4959662.109
MW-19-02	834662	3/26/2019	Perched?	17.5	Screen	7.5	17.5	*718*	*721*	477304.8262	4959695.369
MW-19-03	834663	3/26/2019	Perched?	34	Screen	14	34	*723*	*725.5*	477376.5751	4959697.03
MW-19-04	834661	3/27/2019	Perched?	35	Screen	15	35	*724*	*727*	477362.1911	4959643.292

* Ground surface elevations in italics were estimated based on LIDAR data. TOR elevations in italics are from wells not surveyed and this elevation is estimated based on LIDAR elevations and well construction information. (MSL - mean sea level)

Table 9a

WATER LEVEL MEASUREMENTS
Dump
Focused Remedial Investigation Report
Freeway Landfill and Dump
Burnsville, Minnesota

Well Name	Unique Number	Unit	Top of Riser Elevation (feet, MSL)[1]	Total Well Depth	Date Measured	Depth to Water (feet, TOR)	Groundwater Elevation (feet, MSL)	Analytical Sample Collected?	Comments
OFMW-1	472759	Water Table	708.00	23.2	4/9/2019	--	--	--	Underwater
					5/21/2019	5.19	702.81	Yes	
					6/17/2019	5.62	702.38	--	Needs new lock
MW-97-1	603281	Water Table	721.46	32.91	3/26/2019	18.74	702.72	Yes	
					4/9/2019	18.85	702.61	--	
					6/17/2019	15.14	706.32	--	
MW-97-2	603282	Water Table	719.50	32.12	4/9/2019	--	--	--	Could not open
					6/3/2019	12.3	707.20	Yes	
					6/17/2019	14.18	705.32	--	
MW-97-3	603283	Water Table	716.50	29.55	4/9/2019	12.61	703.89	--	
					5/21/2019	11.20	705.30	Yes	
					6/17/2019	14.29	702.21	--	
MW-97-4	603287	Water Table	721.50	29.53	3/26/2019	11.27	710.23	Yes	
					4/9/2019	10.81	710.69	--	
					6/17/2019	10.69	710.81	--	
MW-97-5	603288	Water Table	720.88	28.54	3/26/2019	11.38	709.50	Yes	
					4/9/2019	10.96	709.92	--	
					6/17/2019	10.46	710.42	--	
MW-97-6	603289	Water Table	722.50	30.3	3/26/2019	20.98	701.52	Yes	
					4/9/2019	19.11	703.39	--	
					6/17/2019	13.75	708.75	--	
MW-97-7	603284	Water Table	707.00	20.99	4/9/2019	--	--	--	Underwater
					5/21/2019	5.89	701.11	Yes	
					6/17/2019	7.99	699.01	--	
MW-97-8	603285	Water Table	705.00	--	4/9/2019	--	--	--	Underwater
					5/21/2019	--	--	No	Could not open
					6/17/2019	--	--	--	Needs repair
MW-97-9	603286	Water Table	708.11	23.22	4/9/2019	--	--	--	Underwater
					5/21/2019	5.94	702.17	Yes	
					6/17/2019	6.53	701.58	--	
MW-19-01	834660	Perched?	*719.5*	20.29	4/3/2019	11.64	707.86	Yes	
					4/9/2019	12.84	706.66	--	
					6/17/2019	14.29	705.21	--	
MW-19-02	834662	Perched?	*721*	38.03	4/3/2019	17.43	703.57	Yes	
					4/9/2019	13.6	707.40	--	
					6/17/2019	15.76	705.24	--	
MW-19-03	834663	Perched?	*725.5*	21.32	4/3/2019	14.98	710.52	Yes	
					4/9/2019	16.86	708.64	--	
					6/17/2019	19.5	706.00	--	
MW-19-04	834661	Perched?	*727*	35.18	4/3/2019	15.07	711.93	Yes	
					4/9/2019	18.74	708.26	--	
					6/17/2019	20.36	706.64	--	

TOR - Top of riser

MSL - Mean sea level

1 - TOR elevations in italics are from wells not surveyed and this elevation is estimated based on LIDAR elevations and well construction information.
Approximate Minnesota River Stage on April 9, 2019 = 708.3 feet MSL
Approximate Minnesota River Stage on June 17, 2019 = 699 feet MSL

Table 9b

WATER LEVEL MEASUREMENTS
Landfill
Focused Remedial Investigation Report
Freeway Landfill and Dump
Burnsville, Minnesota

Well Name	Unique Number	Unit	Top of Riser Elevation (feet, MSL)[1]	Total Well Depth	Date Measured	Depth to Water (feet, TOR)	Groundwater Elevation (feet, MSL)	Analytical Sample Collected?	Comments
MW-1	813761	Perched	735.13	40.03	4/1/2019	36.62	698.51	Yes	
					4/9/2019	33.95	701.18	--	
					6/17/2019	32.3	702.83	--	
MW-2	813762	Perched	741.97	47.55	4/9/2019	47.17	694.80	--	
					5/22/2019	47.21	694.76	No, dry	
					6/17/2019	47.11	694.86	--	
MW-3	813763	Perched	753.29	55.11	4/9/2019	45.09	708.20	--	
					5/22/2019	51.7	701.59	Yes	
					6/17/2019	52.18	701.11	--	
MW-4	813764	Perched	740.07	50.43	4/1/2019	46.38	693.69	Yes	
					4/9/2019	42.94	697.13	--	
					6/17/2019	45.77	694.30	--	
MW-4D	813740	Water Table	739.94	66.35	4/1/2019	55.9	684.04	Yes	
					4/9/2019	55.54	684.40	--	
					6/17/2019	52.52	687.42	--	
MW-5	813765	Perched	748.10	44.19	3/27/2019	29	719.10	Yes	
					4/9/2019	24.90	723.20	--	
					6/17/2019	25.46	722.64	--	
MW-6	813766	Perched	726.61	39.24	3/27/2019	31.45	695.16	Yes	
					4/9/2019	--	--	--	Could not open
					6/17/2019	--	--	--	Could not open
MW-7	813767	Perched	722.66	38.73	3/27/2019	29.75	692.91	Yes	
					4/9/2019	23.34	699.32	--	
					6/17/2019	24.03	698.63	--	
MW-8	813768	Perched	724.60	39.77	3/27/2019	18.41	706.19	Yes	
					4/9/2019	17.76	706.84	--	
					6/17/2019	20.4	704.20	--	
MW-8D	813741	Water Table	724.13	47.45	3/27/2019	37.43	686.70	Yes	
					4/9/2019	29.35	694.78	--	
					6/17/2019	27.13	697.00	--	
MW-9	834659	Perched	*729.5*	28.32	4/9/2019	--	--	--	Not yet installed
					6/3/2019	26.8	702.70	Yes	
					6/17/2019	26.28	703.22	--	
MW-9D	837777	Water Table	*729.5*	84.5	4/9/2019	69.97	659.53	--	
					4/10/2019	69.79	659.71	Yes	
					6/3/2019	64.93	664.57	Yes[3]	
					6/17/2019	64.97	664.53	--	
MW-10D	837776	Water Table	*724*	66.5	4/9/2019	74.31	649.69	--	
					4/10/2019	74.19	649.81	Yes	
					6/3/2019	69.7	654.30	Yes[3]	
					6/17/2019	70.31	653.69	--	
MW-11	834655	Water Table	*710.5*	20.3	4/9/2019	--	--	--	Not yet installed
					5/28/2019	4.03	706.47	Yes	
					6/17/2019	5.5	705.00	--	
MW-12	834656	Water Table	*711.5*	20.33	4/9/2019	--	--	--	Not yet installed
					5/28/2019	3.5	708.00	Yes	
					6/17/2019	7.29	704.21	--	
MW-13	834657	Water Table	*711.5*	20.32	4/9/2019	--	--	--	Not yet installed
					5/28/2019	4.5	707.00	Yes	
					6/17/2019	8.74	702.76	--	

Table 9b

WATER LEVEL MEASUREMENTS
Landfill
Focused Remedial Investigation Report
Freeway Landfill and Dump
Burnsville, Minnesota

Well Name	Unique Number	Unit	Top of Riser Elevation (feet, MSL)[1]	Total Well Depth	Date Measured	Depth to Water (feet, TOR)	Groundwater Elevation (feet, MSL)	Analytical Sample Collected?	Comments
WT-6	240816	Water Table	707.54	25.55	4/1/2019	7.9	699.64	Yes	
					4/9/2019	6.71	700.83	--	
					6/17/2019	9.48	698.06	--	
MP-8[2]	--	Perched	712.87	16.79	3/28/2019	8.93	703.94	Yes	
					4/9/2019	--	--	--	Could not open
					6/17/2019	10.3	702.57	--	
WT-9	434012	Water Table	704.14	--	4/9/2019	--	--	--	Underwater
					6/17/2019	7.82	696.32	--	Needs new lock
WT-10	434010	Water Table	707.96	--	4/9/2019	--	--	--	Underwater
					6/17/2019	14.92	693.04	--	
WT-11B	434011	Water Table	718.31	102	3/28/2019	67.35	650.96	Yes	
					4/9/2019	60.41	657.90	--	
					6/17/2019	58.95	659.36	--	
WT-12B	434013	Water Table	712.25	--	4/9/2019	--	--	--	Could not find
					6/17/2019	44.02	668.23		
WT-13	462523	Water Table	712.16	86.17	3/28/2019	55.52	656.64	Yes	
					4/9/2019	52.60	659.56	--	
					6/17/2019	48.89	663.27	--	
WT-14	462522	Water Table	704.02	81.73	3/29/2019	60.02	644.00	Yes	
					4/9/2019	56.65	647.37	--	
					6/17/2019	52.46	651.56	--	
J-1	268045	Jordan	700.12	--	4/9/2019	--	--	--	Underwater
					6/17/2019	--	--	--	Underwater
J-13	462520	Jordan	712.97	207	3/28/2019	42.49	670.48	Yes	
					4/9/2019	37.42	675.55	--	
					6/17/2019	45.73	667.24	--	
J-14	462521	Jordan	703.37	187	3/29/2019	39.2	664.17	Yes	
					4/9/2019	37.4	665.97	--	
					6/17/2019	42.1	661.27	--	

TOR - Top of riser

MSL - Mean sea level

1 - TOR elevations in italics are from wells not surveyed and this elevation is estimated based on LIDAR elevations and well construction information.

2 - MP-8 was not installed as a monitoring well

3 - MDH parameters were resampled

Approximate Minnesota River Stage on April 9, 2019 = 708.3 feet MSL

Approximate Minnesota River Stage on June 17, 2019 = 699 feet MSL

Table 10

Summary of Exceedances
Water - Phase A
Focused Remedial Investigation Reports
Freeway Landfill and Dump
Burnsville, Minnesota

								LANDFILL										DUMP					
							Location	FL-TT-02	FL-TT-03	FL-TT-04	FL-TT-05	FL-TT-07	FL-TT-08	TS-SB-02	TS-SB-05	TS-SB-07	TS-SB-08	FD-SB-A2	FD-SB-A3	FD-SB-A3	FD-SB-A4	FD-SB-A5	FD-SB-B3
							Date	4/18/2018	4/19/2018	4/19/2018	4/19/2018	4/19/2018	4/20/2018	4/12/2018	4/13/2018	4/13/2018	4/13/2018	3/28/2018	3/26/2018	3/29/2018	3/26/2018	3/21/2018	3/28/2018
							Sample Type	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
				Drinking Water Standards		Surface Water Standards																	
Parameter	Total or Dissolved	Analysis Location	Units	EPA Maximum Contaminant Levels	MDH Human Health-Based Water Guidance Table	Minnesota Surface Water 2Bd Chronic 7050 - 360 Hardness	Minnesota Surface Water 2Bd Final Acute Value 7050 - 360 Hardness																
Effective Date				04/01/2012	04/23/2018	01/24/2012	01/24/2012																
Exceedance Key				**Bold**	*Italic*	Underline	*Shade*																
General Parameters																							
Chloride	NA	Lab	mg/l			230	1720	--	--	--	--	--	ns	ns	ns	ns	820	ns	ns	ns	ns	--	--
Chlorine dioxide	NA	Lab	mg/l	**0.8 (11)**				--	**0.83 h**	**0.88 h**	**1.5 h**	--	ns	ns	ns	ns	--	ns	ns	ns	ns	--	--
Cyanide	NA	Lab	ug/l	200		5.2 (5)	*45 (5)*	22.0	--	--	--	--	16.3	ns	ns	ns	41.3	ns	17.3	ns	ns	*52.0*	26.8
Nitrogen, ammonia, as N	NA	Lab	mg/l			0.04 (3)		10.6	5.0	7.8	4.5	9.7	11.1	ns	ns	ns	95.2	ns	46.9 44.2	ns	ns	72.7	32.8 *
Nitrogen, unionized ammonia, as N	NA	Lab	mg/l			0.04		--	--	--	--	--	--	ns	ns	ns	0.18	ns	ns	ns	ns	ns	0.052
pH	NA	Lab	pH units			6.5 - 9.0		6.3 h	--	--	--	--	--	ns	ns	ns	--	ns	--	ns	ns	--	--
pH	NA	Field	pH units			6.5 - 9.0		5.9	5.6	5.9	6.3	6.2	6.0	ns	ns	ns	--	ns	ns	ns	ns	ns	--
Turbidity	NA	Lab	NTU	**5 (16)**		25		**620**	**156**	**246**	**196**	**152**	**1460 ***	ns	ns	ns	**260**	ns	**520**	ns	ns	**145**	**416**
Metals																							
Aluminum	Dissolved	Lab	ug/l			125	2145	--	--	--	--	358	350 *	--	3810	92800	--	ns	--	ns	ns	--	--
Arsenic	Dissolved	Lab	ug/l	10		2.0	720	7.3	--	3.7	3.4	--	--	3.1	4.4	**71.2**	6.6	ns	--	ns	ns	--	--
Barium	Dissolved	Lab	ug/l	**2000**	*2000 HRL93*			--	--	--	--	--	--	--	***2750***	***2810***	--						
Beryllium	Dissolved	Lab	ug/l	4	*0.08 HRL93*			--	--	--	--	--	--	--	--	*2.8*	--	ns	--	ns	ns	--	--
Boron	Dissolved	Lab	ug/l		*500 RAA17*			*536*	--	*1090*	--	*1610*	--	*582*	*859*	*889*	*6960*	ns	*33000*	ns	ns	*399000*	*51900*
Cadmium	Dissolved	Lab	ug/l	5	*0.5 HRL15 (1)*	2.8 HD CF	270 HD CF	--	--	--	--	--	--	--	--	*3.8*	--	ns	--	ns	ns	--	--
Chromium	Dissolved	Lab	ug/l	100	100 CR HRL93	11 CF CR6	31 CF CR6	--	--	--	--	--	--	--	--	--	--	ns	--	ns	ns	22.2	--
Cobalt	Dissolved	Lab	ug/l			2.8	872	3.2	--	3.6	4.5	--	3.2	--	4.8	105	5.0	ns	--	ns	ns	--	3.8
Copper	Dissolved	Lab	ug/l	1300 TT(12)		21 HD CF	110 HD CF	--	--	--	--	--	--	--	--	313	--	ns	--	ns	ns	--	--
Lead	Dissolved	Lab	ug/l	**15 TT(12)**		13 HD CF	6600 HD CF	--	--	--	--	--	--	--	**24.3**	**113**	--	ns	--	ns	ns	--	--
Manganese	Dissolved	Lab	ug/l		*100 HRL93 (1)*			*985*	*1120*	*1030*	*749*	*902*	*2290*	*722*	*2440*	*9940*	*226*	ns	*623*	ns	ns	*267*	--
Nickel	Dissolved	Lab	ug/l		*100 HRL93*	460 HD CF	8400 HD CF	--	--	--	--	--	--	--	--	*215*	--	ns	--	ns	ns	--	--
Selenium	Dissolved	Lab	ug/l	50	*30 HRL93*	5.0	*40*	--	--	--	--	--	--	--	--	--	--	ns	--	ns	ns	--	--
Thallium	Dissolved	Lab	ug/l	2	*0.6 HRL94*	0.28	128	--	--	--	--	--	--	--	--	***2.9***	--	ns	--	ns	ns	--	--
Vanadium	Dissolved	Lab	ug/l		*50 HRL94*			--	--	--	--	--	--	--	--	*205*	--	ns	--	ns	ns	*102*	--
Zinc	Dissolved	Lab	ug/l		2000 HRL94	310 HD CF	680 HD CF	--	--	--	--	--	--	--	--	492	--	ns	--	ns	ns	--	--
Chromium	Total	Lab	ug/l	100	100 CR HRL93	11 CR6	32 CR6	--	--	--	--	--	--	--	--	--	--	ns	--	ns	ns	ns	--
Chromium, hexavalent	Total	Lab	mg/l	0.1 (14)	0.1 HRL93	0.011	*0.032*	--	--	--	--	--	--	--	--	--	--	ns	--	ns	ns	--	--
Semivolatile Organic Compounds																							
1,4-Dioxane	NA	Lab	ug/l		*1 HRL13 (1)*			--	--	--	--	*1.2*	--	*2.2*	*36*	*11*	*120*	ns	*37*	ns	*40*	*160*	*79*
3,4-Methylphenol (m,p cresols)	NA	Lab	ug/l		*3 MP HRL94*			--	--	--	--	--	--	ns	*232*	--	--	ns	--	ns	--	--	--
Bis(2-ethylhexyl)phthalate	NA	Lab	ug/l	**6**	*7 HRL15 (1)*	1.9	(1)	***13.8***	--	--	***264***	--	--	ns	--	--	--	ns	--	ns	--	--	--
Volatile Organic Compounds																							
1,2-Dichloroethane	NA	Lab	ug/l	**5**	*1 HRL13 (1)*	3.8	90100 (1)	--	--	--	--	--	--	--	--	--	--	--	--	ns	--	--	***12***
Acrylamide	NA	Lab	ug/l	TT(2)	*0.2 HRL15 (1)*			--	--	--	--	--	--	--	--	--	--	ns	ns	ns	ns	--	--
Benzene	NA	Lab	ug/l	**5**	*2 HRL09 (1)*	6.0	8974 (1)	*4.5*	--	--	--	--	--	--	--	--	*3.0*	--	***9.8***	ns	***14***	***10***	***30***
Chlorobenzene	NA	Lab	ug/l	100	100 HRL93	20	846	--	--	--	--	--	--	--	--	--	--	--	--	ns	--	--	20
Ethyl benzene	NA	Lab	ug/l	**700**	*50 HRL11*	68	3717	--	--	--	--	--	--	--	--	--	--	--	--	ns	--	--	***1000***
Tetrahydrofuran	NA	Lab	ug/l		*600 HBV16*			--	--	--	--	--	--	--	--	--	--	--	--	ns	--	--	*4600*
Toluene	NA	Lab	ug/l	**1000**	*200 HRL11*	253	2703	--	--	--	--	--	--	--	--	--	--	--	--	ns	--	--	***1100***
Trichloroethylene (TCE)	NA	Lab	ug/l	5 (9)	*0.4 HRL15 (1)*	25	13976	--	--	--	--	--	--	--	--	--	--	--	--	ns	--	--	--
Vinyl chloride	NA	Lab	ug/l	2	*0.2 HRL09 (1)*	0.18	(1)	--	--	--	--	--	--	--	--	--	--	*0.68*	--	ns	--	*0.37*	*0.45*
Xylene, m & p	NA	Lab	ug/l	10000 (15)	*300 XYL HRL11 (1)*			--	--	--	--	--	--	--	--	--	--	--	--	ns	--	--	*3300*
Xylene, o	NA	Lab	ug/l	10000 (15)	*300 XYL HRL11 (1)*			--	--	--	--	--	--	--	--	--	--	--	--	ns	--	--	*870*
Radiochemical Parameters																							
Gross Alpha (radiation)	NA	Lab	pCi/l	**15**				--	--	--	--	--	ns	ns	ns	ns	--	ns	ns	ns	ns	--	--
Gross Beta (radiation)	NA	Lab	pCi/l	**50(+)**				--	--	--	--	--	ns	ns	ns	ns	**98.0 +/- 19.5**	ns	ns	ns	ns	**142 +/- 26.9**	**98.4 +/- 18.0**
Per- and Polyfluoroalkyl Substances																							
Perfluorooctanesulfonate (PFOS)	NA	Lab	ug/l		*0.027 HBV17*			*0.051*	--	*0.14*	*0.12*	*0.048*	*0.14*	*0.042*	*0.30*	*0.50*	*0.33*	ns	*0.48*	ns	*0.19*	*0.17*	*4.1*
Perfluorooctanoic acid (PFOA)	NA	Lab	ug/l		*0.035 HBV17*			*0.12*	*0.041*	*0.22*	*0.15*	*0.27*	*0.21*	*0.084*	*0.35*	*0.24*	*1.6*	ns	*1.5*	ns	*0.53*	*2.1*	*7.3*

Table 10

Summary of Exceedances
Water - Phase A
Focused Remedial Investigation Reports
Freeway Landfill and Dump
Burnsville, Minnesota

								DUMP										
							Location	FD-SB-B4	FD-SB-B4	FD-SB-B4	FD-SB-B5	FD-SB-D4	FD-SB-D5	FD-SB-D5		FD-SB-E5	FD-TT-06	FD-TT-10
							Date	3/23/2018	3/26/2018	3/29/2018	3/21/2018	3/23/2018	3/21/2018	3/29/2018		3/22/2018	4/12/2018	4/17/2018
							Sample Type	N	N	N	N	N	N	N	FR	N	N	N
				Drinking Water Standards		**Surface Water Standards**												
Parameter	Total or Dissolved	Analysis Location	Units	EPA Maximum Contaminant Levels	MDH Human Health-Based Water Guidance Table	Minnesota Surface Water 2Bd Chronic 7050 - 360 Hardness	Minnesota Surface Water 2Bd Final Acute Value 7050 - 360 Hardness											
Effective Date				04/01/2012	04/23/2018	01/24/2012	01/24/2012											
Exceedance Key				**Bold**	*Italic*	Underline	*Shade*											
General Parameters																		
Chloride	NA	Lab	mg/l			230	1720	ns	ns	ns	ns	ns	ns	ns	ns	--	--	--
Chlorine dioxide	NA	Lab	mg/l	**0.8 (11)**				ns	ns	ns	ns	ns	ns	**1.1 h**	**0.81 h**	--	**1.6 h**	ns
Cyanide	NA	Lab	ug/l	200		5.2 (5)	*45 (5)*	ns	11.0	ns	12.4	26.0	20.6	ns	ns	13.2	--	13.4
Nitrogen, ammonia, as N	NA	Lab	mg/l			0.04 (3)		32.4	ns	ns	8.1	99.2	15.5	ns	ns	2.0 *	5.4	0.11
Nitrogen, unionized ammonia, as N	NA	Lab	mg/l			0.04		ns	ns	ns	ns	0.15	ns	ns	ns	ns	--	--
pH	NA	Lab	pH units			6.5 - 9.0		--	ns	ns	--	--	--	ns	ns	--	--	--
pH	NA	Field	pH units			6.5 - 9.0		ns	ns	ns	ns	--	ns	ns	ns	ns	--	5.9
Turbidity	NA	Lab	NTU	**5 (16)**		25		**18400**	ns	ns	**200**	**309**	**302**	ns	ns	**5.0**	**315**	**388**
Metals																		
Aluminum	Dissolved	Lab	ug/l			125	2145	--	ns	ns	--	--	--	ns	ns	--	1610	--
Arsenic	Dissolved	Lab	ug/l	10		2.0	720	3.5	ns	ns	--	8.1	7.8	ns	ns	--	2.4	--
Barium	Dissolved	Lab	ug/l	**2000**	*2000 HRL93*													
Beryllium	Dissolved	Lab	ug/l	4	*0.08 HRL93*			--	ns	ns	--	--	--	ns	ns	--	*0.21*	--
Boron	Dissolved	Lab	ug/l		*500 RAA17*			*15200*	ns	ns	*10700*	*19500*	*15600*	ns	ns	*1690 **	*6600*	*7030*
Cadmium	Dissolved	Lab	ug/l	5	*0.5 HRL15 (1)*	2.8 HD CF	270 HD CF	--	ns	ns	--	--	--	ns	ns	--	*0.65*	*0.93*
Chromium	Dissolved	Lab	ug/l	100	100 CR HRL93	11 CF CR6	31 CF CR6	--	ns	ns	--	--	14.2	ns	ns	--	--	--
Cobalt	Dissolved	Lab	ug/l			2.8	872	--	ns	ns	--	--	--	ns	ns	--	4.6	4.1
Copper	Dissolved	Lab	ug/l	1300 TT(12)		21 HD CF	110 HD CF	--	ns	ns	--	--	--	ns	ns	--	54.1	26.6
Lead	Dissolved	Lab	ug/l	**15 TT(12)**		13 HD CF	6600 HD CF	--	ns	ns	--	--	**64.8**	ns	ns	--	**21.5**	--
Manganese	Dissolved	Lab	ug/l		*100 HRL93 (1)*			*1300*	ns	ns	*361*	*351*	*801*	ns	ns	*719*	*738*	*496*
Nickel	Dissolved	Lab	ug/l		*100 HRL93*	460 HD CF	8400 HD CF	--	ns	ns	--	--	--	ns	ns	--	--	*159*
Selenium	Dissolved	Lab	ug/l	50	*30 HRL93*	5.0	*40*	--	ns	ns	--	--	--	ns	ns	--	--	*44.0*
Thallium	Dissolved	Lab	ug/l	2	*0.6 HRL94*	0.28	128	--	ns	ns	--	--	--	ns	ns	--	*0.61*	0.57
Vanadium	Dissolved	Lab	ug/l		*50 HRL94*			--	ns	ns	--	--	--	ns	ns	--	--	--
Zinc	Dissolved	Lab	ug/l	2000 HRL94		310 HD CF	680 HD CF	--	ns	ns	--	--	--	ns	ns	--	--	509
Chromium	Total	Lab	ug/l	100	100 CR HRL93	11 CR6	32 CR6	20.0	ns	ns	ns	--	ns	ns	ns	ns	14.6	22.7
Chromium, hexavalent	Total	Lab	mg/l	0.1 (14)	0.1 HRL93	0.011	*0.032*	*0.060* **	ns	ns	--	--	--	ns	ns	--	0.011 **	--
Semivolatile Organic Compounds																		
1,4-Dioxane	NA	Lab	ug/l		*1 HRL13 (1)*			*87*	ns	ns	*10*	*22*	*11*	ns	ns	*8.0*	*8.4*	--
3,4-Methylphenol (m,p cresols)	NA	Lab	ug/l		*3 MP HRL94*			--	ns	ns	--	--	--	ns	ns	--	--	--
Bis(2-ethylhexyl)phthalate	NA	Lab	ug/l	**6**	*7 HRL15 (1)*	1.9	(1)	--	ns	ns	--	--	--	ns	ns	--	--	--
Volatile Organic Compounds																		
1,2-Dichloroethane	NA	Lab	ug/l	**5**	*1 HRL13 (1)*	3.8	90100 (1)	--	ns	ns	--	--	--	ns	ns	--	--	--
Acrylamide	NA	Lab	ug/l	TT(2)	*0.2 HRL15 (1)*			ns	ns	ns	ns	ns	ns	*841*	--	--	--	--
Benzene	NA	Lab	ug/l	**5**	*2 HRL09 (1)*	6.0	8974 (1)	***7.6***	ns	ns	--	***10***	--	ns	ns	--	*2.7*	--
Chlorobenzene	NA	Lab	ug/l	100	100 HRL93	20	846	--	ns	ns	--	--	--	ns	ns	--	--	--
Ethyl benzene	NA	Lab	ug/l	**700**	*50 HRL11*	68	3717	--	ns	ns	--	--	--	ns	ns	--	--	--
Tetrahydrofuran	NA	Lab	ug/l		*600 HBV16*			--	ns	ns	--	--	--	ns	ns	--	--	--
Toluene	NA	Lab	ug/l	**1000**	*200 HRL11*	253	2703	--	ns	ns	--	--	--	ns	ns	--	--	--
Trichloroethylene (TCE)	NA	Lab	ug/l	5 (9)	*0.4 HRL15 (1)*	25	13976	--	ns	ns	--	--	--	ns	ns	--	--	*1.0*
Vinyl chloride	NA	Lab	ug/l	2	*0.2 HRL09 (1)*	0.18	(1)	--	ns	ns	--	--	--	ns	ns	--	--	--
Xylene, m & p	NA	Lab	ug/l	10000 (15)	*300 XYL HRL11 (1)*			--	ns	ns	--	--	--	ns	ns	--	--	--
Xylene, o	NA	Lab	ug/l	10000 (15)	*300 XYL HRL11 (1)*			--	ns	ns	--	--	--	ns	ns	--	--	--
Radiochemical Parameters																		
Gross Alpha (radiation)	NA	Lab	pCi/l	**15**				ns	ns	ns	ns	ns	ns	--	--	--	--	**29.2 +/- 8.77**
Gross Beta (radiation)	NA	Lab	pCi/l	**50(+)**				ns	ns	ns	ns	ns	ns	**48.2 +/- 9.69**	**57.2 +/- 10.7**	--	--	--
Per- and Polyfluoroalkyl Substances																		
Perfluorooctanesulfonate (PFOS)	NA	Lab	ug/l		*0.027 HBV17*			*0.13*	ns	ns	--	*0.63*	*0.28*	ns	ns	--	*0.23*	*0.041*
Perfluorooctanoic acid (PFOA)	NA	Lab	ug/l		*0.035 HBV17*			*1.4*	ns	ns	*1.0*	*3.9*	*25*	ns	ns	*0.19*	*0.79*	--

Data Footnotes and Qualifiers

Barr Standard Footnotes and Qualifiers

--	Sample analyzed; result does not exceed the criteria for this parameter
FR	Sample Type: Field Replicate
N	Sample Type: Normal
NA	NA (not applicable) indicates that a fractional portion of the sample is not part of the analytical testing or field collection procedures.
*	Estimated value, QA/QC criteria not met.
**	Unusable value, QA/QC criteria not met.
h	EPA recommended sample preservation, extraction or analysis holding time was exceeded.
ns	Sample not analyzed for this parameter.

EPA Maximum Contaminant Levels

TT(2)	When Acrylamide is used in drinking water systems, the combination (or product) of dose and monomer level shall not exceed that equivalent to a polyacrylamide polymer containing 0.05% monomer dosed at 1 mg/l.
TT(12)	Copper action level 1.3 mg/l; lead action level 0.015 mg/l.
(9)	Under review.
(11)	1998 Final Rule for Disinfectants and Disinfection By-products: MRDLG=Maximum Residual Disinfection Level Goal; and MRDL=Maximum Residual Disinfection Level.
(14)	Based on the criteria for chromium, total.
(15)	Based on the criteria for xylenes, total.
(16)	At no time can turbidity go above 5 NTU.
(+)	This MCL is no longer an official regulatory level, but is still in use as a trigger for EPA. The actual MCL for Beta is 4 mrem/year but there is no simple conversion between a curie and a rem.

MDH Human Health-Based Water Guidance Table

(1)	Value is representative of the lowest exposure duration published in the Minnesota Department of Health Human Health Advisory Table.
CR	Value represents the criteria for Chromium, hexavalent.
HBV16	Health Based Value 2016.
HBV17	Health Based Value 2017.
HRL09	Health Risk Limit 2009.
HRL11	Health Risk Limit 2011.
HRL13	Health Risk Limit 2013.
HRL15	Health Risk Limit 2015.
HRL93	Health Risk Limit 1993.
HRL94	Health Risk Limit 1994.
RAA17	Risk Assessment Advice 2008.
XYL	Value shown is for the sum of the mixed o,m and p Xylene isomers.

Minnesota Surface Water 2Bd Chronic 7050 - 360 Hardness*

(3)	Value represents the criteria for Ammonia, unionized as N.
(5)	Value based on the criteria for cyanide, free.
CF	Conversion Factor.
CR6	Value represents the criteria for Hexavalent Chromium.
HD	Hardness Dependent.

* Estimated concentrations based on same underlying assumptions of conservative transport mechanisms and same source area. Minnesota River hardness data from MPCA, 2006. Working Draft, Surface Water Pathway Evaluation user's Guide, Appendix E.

Minnesota Surface Water 2Bd Final Acute Value 7050 - 360 Hardness*

(1)	Subpart 7, item E applies.
(5)	Value based on the criteria for cyanide, free.
CF	Conversion Factor.
CR6	Value represents the criteria for Hexavalent Chromium.
HD	Hardness Dependent.

* Estimated concentrations based on same underlying assumptions of conservative transport mechanisms and same source area. Minnesota River hardness data from MPCA, 2006. Working Draft, Surface Water Pathway Evaluation user's Guide, Appendix E.

Table 11

SUMMARY OF EXCEEDANCES - GROUNDWATER
Focused Remedial Investigation Report
Freeway Landfill and Dump
Burnsville, Minnesota

							Project Area	**LANDFILL**															
							Monitoring Well Group	Perched									Water Table						
							Location	**MW-1**	**MW-3**	**MW-4**	**MW-5**	**MW-6**	**MW-7**	**MW-8**	**MW-9**	**MP-8**	**MW-4D**	**MW-8D**		**MW-9D**		**MW-10D**	
							MN Unique ID#	**813761**	**813763**	**813764**	**813765**	**813766**	**813767**	**813768**	**834659**	**240818**	**813740**	**813741**		**837777**		**837776**	
							Date	**4/01/2019**	**5/22/2019**	**4/01/2019**	**3/27/2019**	**3/27/2019**	**3/27/2019**	**3/27/2019**	**6/03/2019**	**3/28/2019**	**4/01/2019**	**3/27/2019**		**4/10/2019**	**6/03/2019**	**4/10/2019**	**6/03/2019**
							Sample Type	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**FR**	**N**	**N**	**N**	**N**
							GROUP																
				Drinking Water Standards		**Surface Water Standards**																	
Parameter	Analysis Location	Total or Dissolved	Units	EPA Maximum Contaminant Levels	MDH Human Health-Based Water Guidance Table	Minnesota Surface Water 2Bd Chronic 7050 - 360 Hardness	Minnesota Surface Water 2Bd Final Acute Value 7050 - 360 Hardness																
Effective Date				04/01/2012	04/03/2019	01/24/2012	01/24/2012																
Exceedance Key				Bold	Italic	Underline	Shade																
General Parameters																							
pH	Field	NA	pH units			6.5 - 9.0		5.7	--	--	--	6.4	6.4	6.3	--	6.2	--	6.5	--	--	--	--	--
Turbidity	Field	NA	NTU	**5 (19)**		25		**440**	--	**107**	**57.5**	**91.0**	**7.5**	--	--	**7.3**	**47.3**	**31.8**	--	--	--	**14.2**	--
Chloride	Lab	NA	mg/l			230	1720	1240	2440	1070	1040	--	--	--	--	--	501	--	--	240 *	--	--	--
Cyanide	Lab	NA	ug/l	200	100 HRL93 (2)	5.2 (5)	45 (5)	--	--	--	--	--	--	29.2	--	--	--	--	--	--	--	--	--
Cyanide, free	Lab	NA	ug/l	200	100 HRL93	5.2	45	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Nitrogen, ammonia, as N	Lab	NA	mg/l			0.04 (3)		621	--	--	296	12.7	30.8	31.4	--	0.47	84.9	9.4	9.6	29.9	--	11.9	--
Nitrogen, unionized ammonia, as N	Lab	NA	mg/l			0.04		0.062	--	--	0.51	--	--	--	--	--	0.15	--	--	0.091	--	--	--
Metals																							
Chromium, hexavalent	Lab	Total	mg/l	**0.1 (14)**	*0.1 HRL93*	0.011	0.032	***0.12***	***0.28***	--	--	--	0.023	0.022	--	***0.14***	--	--	0.012	--	--	--	--
Aluminum	Lab	Dissolved	ug/l			125	2145	2050	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Antimony	Lab	Dissolved	ug/l	**6**	*6 HRL93*	5.5	180	***15.8***	***13.9***	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Arsenic	Lab	Dissolved	ug/l	**10**		2.0	720	**11.4**	--	3.8	5.0	9.6	3.9	--	--	--	**10.9**	**16.1**	**15.7**	7.5	--	4.2	--
Barium	Lab	Dissolved	ug/l	**2000**	*2000 HRL93*			--	--	--	--	--	--	--	--	--	--	***2620***	***2610***	--	--	--	--
Beryllium	Lab	Dissolved	ug/l	4	*0.08 HRL93*			--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Boron	Lab	Dissolved	ug/l		*500 RAA17*			*14800*	*12800*	*2820*	*2260*	*1200*	*5040*	*2590*	--	--	*1220*	*5460*	*5300*	*1260*	--	*567*	--
Cadmium	Lab	Dissolved	ug/l	**5**	*0.5 HRL15 (1)*	2.8 HD CF	270 HD CF	***5.4***	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chromium	Lab	Dissolved	ug/l	100	100 CR HRL93	11 CF CR6	31 CF CR6	74.6	88.9	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cobalt	Lab	Dissolved	ug/l			2.8	872	347	308	42.6	11.8	4.5	--	--	--	--	10.9	8.6	8.7	6.9	--	38.9	--
Lead	Lab	Dissolved	ug/l	**15 TT(12)**		13 HD CF	6600 HD CF	**33.9**	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Manganese	Lab	Dissolved	ug/l		*100 HBV18*			*35700*	--	*289*	*318*	*539*	*220*	*452*	--	*1530*	*101*	--	--	*208*	--	*1190*	--
Nickel	Lab	Dissolved	ug/l		*100 HRL93*	460 HD CF	8400 HD CF	*1730*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Selenium	Lab	Dissolved	ug/l	**50**	*30 HRL93*	5.0	40	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Thallium	Lab	Dissolved	ug/l	**2**	*0.6 HRL94*	0.28	128	--	--	--	--	--	--	--	--	--	--	0.31	0.57	--	--	*1.3*	--
Uranium	Lab	Dissolved	ug/l	**30**				--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Zinc	Lab	Dissolved	ug/l		*2000 HRL94*	310 HD CF	680 HD CF	*64300*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Aluminum	Lab	Total	ug/l			125	2145	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Manganese	Lab	Total	ug/l		*100 HBV18*			--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Selenium	Lab	Total	ug/l	50	30 HRL93	5.0	40	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Thallium	Lab	Total	ug/l	2	*0.6 HRL94*	0.28	128	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Semivolatile Organic Compounds																							
1,4-Dioxane	Lab	NA	ug/l		*1 HRL13 (1)*			--	*220*	*98*	*110*	*8.3*	*15*	*4.2*	*2.1*	--	*40*	*26*	*24*	--	*35*	--	*27*
3,4-Methylphenol (m,p cresols)	Lab	NA	ug/l		*3 MP HRL94*			--	*7670*	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Phenol	Lab	NA	ug/l		4000 HRL93	123	4428	--	2330	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Volatile Organic Compounds																							
1,2-Dichloroethylene, cis	Lab	NA	ug/l	**70**	*6 HRL18 (1)*			***440***	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichloropropane	Lab	NA	ug/l	**5**	*5 HRL94*			***13***	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acetone	Lab	NA	ug/l		*3000 HBV17 (1)*			*8600*	*11000*	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzene	Lab	NA	ug/l	**5**	*2 HRL09 (1)*	6.0	8974 (1)	***16***	***5.6***	*2.8*	*4.0*	--	***8.1***	***6.7***	***11***	--	--	--	--	--	--	--	--
Ethyl benzene	Lab	NA	ug/l	700	*50 HRL11*	68	3717	*120*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methyl ethyl ketone (2-butanone)	Lab	NA	ug/l		*4000 HRL94*			*14000*	*15000*	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methyl isobutyl ketone (MIBK)	Lab	NA	ug/l		*300 HRL94*			*1400*	*630*	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methylene chloride	Lab	NA	ug/l	**5**	*5 HRLMCL*	46	27749 (1)	***39***	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Naphthalene	Lab	NA	ug/l		*70 HRL13*	81	818	--	--	--	--	--	--	--	*93*	--	--	--	--	--	--	--	--
Tetrachloroethylene	Lab	NA	ug/l	**5 (9)**	*4 HBV14 (1)*	3.8	857	***100***	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Tetrahydrofuran	Lab	NA	ug/l		*600 HRL18 (1)*			--	*680*	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Toluene	Lab	NA	ug/l	1000	*200 HRL11*	253	2703	*610*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Trichloroethylene (TCE)	Lab	NA	ug/l	**5 (9)**	*0.4 HRL15 (1)*	25	13976	***150***	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Vinyl chloride	Lab	NA	ug/l	**2**	*0.2 HRL18 (1)*	0.18	(1)	***32***	***4.0***	--	--	--	--	--	--	--	--	***5.1***	***5.2***	--	--	--	--
Xylene, m & p	Lab	NA	ug/l	10000 (15)	*300 XYL HRL11 (1)*			*300*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Xylene, total	Barr Calc	NA	ug/l	10000	*300 XYL HRL11 (1)*	166	2814	*410*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Polychlorinated Biphenyls																							
Polychlorinated biphenyls	Barr Calc	NA	ug/l	**0.5**	*0.04 HRL94*	0.000029	2	--	--	--	--	--	*0.10*	--	--	--	--	--	--	--	--	--	--
Radiochemical Parameters																							
Gross Alpha (radiation)	Lab	NA	pCi/l	**15**				--	--	--	--	--	--	--	--	--	**16.6 +/- 6.48**	**20.9 +/- 6.20**	**20.4 +/- 6.59**	--	--	--	--
Gross Beta (radiation)	Lab	NA	pCi/l	**50(+)**				**365 +/- 96.8**	--	**143 +/- 27.6**	**238 +/- 49.6**	--	--	--	--	--	--	--	--	--	--	--	--
Per- and Polyfluoroalkyl Substances																							
Perfluorobutanoic acid (PFBA)	Lab	NA	ug/l		*7 HRL18 (1)*			--	--	--	*7.4*	--	--	--	--	--	--	--	--	--	--	--	--
Perfluorohexane sulfonate (PFHxS)	Lab	NA	ug/l		*0.047 HBV19*			*0.26*	*0.055*	*0.27 h*	*0.29*	--	--	--	*0.11*	--	*0.087*	--	--	--	*0.063*	--	--
Perfluorooctanesulfonate (PFOS)	Lab	NA	ug/l		*0.015 HBV19*			*0.48*	*0.015 j*	*0.21 h*	*0.092*	*0.045*	*0.13*	*0.17*	*0.10*	--	*0.063*	*0.082*	*0.083*	--	*0.13*	--	*0.073*
Perfluorooctanoic acid (PFOA)	Lab	NA	ug/l		*0.035 HRL18 (1)*			*0.53*	*0.87*	*0.77 h*	*0.41*	*0.19*	*0.57*	*2.6*	*0.30*	--	*0.20*	*0.39*	*0.36*	--	*0.32*	--	*0.58*

Table 11

SUMMARY OF EXCEEDANCES - GROUNDWATER
Focused Remedial Investigation Report
Freeway Landfill and Dump
Burnsville, Minnesota

							Project Area	**LANDFILL**											**DUMP**			
							Monitoring Well Group	Water Table							Jordan				Perched			
							Location	**MW-11**	**MW-12**	**MW-13**	**WT-6**	**WT-11B**	**WT-13**	**WT-14**	**J-13**	**J-14**		**MW-19-01**	**MW-19-02**	**MW-19-03**	**MW-19-04**
							MN Unique ID#	**834655**	**834656**	**834657**	**240816**	**434011**	**462523**	**462522**	**462520**	**462521**		**834660**	**834662**	**834663**	**834661**
							Date	**5/28/2019**	**5/28/2019**	**5/28/2019**	**4/01/2019**	**3/28/2019**	**3/28/2019**	**3/29/2019**	**3/28/2019**	**3/29/2019**		**4/03/2019**	**4/03/2019**	**4/03/2019**	**4/03/2019**
							Sample Type	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**FR**	**N**	**N**	**N**	**N**
							GROUP														
				Drinking Water Standards		**Surface Water Standards**															
Parameter	Analysis Location	Total or Dissolved	Units	EPA Maximum Contaminant Levels	MDH Human Health-Based Water Guidance Table	Minnesota Surface Water 2Bd Chronic 7050 - 360 Hardness	Minnesota Surface Water 2Bd Final Acute Value 7050 - 360 Hardness															
Effective Date				04/01/2012	04/03/2019	01/24/2012	01/24/2012															
Exceedance Key				Bold	Italic	Underline	Shade															
General Parameters																						
pH	Field	NA	pH units			6.5 - 9.0		6.4	--	6.0	--	--	--	--	--	--	--	--	--	--	--	
Turbidity	Field	NA	NTU	**5 (19)**		25		**9.8**	--	--	--	**10.5**	**5.2**	--	**6.0**	--	--	**114**	--	**14**	**9.9**	
Chloride	Lab	NA	mg/l			230	1720	--	--	--	240	--	--	--	--	--	--	--	--	--	--	
Cyanide	Lab	NA	ug/l	200	100 HRL93 (2)	5.2 (5)	45 (5)	--	21.0	--	21.9	--	--	--	--	--	--	--	23.2	44.8	--	
Cyanide, free	Lab	NA	ug/l	200	100 HRL93	5.2	45	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
Nitrogen, ammonia, as N	Lab	NA	mg/l			0.04 (3)		10.6	3.7	1.5	0.14	7.9	6.3	0.50	0.21	0.30	0.29	0.40	7.2	18.7	20.2	
Nitrogen, unionized ammonia, as N	Lab	NA	mg/l			0.04		--	--	--	--	--	--	--	--	--	--	--	--	--	--	
Metals																						
Chromium, hexavalent	Lab	Total	mg/l	**0.1 (14)**	*0.1 HRL93*	0.011	0.032	0.025	0.025	0.016	--	--	--	--	--	--	--	--	--	0.012	--	
Aluminum	Lab	Dissolved	ug/l			125	2145	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
Antimony	Lab	Dissolved	ug/l	**6**	*6 HRL93*	5.5	180	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
Arsenic	Lab	Dissolved	ug/l	**10**		2.0	720	2.2	--	--	3.0	4.7	4.2	--	--	--	--	6.3	--	--	--	
Barium	Lab	Dissolved	ug/l	**2000**	*2000 HRL93*			--	--	--	--	--	--	--	--	--	--	--	--	--	--	
Beryllium	Lab	Dissolved	ug/l	4	*0.08 HRL93*			--	--	--	--	--	--	--	--	--	--	--	--	--	--	
Boron	Lab	Dissolved	ug/l		*500 RAA17*			--	*1760*	--	--	--	*671*	--	--	--	--	*18700*	*20600*	*38400*	*9800*	
Cadmium	Lab	Dissolved	ug/l	**5**	*0.5 HRL15 (1)*	2.8 HD CF	270 HD CF	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
Chromium	Lab	Dissolved	ug/l	100	100 CR HRL93	11 CF CR6	31 CF CR6	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
Cobalt	Lab	Dissolved	ug/l			2.8	872	3.0	--	--	4.4	6.0	6.4	--	--	--	--	--	--	--	--	
Lead	Lab	Dissolved	ug/l	**15 TT(12)**		13 HD CF	6600 HD CF	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
Manganese	Lab	Dissolved	ug/l		*100 HBV18*			*1430*	*4020*	*556*	*1240*	*390*	*994*	--	--	--	--	*604*	*433*	*478*	*414*	
Nickel	Lab	Dissolved	ug/l		*100 HRL93*	460 HD CF	8400 HD CF	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
Selenium	Lab	Dissolved	ug/l	**50**	*30 HRL93*	5.0	40	--	--	--	--	--	--	--	--	--	--	19.0	7.0	--	--	
Thallium	Lab	Dissolved	ug/l	**2**	*0.6 HRL94*	0.28	128	--	--	--	--	--	*0.77*	--	--	--	--	--	--	--	--	
Uranium	Lab	Dissolved	ug/l	**30**				--	--	--	--	--	--	--	--	--	--	--	--	--	--	
Zinc	Lab	Dissolved	ug/l		*2000 HRL94*	310 HD CF	680 HD CF	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
Aluminum	Lab	Total	ug/l			125	2145	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
Manganese	Lab	Total	ug/l		*100 HBV18*			--	--	--	--	--	--	--	--	--	--	--	--	--	--	
Selenium	Lab	Total	ug/l	50	30 HRL93	5.0	40	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
Thallium	Lab	Total	ug/l	2	*0.6 HRL94*	0.28	128	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
Semivolatile Organic Compounds																						
1,4-Dioxane	Lab	NA	ug/l		*1 HRL13 (1)*			--	--	--	*1.2*	*9.9*	*6.2*	*3.8*	--	*3.3*	*3.2*	--	*3.4*	*13*	*7.1*	
3,4-Methylphenol (m,p cresols)	Lab	NA	ug/l		*3 MP HRL94*			--	--	--	--	--	--	--	--	--	--	--	--	--	--	
Phenol	Lab	NA	ug/l		4000 HRL93	123	4428	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
Volatile Organic Compounds																						
1,2-Dichloroethylene, cis	Lab	NA	ug/l	**70**	*6 HRL18 (1)*			--	--	--	--	--	--	--	--	--	--	--	--	--	--	
1,2-Dichloropropane	Lab	NA	ug/l	**5**	*5 HRL94*			--	--	--	--	--	--	--	--	--	--	--	--	--	--	
Acetone	Lab	NA	ug/l		*3000 HBV17 (1)*			--	--	--	--	--	--	--	--	--	--	--	--	--	--	
Benzene	Lab	NA	ug/l	**5**	*2 HRL09 (1)*	6.0	8974 (1)	--	--	--	--	--	--	--	--	--	--	--	--	***7.1***	*4.2*	
Ethyl benzene	Lab	NA	ug/l	700	*50 HRL11*	68	3717	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
Methyl ethyl ketone (2-butanone)	Lab	NA	ug/l		*4000 HRL94*			--	--	--	--	--	--	--	--	--	--	--	--	--	--	
Methyl isobutyl ketone (MIBK)	Lab	NA	ug/l		*300 HRL94*			--	--	--	--	--	--	--	--	--	--	--	--	--	--	
Methylene chloride	Lab	NA	ug/l	**5**	*5 HRLMCL*	46	27749 (1)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
Naphthalene	Lab	NA	ug/l		*70 HRL13*	81	818	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
Tetrachloroethylene	Lab	NA	ug/l	**5 (9)**	*4 HBV14 (1)*	3.8	857	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
Tetrahydrofuran	Lab	NA	ug/l		*600 HRL18 (1)*			--	--	--	--	--	--	--	--	--	--	--	--	--	--	
Toluene	Lab	NA	ug/l	1000	*200 HRL11*	253	2703	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
Trichloroethylene (TCE)	Lab	NA	ug/l	**5 (9)**	*0.4 HRL15 (1)*	25	13976	--	--	--	--	--	--	--	--	--	--	--	*0.47*	--	--	
Vinyl chloride	Lab	NA	ug/l	**2**	*0.2 HRL18 (1)*	0.18	(1)	--	--	--	--	--	--	--	--	--	--	--	--	--	*0.24*	
Xylene, m & p	Lab	NA	ug/l	10000 (15)	*300 XYL HRL11 (1)*			--	--	--	--	--	--	--	--	--	--	--	--	--	--	
Xylene, total	Barr Calc	NA	ug/l	10000	*300 XYL HRL11 (1)*	166	2814	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
Polychlorinated Biphenyls																						
Polychlorinated biphenyls	Barr Calc	NA	ug/l	**0.5**	*0.04 HRL94*	0.000029	2	***31.3***	***0.67***	*0.25*	--	--	--	--	--	--	--	--	--	--	--	
Radiochemical Parameters																						
Gross Alpha (radiation)	Lab	NA	pCi/l	**15**				--	--	--	--	--	--	--	--	**17.6 +/- 4.77**	**21.4 +/- 6.04**	--	**16.3 +/- 4.95**	--	--	
Gross Beta (radiation)	Lab	NA	pCi/l	**50(+)**				--	--	--	--	--	--	--	--	--	--	--	**58.0 +/- 10.9**	**57.9 +/- 10.9**	--	
Per- and Polyfluoroalkyl Substances																						
Perfluorobutanoic acid (PFBA)	Lab	NA	ug/l		*7 HRL18 (1)*			--	--	--	--	--	--	--	--	--	--	--	--	--	--	
Perfluorohexane sulfonate (PFHxS)	Lab	NA	ug/l		*0.047 HBV19*			--	--	--	--	--	--	--	--	--	--	*0.12*	*0.12*	*0.15*	*0.21*	
Perfluorooctanesulfonate (PFOS)	Lab	NA	ug/l		*0.015 HBV19*			*0.078*	*0.056*	*0.10*	*0.046*	*0.016 j*	*0.038*	--	--	--	--	*0.28*	*0.12*	*0.43*	*1.6*	
Perfluorooctanoic acid (PFOA)	Lab	NA	ug/l		*0.035 HRL18 (1)*			*0.14*	*0.10*	*0.052*	*0.061*	*0.083*	*0.11*	*0.068*	--	--	--	*0.95*	*0.93*	*13*	*2.1*	

Table 11

SUMMARY OF EXCEEDANCES - GROUNDWATER
Focused Remedial Investigation Report
Freeway Landfill and Dump
Burnsville, Minnesota

							Project Area	**DUMP**													**KRAEMER QUARRY**		
							Monitoring Well Group	Water Table															
							Location	**0FMW-1**	**MW-97-1**	**MW-97-2**		**MW-97-3**	**MW-97-4**	**MW-97-5**	**MW-97-6**	**MW-97-7**	**MW-97-9**	**SEEP 01**	**DISCHARGE 01**	
							MN Unique ID#	**472759**	**603281**	**603282**		**603283**	**603287**	**603288**	**603289**	**603284**	**603286**	**SEEP 01**	**DISCHARGE 01**	
							Date	**5/21/2019**	**3/26/2019**	**6/03/2019**		**5/21/2019**	**3/26/2019**	**3/26/2019**	**3/26/2019**	**5/21/2019**	**5/21/2019**	**5/29/2019**	**5/29/2019**	
							Sample Type	**N**	**N**	**N**	**FR**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**FR**
							GROUP													
				Drinking Water Standards		**Surface Water Standards**														
Parameter	Analysis Location	Total or Dissolved	Units	EPA Maximum Contaminant Levels	MDH Human Health-Based Water Guidance Table	Minnesota Surface Water 2Bd Chronic 7050 - 360 Hardness	Minnesota Surface Water 2Bd Final Acute Value 7050 - 360 Hardness													
Effective Date				04/01/2012	04/03/2019	01/24/2012	01/24/2012													
Exceedance Key				Bold	Italic	Underline	Shade													
General Parameters																				
pH	Field	NA	pH units			6.5 - 9.0		6.2	--	--	--	--	--	6.5	--	--	--	--	--	--
Turbidity	Field	NA	NTU	**5 (19)**		25		**9.9**	**54.7**	**25.6**	--	**170**	**19.5**	**52.4**	--	**7.4**	**11.4**	--	--	--
Chloride	Lab	NA	mg/l			230	1720	--	--	--	--	--	279	272	291	--	--	--	--	--
Cyanide	Lab	NA	ug/l	200	100 HRL93 (2)	5.2 (5)	45 (5)	--	--	--	--	--	--	--	--	--	--	--	--	--
Cyanide, free	Lab	NA	ug/l	200	100 HRL93	5.2	45	--	--	--	--	--	--	--	--	--	--	--	--	--
Nitrogen, ammonia, as N	Lab	NA	mg/l			0.04 (3)		0.18	--	0.15	0.16	0.77	0.81	0.32	5.3	--	0.12	6.9	0.23	0.23
Nitrogen, unionized ammonia, as N	Lab	NA	mg/l			0.04		--	--	--	--	0.063	--	--	--	--	--	--	--	--
Metals																				
Chromium, hexavalent	Lab	Total	mg/l	**0.1 (14)**	*0.1 HRL93*	0.011	0.032	--	--	--	--	--	--	--	--	--	--	--	--	--
Aluminum	Lab	Dissolved	ug/l			125	2145	--	--	--	--	--	--	--	--	--	--	--	--	--
Antimony	Lab	Dissolved	ug/l	**6**	*6 HRL93*	5.5	180	--	--	--	--	--	--	--	--	--	--	--	--	--
Arsenic	Lab	Dissolved	ug/l	**10**		2.0	720	8.8	--	--	--	2.5	2.6	--	--	--	--	--	--	--
Barium	Lab	Dissolved	ug/l	**2000**	*2000 HRL93*			--	--	--	--	--	--	--	--	--	--	--	--	--
Beryllium	Lab	Dissolved	ug/l	4	*0.08 HRL93*			--	*0.24*	--	--	--	--	--	--	--	--	--	--	--
Boron	Lab	Dissolved	ug/l		*500 RAA17*			*4480*	*30100*	*32700*	*28900*	*52800*	*526*	*901*	*13900*	*10500*	*690*	--	--	--
Cadmium	Lab	Dissolved	ug/l	**5**	*0.5 HRL15 (1)*	2.8 HD CF	270 HD CF	--	--	--	--	--	--	--	--	--	--	--	--	--
Chromium	Lab	Dissolved	ug/l	100	100 CR HRL93	11 CF CR6	31 CF CR6	--	--	--	--	--	--	--	--	--	--	--	--	--
Cobalt	Lab	Dissolved	ug/l			2.8	872	3.0	--	3.8	3.9	--	4.8	6.3	9.6	--	--	--	--	--
Lead	Lab	Dissolved	ug/l	**15 TT(12)**		13 HD CF	6600 HD CF	--	--	--	--	--	--	--	--	--	--	--	--	--
Manganese	Lab	Dissolved	ug/l		*100 HBV18*			*1020*	--	*667*	*672*	*170*	*1150*	*1490*	*1760*	--	*244*	--	--	--
Nickel	Lab	Dissolved	ug/l		*100 HRL93*	460 HD CF	8400 HD CF	--	--	--	--	--	--	--	--	--	--	--	--	--
Selenium	Lab	Dissolved	ug/l	**50**	*30 HRL93*	5.0	40	--	22.9	--	--	***55.0***	--	--	--	15.7	--	--	--	--
Thallium	Lab	Dissolved	ug/l	**2**	*0.6 HRL94*	0.28	128	--	0.42	*0.76*	*0.74*	--	0.28	*1.2*	***4.0***	--	0.48	--	--	--
Uranium	Lab	Dissolved	ug/l	**30**				--	--	--	--	**46.9**	--	--	--	--	--	--	--	--
Zinc	Lab	Dissolved	ug/l		*2000 HRL94*	310 HD CF	680 HD CF	--	--	--	--	--	--	--	--	--	--	--	--	--
Aluminum	Lab	Total	ug/l			125	2145	--	--	--	--	--	--	--	--	--	--	--	317	320
Manganese	Lab	Total	ug/l		*100 HBV18*			--	--	--	--	--	--	--	--	--	--	*744*	--	--
Selenium	Lab	Total	ug/l	50	30 HRL93	5.0	40	--	--	--	--	--	--	--	--	--	--	--	6.5	6.3
Thallium	Lab	Total	ug/l	2	*0.6 HRL94*	0.28	128	--	--	--	--	--	--	--	--	--	--	*1.1*	--	--
Semivolatile Organic Compounds																				
1,4-Dioxane	Lab	NA	ug/l		*1 HRL13 (1)*			--	--	--	--	--	--	--	--	--	--	*19*	*1.5*	--
3,4-Methylphenol (m,p cresols)	Lab	NA	ug/l		*3 MP HRL94*			--	--	--	--	--	--	--	--	--	--	--	--	--
Phenol	Lab	NA	ug/l		4000 HRL93	123	4428	--	--	--	--	--	--	--	--	--	--	--	--	--
Volatile Organic Compounds																				
1,2-Dichloroethylene, cis	Lab	NA	ug/l	**70**	*6 HRL18 (1)*			--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichloropropane	Lab	NA	ug/l	**5**	*5 HRL94*			--	--	--	--	--	--	--	--	--	--	--	--	--
Acetone	Lab	NA	ug/l		*3000 HBV17 (1)*			--	--	--	--	--	--	--	--	--	--	--	--	--
Benzene	Lab	NA	ug/l	**5**	*2 HRL09 (1)*	6.0	8974 (1)	--	--	--	--	--	--	--	--	--	--	--	--	--
Ethyl benzene	Lab	NA	ug/l	700	*50 HRL11*	68	3717	--	--	--	--	--	--	--	--	--	--	--	--	--
Methyl ethyl ketone (2-butanone)	Lab	NA	ug/l		*4000 HRL94*			--	--	--	--	--	--	--	--	--	--	--	--	--
Methyl isobutyl ketone (MIBK)	Lab	NA	ug/l		*300 HRL94*			--	--	--	--	--	--	--	--	--	--	--	--	--
Methylene chloride	Lab	NA	ug/l	**5**	*5 HRLMCL*	46	27749 (1)	--	--	--	--	--	--	--	--	--	--	--	--	--
Naphthalene	Lab	NA	ug/l		*70 HRL13*	81	818	--	--	--	--	--	--	--	--	--	--	--	--	--
Tetrachloroethylene	Lab	NA	ug/l	**5 (9)**	*4 HBV14 (1)*	3.8	857	--	--	--	--	--	--	--	--	--	--	--	--	--
Tetrahydrofuran	Lab	NA	ug/l		*600 HRL18 (1)*			--	--	--	--	--	--	--	--	--	--	--	--	--
Toluene	Lab	NA	ug/l	1000	*200 HRL11*	253	2703	--	--	--	--	--	--	--	--	--	--	--	--	--
Trichloroethylene (TCE)	Lab	NA	ug/l	**5 (9)**	*0.4 HRL15 (1)*	25	13976	--	--	--	--	--	--	--	--	--	--	--	--	--
Vinyl chloride	Lab	NA	ug/l	**2**	*0.2 HRL18 (1)*	0.18	(1)	--	--	--	--	--	--	--	--	--	--	--	--	--
Xylene, m & p	Lab	NA	ug/l	10000 (15)	*300 XYL HRL11 (1)*			--	--	--	--	--	--	--	--	--	--	--	--	--
Xylene, total	Barr Calc	NA	ug/l	10000	*300 XYL HRL11 (1)*	166	2814	--	--	--	--	--	--	--	--	--	--	--	--	--
Polychlorinated Biphenyls																				
Polychlorinated biphenyls	Barr Calc	NA	ug/l	**0.5**	*0.04 HRL94*	0.000029	2	--	--	--	--	--	--	--	--	--	--	--	--	--
Radiochemical Parameters																				
Gross Alpha (radiation)	Lab	NA	pCi/l	**15**				--	--	**16.8 +/- 5.79**	**17.0 +/- 5.59**	**42.8 +/- 16.8**	--	**16.1 +/- 4.62**	--	--	--	--	--	--
Gross Beta (radiation)	Lab	NA	pCi/l	**50(+)**				--	--	--	--	--	--	--	--	--	--	--	--	--
Per- and Polyfluoroalkyl Substances																				
Perfluorobutanoic acid (PFBA)	Lab	NA	ug/l		*7 HRL18 (1)*			--	--	--	--	--	--	--	--	--	--	--	--	--
Perfluorohexane sulfonate (PFHxS)	Lab	NA	ug/l		*0.047 HBV19*			--	--	--	--	--	--	--	--	--	--	--	--	--
Perfluorooctanesulfonate (PFOS)	Lab	NA	ug/l		*0.015 HBV19*			--	*0.015 j*	--	--	--	--	*0.019 j*	*0.20*	*0.037*	*0.037*	*0.037*	*0.034*	*0.029*
Perfluorooctanoic acid (PFOA)	Lab	NA	ug/l		*0.035 HRL18 (1)*			*0.11*	--	--	--	--	--	--	*1.0*	*0.069*	*0.077*	*0.25*	*0.066*	*0.059*

Data Footnotes and Qualifiers

Barr Standard Footnotes and Qualifiers

--	Not analyzed or did not exceed criteria.
N	Sample Type: Normal
NA	NA (not applicable) indicates that a fractional portion of the sample is not part of the analytical testing or field collection procedures.
ND	Not detected.
*	Estimated value, QA/QC criteria not met.
**	Unusable value, QA/QC criteria not met.
b	Potential false positive value based on blank data validation procedures. Concentrations identified as potential false positive are excluded from calculations.
h	EPA recommended sample preservation, extraction or analysis holding time was exceeded.
j	Estimated detected value. The reported value is less than the stated laboratory quantitation limit but greater than the laboratory method detection limit.

EPA Maximum Contaminant Levels

(1)	1998 Final Rule for Disinfectants and Disinfection By-products: The total for trihalomethanes (THM) is 0.08 mg/l.
(5)	The value for m-dichlorobenzene are based on data for o-dichlorobenzene.
(7)	1,2-dibromoethane.
(9)	Under review.
(14)	Based on the criteria for chromium, total.
(15)	Based on the criteria for xylenes, total.
(19)	At no time can turbidity go above 5 NTU.
TT(12)	Copper action level 1.3 mg/l; lead action level 0.015 mg/l.
(+)	This MCL is no longer an official regulatory level, but is still in use as a trigger for EPA. The actual MCL for Beta is 4 mrem/year but there is no simple conversion between a curie and a rem.

MDH Human Health-Based Water Guidance Table

CR	Value represents the criteria for Chromium, hexavalent.
DCP	Value shown is 1,3-dichloropropene in the MDH criterion, however, the laboratory reports cis and trans isomers individually.
(1)	Value is representative of the lowest exposure duration published in the Minnesota Department of Health Human Health Advisory Table.
(2)	Representing the criteria for cyanide, free.
HBV13	Health Based Value 2013.
HBV14	Health Based Value 2014.
HBV17	Health Based Value 2017.
HBV18	Health Based Value 2018.
HBV18	Health Based Value 2018.
HBV19	Health Based Value 2019.
HBV19	Health Based Value 2019.
HRL09	Health Risk Limit 2009.
HRL11	Health Risk Limit 2011.
HRL13	Health Risk Limit 2013.
HRL13	Health Risk Limit 2013.
HRL15	Health Risk Limit 2015.
HRL15	Health Risk Limit 2015.
HRL18	Health Risk Limit 2018.
HRL18	Health Risk Limit 2018.
HRL93	Health Risk Limit 1993.
HRL94	Health Risk Limit 1994.
HRLMCL	Health Risk Limit., Maximum Contaminant Level.
HRL94	Health Risk Limit 1994.
MP	Laboratory reports 3-methylphenol and 4-methylphenol as co-eluting compounds. The criteria in the table represents 4-methylphenol which is the more stringent criteria.
RAA09	Not Detected., Risk Assessment Advice 2009.
RAA10	Risk Assessment Advice 2010.
RAA13	Risk Assessment Advice 2013.
RAA13	Risk Assessment Advice 2013.
RAA16	Risk Assessment Advice 2016.
RAA17	Risk Assessment Advice 2008.
RAA19	Risk Assessment Advice 2019.
XYL	Value shown is for the sum of the mixed o,m and p Xylene isomers.

Data Footnotes and Qualifiers

Minnesota Surface Water 2Bd Chronic 7050 - 360 Hardness*

(3)	Value represents the criteria for Ammonia, unionized as N.
(5)	Value based on the criteria for cyanide, free.
(6)	5.0 mg/l as a daily minimum. This dissolved oxygen standard may be modified on a site-specific basis according to part 7050.0220, subpart 7, except that no site-specific standard shall be less than 5 mg/l as a daily average and 4 mg/l as a daily minimum. Compliance with this standard is required 50 percent of the days at which the flow of the receiving water is equal to the 7Q10.
(7)	5 degree F above natural in streams and 3 degrees above natural in lakes, based on monthly average of the maximum daily temperatures, except in no case shall it exceed the daily average temperature of 86 degrees F.
(8)	pH Dependent. Based on a pH value of 7.0.
CF	Conversion Factor.
CR6	Value represents the criteria for Hexavalent Chromium.
HD	Hardness Dependent.

* Estimated concentrations based on same underlying assumptions of conservative transport mechanisms and same source area. Minnesota River hardness data from MPCA, 2006. Working Draft, Surface Water Pathway Evaluation user's Guide, Appendix E.

Minnesota Surface Water 2Bd Final Acute Value 7050 - 360 Hardness*

(1)	Subpart 7, item E applies.
(5)	Value based on the criteria for cyanide, free.
(8)	pH Dependent. Based on a pH value of 7.0.
CF	Conversion Factor.
CR6	Value represents the criteria for Hexavalent Chromium.

* Estimated concentrations based on same underlying assumptions of conservative transport mechanisms and same source area. Minnesota River hardness data from MPCA, 2006. Working Draft, Surface Water Pathway Evaluation user's Guide, Appendix E.

Figures

Project Areas
Parcel Boundary
County Boundary

N

0 500 1,000
Feet

SITE OVERVIEW
Focused Remedial
Investigation Report
Freeway Landfill and Dump
Burnsville, Minnesota
FIGURE 1

BARR

Barr Footer: ArcGIS 10.6.1, 2019-06-25 15:46 File: I:\Projects\23\19\1372\Maps\Reports\Focused_Remedial_Investigation_Report_2019\Figure 1 - Site Overview.mxd User: RCS2

Phase B Investigation Locations (2019)
- Monitoring Wells
- Borings

Phase A Investigation Locations (2018)
- Borings
- Test Trenches

Previous Investigation Locations
- Active Monitoring Well

Inferred Waste Extent

Elevation Contours, Dakota County, 2011
- 10-Foot Contour
- 2-Foot Contour

Project Areas

Parcel Boundary

0 200 400
Feet

INVESTIGATION LOCATIONS
Freeway Dump
Focused Remedial Investigation Report
Freeway Landfill and Dump
Burnsville, Minnesota

FIGURE 2

Imagery Source: Dakota County, 2018

Barr Footer: ArcGIS 10.6.1, 2019-06-26 07:43 File: I:\Projects\23\19\1372\Maps\Reports\Focused_Remedial_Investigation_Report_2019\Figure 2 - Investigation Locations - Dump.mxd User: RCS2

Phase B Investigation Locations (2019)
- Monitoring Wells
- Borings
- Seep Sample
- Test Trenches

Phase A Investigation Locations (2018)
- Borings
- Test Trenches

Previous Investigation Locations
- Active Monitoring Well
- Historical Borings

Inferred Waste Extent

Elevation Contours, Dakota County, 2011
- 10-Foot Contour

Project Areas

Parcel Boundary

N

0 350 700

Feet

INVESTIGATION LOCATIONS
Freeway Landfill
Focused Remedial Investigation Report
Freeway Landfill and Dump
Burnsville, Minnesota

FIGURE 3

Imagery Source: Dakota County, 2018

BARR

No waste material was identified in the boring logs for these wells. Extent of waste is likely between the toe of the slope and the wells.

Ash observed at FD-TT-03, FD-TT-04, and FD-TT-05. Material described as a "grey silt" (potentially ash) identified in the logs of MnDOT Phase II borings located between the Dump and highway. Historical aerial photos show ground disturbance inthe area directly adjacent to the highway. Extent of the waste material is not known, but deposited ash likely extends to the east edge of the road surface.

Waste material observed at FD-TT-06. Possibly ash identified in boring log of OFMW-1. Exact extent of the waste material is not known, but inferred to continue along the toe of the slope until reaching the Burnsville storage property to the south..

Waste material observed at FD-TT-08. No waste material was observed at MW97-4, MW97-5, or FD-SB-07. It is assumed that the extent of waste is to the property boundary in the southeast corner of the property.

Waste was observed in borings FD-SB-01, FD-SB-04, and FD-SB-08. There was a historical dump site referred to as the "Astleford Dump" that was located south of the Dump along the east side of the frontage road (see Figure 12 and Section 7.1). The delineation between waste associated with the Freeway Dump and the Astleford Dump is based on the review of historical aerial photography.

MCGOWAN MICHAEL B TSTE
NORTHERN STATES POWER CO
KRAEMER MINING & MATERIALS INC
LUTHER CO LP
U.S. FISH AND WILDLIFE SERVICE
BURNSVILLE STORAGE COMPANY-MN LP
ASTLEFORD FAMILY LTD PTNSHP

FREEWAY DUMP

MW-97-8
MW-97-9
MW-97-7
MW-19-03
MW-19-02
MW-19-01
MW-19-04
FD-TT-02
FD-TT-01
FD-SB-A1
FD-SB-A2
FD-SB-A3
FD-SB-A4
FD-SB-A5
FD-TT-06
FD-SB-B1
FD-SB-B2
FD-SB-B3
FD-SB-B4
FD-SB-B5
MW-97-3
FD-TT-12
FD-TT-11
OFMW-1
FD-SB-C1
FD-SB-C2
FD-SB-C3
FD-SB-C4
FD-SB-C5
FD-TT-07
FD-SB-D1
FD-SB-D2
FD-SB-D3
FD-SB-D4
FD-SB-D5
FD-TT-04
MW-97-2
FD-SB-E1
FD-SB-E2
FD-SB-E3
FD-SB-E4
FD-SB-E5
FD-TT-13
FD-TT-14
FD-SB-F1
FD-SB-F2
FD-SB-F3
FD-SB-F4
FD-SB-F5
FD-TT-08
MW-97-4
FD-TT-05
MW-97-1
FD-SB-G1
FD-SB-G2
FD-SB-G3
FD-SB-G4
FD-SB-G5
FD-SB-06
FD-SB-07
MW-97-5
FD-TT-09
FD-TT-10
FD-SB-04
FD-SB-08
MW-97-6
FD-SB-05
FD-SB-01
FD-SB-02
FD-SB-03

35W

Phase B Investigation Locations (2019)
- Monitoring Wells
- Borings

Phase A Investigation Locations (2018)
- Borings
- Test Trenches

Previous Investigation Locations
- Active Monitoring Well

- Inferred Waste Extent
- Waste Thickness 5ft Contours

Elevation Contours, Dakota County, 2011
- 10-Foot Contour
- 2-Foot Contour

- Project Areas
- Parcel Boundary

Elevation Data Source: Fugro Horizons, Inc. and the Minnesota Department of Natural Resources. LiDAR Elevation, Twin Cities Metro Region, Minnesota, 2011. The Minnesota Elevation Mapping Project.

N

0 200 400
Feet

Imagery Source: Dakota County, 2018

WASTE EXTENT
Freeway Dump
Focused Remedial Investigation Report
Freeway Landfill and Dump
Burnsville, Minnesota

FIGURE 4

BARR

Waste material was observed at Phase A test excavations completed along the northern property boundary of the Landfill. Two additional test excavations were conducted on the U.S. Salt property north of the Landfill. Waste was observed at FL-TT-09 and was described as inert construction debris (asphalt, concrete, rebar), while no waste was observed at FL-TT-10. It is assumed that there is some waste that extends onto the U.S. Salt property, but that it is mostly construction debris mixed with fill.

Waste material was not observed at locations FL-TT-06 and FL-TT-07. These test excavations were completed beyond the slope of the elevated landfill. Historical aerial photos also do not show evidence of ground disturbance beyond the toe of the slope as is located currently. The extent of waste material along the east edge of the landfill is likely defined by the base of the slope.

No waste material was observed at locations TS-SB-02 and TS-SB-07, which were completed inside the building. Waste was observed in all other borings completed in the vicinity of the Transfer Station. It is assumed that waste material extends throughout the Transfer Station area with the exception of directly under the buildings and possibly the weighing stations.

The extent of waste material along the south, west, and northwest edges of the Landfill shown here are based on MPCA September 2017 Investigation and Sampling Plan. This assumed waste footprint boundary was informed by previous investigation, for example the 2005 Fuller investigation.

Waste material observed at test excavation FL-TT-08, located on the slope of the landfill. No waste material was identified in the boring log of J-1. Historic aerial photos do not show any disturbance in this corner of the property. It is assumed that waste material extends to the bottom of the slope.

U.S. SALT INC

MCGOWAN MICHAEL B TSTE

KRAEMER MINING & MATERIALS INC

NORTHERN STATES POWER CO

U.S. FISH AND WILDLIFE SERVICE

Hennepin County
Dakota County

Minnesota River

Phase B Investigation Locations (2019)
- Monitoring Wells
- Borings
- Seep Sample
- Test Trenches

Phase A Investigation Locations (2018)
- Borings
- Test Trenches

Previous Investigation Locations
- Active Monitoring Well
- Historical Borings

- Inferred Waste Extent
- Waste Thickness 5ft Contours

Elevation Contours, Dakota County, 2011
- 10-Foot Contour

- Project Areas
- Parcel Boundary

Elevation Data Source:
Fugro Horizons, Inc. and the Minnesota Department of Natural Resources. LiDAR Elevation, Twin Cities Metro Region, Minnesota, 2011. The Minnesota Elevation Mapping Project.

N

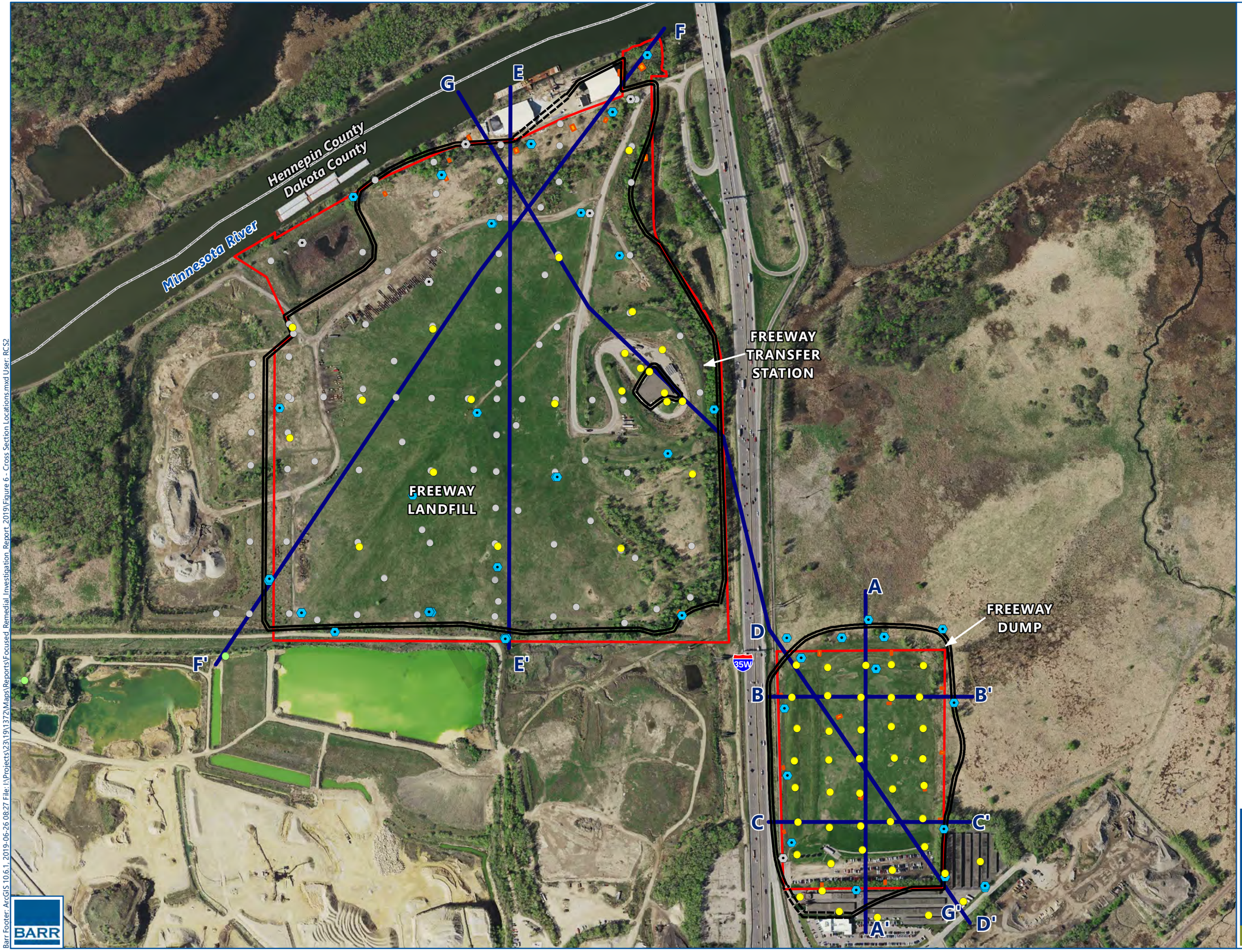
0 350 700
Feet

WASTE EXTENT
Freeway Landfill
Focused Remedial Investigation Report
Freeway Landfill and Dump
Burnsville, Minnesota

FIGURE 5

BARR

Barr Footer: ArcGIS 10.6.1, 2019-06-26 07:59 File: I:\Projects\23\19\1372\Maps\Reports\Focused_Remedial_Investigation_Report_2019\Figure 5 - Waste Extent - Landfill.mxd User: RCS2



Cross Section Location
Monitoring Wells
Borings
Seep Sample
Abandoned Monitoring Wells
Historical Borings
Test Trenches
Inferred Waste Extent
Project Areas

N

0 500 1,000
Feet

CROSS SECTION LOCATIONS
Focused Remedial
Investigation Report
Freeway Landfill and Dump
Burnsville, Minnesota

FIGURE 6

BARR

Barr Footer: ArcGIS 10.6.1, 2019-06-26 08:27 File: I:\Projects\23\19\1372\Maps\Reports\Focused_Remedial_Investigation_Report_2019\Figure 6 - Cross Section Locations.mxd User: RCS2

A
NORTH

A’
SOUTH

Freeway Dump

Northern States Power Company

US Fish and Wildlife

Burnsville Storage Company

730 —
720 —
710 —
700 —
690 —
680 —

MW-19-03
FD-SB-A3
MW-19-04
FD-SB-B3
FD-SB-C3
FD-SB-D3
FD-SB-E3
FD-TT-13
FD-SB-F3
FD-SB-G3
FD-TT-09
MW97-6
FD-SB-02
MW97-8

FILL
ASH
MSW/CD
NATIVE
BEDROCK
(PRAIRIE DU CHIEN)
Wetland

LEGEND

- Geologic Contact
- Inferred Geologic Contact
- Measured Water Level, June 17, 2019
- Monitoring Well Screen
- Soil Boring/Piezometer
- Test Trench
- Parcel Boundary

0 — 150
Approximate Horizontal Scale in Feet
15X Vertical Exaggeration

MSW/CD - Municipal Solid Waste / Construction Debris
*Approximate river elevation on June 17, 2019 was 699 ft MSL
**Unable to measure. Water level inferred.

BARR

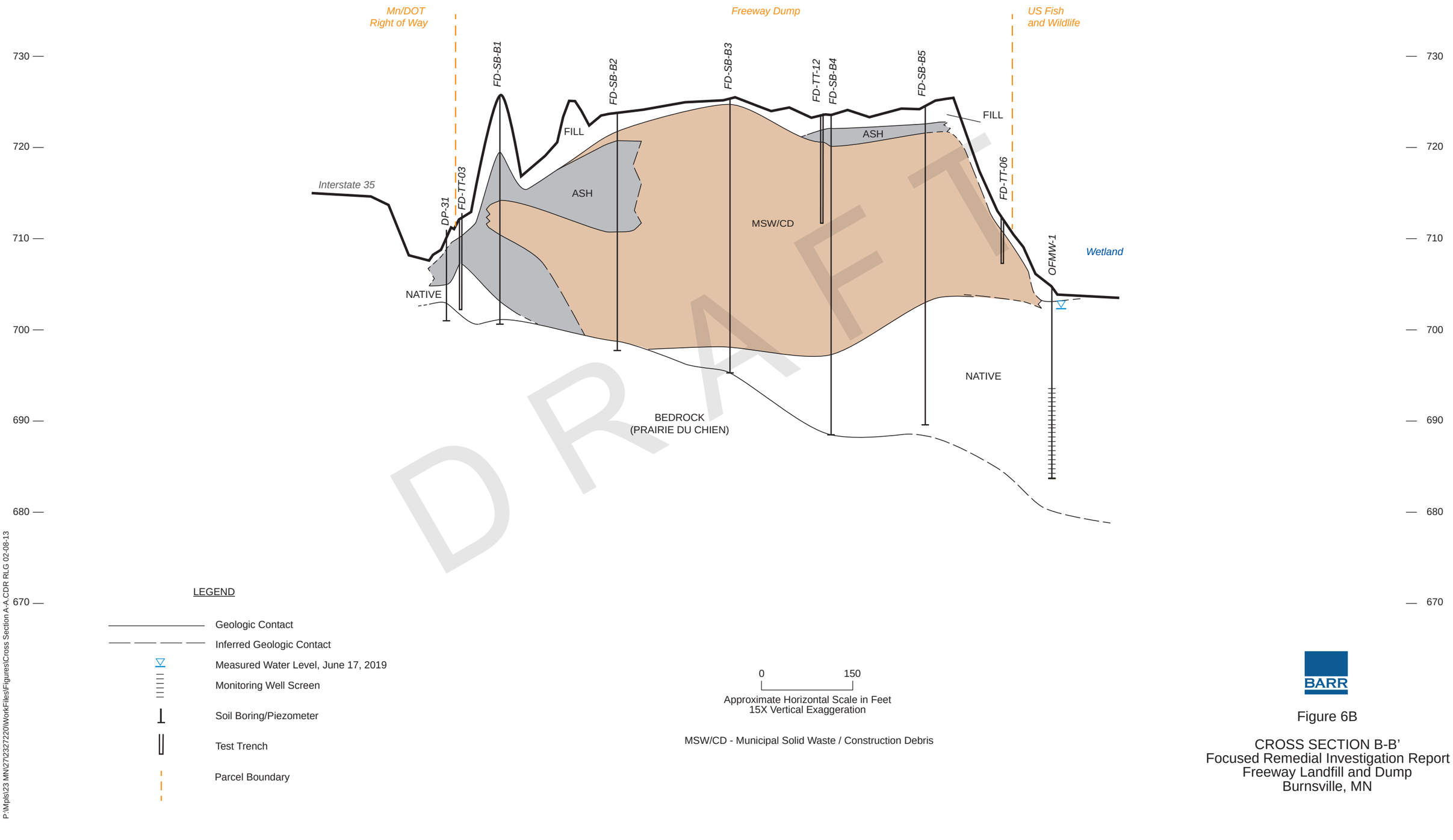
Figure 6A

CROSS SECTION A-A’
Focused Remedial Investigation Report
Freeway Landfill and Dump
Burnsville, MN

P:\Mpls\23 MN\19\23191372 Freeway Landfill Pollution Inv\Work Files\Focused RI\02 - Figures\New cross sections\Dump\A-A'\A-A'_2019_v3.ai

B
WEST

B’
EAST



LEGEND

- Geologic Contact
- Inferred Geologic Contact
- Measured Water Level, June 17, 2019
- Monitoring Well Screen
- Soil Boring/Piezometer
- Test Trench
- Parcel Boundary

0 150

Approximate Horizontal Scale in Feet
15X Vertical Exaggeration

MSW/CD - Municipal Solid Waste / Construction Debris

BARR

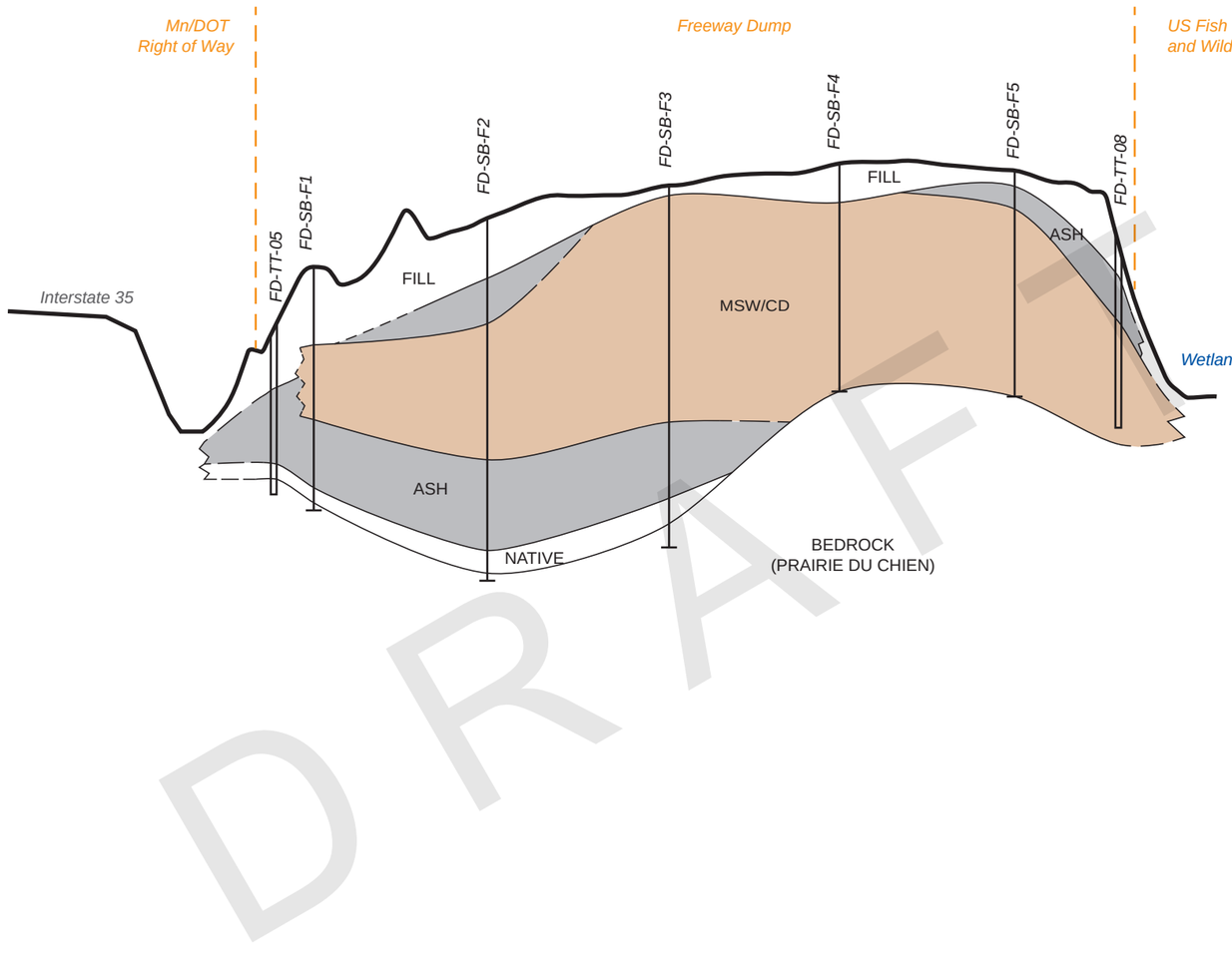
Figure 6B

CROSS SECTION B-B’
Focused Remedial Investigation Report
Freeway Landfill and Dump
Burnsville, MN

P:\Mpls\23 MN\27\23272200\WorkFiles\Figures\Cross Section A-A.CDR RLG 02-08-13

C
WEST

C’
EAST



LEGEND

- Geologic Contact
- Inferred Geologic Contact
- Soil Boring/Piezometer
- Test Trench
- Parcel Boundary

0 150

Approximate Horizontal Scale in Feet
15X Vertical Exaggeration

MSW/CD - Municipal Solid Waste / Construction Debris

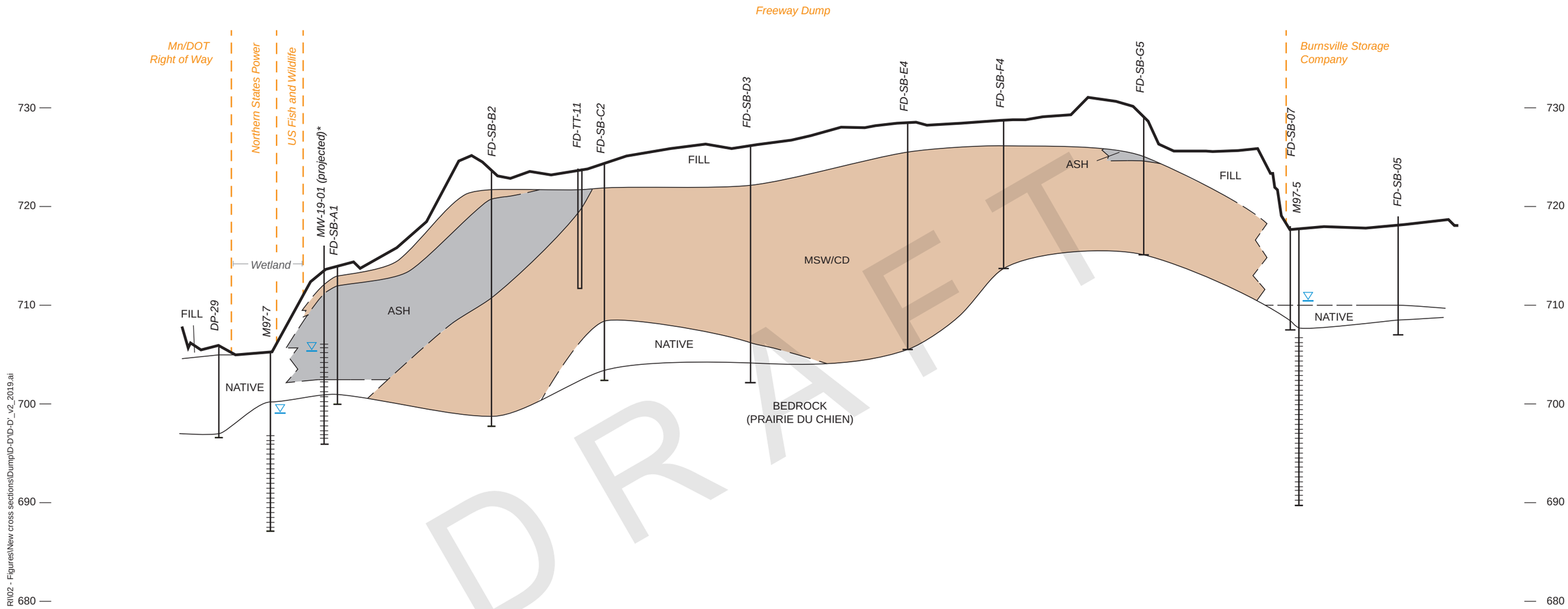
BARR

Figure 6C

CROSS SECTION C-C’
Focused Remedial Investigation Report
Freeway Landfill and Dump
Burnsville, MN

D
NORTHWEST

D'
SOUTHEAST



LEGEND

- Geologic Contact
- Inferred Geologic Contact
- Measured Water Level, June 17, 2019
- Monitoring Well Screen
- Soil Boring/Piezometer
- Test Trench
- Parcel Boundary

0 150

Approximate Horizontal Scale in Feet
15X Vertical Exaggeration

MSW/CD - Municipal Solid Waste / Construction Debris
*Boring not used to depict geologic contacts

BARR

Figure 6D

CROSS SECTION D-D'
Focused Remedial Investigation Report
Freeway Landfill and Dump
Burnsville, MN

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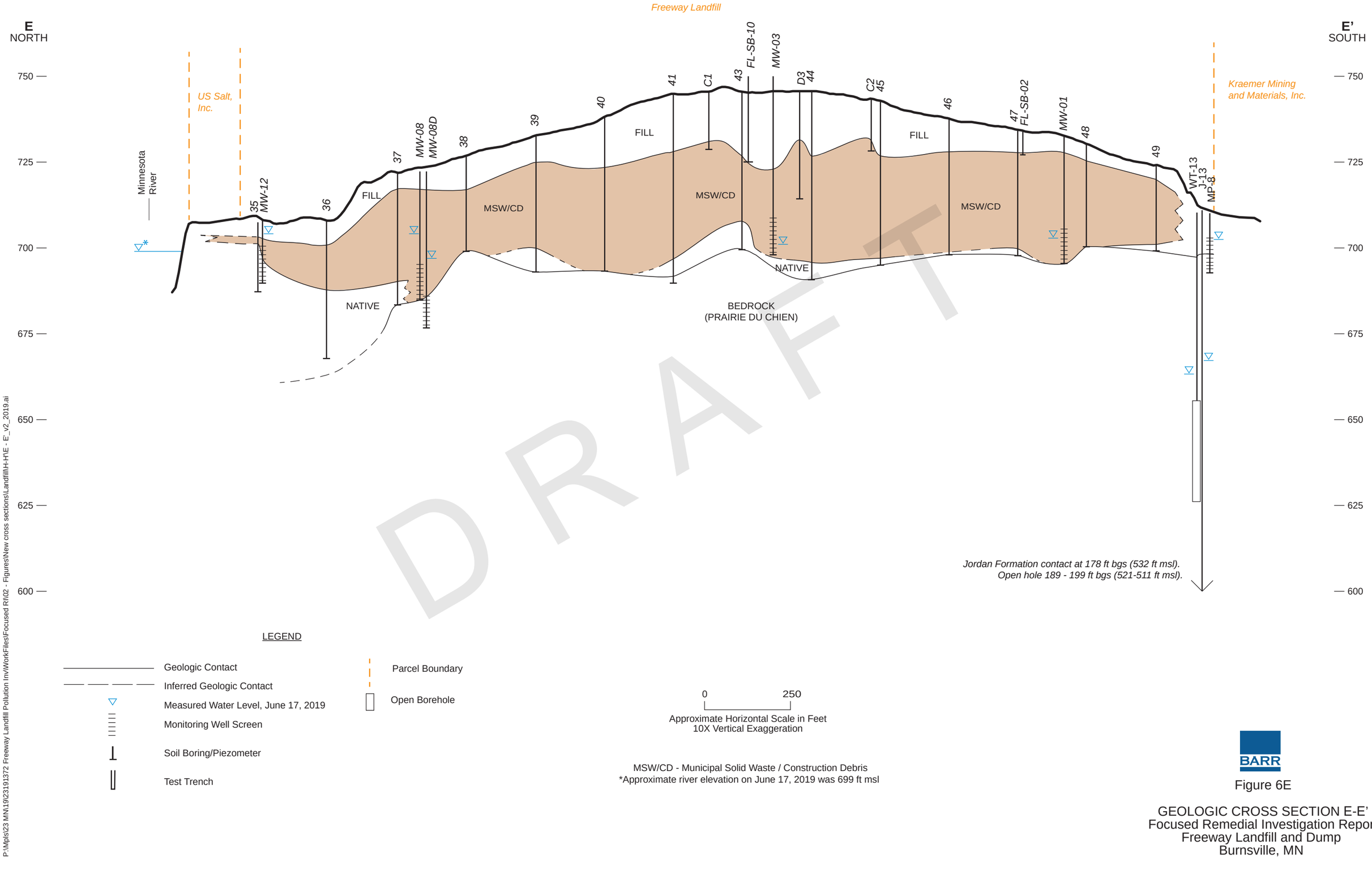

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BARR

Figure 6E

GEOLOGIC CROSS SECTION E-E'
Focused Remedial Investigation Report
Freeway Landfill and Dump
Burnsville, MN

F
NORTHEAST

F'
SOUTHWEST

Freeway Landfill

Kraemer Mining and Materials, Inc.

750 —
725 —
700 —
675 —
650 —
625 —
600 —

Minnesota River*
WT-09
FL-TT-06
FL-TT-09
MW-13
FL-TT-05
51
52
D2
37
MW-08
MW-08D
28
FL-SB-09
B3
29
FL-SB-12
22
15
WT-14
JT-14
8

FILL
MSW/CD
NATIVE
NATIVE
FILL

BEDROCK
(PRAIRIE DU CHEIN)

Seep in Bedrock

Jordan contact at 155' bgs
Open borehole 160 - 180' bgs

LEGEND

- Geologic Contact
- Inferred Geologic Contact
- Measured Water Level, June 17, 2019
- Monitoring Well Screen
- Soil Boring
- Test Trench
- Parcel Boundary
- Open Borehole

0 375
Approximate Horizontal Scale in Feet
15X Vertical Exaggeration

MSW/CD - Municipal Solid Waste / Construction Debris
*Approximate river elevation on June 17, 2019 was 699 ft MSL

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Figure 6F

GEOLOGIC CROSS SECTION F-F'
Focused Remedial Investigation Report
Freeway Landfill and Dump
Burnsville, Minnesota

P:\Mpls\23 MN\19\23191372 Freeway Landfill Pollution Inv\WorkFiles\Focused RI\02 - Figures\New cross sections\Landfill\I-1\F-F'_2019_v4.ai

G
NORTHWEST

G'
SOUTHEAST

D - D'

US Salt | Freeway Landfill | Freeway Transfer Station | Mn/DOT Right of Way | Northern States Power Company | US Fish and Wildlife | Freeway Dump | Burnsville Storage Company

730
715
700
685
670
655

Minnesota River

FL-TT-10 | 35 | FL-TT-03 | 36 | D2 | 53 FL-SB-07 | TS-SB-06 | TS-SB-01 | TS-SB-07 | TS-SB-02 | TS-SB-04 | TS-SB-03 | DP-28 | DP-29 | MW97-7 | MW-19-01 (projected) * | FD-SB-A1 | FD-SB-B2 | FD-TT-11 | FD-SB-C2 | FD-SB-D3 | FD-SB-E4 | FD-SB-F4 | FD-SB-G5 | FD-SB-07 | MW97-5 | FD-SB-05

*Wetland

Transfer Station

FILL
MSW/CD
NATIVE
BEDROCK (PRAIRIE DU CHIEN)
ASH

LEGEND

- Geologic Contact
- Inferred Geologic Contact
- Monitoring Well Screen
- Soil Boring/Piezometer
- Test Trench
- Parcel Boundary

0 375
Approximate Horizontal Scale in Feet
25X Vertical Exaggeration

MSW/CD - Municipal Solid Waste / Construction Debris
*Boring not used to depict geologic contacts

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Figure 6G

CROSS SECTION G-G'
Freeway Dump, Landfill, and Transfer Station
Site Investigation Report
Dakota County, Minnesota

P:\Mpls\23 MN\19\23191372 Freeway Landfill Pollution Inv\Work Files\Focused RI\02 - Figures\New cross sections\Landfill\G-G'\G-G'_V4.ai

Cover Soil Investigation Location

Inferred Waste Extent

Cover Soil Thickness Contours (5ft)**

Project Areas

Parcel Boundary

County Boundary

* Phase A Investigation Location

** Cover soil thickness contours created using boring log data from all recent and historical investigation locations

N

0 500 1,000

Feet

COVER SOIL INVESTIGATION LOCATIONS

Focused Remedial Investigation Report
Freeway Landfill and Dump
Burnsville, Minnesota

FIGURE 7

Perched Monitoring Well
Water Table Monitoring Well
Jordan Monitoring Well

Nested Wells

Perched and Water Table
Water Table and Jordan
Perched, Water Table, and Jordan

Project Areas
Parcel Boundary
County Boundary

Well Network General Descriptions

Perched – Wells that are screened at depths where water or leachate was encountered above the groundwater table.

Water Table – Wells that are screened across the groundwater table (with the exception of WT-9 and WT-10). Typically the water table is in fractured Prairie du Chien bedrock.

Jordan – Wells that are constructed as open borehole bedrock monitoring wells in the Jordan formation which underlies the Prairie du Chien. The open-hole sections of these wells are generally at depths of approximately 160 to 220 feet below ground surface.

N

0 500 1,000
Feet

MONITORING WELL NETWORK
Focused Remedial Investigation Report
Freeway Landfill and Dump
Burnsville, Minnesota

FIGURE 8

Barr Footer: ArcGIS 10.6.1, 2019-06-26 08:05 File: I:\Projects\23\19\1372\Maps\Reports\Focused_Remedial_Investigation_Report_2019\Figure 8 - Monitoring Well Network.mxd User: RCS2

Perched Monitoring Well

Water Table Monitoring Well

Jordan Well

Perched and Water Table

Water Table and Jordan

Groundwater Elevation Contour*
Contour Interval = 5 ft (MSL)

Estimated Flow Direction

Contours, Dakota County, 2011

10-Foot Contour

Project Areas

Parcel Boundary

* Groundwater Elevation from Water Table Monitoring Wells

NM - Not Measured

N

0 350 700

Feet

GROUNDWATER CONTOURS
April 9, 2019
Freeway Landfill
Focused Remedial
Investigation Report
Freeway Landfill and Dump
Burnsville, Minnesota

FIGURE 9

BARR

Barr Footer: ArcGIS 10.6.1, 2019-06-27 13:45 File: J:\Projects\23\19\1372\Maps\Reports\Focused Remedial Investigation Report_2019\Figure 9 - Groundwater Contours - Landfill - April 9, 2019.mxd User: RCS2

River Stage - 699 feet MSL
measured on 06/17/19

MW-97-8
NM

MW-97-9
701.58

MW-97-7
699 699.01

MW-19-02
705.24

MW-19-03
706.00

MW-19-01
705.21

MW-19-04
706.64

MW-97-3
702.21

OFMW-1
702.38

MW-97-2
705.32

MW-97-4
710.81

MW-97-1
706.32

MW-97-5
710.42

MW-97-6
708.75

BURNSVILLE
STORAGE
COMPANY-MN LP

LUTHER CO LP

ASTLEFORD
FAMILY LTD
PTNSHP

35W

700 710 720 730 740

Imagery Source: Dakota County, 2018

Perched Monitoring Well

Water Table Monitoring Well

Groundwater Elevation Contour*
Contour Interval = 1 ft (MSL)

Estimated Flow Direction

Contours, Dakota County, 2011

10-Foot Contour

2-Foot Contour

Project Areas

Parcel Boundary

* Groundwater Elevation from Water Table Monitoring Wells

NM - Not Measured

N

0 200 400

Feet

GROUNDWATER CONTOURS
June 17, 2019
Freeway Dump
Focused Remedial
Investigation Report
Freeway Landfill and Dump
Burnsville, Minnesota

FIGURE 10

Barr Footer: ArcGIS 10.6.1, 2019-06-27 13:47 File: I:\Projects\23\19\1372\Maps\Reports\Focused_Remedial_Investigation_Report_2019\Figure 10 - Groundwater Contours - Dump - June 17, 2019.mxd User: RCS2

- Perched Monitoring Well
- Water Table Monitoring Well
- Jordan Well
- Perched and Water Table
- Water Table and Jordan
- Perched, Water Table, and Jordan
- Groundwater Elevation Contour*
  Contour Interval = 5 ft (MSL)
- Estimated Flow Direction

Contours, Dakota County, 2011

- 10-Foot Contour
- Project Areas
- Parcel Boundary

* Groundwater Elevation from Water Table Monitoring Wells (except WT-9 and WT-10)

NM - Not Measured

N

0 350 700

Feet

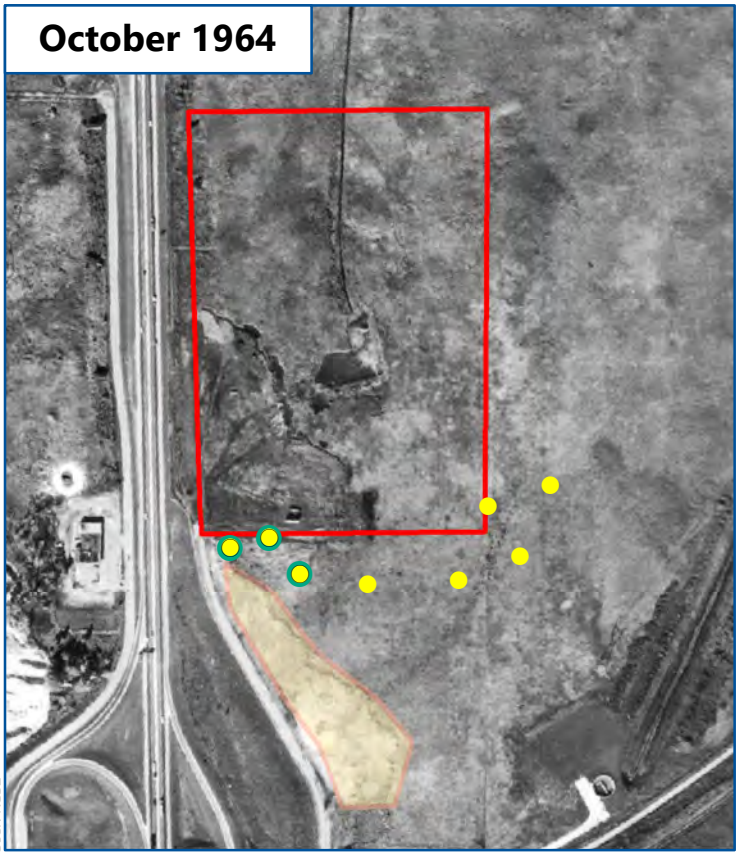
GROUNDWATER CONTOURS
June 17, 2019
Freeway Landfill
Focused Remedial
Investigation Report
Freeway Landfill and Dump
Burnsville, Minnesota

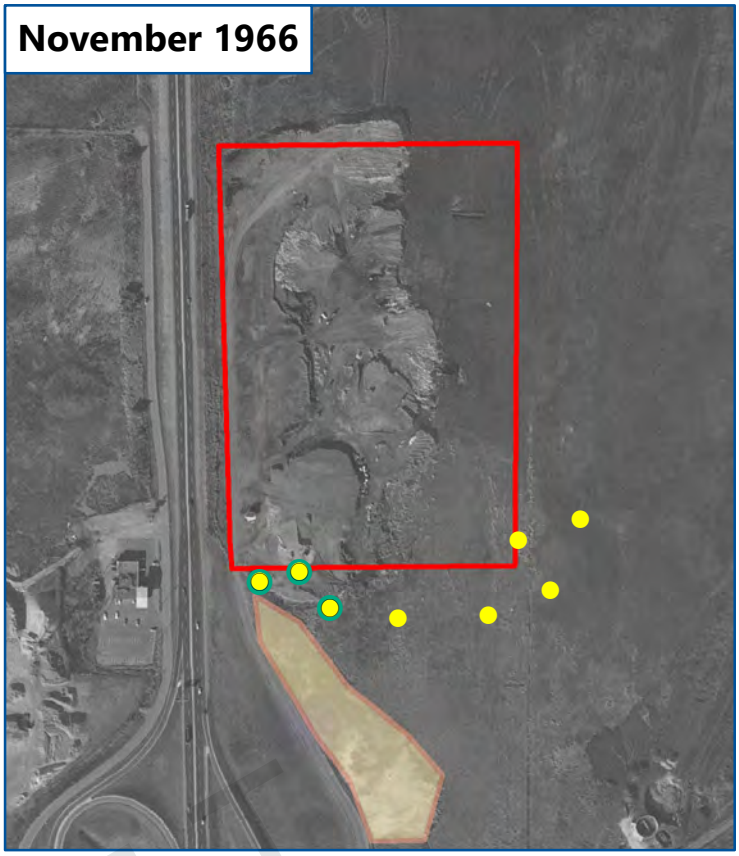
FIGURE 11

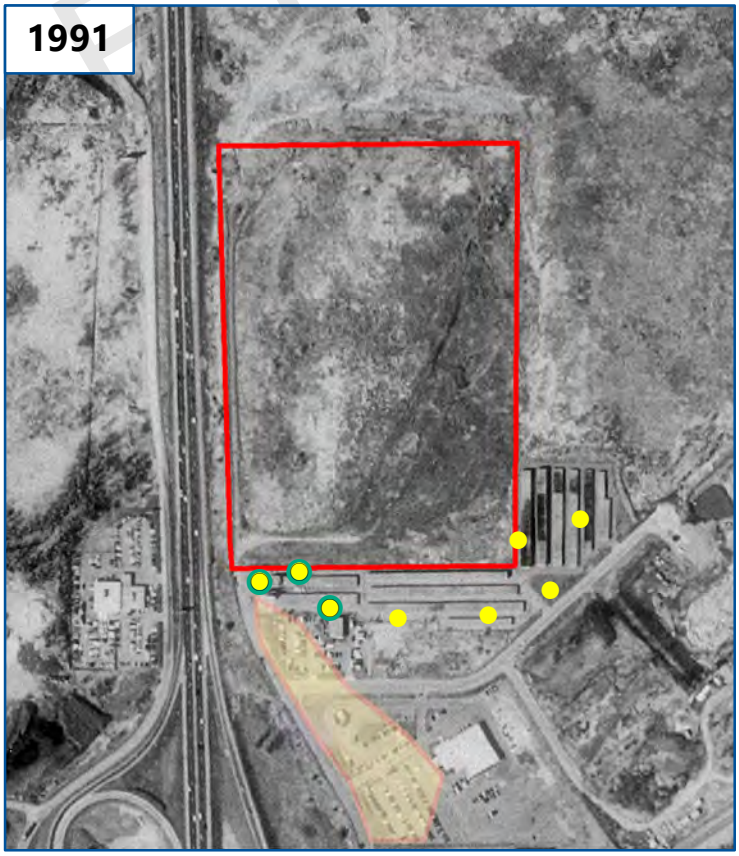
Imagery Source: Dakota County, 2018

BARR

Barr Footer: ArcGIS 10.6.1, 2019-06-27 13:47 File: J:\Projects\23\19\1372\Maps\Reports\Focused Remedial Investigation Report_2019\Figure 11 - Groundwater Contours - Landfill - June 17, 2019.mxd User: RCS2







Waste Extent Boring Location

Waste Observed

Approximate Location of Astleford Dump

Project Areas

N

0 300 600

Feet

Historic Aerial Imagery provided by Historic Information Gatherers (HIG). *http://www.historicalinfo.com/*

HISTORIC AERIAL PHOTOGRAPHS
ASTLEFORD DUMP
Focused Remedial Investigation Report
Freeway Landfill and Dump
Burnsville, Minnesota

FIGURE 12

Appendices

Appendix A-1

Waste Investigation Boring Logs

Barr Engineering Company
4300 MarketPointe Drive Suite 200
Minneapolis, MN 55435
Telephone: 952-832-2600

LOG OF GEOPROBE FD-SB-01

DRAFT

Project:	Freeway Dump and Landfill	Surface Elevation:	720 ft MSL*
Project No.:	23191372	Drilling Method:	Geoprobe
Location:	Burnsville, MN	Sampling Method:	Dual-Tube
Coordinates:	UTM 15 N:477298.734m, E:4959232.848m	Completion Depth:	13.0 ft
Datum:	NAD 83; UTM Zone 15		

Depth, feet	Sample Type & Recovery	Sample No.	ENVIRONMENTAL DATA	USCS	Graphic Log	LITHOLOGIC DESCRIPTION	Elevation, feet
0				GW		ASPHALT: black.	
						GRAVEL BASE (GW): Class 5 gravel; light yellowish brown.	
		1	**PID:**0.0 **D/O/S:**None/ None/ None	SP-SM		POORLY GRADED SAND WITH SILT (SP-SM): fine to medium grained; brownish gray; very dense; trace slag material; [FILL].	
			PID:0.0 **D/O/S:**None/ None/ None				
5						WASTE MATERIAL (WM): silty matrix with glass, plastic, wood, and slag; dark brown/black; wet; trace mono-sheen.	
		2	**PID:**0.0 **D/O/S:**None/ None/ Trace	WM		9.5' - 10': trace roots, disturbed topsoil.	
10						PRAIRIE DU CHIEN (OPC). Bedrock; very weak; blue-greenish gray; highly weathered.	
		3	**PID:**0.0 **D/O/S:**None/ None/ None				
						End of geoprobe 13.0 feet	
15							
20							
25							
30							

Date Boring Started:	3/28/19
Date Boring Completed:	3/28/19
Logged By:	AKS3/EMC
Drilling Contractor:	Midwestern Drilling
Drill Rig:	Geoprobe

Remarks: Background PID: 0.0 ppm
Obstruction encountered at 6' at original location. Moved 1' off and resumed logging from 5' at new location.
*Surface elevation interpreted from LIDAR, MSL = feet above mean sea level

PID = Headspace; D/O/S = Discoloration/Odor/Sheen; FID/MC = FID/Methane Corrected; G/S/F = Gravel/Sand/Fines
Additional data may have been collected in the field which is not included on this log.

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Minneapolis, MN 55435
Telephone: 952-832-2600

LOG OF GEOPROBE FD-SB-02

DRAFT

Project:	Freeway Dump and Landfill	Surface Elevation:	721 ft MSL*
Project No.:	23191372	Drilling Method:	Geoprobe
Location:	Burnsville, MN	Sampling Method:	Dual-Tube
Coordinates:	UTM 15 N:477363.3886m, E:4959222.999m	Completion Depth:	20.0 ft
Datum:	NAD 83; UTM Zone 15		

Depth, feet	Sample Type & Recovery	Sample No.	ENVIRONMENTAL DATA	USCS	Graphic Log	LITHOLOGIC DESCRIPTION	Elevation, feet
0						ASPHALT: black.	
		1	**PID:**0.0 **D/O/S:**None/ None/ None			SILTY SAND (SM): very fine to fine grained; dark gray; moist; very dense; trace slag; with little gravel [FILL].	
			PID:0.2 **D/O/S:**None/ None/ None				
5			**PID:**0.0 **D/O/S:**None/ None/ None			From 5':; fine to medium grained; dark yellowish brown; moist; loose.	
		2				6.5': 2" diameter gravel clast.	
				SM			
10			**PID:**0.0 **D/O/S:**None/ None/ None				
		3				From 13': color change to grayish brown, trace medium gravel. 13': 2" diameter gravel clast.	
15							
		4	**PID:**0.0 **D/O/S:**None/ None/ None			PRAIRIE DU CHIEN (OPC). Bedrock; very weak; olive yellow; moderately weathered.	
20						End of geoprobe 20.0 feet	
25							
30							

Date Boring Started:	3/28/19
Date Boring Completed:	3/28/19
Logged By:	AKS3/EMC
Drilling Contractor:	Midwestern Drilling
Drill Rig:	Geoprobe

Remarks: Background PID: 0.0 ppm
*Surface elevation interpreted from LIDAR, MSL = feet above mean sea level

PID = Headspace; D/O/S = Discoloration/Odor/Sheen; FID/MC = FID/Methane Corrected; G/S/F = Gravel/Sand/Fines
Additional data may have been collected in the field which is not included on this log.

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LOG OF GEOPROBE FD-SB-03

DRAFT

Project:	Freeway Dump and Landfill	Surface Elevation:	719 ft MSL*
Project No.:	23191372	Drilling Method:	Geoprobe
Location:	Burnsville, MN	Sampling Method:	Dual-Tube
Coordinates:	UTM 15 N:477449.7056m, E:4959225.998m	Completion Depth:	10.7 ft
Datum:	NAD 83; UTM Zone 15		

Depth, feet	Sample Type & Recovery	Sample No.	ENVIRONMENTAL DATA	USCS	Graphic Log	LITHOLOGIC DESCRIPTION	Elevation, feet
0				GW		ASPHALT: black.	
						GRAVEL BASE (GW): Class 5 gravel; light yellowish brown.	
			PID:0.0 **D/O/S:**None/ None/ None			SILTY SAND (SM): fine to coarse grained; dark gray; moist; dense; [FILL].	
		1					
			PID:0.0 **D/O/S:**None/ None/ None	SM			
5						From 5': yellowish brown; trace gravel.	
			PID:0.0 **D/O/S:**None/ None/ None				
		2					
				CL		SANDY LEAN CLAY (CL): green/gray; moist; trace gravel; sand is very fine to coarse grained.	
10						PRAIRIE DU CHIEN (OPC). Bedrock; very weak; white/tan; moderately weathered.	
		3	**D/O/S:**None/ None/ None			End of geoprobe 10.7 feet	
15							
20							
25							
30							

Date Boring Started:	3/28/19
Date Boring Completed:	3/28/19
Logged By:	AKS3/EMC
Drilling Contractor:	Midwestern Drilling
Drill Rig:	Geoprobe

Remarks: Dashed line indicates an inferred contact depth
Background PID: 0.0 ppm
*Surface elevation interpreted from LIDAR, MSL = feet above mean sea level

PID = Headspace; D/O/S = Discoloration/Odor/Sheen; FID/MC = FID/Methane Corrected; G/S/F = Gravel/Sand/Fines
Additional data may have been collected in the field which is not included on this log.

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LOG OF GEOPROBE FD-SB-04

DRAFT

Project:	Freeway Dump and Landfill	Surface Elevation:	719 ft MSL*
Project No.:	23191372	Drilling Method:	Geoprobe
Location:	Burnsville, MN	Sampling Method:	Dual-Tube
Coordinates:	UTM 15 N:477232.2676m, E:4959257.994m	Completion Depth:	11.0 ft
Datum:	NAD 83; UTM Zone 15		

Depth, feet	Sample Type & Recovery	Sample No.	ENVIRONMENTAL DATA	USCS	Graphic Log	LITHOLOGIC DESCRIPTION	Elevation, feet
0				GW		ASPHALT: black. GRAVEL BASE (GW): Class 5 gravel; light yellowish brown.	
		1	**PID:**0.0 **D/O/S:**None/ None/ None	SM		SILTY SAND (SM): fine to coarse grained; gray; moist; dense; [FILL]. From 4': brown.	
5						WASTE MATERIAL WITH ASH (WM): moist; wood waste mixed with gray ash.	
		2	**PID:**0.1 **D/O/S:**None/ None/ None	WM			
10		3	**D/O/S:**None/ None/ None			PRAIRIE DU CHIEN (OPC). Bedrock; very weak; white/tan; moderately weathered. End of geoprobe 11.0 feet	
15							
20							
25							
30							

Date Boring Started:	3/29/19
Date Boring Completed:	3/29/19
Logged By:	AKS3
Drilling Contractor:	Midwestern Drilling
Drill Rig:	Geoprobe

Remarks: Dashed line indicates an inferred contact depth
*Surface elevation interpreted from LIDAR, MSL = feet above mean sea level

PID = Headspace; D/O/S = Discoloration/Odor/Sheen; FID/MC = FID/Methane Corrected; G/S/F = Gravel/Sand/Fines
Additional data may have been collected in the field which is not included on this log.

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LOG OF GEOPROBE FD-SB-05

DRAFT

Project: Freeway Dump and Landfill
Project No.: 23191372
Location: Burnsville, MN
Coordinates: UTM 15 N:477508.8484m, E:4959249.176m
Datum: NAD 83; UTM Zone 15

Surface Elevation: 719 ft MSL*
Drilling Method: Geoprobe
Sampling Method: Dual-Tube
Completion Depth: 12.0 ft

Depth, feet	Sample Type & Recovery	Sample No.	ENVIRONMENTAL DATA	USCS	Graphic Log	LITHOLOGIC DESCRIPTION	Elevation, feet
0						ASPHALT: black.	
		1	**PID:**0.6 **D/O/S:**None/ None/ None	SM		SILTY SAND (SM): fine to coarse grained; dark brown to brown, some gray; moist; with pebbles. [FILL].	
5		2	**PID:**0.5 **D/O/S:**None/ None/ None				
				CL		SANDY LEAN CLAY (CL): gray; moist; medium plasticity; sand is very fine to fine grained. [NATIVE].	
10		3	**D/O/S:**None/ None/ None			PRAIRIE DU CHIEN (OPC). Bedrock; very weak; white/tan; moderately weathered.	
						End of geoprobe 12.0 feet	
15							
20							
25							
30							

Date Boring Started: 4/1/19
Date Boring Completed: 4/1/19
Logged By: EMC
Drilling Contractor: Midwestern Drilling
Drill Rig: Geoprobe

Remarks: Background PID: 0.2 ppm
*Surface elevation interpreted from LIDAR, MSL = feet above mean sea level

PID = Headspace; D/O/S = Discoloration/Odor/Sheen; FID/MC = FID/Methane Corrected; G/S/F = Gravel/Sand/Fines
Additional data may have been collected in the field which is not included on this log.

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LOG OF GEOPROBE FD-SB-06

DRAFT

Project:	Freeway Dump and Landfill	Surface Elevation:	719 ft MSL*
Project No.:	23191372	Drilling Method:	Geoprobe
Location:	Burnsville, MN	Sampling Method:	Dual-Tube
Coordinates:	UTM 15 N:477537.5253m, E:4959316.851m	Completion Depth:	13.0 ft
Datum:	NAD 83; UTM Zone 15		

Depth, feet	Sample Type & Recovery	Sample No.	ENVIRONMENTAL DATA	USCS	Graphic Log	LITHOLOGIC DESCRIPTION	Elevation, feet
0				GW		ASPHALT: black.	
						GRAVEL BASE (GW): Class 5 gravel; light yellowish brown.	
		1	**PID:**0.5 **D/O/S:**None/ None/ None			SILTY SAND (SM): fine to coarse grained; brown; moist; w/ gravel; [FILL].	
5				SM		From 5': fine to medium grained, more fines, no gravel.	
		2	**PID:**0.7 **D/O/S:**None/ None/ None				
10				OL		ORGANIC SILT (OL): peat, silty organic; black; moist; [NATIVE].	
		3	**PID:**0.7 **D/O/S:**None/ None/ None	CL		LEAN CLAY (CL): dark gray; moist; medium plasticity; sand is very fine to fine grained w/ gravel [NATIVE].	
						PRAIRIE DU CHIEN (OPC). Bedrock; very weak; white, tan, green; moderately weathered.	
						End of geoprobe 13.0 feet	
15							
20							
25							
30							

Date Boring Started:	4/1/19
Date Boring Completed:	4/1/19
Logged By:	EMC
Drilling Contractor:	Midwestern Drilling
Drill Rig:	Geoprobe

Remarks: Dashed line indicates an inferred contact depth
Background PID: 0.2 ppm
*Surface elevation interpreted from LIDAR, MSL = feet above mean sea level

PID = Headspace; D/O/S = Discoloration/Odor/Sheen; FID/MC = FID/Methane Corrected; G/S/F = Gravel/Sand/Fines
Additional data may have been collected in the field which is not included on this log.

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LOG OF GEOPROBE FD-SB-07

DRAFT

Project:	Freeway Dump and Landfill	Surface Elevation:	718 ft MSL*
Project No.:	23191372	Drilling Method:	Geoprobe
Location:	Burnsville, MN	Sampling Method:	Dual-Tube
Coordinates:	UTM 15 N:477478.1224m, E:4959296.5m	Completion Depth:	10.5 ft
Datum:	NAD 83; UTM Zone 15		

Depth, feet	Sample Type & Recovery	Sample No.	ENVIRONMENTAL DATA	USCS	Graphic Log	LITHOLOGIC DESCRIPTION	Elevation, feet
0				GW		ASPHALT: black.	
						GRAVEL BASE (GW): Class 5 gravel; light yellowish brown.	
		1	**PID:**0.4 **D/O/S:**None/ None/ None			SILTY SAND (SM): fine to coarse grained; brown; moist; trace pebbles; [FILL].	
				SM			
5			**PID:**0.5 **D/O/S:**None/ None/ None				
		2					
				OL		ORGANIC SILT (OL): peat, silty organic; black; moist; [NATIVE].	
10						PRAIRIE DU CHIEN (OPC). Bedrock; very weak; tan; moderately weathered.	
		3	**D/O/S:**None/ None/ None			End of geoprobe 10.5 feet	
15							
20							
25							
30							

Date Boring Started:	4/1/19
Date Boring Completed:	4/1/19
Logged By:	EMC
Drilling Contractor:	Midwestern Drilling
Drill Rig:	Geoprobe

Remarks: Background PID: 0.2 ppm
Pace collected soil gas sample at this location
*Surface elevation interpreted from LIDAR, MSL = feet above mean sea level

PID = Headspace; D/O/S = Discoloration/Odor/Sheen; FID/MC = FID/Methane Corrected; G/S/F = Gravel/Sand/Fines
Additional data may have been collected in the field which is not included on this log.

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LOG OF GEOPROBE FD-SB-08

DRAFT

Project: Freeway Dump and Landfill
Project No.: 23191372
Location: Burnsville, MN
Coordinates: UTM 15 N:477269.8909m, E:4959267.94m
Datum: NAD 83; UTM Zone 15

Surface Elevation: 720 ft MSL*
Drilling Method: Geoprobe
Sampling Method: Dual-Tube
Completion Depth: 14.0 ft

Depth, feet	Sample Type & Recovery	Sample No.	ENVIRONMENTAL DATA	USCS	Graphic Log	LITHOLOGIC DESCRIPTION	Elevation, feet
0				GW		ASPHALT: black.	
						GRAVEL BASE (GW): Class 5 gravel; light yellowish brown.	
		1	**PID:**0.4 **D/O/S:**None/ None/ None			ASH (ASH): very fine to coarse grained; gray; moist; dense; trace slag; [FILL].	
5				ASH			
		2	**PID:**0.5 **D/O/S:**None/ None/ None			From 8': fine to coarse grained; brown.	
10				CL		SANDY LEAN CLAY (CL): medium plastic; sand is very fine to coarse grained; black/green; moist; [NATIVE].	
		3	**PID:**0.6 **D/O/S:**None/ None/ None			PRAIRIE DU CHIEN (OPC). Bedrock; very weak; brown, tan, green, and gray; moderately weathered.	
15						End of geoprobe 14.0 feet	
20							
25							
30							

Date Boring Started: 4/1/19
Date Boring Completed: 4/1/19
Logged By: EMC
Drilling Contractor: Midwestern Drilling
Drill Rig: Geoprobe

Remarks: Background PID: 0.2 ppm
Pace collected soil gas sample at this location
*Surface elevation interpreted from LIDAR, MSL = feet above mean sea level

PID = Headspace; D/O/S = Discoloration/Odor/Sheen; FID/MC = FID/Methane Corrected; G/S/F = Gravel/Sand/Fines
Additional data may have been collected in the field which is not included on this log.

LOG OF Geoprobe FD-SB-A1

BARR

Project:	Freeway Dump and Transfer Station	Surface Elevation:	714.0 ft
Project No.:	23191372	Drilling Method:	Geoprobe
Location:	Burnsville, MN	Sampling Method:	Dual-Tube
Coordinates:	UTM 15 N:4959649.943m, E:477228.009m	Completion Depth:	14.0 ft
Datum:	NAD 83; UTM Zone 15		

Depth, feet	Sample Type & Recovery	Sample No.	ENVIRONMENTAL DATA	USCS	Graphic Log	LITHOLOGIC DESCRIPTION	Elevation, feet
0			**D/O/S:**No/ None/ None	SM		(SM): SILTY SAND with GRAVEL; fine to coarse grained; brown; moist; homogeneous; fill.	
			PID:0.3	WM		(WM): WASTE MATERIAL; gray; moist; with plastic, wood, glass, mixed with silty/ash matrix; [FILL].	
		1	**D/O/S:**No/ None/ None			(ASH): ASH; gray; moist to wet; with very fine grained sand, soft, homogeneous, nonplastic.	
			D/O/S: No/ None/ None				710
5				ASH			
		2	**PID:**0.3			At 7.5': wet.	
			D/O/S: No/ None/ None				705
10			**D/O/S:**No/ None/ None				
			PID:0.3	PT		(PT): PEAT; dark brown; moist; spongy, fibrous, organic odor; [NATIVE].	
		3	**D/O/S:**No/ Organic/ None				
			D/O/S: No/ None/ None	CH		(CH): FAT CLAY; very dark gray; moist; high plasticity, soft; [NATIVE].	
			D/O/S: No/ None/ None			BEDROCK.	
15						End of geoprobe 14.0 feet	700
20							
25							
30							
35							
40							

Date Boring Started:	4/11/18
Date Boring Completed:	4/11/18
Logged By:	ABW
Drilling Contractor:	Range Environmental Drilling
Drill Rig:	Geoprobe

Remarks:

PID = Headspace; D/O/S = Discoloration/Odor/Sheen; FID/MC = FID/Methane Corrected; G/S/F = Gravel/Sand/Fines
Additional data may have been collected in the field which is not included on this log.

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LOG OF Geoprobe FD-SB-A2

BARR

SHEET 1 OF 1

Project:	Freeway Dump and Transfer Station	Surface Elevation:	724.0 ft
Project No.:	23191372	Drilling Method:	Geoprobe
Location:	Burnsville, MN	Sampling Method:	Dual-Tube
Coordinates:	UTM 15 N:4959645.42m, E:477280.64m	Completion Depth:	27.0 ft
Datum:	NAD 83; UTM Zone 15		

Depth, feet	Sample Type & Recovery	Sample No.	ENVIRONMENTAL DATA	USCS	Graphic Log	LITHOLOGIC DESCRIPTION	Elevation, feet
0		1	**PID:**0.7 **D/O/S:**No/ None/ None	SM		(SM): SILTY SAND with GRAVEL; medium grained; brown; moist; homogeneous, stiff; 10% gravel, 70% sand, 20% fines, [FILL].	
				ASH		(ASH): ASH; gray; moist; homogeneous, soft, nonplastic; mixed with waste material.	720
5		2	**PID:**6.0 **D/O/S:**No/ Light/ None	WM		(WM): WASTE MATERIAL; with wood, shingles; light odor.	715
10		3	**PID:**0.9 **D/O/S:**Trace/ None/ None	ASH		(ASH): ASH; gray; moist to wet; homogeneous, soft, with sand and trace black discoloration.	710
15		4				From 15' - 20': No recovery.	705
20		5	**D/O/S:**Trace/ Trace/ None			From 20' - 26': wet, dark gray to black.	700
25		6	**D/O/S:**Black/ None/ None			BEDROCK.	
						End of geoprobe 27.0 feet	
30							
35							
40							

Date Boring Started:	3/27/18
Date Boring Completed:	3/27/18
Logged By:	ABW
Drilling Contractor:	Range Environmental Drilling
Drill Rig:	Geoprobe

Remarks: Dashed line indicates an inferred contact depth

PID = Headspace; D/O/S = Discoloration/Odor/Sheen; FID/MC = FID/Methane Corrected; G/S/F = Gravel/Sand/Fines
Additional data may have been collected in the field which is not included on this log.

LOG OF Geoprobe FD-SB-A3

BARR

SHEET 1 OF 1

Project:	Freeway Dump and Transfer Station	Surface Elevation:	724.0 ft
Project No.:	23191372	Drilling Method:	Geoprobe
Location:	Burnsville, MN	Sampling Method:	Dual-Tube
Coordinates:	UTM 15 N:4959648.941m, E:477345.063m	Completion Depth:	40.0 ft
Datum:	NAD 83; UTM Zone 15		

Depth, feet	Sample No.	ENVIRONMENTAL DATA	USCS	LITHOLOGIC DESCRIPTION	Elevation, feet
0	1	**PID:**0.4 **D/O/S:**No/ None/ None	SM	(SM): SILTY SAND with GRAVEL; fine to coarse grained; dark brown; moist.	
5	2	**PID:**1.2 **D/O/S:**No/ None/ None	ASH	(ASH): ASH; gray; moist; nonplastic, firm. From 5' - 8.5': soft to firm.	720
10	3	**PID:**3.2 **D/O/S:**No/ None/ None		From 10': wood debris observed.	715
15	4	**PID:**3.0 **D/O/S:**No/ Strong/ Slight	WM	(WM): WASTE MATERIAL; wet; with wood, fabric, ash; strong odor and light sheen; [FILL].	710
20	5			From 20' - 25': No recovery.	705
25	6	**PID:**7.9 **D/O/S:**No/ Strong/ Slight		From 25': wood and plastic; strong odor and light sheen.	700
30	7	**PID:**1.5 **D/O/S:**No/ Strong/ Medium	PT	(PT): PEAT; very dark brown; wet; very soft, fibrous, mixed with trace waste material; strong odor and sheen; [NATIVE]. From 33': no waste material.	695
35	8	**PID:**1.1		BEDROCK; tan; pulverized bedrock, with trace wood and plastic. Limestone clast in shoe.	690
40				End of geoprobe 40.0 feet	685
45					
50					

Date Boring Started:	3/23/18
Date Boring Completed:	3/23/18
Logged By:	ABW
Drilling Contractor:	Range Environmental Drilling
Drill Rig:	Geoprobe

Remarks: Dashed line indicates an inferred contact depth

PID = Headspace; D/O/S = Discoloration/Odor/Sheen; FID/MC = FID/Methane Corrected; G/S/F = Gravel/Sand/Fines
Additional data may have been collected in the field which is not included on this log.

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LOG OF Geoprobe FD-SB-A4

BARR

SHEET 1 OF 1

Project:	Freeway Dump and Transfer Station	Surface Elevation:	726.0 ft
Project No.:	23191372	Drilling Method:	Geoprobe
Location:	Burnsville, MN	Sampling Method:	Dual-Tube
Coordinates:	UTM 15 N:4959649.765m, E:477388.457m	Completion Depth:	38.0 ft
Datum:	NAD 83; UTM Zone 15		

Depth, feet	Sample Type & Recovery	Sample No.	ENVIRONMENTAL DATA	USCS	Graphic Log	LITHOLOGIC DESCRIPTION	Elevation, feet
0		1	**PID:**0.5 **D/O/S:**No/ None/ None	SM		(SM): SILTY SAND with GRAVEL; dark brown; moist; homogeneous, loose; 10% gravel, 70% sand, 20% fines, [FILL].	725
5		2	**PID:**2.1 **D/O/S:**No/ None/ None	WM		(WM): WASTE MATERIAL; gray; moist; with brick, wood, glass, mixed with ash and clay.	720
10		3	**PID:**170.4 **D/O/S:**No/ Moderate/ None			From 10': with wood and plastic; moderate odor.	715
15		4				From 15' - 20': No recovery.	710
20		5	**PID:**8.1 **D/O/S:**No/ Light/ Trace			From 20': with wood and plastic, wet, loose/soupy; light odor and light rainbow sheen.	705
25		6	**PID:**71.9 **D/O/S:**No/ Moderate/ None **PID:**11.3 **D/O/S:**No/ Light/ None			From 25': with wood, rubber, plastic; moderate odor.	700
30		7	**PID:**3.0	PT		(PT): PEAT; dark yellowish brown; moist; fibrous; light organic odor; [NATIVE]. From 30': soft, with few shells.	695
35		8	**PID:**1.8 **D/O/S:**No/ None/ None	ML CH		(ML): SILT; tan; moist; nonplastic, soft; [NATIVE]. (CH): FAT CLAY; gray; moist; stiff, high plasticity; [NATIVE]. End of geoprobe 38.0 feet	690
40							

Date Boring Started:	3/22/18
Date Boring Completed:	3/22/18
Logged By:	ABW
Drilling Contractor:	Range Environmental Drilling
Drill Rig:	Geoprobe

Remarks: Dashed line indicates an inferred contact depth

PID = Headspace; D/O/S = Discoloration/Odor/Sheen; FID/MC = FID/Methane Corrected; G/S/F = Gravel/Sand/Fines
Additional data may have been collected in the field which is not included on this log.

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LOG OF Geoprobe FD-SB-A5

BARR

Project:	Freeway Dump and Transfer Station	Surface Elevation:	724.0 ft
Project No.:	23191372	Drilling Method:	Geoprobe
Location:	Burnsville, MN	Sampling Method:	Dual-Tube
Coordinates:	UTM 15 N:4959648.285m, E:477442.506m	Completion Depth:	33.0 ft
Datum:	NAD 83; UTM Zone 15		

Depth, feet	Sample Type & Recovery	Sample No.	ENVIRONMENTAL DATA	USCS	Graphic Log	LITHOLOGIC DESCRIPTION	Elevation, feet
0				SM		(SM): SILTY SAND; [FILL].	
		1	**PID:**0.4 **D/O/S:**No/ None/ None	CL		(CL): SANDY CLAY; gray; moist; with very fine grained sand, few roots.	
			PID:0.8 **D/O/S:**No/ None/ None			Frozen to 2.5' bgs.	720
5		2	**PID:**4.9 **D/O/S:**No/ Moderate/ None			From 5.4' - 6': mixed with paper, wood, plaster; moderate chemical/burnt odor.	
10			**PID:**1.1 **D/O/S:**No/ None/ None			From 10': wet.	715
		3	**PID:**24.5 **D/O/S:**No/ None/ None	WM		(WM): WASTE MATERIAL; moist.	
15		4	**PID:**26.7 **D/O/S:**No/ Slight/ None			From 15': with canvas, glass, wood, plaster, plastic; slight organic/burnt odor.	710
20			**PID:**2.5 **D/O/S:**No/ Slight/ None			From 20': wet, with black fine-grained material, plastic, wood, chalk; slight chemical odor.	705
		5	**PID:**3.0 **D/O/S:**No/ Slight/ None				700
25		6	**PID:**0.4 **D/O/S:**No/ None/ None	PT		(PT): PEAT; very dark brown; moist; fibrous; [NATIVE].	695
30		7	**PID:**0.5 **D/O/S:**No/ None/ None			From 30': more clay, less fibrous, with some shells.	
						End of geoprobe 33.0 feet	
35							
40							

Date Boring Started:	3/20/18
Date Boring Completed:	3/20/18
Logged By:	ARP2
Drilling Contractor:	Range Environmental Drilling
Drill Rig:	Geoprobe

Remarks:

PID = Headspace; D/O/S = Discoloration/Odor/Sheen; FID/MC = FID/Methane Corrected; G/S/F = Gravel/Sand/Fines
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LOG OF Geoprobe FD-SB-B1

BARR

Project:	Freeway Dump and Transfer Station	Surface Elevation:	724.0 ft
Project No.:	23191372	Drilling Method:	Geoprobe
Location:	Burnsville, MN	Sampling Method:	Dual-Tube
Coordinates:	UTM 15 N:4959595.631m, E:477220.286m	Completion Depth:	25.0 ft
Datum:	NAD 83; UTM Zone 15		

Depth, feet	Sample Type & Recovery	Sample No.	ENVIRONMENTAL DATA	USCS	Graphic Log	LITHOLOGIC DESCRIPTION	Elevation, feet
0		1	**PID:**0.3 **D/O/S:**No/ None/ None	SM		(SM): SILTY SAND with GRAVEL; brown; moist; homogeneous, firm, with fine to coarse gravel; 5% gravel, 70% sand, 25% fines, [FILL].	720
5		2	**PID:**0.3 **D/O/S:**No/ None/ None	ASH		(ASH): ASH; gray; moist; alternating with layers of brown silty sand and waste material (brick and concrete).	715
10			**D/O/S:**No/ None/ None			From 10': with more waste material (wood and brick).	
		3	**PID:**9.0 **D/O/S:**No/ Moderate/ None	WM		(WM): WASTE MATERIAL; black; moist; with wood, plastic, concrete; moderate odor.	710
15		4	**PID:**0.3 **D/O/S:**No/ None/ None	ASH		(ASH): ASH; gray; wet; soft, nonplastic, homogeneous.	705
20			**D/O/S:**No/ None/ None				
		5		PT		(PT): PEAT; dark brown; fibrous, spongy; organic odor; [NATIVE].	700
				CH		(CH): FAT CLAY; dark gray; high plasticity; [NATIVE].	
25						BEDROCK; Prairie du Chien. End of geoprobe 25.0 feet	
30							
35							
40							

Date Boring Started:	4/11/18
Date Boring Completed:	4/11/18
Logged By:	ABW
Drilling Contractor:	Range Environmental Drilling
Drill Rig:	Geoprobe

Remarks: Dashed line indicates an inferred contact depth

PID = Headspace; D/O/S = Discoloration/Odor/Sheen; FID/MC = FID/Methane Corrected; G/S/F = Gravel/Sand/Fines
Additional data may have been collected in the field which is not included on this log.

LOG OF Geoprobe FD-SB-B2

BARR

SHEET 1 OF 1

Project:	Freeway Dump and Transfer Station	Surface Elevation:	724.0 ft
Project No.:	23191372	Drilling Method:	Geoprobe
Location:	Burnsville, MN	Sampling Method:	Dual-Tube
Coordinates:	UTM 15 N:4959597.862m, E:477280.649m	Completion Depth:	26.0 ft
Datum:	NAD 83; UTM Zone 15		

Depth, feet	Sample Type & Recovery	Sample No.	ENVIRONMENTAL DATA	USCS	Graphic Log	LITHOLOGIC DESCRIPTION	Elevation, feet
0			**D/O/S:**No/ None/ None	SM		(SM): SILTY SAND with GRAVEL; brown; moist; [FILL].	
		1	**PID:**1.0 **D/O/S:**No/ Trace/ None	WM		(WM): WASTE MATERIAL; with plastic, wood; trace odor.	
			D/O/S: Trace/ None/ None			(ASH): ASH; gray; with trace wood debris.	720
5		2	**PID:**0.3 **D/O/S:**No/ None/ None	ASH		From 8': wet.	
10		3					715
			PID:3.7 **D/O/S:**No/ None/ None			(WM): WASTE MATERIAL; with wood, bricks, plastic; light odor.	710
15			**PID:**1.1 **D/O/S:**No/ Light/ None				
		4		WM			705
20							
		5					700
25						BEDROCK.	
						End of geoprobe 26.0 feet	
30							
35							
40							

Date Boring Started:	3/27/18
Date Boring Completed:	3/27/18
Logged By:	ABW
Drilling Contractor:	Range Environmental Drilling
Drill Rig:	Geoprobe

Remarks:

PID = Headspace; D/O/S = Discoloration/Odor/Sheen; FID/MC = FID/Methane Corrected; G/S/F = Gravel/Sand/Fines
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LOG OF Geoprobe FD-SB-B3

BARR

SHEET 1 OF 1

Project:	Freeway Dump and Transfer Station	Surface Elevation:	725.0 ft
Project No.:	23191372	Drilling Method:	Geoprobe
Location:	Burnsville, MN	Sampling Method:	Dual-Tube
Coordinates:	UTM 15 N:4959595.385m, E:477337.108m	Completion Depth:	30.0 ft
Datum:	NAD 83; UTM Zone 15		

Depth, feet	Sample Type & Recovery	Sample No.	ENVIRONMENTAL DATA	USCS	Graphic Log	LITHOLOGIC DESCRIPTION	Elevation, feet
0				SM		(SM): SILTY SAND with GRAVEL; Topsoil; [FILL].	725
						(WM): WASTE MATERIAL; with brick, concrete, wood.	
		1	**PID:**5.5 **D/O/S:**No/ None/ None			From 0.5' - 5': mixed with silty sand.	
5						From 5' - 10': No recovery.	720
		2					
10			**PID:**5.5 **D/O/S:**No/ Strong/ None			From 10': with ash, wood, plastic; strong treated wood odor.	715
		3		WM			
15			**PID:**20.5 **D/O/S:**No/ Moderate/ None			From 15': with wood, green plastic; moderate odor.	710
		4					
20						From 20' - 25': No recovery.	705
		5					
25						From 25': soupy ash matrix, with some plastic.	700
			PID:150.6 **D/O/S:**No/ Strong/ None				
		6	**D/O/S:**No/ None/ None	PT		(PT): PEAT; dark brown; moist; fibrous, spongy, soft; organic odor; [NATIVE].	
30						End of geoprobe 30.0 feet	695
35							
40							

Date Boring Started:	3/23/18
Date Boring Completed:	3/23/18
Logged By:	ABW
Drilling Contractor:	Range Environmental Drilling
Drill Rig:	Geoprobe

Remarks: Dashed line indicates an inferred contact depth

PID = Headspace; D/O/S = Discoloration/Odor/Sheen; FID/MC = FID/Methane Corrected; G/S/F = Gravel/Sand/Fines
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LOG OF Geoprobe FD-SB-B4

BARR

SHEET 1 OF 1

Project:	Freeway Dump and Transfer Station	Surface Elevation:	724.0 ft
Project No.:	23191372	Drilling Method:	Geoprobe
Location:	Burnsville, MN	Sampling Method:	Dual-Tube
Coordinates:	UTM 15 N:4959594.523m, E:477387.912m	Completion Depth:	35.0 ft
Datum:	NAD 83; UTM Zone 15		

Depth, feet	Sample Type & Recovery	Sample No.	ENVIRONMENTAL DATA	USCS	Graphic Log	LITHOLOGIC DESCRIPTION	Elevation, feet
0				SM		(SM): SILTY SAND with GRAVEL; fine to coarse grained; brown; moist; homogeneous; [FILL].	
		1	**PID:**0.8 **D/O/S:**No/ None/ None	ASH		(ASH): ASH; gray; moist; homogeneous, nonplastic, with some fine grained sand.	
			D/O/S: No/ Strong/ None	WM		(WM): WASTE MATERIAL; dark gray; moist; sandy matrix, with wood and plastic.	720
5			**PID:**222.8 **D/O/S:**No/ Strong/ None			From 5': with treated wood; strong odor.	
		2					715
10			**PID:**175.6 **D/O/S:**No/ Strong/ None			From 10': with treated wood and plastic; strong odor.	
		3					710
15			**PID:**122.9 **D/O/S:**No/ Strong/ None			From 15': black silty sandy matrix, with treated wood and concrete.	
		4					705
20			**PID:**9.5 **D/O/S:**No/ Moderate/ None			From 20': wet, with wood and shingles; moderate odor.	
		5					700
25			**PID:**15.1 **D/O/S:**No/ Moderate/ Moderate			From 25': black granular matrix, with wood and glass; moderate odor and sheen.	
		6		PT		(PT): PEAT; dark brown; moist; fibrous, firm; [NATIVE].	695
30				ML		(ML): SILT; dark grey to tan; wet; possibly pulverized limestone, very soft, homogeneous; sulfur/wetland odor; [NATIVE].	
		7	**PID:**6.6 **D/O/S:**No/ Organic/ None				690
35						End of geoprobe 35.0 feet	
40							

Date Boring Started:	3/22/18
Date Boring Completed:	3/22/18
Logged By:	ABW
Drilling Contractor:	Range Environmental Drilling
Drill Rig:	Geoprobe

Remarks: Dashed line indicates an inferred contact depth

PID = Headspace; D/O/S = Discoloration/Odor/Sheen; FID/MC = FID/Methane Corrected; G/S/F = Gravel/Sand/Fines
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LOG OF Geoprobe FD-SB-B5

BARR

SHEET 1 OF 1

Project:	Freeway Dump and Transfer Station	Surface Elevation:	725.0 ft
Project No.:	23191372	Drilling Method:	Geoprobe
Location:	Burnsville, MN	Sampling Method:	Dual-Tube
Coordinates:	UTM 15 N:4959595.345m, E:477435.754m	Completion Depth:	35.0 ft
Datum:	NAD 83; UTM Zone 15		

Depth, feet	Sample Type & Recovery	Sample No.	ENVIRONMENTAL DATA	USCS	Graphic Log	LITHOLOGIC DESCRIPTION	Elevation, feet
0			**PID:**1.6 **D/O/S:**No/ None/ None	SM		(SM): SILTY SAND; fine to medium grained; moist; [FILL].	725
		1	**PID:**2.1 **D/O/S:**No/ None/ None	ASH		(ASH): ASH; gray; moist; stiff.	
5			**PID:**11.1 **D/O/S:**No/ None/ None	WM		(WM): WASTE MATERIAL; moist; with wood debris. From 5': with paper.	720
		2					
10		3	**PID:**26.3 **D/O/S:**No/ None/ None			From 10': black fine grained matrix, with wood, glass, plastic. At 12': refusal, offset ~10' south.	715
15			**PID:**30.9 **D/O/S:**Black/ Slight/ Moderate			From 15': black fine grained matrix, with wood, plastic, granular blue/gray material (slight odor and moderate sheen).	710
		4					
20			**PID:**16.0 **D/O/S:**No/ None/ None			From 20': wet, black fine grained matrix, with wood.	705
		5	**PID:**1.2 **D/O/S:**No/ None/ None	PT		(PT): PEAT; dark brown; moist; fibrous; [NATIVE].	
25			**PID:**0.2 **D/O/S:**No/ None/ None			From 27': black, less fibrous, more clay.	700
		6					
			PID:0.3 **D/O/S:**No/ None/ None	CL		(CL): SANDY LEAN CLAY; gray; moist; with fine grained sand, small to large round to subrounded gravel, increasing silt with depth; 25% gravel, 25% sand, 50% fines, [NATIVE].	
30							695
		7	**PID:**0.5 **D/O/S:**No/ None/ None	SC-SM		(SC-SM): CLAYEY SAND with SILT; fine to coarse grained; gray; wet; 5% gravel, 80% sand, 15% fines, [NATIVE]. From 32' - 33': more course grained sand. From 34' - 35': more silt.	
35						End of geoprobe 35.0 feet	690
40							

Date Boring Started:	3/20/18
Date Boring Completed:	3/20/18
Logged By:	ARP2
Drilling Contractor:	Range Environmental Drilling
Drill Rig:	Geoprobe

Remarks:

PID = Headspace; D/O/S = Discoloration/Odor/Sheen; FID/MC = FID/Methane Corrected; G/S/F = Gravel/Sand/Fines
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LOG OF Geoprobe FD-SB-C1

BARR

SHEET 1 OF 1

Project:	Freeway Dump and Transfer Station	Surface Elevation:	720.0 ft
Project No.:	23191372	Drilling Method:	Geoprobe
Location:	Burnsville, MN	Sampling Method:	Dual-Tube
Coordinates:	UTM 15 N:4959542.747m, E:477228.698m	Completion Depth:	20.0 ft
Datum:	NAD 83; UTM Zone 15		

Depth, feet	Sample Type & Recovery	Sample No.	ENVIRONMENTAL DATA	USCS	Graphic Log	LITHOLOGIC DESCRIPTION	Elevation, feet
0						(SM): SILTY SAND with GRAVEL; fine to coarse grained; brown; moist; firm; 5% gravel, 70% sand, 25% fines, [FILL].	720
		1	**PID:**3.4 **D/O/S:**No/ None/ None	SM			
5						(WM): WASTE MATERIAL; moist; with paper, brick, wood, plastic.	715
			PID:2.9 **D/O/S:**No/ Trace/ None	WM			
		2	**D/O/S:**No/ None/ None			(ASH): ASH; gray; moist; soft, nonplastic.	
10						From 10': wet.	710
		3	**PID:**1.7 **D/O/S:**No/ None/ None	ASH			
15			**D/O/S:**No/ None/ None				705
		4	**PID:**0.9 **D/O/S:**No/ Organic/ None	PT		(PT): PEAT; moist; organic odor; [NATIVE].	
			D/O/S: No/ None/ None	CH		(CH): FAT CLAY; moist; [NATIVE].	
20			**D/O/S:**No/ None/ None			BEDROCK; moist. End of geoprobe 20.0 feet	700
25							
30							
35							
40							

Date Boring Started:	4/11/18
Date Boring Completed:	4/11/18
Logged By:	ABW
Drilling Contractor:	Range Environmental Drilling
Drill Rig:	Geoprobe

Remarks: Dashed line indicates an inferred contact depth

PID = Headspace; D/O/S = Discoloration/Odor/Sheen; FID/MC = FID/Methane Corrected; G/S/F = Gravel/Sand/Fines
Additional data may have been collected in the field which is not included on this log.

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LOG OF Geoprobe FD-SB-C2

BARR

SHEET 1 OF 1

Project:	Freeway Dump and Transfer Station	Surface Elevation:	724.0 ft
Project No.:	23191372	Drilling Method:	Geoprobe
Location:	Burnsville, MN	Sampling Method:	Dual-Tube
Coordinates:	UTM 15 N:4959537.967m, E:477282.676m	Completion Depth:	22.0 ft
Datum:	NAD 83; UTM Zone 15		

Depth, feet	Sample Type & Recovery	Sample No.	ENVIRONMENTAL DATA	USCS	Graphic Log	LITHOLOGIC DESCRIPTION	Elevation, feet
0				SM		(SM): SILTY SAND with GRAVEL; brown; moist; [FILL].	
		1	**PID:**21.7 **D/O/S:**No/ None/ None	WM		(WM): WASTE MATERIAL; moist; with greenish gray clay, wood, brick, plastic.	720
5			**PID:**23.8 **D/O/S:**No/ None/ None			From 5': with cement and wood.	
		2					715
10			**PID:**33.0 **D/O/S:**No/ Moderate/ Trace			From 10': No recovery (offset), with wood, brick, plastic; moderate odor and trace sheen.	
		3					710
15			**PID:**8.0			From 15': with plastic and wood; moderate odor.	
		4		PT		(PT): PEAT; dark brown; moist; fibrous, spongy; [NATIVE].	705
20		5				BEDROCK.	
						End of geoprobe 22.0 feet	
25							
30							
35							
40							

Date Boring Started:	3/27/18
Date Boring Completed:	3/27/18
Logged By:	ABW
Drilling Contractor:	Range Environmental Drilling
Drill Rig:	Geoprobe

Remarks:

PID = Headspace; D/O/S = Discoloration/Odor/Sheen; FID/MC = FID/Methane Corrected; G/S/F = Gravel/Sand/Fines
Additional data may have been collected in the field which is not included on this log.

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LOG OF Geoprobe FD-SB-C3

BARR

SHEET 1 OF 1

Project:	Freeway Dump and Transfer Station	Surface Elevation:	726.0 ft
Project No.:	23191372	Drilling Method:	Geoprobe
Location:	Burnsville, MN	Sampling Method:	Dual-Tube
Coordinates:	UTM 15 N:4959539.675m, E:477336.735m	Completion Depth:	22.0 ft
Datum:	NAD 83; UTM Zone 15		

Depth, feet	Sample Type & Recovery	Sample No.	ENVIRONMENTAL DATA	USCS	Graphic Log	LITHOLOGIC DESCRIPTION	Elevation, feet
0							725
		1	**PID:**0.4 **D/O/S:**No/ None/ None	SM		(SM): SILTY SAND with GRAVEL; fine to coarse grained; brown; moist; 10% gravel, 70% sand, 20% fines, [FILL].	
5				ASH		(ASH): ASH; gray; moist; soft, massive, nonplastic.	720
		2	**PID:**11.0 **D/O/S:**No/ Moderate/ Trace	WM		(WM): WASTE MATERIAL; with treated wood and brick; moderate odor and trace sheen.	
10						From 10': with brick, wood, concrete.	715
		3	**PID:**21.0 **D/O/S:**No/ Moderate/ None				
15						From 15': with wood, glass, concrete; moderate odor.	710
		4	**PID:**14.6 **D/O/S:**No/ Moderate/ None	ML		(ML): SILT; tan; moist; dense, spongy, nonplastic, with organic material; [NATIVE].	
20				PT		(PT): PEAT; dark brown; moist; fibrous, spongy, soft to firm; organic odor; [NATIVE].	705
		5	**PID:**3.5 **D/O/S:**No/ None/ None			BEDROCK. End of geoprobe 22.0 feet	
25							
30							
35							
40							

Date Boring Started:	3/22/18
Date Boring Completed:	3/22/18
Logged By:	ABW
Drilling Contractor:	Range Environmental Drilling
Drill Rig:	Geoprobe

Remarks: Dashed line indicates an inferred contact depth

PID = Headspace; D/O/S = Discoloration/Odor/Sheen; FID/MC = FID/Methane Corrected; G/S/F = Gravel/Sand/Fines
Additional data may have been collected in the field which is not included on this log.

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LOG OF Geoprobe FD-SB-C4

BARR

SHEET 1 OF 1

Project:	Freeway Dump and Transfer Station	Surface Elevation:	726.0 ft
Project No.:	23191372	Drilling Method:	Geoprobe
Location:	Burnsville, MN	Sampling Method:	Dual-Tube
Coordinates:	UTM 15 N:4959545.138m, E:477388.104m	Completion Depth:	26.0 ft
Datum:	NAD 83; UTM Zone 15		

Depth, feet	Sample Type & Recovery	Sample No.	ENVIRONMENTAL DATA	USCS	Graphic Log	LITHOLOGIC DESCRIPTION	Elevation, feet
0				SM		(SM): SILTY SAND with GRAVEL; medium to coarse grained; brown; moist; homogeneous; 10% gravel, 70% sand, 20% fines, [FILL].	725
		1	**PID:**1.0 **D/O/S:**No/ None/ None	ASH		(ASH): ASH; gray; moist; homogeneous, firm, nonplastic.	
5		2	**PID:**1.0 **D/O/S:**No/ Light/ None **PID:**23.7 **D/O/S:**No/ Moderate/ Trace	WM		(WM): Waste Material; moist; black silty sandy matrix, with wood; light odor. From 5': with treated wood and metal; moderate odor and trace sheen.	720
10		3	**PID:**84.9 **D/O/S:**No/ Strong/ Trace			From 10': with wood, paper, concrete, metal, fabric; light to strong odor and trace sheen.	715
15		4	**PID:**60.4 **D/O/S:**No/ Moderate/ None			From 15': with treated wood; moderate odor.	710
20		5	**PID:**72.1 **D/O/S:**No/ Light/ None			From 20': light gray sandy matrix, with concrete and wood; light odor.	705
25		6	**PID:**2.1			BEDROCK; gray; weathered Prairie du Chien, positive HCl reaction. End of geoprobe 26.0 feet	700
30							
35							
40							

Date Boring Started:	3/22/18
Date Boring Completed:	3/22/18
Logged By:	ABW
Drilling Contractor:	Range Environmental Drilling
Drill Rig:	Geoprobe

Remarks: Dashed line indicates an inferred contact depth

PID = Headspace; D/O/S = Discoloration/Odor/Sheen; FID/MC = FID/Methane Corrected; G/S/F = Gravel/Sand/Fines
Additional data may have been collected in the field which is not included on this log.

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LOG OF Geoprobe FD-SB-C5

BARR

SHEET 1 OF 1

Project:	Freeway Dump and Transfer Station	Surface Elevation:	727.0 ft
Project No.:	23191372	Drilling Method:	Geoprobe
Location:	Burnsville, MN	Sampling Method:	Dual-Tube
Coordinates:	UTM 15 N:4959541.842m, E:477441.886m	Completion Depth:	30.0 ft
Datum:	NAD 83; UTM Zone 15		

Depth, feet	Sample Type & Recovery	Sample No.	ENVIRONMENTAL DATA	USCS	Graphic Log	LITHOLOGIC DESCRIPTION	Elevation, feet
0		1	**PID:**0.4 **D/O/S:**No/ None/ None	SM		(SM): SILTY SAND with GRAVEL; brown; moist; [FILL].	725
			PID:0.4 **D/O/S:**No/ None/ None	ASH		(ASH): ASH; dark gray; moist; stiff.	
5		2	**PID:**18.3 **D/O/S:**No/ None/ None	WM		(WM): WASTE MATERIAL; moist. From 5': with wood, plastic, paper, fabric.	720
10		3	**PID:**16.0 **D/O/S:**No/ Slight/ Trace			From 10': with wood, plastic, rubber; slight odor and light/trace sheen.	715
15		4	**PID:**15.4 **D/O/S:**No/ Moderate/ Heavy			From 15': with wood, plastic, brick, concrete rubber; moderate odor and heavy sheen.	710
20		5	**PID:**5.0 **D/O/S:**No/ None/ None			From 20': black fine grained matrix, with wood and blue powder.	705
25		6	**PID:**1.1 **D/O/S:**No/ Organic/ None	SP		(SP): POORLY GRADED SAND; fine grained; brown; wet; loose, homogenous [refusal at 23' bgs, offset]; 0% gravel, 95% sand, 5% fines, [NATIVE].	700
30						End of geoprobe 30.0 feet	
35							
40							

Date Boring Started:	3/20/18
Date Boring Completed:	3/21/18
Logged By:	ARP2/ABW
Drilling Contractor:	Range Environmental Drilling
Drill Rig:	Geoprobe

Remarks:

PID = Headspace; D/O/S = Discoloration/Odor/Sheen; FID/MC = FID/Methane Corrected; G/S/F = Gravel/Sand/Fines
Additional data may have been collected in the field which is not included on this log.

LOG OF Geoprobe FD-SB-D1

BARR

SHEET 1 OF 1

Project:	Freeway Dump and Transfer Station	Surface Elevation:	724.0 ft
Project No.:	23191372	Drilling Method:	Geoprobe
Location:	Burnsville, MN	Sampling Method:	Dual-Tube
Coordinates:	UTM 15 N:4959487.867m, E:477223.484m	Completion Depth:	25.0 ft
Datum:	NAD 83; UTM Zone 15		

Depth, feet	Sample No.	ENVIRONMENTAL DATA	USCS	LITHOLOGIC DESCRIPTION	Elevation, feet
0	1	**PID:**0.3 **D/O/S:**No/ None/ None	SM	(SM): SILTY SAND with GRAVEL; fine to coarse grained; dark brown; moist; 5% gravel, 70% sand, 25% fines, [FILL]. From 3': no gravel, yellowish brown.	
5	2	**PID:**1.4 **D/O/S:**No/ None/ None	SP	(SP): POORLY GRADED SAND; medium grained; yellowish brown; moist; homogeneous, some iron oxidation from 6.5'-7' bgs; 0% gravel, 95% sand, 5% fines, [FILL].	720
10	3	**D/O/S:**No/ None/ None **PID:**3.9 **D/O/S:**No/ Trace/ None	CL / WM	(CL): SANDY LEAN CLAY; olive green/gray; moist; stiff, low plasticity, with fine to medium grained sand and trace fine gravel; 0% gravel, 30% sand, 70% fines, [FILL]. (WM): WASTE MATERIAL; moist; black silty matrix, with wood, concrete; trace odor.	715
15	4	**PID:**6.9 **D/O/S:**No/ Light/ None **D/O/S:**No/ None/ None	ASH	(ASH): ASH; gray; wet; soft, nonplastic.	710
20	5	**PID:**0.3 **D/O/S:**No/ None/ None	PT	(PT): PEAT; organic odor; [NATIVE].	705
25		**PID:**0.3 **D/O/S:**No/ Organic/ None	CH	(CH): FAT CLAY; [NATIVE]. BEDROCK. End of geoprobe 25.0 feet	700
30					
35					
40					

Date Boring Started:	4/11/18
Date Boring Completed:	4/11/18
Logged By:	ABW
Drilling Contractor:	Range Environmental Drilling
Drill Rig:	Geoprobe

Remarks: Dashed line indicates an inferred contact depth

PID = Headspace; D/O/S = Discoloration/Odor/Sheen; FID/MC = FID/Methane Corrected; G/S/F = Gravel/Sand/Fines
Additional data may have been collected in the field which is not included on this log.

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LOG OF Geoprobe FD-SB-D2

BARR

SHEET 1 OF 1

Project:	Freeway Dump and Transfer Station	Surface Elevation:	724.0 ft
Project No.:	23191372	Drilling Method:	Geoprobe
Location:	Burnsville, MN	Sampling Method:	Dual-Tube
Coordinates:	UTM 15 N:4959489.374m, E:477282.117m	Completion Depth:	23.0 ft
Datum:	NAD 83; UTM Zone 15		

Depth, feet	Sample Type & Recovery	Sample No.	ENVIRONMENTAL DATA	USCS	Graphic Log	LITHOLOGIC DESCRIPTION	Elevation, feet
0		1	**D/O/S:**No/ None/ None	SM		(SM): SILTY SAND with GRAVEL; medium to coarse grained; brown; moist; homogeneous; [FILL].	720
5		2	**PID:**8.1 **D/O/S:**No/ Light/ None **PID:**26.1 **D/O/S:**No/ Strong/ None	WM		(WM): WASTE MATERIAL; moist; with wood and plastic; light odor. From 5': sandy silty matrix, with wood, brick, plastic; strong odor.	715
10		3	**PID:**26.3 **D/O/S:**No/ Strong/ None			From 10': with wood and fabric; strong odor.	710
15		4				From 15' - 20': No recovery.	705
20		5	**PID:**0.7 **D/O/S:**No/ None/ None			BEDROCK.	
						End of geoprobe 23.0 feet	
25							
30							
35							
40							

Date Boring Started:	3/27/18
Date Boring Completed:	3/27/18
Logged By:	ABW
Drilling Contractor:	Range Environmental Drilling
Drill Rig:	Geoprobe

Remarks:

PID = Headspace; D/O/S = Discoloration/Odor/Sheen; FID/MC = FID/Methane Corrected; G/S/F = Gravel/Sand/Fines
Additional data may have been collected in the field which is not included on this log.

LOG OF Geoprobe FD-SB-D3

BARR

SHEET 1 OF 1

Project:	Freeway Dump and Transfer Station	Surface Elevation:	726.0 ft
Project No.:	23191372	Drilling Method:	Geoprobe
Location:	Burnsville, MN	Sampling Method:	Dual-Tube
Coordinates:	UTM 15 N:4959490.852m, E:477334.012m	Completion Depth:	24.0 ft
Datum:	NAD 83; UTM Zone 15		

Depth, feet	Sample No.	ENVIRONMENTAL DATA	USCS	LITHOLOGIC DESCRIPTION	Elevation, feet
0	1	**D/O/S:**No/ None/ None	SM	(SM): SILTY SAND with GRAVEL; brown; moist; homogeneous; 10% gravel, 70% sand, 20% fines, [FILL].	725
5	2	**D/O/S:**No/ Moderate/ None **PID:**8.8 **D/O/S:**No/ Moderate/ None		WASTE MATERIAL; black; moist; with wood and fabric; moderate odor.	720
10	3	**PID:**36.0 **D/O/S:**No/ Moderate/ None		From 10': shingles with wood.	715
15	4	**PID:**15.9 **D/O/S:**No/ Moderate/ Trace		From 15': with wood and metal; moderate odor and trace sheen.	710
20	5	**PID:**0.9 **D/O/S:**No/ None/ None	PT	(PT): PEAT; dark brown; moist; fibrous, spongy; [NATIVE].	705
			CH	(CH): FAT CLAY; dark gray; moist; soft, high plasticity, massive; [NATIVE].	
				BEDROCK.	
25				End of geoprobe 24.0 feet	
30					
35					
40					

Date Boring Started:	3/26/18
Date Boring Completed:	3/26/18
Logged By:	ABW
Drilling Contractor:	Range Environmental Drilling
Drill Rig:	Geoprobe

Remarks: Dashed line indicates an inferred contact depth

PID = Headspace; D/O/S = Discoloration/Odor/Sheen; FID/MC = FID/Methane Corrected; G/S/F = Gravel/Sand/Fines
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LOG OF Geoprobe FD-SB-D4

BARR

SHEET 1 OF 1

Project:	Freeway Dump and Transfer Station	Surface Elevation:	727.0 ft
Project No.:	23191372	Drilling Method:	Geoprobe
Location:	Burnsville, MN	Sampling Method:	Dual-Tube
Coordinates:	UTM 15 N:4959491.983m, E:477392.633m	Completion Depth:	22.0 ft
Datum:	NAD 83; UTM Zone 15		

Depth, feet	Sample Type & Recovery	Sample No.	ENVIRONMENTAL DATA	USCS	Graphic Log	LITHOLOGIC DESCRIPTION	Elevation, feet
0						(SM): SILTY SAND with GRAVEL; medium to coarse grained; dark brown; moist; homogeneous; [FILL].	725
		1	**D/O/S:**No/ None/ None	SM			
			PID:20.6 **D/O/S:**No/ Light/ None			(WM): WASTE MATERIAL; moist; with wood; light odor.	
5			**PID:**142.0 **D/O/S:**No/ Moderate/ Trace			From 5': with wood, plastic, rubber; moderate odor and trace sheen.	720
		2					
10						From 10': silty matrix, with wood and glass; moderte odor and trace sheen.	715
		3	**PID:**29.2 **D/O/S:**No/ Moderate/ Trace	WM			
15						From 15': silty matrix, with wood and semi-cohesive white granular material; moderate odor.	710
		4	**PID:**14.0 **D/O/S:**No/ Moderate/ None				
20							
		5	**PID:**19.5 **D/O/S:**No/ None/ None	PT		(PT): PEAT; dark brown; moist; fibrous; [NATIVE].	705
						BEDROCK; limestone.	
						End of geoprobe 22.0 feet	
25							
30							
35							
40							

Date Boring Started:	3/22/18
Date Boring Completed:	3/22/18
Logged By:	ABW
Drilling Contractor:	Range Environmental Drilling
Drill Rig:	Geoprobe

Remarks: Dashed line indicates an inferred contact depth

PID = Headspace; D/O/S = Discoloration/Odor/Sheen; FID/MC = FID/Methane Corrected; G/S/F = Gravel/Sand/Fines
Additional data may have been collected in the field which is not included on this log.

LOG OF Geoprobe FD-SB-D5

BARR

SHEET 1 OF 1

Project:	Freeway Dump and Transfer Station	Surface Elevation:	728.0 ft
Project No.:	23191372	Drilling Method:	Geoprobe
Location:	Burnsville, MN	Sampling Method:	Dual-Tube
Coordinates:	UTM 15 N:4959490.67m, E:477440.97m	Completion Depth:	23.0 ft
Datum:	NAD 83; UTM Zone 15		

Depth, feet	Sample Type & Recovery	Sample No.	ENVIRONMENTAL DATA	USCS	Graphic Log	LITHOLOGIC DESCRIPTION	Elevation, feet
0				SM		(SM): SILTY SAND with GRAVEL; brown; moist; [FILL].	
			D/O/S: No/ None/ None				
		1	**PID:**1.3	ASH		(ASH): ASH; gray; moist; firm, massive, nonplastic.	
			D/O/S: No/ None/ None				725
			D/O/S: No/ Light/ None			(WM): WASTE MATERIAL; dark gray fine grained matrix, with plastic; light odor.	
5						From 5': wet, black matrix, with wood, plastic; moderate to strong odor.	
			PID:67.1				
			D/O/S: No/ Strong/ None				
		2					720
10						From 10' - 15': No recovery (wood chunk jammed in liner).	
				WM			
		3					715
15						From 15': with wood, plastic; light odor.	
			PID:102.5				
			D/O/S: No/ Light/ None				
		4					710
20			**D/O/S:**No/ Light/ None			From 20': with metal, wood; light odor.	
						BEDROCK; tan; moist; Prairie du Chien, friable, sandy.	
		5	**D/O/S:**No/ None/ None				705
						End of geoprobe 23.0 feet	
25							
30							
35							
40							

Date Boring Started:	3/21/18
Date Boring Completed:	3/21/18
Logged By:	ABW
Drilling Contractor:	Range Environmental Drilling
Drill Rig:	Geoprobe

Remarks:

PID = Headspace; D/O/S = Discoloration/Odor/Sheen; FID/MC = FID/Methane Corrected; G/S/F = Gravel/Sand/Fines
Additional data may have been collected in the field which is not included on this log.

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LOG OF Geoprobe FD-SB-E1

BARR

SHEET 1 OF 1

Project:	Freeway Dump and Transfer Station	Surface Elevation:	724.0 ft
Project No.:	23191372	Drilling Method:	Geoprobe
Location:	Burnsville, MN	Sampling Method:	Dual-Tube
Coordinates:	UTM 15 N:4959442.725m, E:477224.855m	Completion Depth:	25.0 ft
Datum:	NAD 83; UTM Zone 15		

Depth, feet	Sample Type & Recovery	Sample No.	ENVIRONMENTAL DATA	USCS	Graphic Log	LITHOLOGIC DESCRIPTION	Elevation, feet
0				SM		(SM): SILTY SAND with GRAVEL; fine to medium grained; dark brown; moist; [FILL].	
		1	**PID:**0.9 **D/O/S:**No/ None/ None	CL/ML		(CL/ML): LEAN CLAY with SILT; gray; moist; soft, low plasticity, mixed with trace glass and ash.	720
5				SM		(SM): SILTY SAND; brown; moist; with few coarse sand and trace clay.	
		2	**PID:**1.8 **D/O/S:**No/ None/ None	WM		(WM): WASTE MATERIAL; moist; gray silty sandy matrix, with concrete and brick.	715
10			**PID:**7.6 **D/O/S:**No/ Light/ None			From 10': same; light odor.	
		3	**D/O/S:**No/ Moderate/ None			From 12': silty matrix, with wood, paper, plastic, glass; moderate odor.	710
15			**PID:**4.6 **D/O/S:**No/ Light/ None	ASH		(ASH): ASH; gray; wet; soft, nonplastic.	
		4	**D/O/S:**No/ None/ None				705
20				PT		(PT): PEAT; moist; fibrous; organic odor; [NATIVE].	
		5		CH		(CH): FAT CLAY; moist; [NATIVE].	
						BEDROCK.	700
25						End of geoprobe 25.0 feet	
30							
35							
40							

Date Boring Started:	4/11/18
Date Boring Completed:	4/11/18
Logged By:	ABW
Drilling Contractor:	Range Environmental Drilling
Drill Rig:	Geoprobe

Remarks: Dashed line indicates an inferred contact depth

PID = Headspace; D/O/S = Discoloration/Odor/Sheen; FID/MC = FID/Methane Corrected; G/S/F = Gravel/Sand/Fines
Additional data may have been collected in the field which is not included on this log.

LOG OF Geoprobe FD-SB-E2

BARR

SHEET 1 OF 1

Project:	Freeway Dump and Transfer Station	Surface Elevation:	725.0 ft
Project No.:	23191372	Drilling Method:	Geoprobe
Location:	Burnsville, MN	Sampling Method:	Dual-Tube
Coordinates:	UTM 15 N:4959434.995m, E:477283.694m	Completion Depth:	22.0 ft
Datum:	NAD 83; UTM Zone 15		

Depth, feet	Sample Type & Recovery	Sample No.	ENVIRONMENTAL DATA	USCS	Graphic Log	LITHOLOGIC DESCRIPTION	Elevation, feet
0							725
		1	**D/O/S:**No/ None/ None	SM		(SM): SILTY SAND with GRAVEL; brown; moist; [FILL].	
			PID:10.5 **D/O/S:**No/ Moderate/ None			(WM): WASTE MATERIAL; dark gray; moist; with wood, plastic; moderate treated wood odor.	
5							720
			PID:16.1 **D/O/S:**No/ Moderate/ None	WM		From 5': sandy matrix, with wood; moderate odor.	
		2					
10						From 10': with wood and plywood; moderate treated wood odor.	715
			PID:36.6 **D/O/S:**Yes/ Moderate/ None **D/O/S:**Black/ None/ None			(ASH): ASH; dark gray; moist to wet; soft, massive; black discoloration.	
		3					
15						From 15' - 20': No recovery.	710
				ASH			
		4					
20						From 20': wet.	705
		5	**PID:**6.6 **D/O/S:**No/ None/ None			At 22': Bedrock.	
						End of geoprobe 22.0 feet	
25							
30							
35							
40							

Date Boring Started:	3/27/18
Date Boring Completed:	3/27/18
Logged By:	ABW
Drilling Contractor:	Range Environmental Drilling
Drill Rig:	Geoprobe

Remarks:

PID = Headspace; D/O/S = Discoloration/Odor/Sheen; FID/MC = FID/Methane Corrected; G/S/F = Gravel/Sand/Fines
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LOG OF Geoprobe FD-SB-E3

BARR

SHEET 1 OF 1

Project:	Freeway Dump and Transfer Station	Surface Elevation:	727.0 ft
Project No.:	23191372	Drilling Method:	Geoprobe
Location:	Burnsville, MN	Sampling Method:	Dual-Tube
Coordinates:	UTM 15 N:4959432.864m, E:477334.097m	Completion Depth:	25.0 ft
Datum:	NAD 83; UTM Zone 15		

Depth, feet	Sample Type & Recovery	Sample No.	ENVIRONMENTAL DATA	USCS	Graphic Log	LITHOLOGIC DESCRIPTION	Elevation, feet
0				SM		(SM): SILTY SAND with GRAVEL; brown; moist; homogeneous; [FILL].	
				ASH		(ASH): ASH; gray; moist; homogeneous, stiff, nonplastic.	725
		1	**PID:**0.4 **D/O/S:**No/ None/ None				
			D/O/S: No/ Light/ None			(WM): WASTE MATERIAL; with glass and wood.	
5						From 5': with wood and fibrous material; moderate odor.	
			PID:8.6 **D/O/S:**No/ Moderate/ None				
		2		WM			720
10						[offset, no recovery from 10'].	
						(ASH): ASH; gray; moist to wet; soft to stiff, homogeneous, with trace wood; trace odor.	
		3	**PID:**3.4 **D/O/S:**No/ Trace/ None				715
15						From 15': no wood, no odor.	
		4	**PID:**1.9 **D/O/S:**No/ None/ None	ASH			710
20						From 18.5': wet.	
		5	**D/O/S:**No/ None/ None				705
						BEDROCK; limestone.	
25						End of geoprobe 25.0 feet	
30							
35							
40							

Date Boring Started:	3/26/18
Date Boring Completed:	3/26/18
Logged By:	ABW
Drilling Contractor:	Range Environmental Drilling
Drill Rig:	Geoprobe

Remarks:

PID = Headspace; D/O/S = Discoloration/Odor/Sheen; FID/MC = FID/Methane Corrected; G/S/F = Gravel/Sand/Fines
Additional data may have been collected in the field which is not included on this log.

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LOG OF Geoprobe FD-SB-E4

BARR

SHEET 1 OF 1

Project:	Freeway Dump and Transfer Station	Surface Elevation:	728.0 ft
Project No.:	23191372	Drilling Method:	Geoprobe
Location:	Burnsville, MN	Sampling Method:	Dual-Tube
Coordinates:	UTM 15 N:4959439.703m, E:477389.367m	Completion Depth:	23.0 ft
Datum:	NAD 83; UTM Zone 15		

Depth, feet	Sample Type & Recovery	Sample No.	ENVIRONMENTAL DATA	USCS	Graphic Log	LITHOLOGIC DESCRIPTION	Elevation, feet
0							
		1	**D/O/S:**No/ None/ None	SM		(SM): SILTY SAND with GRAVEL; brown; moist; with organic material; [FILL].	
			PID:4.5 **D/O/S:**No/ None/ None	ASH		(ASH): ASH; moist; with sand and waste material (plastic).	725
5							
		2	**PID:**4.9 **D/O/S:**No/ Light/ None			(WM): WASTE MATERIAL; moist; with wood, concrete, rock.	720
10							
		3	**PID:**14.5 **D/O/S:**No/ None/ None	WM			715
15						From 15': with wood; moderate treated wood odor.	
		4	**PID:**20.6 **D/O/S:**No/ Moderate/ None				710
20						From 20': with wood.	
		5	**PID:**4.5 **D/O/S:**No/ None/ None				
						End of geoprobe 23.0 feet	705
25							
30							
35							
40							

Date Boring Started:	3/22/18
Date Boring Completed:	3/22/18
Logged By:	ABW
Drilling Contractor:	Range Environmental Drilling
Drill Rig:	Geoprobe

Remarks: Dashed line indicates an inferred contact depth

PID = Headspace; D/O/S = Discoloration/Odor/Sheen; FID/MC = FID/Methane Corrected; G/S/F = Gravel/Sand/Fines
Additional data may have been collected in the field which is not included on this log.

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LOG OF Geoprobe FD-SB-E5

BARR

SHEET 1 OF 1

Project:	Freeway Dump and Transfer Station	Surface Elevation:	727.0 ft
Project No.:	23191372	Drilling Method:	Geoprobe
Location:	Burnsville, MN	Sampling Method:	Dual-Tube
Coordinates:	UTM 15 N:4959445.53m, E:477442.964m	Completion Depth:	23.0 ft
Datum:	NAD 83; UTM Zone 15		

Depth, feet	Sample Type & Recovery	Sample No.	ENVIRONMENTAL DATA	USCS	Graphic Log	LITHOLOGIC DESCRIPTION	Elevation, feet
0			**D/O/S:**No/ None/ None	SM		(SM): SILTY SAND with GRAVEL; dark gray; moist; firm, massive; [FILL].	
				ASH		(ASH): ASH; gray; moist; stiff, massive, nonplastic.	725
		1	**D/O/S:**No/ None/ None				
			PID:34.5 **D/O/S:**No/ None/ None			(WM): WASTE MATERIAL; gray; moist; with wood, bricks, plastic.	
5						From 5': with wood, fabric, shingles; strong solvent/petroleum odor.	
		2	**PID:**342.8 **D/O/S:**No/ Strong/ None				720
10						From 10' - 15': No recovery.	
		3		WM			715
15			**D/O/S:**No/ Moderate/ None			From 15': with wood and fibrous material.	
		4					710
20			**PID:**35.5 **D/O/S:**No/ None/ None			From 20': with plastic and wood.	
		5				BEDROCK; light yellowish brown; Prairie du Chien limestone.	705
						End of geoprobe 23.0 feet	
25							
30							
35							
40							

Date Boring Started:	3/21/18
Date Boring Completed:	3/21/18
Logged By:	ABW
Drilling Contractor:	Range Environmental Drilling
Drill Rig:	Geoprobe

Remarks:

PID = Headspace; D/O/S = Discoloration/Odor/Sheen; FID/MC = FID/Methane Corrected; G/S/F = Gravel/Sand/Fines
Additional data may have been collected in the field which is not included on this log.

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LOG OF Geoprobe FD-SB-F1

BARR

SHEET 1 OF 1

Project:	Freeway Dump and Transfer Station	Surface Elevation:	722.0 ft
Project No.:	23191372	Drilling Method:	Geoprobe
Location:	Burnsville, MN	Sampling Method:	Dual-Tube
Coordinates:	UTM 15 N:4959384.109m, E:477229.626m	Completion Depth:	16.0 ft
Datum:	NAD 83; UTM Zone 15		

Depth, feet	Sample Type & Recovery	Sample No.	ENVIRONMENTAL DATA	USCS	Graphic Log	LITHOLOGIC DESCRIPTION	Elevation, feet
0							
		1	**D/O/S:**No/ None/ None	SP		(SP): POORLY GRADED SAND with SILT; medium grained; brown; moist; homogeneous, with trace fine gravel; trace% gravel, 90% sand, 10% fines, [FILL].	720
			PID:1.5 **D/O/S:**No/ None/ None	SM		(SM): SILTY SAND; fine to coarse grained; olive gray; moist; homogeneous; 0% gravel, 75% sand, 25% fines, [FILL].	
5							
		2	**PID:**3.5 **D/O/S:**No/ Trace/ None	WM		(WM): WASTE MATERIAL; sandy matrix, with wood, plastic; trace odor.	715
10							
		3	**D/O/S:**No/ None/ None	ASH		(ASH): ASH; gray; wet; soft, homogeneous, with few wood debris.	710
15		4	**PID:**0.6 **D/O/S:**No/ Organic/ None	PT		(PT): PEAT; dark brown; moist; fibrous, spongy; organic odor; [NATIVE].	
			PID:0.3 **D/O/S:**No/ None/ None	CL		(CL): LEAN CLAY; dark gray; moist; [NATIVE].	
						BEDROCK.	
						End of geoprobe 16.0 feet	
20							
25							
30							
35							
40							

Date Boring Started:	4/12/18
Date Boring Completed:	4/12/18
Logged By:	ABW
Drilling Contractor:	Range Environmental Drilling
Drill Rig:	Geoprobe

Remarks: Dashed line indicates an inferred contact depth

PID = Headspace; D/O/S = Discoloration/Odor/Sheen; FID/MC = FID/Methane Corrected; G/S/F = Gravel/Sand/Fines
Additional data may have been collected in the field which is not included on this log.

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LOG OF Geoprobe FD-SB-F2

BARR

SHEET 1 OF 1

Project:	Freeway Dump and Transfer Station	Surface Elevation:	726.0 ft
Project No.:	23191372	Drilling Method:	Geoprobe
Location:	Burnsville, MN	Sampling Method:	Dual-Tube
Coordinates:	UTM 15 N:4959375.135m, E:477282.735m	Completion Depth:	24.0 ft
Datum:	NAD 83; UTM Zone 15		

Depth, feet	Sample Type & Recovery	Sample No.	ENVIRONMENTAL DATA	USCS	Graphic Log	LITHOLOGIC DESCRIPTION	Elevation, feet
0							725
		1	**PID:**6.5 **D/O/S:**No/ None/ None	SM		(SM): SILTY SAND with GRAVEL; brown; moist; compact, massive; 10% gravel, 70% sand, 20% fines, [FILL].	
5			**D/O/S:**No/ None/ None	ASH		(ASH): ASH; dark gray; moist; nonplastic, stiff, more clay at 6' bgs.	720
			D/O/S: No/ None/ None				
		2	**PID:**13.2 **D/O/S:**No/ Moderate/ None	WM		(WM): WASTE MATERIAL; moist; dark gray sandy matrix, with wood, glass, plastic; moderate treated wood odor.	
10			**PID:**16.2 **D/O/S:**No/ Moderate/ None				715
		3					
15			**PID:**8.8 **D/O/S:**Black/ Moderate/ None			From 15': wet, silty matrix, with green plastic and wood; black discoloration.	710
			D/O/S: No/ None/ None	ASH		(ASH): ASH; gray; wet; soft, sandy, massive.	
		4					
20			**D/O/S:**No/ None/ None				705
		5		PT		(PT): PEAT; dark brown; moist; fibrous, spongy; organic odor; [NATIVE].	
						BEDROCK.	
25						End of geoprobe 24.0 feet	
30							
35							
40							

Date Boring Started:	3/27/18
Date Boring Completed:	3/27/18
Logged By:	ABW
Drilling Contractor:	Range Environmental Drilling
Drill Rig:	Geoprobe

Remarks:

PID = Headspace; D/O/S = Discoloration/Odor/Sheen; FID/MC = FID/Methane Corrected; G/S/F = Gravel/Sand/Fines
Additional data may have been collected in the field which is not included on this log.

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LOG OF Geoprobe FD-SB-F3

BARR

SHEET 1 OF 1

Project:	Freeway Dump and Transfer Station	Surface Elevation:	727.0 ft
Project No.:	23191372	Drilling Method:	Geoprobe
Location:	Burnsville, MN	Sampling Method:	Dual-Tube
Coordinates:	UTM 15 N:4959377.367m, E:477335.344m	Completion Depth:	24.0 ft
Datum:	NAD 83; UTM Zone 15		

Depth, feet	Sample Type & Recovery	Sample No.	ENVIRONMENTAL DATA	USCS	Graphic Log	LITHOLOGIC DESCRIPTION	Elevation, feet
0			**D/O/S:**No/ None/ None	SM		(SM): SILTY SAND with GRAVEL; moist; [FILL].	
						WASTE MATERIAL; black sandy matrix, with paper, wood, plastic; light odor.	725
		1	**PID:**4.2 **D/O/S:**No/ Light/ None				
5						From 5': silty matrix.	
			PID:17.0 **D/O/S:**No/ Moderate/ None				720
		2					
10			**PID:**26.5 **D/O/S:**No/ Moderate/ None				
		3					715
15			**D/O/S:**No/ Moderate/ None				
						(ASH): ASH; dark gray; wet; homogeneous, soft, nonplastic.	710
		4	**PID:**3.5 **D/O/S:**No/ None/ None	ASH			
20			**D/O/S:**No/ None/ None				
				PT		(PT): PEAT; moist; strong organic odor; [NATIVE].	
		5	**PID:**0.9 **D/O/S:**No/ Organic/ None	CH		(CH): FAT CLAY; moist; strong organic odor; [NATIVE].	705
			D/O/S: No/ None/ None			BEDROCK; limestone.	
25						End of geoprobe 24.0 feet	
30							
35							
40							

Date Boring Started:	3/26/18
Date Boring Completed:	3/26/18
Logged By:	ABW
Drilling Contractor:	Range Environmental Drilling
Drill Rig:	Geoprobe

Remarks:

PID = Headspace; D/O/S = Discoloration/Odor/Sheen; FID/MC = FID/Methane Corrected; G/S/F = Gravel/Sand/Fines
Additional data may have been collected in the field which is not included on this log.

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LOG OF Geoprobe FD-SB-F4

BARR

SHEET 1 OF 1

Project:	Freeway Dump and Transfer Station	Surface Elevation:	728.0 ft
Project No.:	23191372	Drilling Method:	Geoprobe
Location:	Burnsville, MN	Sampling Method:	Dual-Tube
Coordinates:	UTM 15 N:4959384.681m, E:477385.94m		
Datum:	NAD 83; UTM Zone 15	Completion Depth:	15.0 ft

Depth, feet	Sample Type & Recovery	Sample No.	ENVIRONMENTAL DATA	USCS	Graphic Log	LITHOLOGIC DESCRIPTION	Elevation, feet
0				SM		(SM): SILTY SAND with GRAVEL; brown; moist; [FILL].	
		1	**PID:**6.9 **D/O/S:**No/ None/ None				
			D/O/S: No/ None/ None			(WM): WASTE MATERIAL; dark brown sandy matrix, with plastic and wood.	725
5			**PID:**56.9 **D/O/S:**No/ Moderate/ Slight			From 5': brown sandy matrix, with wood, plastic, glass; moderate odor and light sheen.	
		2		WM			720
10			**PID:**7.3 **D/O/S:**No/ Moderate/ None			From 10': gray silty matrix, with wood; treated wood odor.	
		3					715
15						[offset due to refusal at 14', second refusal at 15'].	
						End of geoprobe 15.0 feet	
20							
25							
30							
35							
40							

Date Boring Started:	3/21/18
Date Boring Completed:	3/21/18
Logged By:	ABW
Drilling Contractor:	Range Environmental Drilling
Drill Rig:	Geoprobe

Remarks:

PID = Headspace; D/O/S = Discoloration/Odor/Sheen; FID/MC = FID/Methane Corrected; G/S/F = Gravel/Sand/Fines
Additional data may have been collected in the field which is not included on this log.

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LOG OF Geoprobe FD-SB-F5

BARR

SHEET 1 OF 1

Project:	Freeway Dump and Transfer Station	Surface Elevation:	728.0 ft
Project No.:	23191372	Drilling Method:	Geoprobe
Location:	Burnsville, MN	Sampling Method:	Dual-Tube
Coordinates:	UTM 15 N:4959389.466m, E:477440.794m	Completion Depth:	15.0 ft
Datum:	NAD 83; UTM Zone 15		

Depth, feet	Sample Type & Recovery	Sample No.	ENVIRONMENTAL DATA	USCS	Graphic Log	LITHOLOGIC DESCRIPTION	Elevation, feet
0			**D/O/S:**No/ None/ None	SM		(SM): SILTY SAND with GRAVEL; moist; compact; [FILL].	
			D/O/S: No/ None/ None	ASH		(ASH): ASH; gray; moist; homogeneous, stiff, nonplastic.	
		1	**PID:**9.0 **D/O/S:**No/ Moderate/ None	WM		(WM): WASTE MATERIAL; with plastic and wood; moderate odor.	725
5			**PID:**119.8 **D/O/S:**No/ Moderate/ None			From 5': black/dark gray matrix, with plastic and wood; moderate odor.	
		2					720
10			**PID:**99.5 **D/O/S:**No/ Light/ None			From 10': black matrix, with wood and plastic; light odor.	
		3					715
15						Bedrock in shoe, refusal.	
						End of geoprobe 15.0 feet	
20							
25							
30							
35							
40							

Date Boring Started:	3/21/18
Date Boring Completed:	3/21/18
Logged By:	ABW
Drilling Contractor:	Range Environmental Drilling
Drill Rig:	Geoprobe

Remarks: Dashed line indicates an inferred contact depth

PID = Headspace; D/O/S = Discoloration/Odor/Sheen; FID/MC = FID/Methane Corrected; G/S/F = Gravel/Sand/Fines
Additional data may have been collected in the field which is not included on this log.

LOG OF Geoprobe FD-SB-G1

BARR

SHEET 1 OF 1

Project:	Freeway Dump and Transfer Station	Surface Elevation:	724.0 ft
Project No.:	23191372	Drilling Method:	Geoprobe
Location:	Burnsville, MN	Sampling Method:	Dual-Tube
Coordinates:	UTM 15 N:4959329.617m, E:477227.442m	Completion Depth:	23.0 ft
Datum:	NAD 83; UTM Zone 15		

Depth, feet	Sample No.	ENVIRONMENTAL DATA	USCS	LITHOLOGIC DESCRIPTION	Elevation, feet
0	1	**PID:**0.6 **D/O/S:**No/ None/ None	SP-SM	(SP-SM): POORLY GRADED SAND with SILT; fine to coarse grained; brown; moist; homogeneous, with trace fine gravel; trace% gravel, 90% sand, 10% fines, [FILL].	720
5	2	**PID:**0.9 **D/O/S:**No/ None/ None	SM	(SM): SILTY SAND; very dark brown; moist; with fine gravel; 5% gravel, 75% sand, 20% fines, [FILL].	715
10	3	**PID:**0.6 **D/O/S:**No/ None/ None	ASH	(ASH): ASH; gray; wet; soft, homogeneous, with few white very fine grained flecks.	710
15	4	**PID:**0.2 **D/O/S:**No/ None/ None			
20	5	**D/O/S:**No/ Organic/ None **PID:**0.0	PT	(PT): PEAT; very dark brown; moist; fibrous, organic odor; [NATIVE].	705
				BEDROCK.	
				End of geoprobe 23.0 feet	
25					
30					
35					
40					

Date Boring Started:	4/12/18
Date Boring Completed:	4/12/18
Logged By:	ABW
Drilling Contractor:	Range Environmental Drilling
Drill Rig:	Geoprobe

Remarks:

PID = Headspace; D/O/S = Discoloration/Odor/Sheen; FID/MC = FID/Methane Corrected; G/S/F = Gravel/Sand/Fines
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LOG OF Geoprobe FD-SB-G2

BARR

Project:	Freeway Dump and Transfer Station	Surface Elevation:	725.0 ft
Project No.:	23191372	Drilling Method:	Geoprobe
Location:	Burnsville, MN	Sampling Method:	Dual-Tube
Coordinates:	UTM 15 N:4959314.193m, E:477284.823m	Completion Depth:	19.0 ft
Datum:	NAD 83; UTM Zone 15		

Depth, feet	Sample Type & Recovery	Sample No.	ENVIRONMENTAL DATA	USCS	Graphic Log	LITHOLOGIC DESCRIPTION	Elevation, feet
0							725
		1	**PID:**0.2 **D/O/S:**No/ None/ None	SM		(SM): SILTY SAND with GRAVEL; brown; moist; compact, massive; [FILL].	
5		2	**PID:**0.2 **D/O/S:**No/ None/ None	ASH		(ASH): ASH; gray; moist; homogeneous, soft, nonplastic, with very little waste mixed.	720
10		3	**PID:**3.6 **D/O/S:**No/ Moderate/ None	WM		(WM): WASTE MATERIAL; moist to wet; black matrix, with plastic, paper, wood; moderate odor.	715
			PID:0.1 **D/O/S:**No/ None/ None	ASH		(ASH): ASH; gray; wet; homogeneous, soft, nonplastic, increasingly granular.	
15		4	**PID:**0.1 **D/O/S:**No/ None/ None	PT		(PT): PEAT; moist; [NATIVE].	710
			PID:0.1 **D/O/S:**No/ None/ None			BEDROCK; moist.	
20						End of geoprobe 19.0 feet	
25							
30							
35							
40							

Date Boring Started:	3/26/18
Date Boring Completed:	3/26/18
Logged By:	ABW
Drilling Contractor:	Range Environmental Drilling
Drill Rig:	Geoprobe

Remarks:

PID = Headspace; D/O/S = Discoloration/Odor/Sheen; FID/MC = FID/Methane Corrected; G/S/F = Gravel/Sand/Fines
Additional data may have been collected in the field which is not included on this log.

LOG OF Geoprobe FD-SB-G3

BARR

Project:	Freeway Dump and Transfer Station	Surface Elevation:	730.0 ft
Project No.:	23191372	Drilling Method:	Geoprobe
Location:	Burnsville, MN	Sampling Method:	Dual-Tube
Coordinates:	UTM 15 N:4959336.563m, E:477338.452m	Completion Depth:	24.0 ft
Datum:	NAD 83; UTM Zone 15		

Depth, feet	Sample Type & Recovery	Sample No.	ENVIRONMENTAL DATA	USCS	Graphic Log	LITHOLOGIC DESCRIPTION	Elevation, feet
0							730
		1	**PID:**0.2 **D/O/S:**No/ None/ None	SM		(SM): SILTY SAND with GRAVEL; brown; moist; [FILL].	
			D/O/S: No/ None/ None			(WM): WASTE MATERIAL; moist; silty matrix, with brick, wood, light debris.	
5			**D/O/S:**No/ None/ None			From 5': silty matrix, with wood, paper, plastic.	725
		2	**PID:**1.2 **D/O/S:**No/ Moderate/ Trace				
			D/O/S: No/ None/ None			[refusal at 9' bgs, offset].	
10						From 10': with concrete and treated wood; strong odor.	720
		3	**PID:**22.7 **D/O/S:**No/ Strong/ None	WM			
15						From 15': with treated wood; strong odor and trace sheen.	715
		4	**PID:**29.7 **D/O/S:**No/ Moderate/ Trace				
20						BEDROCK.	710
		5					
25						End of geoprobe 24.0 feet	
30							
35							
40							

Date Boring Started:	3/26/18
Date Boring Completed:	3/26/18
Logged By:	ABW
Drilling Contractor:	Range Environmental Drilling
Drill Rig:	Geoprobe

Remarks: Dashed line indicates an inferred contact depth

PID = Headspace; D/O/S = Discoloration/Odor/Sheen; FID/MC = FID/Methane Corrected; G/S/F = Gravel/Sand/Fines
Additional data may have been collected in the field which is not included on this log.

LOG OF Geoprobe FD-SB-G4

BARR

Project:	Freeway Dump and Transfer Station	Surface Elevation:	727.0 ft
Project No.:	23191372	Drilling Method:	Geoprobe
Location:	Burnsville, MN	Sampling Method:	Dual-Tube
Coordinates:	UTM 15 N:4959302.264m, E:477388.464m	Completion Depth:	21.0 ft
Datum:	NAD 83; UTM Zone 15		

Depth, feet	Sample Type & Recovery	Sample No.	ENVIRONMENTAL DATA	USCS	Graphic Log	LITHOLOGIC DESCRIPTION	Elevation, feet
0				SM		(SM): SILTY SAND with GRAVEL; brown; moist; compact, homogeneous; 10% gravel, 70% sand, 20% fines, [FILL].	
		1	**PID:**0.4 **D/O/S:**No/ None/ None	ASH		(ASH): ASH; dark gray; moist to wet; compact, stiff, nonplastic.	725
5			**D/O/S:**No/ None/ None				
		2	**PID:**51.0 **D/O/S:**No/ Strong/ None	WM		(WM): WASTE MATERIAL; moist; black sandy matrix, with paper, plastic, wood; strong treated wood odor.	720
10			**PID:**38.6 **D/O/S:**No/ Strong/ None			From 10': with concrete, glass, plastic, wood; strong odor.	
		3					715
15			**D/O/S:**No/ Strong/ None	PT		(PT): PEAT; [NATIVE].	
			PID:1.1	CH		(CH): FAT CLAY; [NATIVE].	
		4	**D/O/S:**No/ None/ None			BEDROCK; crushed/weathered.	710
20		5				End of geoprobe 21.0 feet	
25							
30							
35							
40							

Date Boring Started:	3/26/18
Date Boring Completed:	3/26/18
Logged By:	ABW
Drilling Contractor:	Range Environmental Drilling
Drill Rig:	Geoprobe

Remarks: Dashed line indicates an inferred contact depth

PID = Headspace; D/O/S = Discoloration/Odor/Sheen; FID/MC = FID/Methane Corrected; G/S/F = Gravel/Sand/Fines
Additional data may have been collected in the field which is not included on this log.

LOG OF Geoprobe FD-SB-G5

BARR

Project:	Freeway Dump and Transfer Station	Surface Elevation:	730.0 ft
Project No.:	23191372	Drilling Method:	Geoprobe
Location:	Burnsville, MN	Sampling Method:	Dual-Tube
Coordinates:	UTM 15 N:4959341.95m, E:477443.476m	Completion Depth:	14.0 ft
Datum:	NAD 83; UTM Zone 15		

Depth, feet	Sample Type & Recovery	Sample No.	ENVIRONMENTAL DATA	USCS	Graphic Log	LITHOLOGIC DESCRIPTION	Elevation, feet
0							730
		1	**PID:**2.5 **D/O/S:**No/ None/ None	SM		(SM): SILTY SAND with GRAVEL; brown; moist; [FILL].	
				ASH		(ASH): ASH; gray; moist.	
5							725
		2	**PID:**16.0 **D/O/S:**No/ Light/ None	WM		(WM): WASTE MATERIAL; black sandy matrix, with brick, slag, wood, plastic; light odor.	
10						From 10': black silty matrix, with wood and plastic; light odor.	720
		3	**PID:**12.1 **D/O/S:**No/ Light/ None				
						[Refusal at 14' bgs, metal on bedrock].	
15						End of geoprobe 14.0 feet	
20							
25							
30							
35							
40							

Date Boring Started:	3/21/18
Date Boring Completed:	3/21/18
Logged By:	ABW
Drilling Contractor:	Range Environmental Drilling
Drill Rig:	Geoprobe

Remarks: Dashed line indicates an inferred contact depth

PID = Headspace; D/O/S = Discoloration/Odor/Sheen; FID/MC = FID/Methane Corrected; G/S/F = Gravel/Sand/Fines
Additional data may have been collected in the field which is not included on this log.

LOG OF Geoprobe TS-SB-01

BARR

SHEET 1 OF 1

Project:	Freeway Dump and Transfer Station	Surface Elevation:	711.0 ft
Project No.:	23191372	Drilling Method:	Geoprobe
Location:	Burnsville, MN	Sampling Method:	Dual-Tube
Coordinates:	UTM 15 N:4960152.756m, E:476966.31m	Completion Depth:	23.5 ft
Datum:	NAD 83; UTM Zone 15		

Depth, feet	Sample Type & Recovery	Sample No.	ENVIRONMENTAL DATA	USCS	Graphic Log	LITHOLOGIC DESCRIPTION	Elevation, feet
0			**PID:**1 **D/O/S:**No/ None/ None	SM		(SM): SILTY SAND with GRAVEL; medium grained; dark grayish brown; moist; 5% gravel, 80% sand, 15% fines, [FILL].	710
		1	**D/O/S:**No/ Slight/ None			WASTE MATERIAL; moist; black silty matrix, with plastic, wood; slight odor.	
5			**PID:**7.7 **D/O/S:**No/ Slight/ Trace			From 6.5': asphalt debris; strong petroleum odor and moderate sheen.	705
		2	**PID:**23.6 **D/O/S:**No/ Strong/ Moderate				
10			**PID:**6.9 **D/O/S:**No/ None/ None	SP		(SP): POORLY GRADED SAND; medium grained; dark gray; moist; homogeneous, little fine gravel; [FILL].	700
		3	**PID:**16.5				
			D/O/S: No/ None/ None	WM		(WM): WASTE MATERIAL; moist; silty matrix, with wood, concrete, brick.	
15			**PID:**1.4 **D/O/S:**No/ None/ None				695
		4		PT		(PT): PEAT; very dark brown; moist; fibrous, spongy; [NATIVE].	
			PID:1.4 **D/O/S:**No/ None/ None	OH		(OH): ORGANIC CLAY; very dark gray; moist; homogeneous, soft, medium to high plasticity, with shells; [NATIVE].	
20		5	**PID:**0.8 **D/O/S:**No/ None/ None				690
						BEDROCK.	
						End of geoprobe 23.5 feet	
25							
30							

Date Boring Started:	4/12/18
Date Boring Completed:	4/12/18
Logged By:	ABW/ARP2
Drilling Contractor:	Range Environmental Drilling
Drill Rig:	Geoprobe

Remarks: Dashed line indicates an inferred contact depth

PID = Headspace; D/O/S = Discoloration/Odor/Sheen; FID/MC = FID/Methane Corrected; G/S/F = Gravel/Sand/Fines
Additional data may have been collected in the field which is not included on this log.

LOG OF Geoprobe TS-SB-02

BARR

SHEET 1 OF 1

Project:	Freeway Dump and Transfer Station	Surface Elevation:	712.0 ft
Project No.:	23191372	Drilling Method:	Geoprobe
Location:	Burnsville, MN	Sampling Method:	Dual-Tube
Coordinates:	UTM 15 N:4960110.853m, E:477006.688m	Completion Depth:	25.5 ft
Datum:	NAD 83; UTM Zone 15		

Depth, feet	Sample Type & Recovery	Sample No.	ENVIRONMENTAL DATA	USCS	Graphic Log	LITHOLOGIC DESCRIPTION	Elevation, feet
0		1	**PID:**0.7 **D/O/S:**No/ None/ None	SP		(SP): POORLY GRADED SAND; fine to medium grained; light to dark brown; moist; homogeneous, little fine gravel, [fill]; 5% gravel, 90% sand, 5% fines, [FILL].	710
5			**PID:**0.6 **D/O/S:**No/ None/ None				
			PID:0.6 **D/O/S:**Black/ None/ None			(SM): SILTY SAND with GRAVEL; grayish brown; moist; 10% gravel, 70% sand, 20% fines, [FILL].	705
		2	**PID:**0.6 **D/O/S:**Black/ None/ Trace			From 7.5' - 8': few black discolorations, wood, trace sheen.	
			PID:6 **D/O/S:**No/ None/ None				
10			**PID:**0.6 **D/O/S:**No/ None/ None				700
		3					
15				SM		From 16': moist to wet.	695
			PID:0.3 **D/O/S:**No/ None/ None				
		4					
			PID:0.5 **D/O/S:**No/ None/ None				
20						From 20': gray.	690
		5	**PID:**0.3 **D/O/S:**No/ None/ None				
25		6	**D/O/S:**No/ None/ None			End of geoprobe 25.5 feet	
30							

Date Boring Started:	4/12/18
Date Boring Completed:	4/12/18
Logged By:	ABW/ARP2
Drilling Contractor:	Range Environmental Drilling
Drill Rig:	Geoprobe

Remarks:

PID = Headspace; D/O/S = Discoloration/Odor/Sheen; FID/MC = FID/Methane Corrected; G/S/F = Gravel/Sand/Fines
Additional data may have been collected in the field which is not included on this log.

LOG OF Geoprobe TS-SB-03

BARR

SHEET 1 OF 1

Project:	Freeway Dump and Transfer Station	Surface Elevation:	708.0 ft
Project No.:	23191372	Drilling Method:	Geoprobe
Location:	Burnsville, MN	Sampling Method:	Dual-Tube
Coordinates:	UTM 15 N:4960096.446m, E:477037m	Completion Depth:	14.0 ft
Datum:	NAD 83; UTM Zone 15		

Depth, feet	Sample Type & Recovery	Sample No.	ENVIRONMENTAL DATA	USCS	Graphic Log	LITHOLOGIC DESCRIPTION	Elevation, feet
0				SP-SM		(SP-SM): POORLY GRADED SAND with SILT; light brown; moist; [FILL].	
		1	**PID:**0.2 **D/O/S:**No/ None/ None				
			PID:0.5 **D/O/S:**No/ Light/ Slight	WM		(WM): WASTE MATERIAL; moist; black silty sandy matrix; light organic odor andn light sheen.	705
5		2				From 5' - 10': No recovery.	700
10		3	**PID:**0.3 **D/O/S:**No/ None/ None	OH		(OH): ORGANIC CLAY; dark gray; moist; high plasticity, with trace shells; [NATIVE].	695
						End of geoprobe 14.0 feet	
15							
20							
25							
30							

Date Boring Started:	4/12/18
Date Boring Completed:	4/12/18
Logged By:	ABW/ARP2
Drilling Contractor:	Range Environmental Drilling
Drill Rig:	Geoprobe

Remarks: Dashed line indicates an inferred contact depth

PID = Headspace; D/O/S = Discoloration/Odor/Sheen; FID/MC = FID/Methane Corrected; G/S/F = Gravel/Sand/Fines
Additional data may have been collected in the field which is not included on this log.

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LOG OF Geoprobe TS-SB-04

BARR

SHEET 1 OF 1

Project:	Freeway Dump and Transfer Station	Surface Elevation:	711.0 ft
Project No.:	23191372	Drilling Method:	Geoprobe
Location:	Burnsville, MN	Sampling Method:	Dual-Tube
Coordinates:	UTM 15 N:4960095.736m, E:477010.702m	Completion Depth:	20.0 ft
Datum:	NAD 83; UTM Zone 15		

Depth, feet	Sample Type & Recovery	Sample No.	ENVIRONMENTAL DATA	USCS	Graphic Log	LITHOLOGIC DESCRIPTION	Elevation, feet
0							710
			PID:0 **D/O/S:**No/ None/ None	SM		(SM): SILTY SAND; fine grained; brown to gray; moist; [FILL].	
		1	**PID:**0.9 **D/O/S:**No/ None/ None	SP-SM		(SP-SM): POORLY GRADED SAND with SILT; medium to coarse grained; black; moist; with some asphalt-like material; [FILL]. At 5.5': large brick/concrete clast.	
5							705
			PID:0.2 **D/O/S:**No/ None/ None	SM		(SM): SILTY SAND with GRAVEL; fine to coarse grained; gray; moist; [FILL].	
		2	**PID:**0.6 **D/O/S:**No/ None/ None	WM		(WM): WASTE MATERIAL; silty sand fill intermixed with waste material.	
10							700
		3	**PID:**1.2 **D/O/S:**No/ None/ None				
15							695
			PID:3.5 **D/O/S:**No/ None/ None			BEDROCK; weathered.	
		4					
20						End of geoprobe 20.0 feet	
25							
30							

Date Boring Started:	4/13/18
Date Boring Completed:	4/13/18
Logged By:	ABW/ARP2
Drilling Contractor:	Range Environmental Drilling
Drill Rig:	Geoprobe

Remarks:

PID = Headspace; D/O/S = Discoloration/Odor/Sheen; FID/MC = FID/Methane Corrected; G/S/F = Gravel/Sand/Fines
Additional data may have been collected in the field which is not included on this log.

LOG OF Geoprobe TS-SB-05

BARR

SHEET 1 OF 1

Project:	Freeway Dump and Transfer Station	Surface Elevation:	712.0 ft
Project No.:	23191372	Drilling Method:	Geoprobe
Location:	Burnsville, MN	Sampling Method:	Dual-Tube
Coordinates:	UTM 15 N:4960183.746m, E:477003.406m	Completion Depth:	24.0 ft
Datum:	NAD 83; UTM Zone 15		

Depth, feet	Sample Type & Recovery	Sample No.	ENVIRONMENTAL DATA	USCS	Graphic Log	LITHOLOGIC DESCRIPTION	Elevation, feet
0							
			PID:0.9 **D/O/S:**No/ None/ None	SM		(SM): SILTY SAND with GRAVEL; dark brown; moist; 10% gravel, 70% sand, 20% fines, [FILL].	
			D/O/S: No/ None/ None			At 1.5': crushed concrete.	710
		1	**PID:**2.1	ML		(ML): SILT; dark gray; moist; with fine grained sand, homogeneous, nonplastic.	
			D/O/S: No/ None/ None **D/O/S:**Trace/ Trace/ None	SP		(SP): POORLY GRADED SAND; fine grained; gray; moist; homogeneous, few fine gravel; trace dark discoloration and odor at bottom of sample; [FILL].	
5							
				WM		(WM): WASTE MATERIAL; moist; with wood, glass, plastic; moderate odor and trace sheen.	
			PID:36.7 **D/O/S:**No/ Moderate/ Trace				705
		2					
10							
			PID:9.8 **D/O/S:**No/ Moderate/ Slight				
			D/O/S: No/ None/ None			(OH): ORGANIC CLAY; dark gray; moist; few fine grained sand and silt, few shells, medium plasticity; [NATIVE].	700
		3					
15							
			PID:1.7 **D/O/S:**No/ None/ None	OH			
						At 16.5 possible waste material observed, below 16.5' clay is black with increasing plasticity and shells.	695
		4	**PID:**1.1 **D/O/S:**No/ None/ None				
20							
						At 20.5': few fine gravel.	
			PID:0.7 **D/O/S:**No/ None/ None	SM		(SM): SILTY SAND; very fine to fine grained; gray; moist to wet; homogeneous, nonplastic fines; 0% gravel, 70% sand, 30% fines.	
		5	**PID:**0.4 **D/O/S:**No/ None/ None				690
						BEDROCK.	
25						End of geoprobe 24.0 feet	
30							

Date Boring Started:	4/13/18
Date Boring Completed:	4/13/18
Logged By:	ABW/ARP2
Drilling Contractor:	Range Environmental Drilling
Drill Rig:	Geoprobe

Remarks: Dashed line indicates an inferred contact depth

PID = Headspace; D/O/S = Discoloration/Odor/Sheen; FID/MC = FID/Methane Corrected; G/S/F = Gravel/Sand/Fines
Additional data may have been collected in the field which is not included on this log.

LOG OF Geoprobe TS-SB-06

BARR

SHEET 1 OF 1

Project:	Freeway Dump and Transfer Station	Surface Elevation:	708.0 ft
Project No.:	23191372	Drilling Method:	Geoprobe
Location:	Burnsville, MN	Sampling Method:	Dual-Tube
Coordinates:	UTM 15 N:4960177.95m, E:476939.906m	Completion Depth:	18.0 ft
Datum:	NAD 83; UTM Zone 15		

Depth, feet	Sample Type & Recovery	Sample No.	ENVIRONMENTAL DATA	USCS	Graphic Log	LITHOLOGIC DESCRIPTION	Elevation, feet
0			**PID:**0.5 **D/O/S:**No/ None/ None	OL/OH		(OL/OH): TOPSOIL; black; moist; silty/organic; [FILL].	
				SP		(SP): POORLY GRADED SAND; fine to medium grained; light brown; moist; 5% gravel, 90% sand, 5% fines, [FILL].	
		1	**PID:**0.6 **D/O/S:**No/ None/ None	SM		(SM): SILTY SAND with GRAVEL; gray; moist; 10% gravel, 60% sand, 30% fines, [FILL].	705
			PID:2.6 **D/O/S:**No/ Light/ None			(WM): WASTE MATERIAL; moist; black sandy matrix, with wood; light odor.	
5						From 5': black sandy matrix, with wood, concrete, styrofoam, shingles, plastic; light odor and light 'film' (no sheen).	
		2	**PID:**9.4 **D/O/S:**No/ Light/ None	WM			700
10			**PID:**15.2 **D/O/S:**No/ Light/ None				
		3	**PID:**1.4 **D/O/S:**No/ None/ None			(OH): ORGANIC CLAY; black; moist; with shells and few very fine sand, soft to firm, medium to high plasticity, less sand with depth; 0% gravel, 10% sand, 90% fines, [NATIVE].	695
15				OH			
		4	**PID:**0.6 **D/O/S:**No/ None/ None				
						End of geoprobe 18.0 feet	690
20							
25							
30							

Date Boring Started:	4/13/18
Date Boring Completed:	4/13/18
Logged By:	ABW/ARP2
Drilling Contractor:	Range Environmental Drilling
Drill Rig:	Geoprobe

Remarks:

PID = Headspace; D/O/S = Discoloration/Odor/Sheen; FID/MC = FID/Methane Corrected; G/S/F = Gravel/Sand/Fines
Additional data may have been collected in the field which is not included on this log.

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LOG OF Geoprobe TS-SB-07

BARR

SHEET 1 OF 1

Project:	Freeway Dump and Transfer Station	Surface Elevation:	712.0 ft
Project No.:	23191372	Drilling Method:	Geoprobe
Location:	Burnsville, MN	Sampling Method:	Dual-Tube
Coordinates:	UTM 15 N:4960146.303m, E:476981.276m	Completion Depth:	26.5 ft
Datum:	NAD 83; UTM Zone 15		

Depth, feet	Sample Type & Recovery	Sample No.	ENVIRONMENTAL DATA	USCS	Graphic Log	LITHOLOGIC DESCRIPTION	Elevation, feet
0						(SM): SILTY SAND with GRAVEL; gray; moist; homogenous, dense; 5% gravel, 70% sand, 25% fines, [FILL].	
		1	**PID:**0.5 **D/O/S:**No/ None/ None				710
5			**PID:**0.6 **D/O/S:**No/ None/ None				
		2	**PID:**0.4 **D/O/S:**No/ None/ None				705
10			**PID:**1 **D/O/S:**No/ None/ None				
		3		SM			700
			PID:0.8 **D/O/S:**No/ None/ None				
15			**PID:**1.3 **D/O/S:**No/ None/ None				
		4					695
			PID:0.5 **D/O/S:**No/ None/ None				
20						At 20': wet.	
			PID:0.4 **D/O/S:**No/ None/ None				
		5					690
			PID:0.2 **D/O/S:**No/ None/ None				
25							
		6	**PID:**0.1 **D/O/S:**No/ None/ None			BEDROCK.	
						End of geoprobe 26.5 feet	
30							

Date Boring Started:	4/13/18
Date Boring Completed:	4/13/18
Logged By:	ABW/ARP2
Drilling Contractor:	Range Environmental Drilling
Drill Rig:	Geoprobe

Remarks:

PID = Headspace; D/O/S = Discoloration/Odor/Sheen; FID/MC = FID/Methane Corrected; G/S/F = Gravel/Sand/Fines
Additional data may have been collected in the field which is not included on this log.

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LOG OF Geoprobe TS-SB-08

BARR

Project:	Freeway Dump and Transfer Station	Surface Elevation:	726.0 ft
Project No.:	23191372	Drilling Method:	Geoprobe
Location:	Burnsville, MN	Sampling Method:	Dual-Tube
Coordinates:	UTM 15 N:4960113.988m, E:476934.666m	Completion Depth:	28.0 ft
Datum:	NAD 83; UTM Zone 15		

Depth, feet	Sample Type & Recovery	Sample No.	ENVIRONMENTAL DATA	USCS	Graphic Log	LITHOLOGIC DESCRIPTION	Elevation, feet
0				SM		(SM): SILTY SAND with GRAVEL; gray; moist; homogenous, dense, with trace clay and fine gravel; 10% gravel, 50% sand, 40% fines, [FILL].	725
		1	**PID:**0.1 **D/O/S:**No/ None/ None				
			PID:2.6 **D/O/S:**No/ Light/ None			(WM): WASTE MATERIAL; black matrix, with wood, plastic; light odor.	
5						From 5': with wood, brick, plastic; at 6.8' soft, gooey, white substance with strong odor observed.	720
			PID:7.6 **D/O/S:**No/ Strong/ Trace				
		2					
10						From 10': with wood, paper, plastic, insulating material; strong odor.	715
			PID:24.8 **D/O/S:**No/ Strong/ Moderate				
		3					
15				WM		From 15': with abundant paper.	710
			PID:27.9 **D/O/S:**No/ Moderate/ Moderate				
		4					
20						From 20': sandy matrix, with wood and fabric.	705
			PID:5.1 **D/O/S:**No/ Moderate/ None				
		5					
25						From 25' - 28': No recovery.	700
		6					
30						End of geoprobe 28.0 feet	

Date Boring Started:	4/13/18
Date Boring Completed:	4/13/18
Logged By:	ABW/ARP2
Drilling Contractor:	Range Environmental Drilling
Drill Rig:	Geoprobe

Remarks:

PID = Headspace; D/O/S = Discoloration/Odor/Sheen; FID/MC = FID/Methane Corrected; G/S/F = Gravel/Sand/Fines
Additional data may have been collected in the field which is not included on this log.

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Appendix A-2

Cover Soil Investigation Boring Logs

Barr Engineering Company
4300 MarketPointe Drive Suite 200
Minneapolis, MN 55435
Telephone: 952-832-2600

LOG OF GEOPROBE FL-SB-01

DRAFT

Project: Freeway Dump and Landfill
Project No.: 23191372
Location: Burnsville, MN
Coordinates: UTM 15 N:476490.098m, E:4959852.948m
Datum: NAD 83; UTM Zone 15

Surface Elevation: 729 ft MSL*
Drilling Method: Geoprobe
Sampling Method: Dual-Tube
Completion Depth: 15.0 ft

Depth, feet	Sample Type & Recovery	Sample No.	ENVIRONMENTAL DATA	USCS	Graphic Log	LITHOLOGIC DESCRIPTION	Elevation, feet
0				SM		TOPSOIL (SM): moist.	
						SILTY SAND (SM): fine to coarse grained; brown to dark gray; moist; trace fine gravel; [FILL].	
		1	**D/O/S:**None/ None/ None				
5							
		2	**D/O/S:**None/ None/ None	SM			
10						From 10': silty matrix; mixed with silty ash; black to dark gray.	
		3	**D/O/S:**None/ None/ None				
				WM		WASTE MATERIAL WITH ASH (WM): moist; metal; paper; glass; gray ash mixed in with waste material.	
15						End of geoprobe 15.0 feet	
20							
25							
30							

Date Boring Started: 4/2/19
Date Boring Completed: 4/2/19
Logged By: EMC
Drilling Contractor: Midwestern Drilling
Drill Rig: Geoprobe

Remarks: Pace sampled soil 0-10'
*Surface elevation interpreted from LIDAR, MSL = feet above mean sea level

PID = Headspace; D/O/S = Discoloration/Odor/Sheen; FID/MC = FID/Methane Corrected; G/S/F = Gravel/Sand/Fines
Additional data may have been collected in the field which is not included on this log.

Barr Engineering Company
4300 MarketPointe Drive Suite 200
Minneapolis, MN 55435
Telephone: 952-832-2600

LOG OF GEOPROBE FL-SB-02

DRAFT

Project: Freeway Dump and Landfill
Project No.: 23191372
Location: Burnsville, MN
Coordinates: UTM 15 N:476723.905m, E:4959852.229m
Datum: NAD 83; UTM Zone 15

Surface Elevation: 735 ft MSL*
Drilling Method: Geoprobe
Sampling Method: Dual-Tube
Completion Depth: 7.0 ft

Depth, feet	Sample Type & Recovery	Sample No.	ENVIRONMENTAL DATA	USCS	Graphic Log	LITHOLOGIC DESCRIPTION	Elevation, feet
0				SM		TOPSOIL (SM): moist.	
		1	**D/O/S:**None/ None/ None	CL		SANDY LEAN CLAY (CL): medium plasticity; dark gray; moist; trace fine gravel; sand is very fine to medium grained; [FILL].	
5		2	**D/O/S:**None/ None/ None	SM		SILTY SAND (SM): fine to coarse grained; dark gray; moist; [FILL].	
				WM		WASTE MATERIAL WITH ASH (WM): moist; brick; cardboard; dark gray ash mixed in with waste material.	
						End of geoprobe 7.0 feet	
10							
15							
20							
25							
30							

Date Boring Started: 4/2/19
Date Boring Completed: 4/2/19
Logged By: EMC
Drilling Contractor: Midwestern Drilling
Drill Rig: Geoprobe

Remarks: Pace sampled soil 0-6'
*Surface elevation interpreted from LIDAR, MSL = feet above mean sea level

PID = Headspace; D/O/S = Discoloration/Odor/Sheen; FID/MC = FID/Methane Corrected; G/S/F = Gravel/Sand/Fines
Additional data may have been collected in the field which is not included on this log.

Barr Engineering Company
4300 MarketPointe Drive Suite 200
Minneapolis, MN 55435
Telephone: 952-832-2600

LOG OF GEOPROBE FL-SB-03

DRAFT

Project: Freeway Dump and Landfill
Project No.: 23191372
Location: Burnsville, MN
Coordinates: UTM 15 N:476932.334m, E:4959848.521m
Datum: NAD 83; UTM Zone 15

Surface Elevation: 732 ft MSL*
Drilling Method: Geoprobe
Sampling Method: Dual-Tube
Completion Depth: 8.0 ft

Depth, feet	Sample Type & Recovery	Sample No.	ENVIRONMENTAL DATA	USCS	Graphic Log	LITHOLOGIC DESCRIPTION	Elevation, feet
0				SM		TOPSOIL (SM): moist.	
		1	**D/O/S:**None/ None/ None	SM		SILTY SAND (SM): very fine to coarse grained; gray; moist; dense; trace fine gravel and clay; [FILL].	
5				CL		LEAN CLAY (CL): medium plasticity; gray; moist; stiff; [FILL].	
		2	**D/O/S:**None/ None/ None	WM		WASTE MATERIAL (WM): waste material; layers of clay fill mixed with waste; moist; wood; paper; plastic.	
						End of geoprobe 8.0 feet	
10							
15							
20							
25							
30							

Date Boring Started: 4/2/19
Date Boring Completed: 4/2/19
Logged By: EMC
Drilling Contractor: Midwestern Drilling
Drill Rig: Geoprobe

Remarks: Pace sampled soil 0-6.5'
*Surface elevation interpreted from LIDAR, MSL = feet above mean sea level

PID = Headspace; D/O/S = Discoloration/Odor/Sheen; FID/MC = FID/Methane Corrected; G/S/F = Gravel/Sand/Fines
Additional data may have been collected in the field which is not included on this log.

Barr Engineering Company
4300 MarketPointe Drive Suite 200
Minneapolis, MN 55435
Telephone: 952-832-2600

LOG OF GEOPROBE FL-SB-04

DRAFT

Project: Freeway Dump and Landfill
Project No.: 23191372
Location: Burnsville, MN
Coordinates: UTM 15 N:477053.568m, E:4959973.610m
Datum: NAD 83; UTM Zone 15

Surface Elevation: 725 ft MSL*
Drilling Method: Geoprobe
Sampling Method: Dual-Tube
Completion Depth: 2.5 ft

Depth, feet	Sample Type & Recovery	Sample No.	ENVIRONMENTAL DATA	USCS	Graphic Log	LITHOLOGIC DESCRIPTION	Elevation, feet
0		1	**D/O/S:**None/ None/ None	SM		TOPSOIL (SM): moist.	
				SM		1.5': Large white gravel clast. SILTY SAND (SM): very fine to medium grained; gray; moist; [FILL].	
						End of geoprobe 2.5 feet	
5							
10							
15							
20							
25							
30							

Date Boring Started: 4/2/19
Date Boring Completed: 4/2/19
Logged By: EMC
Drilling Contractor: Midwestern Drilling
Drill Rig: Geoprobe

Remarks: Pace sampled soil 0-2.5'
*Surface elevation interpreted from LIDAR, MSL = feet above mean sea level

PID = Headspace; D/O/S = Discoloration/Odor/Sheen; FID/MC = FID/Methane Corrected; G/S/F = Gravel/Sand/Fines
Additional data may have been collected in the field which is not included on this log.

Barr Engineering Company
4300 MarketPointe Drive Suite 200
Minneapolis, MN 55435
Telephone: 952-832-2600

LOG OF GEOPROBE FL-SB-05

DRAFT

Project: Freeway Dump and Landfill
Project No.: 23191372
Location: Burnsville, MN
Coordinates: UTM 15 N:476821.380m, E:4960093.155m
Datum: NAD 83; UTM Zone 15

Surface Elevation: 733 ft MSL*
Drilling Method: Geoprobe
Sampling Method: Dual-Tube
Completion Depth: 15.0 ft

Depth, feet	Sample Type & Recovery	Sample No.	ENVIRONMENTAL DATA	USCS	Graphic Log	LITHOLOGIC DESCRIPTION	Elevation, feet
0				SM		TOPSOIL (SM): moist.	
				CL		SANDY LEAN CLAY (CL): medium plasticity; brown; moist; sand is very fine to fine grained; [FILL].	
		1	**D/O/S:**None/ None/ None	SM		SILTY SAND (SM): fine to coarse grained; gray and brown; moist; trace fine gravel; [FILL].	
5							
		2	**D/O/S:**None/ None/ None	WM		WASTE MATERIAL (WM): plastic; brick; carpet; wood; paper.	
10							
		3	**D/O/S:**None/ None/ None				
15						End of geoprobe 15.0 feet	
20							
25							
30							

Date Boring Started: 4/2/19
Date Boring Completed: 4/2/19
Logged By: EMC
Drilling Contractor: Midwestern Drilling
Drill Rig: Geoprobe

Remarks: Pace sampled soil 0-6.5'
Pace sampled waste material 6.5-15'
*Surface elevation interpreted from LIDAR, MSL = feet above mean sea level

PID = Headspace; D/O/S = Discoloration/Odor/Sheen; FID/MC = FID/Methane Corrected; G/S/F = Gravel/Sand/Fines
Additional data may have been collected in the field which is not included on this log.

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LOG OF GEOPROBE FL-SB-06

DRAFT

Project: Freeway Dump and Landfill
Project No.: 23191372
Location: Burnsville, MN
Coordinates: UTM 15 N:476953.065m, E:4960247.897m
Datum: NAD 83; UTM Zone 15

Surface Elevation: 746 ft MSL*
Drilling Method: Geoprobe
Sampling Method: Dual-Tube
Completion Depth: 15.0 ft

Depth, feet	Sample Type & Recovery	Sample No.	ENVIRONMENTAL DATA	USCS	Graphic Log	LITHOLOGIC DESCRIPTION	Elevation, feet
0		1	**D/O/S:**None/ None/ None	SM		SILTY SAND (SM): silty sand transitioning to silt/clay with sand at 1-1.5'; brown to gray; moist; [FILL].	
5		2	**D/O/S:**None/ Light/ None	WM		WASTE MATERIAL (WM): waste material mixed with soil; dark brown to black; moist; with wood; paper; plastic; light decomposition odor.	
10		3	**D/O/S:**None/ Strong/ None			12 - 14': black clay lense. 14 - 15': strong decomposition odor.	
15						End of geoprobe 15.0 feet	
20							
25							
30							

Date Boring Started: 4/2/19
Date Boring Completed: 4/2/19
Logged By: EMC
Drilling Contractor: Midwestern Drilling
Drill Rig: Geoprobe

Remarks: *Surface elevation interpreted from LIDAR, MSL = feet above mean sea level

PID = Headspace; D/O/S = Discoloration/Odor/Sheen; FID/MC = FID/Methane Corrected; G/S/F = Gravel/Sand/Fines
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LOG OF GEOPROBE FL-SB-07

DRAFT

Project: Freeway Dump and Landfill
Project No.: 23191372
Location: Burnsville, MN
Coordinates: UTM 15 N:476829.530m, E:4960340.349m
Datum: NAD 83; UTM Zone 15

Surface Elevation: 726 ft MSL*
Drilling Method: Geoprobe
Sampling Method: Dual-Tube
Completion Depth: 15.0 ft

Depth, feet	Sample Type & Recovery	Sample No.	ENVIRONMENTAL DATA	USCS	Graphic Log	LITHOLOGIC DESCRIPTION	Elevation, feet
0				SM		TOPSOIL (SM): moist.	
		1	**D/O/S:**None/ None/ None	SM		SILTY SAND WITH GRAVEL (SM): dark brown; moist; [FILL]. From 3.5': very fine to fine; brown/dark gray.	
5		2	**D/O/S:**None/ Light/ None	WM		WASTE MATERIAL (WM): moist; with wood; paper; plastic; fabric; brick; concrete; chalk; light decomposition odor. From 5 -7': layer of silty sand fill.	
10		3	**D/O/S:**None/ Light/ None				
15						End of geoprobe 15.0 feet	
20							
25							
30							

Date Boring Started: 4/2/19
Date Boring Completed: 4/2/19
Logged By: EMC
Drilling Contractor: Midwestern Drilling
Drill Rig: Geoprobe

Remarks: Pace sampled soil 0-4.5'
Pace sampled waste material 4.5-15' (portions without fill)
*Surface elevation interpreted from LIDAR, MSL = feet above mean sea level

PID = Headspace; D/O/S = Discoloration/Odor/Sheen; FID/MC = FID/Methane Corrected; G/S/F = Gravel/Sand/Fines
Additional data may have been collected in the field which is not included on this log.

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LOG OF GEOPROBE FL-SB-08

DRAFT

Project: Freeway Dump and Landfill
Project No.: 23191372
Location: Burnsville, MN
Coordinates: UTM 15 N:476948.426m, E:4960520.597m
Datum: NAD 83; UTM Zone 15

Surface Elevation: 713 ft MSL*
Drilling Method: Geoprobe
Sampling Method: Dual-Tube
Completion Depth: 15.0 ft

Depth, feet	Sample Type & Recovery	Sample No.	ENVIRONMENTAL DATA	USCS	Graphic Log	LITHOLOGIC DESCRIPTION	Elevation, feet
0				SM		TOPSOIL (SM): moist.	
		1	**D/O/S:**None/ None/ None	SM		SILTY SAND (SM): layers of firm, medium plasticity lean clay; fine to coarse grained; gray/dark gray to brown; moist; trace fine gravel; [FILL].	
5							
		2	**D/O/S:**None/ None/ None	WM		WASTE MATERIAL (WM): wood waste mixed with dark gray silty sand fill; wet.	
10							
		3	**D/O/S:**None/ Light/ None				
15						End of geoprobe 15.0 feet	
20							
25							
30							

Date Boring Started: 4/2/19
Date Boring Completed: 4/2/19
Logged By: EMC
Drilling Contractor: Midwestern Drilling
Drill Rig: Geoprobe

Remarks: Dashed line indicates an inferred contact depth
Pace sampled soil 0-5'
Pace sampled waste material 6-15' (portions without fill)
*Surface elevation interpreted from LIDAR, MSL = feet above mean sea level
PID = Headspace; D/O/S = Discoloration/Odor/Sheen; FID/MC = FID/Methane Corrected; G/S/F = Gravel/Sand/Fines
Additional data may have been collected in the field which is not included on this log.

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LOG OF GEOPROBE FL-SB-09

DRAFT

Project: Freeway Dump and Landfill
Project No.: 23191372
Location: Burnsville, MN
Coordinates: UTM 15 N:476615.691m, E:4960220.658m
Datum: NAD 83; UTM Zone 15

Surface Elevation: 735 ft MSL*
Drilling Method: Geoprobe
Sampling Method: Dual-Tube
Completion Depth: 20.0 ft

Depth, feet	Sample Type & Recovery	Sample No.	ENVIRONMENTAL DATA	USCS	Graphic Log	LITHOLOGIC DESCRIPTION	Elevation, feet
0				SM		TOPSOIL (SM): moist.	
		1	**D/O/S:**None/ None/ None			SILTY SAND (SM): fine to coarse grained; brown; moist; w/ gravel; [FILL].	
						From 3': dense; gray; trace fine gravel.	
5				SM		From 5': very fine to fine grained, dark brown to gray.	
		2	**D/O/S:**None/ None/ None			8.5': 6" layer of concrete debris.	
10						WASTE MATERIAL (WM): moist; with wood, concrete; light waste odor; sample stuck in sampling tube; attempted to sample with macro core; appeared to be wood waste material.	
		3				From 10 - 15': no recovery.	
15				WM			
		4	**D/O/S:**None/ Light/ None				
20						End of geoprobe 20.0 feet	
25							
30							

Date Boring Started: 4/2/19
Date Boring Completed: 4/2/19
Logged By: EMC
Drilling Contractor: Midwestern Drilling
Drill Rig: Geoprobe

Remarks: Dashed line indicates an inferred contact depth
Pace sampled soil 0-8'; Pace sampled waste material 17-20'
Sample 3 from 10-15' stuck in sampling tube
*Surface elevation interpreted from LIDAR, MSL = feet above mean sea level

PID = Headspace; D/O/S = Discoloration/Odor/Sheen; FID/MC = FID/Methane Corrected; G/S/F = Gravel/Sand/Fines
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LOG OF GEOPROBE FL-SB-10

DRAFT

Project: Freeway Dump and Landfill
Project No.: 23191372
Location: Burnsville, MN
Coordinates: UTM 15 N:476679.998m, E:4960100.812m
Datum: NAD 83; UTM Zone 15

Surface Elevation: 750 ft MSL*
Drilling Method: Geoprobe
Sampling Method: Dual-Tube
Completion Depth: 25.0 ft

Depth, feet	Sample Type & Recovery	Sample No.	ENVIRONMENTAL DATA	USCS	Graphic Log	LITHOLOGIC DESCRIPTION	Elevation, feet
0				SM		TOPSOIL (SM): moist.	
		1	**D/O/S:**None/ None/ None			SILTY SAND (SM): fine to coarse grained; brown to black; moist; [FILL].	
5				SM		From 5': gray; layers of white sandy fill with coarse gravel; trace wood debris.	
		2	**D/O/S:**None/ None/ None				
10				CL		SANDY LEAN CLAY (CL): medium plasticity; gray; moist; sand is very fine to medium grained; trace wood debris; [FILL].	
		3	**D/O/S:**None/ None/ None				
15				SM		SILTY SAND (SM): very fine to medium grained; gray; moist; trace fine gravel; [FILL].	
		4	**D/O/S:**None/ None/ None				
20							
		5	**D/O/S:**None/ None/ None				
25						End of geoprobe 25.0 feet	
30							

Date Boring Started: 4/2/19
Date Boring Completed: 4/2/19
Logged By: EMC
Drilling Contractor: Midwestern Drilling
Drill Rig: Geoprobe

Remarks: Pace sampled soil 0-25'
No waste material encountered
*Surface elevation interpreted from LIDAR, MSL = feet above mean sea level

PID = Headspace; D/O/S = Discoloration/Odor/Sheen; FID/MC = FID/Methane Corrected; G/S/F = Gravel/Sand/Fines
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LOG OF GEOPROBE FL-SB-11

DRAFT

Project:	Freeway Dump and Landfill	Surface Elevation:	745 ft MSL*
Project No.:	23191372	Drilling Method:	Geoprobe
Location:	Burnsville, MN	Sampling Method:	Dual-Tube
Coordinates:	UTM 15 N:476615.776m, E:4959978.483m	Completion Depth:	25.0 ft
Datum:	NAD 83; UTM Zone 15		

Depth, feet	Sample Type & Recovery	Sample No.	ENVIRONMENTAL DATA	USCS	Graphic Log	LITHOLOGIC DESCRIPTION	Elevation, feet
0				SM		TOPSOIL (SM): moist.	
		1	**D/O/S:**None/ None/ None			SILTY SAND (SM): very fine to medium grained; brown, black, gray; moist; trace fine gravel; [FILL].	
5				SM		From 5': gray.	
		2	**D/O/S:**None/ None/ None				
10							
		3	**D/O/S:**None/ None/ None	OL		ORGANIC SILT (OL): organics; black; soft; moist; [FILL].	
				CL		LEAN CLAY (CL): medium plasticity; gray; stiff to soft; moist; [FILL].	
15							
		4	**D/O/S:**None/ None/ None				
20				WM		WASTE MATERIAL (WM): mixed layers of gray silty sand/lean clay with waste material; moist; wood; organics; plastic; brick; brown sludge; light waste odor.	
		5	**D/O/S:**Yes/ Light/ None				
25						End of geoprobe 25.0 feet	
30							

Date Boring Started:	4/2/19
Date Boring Completed:	4/2/19
Logged By:	EMC
Drilling Contractor:	Midwestern Drilling
Drill Rig:	Geoprobe

Remarks: Dashed line indicates an inferred contact depth
Pace sampled soil 0-20'
Pace sampled waste material 20-25' (portions without fill)
*Surface elevation interpreted from LIDAR, MSL = feet above mean sea level

PID = Headspace; D/O/S = Discoloration/Odor/Sheen; FID/MC = FID/Methane Corrected; G/S/F = Gravel/Sand/Fines
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LOG OF GEOPROBE FL-SB-12

DRAFT

Project:	Freeway Dump and Landfill	Surface Elevation:	731 ft MSL*
Project No.:	23191372	Drilling Method:	Geoprobe
Location:	Burnsville, MN	Sampling Method:	Dual-Tube
Coordinates:	UTM 15 N:476495.800m, E:4960100.822m	Completion Depth:	15.0 ft
Datum:	NAD 83; UTM Zone 15		

Depth, feet	Sample Type & Recovery	Sample No.	ENVIRONMENTAL DATA	USCS	Graphic Log	LITHOLOGIC DESCRIPTION	Elevation, feet
0				SM		TOPSOIL (SM): moist.	
		1	**D/O/S:**None/ None/ None	CL		SANDY LEAN CLAY (CL): gray; moist; soft; medium plasticity; sand is very fine grained to fine grained; mixed with layers of fine to coarse grained silty sand with trace gravel; [FILL].	
5		2	**D/O/S:**None/ None/ None				
10		3	**D/O/S:**None/ Light/ None	WM		WASTE MATERIAL (WM): moist; with brick, wood, coal tar; light petroleum odor.	
15						End of geoprobe 15.0 feet	
20							
25							
30							

Date Boring Started:	4/2/19
Date Boring Completed:	4/2/19
Logged By:	EMC
Drilling Contractor:	Midwestern Drilling
Drill Rig:	Geoprobe

Remarks: Dashed line indicates an inferred contact depth
Pace sampled soil 0-10'
Pace sampled waste material 10-15'
*Surface elevation interpreted from LIDAR, MSL = feet above mean sea level

PID = Headspace; D/O/S = Discoloration/Odor/Sheen; FID/MC = FID/Methane Corrected; G/S/F = Gravel/Sand/Fines
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LOG OF GEOPROBE FL-SB-13

DRAFT

Project: Freeway Dump and Landfill
Project No.: 23191372
Location: Burnsville, MN
Coordinates: UTM 15 N:476378.648m, E:4960224.179m
Datum: NAD 83; UTM Zone 15

Surface Elevation: 718 ft MSL*
Drilling Method: Geoprobe
Sampling Method: Dual-Tube
Completion Depth: 14.0 ft

Depth, feet	Sample Type & Recovery	Sample No.	ENVIRONMENTAL DATA	USCS	Graphic Log	LITHOLOGIC DESCRIPTION	Elevation, feet
0		1	**D/O/S:**None/ None/ None	SM		SILTY SAND (SM): fine to coarse grained; gray; moist; [FILL]. From 2.5': dense, very fine to fine grained.	
5		2	**D/O/S:**None/ Light/ Slight	WM		WASTE MATERIAL (WM): mixed layers of silty sand fill with waste; moist. 4.5 - 6': potentially CCR impacted fill; light undefined odor; cloudy filmy sheen. 6': large white gravel clast.	
10		3	**D/O/S:**None/ None/ None				
						End of geoprobe 14.0 feet	
15							
20							
25							
30							

Date Boring Started: 4/2/19
Date Boring Completed: 4/2/19
Logged By: EMC
Drilling Contractor: Midwestern Drilling
Drill Rig: Geoprobe

Remarks: Pace sampled soil 0-6'
Pace sampled waste material 6.5-14' (portions without fill)
*Surface elevation interpreted from LIDAR, MSL = feet above mean sea level

PID = Headspace; D/O/S = Discoloration/Odor/Sheen; FID/MC = FID/Methane Corrected; G/S/F = Gravel/Sand/Fines
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LOG OF GEOPROBE FL-SB-14

DRAFT

Project: Freeway Dump and Landfill
Project No.: 23191372
Location: Burnsville, MN
Coordinates: UTM 15 N:476373.391m, E:4960037.175m
Datum: NAD 83; UTM Zone 15

Surface Elevation: 730 ft MSL*
Drilling Method: Geoprobe
Sampling Method: Dual-Tube
Completion Depth: 13.0 ft

Depth, feet	Sample Type & Recovery	Sample No.	ENVIRONMENTAL DATA	USCS	Graphic Log	LITHOLOGIC DESCRIPTION	Elevation, feet
0				SM		TOPSOIL (SM): moist.	
		1	**D/O/S:**None/ None/ None	SM		SILTY SAND (SM): very fine to medium grained; dark brown to gray; moist; trace gravel; [FILL].	
5							
		2	**D/O/S:**None/ None/ None	CL		LEAN CLAY (CL): very fine to fine grained; gray; moist; soft; medium plasticity; sand is very fine to fine grained; [FILL].	
				SM		SILTY SAND (SM): very fine to medium grained; gray; moist; trace gravel; [FILL].	
10		3		WM		WASTE MATERIAL (WM): sample stuck in sampling tube; attempted to sample with macro core; appeared to be asphalt.	
						End of geoprobe 13.0 feet	
15							
20							
25							
30							

Date Boring Started: 4/2/19
Date Boring Completed: 4/2/19
Logged By: EMC
Drilling Contractor: Midwestern Drilling
Drill Rig: Geoprobe

Remarks: Dashed line indicates an inferred contact depth
Pace sampled soil 0-10'
No waste sampled, waste sample stuck in tube
*Surface elevation interpreted from LIDAR, MSL = feet above mean sea level
PID = Headspace; D/O/S = Discoloration/Odor/Sheen; FID/MC = FID/Methane Corrected; G/S/F = Gravel/Sand/Fines
Additional data may have been collected in the field which is not included on this log.

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LOG OF GEOPROBE FD-SB-A4 (19)

DRAFT

Project:	Freeway Dump and Landfill	Surface Elevation:	726 ft MSL*
Project No.:	23191372	Drilling Method:	Geoprobe
Location:	Burnsville, MN	Sampling Method:	Dual-Tube
Coordinates:	UTM 15 N:4959649.765m, E:477388.457m	Completion Depth:	5.0 ft
Datum:	NAD 83; UTM Zone 15		

Depth, feet	Sample Type & Recovery	Sample No.	USCS	Graphic Log	LITHOLOGIC DESCRIPTION	Elevation, feet
0		1	SM		(SM): SILTY SAND with GRAVEL; dark brown; moist; homogeneous, loose; 10% gravel, 70% sand, 20% fines, [FILL].	
			ASH		(ASH): ASH; gray; moist; massive.	
5					End of geoprobe 5.0 feet	
10						
15						
20						
25						
30						

Date Boring Started:	3/29/19
Date Boring Completed:	3/29/19
Logged By:	AKS3/EMC
Drilling Contractor:	Midwestern Drilling
Drill Rig:	Geoprobe

Remarks: *Surface elevation interpreted from LIDAR, MSL = feet above mean sea level

Additional data may have been collected in the field which is not included on this log.

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LOG OF GEOPROBE FD-SB-B1 (19)

DRAFT

Project:	Freeway Dump and Landfill	Surface Elevation:	724 ft MSL*
Project No.:	23191372	Drilling Method:	Geoprobe
Location:	Burnsville, MN	Sampling Method:	Dual-Tube
Coordinates:	UTM 15 N:4959595.631m, E:477220.286m	Completion Depth:	10.0 ft
Datum:	NAD 83; UTM Zone 15		

Depth, feet	Sample Type & Recovery	Sample No.	USCS	Graphic Log	LITHOLOGIC DESCRIPTION	Elevation, feet
0		1	SM		(SM): SILTY SAND with GRAVEL; brown; moist; homogeneous, firm, with fine to coarse gravel; 5% gravel, 70% sand, 25% fines, [FILL].	
5		2	ASH		(ASH): ASH; gray; moist; layer of brown silty sand below ash.	
10					End of geoprobe 10.0 feet	
15						
20						
25						
30						

Date Boring Started:	3/29/19
Date Boring Completed:	3/29/19
Logged By:	AKS3/EMC
Drilling Contractor:	Midwestern Drilling
Drill Rig:	Geoprobe

Remarks: *Surface elevation interpreted from LIDAR, MSL = feet above mean sea level

Additional data may have been collected in the field which is not included on this log.

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LOG OF GEOPROBE FD-SB-C3 (19)

DRAFT

Project:	Freeway Dump and Landfill	Surface Elevation:	726 ft MSL*
Project No.:	23191372	Drilling Method:	Geoprobe
Location:	Burnsville, MN	Sampling Method:	Dual-Tube
Coordinates:	UTM 15 N:4959539.675m, E:477336.735m	Completion Depth:	10.0 ft
Datum:	NAD 83; UTM Zone 15		

Depth, feet	Sample Type & Recovery	Sample No.	USCS	Graphic Log	LITHOLOGIC DESCRIPTION	Elevation, feet
0		1	SM		(SM): SILTY SAND with GRAVEL; fine to coarse grained; brown; moist; 10% gravel, 70% sand, 20% fines, [FILL].	
			ASH		(ASH): ASH; gray; moist; soft, massive, nonplastic.	
5		2	WM		(WM): WASTE MATERIAL; with treated wood and brick.	
10					End of geoprobe 10.0 feet	
15						
20						
25						
30						

Date Boring Started:	3/29/19
Date Boring Completed:	3/29/19
Logged By:	AKS3/EMC
Drilling Contractor:	Midwestern Drilling
Drill Rig:	Geoprobe

Remarks: Dashed line indicates an inferred contact depth
*Surface elevation interpreted from LIDAR, MSL = feet above mean sea level

Additional data may have been collected in the field which is not included on this log.

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LOG OF GEOPROBE FD-SB-F2 (19)

DRAFT

Project:	Freeway Dump and Landfill	Surface Elevation:	726 ft MSL*
Project No.:	23191372	Drilling Method:	Geoprobe
Location:	Burnsville, MN	Sampling Method:	Dual-Tube
Coordinates:	UTM 15 N:4959375.135m, E:477282.735m	Completion Depth:	10.0 ft
Datum:	NAD 83; UTM Zone 15		

Depth, feet	Sample Type & Recovery	Sample No.	USCS	Graphic Log	LITHOLOGIC DESCRIPTION	Elevation, feet
0		1	SM		(SM): SILTY SAND with GRAVEL; brown; moist; compact, massive; 10% gravel, 70% sand, 20% fines, [FILL].	
5			ASH		(ASH): ASH; dark gray; moist; nonplastic, stiff, more clay at 6' bgs.	
		2	WM		(WM): WASTE MATERIAL; moist; dark gray sandy matrix, with wood, glass, plastic; moderate treated wood odor.	
10					End of geoprobe 10.0 feet	
15						
20						
25						
30						

Date Boring Started:	3/29/19
Date Boring Completed:	3/29/19
Logged By:	AKS3/EMC
Drilling Contractor:	Midwestern Drilling
Drill Rig:	Geoprobe

Remarks: *Surface elevation interpreted from LIDAR, MSL = feet above mean sea level

Additional data may have been collected in the field which is not included on this log.

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LOG OF GEOPROBE FD-SB-G5 (19)

DRAFT

Project:	Freeway Dump and Landfill	Surface Elevation:	730 ft MSL*
Project No.:	23191372	Drilling Method:	Geoprobe
Location:	Burnsville, MN	Sampling Method:	Dual-Tube
Coordinates:	UTM 15 N:4959341.95m, E:477443.476m	Completion Depth:	10.0 ft
Datum:	NAD 83; UTM Zone 15		

Depth, feet	Sample Type & Recovery	Sample No.	USCS	Graphic Log	LITHOLOGIC DESCRIPTION	Elevation, feet
0		1	SM		(SM): SILTY SAND with GRAVEL; brown; moist; [FILL].	
5		2	ASH		(ASH): ASH; gray; moist.	
			WM		(WM): WASTE MATERIAL; black sandy matrix, with brick, slag, wood, plastic; light odor.	
10					End of geoprobe 10.0 feet	
15						
20						
25						
30						

Date Boring Started:	3/29/19
Date Boring Completed:	3/29/19
Logged By:	AKS3/EMC
Drilling Contractor:	Midwestern Drilling
Drill Rig:	Geoprobe

Remarks: Dashed line indicates an inferred contact depth
*Surface elevation interpreted from LIDAR, MSL = feet above mean sea level

Additional data may have been collected in the field which is not included on this log.

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Appendix A-3

Monitoring Well Boring Logs

Barr Engineering Company
4300 MarketPointe Drive Suite 200
Minneapolis, MN 55435
Telephone: 952-832-2600

LOG OF BORING MW-09

DRAFT

Project:	Freeway Dump and Landfill	Surface Elevation:	727 ft MSL*
Project No.:	23191372	Drilling Method:	Geoprobe
Location:	Burnsville, MN	Sampling Method:	Dual-Tube
Coordinates:	UTM 15 N:476607.023m, E:4959741.980m	Completion Depth:	26.0 ft
Datum:	NAD 83; UTM Zone 15	Unique Well No.:	834659

Depth, feet	Sample Type & Recovery	Sample No.	ENVIRONMENTAL DATA	USCS	Graphic Log	LITHOLOGIC DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	Elevation, feet
0				SM		SILTY SAND (SM): fine to medium grained; brown; moist to wet; subangular; few gravel; few roots and organics.	0 - 2': Quick Set Cement Grout	
		1	**PID:**4 **D/O/S:**None/ None/ Slight	CL		SANDY LEAN CLAY (CL): dark gray; firm; medium grained sand, few subangular gravel, trace asphalt; slight monochrome sheen.		
5						WASTE MATERIAL (WM): moderate waste odor. 5.5 - 15': wood, concrete, plastic, decomposition odor; moist.		
		2	**PID:**47.1 **D/O/S:**None/ Moderate/ None				2 - 15': Bentonite Chip Grout	
10			**D/O/S:**None/ None/ None					
		3						
15				WM		15 - 20': paper, wood, metal, glass, plastic; wet.		
		4	**PID:**53.1 **D/O/S:**None/ Moderate/ None					
20						20 - 25': wood, paper, ash.	15 - 26': Red Flint Sand Pack, No. 20	
		5	**PID:**74.6 **D/O/S:**None/ Moderate/ None				16 - 26': 0.010 Slot PVC Screen	
25		6	**PID:**28.2 **D/O/S:**None/ None/ None	SP		POORLY GRADED SAND (SP): fine to medium grained; brown to black.		
				OPC		OPC (OPC). DOLOMITE LIMESTONE; Prairie du Chien; white to gray; moderately weathered.		
						End of boring 26.0 feet		
30								

Date Boring Started:	5/21/19
Date Boring Completed:	5/21/19
Logged By:	EMC
Drilling Contractor:	Midwestern
Drill Rig:	Geoprobe

Remarks: Background PID: 0.2 ppm
LandGEM 2000: 66.8% CH4, 32.2% CO2, 0.3% O2, 0.7% Balance
Refusal at 26'
*Surface elevation interpreted from LIDAR, MSL = feet above mean sea level

PID = Headspace; D/O/S = Discoloration/Odor/Sheen; FID/MC = FID/Methane Corrected; G/S/F = Gravel/Sand/Fines
Additional data may have been collected in the field which is not included on this log.

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LOG OF BORING MW-09D

DRAFT

Project:	Freeway Dump and Landfill	Surface Elevation:	726 ft MSL*
Project No.:	23191372	Drilling Method:	Sonic/Rock Coring
Location:	Burnsville, MN	Sampling Method:	Sonic/HQ Core
Coordinates:	UTM 15 N:476611.274m, E:4959741.311m	Completion Depth:	83.0 ft
Datum:	NAD 83; UTM Zone 15	Unique Well No.:	837777

Depth, feet	Sample Type & Recovery	Sample No.	ENVIRONMENTAL DATA	USCS	Graphic Log	LITHOLOGIC DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	Elevation, feet
0			**PID:**0.3 **D/O/S:**None/ Light/ None	SC-CL		CLAYEY SAND TO SANDY LEAN CLAY (SC-CL): very dark gray(10 YR 3/1); firm; cohesive; trace gravel, approximately 50% sand, and 50% fines.		
		1		CL		SANDY LEAN CLAY (CL): fine to coarse grained; mottled very dark and olive gray (10 YR 3/1 and 5 Y 4/2); firm; medium plasticity; medium toughness; approximately 5% gravel and 30% sand.		
5			**PID:**2 **D/O/S:**Black/ Light/ None			WASTE MATERIAL (WM): newspaper, glass, wood, wire, platic bags, and plastic in black clayey matrix, light waste odor and black discoloration throughout.		
			PID:4.1 **D/O/S:**Black/ Light/ None					
10		2	**PID:**28.1 **D/O/S:**Red/ Moderate/ None			11': red paint/grease, moderate odor, 28.1 ppm PID reading.		
			PID:25.3 **D/O/S:**Black/ Light/ None	WM		13': tire.		
15							0 - 45': Portland Cement Grout	
			PID:49.3 **D/O/S:**Black/ Light/ Trace			16 - 20': trace biogenic sheen, 49.3 ppm PID reading.		
20		3	**PID:**26			21': 26 ppm PID reading.		
						22': concrete.		
			PID:11 **D/O/S:**Black/ Light/ Trace					
25			**PID:**1.6	OPC		PRAIRIE DU CHEIN (OPC): Dolomitic limestone, hard, white/gray to light brown, fine to medium grained, medium bedding, moderately to intensely fractured, fractures are primarily horizontal with secondary mineralization/infilling, frequent vuggy zones, occasional dolomite recrystallization in vugs.		
		4						
30								

Date Boring Started:	4/2/19
Date Boring Completed:	4/4/19
Logged By:	KAM/AKS3
Drilling Contractor:	Cascade Drilling LP
Drill Rig:	Full Size Track Mounted Rotasonic

Remarks: Sonic drilled to 31' bgs then switched to HQ core barrel. Driller reported loss of water return at 65' and 70'. Returned at 67'. *Surface elevation interpreted from LIDAR, MSL = feet above mean sea level

PID = Headspace; D/O/S = Discoloration/Odor/Sheen; FID/MC = FID/Methane Corrected; G/S/F = Gravel/Sand/Fines
Additional data may have been collected in the field which is not included on this log.

Barr Engineering Company
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Telephone: 952-832-2600

LOG OF BORING MW-09D

DRAFT

Project: Freeway Dump and Landfill
Project No.: 23191372
Location: Burnsville, MN
Coordinates: UTM 15 N:476611.274m, E:4959741.311m
Datum: NAD 83; UTM Zone 15

Surface Elevation: 726 ft MSL*
Drilling Method: Sonic/Rock Coring
Sampling Method: Sonic/HQ Core
Completion Depth: 83.0 ft

Unique Well No.: 837777

Depth, feet	Sample Type & Recovery	Sample No.	ENVIRONMENTAL DATA	USCS	Graphic Log	LITHOLOGIC DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	Elevation, feet
30		5				PRAIRIE DU CHEIN (OPC): Dolomitic limestone, hard, white/gray to light brown, fine to medium grained, medium bedding, moderately to intensely fractured, fractures are primarily horizontal with secondary mineralization/infilling, frequent vuggy zones, occasional dolomite recrystallization in vugs. *(continued)*		
						33.4': thin bedding, moderately fractured.		
35		6				34.4 - 34.8': rubble zone, light gray, angular dolomite fragments. 34.8 - 43': transition to unfractured/slightly fractured vuggy dolomite, light brown.		
40		7						
						43 - 44': increase in fracture density (slight to moderate), iron and manganese coating on fracture planes. 44-49': return to competant/relatively unfractured rock. 44': loss of water circulation during drilling.		
45		8		OPC		46': highly vuggy zone.		
						49 - 50.7': highly vugged zone with moderate to intense fractured. Secondary dolomite mineralizarion in vugs and infilling fractures.		
50		9				50.7 - 53': decrease to moderate fracture intensity. Persistent large vugs with dolomite recrystallization.	45 - 83': Open to Bedrock	
55		10						
60								

Date Boring Started: 4/2/19
Date Boring Completed: 4/4/19
Logged By: KAM/AKS3
Drilling Contractor: Cascade Drilling LP
Drill Rig: Full Size Track Mounted Rotasonic

Remarks: Sonic drilled to 31' bgs then switched to HQ core barrel. Driller reported loss of water return at 65' and 70'. Returned at 67'. *Surface elevation interpreted from LIDAR, MSL = feet above mean sea level

PID = Headspace; D/O/S = Discoloration/Odor/Sheen; FID/MC = FID/Methane Corrected; G/S/F = Gravel/Sand/Fines
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LOG OF BORING MW-09D

DRAFT

Project: Freeway Dump and Landfill
Project No.: 23191372
Location: Burnsville, MN
Coordinates: UTM 15 N:476611.274m, E:4959741.311m
Datum: NAD 83; UTM Zone 15

Surface Elevation: 726 ft MSL*
Drilling Method: Sonic/Rock Coring
Sampling Method: Sonic/HQ Core
Completion Depth: 83.0 ft

Unique Well No.: 837777

Depth, feet	Sample Type & Recovery	Sample No.	ENVIRONMENTAL DATA	USCS	Graphic Log	LITHOLOGIC DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	Elevation, feet
60		11				PRAIRIE DU CHEIN (OPC): Dolomitic limestone, hard, white/gray to light brown, fine to medium grained, medium bedding, moderately to intensely fractured, fractures are primarily horizontal with secondary mineralization/infilling, frequent vuggy zones, occasional dolomite recrystallization in vugs. *(continued)*		
65		12						
70		13		OPC		70 - 72': driller reported 1' void and soft drilling. 71 - 72': Sandy dolomite, pitted and vuggy. 73 - 75.3': thinly bedded sandy zone.	45 - 83': Open to Bedrock	
75		14				76.4 - 76.6': broken, pitted and vugs throughout. Manganese and iron staining on fracture faces. From 77.3': sandy dolomite.		
80		15				78 - 83': sampled with 4" sonic core barrel to deepen open hole. No RQD completed.		
85						End of boring 83.0 feet		
90								

Date Boring Started: 4/2/19
Date Boring Completed: 4/4/19
Logged By: KAM/AKS3
Drilling Contractor: Cascade Drilling LP
Drill Rig: Full Size Track Mounted Rotasonic

Remarks: Sonic drilled to 31' bgs then switched to HQ core barrel. Driller reported loss of water return at 65' and 70'. Returned at 67'. *Surface elevation interpreted from LIDAR, MSL = feet above mean sea level

PID = Headspace; D/O/S = Discoloration/Odor/Sheen; FID/MC = FID/Methane Corrected; G/S/F = Gravel/Sand/Fines
Additional data may have been collected in the field which is not included on this log.

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LOG OF BORING MW-10D

DRAFT

Project:	Freeway Dump and Landfill	Surface Elevation:	721 ft MSL*
Project No.:	23191372	Drilling Method:	Sonic/Rock Coring
Location:	Burnsville, MN	Sampling Method:	Sonic/HQ Core
Coordinates:	UTM 15 N:476391.914m, E:4959741.246m	Completion Depth:	88.0 ft
Datum:	NAD 83; UTM Zone 15	Unique Well No.:	837776

Depth, feet	Sample Type & Recovery	Sample No.	ENVIRONMENTAL DATA	USCS	Graphic Log	LITHOLOGIC DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	Elevation, feet
0				CL		SANDY LEAN CLAY (CL): brown (10 YR 4/3) to very dark gray (10 YR 3/1); medium plasticity; medium toughness; trace to 5% gravel, 30% fine to coarse grained sand; black discoloration.		
		1	**PID:**4.9 **D/O/S:**Black/ Light/ None			WASTE MATERIAL (WM): plywood, wood, plastic, paper, metal, wire, burlap, tubing, plastic bags and containers, newspaper, glass, light to moderate waste odors and black discoloration throughout. 2 - 2.4': pulverized concrete.		
5						6': 62.5 ppm PID detection.		
			PID:5.6 **D/O/S:**Black/ Light/ None					
10		2	**PID:**62.5 **D/O/S:**Black/ Light/ None	WM				
15						16': 1971 newspaper, 57.9 ppm PID detection.	0 - 66.5': Portland Cement Grout	
			PID:203 **D/O/S:**Black/ Moderate/ Rainbow			19': 203 ppm PID detection, rainbow sheen.		
20		3	**PID:**57.9 **D/O/S:**Black/ Light/ None					
			PID:5.9 **D/O/S:**Black/ Light/ None			PRAIRIE DU CHIEN (OPC): Prairie du Chien limestone, hard to very hard, gray to light orangeish brown, fine grained, medium to thickly bedded, slightly decomposed, moderately disintegrated, moderately fractured, near horizontal bedding plane joints, pin holes and vugs are partially healed with dolomite/calcite. 22 - 24': pulverized highly weathered limestone, light to pale brown.		
25				OPC				
		4						
30								

Date Boring Started:	3/27/19
Date Boring Completed:	4/1/19
Logged By:	KAM
Drilling Contractor:	Cascade Drilling LP
Drill Rig:	Full Size Track Mounted Rotasonic

Remarks: Sonic drilled to 31' bgs then switched to HQ core barrel. Driller reported core barrel drop in the last 4" of the 43 - 48' core interval, and loss of water return at 55' and 78'. *Surface elevation interpreted from LIDAR, MSL = feet above mean sea level

PID = Headspace; D/O/S = Discoloration/Odor/Sheen; FID/MC = FID/Methane Corrected; G/S/F = Gravel/Sand/Fines
Additional data may have been collected in the field which is not included on this log.

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Telephone: 952-832-2600

LOG OF BORING MW-10D

DRAFT

Project:	Freeway Dump and Landfill	Surface Elevation:	721 ft MSL*
Project No.:	23191372	Drilling Method:	Sonic/Rock Coring
Location:	Burnsville, MN	Sampling Method:	Sonic/HQ Core
Coordinates:	UTM 15 N:476391.914m, E:4959741.246m	Completion Depth:	88.0 ft
Datum:	NAD 83; UTM Zone 15	Unique Well No.:	837776

Depth, feet	Sample Type & Recovery	Sample No.	ENVIRONMENTAL DATA	USCS	Graphic Log	LITHOLOGIC DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	Elevation, feet
30		5				PRAIRIE DU CHIEN (OPC): Prairie du Chien limestone, hard to very hard, gray to light orangeish brown, fine grained, medium to thickly bedded, slightly decomposed, moderately disintegrated, moderately fractured, near horizontal bedding plane joints, pin holes and vugs are partially healed with dolomite/calcite. *(continued)* From 33': thin to thick bedding.		
35		6				35.5 - 36.5: thin shale lenses and laminations present. 36.5 - 37.8: oolitic dolomite. From 37.8': manganese in dendritic pattern on fracture faces. 39': some manganese infilling of fractures.		
40		7				42.4': thin shale laminations (~2-5 mm) dipping approximately 10% from horizontal. Pitted and small vugs with calcite infilling. 42.7': sandstone lamination.		
45		8		OPC		45.5': large vug. 46': soft shale bed, gray. 46.8': soft shale bed, gray.		
50		9				50.3 - 51.3': broken and vuggy with manganese staining, steep 80 degree fracture on edge of core.		
55		10				55': broken and vuggy. 56.5': fractured with calcite crystals also found in vugs and pinholes. 57.5 - 58.3': thinly bedded. 59.2 - 60.6': very broken/vuggy weak rock with manganese staining prevalent.		
60								

Date Boring Started:	3/27/19
Date Boring Completed:	4/1/19
Logged By:	KAM
Drilling Contractor:	Cascade Drilling LP
Drill Rig:	Full Size Track Mounted Rotasonic

Remarks: Sonic drilled to 31' bgs then switched to HQ core barrel. Driller reported core barrel drop in the last 4" of the 43 - 48' core interval, and loss of water return at 55' and 78'. *Surface elevation interpreted from LIDAR, MSL = feet above mean sea level

PID = Headspace; D/O/S = Discoloration/Odor/Sheen; FID/MC = FID/Methane Corrected; G/S/F = Gravel/Sand/Fines
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LOG OF BORING MW-10D

DRAFT

Project:	Freeway Dump and Landfill	Surface Elevation:	721 ft MSL*
Project No.:	23191372	Drilling Method:	Sonic/Rock Coring
Location:	Burnsville, MN	Sampling Method:	Sonic/HQ Core
Coordinates:	UTM 15 N:476391.914m, E:4959741.246m	Completion Depth:	88.0 ft
Datum:	NAD 83; UTM Zone 15	Unique Well No.:	837776

Depth, feet	Sample Type & Recovery	Sample No.	ENVIRONMENTAL DATA	USCS	Graphic Log	LITHOLOGIC DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	Elevation, feet
60		11				PRAIRIE DU CHIEN (OPC): Prairie du Chien limestone, hard to very hard, gray to light orangeish brown, fine grained, medium to thickly bedded, slightly decomposed, moderately disintegrated, moderately fractured, near horizontal bedding plane joints, pin holes and vugs are partially healed with dolomite/calcite. *(continued)* 60': driller reported soft drilling. 60.8': steep 80 degree fracture on edge of core (possibly mechanical).		
65		12				63.7': some green mineral infilling of pinholes - soft shale/mud, manganese along near horizontal fractures. 65.5': core broken, vuggy and pitted. 65.6': calcite healed vugs. 68 - 69.5': thinly bedded.		
70		13				70.5': large vugs/fractures recrystallized dolomite and calcite crystals. 71.5': water level during drilling.		
75		14		OPC		74 - 76.3': abundant vugs and pinholes, large vug at 74'. Water level at 74' after drilling.	66.5 - 88': Open Borehole	
80		15				78.5 - 79': large vugs and pinholes. 79.5': 45 degree fracture, smaller pinholes below. 80.7': fracture on bedding plane. 81': large vug. 81.8 - 82.5': large vugs, core broken in pieces, green (possibly chlorite) mineralization along bedding plane fracture at 81.8'. 83': top 3" broken. Broken from: 83.9 - 84', 85 - 85.5', 85.9 - 87.3'. Iron and manganese staining present in all broken zones.		
85		16						
90						End of boring 88.0 feet		

Date Boring Started:	3/27/19
Date Boring Completed:	4/1/19
Logged By:	KAM
Drilling Contractor:	Cascade Drilling LP
Drill Rig:	Full Size Track Mounted Rotasonic

Remarks: Sonic drilled to 31' bgs then switched to HQ core barrel. Driller reported core barrel drop in the last 4" of the 43 - 48' core interval, and loss of water return at 55' and 78'. *Surface elevation interpreted from LIDAR, MSL = feet above mean sea level

PID = Headspace; D/O/S = Discoloration/Odor/Sheen; FID/MC = FID/Methane Corrected; G/S/F = Gravel/Sand/Fines
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LOG OF BORING MW-11

DRAFT

Project:	Freeway Dump and Landfill	Surface Elevation:	708 ft MSL*
Project No.:	23191372	Drilling Method:	Geoprobe
Location:	Burnsville, MN	Sampling Method:	Dual-Tube
Coordinates:	UTM 15 N:476631.197m, E:4960480.334m	Completion Depth:	18.0 ft
Datum:	NAD 83; UTM Zone 15	Unique Well No.:	834665

Depth, feet	Sample Type & Recovery	Sample No.	ENVIRONMENTAL DATA	USCS	Graphic Log	LITHOLOGIC DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	Elevation, feet
0								
		1	**PID:**1.4 **D/O/S:**None/ Slight/ Rainbow	OL		ORGANIC SILT (OL): organics, roots; brown and black; moist; slight natural organic odor, light rainbow sheen; [FILL].	0 - 1': Quick Set Cement Grout	
				WM		WASTE MATERIAL (WM): wood, plastic.		
5		2	**PID:**9.9 **D/O/S:**None/ None/ None **PID:**20.4 **D/O/S:**None/ None/ None				1 - 7': Bentonite Chip Grout	
10		3	**PID:**1.4 **D/O/S:**None/ None/ None				8 - 18': Red Flint Sand Pack, No. 20	
15		4	**PID:**0.9 **D/O/S:**None/ None/ None	SM		SILTY SAND (SM): very fine to fine grained. 13 - 14.5': interbedded with some lenses of soft clayey silt, cohesive, non plastic. 14.5 - 18': interbeded with some lenses of poorly graded sand.	7 - 18': 0.010 Slot PVC Screen	
						End of boring 18.0 feet		
20								
25								
30								

Date Boring Started:	5/21/19
Date Boring Completed:	5/21/19
Logged By:	EMC
Drilling Contractor:	Midwestern
Drill Rig:	Geoprobe

Remarks: Background PID: 0.2 ppm
Refusal at 6', moved locations several times
*Surface elevation interpreted from LIDAR, MSL = feet above mean sea level

PID = Headspace; D/O/S = Discoloration/Odor/Sheen; FID/MC = FID/Methane Corrected; G/S/F = Gravel/Sand/Fines
Additional data may have been collected in the field which is not included on this log.

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LOG OF BORING MW-12

DRAFT

Project:	Freeway Dump and Landfill	Surface Elevation:	709 ft MSL*
Project No.:	23191372	Drilling Method:	Geoprobe
Location:	Burnsville, MN	Sampling Method:	Dual-Tube
Coordinates:	UTM 15 N:476782.998m, E:4960532.702m	Completion Depth:	18.0 ft
Datum:	NAD 83; UTM Zone 15	Unique Well No.:	834656

Depth, feet	Sample Type & Recovery	Sample No.	ENVIRONMENTAL DATA	USCS	Graphic Log	LITHOLOGIC DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	Elevation, feet
0		1	**PID:**0.6 **D/O/S:**None/ None/ None	OL		ORGANIC SILT (OL): dark gray; medium stiff; 0% gravel, 10% sand, 90% fines. 0.6': 2" brown medium grained sand lense. From 0.8': very soft, wet.	0 - 1': Quick Set Cement Grout 1 - 7': Bentonite Chip Grout	
5		2	**PID:**1 **D/O/S:**None/ None/ None	WM		WASTE MATERIAL (WM): wood and plastic debris; wet.		
10		3	**PID:**1.3 **D/O/S:**None/ None/ Medium	SM		SILTY SAND (SM): interbedded with some poorly graded sand. From 11.5 - 15': medium sheen, possibly rainbow.	8 - 18': Red Flint Sand Pack, No. 20	
15		4	**PID:**0.7 **D/O/S:**None/ None/ Slight			From 15 - 18': light monochrome sheen.	7 - 18': 0.010 Slot PVC Screen	
				ML		CLAYEY SILT (ML): soft; cohesive; non-plastic. End of boring 18.0 feet		
20								
25								
30								

Date Boring Started:	5/20/19
Date Boring Completed:	5/20/19
Logged By:	ARP2/EMC
Drilling Contractor:	Midwestern
Drill Rig:	Geoprobe

Remarks: Background PID: 0.2 ppm
*Surface elevation interpreted from LIDAR, MSL = feet above mean sea level

PID = Headspace; D/O/S = Discoloration/Odor/Sheen; FID/MC = FID/Methane Corrected; G/S/F = Gravel/Sand/Fines
Additional data may have been collected in the field which is not included on this log.

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Telephone: 952-832-2600

LOG OF BORING MW-13

DRAFT

Project:	Freeway Dump and Landfill	Surface Elevation:	709 ft MSL*
Project No.:	23191372	Drilling Method:	Geoprobe
Location:	Burnsville, MN	Sampling Method:	Dual-Tube
Coordinates:	UTM 15 N:476920.591m, E:4960585.354m	Completion Depth:	18.0 ft
Datum:	NAD 83; UTM Zone 15	Unique Well No.:	834657

Depth, feet	Sample Type & Recovery	Sample No.	ENVIRONMENTAL DATA	USCS	Graphic Log	LITHOLOGIC DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	Elevation, feet
0		1	**PID:**2.8 **D/O/S:**None/ None/ None	SM		SILTY SAND (SM): with organic fines; fine to medium grained; brown and black; moist; with little fine to coarse gravel (subangular to subrounded); 20% gravel, 60% sand, 20% fines.	0 - 1': Quick Set Cement Grout	
5		2	**PID:**10.1 **D/O/S:**None/ None/ None	WM		WASTE MATERIAL (WM): wood, plastic, concrete (low recovery); brown and black; wet.	1 - 7': Bentonite Chip Grout	
10		3	**PID:**2.1 **D/O/S:**None/ None/ Rainbow				8 - 18': Red Flint Sand Pack, No. 20	
15		4	**PID:**1.2 **D/O/S:**None/ None/ Rainbow	SM		SILTY SAND (SM): very fine to fine grained; gray; interbedded with stiff sandy silt; 0% gravel, 50% sand, 50% fines, medium rainbow sheen, no odors other than natural organic.	7 - 18': 0.010 Slot PVC Screen	
						End of boring 18.0 feet		
20								
25								
30								

Date Boring Started:	5/20/19
Date Boring Completed:	5/20/19
Logged By:	ARP2/EMC
Drilling Contractor:	Midwestern
Drill Rig:	Geoprobe

Remarks: *Surface elevation interpreted from LIDAR, MSL = feet above mean sea level

PID = Headspace; D/O/S = Discoloration/Odor/Sheen; FID/MC = FID/Methane Corrected; G/S/F = Gravel/Sand/Fines
Additional data may have been collected in the field which is not included on this log.

M:\GINT\FREEWAY LANDFILL_23191372.GPJ BARRLIBRARY.GLB ENVIRO LOG BARR TEMPLATE.GDT

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Telephone: 952-832-2600

LOG OF BORING MW-19-01

DRAFT

Project:	Freeway Dump and Landfill	Surface Elevation:	716 ft MSL*
Project No.:	23191372	Drilling Method:	Geoprobe
Location:	Burnsville, MN	Sampling Method:	Dual-Tube
Coordinates:	UTM 15 N:477235.842m, E:4959662.109m	Completion Depth:	18.0 ft
Datum:	NAD 83; UTM Zone 15	Unique Well No.:	834660

Depth, feet	Sample Type & Recovery	Sample No.	ENVIRONMENTAL DATA	USCS	Graphic Log	LITHOLOGIC DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	Elevation, feet
0				SM		SILTY SAND (SM): fine to medium grained; very dark gray; moist; trace small gravel [FILL]. Few organics and roots 0 - 1'; trace glass and slag 1 - 1.4'.		
		1	**PID:**0.0 **D/O/S:**None/ None/ None			ASH (ASH): dark gray; moist; soft to stiff; massive.	0 - 5': Bentonite Grout	
5			**PID:**0.0 **D/O/S:**None/ Slight/ None			5 - 6': pulverized concrete, woodchips, and asphalt, woodchips have slight treated odor.	5 - 6': Bentonite Chip Seal	
		2		ASH				
10			**PID:**0.1 **D/O/S:**None/ None/ None				6 - 17': Red Flint Sand Pack, No. 15	
		3	**PID:**0.0 **D/O/S:**None/ None/ None				7 - 17': 0.010 Slot PVC Screen	
15				PT		PEAT (PT): black/dark brown; fibrous; [NATIVE].		
				CL-CH		LEAN CLAY (CL-CH): very dark gray; soft; medium to high plasticity; medium toughness; [NATIVE].		
		4	**PID:**0.0 **D/O/S:**None/ None/ None			PRAIRIE DU CHIEN (OPC). Bedrock; weak; light brownish gray; highly weathered.		
						End of boring 18.0 feet		
20								
25								
30								

Date Boring Started:	3/28/19
Date Boring Completed:	3/28/19
Logged By:	AKS3
Drilling Contractor:	Midwestern Drilling
Drill Rig:	Geoprobe

Remarks: Dashed line indicates an inferred contact depth
Background PID: 0.0 - 0.3
Refusal at 18', with poor recovery from 15 - 18'. Offset and resampled 15 - 18' with macro-core.
*Surface elevation interpreted from LIDAR, MSL = feet above mean sea level

PID = Headspace; D/O/S = Discoloration/Odor/Sheen; FID/MC = FID/Methane Corrected; G/S/F = Gravel/Sand/Fines
Additional data may have been collected in the field which is not included on this log.

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LOG OF BORING MW-19-02

DRAFT

Project:	Freeway Dump and Landfill	Surface Elevation:	718 ft MSL*
Project No.:	23191372	Drilling Method:	Geoprobe
Location:	Burnsville, MN	Sampling Method:	Macro Core
Coordinates:	UTM 15 N:477304.826m, E:4959695.369m	Completion Depth:	21.0 ft
Datum:	NAD 83; UTM Zone 15	Unique Well No.:	834662

Depth, feet	Sample Type & Recovery	Sample No.	ENVIRONMENTAL DATA	USCS	Graphic Log	LITHOLOGIC DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	Elevation, feet
0			**PID:**1.1 **D/O/S:**None/ None/ None	CL		LEAN CLAY (CL): very dark gray-brown; frozen; medium plasticity; medium toughness; abundant roots at surface, piece of white glass at 1'; [FILL].		
		1	**PID:**0.2			ASH (ASH): dark gray; moist to wet; soft; massive.	0 - 3.5': Bentonite Grout	
5						4.5': slag and roots.	3.5 - 5.5': Bentonite Chip Seal	
			PID:0.2 **D/O/S:**None/ None/ None					
		2	**PID:**0.0	ASH		7': wooden obstruction.		
10							5.5 - 17.5': Red Flint Sand Pack, No. 15	
		3	**PID:**0.0 **D/O/S:**None/ None/ None				7.5 - 17.5': 0.010 Slot PVC Screen	
15			**PID:**0.1 **PID:**0.2					
			PID:0.7 **D/O/S:**None/ None/ None	PT		PEAT (PT): black/dark brown; moist; fibric to hemic; [NATIVE].		
		4	**PID:**0.1	CL-CH		GRAVELLY CLAY (CL-CH): greenish gray to olive gray; soft; high plasticity; high toughness; ~30% small sub-rounded gravel; [NATIVE].		
20						DOLOMITE LIMESTONE; Prairie du Chien; light gray to yellow-brown; moderately weathered.		
			PID:0.3 **D/O/S:**None/ None/ None					
		5				End of boring 21.0 feet		
25								
30								

Date Boring Started:	3/26/19
Date Boring Completed:	3/26/19
Logged By:	KAM
Drilling Contractor:	Midwestern Drilling
Drill Rig:	Geoprobe

Remarks: Dashed line indicates an inferred contact depth
Encountered obstruction at 7' at first location, moved 2' east.
Background PID: 0.3
*Surface elevation interpreted from LIDAR, MSL = feet above mean sea level

PID = Headspace; D/O/S = Discoloration/Odor/Sheen; FID/MC = FID/Methane Corrected; G/S/F = Gravel/Sand/Fines
Additional data may have been collected in the field which is not included on this log.

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LOG OF BORING MW-19-03

DRAFT

Project: Freeway Dump and Landfill
Project No.: 23191372
Location: Burnsville, MN
Coordinates: UTM 15 N:477376.575m, E:4959697.030m
Datum: NAD 83; UTM Zone 15

Surface Elevation: 723 ft MSL*
Drilling Method: Geoprobe
Sampling Method: Macro Core
Completion Depth: 35.0 ft

Unique Well No.: 834663

Depth, feet	Sample Type & Recovery	Sample No.	ENVIRONMENTAL DATA	USCS	Graphic Log	LITHOLOGIC DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	Elevation, feet
0		1	**PID:**0.8 **D/O/S:**None/ None/ None	SM		SILTY SAND (SM): fine to medium with trace coarse grained; very dark gray; few small roots decrease with depth; [FILL].		
			PID:0.1			3.5': few clay lenses.		
				ASH		ASH (ASH): dark gray; moist; soft; massive.		
5		2	**PID:**0.6 **D/O/S:**None/ None/ None **PID:**1.4				0 - 12': Bentonite Grout	
10		3	**PID:**3.8 **D/O/S:**None/ Slight/ None	WM		WASTE MATERIAL (WM): paper, concrete, wood, plastic, and glass; wood has creosote odor.	12 - 13': Bentonite Chip Seal	
15		4	**PID:**0.6 **D/O/S:**None/ None/ None **PID:**0.5	ASH		ASH (ASH): dark gray; moist; soft; massive; wood at bottom of core.		
20						20 - 22': No recovery, see remarks below.	13 - 34': Red Flint Sand Pack, No. 15	
						PEAT (PT): black; wet; very soft.		
25		7	**PID:**0.6 **PID:**0.2 **D/O/S:**None/ None/ None	PT				
						28': Peat/soil mix with some plastic and snail shells. Grades to dark gray at 28.5'.		
				CH		FAT CLAY (CH): with shells; dark gray; moist; firm; high plasticity; high toughness; lacustrine deposit.		
30		8	**PID:**0.7 **D/O/S:**None/ None/ None	SP-SM		POORLY GRADED SAND WITH SILT (SP-SM): fine to coarse grained; dark gray; saturated; subangular to subrounded; 30% gravel, 60% sand, 10% fines, fine gravel.	14 - 34': 0.010 Slot PVC Screen	
			PID:0.2	GP		POORLY GRADED GRAVEL WITH SAND (GP): fine gravel with fine grained to coarse grained sand; dark gray; 60% gravel, 35% sand, 5% fines.		
35						End of boring 35.0 feet		
40								

Date Boring Started: 3/26/19
Date Boring Completed: 3/26/19
Logged By: KAM
Drilling Contractor: Midwestern Drilling
Drill Rig: Geoprobe

Remarks: Dashed line indicates an inferred contact depth
Refusal at 27', with no recovery from 20 - 27'. Offset 2' west, refusal at 17'. Offset 2' east, closed piston macro sampler used, starting at 22'.
*Surface elevation interpreted from LIDAR, MSL = feet above mean sea level

PID = Headspace; D/O/S = Discoloration/Odor/Sheen; FID/MC = FID/Methane Corrected; G/S/F = Gravel/Sand/Fines
Additional data may have been collected in the field which is not included on this log.

M:\GIN\FREEWAY LANDFILL_23191372.GPJ BARRLIBRARY.GLB ENVIRO LOG BARR TEMPLATE.GDT

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Minneapolis, MN 55435
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LOG OF BORING MW-19-04

DRAFT

Project: Freeway Dump and Landfill
Project No.: 23191372
Location: Burnsville, MN
Coordinates: UTM 15 N:477362.191m, E:4959643.292m
Datum: NAD 83; UTM Zone 15

Surface Elevation: 724 ft MSL*
Drilling Method: Geoprobe
Sampling Method: Dual-Tube
Completion Depth: 40.0 ft

Unique Well No.: 834661

Depth, feet	Sample Type & Recovery	Sample No.	ENVIRONMENTAL DATA	USCS	Graphic Log	LITHOLOGIC DESCRIPTION	WELL OR PIEZOMETER CONSTRUCTION DETAIL	Elevation, feet
0		1	**PID:**0.5 **D/O/S:**None/ None/ None	SM		SILTY SAND WITH GRAVEL (SM): medium grained; dark brown; dry to moist; trace concrete and slag; small gravel [FILL].		
5		2	**PID:**1.0 **D/O/S:**None/ None/ None	ASH		ASH (ASH): gray; moist; soft; massive. 5 - 9': few slag, glass, and wood debris.	0 - 13': Bentonite Grout	
10		3	**PID:**0.9 **D/O/S:**None/ None/ None				13 - 14': Bentonite Chip Seal	
15		4	**PID:**0.3 **D/O/S:**None/ Slight/ None	WM		WASTE MATERIAL (WM): ash with wood, plastic, paper, glass; gray; wet; waste odor.		
20		5	**PID:**0.6 **D/O/S:**None/ Slight/ None				14 - 35': Red Flint Sand Pack, No. 15	
25		6	**PID:**0.6 **D/O/S:**None/ Slight/ None					
30		7	**PID:**0.5 **D/O/S:**None/ Slight/ None	PT		PEAT (PT): black/dark brown and red; wet; fibrous; swampy organic odor; [NATIVE].	15 - 35': 0.010 Slot PVC Screen	
35		8	**PID:**0.3 **D/O/S:**None/ None/ None			PRAIRIE DU CHIEN (OPC). Bedrock; very weak; white/tan; highly weathered; possible lime sludge.		
40						End of boring 40.0 feet		
45								
50								

Date Boring Started: 3/27/19
Date Boring Completed: 3/27/19
Logged By: AKS3
Drilling Contractor: Midwestern Drilling
Drill Rig: Geoprobe

Remarks: Dashed line indicates an inferred contact depth
*Surface elevation interpreted from LIDAR, MSL = feet above mean sea level

PID = Headspace; D/O/S = Discoloration/Odor/Sheen; FID/MC = FID/Methane Corrected; G/S/F = Gravel/Sand/Fines
Additional data may have been collected in the field which is not included on this log.

Appendix B

Test Excavation Field Logs

TEST TRENCH FIELD SAMPLING AND SCREENING LOG

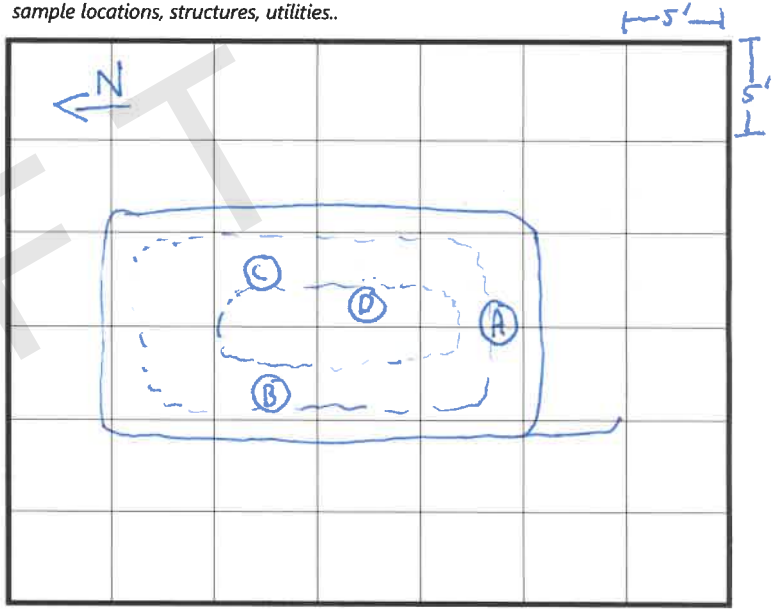
Client: Minnesota Pollution Control Agency
Project Name: Freeway Landfill & Dump Investigation
Number: 23 / 19 - 1372
Location ID: FD-TT-01

Date: 04/11/18
Time Statred: 9:20
Time Ended: 11:00

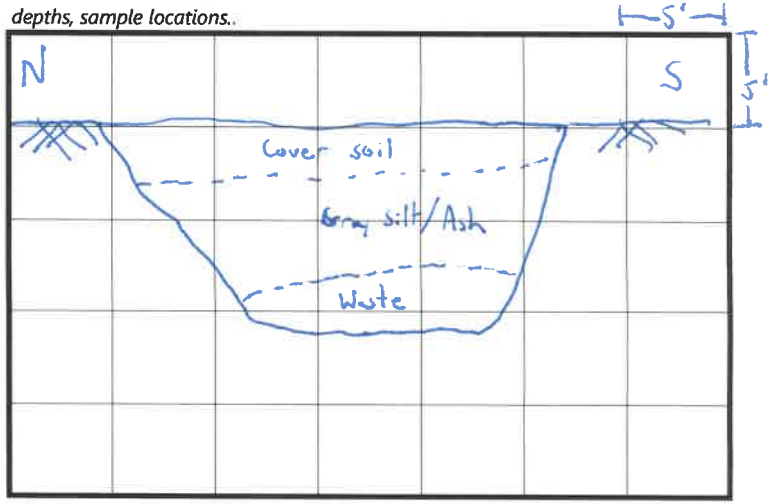
Sampler: ARP2 / Pace
Calibration Time: 8:50
Background Headspace: 0.0 ppm

Sample ID	Depth (ft)	Odor/ Sheen	Headspace Reading (ppm)	Description
A	0-3	N/N	0.2	Sandy silty clay
B	3-5	N/N	1.8	Silt/Ash w/ debris + sand
C	5-8	N/N	0.8	Ash w/ little debris
D	8-12	mild chem/ trace	97.6	Waste material

PLAN VIEW SKETCH: identify scale and direction, excavation extents and depths, sample locations, structures, utilities..



CROSS SECTION SKETCH: identify scale and direction, excavation extents and depths, sample locations..



General stratigraphy description / General notes

0-3: Cover soil - Sandy silty clay (10/46/50) w/ gravel, brown

3-8: Silt/Ash - Gray, little debris throughout, w/fg sand from 3-5, ~~mott~~ denser / darker color from 6-8.

8-12: Waste Material - decomp. wood, metal wiring, plastic conduit, rubber tire, motor oil containers (empty, 1 qt)

Sample collected: FD-TT-01 (W, 10-12)

TEST TRENCH FIELD SAMPLING AND SCREENING LOG

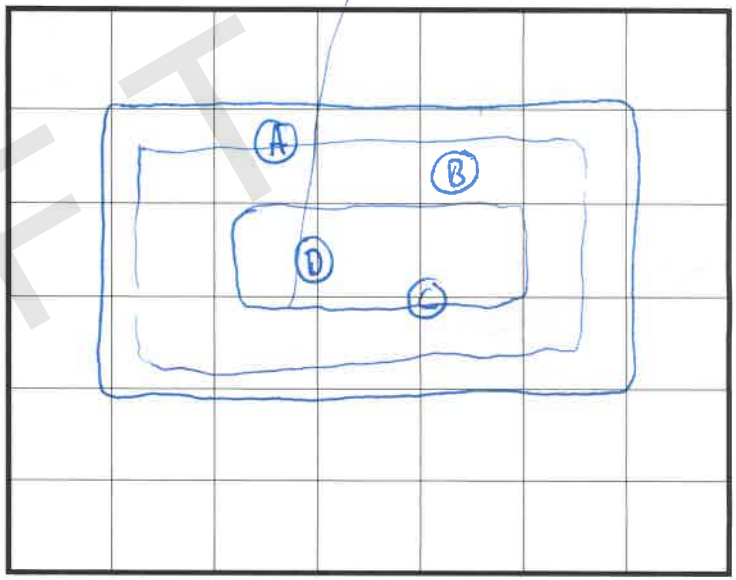
Client: Minnesota Pollution Control Agency
Project Name: Freeway Landfill & Dump Investigation
Number: 23 / 19 - 1372
Location ID: FD-TT-02

Date: 04/11/18
Time Statred: 11:30
Time Ended:

Sampler: ARP2 / Pace
Calibration Time: 8:50
Background Headspace: 0.0 ppm

Sample ID	Depth (ft)	Odor/ Sheen	Headspace Reading (ppm)	Description
A	0-3	N/N	1.0	Topsoil / Waste mat.
B	3-6	N/N	0.3	Waste Mat. * collected From
C	6-9	N/N	0.8	Waste Mat / Silt/Ash
D	9-12	N/N	0.7	Silt/Ash

PLAN VIEW SKETCH: identify scale and direction, excavation extents and depths, sample locations, structures, utilities..

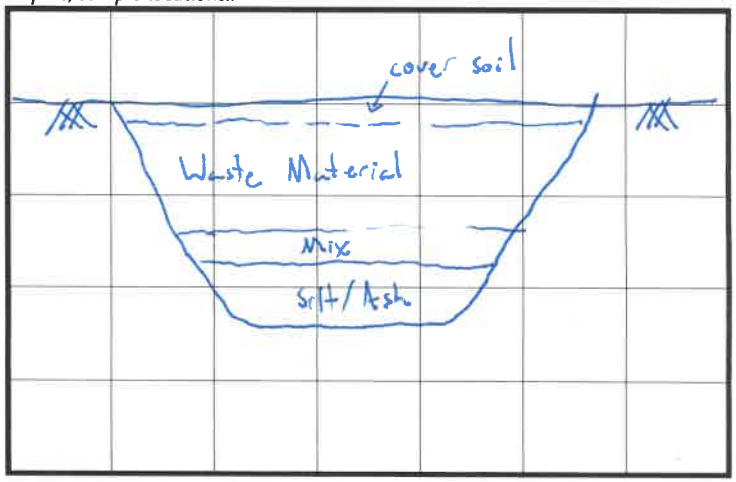


General stratigraphy description / General notes

0-1: Cover soil - sandy silty clay w/ gravel, brown
1-7: Waste mat - MSW, tree trunks, building materials
7-9: Waste mat mixed w/ silt/Ash
9-12: Gray silt/Ash w/ some dry sand

Sample collected: FD-TT-02 (W, 7-9)

CROSS SECTION SKETCH: identify scale and direction, excavation extents and depths, sample locations..



TEST TRENCH FIELD SAMPLING AND SCREENING LOG

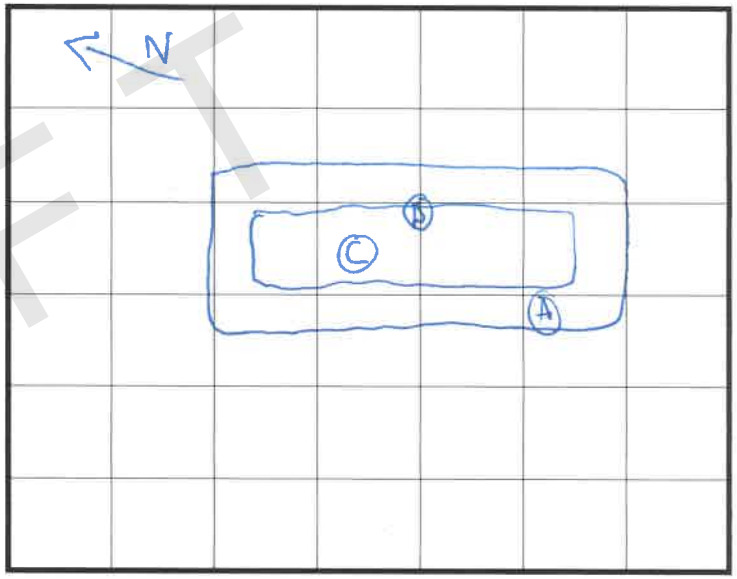
Client: Minnesota Pollution Control Agency
Project Name: Freeway Landfill & Dump Investigation
Number: 23 / 19 - 1372
Location ID: FD-TT-03

Date: 04/11/14
Time Statred: 14:05
Time Ended: 15:10

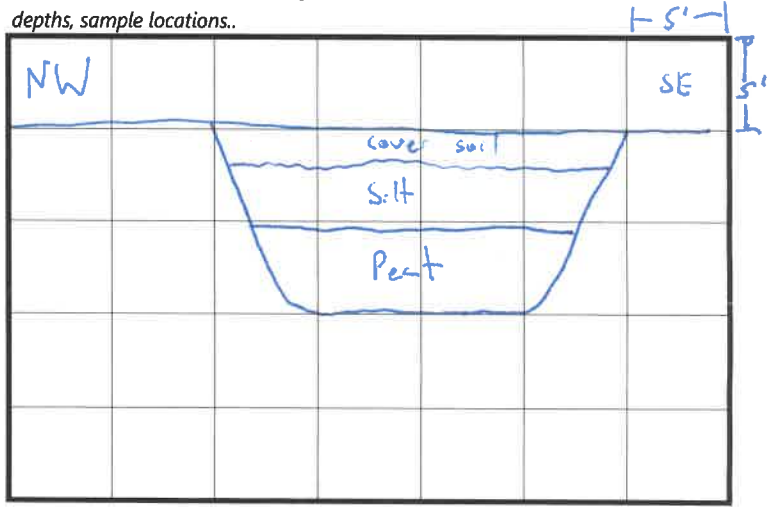
Sampler: ARR2 / Pace
Calibration Time: 8:50
Background Headspace: 0.2 ppm

Sample ID	Depth (ft)	Odor/ Sheen	Headspace Reading (ppm)	Description
A	0-2	N/N	0.4	Clayey Sand * collected from stockpile
B	2-5	N/N	0.4	Gray Silt
C	5-10	N/N	0.4	Peat

PLAN VIEW SKETCH: identify scale and direction, excavation extents and depths, sample locations, structures, utilities..



CROSS SECTION SKETCH: identify scale and direction, excavation extents and depths, sample locations..



General stratigraphy description / General notes

0-2: Cover soil - Clayey Sand w/ silt + gravel

2-5: Silt, grey w/ some vfg sand

5-10: Peat, very fiberous, black/brown

Sample collected FD-TT-03 (S, 2-5)

TEST TRENCH FIELD SAMPLING AND SCREENING LOG

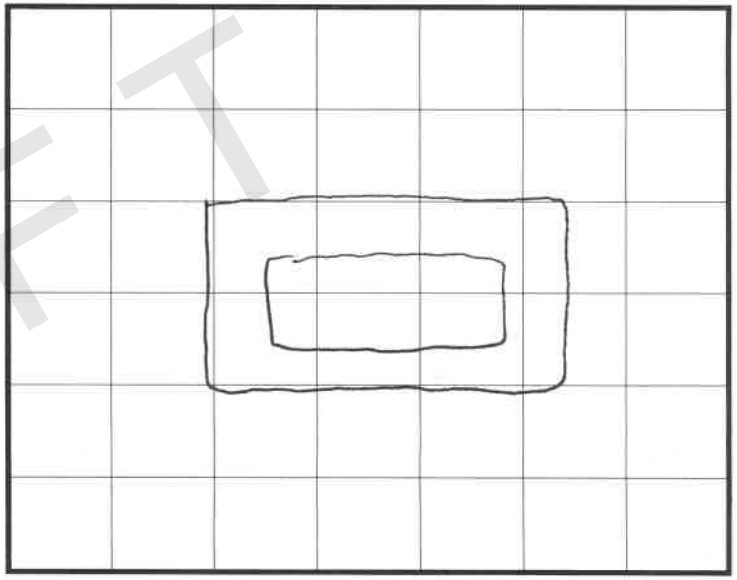
Client: Minnesota Pollution Control Agency
Project Name: Freeway Landfill & Dump Investigation
Number: 23 / 19 - 1372
Location ID: FD-TT-04

Date: 04/11/18
Time Statred: 15:25
Time Ended: 16:05

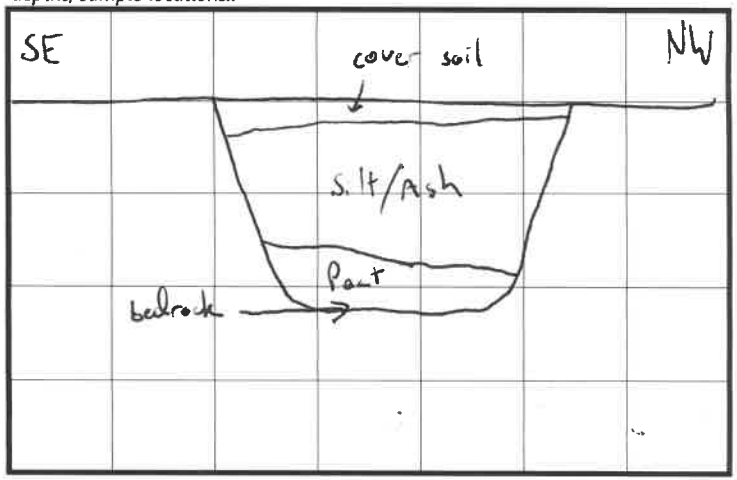
Sampler: ARP2
Calibration Time: 8:56
Background Headspace: 0.2 ppm

Sample ID	Depth (ft)	Odor/ Sheen	Headspace Reading (ppm)	Description
A	0-2	N/N	0.4	Cover soil
B	2-5	N/N	0.3	Silt/Ash
C	6-10	N/N	0.2	Silt/Ash
D	10-12	N/N	0.3	Peat

PLAN VIEW SKETCH: identify scale and direction, excavation extents and depths, sample locations, structures, utilities..



CROSS SECTION SKETCH: identify scale and direction, excavation extents and depths, sample locations..



General stratigraphy description / General notes

0-1.5: Cover soil, clayey sand w/ silt + gravel, brown

1.5-10: Silt/Ash, gray, random plastic sheeting observed from ~6-10, harder, partially solidified, very small white flecks observed ~~during~~ from sheen test

10-12: Peat, very fiberous, black/brown
Bedrock encountered @ ~12' bgs

No sample collected

TEST TRENCH FIELD SAMPLING AND SCREENING LOG

Client: Minnesota Pollution Control Agency
Project Name: Freeway Landfill & Dump Investigation
Number: 23 / 19 - 1372
Location ID: FD-TT-05

Date: 4/12/18
Time Statred: 8:50
Time Ended: 9:45

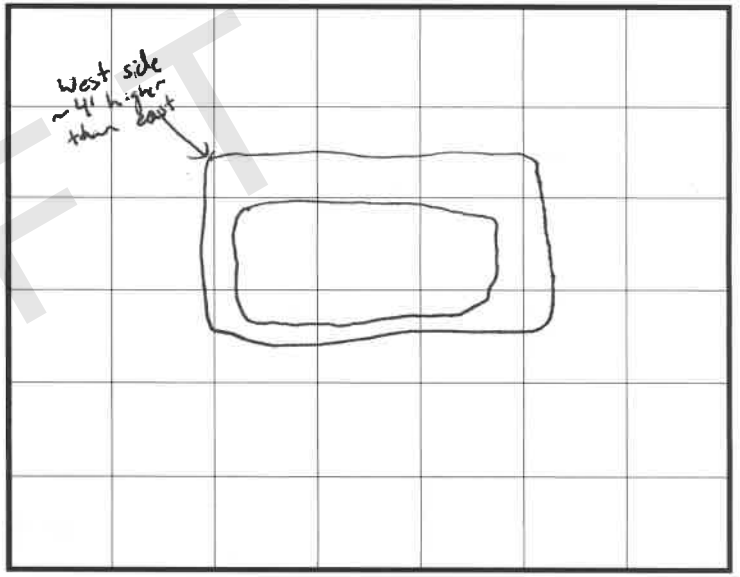
Sampler: NRP2 / Pace
Calibration Time: 8:50
Background Headspace: 0.1 ppm

West face

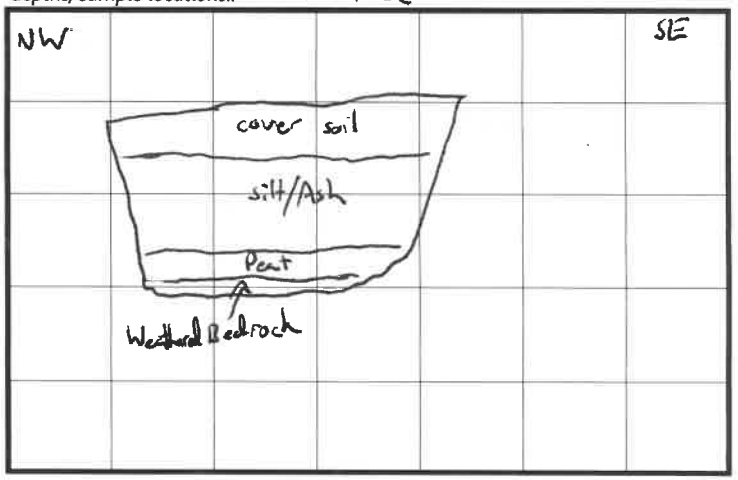
Sample ID	Depth (ft)	Odor/ Sheen	Headspace Reading (ppm)	Description
A	0-4	N/N	0.2	Cover soil
B	4-9	N/N	0.2	Silt/Ash
C	9-12	N/N	0.2	Peat / Weather BR

Collected from stockpiles

PLAN VIEW SKETCH: identify scale and direction, excavation extents and depths, sample locations, structures, utilities..



CROSS SECTION SKETCH: identify scale and direction, excavation extents and depths, sample locations.. West face



General stratigraphy description / General notes

0-4: Cover soil - Clayey sand w/ silt + gravel, brown, chunks of asphalt observed (12"-18")

4-9: Silt/Ash - Gray, some vfg sand, white flecks observed from sheen test

9-10: Peat/organic clay, black, w/ some sand

10-11: Weathered bedrock

TEST TRENCH FIELD SAMPLING AND SCREENING LOG

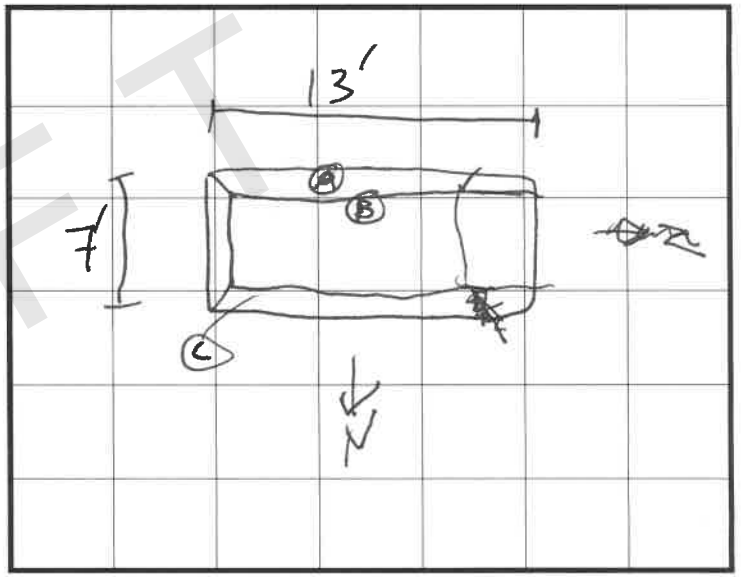
Client: Minnesota Pollution Control Agency
Project Name: Freeway Landfill & Dump Investigation
Number: 23 / 19 - 1372
Location ID: FD-TT-06

Date: 4-12-18
Time Statred: 10:45
Time Ended: 13:30 - backfilled

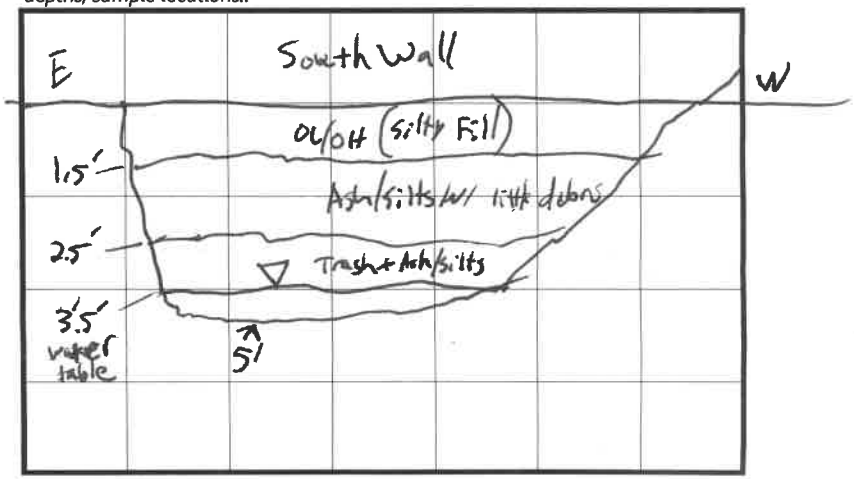
Sampler: JWJ / Pace
Calibration Time: 8:50
Background Headspace: 0.3 ppm

Sample ID	Depth (ft)	Odor/ Sheen	Headspace Reading (ppm)	Description
A	0-1.5'	org/N	0.4	Black silty fill w/ roots and some wood debris (OL/OH)
B	1.5-3.5'	Odor/N	1.0	Ash/silt w/ debris & sand (Trash 2.5'-3.5')
C	@3'	None/N	0.5	Green colored soils in silty ash layer

PLAN VIEW SKETCH: identify scale and direction, excavation extents and depths, sample locations, structures, utilities..



CROSS SECTION SKETCH: identify scale and direction, excavation extents and depths, sample locations..



General stratigraphy description / General notes

0'-1.5' = Black silty fill w/ some woody debris (45/15/180)

1.5'-3.5' (5' SWJ) = Gray, little debris to 1.5'-2.5'. Trash from 2.5'-3.5' glass bottles, metal, wood, plastics rusty coloration. grabbed green colored soils @3' from NE Corner (C) on Plan View

water @ 3.5' light sheen noticed

TEST TRENCH FIELD SAMPLING AND SCREENING LOG

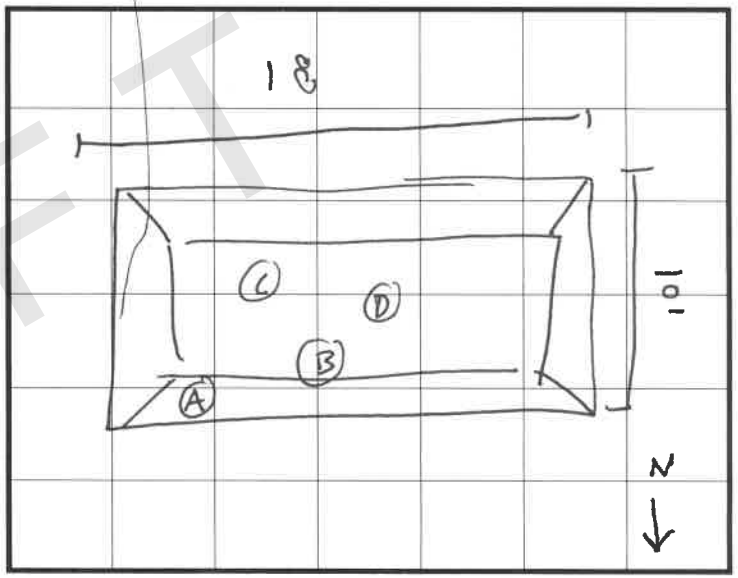
Client: Minnesota Pollution Control Agency
Project Name: Freeway Landfill & Dump Investigation
Number: 23 / 19 - 1372
Location ID: FD-TT-07

Date: 4/12/18
Time Statred: 1130
Time Ended: 12:50

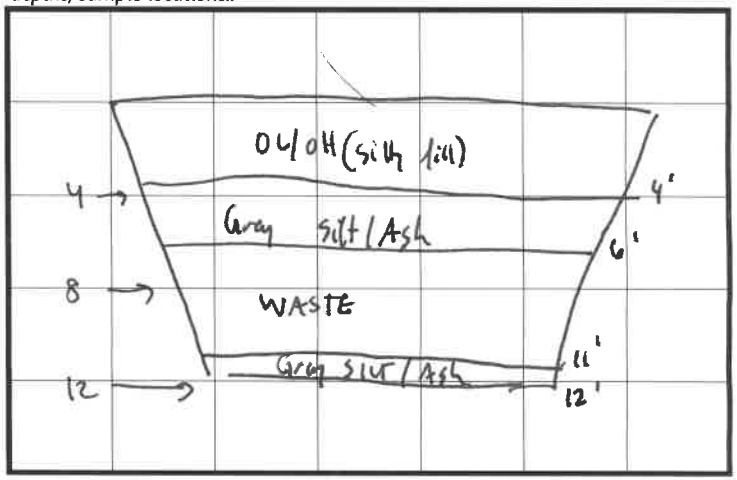
Sampler: ABW / Pace
Calibration Time: 8:58
Background Headspace: 0.3 ppm

Sample ID	Depth (ft)	Odor/ Sheen	Headspace Reading (ppm)	Description
A	0-4	N/N	0.4	Upper fill, Sample grabbed from stockpile
B	4-6	N/N	0.5	Silt/Ash Sample grabbed from #8
C	6-11	lt/Trace	6.0	from stockpile,
D	11-12	N/N	0.8	bucket taken from base of exc.

PLAN VIEW SKETCH: identify scale and direction, excavation extents and depths, sample locations, structures, utilities..



CROSS SECTION SKETCH: identify scale and direction, excavation extents and depths, sample locations..



General stratigraphy description / General notes

0-4 - V. Dk Brn silty sand fill, few med-Cg gravel, [5/60/35] [cover]

4-6 - Gray silt/Ash, trace debris throughout

6-11 - WASTE MATERIAL - Mixed - no defined layers [pipe (metal) plastic, wood (abundant wood), tires, brick, ash, silt fence, bottles] lt odor

11-12 : Gray silt/Ash, No debris noticed

Sample collected - FD-TT-07 (WM, 6-11)

TEST TRENCH FIELD SAMPLING AND SCREENING LOG

Client: Minnesota Pollution Control Agency
Project Name: Freeway Landfill & Dump Investigation
Number: 23 / 19 - 1372
Location ID: FD-TT-08

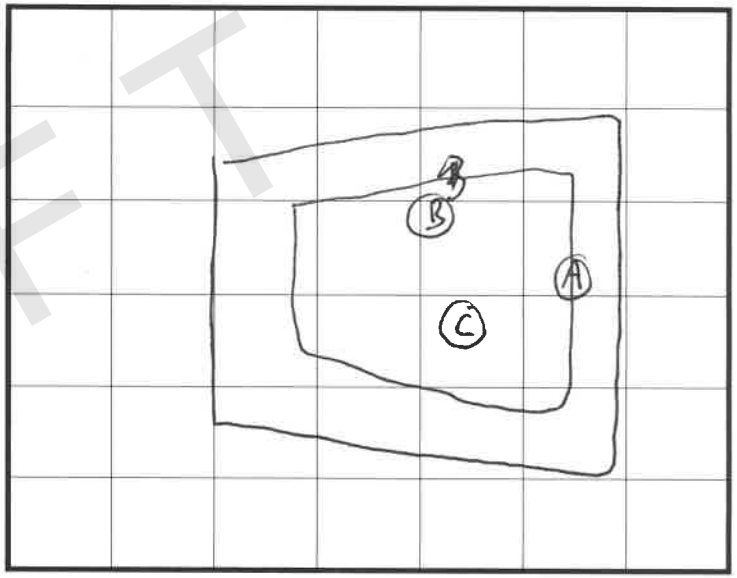
Date: 4/12/18
Time Stated: 13:45
Time Ended: 15:00

Sampler: ARM2 / Pace
Calibration Time: 8:50
Background Headspace: 0.3 ppm

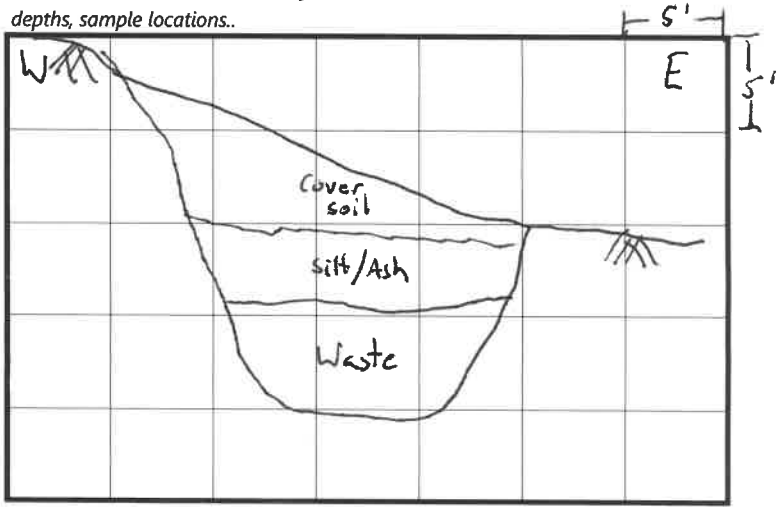
From E edge

Sample ID	Depth (ft)	Odor/ Sheen	Headspace Reading (ppm)	Description
A	0-2	N/N	0.6	Cover
B	2-5	N/N	0.5	Silt/Ash
C	5-12	mild decomp. / N	2.3	Waste

PLAN VIEW SKETCH: identify scale and direction, excavation extents and depths, sample locations, structures, utilities..



CROSS SECTION SKETCH: identify scale and direction, excavation extents and depths, sample locations..



from E edge General stratigraphy description / General notes

0-2: cover soil - silty sand w/ gravel, mg-cg, brown

2-5: Silt/Ash - Gray, w/ tiny white flecks

5-12: Waste material - MSW, steel container, tires, paper, plastic, metal wire

Sample collected: FD-TT-08 (W, 5-12)

TEST TRENCH FIELD SAMPLING AND SCREENING LOG

* Soil Sample collected 4-12' bgs (waste Material)

*"Point" gps location collected - could not walk around trench due to trees/slope

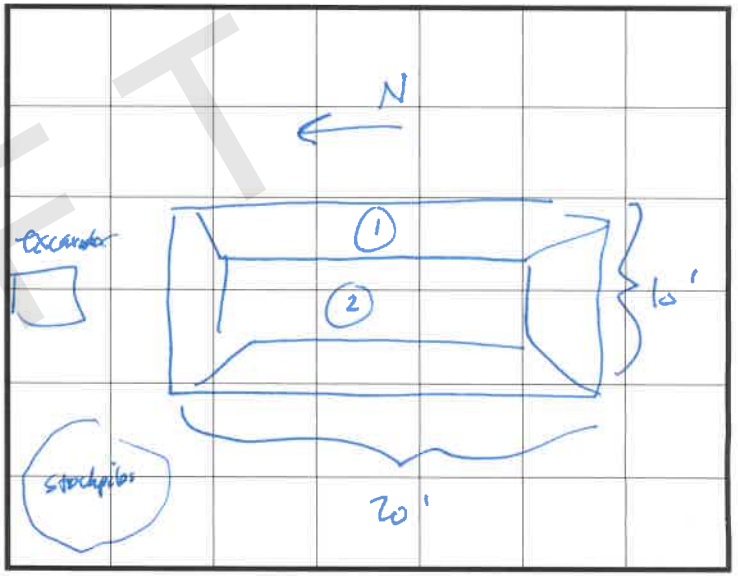
Client: Minnesota Pollution Control Agency
Project Name: Freeway Landfill & Dump Investigation
Number: 23 / 19 - 1372
Location ID: FD-TT-09

Date: 4/17/18
Time Statred: 840
Time Ended:

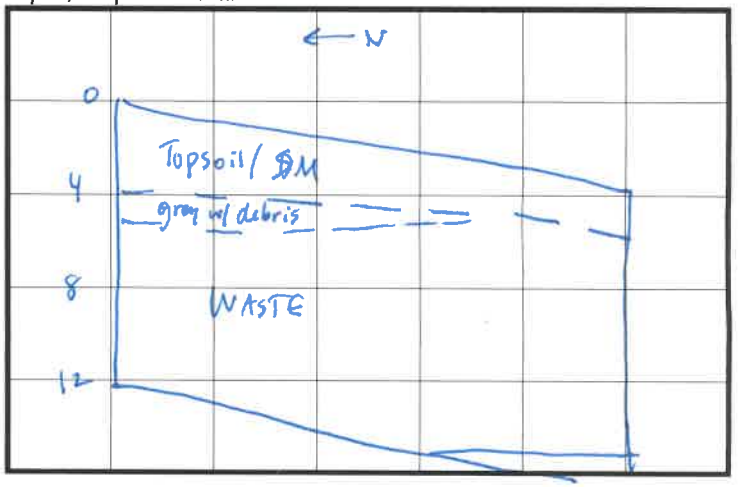
Sampler: ABW/Pcw
Calibration Time: 815
Background Headspace: 0.1 - 0.3 ppm

Sample ID	Depth (ft)	Odor/ Sheen	Headspace Reading (ppm)	Description
0	4	None	0.5	Silty Sand topsoil/fill, brown, from stockpile
4	12	NONE	2.2	Debris/Waste Material (from stockpile

PLAN VIEW SKETCH: identify scale and direction, excavation extents and depths, sample locations, structures, utilities..



CROSS SECTION SKETCH: identify scale and direction, excavation extents and depths, sample locations..



General stratigraphy description / General notes

0-3': Dk brown topsoil/SM [t/70/30] loose, homogenous, organics/roots, M-W

3-4: dk gray SM (S.A.A) w/ few construction debris (concrete), same as above, less wet w/ debris, thinner to South of excavation, (lumped in w/ 0-3 for screening)

4-12: WASTE Material: Moist, dk gray to black, Tires, plastic, wood, metal, rubber hose, few large concrete pieces

TEST TRENCH FIELD SAMPLING AND SCREENING LOG

* Water Sampled ABC List
* WASTE Sampled 2.5-10'
* "Point" gps collected due to slope / stability

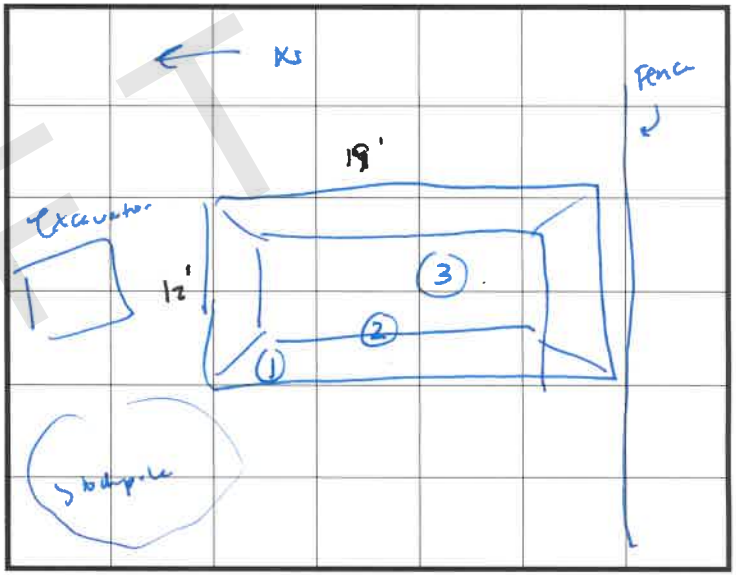
Client: Minnesota Pollution Control Agency
Project Name: Freeway Landfill & Dump Investigation
Number: 23 / 19 - 1372
Location ID: FD-TT-10

Date: 4/17/18
Time Statred: 1015
Time Ended:

Sampler: ABW / Pace
Calibration Time: 815
Background Headspace: 0.3 ppm

	Sample ID	Depth (ft)	Odor/ Sheen	Headspace Reading (ppm)	Description
1	0	2	NONE	3.0	SM Cover/Fill
2	2	2.5	NONE	0.4	Ash/ML-gray
3	2.5	10.5	Light/Non	3.3	WASTE MATERIAL

PLAN VIEW SKETCH: identify scale and direction, excavation extents and depths, sample locations, structures, utilities..



CROSS SECTION SKETCH: identify scale and direction, excavation extents and depths, sample locations..

General stratigraphy description / General notes

0-2: Dk brown SM Fill/cover soil [*/70/20] organics, roots, M-W, Partially Frozen

2-2.5: very thin ML / Ash layer, soft, homogeneous, loose, few vf sands

2.5-10.5 WASTE MATERIAL: wood, bricks, bottles, rubber hose & tires, cinder blocks & construction material, wet @ 10' bgs

* accessed on foot

* Sample collected 4-12' bgs

TEST TRENCH FIELD SAMPLING AND SCREENING LOG

Landfill gas: CH4 | CO2 | O2 | Bal | LEL

Client: Minnesota Pollution Control Agency

Project Name: Freeway Landfill & Dump Investigation

Number: 23 / 19 - 1372

Location ID: ~~TT~~- FD- TT- U

Date: 4/17/18

Time Statred: 1245

Time Ended:

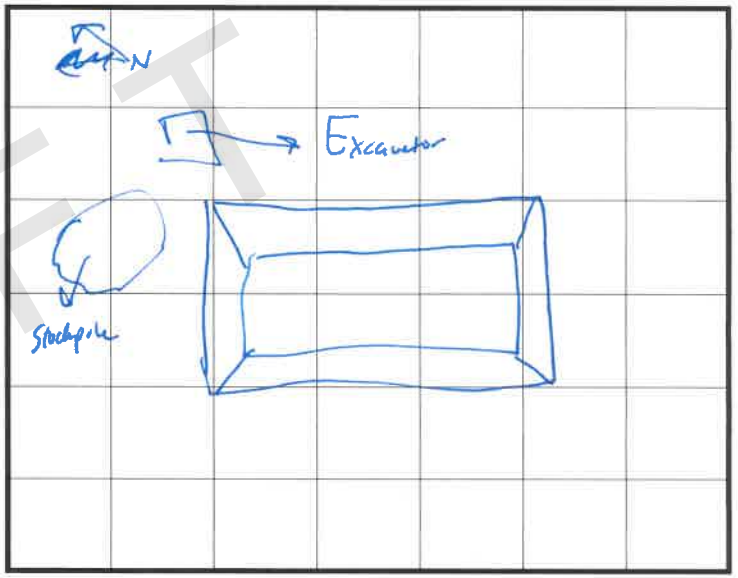
Sampler: AB w/ Pacer

Calibration Time: 815

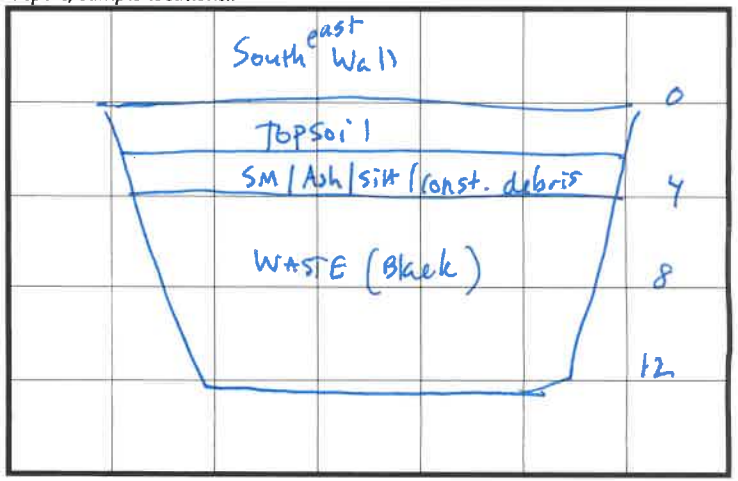
Background Headspace: 0.1 ppm

Sample ID	Depth (ft)	Odor/ Sheen	Headspace Reading (ppm)	Description
0	2	None	0.2	Topsoil
2	4	None	0.8	Mixed Brown SM w/ Ml/Ash : construction debris
4	12	Treated wood/ Light	21.9	WASTE MATERIAL

PLAN VIEW SKETCH: identify scale and direction, excavation extents and depths, sample locations, structures, utilities..



CROSS SECTION SKETCH: identify scale and direction, excavation extents and depths, sample locations..



General stratigraphy description / General notes

0-2 : Dk gray topsoil : 0/70/30 SM, Organics, grass, cover soil, moist

2-4 : Mixed light brown SM w/ gray ash/silt ; Construction debris → wood, Bricks, Concrete, moist

4-12 : WASTE Material, moist, black silty sand matrix, heavy debris [wood, plastic, bottles, wire, rubber, newspapers, metal, Ash]

* Waste sample collected @ 3-12' bgs

TEST TRENCH FIELD SAMPLING AND SCREENING LOG

Landfill	CH_4	CO_2	O_2	Bal	LEL
	0	0	19.9	20.1	0 %

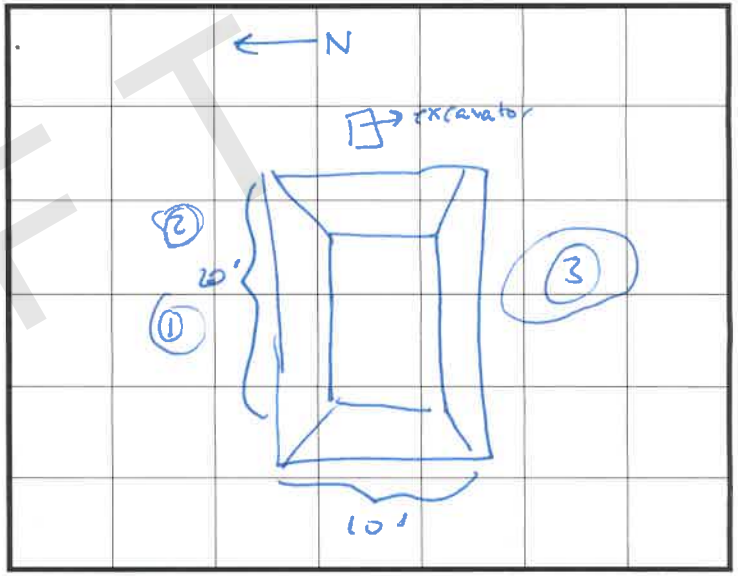
Client: Minnesota Pollution Control Agency
Project Name: Freeway Landfill & Dump Investigation
Number: 23 / 19 - 1372
Location ID: FD-TT-12

Date: 4/17/18
Time Statred: 1410
Time Ended:

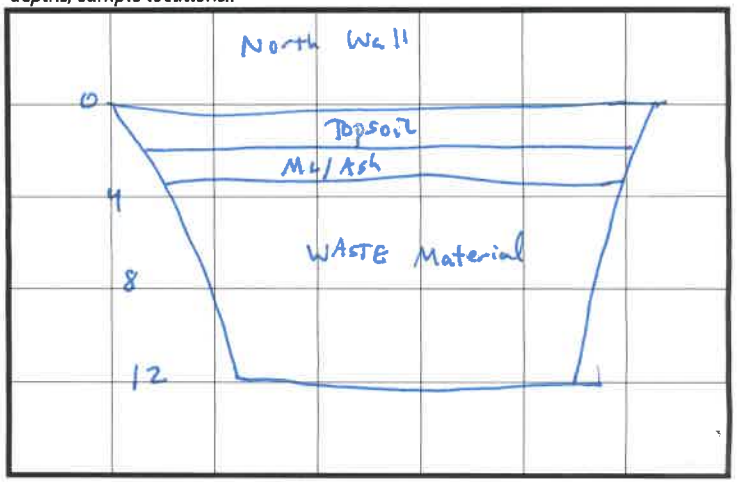
Sampler: ABW
Calibration Time: 815
Background Headspace: 0.0 ppm

Sample ID	Depth (ft)	Odor/ Sheen	Headspace Reading (ppm)	Description
0	1.5	None	1.0	Topsoil
1.5	3	None	0.5	hardened / solidified Ash/ML → difficult to break thru w/ excavator
3	12	Strong / Lt.	129.4	WASTE MATERIAL

PLAN VIEW SKETCH: identify scale and direction, excavation extents and depths, sample locations, structures, utilities..



CROSS SECTION SKETCH: identify scale and direction, excavation extents and depths, sample locations..



General stratigraphy description / General notes

0-1.5: Topsoil, Dk gry/Brown, silty w/ organics (OL)

1.5-3: gry Ash/silt → solidified/hard → very difficult to dig thru, fg silt or ash, 10YR 4/1 gray, few concrete pieces mixed in

3-12: WASTE MATERIAL: Very strong decomp. odor, light sheen, Assorted debris w/ black silty sand [bottles, wood, cardboard, paper, chord, tape, shingles, etc]

* WASTE SAMPLE collected 3-12'

Landfill :

CH_4	CO_2	O_2	Bal	LEL
0	0	21.3	78.7	0

TEST TRENCH FIELD SAMPLING AND SCREENING LOG

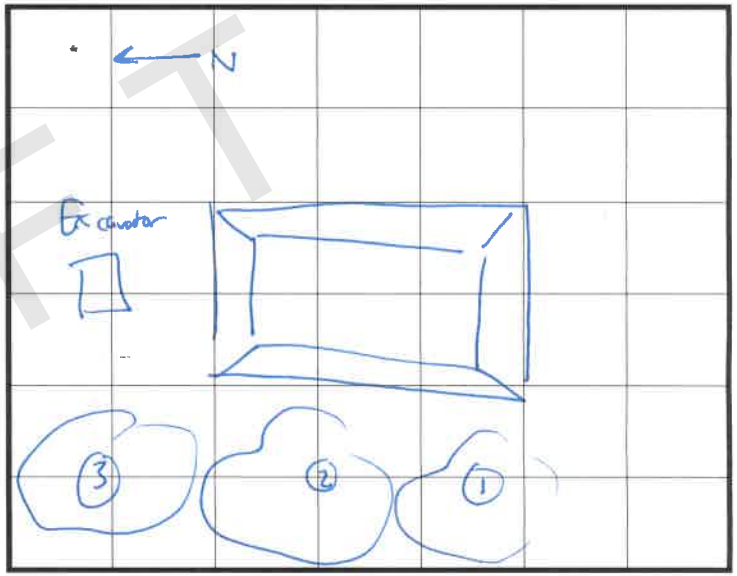
Client: Minnesota Pollution Control Agency
Project Name: Freeway Landfill & Dump Investigation
Number: 23 / 19 - 1372
Location ID: FD-TT-13

Date: 4/17/18
Time Statred: 1515
Time Ended:

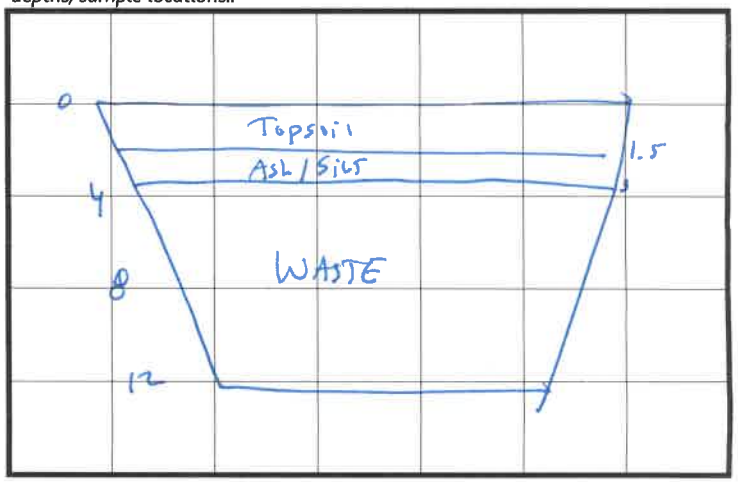
Sampler: ABW
Calibration Time: 815
Background Headspace: 0.0 ppm

	Sample ID	Depth (ft)	Odor/ Sheen	Headspace Reading (ppm)	Description
(1)	0	1.5	NONE	4.5	Topsoil
(2)	1.5	3.0	NONE	0.9	Gray Solidified silt/Ash
(3)	3.0	12	strong decomp Lt	71.9	WASTE MATERIAL

PLAN VIEW SKETCH: identify scale and direction, excavation extents and depths, sample locations, structures, utilities..



CROSS SECTION SKETCH: identify scale and direction, excavation extents and depths, sample locations..



General stratigraphy description / General notes

0-1.5 → Topsoil, Dk brown OL w/ silty material

1.5-3.0 → Ash/ML → hard, difficult to dig thru, compact, gray, very fine material layer 4/1 gray

3.0 → 12 → WASTE MATERIAL: Assorted waste → paper, wood, metal, insulation, dishwasher, metal, fencing, plastic, glass, etc

* waste sample collected 2'-12'

TEST TRENCH FIELD SAMPLING AND SCREENING LOG

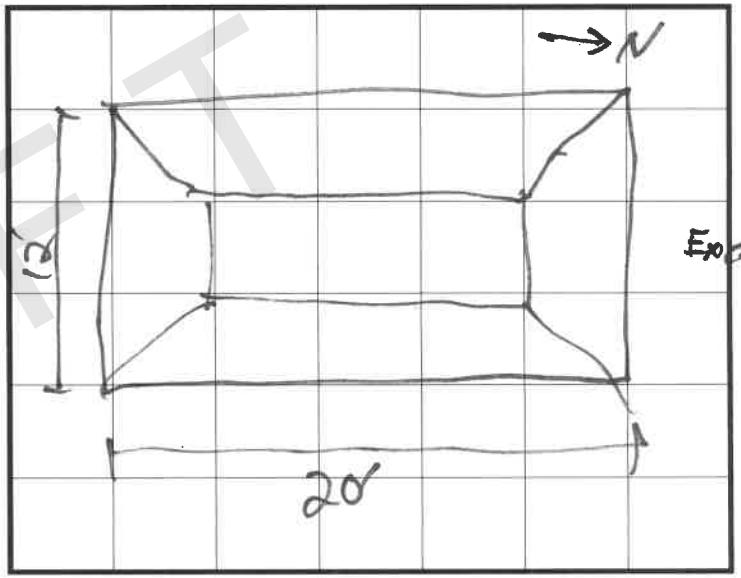
Client: Minnesota Pollution Control Agency
Project Name: Freeway Landfill & Dump Investigation
Number: 23 / 19 - 1372
Location ID: FD-TT-14

Date: 4-18-18
Time Statred: 08:45
Time Ended: 09:50

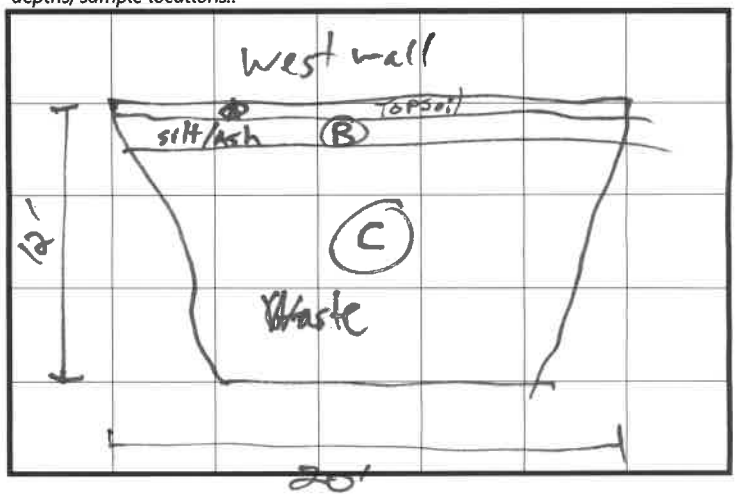
Sampler: JWJ
Calibration Time: 08:20
Background Headspace: 0.3 ppm

Sample ID	Depth (ft)	Odor/ Sheen	Headspace Reading (ppm)	Description
A	0'-0.5'	N/	1.5	Topsoil
B	0.5'-2'	N/	2.1	Gray solidified silt/Ash
C	2'-12'	strong/ chemical	28.5	Waste Material

PLAN VIEW SKETCH: identify scale and direction, excavation extents and depths, sample locations, structures, utilities..



CROSS SECTION SKETCH: identify scale and direction, excavation extents and depths, sample locations..



General stratigraphy description / General notes

0'-0.5' = Topsoil, Dk brown OL/OH w/ silty material

0.5'-2' = Ash/ML(silty) compact gray very fine material 10YR 4/1 gray

2'-12' = Waste Material : Assorted waste; paper, shingles insulation, wood, metal, plastic sheeting, concrete chunks, glass strong chemical odor

Waste Sample collected @ 3'-11'

TEST TRENCH FIELD SAMPLING AND SCREENING LOG

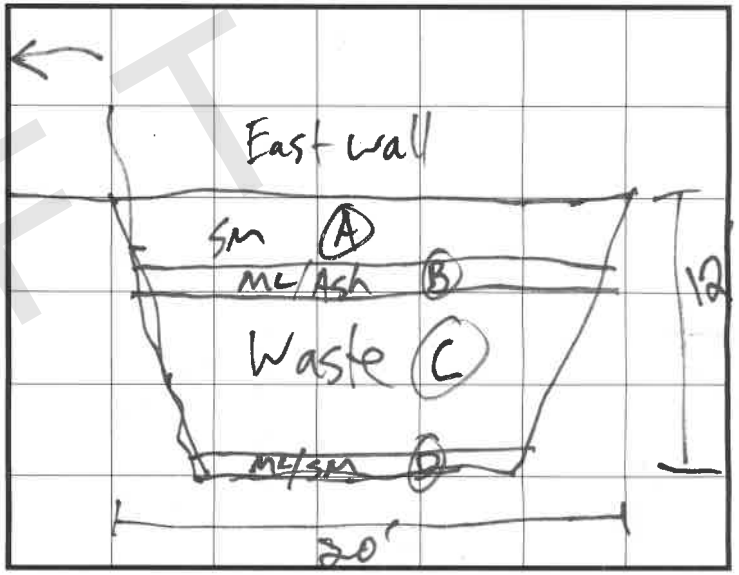
Client: Minnesota Pollution Control Agency
Project Name: Freeway Landfill & Dump Investigation
Number: 23 / 19 - 1372
Location ID: FL-TT-01

Date: 4-18-18
Time Statred: 12:30
Time Ended:

Sampler: JWJ
Calibration Time: 08:20
Background Headspace: 0.3 ppm

Sample ID	Depth (ft)	Odor/ Sheen	Headspace Reading (ppm)	Description
A	0-2	N/N	0.4	Brown silty sands
B	2-3	N/N	0.7	Gray silt/Ash
C	3-11	N/N	1.6	Waste
D	11-12	N/N	1.1	Gray silts/sands and silty

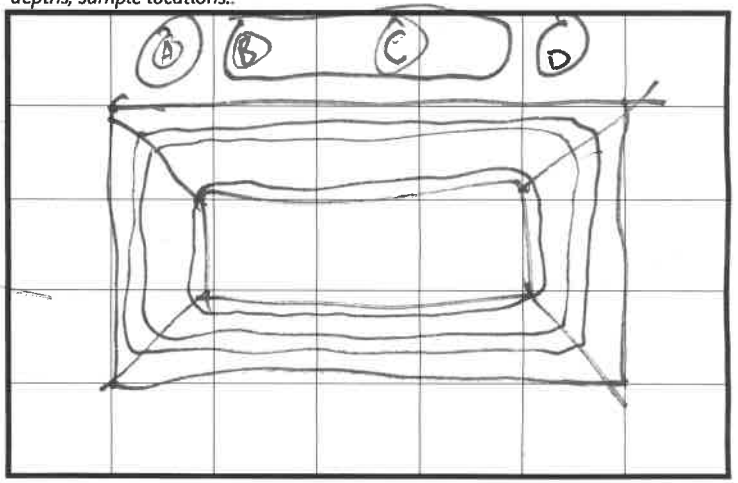
PLAN VIEW SKETCH: identify scale and direction, excavation extents and depths, sample locations, structures, utilities..



General stratigraphy description / General notes

A 0'-2' = Brown silty sand + topsoil Cover (SM)
B 2'-3' = Gray silts/Ash (ML)
C 3'-11' = Waste, glass, plastics, wood, brick some concrete
D 11'-12' = Layers of gray silty sands (fg-mg) over Gray silts w/some clay.

CROSS SECTION SKETCH: identify scale and direction, excavation extents and depths, sample locations..



Pace Sampled water @ ~10' bgs
waste sample collected 2'-10.5'

TEST TRENCH FIELD SAMPLING AND SCREENING LOG

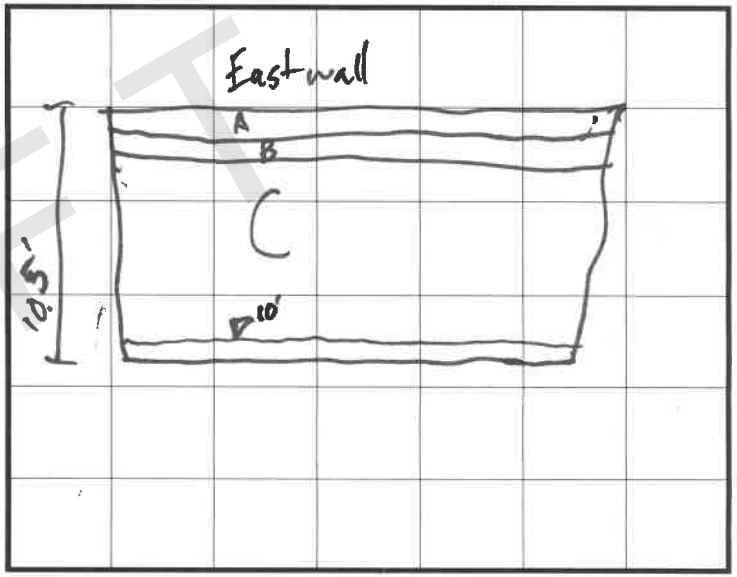
Client: Minnesota Pollution Control Agency
Project Name: Freeway Landfill & Dump Investigation
Number: 23 / 19 - 1372
Location ID: FL-TT-02

Date: 4-18-18
Time Statred: 13:30
Time Ended: 16:00

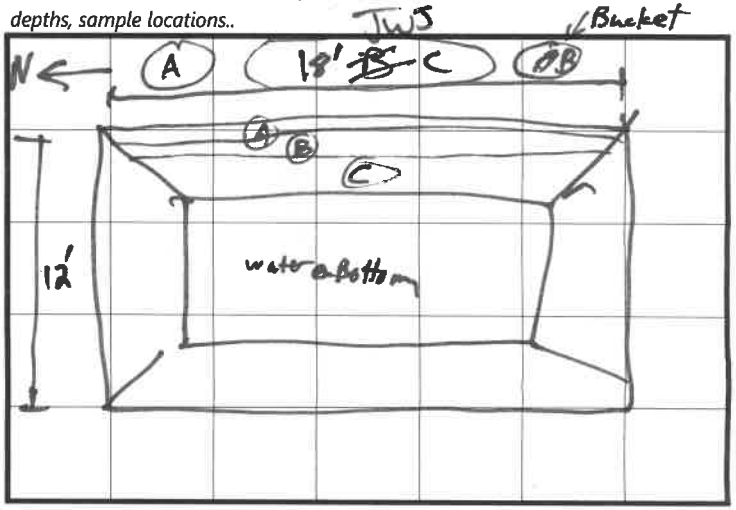
Sampler: JWS
Calibration Time: 08:20
Background Headspace: 0.3 ppm

Sample ID	Depth (ft)	Odor/ Sheen		Headspace Reading (ppm)	Description
A	0-1	N	N	0,4	Dark Brown topsoil Fill
B	1-2	N	N	5,4	Gray ~~silty/Ash~~ JWS silty sand (SM)
C	2-10.5	Lt.	Lt.	20,5	Waste

PLAN VIEW SKETCH: identify scale and direction, excavation extents and depths, sample locations, structures, utilities..



CROSS SECTION SKETCH: identify scale and direction, excavation extents and depths, sample locations..



General stratigraphy description / General notes

A = Dark Brown topsoil fill 0%/0H

B = Gray ~~silty/Ash~~ JWS silty sand (SM) Fill ~15% silts (Frozen)

C = Waste Fill, wood, bricks, plastic, paper, glass, scrap metal
wet @ ~10' BGS Lt chemical odor, Lt. sheen
Pace sampled water @ 10'

TEST TRENCH FIELD SAMPLING AND SCREENING LOG

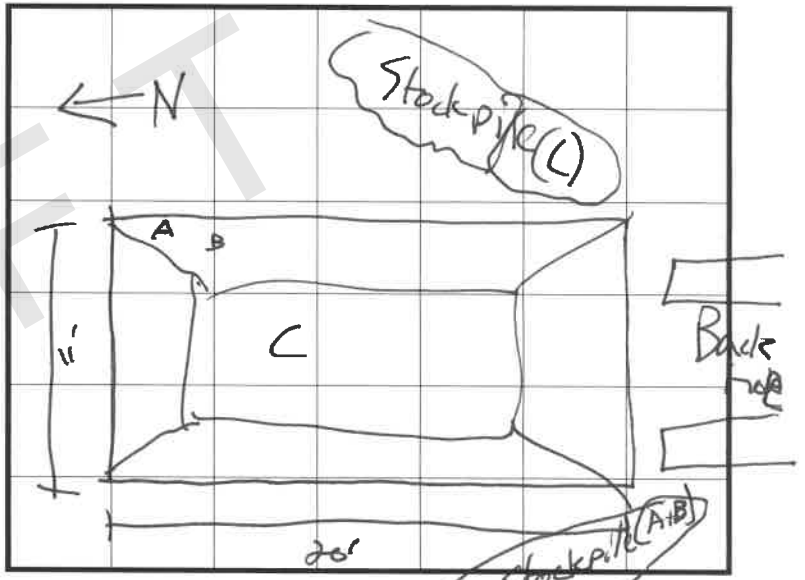
Client: Minnesota Pollution Control Agency
Project Name: Freeway Landfill & Dump Investigation
Number: 23 / 19 - 1372
Location ID: FL-TT-02a

Date: 4-20-18
Time Started: 08:45
Time Ended: 09:45

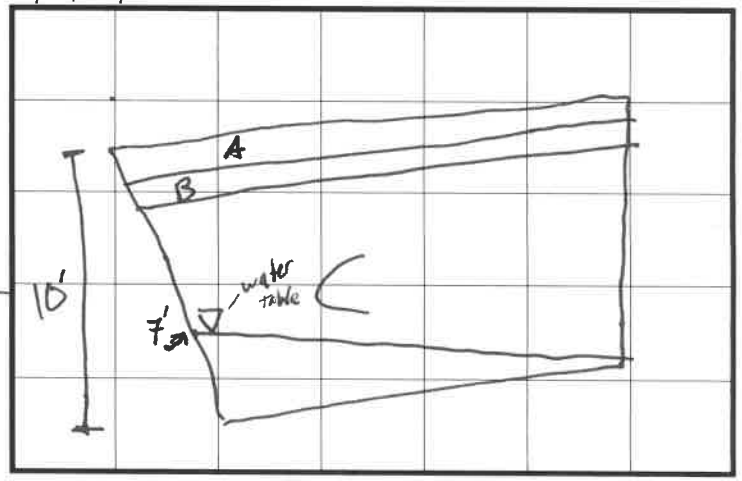
Sampler: JWJ
Calibration Time: 0740
Background Headspace: 0.4 ppm

Sample ID	Depth (ft)	Odor/ Sheen	Headspace Reading (ppm)	Description
A	0-1	N / N	2.7	Dark brown topsoil + silty sand (SM)
B	1-2	N / N	0.5	Gray silty sand w some debris
C	2-10	Lt / Rainbow	4.8	Waste

PLAN VIEW SKETCH: identify scale and direction, excavation extents and depths, sample locations, structures, utilities..



CROSS SECTION SKETCH: identify scale and direction, excavation extents and depths, sample locations..



General stratigraphy description / General notes

A = Dark brown organic topsoil w/ silty sand (SM) tree roots present

B = Gray silty sand cover w/ some concrete blocks

C = Waste fill including wood, plastics, glass, paper, wiring, lt chemical odor, Rainbow sheen in darker colored soils

water @ 7'

Soil Sample Collected [2-10]

* ABC WATER Sample

TEST TRENCH FIELD SAMPLING AND SCREENING LOG

Landfill >

CH_4	CO_2	O_2	Bal	LEL 2
6.0	0.0	21.4	0.6	0%

Client: Minnesota Pollution Control Agency

Project Name: Freeway Landfill & Dump Investigation

Number: 23 / 19 - 1372

Location ID: FL - TT-03

Date: 4/19/18

Time Statred: 730

Time Ended:

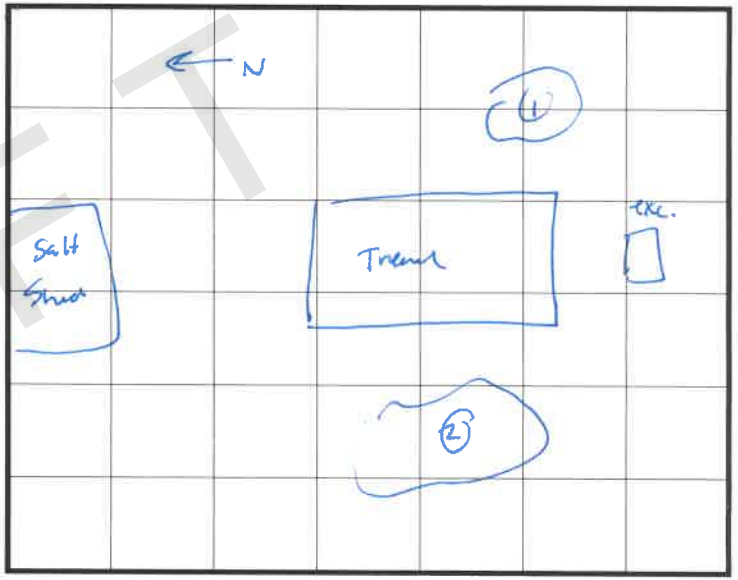
Sampler: ABW

Calibration Time: 730

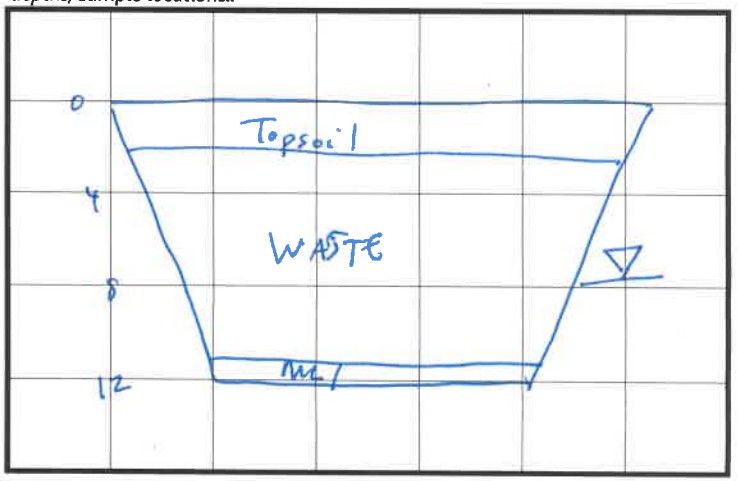
Background Headspace: 0.0 ppm

Sample ID	Depth (ft)	Odor/ Sheen	Headspace Reading (ppm)	Description
0	2	None	0.5	Topsoil → org OL
2	10	H. Wood, None	4.0	WASTE MATERIAL
10	12	None	0.2	Gray silt

PLAN VIEW SKETCH: identify scale and direction, excavation extents and depths, sample locations, structures, utilities..



CROSS SECTION SKETCH: identify scale and direction, excavation extents and depths, sample locations..



General stratigraphy description / General notes

0-2 : Dk brown OL (topsoil), abundant roots, silty, lev fine gravel

2-10: Waste Material : Wood, plastic, rubber, w/ silty sand, brown, moist to 8' bgs, wet below, [Industrial WASTE]

10-12 : gray silt w/ sand, noplastic, fine sand, gray (10YR 4/1) wet, homogeneous, loose, [0/30/70]

* ABC Waste
* Waste 2-14

TEST TRENCH FIELD SAMPLING AND SCREENING LOG

Client: Minnesota Pollution Control Agency
Project Name: Freeway Landfill & Dump Investigation
Number: 23 / 19 - 1372
Location ID: FL-TT-04

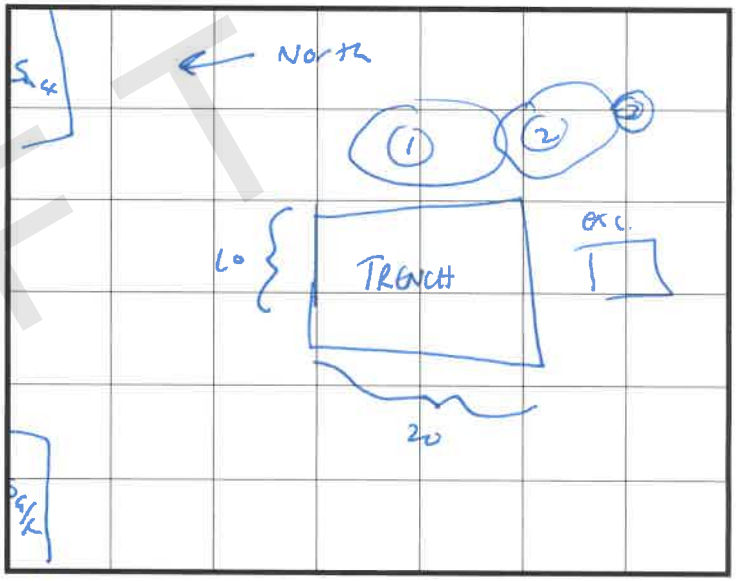
Date: 4/19/18
Time Statred: 820
Time Ended:

Sampler: ABW
Calibration Time: 730
Background Headspace: 0.0 ppm

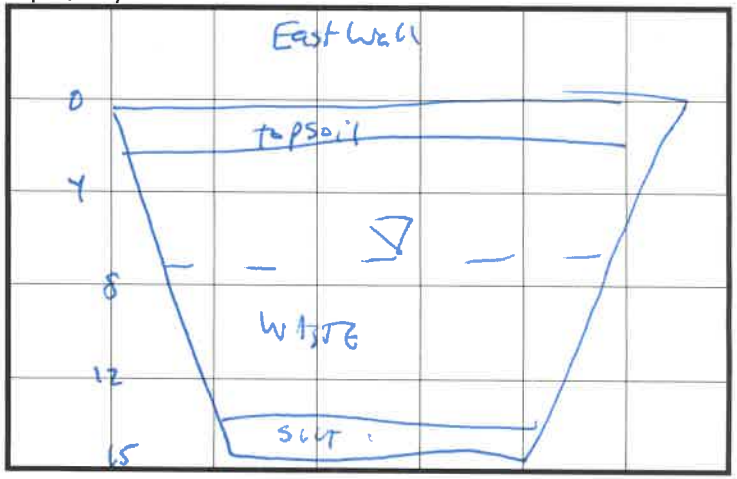
Sample ID	Depth (ft)	Odor/ Sheen	Headspace Reading (ppm)	Description
0	2	NONE	0.1	Topsoil (Brown)
2	14	Trace/ NONE	0.2	WASTE MATERIAL
14	15	NONE	0.1	Gray silt w/ Sand

7' bgs ▽

PLAN VIEW SKETCH: identify scale and direction, excavation extents and depths, sample locations, structures, utilities..



CROSS SECTION SKETCH: identify scale and direction, excavation extents and depths, sample locations..



General stratigraphy description / General notes

0-2 Topsoil (OL) Brown - Dk brown, silty sand w/ organics

2-14: WASTE MATERIAL - Black silty Sand, wood, plastic, Rubber, bricks, Concrete, vetc 7, asa trace sheen, Lt. woody odor, Insulation, glass (Construction debris)

14-15: Sandy silt, gray (10YR 4/1), loose, homogenous fg. Vfg Sand [Native]

... Metal / Electrical

* Sample Waste 5-15

* ABC List Waters

TEST TRENCH FIELD SAMPLING AND SCREENING LOG

LF	Meth	CO_2	O_2	Bal	LEL2
	0.0	0.0	20.0	80.0	0%

Client: Minnesota Pollution Control Agency

Project Name: Freeway Landfill & Dump Investigation

Number: 23 / 19 - 1372

Location ID: FL-TT-05

Date: 4/19/18

Time Statred: 930

Time Ended: 1015

Sampler: ABC/Pace

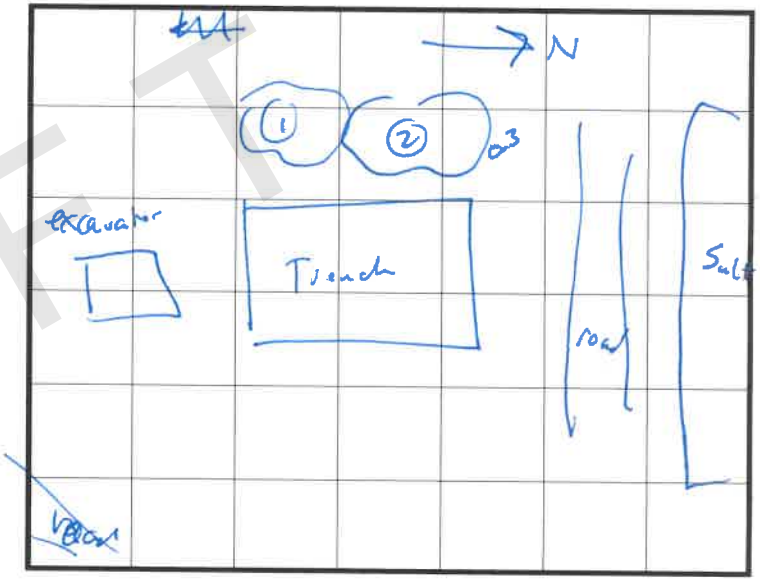
Calibration Time: 730

Background Headspace: 0.0 ppm

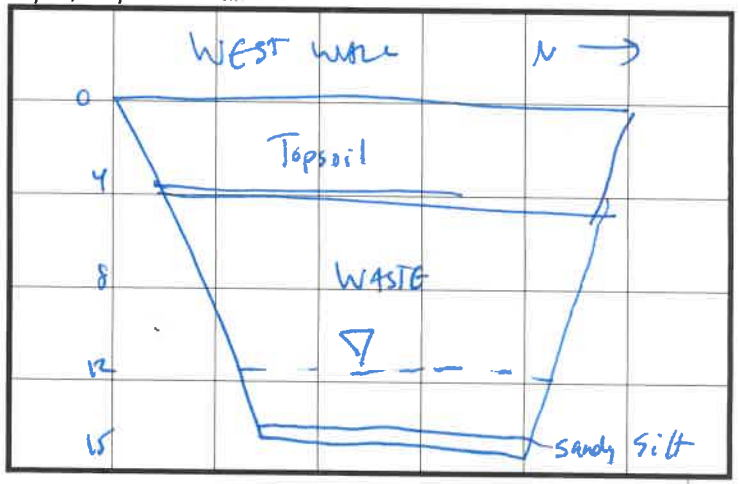
Sample ID	Depth (ft)	Odor/ Sheen	Headspace Reading (ppm)	Description
0	5	N/A/N	0.6	Topsoil → Black, organics
5	15	strong decomp./ trace	29.2	WASTE MATERIAL
15	—			@ 15 → gray Sandy silt

11' bgs

PLAN VIEW SKETCH: identify scale and direction, excavation extents and depths, sample locations, structures, utilities..



CROSS SECTION SKETCH: identify scale and direction, excavation extents and depths, sample locations..



General stratigraphy description / General notes

0-5: Topsoil, Black, organic, Sandy silt (OL)(@ 50/50)

Waste 5-15: WASTE Material, Tires, metal, wood, plastic, glass, automotive & construction debris, strong decomposition odor, trace sheen, Black Silty sand throughout

@ 15: last Bucket contained Sandy Silt, gray, VF fgsand, homogeneous, loose, wet, (0/40/60) [Native]

Soil Sample 0 - 10 'bgs

TEST TRENCH FIELD SAMPLING AND SCREENING LOG

* No water Sample → ~~Not enough~~ Only trickle of water entering trench

Client: Minnesota Pollution Control Agency

Project Name: Freeway Landfill & Dump Investigation

Number: 23 / 19 - 1372

Location ID: FL-TT-06

Date: 4/19/18

Time Statred: 1045

Time Ended:

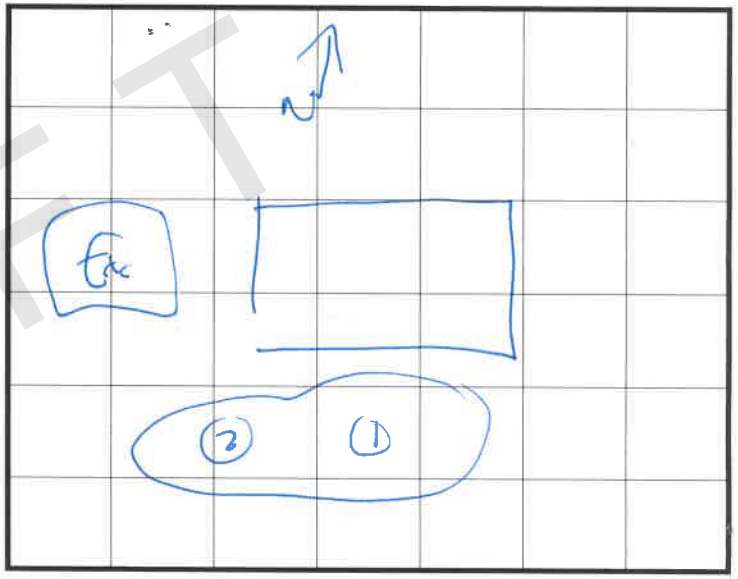
Sampler: ABW

Calibration Time: 730

Background Headspace: 0.0 ppm

Sample ID	Depth (ft)	Odor/ Sheen	Headspace Reading (ppm)	Description
0	10	None	0.4	Brown ~~sandy silt~~ Silty sand
10	13	None	0.4	Gray sandy silt, few clay

PLAN VIEW SKETCH: identify scale and direction, excavation extents and depths, sample locations, structures, utilities..



CROSS SECTION SKETCH: identify scale and direction, excavation extents and depths, sample locations..

General stratigraphy description / General notes

0-10: Brown ~~Sandy Silt~~ Silty Sand, 10YR 4/3 Brown, organics 0-4' bgs [0/60/40] f-mg sand (mostly fg), Soft, loose, homogeneous, few clay, Soil forms "dumps"

[x water entering trench @ 8' bgs Trickle, ~~not~~ no standing water]

10-13: Gray Sandy silt w/ clay, soft low plast, (few clay), dense, homogeneous, few thin laminations, iron ox throughout, 10YR 4/1 [0/30/70]

* Soil Sample ~~5-10~~ 1-5'
* Water ABC list

TEST TRENCH FIELD SAMPLING AND SCREENING LOG

[Another small pothole (~6') dug just NW on toe of slope → contained water]

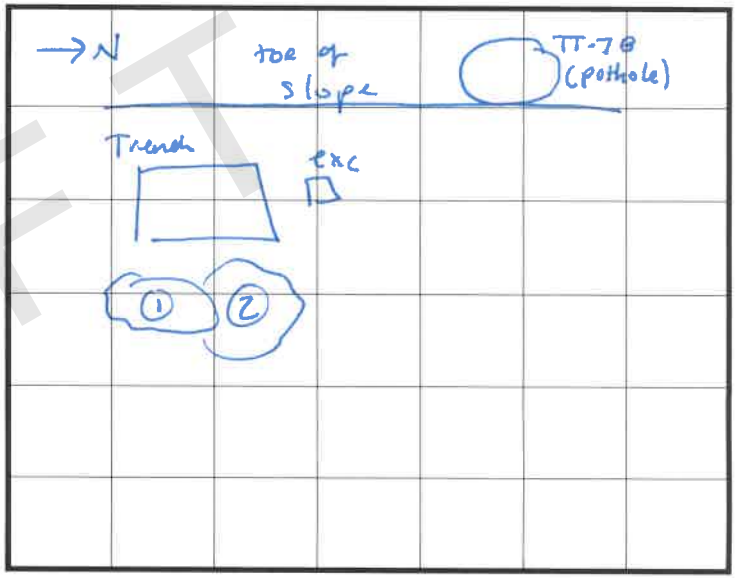
Client: Minnesota Pollution Control Agency
Project Name: Freeway Landfill & Dump Investigation
Number: 23 / 19 - 1372
Location ID: FL-TT-07

Date: 4/19/18
Time Statred: 1245
Time Ended:

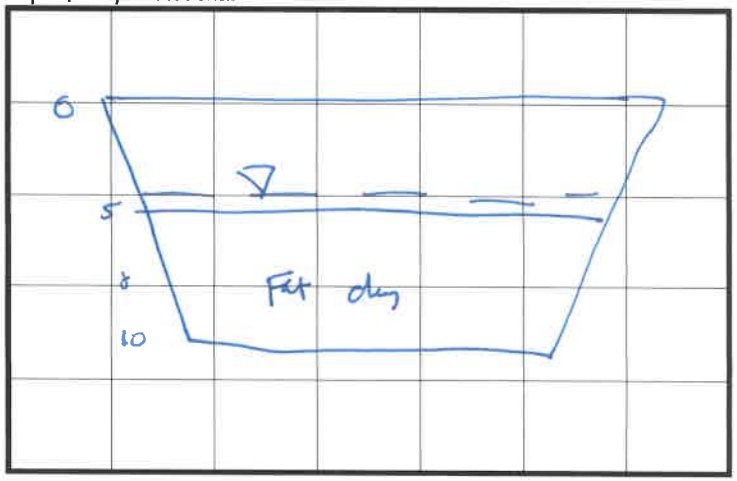
Sampler: ABW/Pace
Calibration Time: 730
Background Headspace: 0.0 ppm

Sample ID	Depth (ft)	Odor/ Sheen	Headspace Reading (ppm)	Description
0	5	None	0.3	Clayey Sand (Dk grayish Brown)
5	10	NONE	0.3	Fat clay (Dk gray)

PLAN VIEW SKETCH: identify scale and direction, excavation extents and depths, sample locations, structures, utilities..



CROSS SECTION SKETCH: identify scale and direction, excavation extents and depths, sample locations..



General stratigraphy description / General notes

0-1 Topsoil: org. Ol

1-5: Clayey Sand [0/70/30] Dk grayish Brown, fg sand, w/ gray mod plast clay, forms small clumps ~ 1", irox oxidation 1.5-2' bgs, water entering trench @ 4' bgs

5-10: Dk gray Fat clay, high plast [0/10/90] Thin bedding, shells, org odor, wet to moist

TEST TRENCH FIELD SAMPLING AND SCREENING LOG

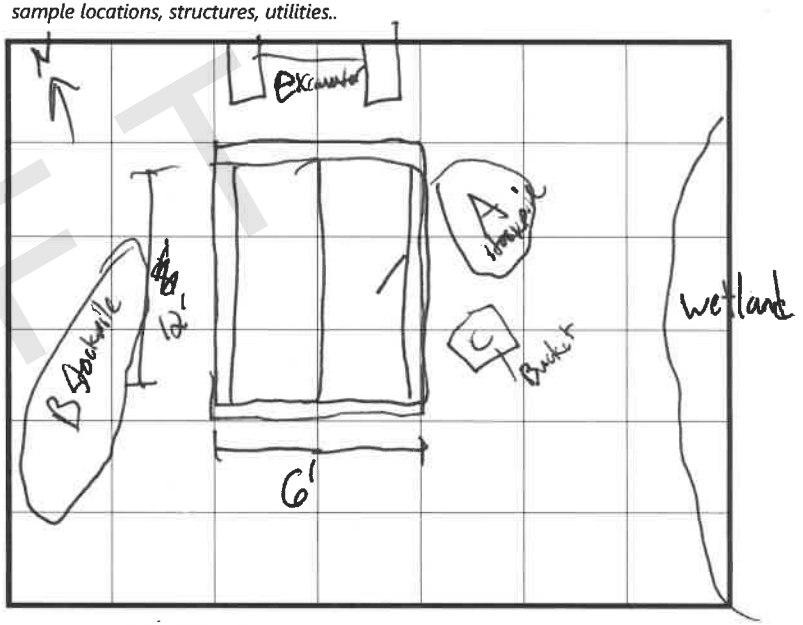
Client: Minnesota Pollution Control Agency
Project Name: Freeway Landfill & Dump Investigation
Number: 23 / 19 - 1372
Location ID: FL-TT-08

Date: 4-20-18
Time Started: 13:55
Time Ended:

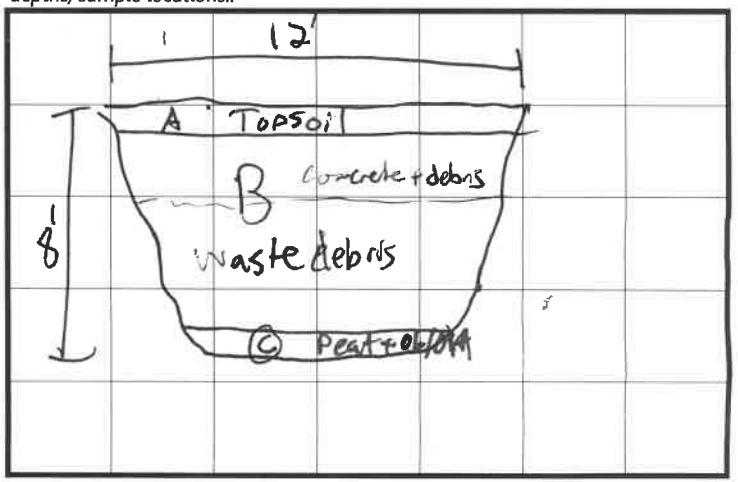
Sampler: JWJ
Calibration Time: 07:40
Background Headspace: 0.2 ppm

Sample ID	Depth (ft)	Odor/ Sheen		Headspace Reading (ppm)	Description
A	0-1'	N	N	2.8	Black topsoil + roots
B	1-7'	N	org plastic	35	Black soils + WASTE
C	7'-8'	Lt chemical	N	4.3	Black + Dk brown Peat + OL/OH Native

PLAN VIEW SKETCH: identify scale and direction, excavation extents and depths, sample locations, structures, utilities..



CROSS SECTION SKETCH: identify scale and direction, excavation extents and depths, sample locations..



General stratigraphy description / General notes

A - Black topsoil + roots

B - Black organic soils + WASTE
- plastics, rope, paper, fabric, wood, metal, metal piping
plastic 1'-3' = concrete rubble + debris

C - Black and dark brown peat w/ organic silts (OL/OH)
Native

Field Form 3

TEST EXCAVATION FIELD LOG

Client: Minnesota Pollution Control Agency

Project Name: Freeway Landfill - Phase B

Number: 23 / 19 - 1372

Location ID: FL-TT-09

Date: 5/30/19

Time Started: 09:20

Time Ended: 09:40

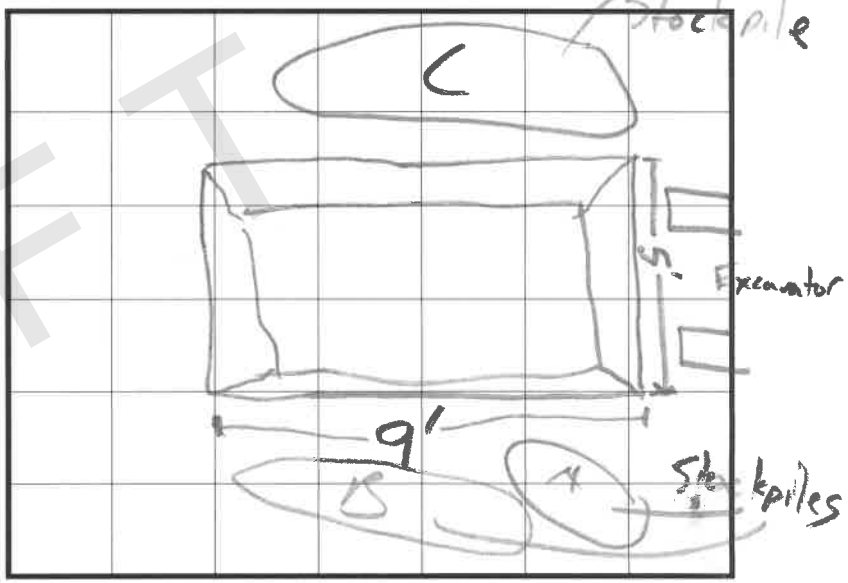
Sampler: JWJ

Calibration Time: 9:15

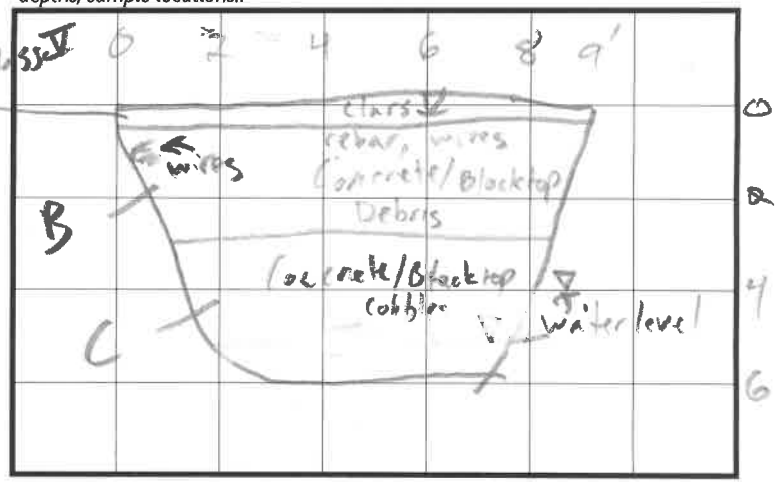
Background Headspace: 0.0 ppm

Sample ID	Depth (ft)	Odor/ Sheen	Headspace Reading (ppm)	Description
A	0-0.5	N / N	1.1	light brown/tan class V gravel
B	0.5-3	N / N	1.4	Med brown silty sand w/ Concrete, blacktop, wiring, rebar
C	3'-6'	N / lt. sheen	1.8	Dark gray brown silty sand w/ concrete, blacktop, cobbles

PLAN VIEW SKETCH: identify scale and direction, excavation extents and depths, sample locations, structures, utilities..



CROSS SECTION SKETCH: identify scale and direction, excavation extents and depths, sample locations..



General stratigraphy description / General notes

A = Tan/Brown class II gravel
Trace debris at surface

B = SM = Fill med brown silty sand w debris (concrete, Blacktop, wiring, rebar, cobbles)

C = SM = Fill Dark gray brown silty sands w/ debris (concrete, Blacktop, cobbles) wet @ ~4'
lt. sheen (swirly)

Field Form 3

TEST EXCAVATION FIELD LOG

Client: Minnesota Pollution Control Agency

Project Name: Freeway Landfill - Phase B

Number: 23 / 19 - 1372

Location ID: FL-TI-10

Date: 5/30/19

Time Statred: 10:00

Time Ended: 10:08

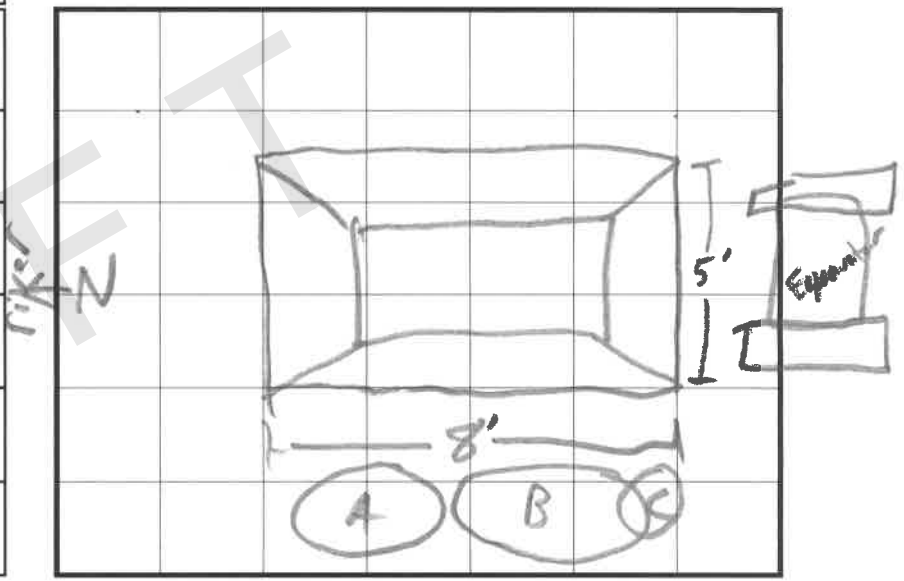
Sampler: JWJ

Calibration Time: 09:15

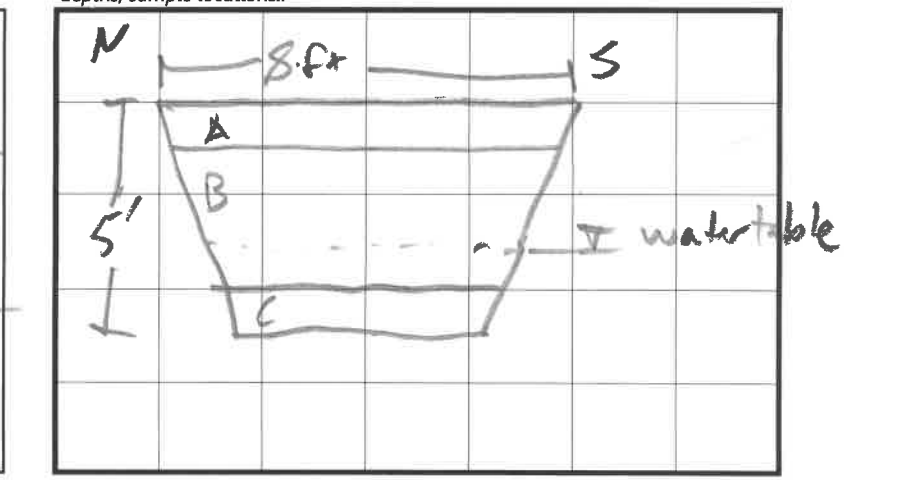
Background Headspace: 0.0 ppm

Sample ID	Depth (ft)	Odor/ Sheen	Headspace Reading (ppm)	Description
A	0-1'	N / N	1.0	Class V gravel
B	1-4'	N / N	1.1	class V gravel (mostly mg-cg sand)
C	4-5'	N / N	1.1	SC clayey sand w/silts

PLAN VIEW SKETCH: identify scale and direction, excavation extents and depths, sample locations, structures, utilities..



CROSS SECTION SKETCH: identify scale and direction, excavation extents and depths, sample locations..



General stratigraphy description / General notes

A: Class V gravel
tan/lt brown
sm — No debris — fill

B: class V gravel tan/lt brown wet @ 3'
sm mostly fg-cg sand — No Debris — Fill

C: Dark brown
SC clayey sand, w/silts — No Debris

Appendix C-1

Included in Separate File

Laboratory Analytical Reports

Solid Media – Phase A (2018)

Appendix C-2

Included in Separate File

Laboratory Analytical Reports

Water – Phase A (2018)

Appendix C-3

Included in Separate File

Laboratory Analytical Reports

Solid Media – Phase B (2019)

Appendix C-4

Included in Separate File

Laboratory Analytical Reports

Water – Phase B (2019)

Appendix C-5

Included in Separate File

Laboratory Analytical Report

Soil Gas – Phase B (2019)

Appendix D

Minnesota River Elevations and Monthly Precipitation

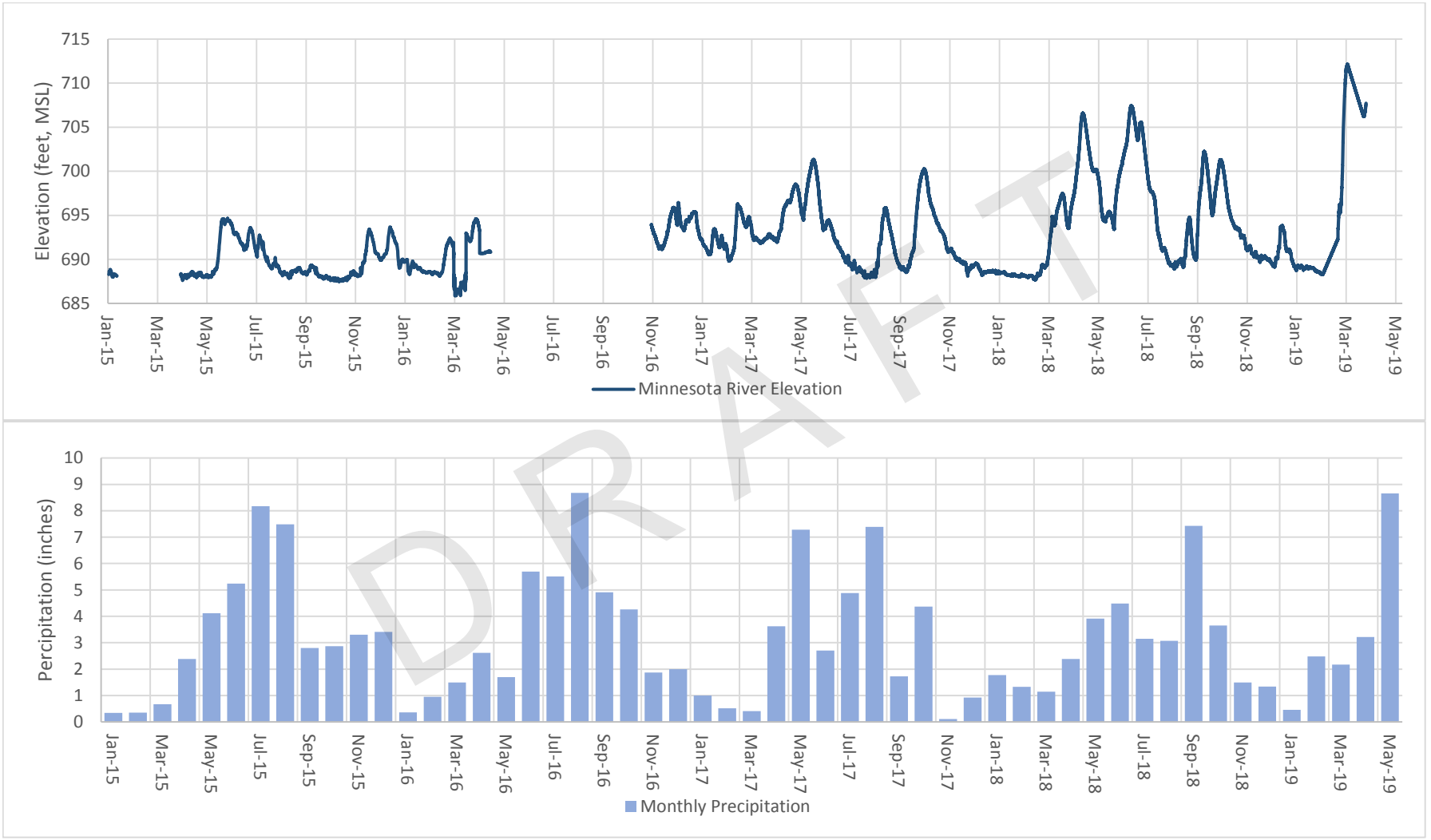
Appendix D

MINNESOTA RIVER ELEVATION and MONTHLY PRECIPITATION

Focused Remedial Investigation Report

Freeway Landfill and Dump

Burnsville, Minnesota



Precipitation data from Minnesota State Climatolgy Office website http://climateapps.dnr.state.mn.us/HIDradius/radius_new.asp

Minnesota River Elevation at gauge in Savage, MN. Data received from US Army Corps of Engineers, St Paul District

Appendix E

Data Quality Review

Appendix E

Data Quality Review

[DRAFT using data available as of 06/28/19]

The quality assurance data from the 2019 sampling event were evaluated to determine the integrity of the sampling procedures and the validity of the analytical results. Review procedures were performed in accordance with Barr standard operating procedures (SOPs) and/or method QC requirements where no SOP was available.

Both laboratory and field sampling procedures were examined in the review of the sampling events. Field sampling procedures were examined utilizing field blank and field duplicate analysis; additionally, laboratory procedures were evaluated by examining technical holding times, precision and accuracy data, laboratory method blank analysis, duplicate analysis, and data package completeness.

1.1 Field Procedures

Four field duplicates were collected with this sampling event. Duplicate relative percent differences (RPDs) were calculated for all otherwise unqualified results greater than five times the reporting limit (RL). RPD values close to the reporting limit are not always good measures of precision, and were therefore not necessarily evaluated as part of the review. All duplicate results greater than five times the reporting limit exhibited acceptable RPDs.

One field blank had detectable concentrations of methylene chloride and perfluoropentanoic acid (PFPeA). All methylene chloride concentrations were non-detect for the associated samples and not qualification was required. A number of samples reported concentrations of PFPeA between the reporting limit and five times that of the detected concentration in the field blank and the associated results were qualified as potential false positives. In a separate field blank, methylene chloride was also had reported detectable concentrations. All associated methylene chloride concentrations in project samples were non-detect or greater than five times the detected values in the blank, and no qualification was required.

1.2 Laboratory Procedures

1.2.1 Technical Holding Times

Technical holding times were evaluated for each sample and target compound based on the Environmental Protection Agency (EPA) recommendations listed in 40 CFR SW846 "Test Methods for Evaluating Hazardous Waste" or method recommendations. The pH was measured using field instruments at the time of sampling at each monitoring location, and field results are reported in the tables. The pH was also analyzed in the laboratory for confirmatory purposes and was generally analyzed several days later. The EPA-recommended hold time for pH analysis is immediately after sample collection; as it is not feasible to meet this holding time with laboratory analysis, the field-measured pH appropriately taken at the time of sample collection is reported in the tables.

PFAS analysis of sample 813764 was conducted outside recommended hold times and the associated results are qualified accordingly.

Bedrock core samples reported with Pace work order 10471713 were submitted to the laboratory past hold for a number of parameters and with elevated temperatures (20.7°C). All organic parameters were qualified as past hold, as well as a number of short-hold general parameters – these results may be potentially biased low, some of them significantly so.

Several other samples coolers were received by the laboratories at elevated temperatures. However, this always occurred within typical allowed cool-down periods after sample collection and no qualifiers were applied as a result.

The remaining technical holding times were within recommendations for all of the samples.

1.2.2 Precision and Accuracy Data

The accuracy and precision of the analytical process were reviewed by comparing sample surrogate recoveries, matrix spike (MS) and matrix spike duplicate (MSD), laboratory control sample (LCS) and laboratory control sample duplicate (LCSD) percent recoveries for spiked target compounds. Accuracy was evaluated by comparing the percent recoveries of the target compounds to laboratory acceptance criteria. Precision was evaluated using the percent recoveries of the laboratory duplicate samples, LCS/LCSD and MS/MSD data and calculating duplicate relative percent differences (RPDs).

In general, surrogate recoveries on samples were acceptable when the results came from undiluted analyses. No action was taken for those surrogate results outside laboratory acceptance criteria if the sample was analyzed at dilution or if only one surrogate was outside control on a given sample.

Laboratory duplicate samples displayed acceptable RPDs for all results greater than five times the RL, except where noted in the tables. In general LCS/LCSD displayed acceptable percent recoveries and all RPDs met laboratory acceptance criteria; however, there were a few instances where this was not the case (largely individual VOC, SVOC or pesticide analyses) and samples associated with the affected batches were qualified as estimated values where appropriate.

It is noted that MS/MSD sample results reported by the laboratory included project and non-project specific samples. Where MS/MSD recoveries and/or associated RPDs failed acceptance criteria and where the native sample was associated with another laboratory client, acceptance of the sample results were based on the acceptable LCS/LCSD data which generally indicated in-control analytical systems during this project with the exception of the aforementioned issues with various organics analyses. Results of MS/MSD samples not specific to this project are not discussed herein.

The MS/MSD recoveries for the several analytes were occasionally outside acceptance criteria. Where the parent sample concentrations were greater than four times the spike added, no qualification was required. In other cases where MS/MSD results were outside laboratory control limits, but were less than 5% outside control limits, no qualification was added. In other cases where MS/MSD results were outside of control limits and the sample was associated with this project, qualifiers were applied accordingly to indicate that the sample results reported reflect estimated values. In one instance, hexavalent chromium MS/MSD results recoveries were reported as having no recovery of the spiked amount and the associated reported result was qualified as a rejected value.

1.2.3 Laboratory Method Blank Results

In several series of VOC samples analyzed, the continuing calibration verification and/or LCS/LCSD recoveries were low for hexachlorocyclopentadiene, hexachloroethane, bromomethane, bentazon, and/or dichlorodifluoromethane. Affected results were qualified as estimated values. A few samples were impacted by recoveries and RPDs outside laboratory acceptance criteria for ethalfluralin, fonofos, propachlor, and triallate. Because both the recovery and RPD were outside of control, the affected samples were qualified as estimated values.

No other target compounds were detected in the laboratory method blanks.

1.2.4 Accreditations

With respect to all solid samples, there were a few parameters reported that Pace lacked accreditation in. Where the lab was not accredited for a target parameter, but accreditation was available, results were qualified as estimated values.

1.2.3 Completeness

Data completeness was evaluated by comparing the analysis requested with the data package as received. The data package received from the laboratory is complete.

1.2.3 Conclusion

All data met the data quality objectives of the project and are deemed acceptable for the purposes of this project, as qualified in the accompanying tables.