Attachment #1

Facility Description and Waste Types

1 GENERAL DATA

1.1 GENERAL FACILITY DESCRIPTION

The Salt Lake Valley Solid Waste Management Facility (SLVSWMF, Facility, or Landfill) is located approximately 9 miles west of the center of Salt Lake City, within the incorporated limits of Salt Lake City, as shown on Figure 1. The site lies adjacent to and north of California Avenue (1300 South), west of 5600 West Street, south of and adjacent to the Union Pacific and Western Pacific Railroad right of way, and east of 8000 West Street as shown on Figure 2. The latitude and longitude coordinates of the entrance facilities are approximately 40º 44' 25" North, 112º 1' 57" West.

The Facility is jointly owned by Salt Lake City and Salt Lake County. In July 1993, the Facility began accepting waste. The Facility is designed to cover approximately 455 acres along the north side of California Avenue. The solid waste cells occupy parts of Sections 10 and 11, Township 1 South, Range 2 West, Salt Lake Base and Meridian.

The Landfill is divided into 11 modules. Currently, seven modules have been opened and have accepted or are currently accepting waste. The Landfill plans to begin construction on a new module, Module 8, sometime in 2020. Construction and design plans have not been finalized for Module 8 at this time; once these are finalized, the Landfill will submit a major modification for their Solid Waste Permit. The locations of each existing module and the location of the proposed Module 8 are shown in Figure 2.

1.2 AREA SERVED

The Facility accepts municipal solid waste (MSW or waste) from multiple cities and municipalities in Salt Lake County. The waste is either transported to the Facility directly or from SLVSWMF's transfer station located at 502 West 3300 South in South Salt Lake, Utah. MSW from areas in the southern parts of Salt Lake County go to the Trans Jordan Cities Landfill in South Jordan.

Construction and demolition wastes generally go to appropriate construction waste landfills located near the Facility and at other locations in Utah.

1.3 WASTE TYPES

The amount of waste landfilled by the Facility since 1993 is as follows:

Year	Waste Landfilled (tons)
1993	689,000
1994	662,883
1995	727,995
1996	733,574
1997	760,807
1998	783,425
1999	707,367
2000	612,424
2001	607,071
2002	596,529
2003	569,248
2004	633,451
2005	513,103
2006	371,483
2007	471,068
2008	470,804
2009	485,814
2010	468,566
2011	434,247
2012	425,317
2013	400,764
2014	369,469
2015	338,852
2016	350,985
2017	394,899
2018	393,993

These figures indicate a relatively steady total waste stream over the past few years and a decline from the early 2000s.

The Facility accepts only non-hazardous solid waste including all wastes defined in UAC R315-301-2(7).

Asbestos and infectious waste are currently accepted for disposal at the site according to Salt Lake County Health Permit #35-017269. Infectious waste is largely contributed by medical centers and small clinics. Asbestos waste is brought to the Landfill in proper containment by licensed asbestos contractors and citizens. Non-friable asbestos waste and infectious waste is placed into a pre-dug hole within the Landfill, buried with additional non-infectious, non-asbestos waste material, and compacted. Friable asbestos waste is placed in designated areas of the Landfill.

Household hazardous waste (paint, household chemicals, etc.) is diverted from the Landfill through the Household Hazardous Waste Facility (HHWF) located at the Facility and operated by the Salt Lake County Health Department. This facility collects small containers of waste that would probably otherwise be mixed with municipal loads.

Materials are also received at the site as part of the non-hazardous soils regeneration site (SRS) program conducted by E. T. Technologies. E. T. Technologies uses approximately 60 acres of land within the active Landfill. The SRS was designed to process various types of non-hazardous industrial wastes in an environmentally sound manner to produce a nutrient enriched soil product for use at the Landfill. Incoming waste streams are blended with native soils within lined blending parcels. The SRS process is designed to optimize the microbial degradation of undesirable constituents contained in the industrial waste streams received. Enhanced conditions for microbial activity are obtained by controlling environmental factors such as soil moisture, nutrient concentrations and contaminant loading rates. SRS operations currently are fully permitted and monitored by E. T. Technologies. As the active Landfill is filled, the area used by E. T. Technologies (Module 11) will be incorporated into construction by the Salt Lake Valley Solid Waste Management Facility and the soils regeneration program will be closed or relocated.

2 LEGAL DESCRIPTION

The legal description for the Facility is as follows:

> Beginning at the south quarter corner of Section 11, Township 1 South, Range 2 West, Salt Lake Base Meridian; thence N0°01'29"W along the quarter section line a distance of 3633.55 feet to southerly right of way line of the Union Pacific Railroad; thence along said right of way N87°09'39" W 1334.75 feet and S0°05'04"E 25.00 feet and N87°09;39"W 3970.81 feet to the quarter section line of Section 10, Township 1 South Range 2 West, Salt Lake Base and Meridian; thence S0°08'18"W along said quarter section line a distance of 3882.75 feet to the south quarter corner of said Section 10; thence N89°51'59"E along section line a distance of 2658.36 feet to the southeast corner of said Section 10; thence N89°53'15"E along the section line a distance of 2651.59 feet to the point of beginning.
>
> Less and excepting Union Pacific Railroad 3.083-acre, parcel contains 453.786 acres.
>
> Begin 1533.02 feet west of the southeast corner of Section 11, Township 1 South Range 2 West, SLBM; thence N 89°55’44” West 1125.35 feet, then N 0°04’54” East a distance of 3589.73 feet; then N 77°33’ East for a distance of 1155.38 feet, then South 0°00’51” East for a distance of 1645.68 feet, then South 2°55’05” West for 176.08 feet; then South 0°01’ East for 2018.68 feet to beginning. Less the Union Pacific Railroad R-O-W. Parcel contains 89.26 acres.

The Facility is owned jointly by Salt Lake City and Salt Lake County; therefore, the Landfill is not a commercial facility. Ownership information for the site is shown in Appendix B.

Attachment #2

Alternative Final Cover

ATTACHMENT A

HYDRUS-1D Model Evaluations in Support of the Salt Lake Valley Landfill Alternative Cover Design

HYDRUS-1D Model Evaluations in Support of the Salt Lake Valley Landfill Alternative Cover Design

PREPARED FOR: Roy Van Os / DSHW

PREPARED BY: Darren Meadows/ CH2M HILL
David Waite/CH2M HILL

REVIEWED BY: Jim Jordahl/ CH2M HILL

DATE:

Introduction

This technical memorandum summarizes the results of hydrologic modeling performed to support the design of an evapotranspiration (ET) alternative cover for use at the Salt Lake Valley Landfill (SLVLF), Salt Lake City, Utah (Figure 1). The ET cover described in this memorandum will serve as an alternative for the currently-permitted landfill cap design. The primary goals of the ET cover are to reduce surface infiltration of precipitation and minimize percolation of soil water below the ET cover into the waste layer

Hydrologic modeling was performed to evaluate the potential effectiveness of several potential ET cover designs at the SLVLF. Performance of the modeled ET cover was evaluated based on the Solid Waste Permitting and Management Rules promulgated under the authority of the Solid and Hazardous Waste Act (Utah Administrative Code, Title R315, effective February 1, 2015). Under these rules, the modeled ET cover must show a rate of percolation below the cover of no greater than 3 millimeters per year (mm/yr) during any year of the simulation. Furthermore, this level of performance must be maintained throughout the five wettest consecutive years on record at the site.

The ET cover system will consist of several feet of fine-grained (most likely silty to clayey loam), vegetated soil to provide soil moisture storage above the waste material. The cover system is designed to limit infiltration of precipitation and to retain the water that does infiltrate into the cover material, so that it can be removed by transpiration through vegetation or soil evaporation before it percolates into the underlying waste material. The cover system uses the water storage capacity of the soil layers rather than lower permeability physical characteristics of traditional cover materials (for example, clays or synthetic liners) to minimize infiltration. ET covers can be a cost-effective and sustainable (long-term) way of minimizing infiltration as compared to more traditional engineered cover designs.

ET Cover System HYDRUS Modeling

The ET cover was evaluated using HYDRUS-1D version 4.15 (Šimůnek et al., 2008, 2009). HYDRUS-1D is a finite element numerical model designed for simulating saturated/unsaturated flow through porous media. The HYDRUS code has been used extensively to model ET covers at varied sites nationwide (Albright et al., 2002; Cadmus Group, 2011; CH2M HILL, 2013; USEPA, 2011; Zornberg and McCartney, 2005). The current modeling study was used to evaluate the performance of an ET cover base case scenario (Scenario 1), which implemented conservative input parameters. Additional model scenarios were run where key design parameters were varied to evaluate the sensitivity of the cover performance. The sensitivity analyses were performed considering variable soil hydraulic properties and ET cover thickness to evaluate the effect on modeled percolation rates through the bottom of the ET cover and are described in the *HYDRUS-1D Model Results* section.

Model Inputs

The following sections describe the key parameters used in the development of the ET cover models. Model inputs include site-specific climate data (recorded at the Salt Lake City International Airport, located about 2.5 miles from the site) and soil hydraulic property data collected from potential borrow materials currently stockpiled at the SLVLF (CH2M HILL, 2014). Additional model inputs include root water uptake and water stress parameters for grass species likely to be used to vegetate the ET cover. The modeling was conducted for a total simulation period of 20 years, using the 5 wettest years on record. Specific information for processes simulated in the HYDRUS-1D package is described in the HYDRUS-1D users' manual (Simunek et al., 2012).

Boundary Conditions

The following section describes the development of the boundary conditions and model parameters used in the base case scenario (Scenario 1).

Top Boundary Condition

The top boundary condition of the soil profile was defined by three processes: precipitation, potential evaporation (PE), and potential transpiration (PT). Transpiration is not, strictly speaking, a boundary condition, but is instead distributed throughout the root zone of the model. However, potential transpiration relates mainly to atmospheric conditions and leaf coverage of the surface, and therefore is discussed here along with potential evaporation as part of the climatological data that define the upper boundary condition of the HYDRUS-1D model.

Climate data from the weather station at the Salt Lake City International Airport (1948 through 2013) was used to define the wettest 5 year period on record, 1982 through 1986, with an average annual precipitation of 21.0 inches[1] (Figure 2). The assumed average annual precipitation used for modeling purposes (21.0 inches) is much larger (conservative) than the average annual precipitation value of 15.6 inches over the entire period of record. The 5 year series of daily precipitation values was used directly in the HYDRUS-1D model as the precipitation input for all model scenarios. This 5 year period of daily climate data was cycled through the model four times for a total simulation time of 20 years.

Daily potential evapotranspiration (PET) data calculated using the Hargreaves equation (Jensen et al., 1997) was also downloaded from the weather station at the Salt Lake City International Airport for the wettest 5 year period (Figure 2). However, HYDRUS-1D requires input of separate PE and PT values. The Ritchie-Burnett-Ankeny function was used to calculate PT from PET (Chadwick et al., 1999; Ogorzalek et al., 2008)

$$PT = 0.52 \times PET \times LAI^{0.5} \quad (1)$$

where LAI = leaf area index

The PE was then calculated as the remainder of the PET:

$$PE = PET - PT \quad (2)$$

Table 2 shows the average LAI values for western wheatgrass from a study conducted in Mandan, North Dakota (Frank, 2002). Western wheatgrass is a typical species used for revegetation in the Salt Lake Valley. Furthermore, using these values is likely conservative given the shorter growing season in North Dakota as compared to the Salt Lake Valley. To generate the input used in the model, the monthly LAI value was used in the calculation of daily PT values for each respective month.

TABLE 1
Leaf Area Index Values for Calculation of Potential Transpiration
HYDRUS-1D Model Evaluations in Support of the Salt Lake Valley Landfill Evapotranspiration Cover Design

Month	LAI
April	0.11

[1] https://climate.usurf.usu.edu/mapGUI/mapGUI.php - Accessed 11/25/2014

TABLE 1
Leaf Area Index Values for Calculation of Potential Transpiration
HYDRUS-1D Model Evaluations in Support of the Salt Lake Valley Landfill Evapotranspiration Cover Design

Month	LAI
May	0.36
June	0.45
July	0.43
August	0.35
September	0.22

LAI – Leaf Area Index
LAI values for months not shown equal 0

Bottom Boundary Condition

A free draining boundary condition was placed at the base of the simulated ET cover. Flow through this bottom boundary was counted as percolation which escaped ET and migrated below the cover system.

Soil Types

The soil hydraulic properties used in the HYDRUS-1D modeling for Scenario 1 (base case) were based on the results of laboratory analyses of soil samples collected from multiple stockpiles at the SLVLF. These stockpiles have been designated as potential borrow sources for the ET cover. Complete laboratory results are provided in Attachment 1.

Soil hydraulic parameters for Scenario 1 were taken from the sample collected at test pit 1 (TP-1) within the depth range of 15- to 18 feet. The results from this location were used as the base case because it represents the median value of saturated hydraulic conductivity (K_s) of the 10 samples that were analyzed. Additionally, this sample was one of the most coarse-grained of the samples analyzed. Thus, using this sample's hydraulic properties was a conservative choice. Table 2 summarizes the laboratory-determined soil hydraulic properties from the sample collected at TP-1 in the 15- to 18 foot depth range.

TABLE 2
Laboratory-Determined Soil Hydraulic Properties for Model Scenario 1
HYDRUS-1D Model Evaluations in Support of the Salt Lake Valley Landfill Evapotranspiration Cover Design

Sample	USDA Textural Classification	van Genuchten's α (cm^{-1})	van Genuchten's n (-)	θ_r (% vol)	θ_s (% vol)	K_s (cm/s)
TP-1 (15 to 18 ft bgs)	Sandy loam	0.0053	1.91	4.8	43.72	9.8×10^{-6}*

USDA – U.S. Department of Agriculture
θ_r – Residual moisture content
θ_s – Saturated moisture content
K_s – Saturated hydraulic conductivity
ft bgs – Feet below ground surface
% vol – percent by volume
cm/s – centimeters per second
* - at 84.6% of maximum dry density; remolded dry bulk density = 1.50 grams per cubic centimeter

Vegetation Parameters

The cover is assumed to be planted with mixed perennial grasses dominated by wheatgrass species. It was assumed that roots would be present throughout the thickness of the ET cover. Root density distributions for a revegetated ET cover were measured as part of the Alternative Cover Assessment Program on a test site near Helena, MT. The measured root density with depth was reported in Albright (2003) and is used in this modeling effort (Table 4). The use of this root density distribution is likely conservative because abnormally dry conditions following cover construction prevented the deeper rooted species from becoming well-established in the Albright (2003) study. Thus, the root density at the deeper depths (Table 4) is probably lower than that expected from a robust plant community. Table 5 shows the parameters that define the plant water stress response function (Feddes et al., 1978), which are representative of wheatgrass-dominated vegetation, used in the model.

TABLE 4
Relative Rooting Depth Distribution Used in HYDRUS-1D Models
HYDRUS-1D Model Evaluations in Support of the Salt Lake Valley Landfill Evapotranspiration Cover Design

Depth (cm)	Relative Root Density
0-10	0.284
10-20	0.213
20-30	0.159
30-40	0.119
40-50	0.089
50-60	0.067
60-70	0.05
70-80	0.037
80-90	0.028
90-100	0.021
100-110	0.016
110-120	0.012
120-130	0.009

cm – centimeters

TABLE 5
Plant Water Stress Parameters Used in HYDRUS-1D Models
HYDRUS-1D Model Evaluations in Support of the Salt Lake Valley Landfill Evapotranspiration Cover Design

Parameter	Description	Value
P0	Upper water content limit for root uptake to occur	-10 cm
Popt	Upper limit of optimum uptake range	-25 cm
P2H	Lower limit of optimum range	-5099 cm
P2L	Lower limit of optimum range	-5099 cm
P3	Lower water content limit for root uptake to occur-wilting point	-30591 cm
r2H	Potential transpiration rate at P2H	0.5 cm/d
r2L	Potential transpiration rate at P2L	0.1 cm/d

Parameters defining the water stress response function (Feddes et al., 1978)
Sources: Trlica and Biondini, 1990; Frank and Reis, 1990
cm – centimeters
cm/d – centimeters per day

Initial Conditions

The initial moisture content profile for each scenario was established by running the model for a twenty year period and using the final moisture content profile at the end of that period as the initial moisture profile. By running the model for a period of 20 years, the 5 year-period of climate data was repeated through 4 cycles. This process allows the soil hydraulic properties used in the model to come into a quasi-equilibrium with the climate inputs.

HYDRUS-1D Model Results

For this analysis, a total of 6 separate simulations were run. Two base simulations (Scenario 1) were run using the properties described above with assumed ET cover thicknesses of 3- and 4 feet. Four additional simulations were run using the same climatic and plant parameter inputs as Scenario 1, but different soil hydraulic properties. These additional simulations represent Scenarios 2 and 3, and were also run with cover thicknesses of 3- and 4 feet.

Scenario 2 represents a second set of onsite hydraulic properties taken from test pit 13 (TP-13). The hydraulic properties used in Scenario 2 are presented in Table 6. This set of properties was chosen because it represents a very different set of values from those used in Scenario 1. The K_s and *n* values are both significantly lower for the Scenario 2 parameters, which makes the soil more permeable than Scenario 1 under drier soil conditions. Thus, Scenarios 1 and 2 provide results from a wide range of site-specific hydraulic properties.

The purpose of Scenario 3 was to simulate moisture flux through a more mature ET cover representing potential long-term soil properties. Over time, the soil hydraulic properties of an ET cover change from the as-built parameters as soil structure develops and roots grow into deeper soil. Benson et al. (2011) summarized the findings of a survey of 12 different landfill sites across the United States where soil hydraulic properties of the landfill covers ranging in age from 5 to 10 years were compared to their as-built properties. Given the property changes that occurred in all of the covers in their study, they recommended the use of long-term properties as input to models used for ET cover performance assessment. This in most cases is a conservative approach, as the K_s for fine grained soils tends to increase over time due to desiccation and freeze-thaw cycles. Benson et al. (2011) found that, regardless of the initial soil conditions, the long-term soil properties for fine grained soils tended to coalesce around similar values. Table 6 presents soil hydraulic properties that are recommended by Benson et al. (2011) for use in modeling studies of long-term cover performance.

TABLE 6
Soil Hydraulic Properties for Model Scenarios 2 and 3
HYDRUS-1D Model Evaluations in Support of the Salt Lake Valley Landfill Evapotranspiration Cover Design

Scenario	USDA Textural Classification	van Genuchten's α (cm^{-1})	van Genuchten's n (-)	θ_r (% vol)	θ_s (% vol)	K_s (cm/s)
Scenario 2 (TP-13)	Sandy loam	0.0076	1.27	0	45.6	2.9×10^{-6}*
Scenario 3 (Benson et al., 2011)	-	0.0196	1.3	0**	40	5×10^{-5}

USDA – U.S. Department of Agriculture
θ_r – Residual moisture content
θ_s – Saturated moisture content
K_s – Saturated hydraulic conductivity
cm/s – centimeters per second
* - at 84.8% of maximum dry density; remolded dry bulk density = 1.47 grams per cubic centimeter
** - Value not provided in Benson et al. (2011). 0 assumed.

Figure 3 shows the simulated results for all modeled scenarios. The model results suggest that a three foot cover thickness may not be sufficient, assuming conservative final cover soil properties, to limit percolation through the ET cover to less than 3 mm/yr. In Scenarios 1 and 3, cumulative flux through the ET cover regularly exceeds 3 mm/yr for the 3 foot cover thickness case. Alternatively, none of the scenarios investigated shows cumulative flux through the ET cover exceeding 3 mm/yr when cover thickness is increased to 4 feet.

Figure 3 also shows that Scenario 3 (long-term hydraulic properties) allows less flux through the ET cover than Scenario 1; this difference in flux between the two simulations is significant for the case of a 4 foot cover thickness. Although K_s is greater for Scenario 3 as compared to Scenario 1 (5×10^{-5} cm/s versus 9.8×10^{-6} cm/s, respectively), the unsaturated parameter, *n*, is much higher for Scenario 1 than Scenario 3 (1.91 versus 1.3, respectively). Because the simulations forecast that the ET cover is never fully saturated, the unsaturated hydraulic properties significantly impact the overall permeability of the ET cover. Thus, K_s alone is not necessarily an indication of a cover's performance.

Conclusions

This analysis evaluated three sets of hydraulic properties for the final cover soil, and two different ET cover thicknesses to help in the design of the proposed ET cover at the SLVLF. Climate inputs for all evaluated scenarios were daily data representing the five consecutive wettest years on record. The hydraulic properties evaluated represent a wide range of site-specific values from onsite test pits that could potentially be used as borrow material for the ET cover, in addition to a set of properties that might be representative of longer term values for fine-grained soils. Model results show that across the wide range of hydraulic properties evaluated, the use of a four foot cover thickness limited the cumulative moisture flux through the bottom of the ET cover to less than 3 mm/yr. Furthermore, the use of the likely long-term hydraulic properties after weathering showed percolation rates of less than 3 mm/yr under both three and four foot cover thicknesses.

Limitations

Mathematical models can only approximate processes of physical systems. Models are inherently inexact because the mathematical description of the physical system is imperfect and the understanding of interrelated physical processes is incomplete. However, the models described in this appendix are good tools that can provide useful insight into moisture dynamics within the physical system. Assumptions inherent in these models include the presence of a robust plant community with good spatial distribution across the landfill and an extensive root distribution. It is also assumed that the cover will be well-maintained to prevent the formation of significant surface cracks or other preferential flowpaths into the subsurface and to prevent significant ponding of water at the surface.

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Figures

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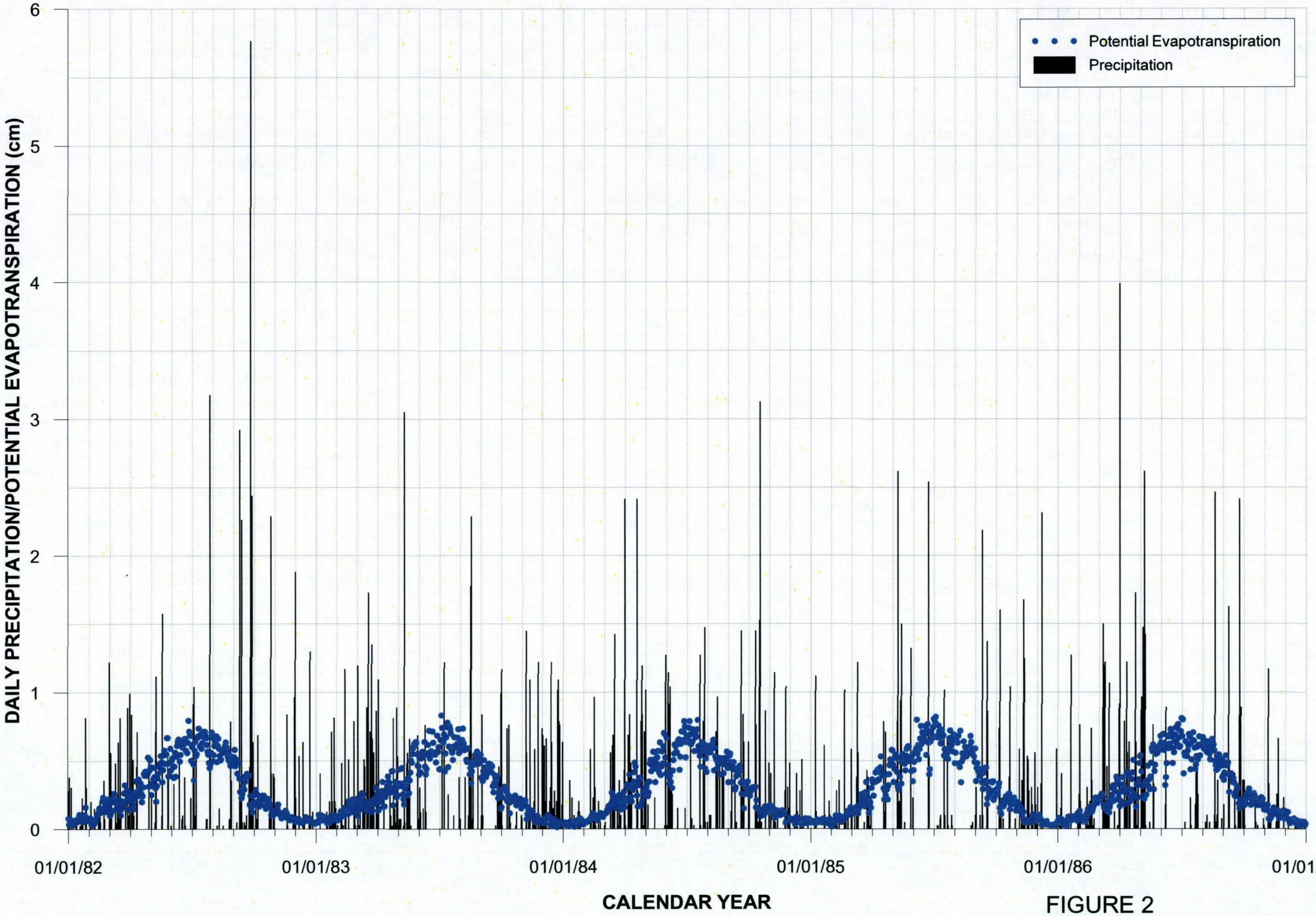
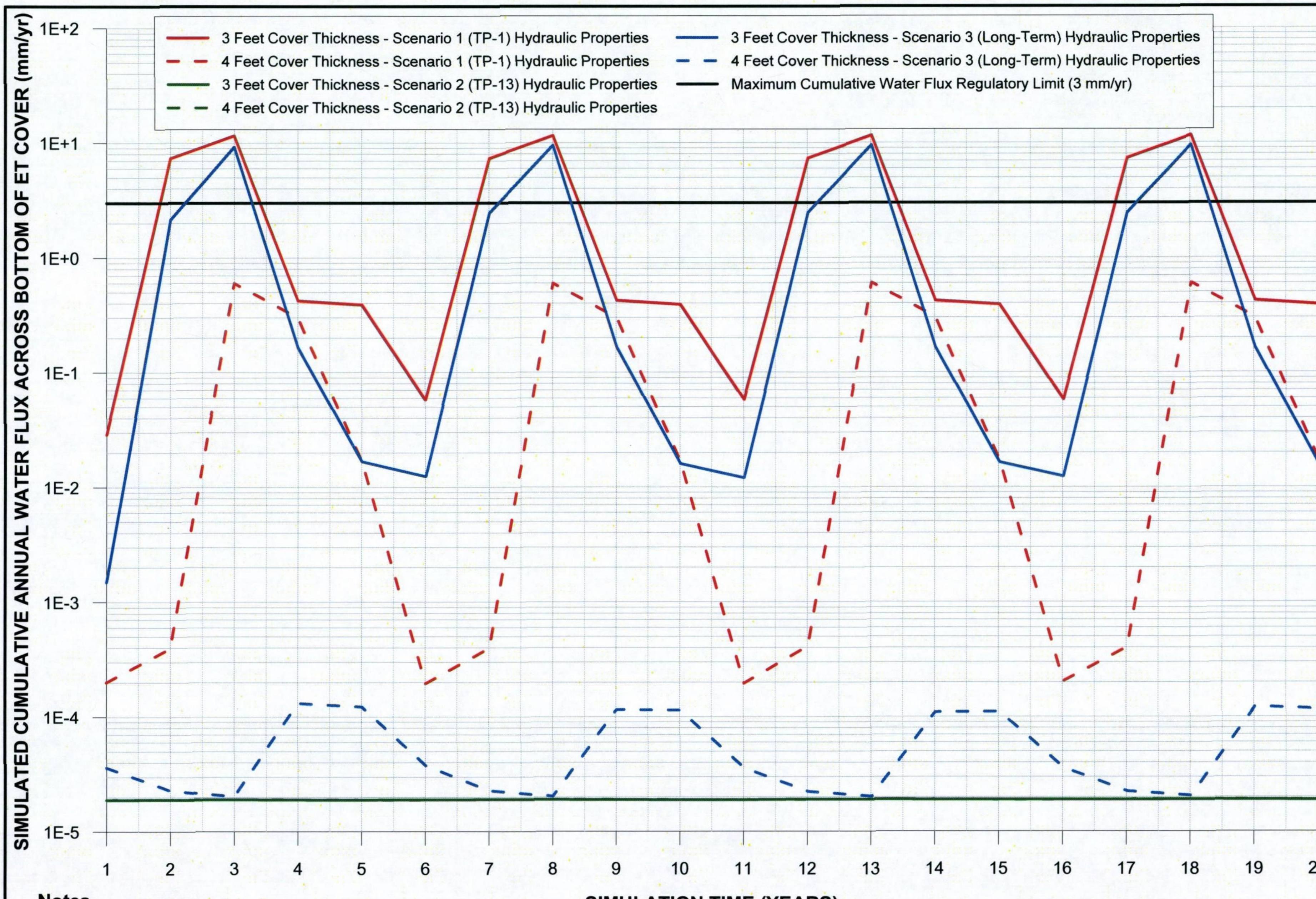
FIGURE 1
SALT LAKE VALLEY LANDFILL LOCATION MAP
SALT LAKE VALLEY LANDFILL
SALT LAKE CITY, UTAH



Note
1. cm - centimeters
2. Data measured at Salt Lake City International Airport.

FIGURE 2
Meteorologic Data from Wettest 5 Year Period on Record
Salt Lake Valley Landfill
Salt Lake City, Utah

CH2MHILL



Notes

1. Results for Scenario 2 simulations overlay each other.
2. Long-term hydraulic properties from Benson et al. (2011).
3. mm/yr - millimeters per year
4. ET - evapotranspiration
5. TP - test pit

FIGURE 3
Simulated Cumulative Annual Water Flux Across Bottom of ET Cover
Salt Lake Valley Landfill
Salt Lake City, Utah

CH2MHILL

Attachment 1
Analytical Testing Results for Potential Borrow Materials

Table 1

Soil Classification

Salt Lake Valley Landfill Stockpile Characterization

Stockpile	Test Pit Location	Excavation Depth (ft bgs)	Sample Depth (ft bgs)	Group Symbol	Group Name	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Gravel (%)	Sand (%)	Fines (%)
1	TP-1	18	0-15	CL	Lean CLAY with sand	35	17	18	1.7	21.2	77.1
	TP-1		15-18	CL	Sandy lean CLAY	32	17	15	0.7	35.7	63.6
	TP-2	20	0-10	CL	Sandy lean CLAY	28	18	10	1.1	32	66.9
	TP-2		10-20	CL	Lean CLAY with sand	38	19	19	0.8	17.5	81.7
	TP-3	21	0-10	CL	Lean CLAY with sand	37	18	19	0.2	15.5	84.3
	TP-3		10-21	CL	Lean CLAY	31	19	12	0.2	8	91.8
	TP-4	20	0-10	CL	Lean CLAY with sand	37	19	18	4.5	16.8	78.7
	TP-4		10-20	CL	Lean CLAY with sand	41	19	22	0.4	18.7	80.8
	TP-5	17	0-10	CL	Lean CLAY with sand	32	18	14	0.1	21.1	78.7
	TP-5		10-17	ML	Sandy SILT	22	19	3	0.1	44.4	55.5
2a	TP-6	22	0-10	SC	Clayey SAND with gravel	77	32	45	18.3	33.6	48.1
	TP-6		10-22	SC	Clayey SAND with gravel	59	30	29	17.4	51.6	31
	TP-7	22	0-10	SM	Silty SAND with gravel	72	36	36	20	56.2	23.8
	TP-7		10-22	SC	Clayey SAND	68	31	37	14.3	55.4	30.3
	TP-8	19	0-10	SC	Clayey SAND	62	30	32	13.9	57.6	28.5
	TP-8		10-19	SC	Clayey SAND with gravel	54	29	25	16.3	44.5	39.2
	TP-9	10	0-10	SC	Clayey SAND	45	25	20	6.6	46.2	47.2
	TP-10	21	0-10	CL	Lean CLAY with sand	36	19	17	0.3	15.3	84.5
	TP-10		10-21	CL	Lean CLAY with sand	35	19	16	2.4	16.2	81.4
2b	TP-11	11	0-11	CL	Lean CLAY with sand	32	17	15	0.5	19.1	80.4
	TP-12	11	0-11	CL	Lean CLAY	35	19	16	0.4	11.4	88.2
	TP-13	12	0-12	CL	Lean CLAY with sand	35	18	17	0.1	27.6	72.3
3	TP-14	18	0-10	SC	Clayey SAND	53	27	26	9.7	49.2	41.2
	TP-14		10-18	SC	Clayey SAND	60	30	30	11.4	48.9	39.7
	TP-15	21	0-10	SM	Silty SAND	51	29	22	8.8	51.5	39.7
	TP-15		10-21	SC	Clayey SAND	59	29	30	14	52.7	33.2
	TP-16	20	0-10	SC	Clayey SAND with gravel	66	30	36	32.2	46.3	21.5
	TP-16		10-20	SC	Clayey SAND	57	30	27	7.4	54.3	38.3
					Side Slope Final Cover Grab Samples						
	GS-1		0-1.5	SM	Silty SAND	54	31	23	8	58.7	33.2
	GS-2		0-1.5	SC	Clayey SAND with gravel	54	29	25	16.6	45.5	37.8
	GS-3		0-1.5	CL	Sandy lean CLAY	36	19	17	10.9	24.8	64.3
	GS-4		0-1.5	CL	Lean CLAY with sand	41	21	20	0.5	21.6	77.9

Notes:

bgs = below ground surface

ft = feet

Table 2

Summary of Standard Proctor Results and Organic Matter

Salt Lake Valley Landfill Stockpile Characterization

Stockpile	Test Pit Location	Sample Depth (ft bgs)	Group Symbol	Group Name	Optimum Water Content (%)	Maximum Dry Unit Weight (pcf)	Organic Matter (%)
1	TP-1	0-15	CL	Lean CLAY with sand	17.1	111.3	3.4
	TP-1	15-18	CL	Sandy lean CLAY	15.8	110.6	2.3
	TP-3	10-21	CL	Lean CLAY	18.8	107.6	2.8
	TP-4	10-20	CL	Lean CLAY with sand	17.2	109.8	4.0
2a	TP-7	0-10	SM	Silty SAND with gravel	29.9	83.6	12.7
	TP-9	0-10	SC	Clayey SAND	20.5	95.8	9.2
	TP-10	10-21	CL	Lean CLAY with sand	17.7	108.7	4.1
2b	TP-13	0-12	CL	Lean CLAY with sand	18.2	108.5	3.2
3	TP-15	10-21	SC	Clayey SAND	26.0	90.0	9.4
	TP-16	0-10	SC	Clayey SAND with gravel	25.5	90.5	9.1

Notes:

bgs = below ground surface

ft = feet

pcf = pounds per cubic foot

Table 3
Summary of Sample Preparation/Volume Changes
Salt Lake Valley Landfill Stockpile Characterization

	Proctor Data		Target Remold Parameters[1]			Actual Remold Data			Volume Change Post Saturation[2]			Volume Change Post Drying Curve[3]		
Sample Number	Opt. Moist. Cont. (%, g/g)	Max. Dry Density (g/cm³)	Moist. Cont. (%, g/g)	Dry Bulk Density (g/cm³)	% of Max. Density (%)	Moist. Cont. (%, g/g)	Dry Bulk Density (g/cm³)	% of Max. Density (%)	Dry Bulk Density (g/cm³)	% Volume Change (%)	% of Max. Density (%)	Dry Bulk Density (g/cm³)	% Volume Change (%)	% of Max. Density (%)
TP-1 0'-15' (85%, 1.51)	17.1	1.78	15.1	1.52	85%	15.8	1.51	84.8%	1.47	+2.9%	82.4%	1.51	---	84.8%
TP-1 15'-18' (85%, 1.50)	15.8	1.77	13.8	1.51	85%	14.6	1.50	84.6%	1.50	---	84.6%	1.70	-11.9%	96.0%
TP-3 10'-21' (85%, 1.46)	18.8	1.72	16.8	1.47	85%	17.3	1.46	84.9%	1.44	+1.9%	83.3%	1.46	---	84.9%
TP-4 10'-20' (85%, 1.49)	17.2	1.76	15.2	1.50	85%	16.1	1.49	84.6%	1.44	+3.3%	81.9%	1.44	+3.0%	82.1%
TP-7 0'-10' (84%, 1.13)	29.9	1.34	27.9	1.14	85%	29.7	1.13	84.2%	1.10	+2.5%	82.1%	1.13	---	84.2%
TP-9 0'-10' (84%, 1.28)	20.5	1.53	18.5	1.30	85%	20.5	1.28	83.5%	1.24	+3.1%	80.9%	1.28	---	83.5%
TP-10 10'-21' (85%, 1.48)	17.7	1.74	15.7	1.48	85%	16.0	1.48	84.8%	1.48	---	84.8%	1.48	---	84.8%
TP-13 0'-12' (85%, 1.47)	18.2	1.74	16.2	1.48	85%	16.8	1.47	84.8%	1.45	+1.3%	83.7%	1.47	---	84.8%
TP-15 10'-21' (84%, 1.21)	26.0	1.44	24.0	1.23	85%	26.3	1.21	83.8%	1.18	+2.4%	81.9%	1.21	---	83.8%
TP-16 0'-10' (84%, 1.21)	25.5	1.45	23.5	1.23	85%	25.3	1.21	83.7%	1.16	+4.5%	80.1%	1.21	---	83.7%

[1]Target Remold Parameters: Provided by the client: 85% of maximum dry density at 2% below optimum moisture content.

[2]Volume Change Post Saturation: Volume change measurements were obtained after saturated hydraulic conductivity testing.

[3]Volume Change Post Drying Curve: Volume change measurements were obtained throughout hanging column and pressure plate testing. The 'Volume Change Post Drying Curve' values represent the final sample dimensions after the last pressure plate point.

Notes:

"+" indicates sample swelling, "-" indicates sample settling, and "---" indicates no volume change occurred.

g/cm^3 = gram per cubic centimeter

g/g = gram per gram

Table 4
Summary of Initial Moisture Content, Dry Bulk Density
Salt Lake Valley Landfill Stockpile Characterization

Sample Number	Moisture Content				Dry Bulk Density (g/cm^3)	Wet Bulk Density (g/cm^3)	Calculated Porosity (%)
	As Received		Remolded				
	Gravimetric (%, g/g)	Volumetric (%, cm^3/cm^3)	Gravimetric (%, g/g)	Volumetric (%, cm^3/cm^3)			
TP-1 0'-15' (85%, 1.51)	NA	NA	15.8	23.9	1.51	1.75	44.4
TP-1 15'-18' (85%, 1.50)	NA	NA	14.6	21.9	1.50	1.72	44.0
TP-3 10'-21' (85%, 1.46)	NA	NA	17.3	25.4	1.46	1.72	46.0
TP-4 10'-20' (85%, 1.49)	NA	NA	16.1	23.9	1.49	1.73	44.9
TP-7 0'-10' (84%, 1.13)	NA	NA	29.7	33.5	1.13	1.46	54.7
TP-9 0'-10' (84%, 1.28)	NA	NA	20.5	26.2	1.28	1.54	50.2
TP-10 10'-21' (85%, 1.48)	NA	NA	16.0	23.7	1.48	1.71	44.9
TP-13 0'-12' (85%, 1.47)	NA	NA	16.8	24.8	1.47	1.72	45.3
TP-15 10'-21' (84%, 1.21)	NA	NA	26.3	31.8	1.21	1.53	53.1
TP-16 0'-10' (84%, 1.21)	NA	NA	25.3	30.6	1.21	1.52	53.1

Notes:
NA = Not analyzed
--- = This sample was not remolded
cm^3/cm^3 = cubic centimeter per cubic centimeter
g/cm^3 = gram per cubic centimeter
g/g = gram per gram

Table 5

Summary of Saturated Hydraulic Conductivity Tests - Falling Head Flexible Wall Analysis

Salt Lake Valley Landfill Stockpile Characterization

Sample Number	K_{sat} (cm/sec)	Oversize Corrected K_{sat} (cm/sec)
TP-1 0'-15' (85%, 1.51)	1.5E-06	---
TP-1 15'-18' (85%, 1.50)	9.8E-06	---
TP-3 10'-21' (85%, 1.46)	8.4E-07	---
TP-4 10'-20' (85%, 1.49)	3.1E-06	---
TP-7 0'-10' (84%, 1.13)	5.48E-05	4.87E-05
TP-9 0'-10' (84%, 1.28)	4.64E-05	---
TP-10 10'-21' (85%, 1.48)	3.78E-04	---
TP-13 0'-12' (85%, 1.47)	2.9E-06	---
TP-15 10'-21' (84%, 1.21)	7.6E-06	6.8E-06
TP-16 0'-10' (84%, 1.21)	1.7E-04	1.3E-04

Notes:

cm/sec = centimeter per second

NR = Not requested

NA = Not applicable

--- = Oversize correction is unnecessary since coarse fraction < 5% of composite mass

Table 6

Summary of Moisture Characteristics of the Initial Drainage Curve

Salt Lake Valley Landfill Stockpile Characterization

Sample Number	Pressure Head (-cm water)	Moisture Content (%, cm^3/cm^3)
TP-1 0'-15' (85%, 1.51)	0	43.1 ‡‡
	21	43.1 ‡‡
	68	40.3 ‡‡
	147	38.1 ‡‡
	337	35.3
	848426	6.1
TP-1 15'-18' (85%, 1.50)	0	44.1
	16	43.4 ‡‡
	49	42.0 ‡‡
	120	37.9 ‡‡
	337	24.9 ‡‡
	848426	4.8 ‡‡
TP-3 10'-21' (85%, 1.46)	0	46.3 ‡‡
	21	46.1 ‡‡
	67	42.7 ‡‡
	146	38.6 ‡‡
	337	34.7
	848426	5.2
TP-4 10'-20' (85%, 1.49)	0	45.3 ‡‡
	21	45.6 ‡‡
	67	45.3 ‡‡
	146	43.1 ‡‡
	337	38.6 ‡‡
	848426	7.1 ‡‡
TP-7 0'-10' (84%, 1.13)	0	55.1 ‡‡
	11	55.1 ‡‡
	32	52.4 ‡‡
	95	44.4 ‡‡
	337	38.3
	848426	3.7
TP-9 0'-10' (84%, 1.28)	0	51.2 ‡‡
	16	50.9 ‡‡
	47	48.5 ‡‡
	121	40.7 ‡‡
	337	35.1
	848426	4.3
TP-10 10'-21' (85%, 1.48)	0	44.2
	6	42.5
	20	35.8
	66	31.3
	337	22.4
	848426	3.5
TP-13 0'-12' (85%, 1.47)	0	45.2 ‡‡
	16	44.7 ‡‡
	47	44.0 ‡‡
	121	39.9
	337	33.0
	848426	4.4
TP-15 10'-21' (84%, 1.21)	0	52.8 ‡‡
	16	52.7 ‡‡
	49	52.0 ‡‡
	120	47.1 ‡‡
	337	32.7
	848426	4.2
TP-16 0'-10' (84%, 1.21)	0	53.2 ‡‡
	11	53.5 ‡‡
	32	53.4 ‡‡
	95	45.6 ‡‡
	337	40.4
	848426	3.0

Notes:

‡‡ Volume adjustments are applicable at this matric potential (see data sheet for this sample).

cm = centimeter

cm^3/cm^3 = cubic centimeter per cubic centimeter

Table 7

Summary of Calculated Unsaturated Hydraulic Properties

Salt Lake Valley Landfill Stockpile Characterization

Sample Number	a (cm^{-1})	N (dimensionless)	q_r (% vol)	q_s (% vol)	Oversize Corrected q_r (% vol)	Oversize Corrected q_s (% vol)
TP-1 0'-15' (85%, 1.51)	0.0057	1.2269	0.00	43.08	---	---
TP-1 15'-18' (85%, 1.50)	0.0053	1.9056	4.82	43.72	---	---
TP-3 10'-21' (85%, 1.46)	0.0089	1.2422	0.00	46.54	---	---
TP-4 10'-20' (85%, 1.49)	0.0038	1.2336	0.00	45.98	---	---
TP-7 0'-10' (84%, 1.13)	0.0128	1.2632	0.00	55.32	0.00	52.41
TP-9 0'-10' (84%, 1.28)	0.0124	1.2647	0.00	51.76	---	---
TP-10 10'-21' (85%, 1.48)	0.0783	1.2125	0.00	44.34	---	---
TP-13 0'-12' (85%, 1.47)	0.0076	1.2717	0.00	45.55	---	---
TP-15 10'-21' (84%, 1.21)	0.0044	1.8824	4.20	52.92	4.00	50.45
TP-16 0'-10' (84%, 1.21)	0.0065	1.3090	0.00	53.44	0.00	46.47

Notes:

cm = centimeter

vol = volume

Table 8

Summary of Specific Gravity Tests

Salt Lake Valley Landfill Stockpile Characterization

Sample Number	Test Sample			Oversize Material			Bulk Sample
	Specific Gravity	Particle Size	% of Bulk Sample	Specific Gravity	Particle Size	% of Bulk Sample	Specific Gravity[1]
TP-1 0'-15'	2.72	<4.75mm	98.3%	---	>4.75mm	1.7%	2.72
TP-1 15'-18'	2.68	<4.75mm	99.3%	---	>4.75mm	0.7%	2.68
TP-3 10'-21'	2.72	<4.75mm	99.8%	---	>4.75mm	0.2%	2.72
TP-4 10'-20'	2.71	<4.75mm	99.6%	---	>4.75mm	0.4%	2.71
TP-7 0'-10'	2.49	<4.75mm	80.0%	NR	>4.75mm	20.0%	2.49
TP-9 0'-10'	2.58	<4.75mm	93.4%	NR	>4.75mm	6.6%	2.58
TP-10 10'-21'	2.69	<4.75mm	97.6%	---	>4.75mm	2.4%	2.69
TP-13 0'-12'	2.70	<4.75mm	99.9%	---	>4.75mm	0.1%	2.70
TP-15 10'-21'	2.58	<4.75mm	86.0%	NR	>4.75mm	14.0%	2.58
TP-16 0'-10'	2.59	<4.75mm	67.8%	NR	>4.75mm	32.2%	2.59

Notes:

[1]Based on the <4.75mm material

mm = millimeter

NA = Not analyzed

NR = Not requested

--- = Unnecessary since specified fraction < 5% of composite mass

Table 9
Agronomic Properties
Salt Lake Valley Landfill Stockpile Characterization

Stockpile	Test Pit Location	Sample Depth (ft bgs)	Texture	pH	Salinity (dS/m)[1]	Phosphorus (mg/kg)	Potassium (mg/kg)	Nitrate-Nitrogen (mg/kg)	Zinc (mg/kg)	Iron (mg/kg)	Copper (mg/kg)	Manganese (mg/kg)	Sulfate-Sulfur (mg/kg)	Organic Matter (%)
1	TP-1	0-15	Silty Clay Loam	8.2	6.38	4.90	407	4.40	1.41	9.46	2.79	9.99	255	0.7
	TP-1	15-18	Sandy Loam	8.1	6.22	3.50	274	4.55	1.50	15.7	2.80	8.25	200	0.7
	TP-3	10-21	Silty Clay Loam	8.7	7.56	4.80	566	5.42	0.95	10.7	2.14	11.1	239	0.6
	TP-4	10-20	Silty Clay Loam	8.1	8.14	16.8	321	22.1	2.85	28.9	3.03	14.8	229	0.8
2a	TP-7	0-10	Clay Loam	7.9	6.41	274	899	0.17	101	150	23.9	54.7	1101	6.4
	TP-9	0-10	Clay Loam	8.0	6.13	221	678	70.1	47.5	96.3	17.3	19.7	858	5.9
	TP-10	10-21	Silty Clay Loam	8.0	4.56	56	253	15.4	7.16	38.2	5.27	10.5	275	1.5
2b	TP-13	0-12	Sandy Loam	8.2	8.29	10.4	246	2.77	1.99	21.1	2.31	7.78	221	0.8
3	TP-15	10-21	Clay Loam	7.9	7.36	250	814	0.25	77.3	167	23.1	32.3	1781	6.0
	TP-16	0-10	Clay Loam	7.9	7.66	195	810	4.02	61.3	202	10.7	32.4	1820	5.9

Notes:
[1]Salinity results from Daniel B Stephens & Associates. Salinity results from Utah State University Analytical Laboratory determined to be erroneous.
bgs = below ground surface
dS/m = decisiemens per meter
ft = feet
mg/kg = milligrams per kilogram

Attachment #3

Leachate Collection
Floor Design
Addendum

SALT LAKE COUNTY

SALT LAKE VALLEY SOLID WASTE MANAGEMENT COUNCIL

6030 West California Ave (1300 South)
Salt Lake City, Utah 84104
(385) 468-6370

To: Roy Van Os, Utah Department of Environmental Quality

From: Salt Lake Valley Solid Waste Management Facility (SLVSWMF)

Re: Addendum to Permit Application – Design for Construction of Landfill Cell(s)

Date: January 14, 2022

In June of 2019, SLVSWMF submitted a renewal application for its Solid Waste Permit #9429R1. SLVSWMF proposes to expand the landfill with construction of a new waste cell (referred to as Module 8 or Mod 8). As part of the proposed expansion, SLVSWMF is also proposing modifying the landfill floor design for future waste cells and the landfill's leachate collection and recovery system (LCRS).

Specifically, SLVSWMF is submitting following design information to be incorporated into Division of Waste Management and Radiation Control's (DWMRC) ongoing review of SLVSWMF's permit application:

- Modified landfill floor design for new waste cell Module 8,
- Modified landfill floor design for future waste cells Modules 9, 10 and 11,
- Modified design for the landfill's LCRS,

The proposed landfill LCRS design is intended to discontinue use and abandon in place the current vertical leachate risers in Modules 1 through 5. Leachate risers in Modules 6 and 7 are proposed to be retained until at least the new proposed LCRS gets constructed and is in operation.

Drawings associated with the proposed design modifications are included in Attachment A. an engineering design report will subsequently be submitted to the DWMRC in February of 2022.

SLVSWMF requests that this information be included in the DWMRC's ongoing review of the Landfill's solid waste permit renewal application. After approval of these permit design plans, SLVSWMF shall submit construction design drawings and a Construction Quality Control and Construction Quality Assurance (CQC/CQA) Plan to the DWMRC for approval prior to any module construction.

If you have any questions regarding the information provided in this letter, please contact me at 801.381.3467 or Kleinfelder at 801.261.3336.

Thank You,

01-14-22

John (Yianni) Ioannou
Director
Salt Lake Valley Solid Waste Management Facility

Date

Attachment A – SLVSWMF Design Drawings

KLEINFELDER
Bright People. Right Solutions.

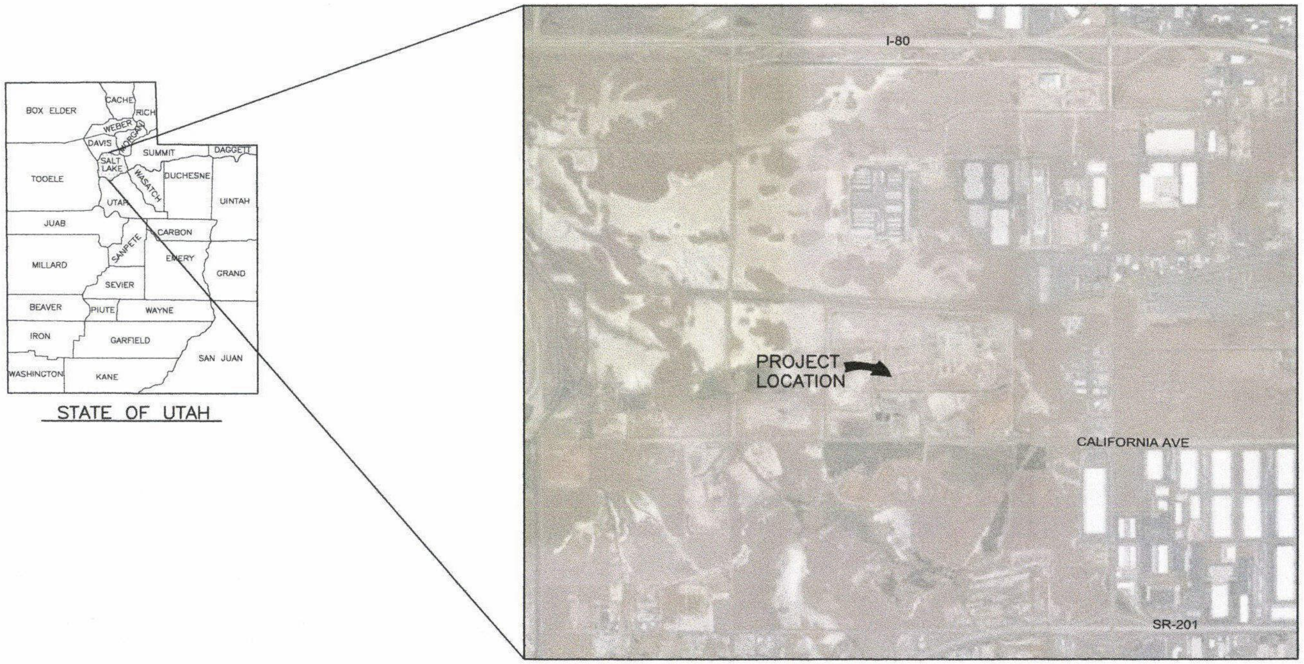
Attachment A

SALT LAKE VALLEY SOLID WASTE MANAGMENT FACILITY

SALT LAKE VALLEY LANDFILL

2022 PERMIT RENEWAL

JANUARY 2022



PROFESSIONAL ENGINEER
MICHAEL E. NAVIDOMSKIS
No. 12464689-2202
1/14/22
STATE OF UTAH

HANSEN ALLEN & LUCE INC ENGINEERS

859 W. South Jordan Pkwy. Ste. 200
South Jordan, Utah 84095
(801) 566-5599

SALT LAKE COUNTY LANDFILL

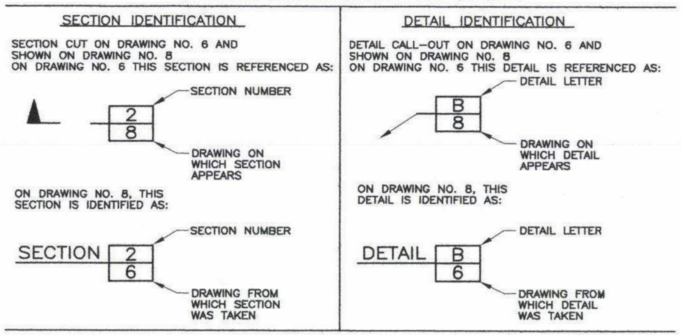
SALT LAKE CITY

FILE NAME:
FILE DATE:

GENERAL NOTES

1. DRAWINGS ARE INTENDED FOR PERMIT PURPOSES ONLY. THEY ARE NOT INTENDED FOR CONSTRUCTION. DETAILED DRAWINGS AND SPECIFICATIONS SHALL BE PROVIDED FOR EACH PHASE OF CONSTRUCTION.
2. PROMPT NOTIFICATION SHALL BE PROVIDED TO THE STATE HISTORIC PRESERVATION OFFICE UPON DISCOVERY OF ANY ARCHEOLOGICAL OR BURIAL FINDINGS.
3. MONITORING WELLS SHALL BE PROTECTED FROM DAMAGE DURING CONSTRUCTION.
4. ALL AREAS TO BE CLEARED AND GRUBBED OF VEGETATION AND OTHER DEBRIS PRIOR TO FILL PLACEMENT.

SECTION & DETAIL IDENTIFICATION



NOTES:

1. IF SECTION AND DETAILS ARE SHOWN ON THE SAME DRAWING AS SECTION CUTS AND SECTION OR DETAIL CALL-OUTS DRAWING NUMBER IS REPLACED BY A LINE.
2. DETAIL LETTERS "I" AND "O" NOT USED.

INDEX OF DRAWINGS

SHEET NO.	GENERAL
G-1	COVER SHEET
G-2	GENERAL NOTES & LEGEND
G-3	OVERALL SITE PLAN
	LANDFILL
LF-1	PLAN VIEW
LF-2	LINER "TIE-IN" DETAILS
LEACHATE CONVEYANCE & REMOVAL SYSTEM (LCRS)	
LS-1	LCRS PLAN
LS-2	SUMP PLAN
LS-3	LCRS DETAILS
LS-4	LEACHATE WITHDRAWAL PIPE SECTIONS

TABLE OF ABBREVIATIONS

DIA.	DIAMETER	N.T.S.	NOT TO SCALE
EL.	ELEVATION	OD	OUTSIDE DIAMETER
ID	INSIDE DIAMETER	OZ.	OUNCE
INV EL.	INVERT ELEVATION	SDR	STANDARD DIMENSION RATIO
MAX.	MAXIMUM	TYP.	TYPICAL
MIN.	MINIMUM	GCL	GEOSYNTHETIC CLAY LINER
		HDPE	HIGH DENSITY POLYETHYLENE

PROJECT CONTROL

Survey Control Ground Points - Salt Lake Valley Landfill Project

Point #	Northing	Easting	Elevation	Description
1116036	877228.320	1849557.305	4226.11	FND AT T CP 406
1116037	877235.850	1846807.460	4223.84	FND AT T CP 405
1116038	877241.380	1846748.933	4224.39	FND REBAR CP 103
1116039	879344.996	1852059.390	4235.03	FND AT MAG NAIL

CP - Control Point
FND - Found
AT - Aerial Target with Center Point
AT T - Aerial Target T Shape with Center Point

Coordinate Units: US Survey Feet

DESIGNED	MEN	3			
DRAFTED	MEN	2			
CHECKED	GLJ	1			
DATE	JANUARY 2022	NO.	DATE	REVISIONS	BY / APVD.

PROJECT ENGINEER

SCALE

GENERAL
GENERAL NOTES & LEGEND

SHEET G-2

446.02.100

FILE NAME:
FILE DATE:

10/07

FILE NAME: PROJECTS\446 – KLEINFELDER\02.100 – \CAD\G-3 OVERALL SITE PLAN.DWG
FILE DATE: 2.4.2021 14:45:59 (CAH)

10/07

HANSEN ALLEN & LUCE INC. ENGINEERS

PROFESSIONAL ENGINEER · NAMDOMSKIS · No. 12464689-2202 · 1/19/22 · STATE OF UTAH

PROJECT ENGINEER

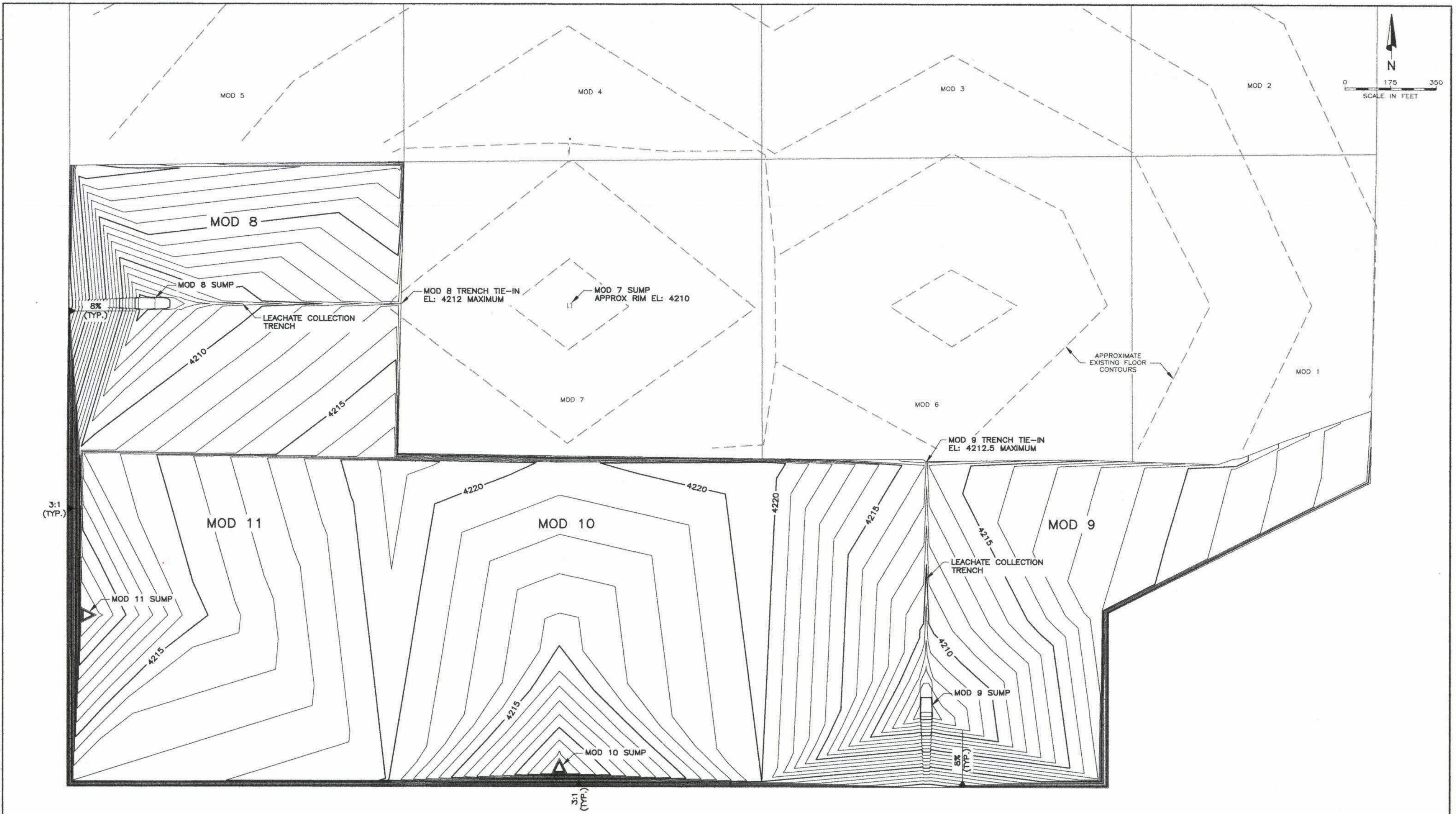
DESIGNED	MEN	3			
DRAFTED	MEN	2			
CHECKED	GLJ	1			
DATE	JANUARY 2022	NO.	DATE	REVISIONS	BY / APVD.

SCALE: 1"=200'

LANDFILL
OVERALL SITE PLAN

SHEET G-3

446.02.100



NOTE:
1. INTERIOR SUMP RISERS FOR MOD 1-5 TO BE ABANDONED IMMEDIATELY.
2. INTERIOR SUMP RISERS FOR MOD 6 AND MOD 7 TO BE ABANDONED ONCE MOD 8 AND MOD 9 SUMPS ARE CONSTRUCTED.

HANSEN ALLEN & LUCE INC ENGINEERS

PROFESSIONAL ENGINEER MICHAEL E. NAMDOMSKIS No. 12464689-2202 1/14/22 STATE OF UTAH
PROJECT ENGINEER

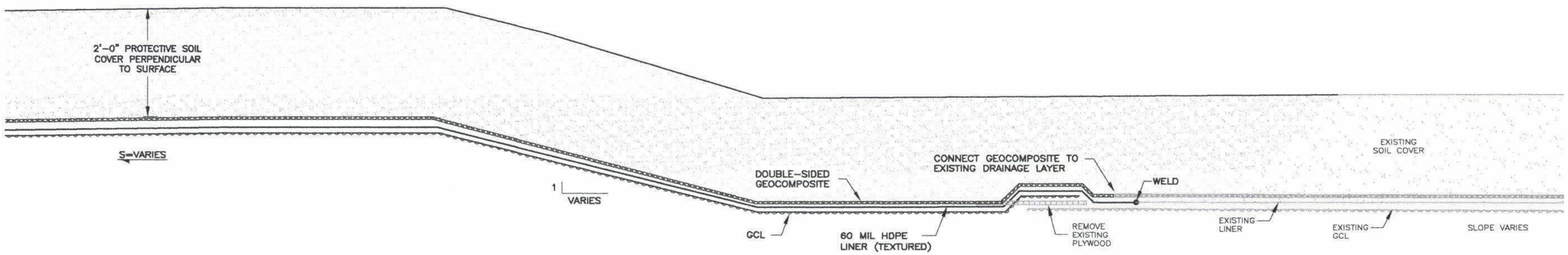
DESIGNED	MEN	3				
DRAFTED	MEN	2				
CHECKED	GLJ	1				
DATE	JANUARY 2022	NO.	DATE	REVISIONS	BY	APVD.

SCALE 1":175'

LANDFILL
PLAN VIEW

SHEET LF-1
446.02.100

10/07



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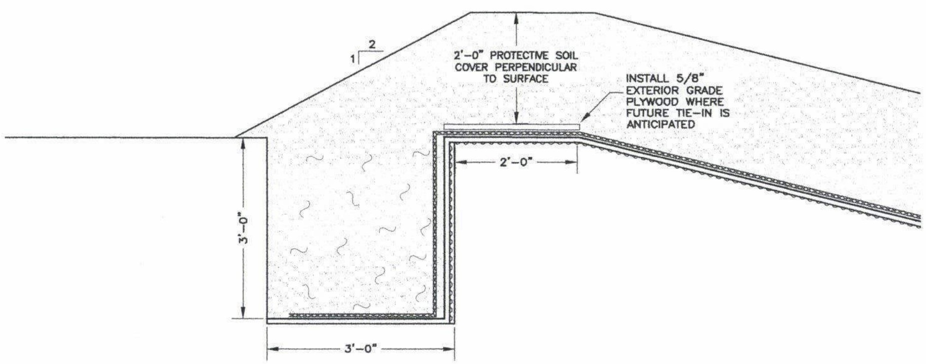

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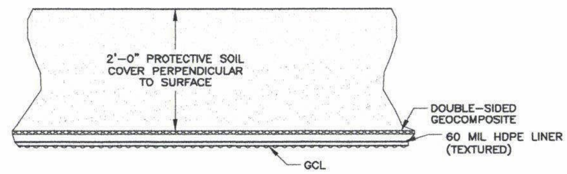

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FILE DATE: 2.4.2021 14:45:59 (CAH)

10/07

HANSEN ALLEN & LUCE inc ENGINEERS

PROJECT ENGINEER

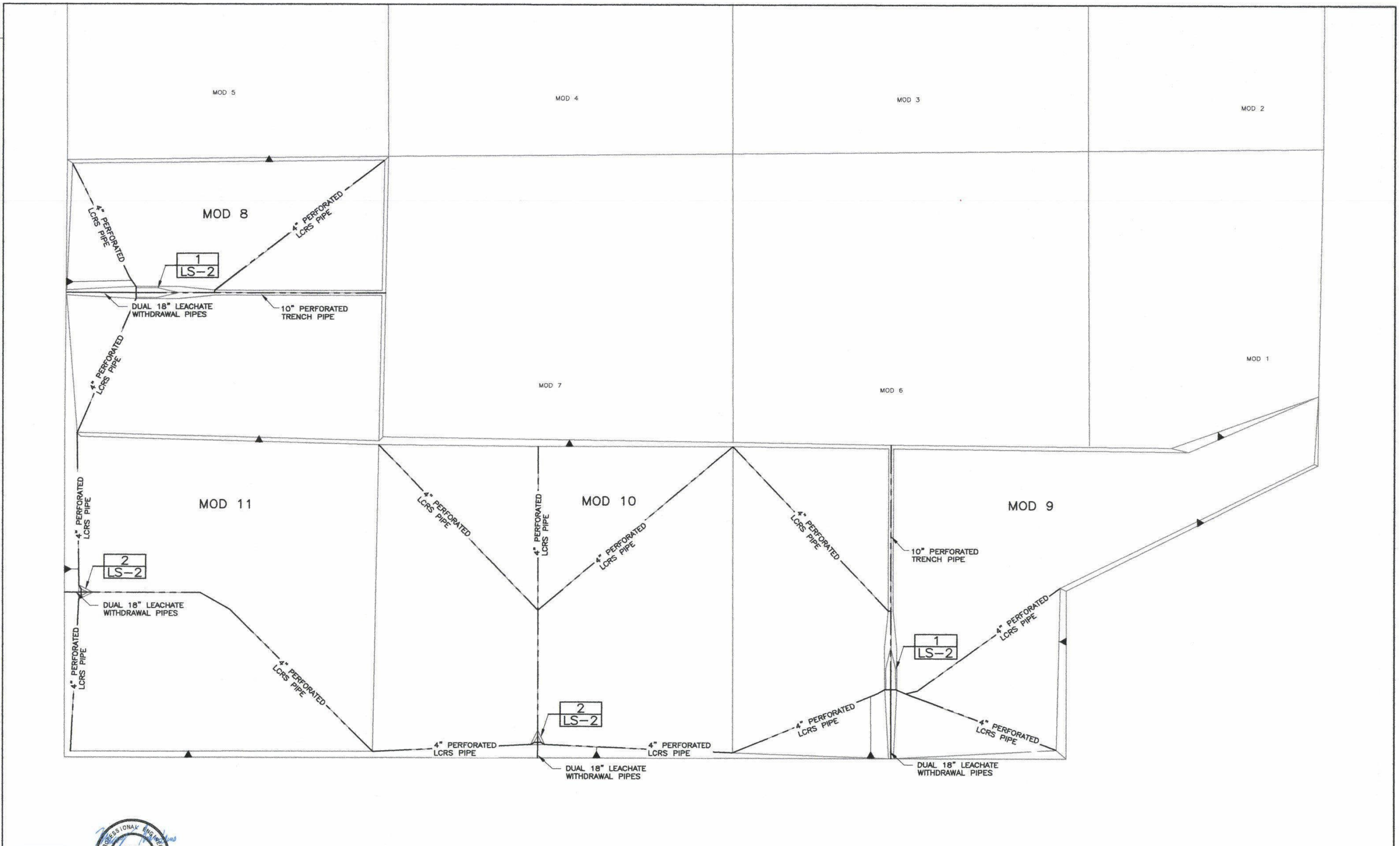
DESIGNED	MEN	3					
DRAFTED	MEN	2					
CHECKED	GLJ	1					
DATE	JANUARY 2022	NO.	DATE	REVISIONS	BY	APVD.	

SCALE: AS SHOWN

LANDFILL
LINER "TIE-IN" DETAILS

SHEET: LF-2

446.02.100



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HANSEN ALLEN & LUCE INC ENGINEERS

PROFESSIONAL ENGINEER MICHAEL E. NAWDOMSKIS No. 12464800-2202 STATE OF UTAH 1/14/22

PROJECT ENGINEER

DESIGNED	MEN	3				
DRAFTED	MEN	2				
CHECKED	GLJ	1				
DATE	JANUARY 2022	NO.	DATE	REVISIONS	BY	APVD.

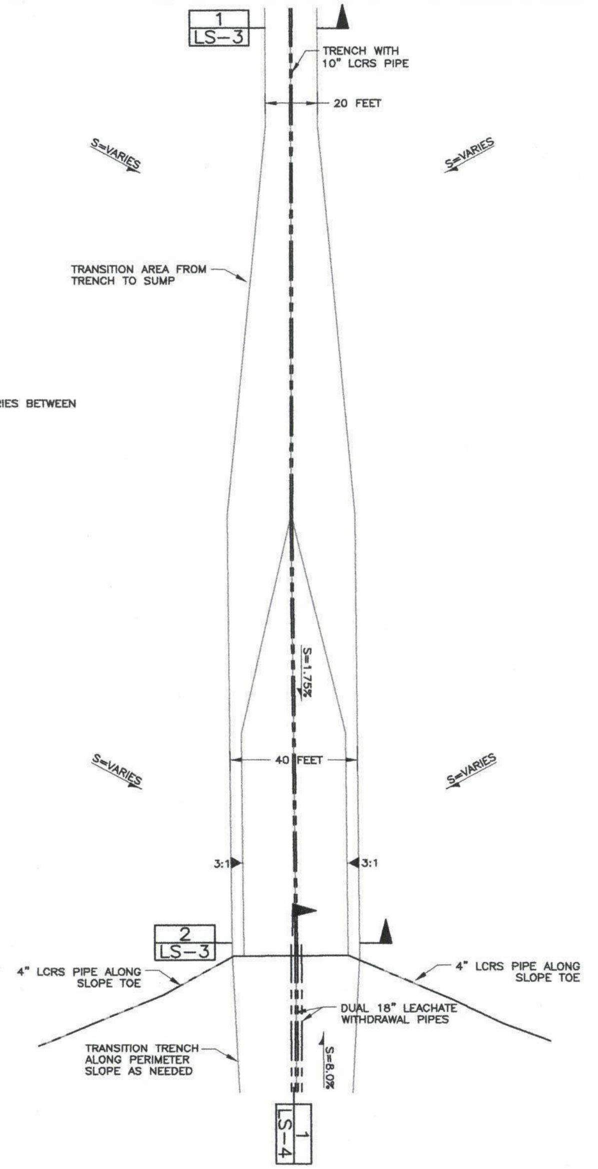
SCALE 1":175'

LANDFILL
LCRS PLAN

SHEET LS-1

446.02.100

NOTE:
1) LCRS PIPE CONFIGURATION VARIES BETWEEN MOD 8 AND MOD 9 SUMPS



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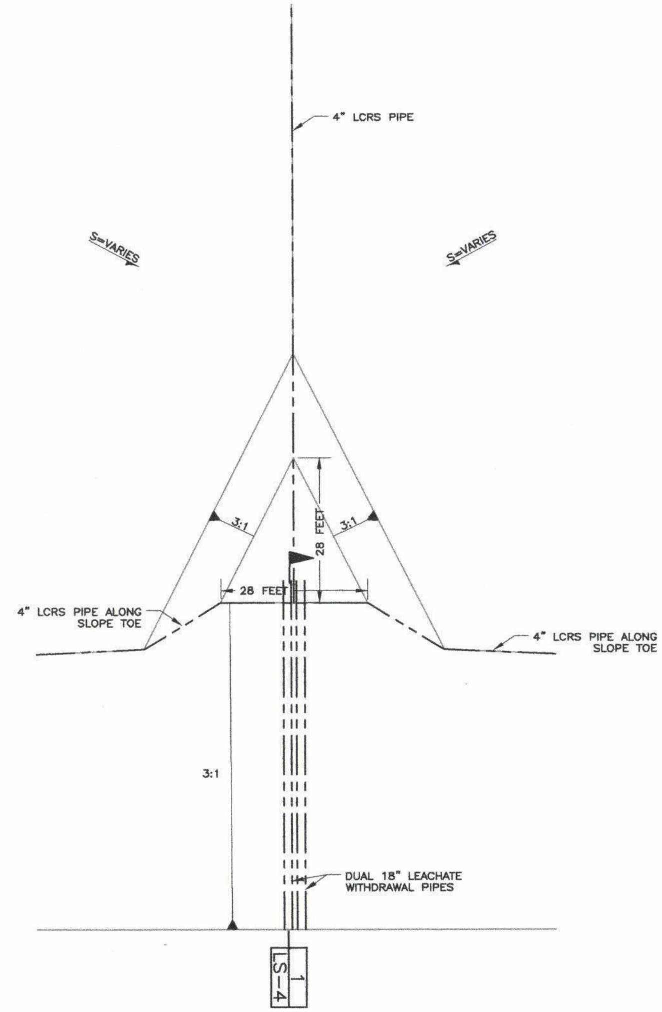

MOD 10/MOD 11 SUMP 2 LS-2
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FILE DATE: 2.4.2021 14:45:59 (CAH)

10/07

HANSEN ALLEN & LUCE INC ENGINEERS

PROFESSIONAL ENGINEER — STATE OF UTAH

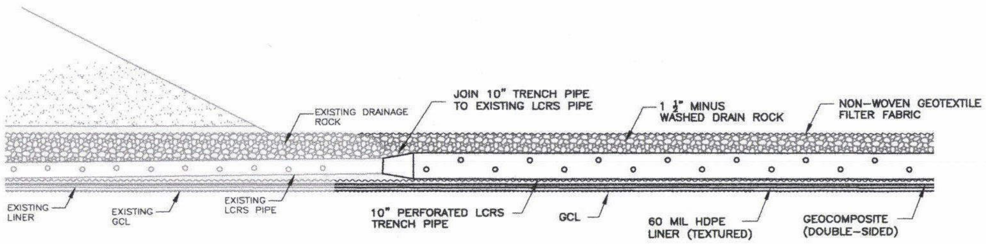
PROJECT ENGINEER

DESIGNED	MEN	3					
DRAFTED	MEN	2					
CHECKED	GLJ	1					
DATE	JANUARY 2022	NO.	DATE	REVISIONS	BY	APVD.	

SCALE: AS SHOWN

LANDFILL
SUMP PLAN

SHEET: LS-2
446.02.100



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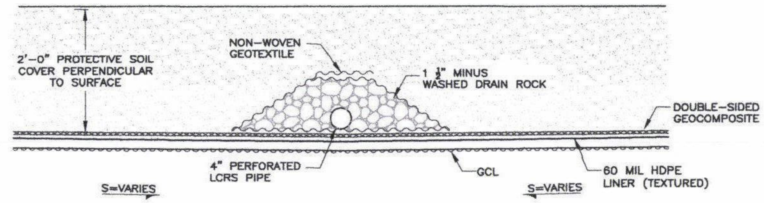

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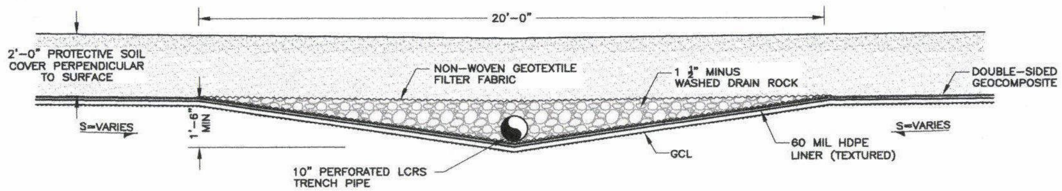

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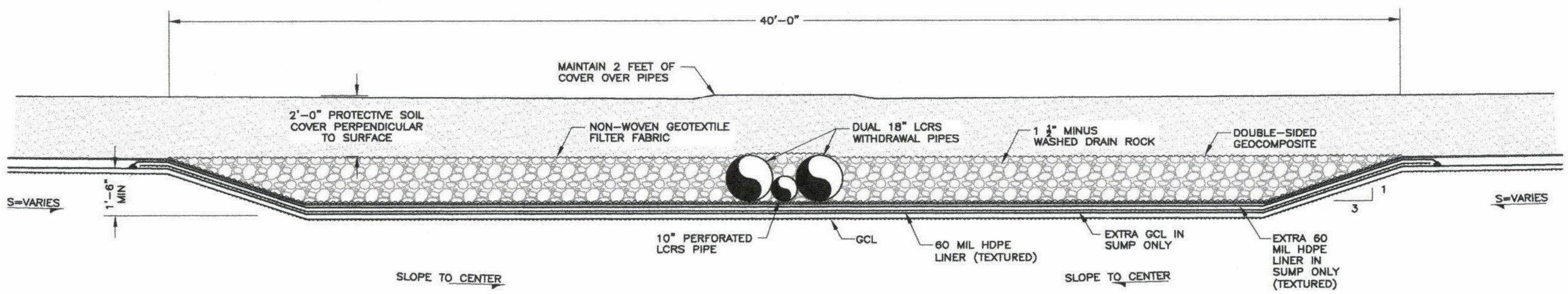

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HANSEN ALLEN & LUCE INC ENGINEERS

PROFESSIONAL ENGINEER MICHAEL E. NAVCOMSKY No. 12464886-2202 STATE OF UTAH

PROJECT ENGINEER

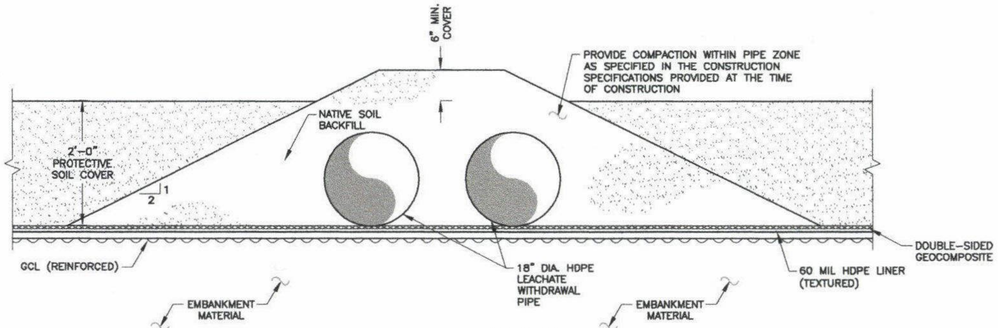
DESIGNED	MEN	3			
DRAFTED	MEN	2			
CHECKED	GLJ	1			
DATE	JANUARY 2022	NO.	DATE	REVISIONS	BY / APVD.

SCALE: AS SHOWN

LANDFILL
LCRS SECTIONS

SHEET LS-3

446.02.100



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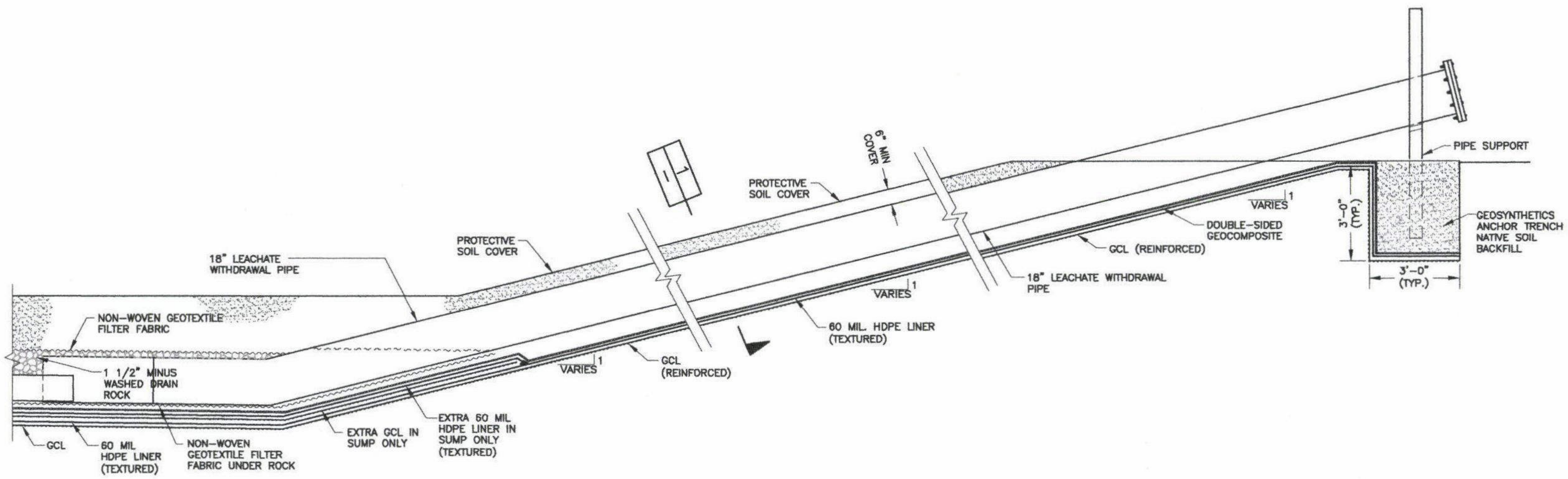

SECTION 1
N.T.S. LS-4

FILE NAME:
FILE DATE:

HANSEN ALLEN & LUCE INC. ENGINEERS

PROFESSIONAL ENGINEER MICHAEL NAMDOMSKIS No. 12464680-2202 STATE OF UTAH 1/19/22

PROJECT ENGINEER

DESIGNED	MEN	3			
DRAFTED	MEN	2			
CHECKED	GLJ	1			
DATE	JANUARY 2022	NO.	DATE	REVISIONS	BY / APVD.

SCALE: AS SHOWN

LCRS
LEACHATE WITHDRAWAL PIPE SECTIONS

SHEET LS-4
446.02.100

Attachment #4

Plan of Operations

3 OPERATIONS PLAN

3.1 CONSTRUCTION SCHEDULE

The active Landfill will be expanded sequentially in 11 modules. The locations of the 11 modules are shown on Figure 2.

The current schedule for construction of the 11 modules is as follows:

Year/Expected Year of Construction	Module	Notes
1993	2	Complete, receiving waste
1993 - 94	1	Complete, receiving waste
1994 - 95	3	Complete, receiving waste
1996	4	Complete, receiving waste
1997	5	Complete, receiving waste
2001	6	Complete, receiving waste
2003	7	Complete, receiving waste
2020	8	Proposed start of construction is 2020
2027	11	None
2031	10	None
2040	9	None

This schedule may change in the future, depending on actual waste stream growth and diversions. As shown, the Landfill plans to begin construction on a new module, Module 8, sometime in 2020. Detailed design information is not available for Module 8 at this time; the Landfill will submit a permit modification application with this information once it becomes available.

3.2 WASTE HANDLING PRACTICES

3.2.1 Hours of Site Operations

The Landfill is presently open to the general public for solid waste disposal Monday through Saturday from 7:00 a.m. to 5:00 p.m. The Landfill is closed Christmas, New Year's Day, Thanksgiving, and Sundays.

3.2.2 Record Keeping

All vehicles delivering wastes to the Landfill are stopped at the scalehouse. Scalehouse personnel weigh the load and enter into the computer the vehicle license number, material type, gross weight, tare weight*, date, time, scalehouse attendant's code number, transaction number, and fee collected. Average loads brought by the general public are entered at a weight of 700 pounds, based on past studies of general public loads. This information is then stored in the computer and can be output at any time. An example of the output forms generated by the computer is included in Appendix C.

After the load has been inspected and recorded at the scalehouse, vehicles are routed to the active disposal area and directed to the appropriate discharge location by Landfill personnel. No hazardous waste or materials will be permitted to enter the Landfill (see Section 3.9). Friable asbestos wastes are directed to a separate disposal area within the facility. The current location of the friable asbestos disposal area on Module 1 is shown on Figure 3. Non-friable asbestos is buried within the active tipping cell. Infectious wastes are discharged where they can be immediately covered after tipping.

The general public is routed to the public unloading center located on the south side of Module 9 (see Figure 2). The public unloading facility provides a place for the general public to drop off recyclables and to dispose of refuse. Several roll-off bins are provided for various recyclable

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* The tare weight of vehicles that come to the site frequently is maintained by the computer, based on the vehicle license number. First-time users must return to the scalehouse after tipping to obtain tare weight.

materials, including newspaper, foam rubber, and several types of ferrous and non-ferrous metals (including aluminum). The refuse brought to the Landfill by the general public is discharged into a concrete-lined pit, where wastes are inspected closely by Landfill personnel. Public loads of yard waste only are directed to and unloaded at the composting area in Module 10. Potentially hazardous wastes, such as household chemicals and batteries, are directed to and unloaded at the covered HHWF until they can be properly disposed at an appropriate facility. Once all loads have been inspected, segregated, or redirected as described, a loader operating in the pit at the public unloading area then pushes the remaining refuse into an open-top roll-off container for transport to the active face of the Landfill.

3.2.3 Landfilling

The Landfill will be constructed by the area fill method. For new modules, a defined area will be excavated, lined, and covered with a protective operations layer. After the operations layer has been placed, the initial 12- to 20-foot-thick lift of refuse is pushed onto the operations layer. The spreading and compacting equipment will always be on a layer of refuse, not directly on the operations layer. Once the initial lift is completed, landfilling will proceed as described below.

Refuse will generally be placed in lifts up to 20 feet thick. Refuse will be spread and compacted in approximately 2-foot-thick layers on a working face that is a maximum of approximately 300 feet wide and sloped at 3:1 (horizontal:vertical) or flatter. Wastes may be deposited at either the base or top of the working face, and then spread and compacted over the face. The compaction equipment will make several passes over each 2-foot-thick layer of refuse spread across the working face to obtain adequate compaction of all wastes. To prevent bridging of the surrounding refuse, large or bulky wastes will be separated and placed in the lower portion of the advancing lift, and thoroughly crushed by compacting equipment. Open burning of the refuse will not take place at the Landfill.

Temporary berms will be placed on lifts as necessary to divert surface water away from the active working face. Working faces advanced upslope will be aligned as necessary to avoid trapping runoff.

The Landfill will be covered daily with a combination of 6 inches of soil, automotive shredder fluff, compost, mulch, foam, or other approved alternative daily cover, depending on conditions and available materials, unless extreme seasonal climatic conditions prevent the placement of daily cover. In September 2018, UDEQ approved the use of shredded waste as alternate daily cover. The approval letter is included as Appendix D.

3.2.4 Landfill Equipment

The following equipment currently is kept and used at the Landfill to spread and compact waste, control dust, and perform other landfill operations.

- Dozers
- Compactors
- Graders
- Excavator
- Haul Trucks
- Water Wagon
- Rolloff Trucks
- Service Trucks
- Trommel Screen
- Loaders

An inventory of equipment with similar or more capabilities will be maintained at the Landfill throughout its operational life.

3.2.5 Composting

Beginning in 1994, yard waste was diverted from the Landfill to a composting area. The on-site citizen unloading facility also provides the public with a convenient place to dispose of their recyclable yard and wood wastes. Recycling these wastes provides an inexpensive means of generating compost and mulching materials. Composting conserves nutrients and reduces the need for fertilizer. Yard waste, such as twigs, leaves, and grass clippings are composted.

The compost piles are then windrowed and allowed to sit. The piles are turned every week and sprayed with water for dust control. The resulting compost is sold to the public. The mulching, composting, and SRS operations are located in the last area scheduled for development (Module 10, see Figure 2).

3.3 LANDFILL GAS COLLECTION SYSTEM

The active Landfill is equipped with a landfill gas collection system (LGCS), which was brought online in December 2000. The LGCS starts with a network of vertical and horizontal gas collection wells through which landfill gas is collected. These collection wells are connected to lateral lines, which in turn bring the gas into a main header pipeline. The header pipeline is designed to ring the perimeter of the active Landfill, and includes a series of condensate knockout units where condensate is removed from the gas and returned to the Landfill. The main header pipeline routes collected landfill gas to the Facility's flare station and to an off-site gas-to-energy facility (operated by Aria Energy Systems) for electricity generation. The landfill gas is combusted in a large, internal combustor flare, and by Aria's reciprocating internal combustion engines.

The LGCS was designed, installed, and is operated in accordance to regulations found in the Clean Air Act (CAA), which are enforced by the Utah Division of Air Quality, and encompassed in the facility's Title V Operating Permit No. 3500536002, dated June 23, 2015. These regulations specify operating conditions for the LGCS, including wellhead function, flare function and gas destruction, surface emissions monitoring, future expansion of the system in correlation to Landfill growth, how to resolve process upsets to the system, and finally, when the LGCS can ultimately be removed following Landfill closure. A detailed description and design drawings for the LGCS is included in the Landfill's Gas Plan, provided as Appendix E.

3.4 SCHEDULE FOR MONITORING AND SELF INSPECTION

The Landfill will perform the following monitoring and inspections:

Type of Monitoring/Inspection	Frequency	Description of Monitoring
Groundwater	Semi-annual	Collect and laboratory-analyze samples from monitoring wells MW-1 through MW-10 (see Groundwater Monitoring Plan and Protocol, Appendix F and F-1).
Landfill gas	Quarterly	Field analyze samples of landfill gas from monitoring probes and landfill structures with combustible gas meter (see Section 3.4.1).
Leachate	Bi-weekly	Monitor sumps for presence of leachate.
Surface Water	Semi-annual	Collect and laboratory-analyze samples of storm-water runoff.
Disease Vectors	Weekly	Visual inspection for signs of vector or rodent activity.
Drainages, Roads and final cover areas	Weekly	Visual inspection for needed repairs due to erosion, etc.
Visible Fugitive Dust	Daily	Visual observation for fugitive dust.
Opacity	Quarterly	Visual survey for opacity to see that procedures are controlling fugitive dust. EPA Method 9 certified personnel will perform the opacity readings.

Forms used for groundwater monitoring are included as an attachment to the Groundwater Monitoring Protocol (Appendix F-1). Examples of all other inspection/monitoring logs that will be maintained are contained in Appendix C.

In January 2019, the Landfill submitted a letter to UDEQ requesting to remove three groundwater monitoring wells from the Groundwater Monitoring Plan. This correspondence is attached as Appendix G. Since this request has not yet been approved by UDEQ, the Groundwater Monitoring Plan, created in 2009, is still utilized for the Landfill along with an updated 2018 Groundwater Monitoring Protocol reflecting the removal of these monitoring wells. The plan and protocol have been included as Appendix F and F-1, respectively. The Groundwater Monitoring Plan will be updated once the request to remove the three monitoring wells has been approved.

3.4.1 Explosive Landfill Gas Monitoring

Requirements for explosive gas monitoring pertaining to solid waste disposal facilities are codified in Utah Administrative Code (UAC) Rule Utah Rule 315-303-2(2). The rule specifies that owner and/or operators of disposal facilities must perform explosive gas concentration monitoring in facility structures (with exclusion of gas control or recovery system components) to demonstrate that concentrations do not exceed twenty-five percent of the lower explosive limit (LEL) for explosive gases. The rule also requires monitoring for the LEL of explosive gases at the property boundary for the disposal facility.

In accordance with UAC R315-303-2, a technician performs explosive gas monitoring on a quarterly-basis at all above-grade structures on the Landfill using a calibrated Flame Ionization Detector (FID). In addition to the explosive gas monitoring performed at Landfill structures, a technician monitors probes installed along the perimeter of the Landfill boundary to determine the concentration of explosive gases using a calibrated FID. The technician documents the field calibration of the FID instrument on the Explosive Gas Monitoring Form, shown in Appendix C, prior to starting monitoring work. Following calibration, the technician monitors the indoor air of Landfill structures as well as accessible spaces below the structures using the FID. Explosive gas monitoring readings are documented on the Explosive Gas Monitoring Form. A detection of twenty-five percent or more LEL within the Landfill structures using the FID are documented on the Explosive Gas Monitoring Form and the technician will immediately notify Landfill staff to take necessary corrective actions in accordance with applicable regulations.

A technician walks the perimeter of the Landfill to access perimeter probes (GM-1 through GM-10) and connect the FID via tubing to the probe sample port. Explosive gas detections are documented on the Explosive Gas Monitoring Form. Any detection of one hundred percent of the LEL (50,000 ppm) for explosive gases will be immediately reported to Landfill staff to initiate corrective actions in accordance with applicable regulations.

3.5 CONTINGENCY PLANS

3.5.1 Potential Contingency Situations

Although Salt Lake County will conduct operations at the site to preclude the potential for emergency situations or occurrences, it is possible for events to occur that are beyond the control of Landfill personnel. The Landfill has developed contingency plans, included as Appendix H, which describe the responsibilities of Landfill personnel in the event that any of the following emergencies or major disasters occurs:

- Earthquakes;
- Significant failure of refuse fill or excavation slopes;
- Fires within the Landfill site boundary, including Landfill areas, and structures;
- Explosions within the Landfill site boundary;
- Release of explosive gasses;
- Presence of fluid/leachate seeps from the side slopes of the refuse fill areas;
- Unauthorized discharge of hazardous or toxic materials, including accidental spills of materials authorized on site, and illegal discharges by waste haulers;
- Failure of temporary or permanent drainage facilities;
- Loss of equipment or personnel; and
- Loss or failure of general on-site facilities.

3.5.2 Groundwater Contamination Corrective Action Plan

A corrective action program, consistent with Utah Administrative Code R315-308-3, will be initiated in the event that monitoring indicates groundwater has been impacted. A general schedule for the program is presented in Appendix I.

3.6 ALTERNATIVE WASTE HANDLING/DISPOSAL

Alternative waste handling practices or disposal areas may be required when wet weather or unforeseen events prevent the Landfill from disposing of wastes as planned.

A wet-weather disposal area will be provided within the active module for landfill operations during periods of extremely heavy or sustained rainfall. The wet-weather disposal area will be designed to provide an adequate tipping area for refuse collection vehicles. This area will be accessed by an all-weather road. Gravel, crushed stone, or demolition rubble may be applied on the surface to prevent refuse vehicles from picking up mud or refuse from the active area. The wet-weather disposal area will be relocated, as necessary, to facilitate site operations.

In addition to wet weather, there are several potential scenarios that could disrupt vehicle traffic to the Landfill and/or prevent tipping at the planned sites. Scenarios that could disrupt vehicle traffic include fires, traffic accidents, and chemical spills on the approach to the Landfill. If the normal modules are not available for tipping, waste is directed to another available lined Landfill area and is covered with intermediate cover.

3.7 MAINTENANCE OF INSTALLED EQUIPMENT

The condition of Landfill monitoring wells, gas wells and lines, leachate risers, and the flare station will be assessed during each monitoring event. The schedule for monitoring is presented in Section 3.4. Inspection records will be filled out and retained to document the condition of equipment.

If needed maintenance or repairs are identified during the monitoring event, Landfill personnel will arrange to have the work performed as soon as possible. Documentation of repair or maintenance will be filed with the inspection report.

3.8 PROCEDURES TO CONTROL NUISANCES AND DISEASE VECTORS

3.8.1 Unsightliness, Dust, and Odor

Unsightliness, dust, and odor will be controlled by (1) timely placement of daily, intermediate, and final cover over the refuse fill; (2) proper maintenance of haul roads (grading and watering); (3) application of fine water spray or dust palliative on soil-covered work areas, soil excavation areas, and soil stockpile areas where conditions may result in fugitive dust; (4) application of water or planting of temporary vegetation on intermediate soil cover when conditions might create fugitive dust; and (5) planting and maintenance of vegetated cover on completed fill slopes. A soil cover will be placed on the top of refuse piles on a daily basis. Soil or alternate daily cover will be placed on the vertical sides of refuse piles. Daily cover will control dust and odors and improve aesthetics. A Fugitive Dust Control Plan is presented as Appendix J.

3.8.2 Litter

The site operator will use a litter collection program to minimize the impacts of litter on site and in the area surrounding the site. This program consists of various activities designed to reduce windblown litter, as well as other site features and operations that inadvertently help to reduce windblown litter. Activities specifically designed to reduce amounts of windblown litter include minimizing the size of the active face to reduce the area of wastes exposed to wind and adjusting the height and length of litter fences to maximize their effectiveness in trapping windblown litter.

Features and operating techniques that reduce windblown litter include constructing perimeter fencing around the Landfill, applying daily and intermediate cover, and compacting refuse layers at a maximum thickness of 2 feet to hold freshly deposited refuse to underlying landfill layers. Site and surrounding area inspections will be conducted routinely, and any windblown litter that is found will be collected. Temporary employees will be utilized in an active litter cleanup program at the Landfill and along perimeter properties as needed.

3.8.3 Disease Vectors

A properly operated solid waste management facility does not present health hazards because today's waste management practices do not create conditions that attract and allow the breeding of such potential disease vectors as rodents and flies. Timely placement of daily soil and alternate daily cover on the refuse, and intermediate and final cover placement will prevent birds and rodents from using refuse for food and habitat. Daily and intermediate cover is also effective in preventing the emergence of flies from eggs which were laid in household refuse before it was collected and brought to the site for disposal. Site personnel will inspect site areas weekly for any signs of vector or rodent activity. If such activity is observed, site personnel will contact pest control specialists for professional advice and any services needed to ensure that a vector nuisance does not develop.

3.8.4 Noise

Noise levels of on-site equipment will be controlled by properly maintaining equipment mufflers.

3.8.5 Fire

Equipment operators and maintenance personnel will frequently remove debris and dust from undercarriages and engine compartments, check for and repair fuel and oil leaks, and provide portable fire extinguishers on landfill equipment to protect landfill equipment and vehicles from fire danger. The entrance facilities and maintenance buildings will be equipped with fire extinguishers for controlling minor fires and maintaining personnel safety.

Open burning will not take place at the Landfill. Fire protection for the refuse fill will be provided by minimizing the size of the tipping face, and by preventing deposition of or removing burning material. Any fire that occurs on the Landfill will be extinguished by trained Landfill personnel using appropriate site equipment, stockpiled soil cover, and when necessary, a water truck or auxiliary fire truck (see Section 4.6.1). Water will be supplied by the on-site water well. If additional firefighting resources are needed, the Salt Lake City Fire Department will be summoned.

3.9 HAZARDOUS WASTE EXCLUSION PLAN

A "Prohibited Waste" control program designed to detect and deter attempts to dispose of hazardous and other unacceptable wastes is in place at the Facility. The program is designed to protect the health and safety of employees, customers, and the general public, as well as protect against contamination of the environment. The Environmental Manager will be in charge of hazardous waste exclusion activities. The complete program is included in Appendix K.

The site is open for public and private disposal. Signs posted near the site entrance clearly indicate (1) the types of wastes that are accepted; (2) that hazardous wastes are not accepted at the site; and (3) the penalty for illegal disposal. All vehicles delivering wastes to the site will be stopped at the scalehouse. Scalehouse personnel will, to the extent possible, visually inspect incoming waste for hazardous materials. Any vehicle suspected of carrying unacceptable materials (liquid waste, sludges, or hazardous waste) will be prevented from entering the disposal site area. Vehicles carrying hazardous materials will be required to exit the site without tipping their loads. If a load contains or is suspected of containing hazardous materials, the Waste Inspector will be notified and the following information will be recorded: date, name of hauler, and license plate number.

After the load has been inspected at the scalehouse, the vehicle will be routed to the active disposal area and directed to the appropriate discharge location by site personnel. Loads will be randomly inspected at the tipping face by Landfill personnel. If a discharged load contains hazardous material, the discharger will be required to reload the material and remove it from the Landfill site. The discharger will be instructed on how to dispose of the wastes. A rejected load form will be completed and provided to the Salt Lake Valley Health Department.

If the discharger is not identified, the area where the hazardous material was discharged will be cordoned off. The hazardous material will be moved to a designated area for identification and preparation for proper disposal.

3.10 RECYCLING/RESOURCE RECOVERY

Current waste diversion programs at the Facility include salvage contracts for resalable recyclable materials, a soils regeneration site contract for blending waste materials into native soils to produce a final cover able to sustain vegetation, a mulching and composting operation for yard and wood waste, and a household hazardous waste facility.

The Facility's on-site citizen unloading facility provides residents a convenient means of recycling their yard and wood wastes and other recyclables. Several bins are provided for various recyclable materials including mixed paper, glass, plastics and metals. Yard waste (leaves, grass clippings) are windrowed and turned periodically to promote composting. The resulting compost is sold to the public. Wood wastes may be chipped to provide landfill cover or mulch/compost for landscaping. The Facility contracts a vendor to remove refrigerants from any appliances received; the appliances are then stickered and transported to an off-site metal recycling facility. Rubber tires and mattresses are segregated from other wastes and taken to off-site recyclers. The design and operations of the public unloading facility do not allow for public scavenging of discharged materials, including recyclables.

The Salt Lake County Health Department operates a Household Hazardous Waste Facility (HHWF) at the SLVSWMF. The HHWF's goal is to reduce the amount of hazardous wastes disposed in the Landfill cells, thereby reducing the risk of future impact to soil and groundwater. The HHWF accepts only wastes from private homeowners. Materials accepted include aerosol cans, non-halogenated flammables (mostly fuels), oil, oil-based paint, latex-based paint, lab packs, and other materials such as anti-freeze, dioxins, and automobile batteries. Wastes are segregated by HHWF personnel, manifested, and transported to a hazardous waste disposal facility. Antifreeze, batteries, and used oil are picked up by registered recyclers.

3.11 EMPLOYEE TRAINING

The Landfill conducts operations training for new and existing equipment operation, Hazardous Waste Operations and Emergency Response (HAZWOPER) training and refresher courses, and emergency response training. A list of all training courses offered for Landfill personnel in 2018 are shown in Appendix A.

Attachment #5

Groundwater Monitoring Plan (2009)

KLEINFELDER
Bright People. Right Solutions.

FINAL
GROUNDWATER MONITORING PLAN
SALT LAKE VALLEY SOLID WASTE
MANAGEMENT FACILITY
SALT LAKE COUNTY, UTAH

August 18, 2009

A Report Prepared For:

Salt Lake City Corporation
Salt Lake City Public Works
324 South State Street
Salt Lake City, UT 84111

File No.: 54629.001

FINAL
GROUNDWATER MONITORING PLAN
SALT LAKE VALLEY SOLID WASTE
MANAGEMENT FACILITY
SALT LAKE COUNTY, UTAH

Prepared by:

Nathan Jones, E.I.T.
Staff Engineer

Mark Hooyer
Senior Project Manager

KLEINFELDER WEST, INC.
849 West Levoy Drive, Suite 200
Salt Lake City, Utah 84123
(801) 261-3336

August 18, 2009

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TABLES

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APPENDICES

KLEINFELDER
Bright People. Right Solutions.

GROUNDWATER MONITORING PLAN
REVISION HISTORY

This page is a record of all revisions to the Salt Lake Valley Solid Waste Management Facility (SLVSWMF) Groundwater Monitoring Plan and Appendices. Each time the document is revised the revision Table below will be updated and reissued to SLVSWMF, Salt Lake City Corp., Salt Lake Valley Health Department, Utah's Division of Solid and Hazardous Waste and Consultant, along with revised content as necessary.

Rev. #	Effective Date	Pages Revised	Description	Type of Revision (Technical or Editorial)	Update Requires Review
0	November 2, 1993	All	Initial Issue.	NA	NA
1	July 7, 1997	All	Updated Plan.	NA	No
2	May 23, 2002	All	Updated Plan.	NA	No
3	March 11, 2005	All	Updated Plan.	NA	No
4	August 18, 2009	All	Updated Plan. Added the approved use of peristaltic pump and Appendix A, QA/QC for Well Installation.	Technical	Yes

1. INTRODUCTION

1.1 BACKGROUND

The Salt Lake Valley Solid Waste Management Facility (SLVSWMF) is located approximately 9 miles west of downtown Salt Lake City (Figure 1). The facility currently receives municipal and industrial solid waste from approximately 66 percent of the businesses and residents of Salt Lake County. The facility is jointly owned and operated by Salt Lake City Corporation and Salt Lake County and began accepting waste in 1993 and is scheduled to close in approximately 2052. The active landfill portion of the facility is being constructed sequentially and will eventually include 11 modules, encompassing approximately 455 acres. Groundwater monitoring is the responsibility of the SLVSWMF's Environmental Manager (currently Tom Burrup) through the facility's designated environmental consulting firm (currently Kleinfelder, Inc.) This Groundwater Monitoring Plan was designed to use historical data to develop a cost-effective plan that is able to detect a potential release from the facility, and in compliance with the waste management rules, specifically Section 4.1.6 of Salt Lake Valley Health Department (SLVHD) Regulation #1 and Utah Administrative Code (UAC) R315-308 as enforced by the Utah Division of Solid and Hazardous Waste (DSHW).

Since 1982, 12 groundwater monitoring wells have been installed around the active landfill; three of these wells were abandoned during site development. There are currently eight long-term detection monitoring wells (MW-1A through MW-8A) around the active landfill area (Figure 2). Since 1993, most of these wells have been sampled semi-annually to monitor groundwater quality. A ninth well, Well F, is monitored as required by SLVHD and is located within Module 10. When Module 10 is constructed, Well F will be abandoned. Therefore, Well F is not considered part of the detection monitoring network. In addition, three wells (MW-11A, MW-12A, and MW-13A) are planned for installation (Summer/Fall 2009) to serve as background and detection points downgradient from a new leachate detention pond constructed northeast of the current landfill area. The three wells include one upgradient well (MW-11A) and two down gradient wells (MW-12A and MW-13A). The proposed locations for the three groundwater monitoring wells for the new leachate holding pond are shown on Figure 3. A quality control/quality assurance (QC/QA) plan for well construction and a proposed well construction worksheet are included in Appendix A.

1.2 GROUNDWATER LEVEL MEASUREMENTS, ELEVATIONS, AND GRADIENT

Depth-to-water measurements are made in existing wells twice a year (once in the Spring and once in the Fall). Measuring the depth to water began in 1994 and the measurements are made from the top of the polyvinyl chloride (PVC) well casing with a conductivity-based water level meter or an electronic interface probe. Historical depth-to-groundwater readings are converted to groundwater elevations above mean sea level by subtracting them from the surveyed well casing elevations provided by Salt Lake City Public Works. Groundwater elevations for the wells have been contoured for the past two monitoring rounds on Figures 4 and 5. The groundwater slope beneath Landfill has varied from approximately 0.001 feet per foot (ft/ft) to 0.003 ft/ft towards the northwest for the past several years.

This groundwater slope is generally consistent with the regional groundwater flow pattern indicated by Seiler and Waddell (1984), who show groundwater flow direction toward the northwest near the facility.

1.2.1 Groundwater Velocity

Using the above groundwater slopes and an estimate of the hydraulic conductivity, it is possible to roughly estimate the groundwater velocity in the active landfill area. According to EMCON (1990, Drawing No. B-4, located in Appendix A of the 2006 Master Plan), near-surface soils at the Facility consist of clay with inter-bedded silty sand. The majority of groundwater flow is likely to occur within the silty sand. Freeze and Cherry (1979) list 10^{-3} to 10^{-4} cm/sec (0.3 to 3 ft/day) as average hydraulic conductivities for silty sand, and 40 percent as an average porosity. Using these values for hydraulic conductivity and porosity, and 0.0025 ft/ft for the hydraulic gradient, the velocity of groundwater flow at the landfill is given by:

$$\text{Velocity} = \frac{(\text{conductivity})\ (\text{Gradient})}{(\text{porosity})} = \frac{(0.3 \text{ to } 3 \text{ ft/day})\ (0.0025)\ \text{ft}}{0.4 \text{ ft}}$$

Velocity = 0.0019 to 0.019 ft/day = 0.684 to 6.84 feet/yr

Given this value for groundwater flow velocity, and given that wells are at least 50 feet from the buried refuse, it would likely take approximately seven to 14 years (if hydraulic gradient is closer to 0.001 ft/ft) for water from beneath the active landfill modules to reach the down-gradient wells. The landfill began receiving solid waste approximately 17 years ago (July 1993). Based on these calculations, it is likely the downgradient wells do contain groundwater that has flowed under a portion of the landfill.

1.3 SUMMARY OF EXISTING MONITORING WELLS

Nine existing groundwater wells (MW-1A, MW-2A, MW-3A, MW-4A, MW-5A, MW-6A, MW-7A, MW-8A and F) are currently sampled and analyzed twice a year to assess groundwater quality around the active landfill. The groundwater is currently sampled by Kleinfelder with oversight by Tom Burrup, the Environmental Manager for the SLVSWMF. The locations of these wells are shown on Figure 2. These depths of these wells are approximately 23 to 29 feet below ground surface (bgs) which is approximately 15 to 20 feet below the typical groundwater level. Construction details for the wells, where known or estimated, are summarized in Table 1. The constituents in groundwater, collected from the SLVSWMF, analyzed by the laboratory during each sampling round are summarized in Table 2.

Based on the regional groundwater gradient to the northwest, six of the existing wells are downgradient of the active landfill area (MW-4A, MW-5A, MW-6A, MW-7A, MW-8A, and F) and three of the existing wells are upgradient (MW-1A, MW-2A, and MW-3A). MW-3A is located to the west of the new leachate holding pond which is likely to be downgradient with respect to groundwater flow. The use of MW-3A as an upgradient control well will be reevaluated over time as analytical results become available for the proposed leachate detention pond monitoring wells. It is possible MW-11A, the planned upgradient monitoring well for the leachate detention pond, maybe used as an upgradient well for the Landfill.

1.4 SUMMARY OF EXISTING DATA

The results of groundwater analyses are shown in Table 3. The data indicate that groundwater quality is generally poor, and that the water quality varies significantly across the active landfill area. For example, reported TDS concentrations during a single monitoring round (Spring 2009) have ranged from 5,800 milligrams per liter (mg/L) in MW-1A to 24,000 mg/L in MW-3A. Sodium and chloride are the dominant anions present in the groundwater, indicating that the shallow groundwater is influenced by saline soil. Sulfates are also present at relatively high concentrations. Iron, and manganese concentrations have exceeded federal drinking water standards in both upgradient and downgradient wells. Arsenic consistently exceeded its Solid Waste Groundwater Quality Protection Standards (SWGQPS) with the greatest concentration of arsenic reported in groundwater from upgradient wells. Therefore the arsenic concentration regulatory action level has been increased from 0.010 mg/L to 0.020 mg/L by the DSHW as noted in a letter dated July 9, 2009 (Appendix B).

It is important to note that no evidence of an impact to groundwater in the vicinity of the landfill operations has been observed.

2. NEW MONITORING WELL INSTALLATION

The construction of new detection monitoring wells at the SLVSWMF will be constructed in accordance with the SLVSWMF QC/QA plan for well installation and Section 33 24 13 of the American Public Works Association's (APWA) Manual of Standard Specifications (Section 33 24 13). Each detection groundwater monitoring well will be installed such that the screened interval spans the groundwater/vadose zone interface. The screen will be positioned to allow for maximum fluctuations of groundwater elevation within the screened interval. In addition, each newly installed well will be developed to ensure groundwater samples are free of artificial turbidity as specified in the QC/QA plan. The SLVSWMF QC/QA plan for well installation and Section 33 24 13 are included in Appendix A. Prior to beginning construction of new monitoring wells, approval in compliance with Regulation #1 Section 4.1.6(i)a., will be obtained from the director of the SLVHD.

3. SAMPLING AND ANALYSIS PLAN

3.1 MONITORING NETWORK

Currently, eight detection monitoring wells exist around the active landfill (MW-1A, MW-2A, MW-3A, MW-4A, MW-5A, MW-6A, MW-7A and MW-8A). Several of these wells had different number designations prior to 1993 (see Table 1). Any well (MW-1A through MW-8A) and planned wells (MW-9A through MW-13A) that is replaced in the future (e.g., due to damages) will receive the next sequential letter designation (e.g., MW-1B will replace MW-1A).

Wells MW-1A, MW-2A, MW-3A, MW-4A, MW-6A, MW-7A and MW-8A have been part of the existing monitoring system since December 1993 (Figure 2). Well MW-5A was constructed in 1994, and was first sampled in May 1994. A ninth well (well F) will be properly abandoned at a future date, but has been sampled semi-annually since April 1996 to provide supplemental data. The monitoring network will eventually include wells MW-1A through MW-8A, along with the leachate detention pond monitoring wells (MW-11A, MW-12A and MW-13A) planned for installation Summer/Fall 2009 and two new landfill monitoring wells (MW-9A and MW-10A) as outlined in the SLVSWMF's Master Plan.

Currently based on an assumed hydraulic gradient to the northwest, three of the wells monitor up-gradient groundwater quality (MW-1A, MW-2A and MW-3A), and five wells monitor down-gradient water quality (MW-4A through MW-8A). The two southern-most uninstalled monitoring wells, MW-9A and MW-10A, will not be included in the monitoring program until after the development of the modules on the south side of the landfill, unless observed groundwater gradients become southwesterly. When excavation for Module 8 is initiated, MW-9A and MW-10A will be added to the program so that several years of data will exist for these two wells by the time Modules 8, 10 and 11 (the modules most likely to affect MW-9A and MW-10A) are built.

By Fall 2009 three wells (MW-11A, MW-12A, and MW-13A) will monitor up and downgradient groundwater quality for the leachate detention pond. These well locations are to provide consistent long-term points-of-compliance. After establishment of background water quality (as discussed in SLVHD Regulation #1, Sections 4.1.4 and 4.1.6) is complete for wells MW-11A through MW-13A, they will be incorporated into the SLVSWMF's monitoring program.

3.2 FREQUENCY OF MONITORING

The groundwater around the active landfill cell will be monitored semi-annually, in the spring and fall. Groundwater from monitoring wells MW-11A will be sampled eight times during the first year of installation and wells MW-12A and MW-13A will be sampled four times with in the first year to establish background concentrations per UAC 315-308.2.5.a and Regulation #1 Section 4.1.4.n.

3.3 DETECTION MONITORING ANALYTES

Prior to 1993, groundwater samples from the active landfill wells had been analyzed for the constituents listed in "Salt Lake County Landfill Groundwater Monitoring Quality Assurance Project Plan" prepared by the Salt Lake City-County Health Department.

The list of analytes in the Quality Assurance Project Plan is similar to the constituents for detection monitoring contained in Section 315-308-4 of the Solid Waste Permitting and Management Rules. To be consistent with monitoring under the rules at the active landfill cells, the groundwater samples from the wells around the active landfill area will be analyzed for the list of constituents shown in Table 2, "Laboratory Analysis for Groundwater Monitoring" included in this report. Metals analyses are performed for dissolved metals concentrations rather than total metals concentrations due to high natural turbidity of groundwater. This exception was approved by the executive secretary of the DSHW in 1996.

3.4 SAMPLING PROTOCOL

The wells will be sampled using currently accepted and approved technology or approved equivalent techniques. The protocol for sampling the wells is described below and in SLVSWMF's Protocol for Groundwater Monitoring (Chapter 1).

3.4.1 Water Level Measurements

Water level measurements will be made with an electronic oil/water interface meter or equivalent instrument capable of obtaining readings to the nearest 0.01-foot. Washing with a non-phosphate detergent and rinsing with distilled water will clean the probe prior to use in each well.

3.4.2 Detection of Immiscible Layers

An interface probe will be lowered into the well to detect immiscible layers, light and/or dense. Careful recording of the depths of the air/floater and floater/water interfaces establishes a measurement of the thickness of the light phase immiscible layer. The device will be lowered to the bottom of the well where the interface probe will register the presence of dense organic liquids. If immiscible layers are found, they will be sampled by carefully lowering a bailer and retrieving the sample. It should be noted that immiscible layers have not been detected in any groundwater monitoring wells at the SLVSWMF since groundwater monitoring began.

3.4.3 Purging Activities

A "low-flow" purging and water sample collection procedure will be used, if possible, for all monitoring wells. Purging and groundwater sample collection at detection monitoring wells shall be conducted using a peristaltic pump or an electric submersible pump. A peristaltic pump will be the preferred device as it is believed to allow collection of the most representative groundwater sample. Care will be taken when sampling with a peristaltic pump to minimize aeration in the sample collection tubing to prevent any possible loss of volatile organic compounds (VOCs). Use of a peristaltic pump eliminates the potential for cross-contamination possibilities that are present when using a submersible pump. In addition, a peristaltic pump can maintain lower flow rates than standard submersible pumps.

If a submersible pump is used to sample monitoring wells with slow groundwater recharge the pump has difficulty maintaining flow rates low enough to prevent water column drawdown. Trying to maintain low flow rates with a submersible pump typically causes the pump to seize. The seizing results in the pump needing to be "jogged" or completely stopped and restarted, which agitates the groundwater column, potentially affecting the groundwater quality. Peristaltic pumps and submersible pumps are VOC-approved groundwater sampling pumps by the U.S. Environmental Protection Agency (EPA). If submersible pumps are used they will be carefully and thoroughly decontaminated before and after sampling the first well and then after sampling each subsequent well. The polyethylene tubing and silicon tubing used to collect samples will either be dedicated to that well, or will be new and disposed of after each use.

Purging and sampling will be performed at a rate between approximately 0.1 to 0.5 liters/minute. A flow-through-cell with probes for pH, temperature, conductivity, dissolved oxygen, and turbidity (measured outside the flow through cell) measurements shall be used during purging to determine when a "representative" sample can be collected. All of these parameters should be stable prior to collecting the sample.

Purging shall be considered to have stabilized when all of the following parameters vary less than the limits stated below after three successive measurements taken every three to five minutes:

- pH: ± 0.2 pH units
- Temperature: ±1.0°C
- Conductivity: ± 5 percent
- Dissolved Oxygen: ± 10 percent
- Turbidity :±10 NTU
- Water level in well: <0.3 foot change using 0.1 to 0.5 liters/min flow rate.

If the parameters do not stabilize to within these limits after 30 minutes of purging, a sample shall be collected after five more sets of parameter readings have been taken and recorded.

3.4.4 Monitoring Well Sample Collection

After well purging is completed, groundwater samples will be collected directly from the pump's discharge into the appropriate sampling containers. Groundwater samples will be analyzed in the micrograms per liter (ug/L) range; therefore, extreme care must be exercised to prevent contamination of samples. For VOC samples, it is important to use caution to assure that the samples are not exposed to the atmosphere unnecessarily. Groundwater samples will be stored in a cooler with ice or freezer packs until delivery under chain-of-custody documentation to American West Analytical Laboratory (AWAL) in Salt Lake City, Utah.

3.4.5 Equipment Decontamination—Monitoring Well Installation

During monitoring well installation activities, appropriate decontamination measures will be taken to reduce contamination between boring holes and any soil samples collected.

Non-disposable or non-dedicated sampling equipment will be decontaminated before being used during the collection of samples. Decontamination shall be executed immediately prior to equipment use, if possible; whenever this is not possible or practical, appropriate measures will be taken to ensure that contamination of clean equipment will not occur. Field personnel will wear clean, disposable gloves while decontaminating sampling equipment and tools. Clean sampling equipment will not be placed on the ground or other contaminated surfaces prior to use.

The decontamination procedure is as follows:

Step 1 Rinse or wash with approved source water (commercially bottled distilled water).

Step 2 Wash in water with approximately 0.01 percent laboratory grade, non-phosphate detergent (e.g., Liquinox®).

Step 3 Triple rinse with tap water.

3.4.6 Equipment Decontamination—Groundwater Sampling

During groundwater sampling activities, appropriate decontamination measures will be taken to reduce sample contamination between samples. Decontamination will be consistent with those outlined in "Test Methods for Evaluating Solid Waste-Physical/Chemical Methods" (U.S. EPA SW-846, current edition). The electric interface probe and the electric submersible pump (if used) are the only devices that require decontamination in-between wells because they are the only non-dedicated or non-disposable equipment used for purging and sampling.

Non-disposable or non-dedicated sampling equipment will be decontaminated before being used during the collection of samples. Decontamination shall be executed immediately prior to equipment use, if possible; whenever this is not possible or practical, appropriate measures will be taken to ensure that contamination of clean equipment will not occur. Field personnel will wear clean, disposable gloves while decontaminating sampling equipment and tools. Clean sampling equipment will not be placed on the ground or other contaminated surfaces prior to use. The decontamination procedure described in Section 3.4.5 will be followed.

3.4.7 Sampling Handling

Once collected, each sample will be immediately labeled, recorded in the field logbook/sample control log, and placed in a sample cooler with ice or freezer packs. The sample will be recorded on a chain-of-custody and will remain in the possession of the sampler until custody is formally released to another individual or the laboratory.

3.4.8 Documentation

The sampler will keep a field log, which will contain the following documents:

- Well identification;
- Well depth;
- Static water level depth;
- Sample collection methods;
- Sample identification numbers;
- Preservatives and containers used;
- Parameters requested for analysis;
- Field analysis data and methods;
- Sample distribution and transporter;
- Field observations including weather; and

- Name of collector.

3.4.9 Sample Custody

Samples will remain in the custody of the sampler until they are checked in and relinquished to the laboratory or until they are relinquished to a qualified individual for transport to the laboratory. If, after samples are collected, the laboratory is closed, sample personnel will have 24-hour access to a "Laboratory Secure Area" (equipped with a refrigerator) for storing samples until regular laboratory hours, when sample custody can be transferred. Custody will be documented on the chain of custody form.

3.5 QUALITY CONTROL/QUALITY ASSESMENT

A QC/QA) plan for groundwater sampling and analysis is required by SLVHD Regulation #1 Section 4.1.6, i, e. A QC/QA plan for groundwater sample collection and analysis is described below.

3.5.1 QA/QC Samples

A minimum of two quality assurance/quality control (QA/QC) samples will be analyzed during each sampling round to assess measurement accuracy and precision. These samples will include a trip blank and one blind duplicate sample. If a submersible pump is used to collect samples a third QA/QC sample, an equipment blank, will be collected and submitted for analysis.

3.5.2 Trip Blanks

One laboratory-prepared trip blank per each day of sampling will be used to assess the potential for contamination introduced from the sampling bottles or during sample transport. The trip blanks will be handled and transported along with the other samples. However, only one Trip Blank will be analyzed by the laboratory unless circumstances exists which indicate the possibility that contamination occurred. If the possibility of contamination is believed to exist applicable trip blanks will be analyzed.

3.5.3 Equipment Blanks

If any non-dedicated or non-disposable sampling equipment is used (non-dedicated submersible pumps, bailers, filtering pumps, etc.), an equipment blank will be prepared to assess the potential for cross contamination due to incomplete decontamination. The blank will be prepared by pouring distilled rinse water over or through the equipment after it is decontaminated, and collecting the rinse water in laboratory-prepared sampling containers. In the past distilled water, obtained from commercial sources, has contained reportable levels of chloroform. Therefore, distilled water should be procured from a source with greater water distillation capabilities than standard commercial bottled water companies. Analytical laboratories are typically good sources for appropriately distilled water. If distilled water is used from a commercial source care should be taken that the distilled water is free of all chloroform and other constituents. The equipment blank must be analyzed for the same set of analyses as the primary samples. The equipment blank will be labeled, stored, handled, and transported with the primary samples.

3.5.4 Blind Duplicates

A least one blind duplicate sample will be collected during each sampling round to assess data precision. Precision is a measure of the agreement of a set of replicate results (i.e., how closely the results match regardless of whether the results are correct). The relative percent difference (RPD) between the two results (A and B) will be calculated for each analyte as follows:

$$RPD = \frac{(A-B)}{(A+B)} * 100 \text{ percent}$$

A quality control chart will be maintained over time for each parameter analyzed. The standard deviation of the accumulated data for each parameter will be twice the standard deviation of the quality control samples collected to date.

4. DATA ANALYSIS PLAN

4.1 DATA VALIDATION

When the laboratory data is received, it will be reviewed to assess data validity. The data package will be checked to ensure that:

- Sample IDs match chain-of-custody and field notes and can be matched to sample location, date, and time.
- Samples were analyzed by requested methods.
- Samples were analyzed within holding times.
- Analysis reporting limits are acceptable.
- Laboratory method blank results are included and acceptable.
- Laboratory Matrix Spike and Matrix Spike Duplicate (MS/MSD) results for representative analytes are included and acceptable.
- Field QA/QC sample results (trip and equipment blanks and blind duplicates) are included and acceptable.

If the listed checks indicate potential problems or discrepancies, the laboratory will be notified and requested to help resolve the question. If the cause of the problem cannot be located, the affected data will be qualified or the affected wells will be resampled, depending on the severity of the problem.

4.2 DATA ANALYSIS

The data will be analyzed by:

- Looking for the presence of non-naturally occurring compounds in the sample (such as volatile organic compounds), and

- Plotting the concentrations of naturally occurring constituents (metals and minerals) in each well on control charts for that well.

If non-naturally occurring compounds are reported by the laboratory, the validity of the result(s) will be assessed by reviewing method blank results, raw laboratory data, the compound's potential status as a common laboratory contaminant, and the reported concentration relative to the method detection limit. If the positive results appear potentially valid, the affected well will be re-sampled to verify the result.

The relative concentrations of naturally occurring constituents will be analyzed to assess whether the groundwater is impacted. The spatial distribution of naturally occurring constituents is highly variable in site groundwater as shown in Table 3. This is probably due, in part, to local influences from the Great Salt Lake and from intermittent ponds around the site.

4.2.1 Control Limits for Analytes Detected Less than 25 Percent of the Time

American Society for Testing and Materials (ASTM) Designation D6312-98, *Standard Guide for Developing Appropriate Statistical Approaches for Groundwater Detection Monitoring Programs*, states that if a facility has no definable hydraulic gradient, has no existing contamination, or has significant natural variations in water quality between up-gradient and down-gradient wells, then the preferred method of statistical analysis for detection monitoring is Shewart-CUSUM control charts. Each of these conditions exists at the SLVSWMF; the groundwater gradient at the Facility is very shallow, It is likely that between 2000 and 2005, water from the landfill cells reached the downgradient monitoring wells (Section 2.2). There also appears to be significant variations in water quality across the facility (Section 2.4). Shewart-CUSUM control charts will, therefore, be used for detection monitoring at the Facility.

Prior to using Shewart-CUSUM control charts for a well, the background conditions for that well must first be established (i.e., the natural water quality and variability of water quality). The background water quality is established by analysis of at least eight independent samples from the well. The background data are required to satisfy the assumptions of the control chart method, i.e.:

1) The data are expected to represent uncontaminated wells;

2) The data are expected to be independent and normally distributed based on the types of constituents targeted; and

3) The sample mean is fixed and the standard deviation is constant.

Once the initial data was obtained, a combined Shewhart-CUSUM control chart was constructed for constituents detected at least 25 percent of the time, as per recommendations in the Statistical Analysis of Groundwater Monitoring Data at Resource Conservation and Recovery Act (RCRA) Facilities (EPA, 1989) and ASTM Designation D6312-98. Control charts show the standardized concentration (Z_i) and the cumulative sum (CUSUM) for each parameter. These parameters are described below:

The standardized concentration for each parameter for each well is calculated from:

$$Z_i = (X_i - m)/S$$

Where X_i equals the measured parameter concentration for the sampling period; m equals the mean concentration of that parameter during the “background” sampling period; and S equals the standard deviation of that parameter in that well during the background sampling period. The Z_i is thus a measure of how a given parameter concentration compares with the mean “background” concentration for that parameter.

The cumulative sum is calculated from:

$$CUSUM = \max\{0, (Z_i - 1 + S_{i-1})\}$$

Where S_{i-1} equals the cumulative sum from the previous sampling period. The CUSUM tracks increases in concentration greater than one standard deviation above the mean. The function of the CUSUM is to track small but persistent increases in concentration (increases that would not appear significant based on results of single sampling events).

Kleinfelder conducted initial background water quality monitoring from December 1993 through August 1994. Over that period, the following existing wells in the Active Landfill monitoring network MW-1A, MW-2A, MW-3A, MW-4A, MW-6A, MW-7A, and MW-8A were sampled eight times. The monitoring data obtained during the eight rounds were used to establish the "background" water conditions for these wells, i.e., to establish the groundwater conditions prior to potential impacts from activities at the Landfill. The background data were used to construct Shewart-CUSUM control charts for intra-well detection monitoring of several parameters in each well. In October 1994, Kleinfelder began semiannual detection monitoring of the groundwater at the Active Landfill in accordance with Kleinfelder's former Groundwater Monitoring Plan dated November 2, 1993.

In the Fall 1994 through Spring 1996 monitoring rounds, concentrations of several parameters increased relative to the earlier established background conditions. The increases were most pronounced in up-gradient well MW-1A (e.g. barium, calcium, magnesium, manganese, potassium, sodium, alkalinity, bicarbonate, sulfate, chloride, and TDS). Several of those parameters that showed increases occur naturally at relatively high concentrations in shallow groundwater in the Salt Lake Valley (e.g. calcium, magnesium, potassium, sodium, chloride, and TDS) (Thiros, 1995). Furthermore, the down-gradient wells that did show increases are too far from any buried refuse to have been impacted by the landfill. These increases thus appear to have resulted from natural variations in water quality. Standardized concentrations and cumulative sums for some analytes exceeded decision interval values in Spring 1996. In the Fall 1996 monitoring round, some of the trends of increasing concentration continued, especially in up-gradient well MW-1A. Because the increases appear to represent natural variations in groundwater conditions, and because none of the wells was thought to be close enough to be impacted by the landfill, data collected through Fall 1996 was incorporated into the background data analysis for detection monitoring for wells MW-1A, MW-2A, MW-3A, MW-4A, MW-6A, MW-7A and MW-8A.

Well MW-5A was installed during the Fall 1995 monitoring round. From Fall 1995 through Spring 1997, eight groundwater samples were collected from well MW-5A. Initially, the data from these eight samples were used to establish the background groundwater conditions for well MW-5A. However, per our recommendations the statistics were reevaluated for this well. Specifically, we incorporated all data collected from Fall 1995 through Fall 1999 to establish a greater and more representative background. The statistics using the data from Fall 1995 through Fall 1999 better characterize the variability of the groundwater conditions in this well.

Beginning in Spring 1997, the CUSUM were set to zero. A significant trend of increasing concentration will be indicated if the CUSUM value at any time exceeds 4.5, as suggested by ASTM Designation D6312-98. Figure 6 shows the Z_i and CUSUM based on the background data for the parameters detected over 25 percent of the time from Fall 1993 through Spring 2009. Background concentrations will be established with in approximately the first year for MW-11A (upgradient) and the second year for MW-12A and MW-13A (downgradient).

4.2.2 Control Limits for Analytes Detected Greater than 25 Percent of the Time

For those parameters that were detected between 0 percent and 25 percent of the time, ASTM Designation D6312-98 suggests that the maximum detected value be used as the nonparametric prediction limit. If all background samples are non-detects, then ASTM Designation D6312-98 suggests that the quantification limit should be used as the nonparametric prediction limit. Alternatively, an appropriate limit between the quantification limit and the SWGWQPS may be proposed. For the Salt Lake Landfill, the control limit for analytes not previously detected will be halfway between the detection limit and the SWGWQPS. If a given concentration exceeds the established limit, the well should be re-sampled twice prior to reporting the result. If either of the re-samples is negative (lower concentration than the nonparametric prediction limit), then the original result should be considered a false positive.

4.3 DATA REPORTING

Semi-annual monitoring reports will be prepared. Each report will include:

- Description of Sampling Activities;
- Discussion of Data Validity;
- Discussion of Laboratory QA/QC;
- Presentation of Water Elevation Measurements and a Contour Map;
- Presentation of Field and Laboratory Data in Tables;
- Graphical Presentation of Trends in Analyte Concentrations Over Time; and
- Contours of TDS, TOC, and Arsenic Concentrations for the Sampling Event.

Final reports are provided to the SLVSWMF's Environmental Manager and submitted to the DSHW and the SLVHD.

5. REFERENCES

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TABLES

TABLE 1
WELL CONSTRUCTION DETAILS
ACTIVE SALT LAKE VALLEY LANDFILL

OLD WELL NUMBER	NEW WELL NO.	YEAR INSTALLED	X COORDINATE (EASTINGS)	Y COORDINATE (NORTHINGS)	CASING ELEVATION (FT,MSL)	TOTAL WELL DEPTH (FEET)	SCREEN INTERVAL (FT,BGS)	CASING DIAMETER (INCHES)	SCREEN SLOT SIZE (INCHES)	SAND PACK
F	F	~1982	1849447.18	878223.51	4228.65	19.7	NA	4	NA	NA
ET-0	MW-1A	NA	1849769.20	877224.18	4227.85	25	NA	4	NA	NA
EE	MW-2A	1993	1852069.38	879167.89	4229.73	25	15-25	4	0.01	#20/40
2	MW-3A	Nov. 1992	1852073.88	879924.18	4231.46	25	15-25	4	0.02	#10/20
1A	MW-4A	Aug. 1993	1850784.48	880847.13	4226.82	25	15-25	4	0.01	#20/40
NA	MW-5A	Sep. 1995	1849702.95	880890.46	4226.16	29	24-29	4	0.02	#10/20
E-26	MW-6A	July 1990	1848587.03	880947.68	4225.90	29	24-29	4	0.02	#10/20
E-25	MW-7A	July 1990	1846925.26	880957.42	4222.34	24.5	19.5-24.5	4	0.02	#10/20
E-27	MW-8A	July 1990	1846909.13	879719.65	4226.09	23	13-23	4	0.02	#10/20

Notes:

Ft – Feet
msl – mean sea level
bgs – below ground surface
NA – Information not available

Table 2
Laboratory Analysis for Groundwater Monitoring
Active Landfill Area

General Minerals
Alkalinity as CaCO3 Bicarbonate as CaCO3 Carbonate as CaCO3 Sulfate Chloride Calcium Potassium Sodium Magnesium
Metals
Antimony (Dissolved) Arsenic (Dissolved) Barium (Dissolved) Beryllium (Dissolved) Cadmium (Dissolved) Chromium (Dissolved) Cobalt (Dissolved) Copper (Dissolved) Iron (Dissolved) Iron (Total) Lead (Dissolved) Manganese (Dissolved) Mercury (Dissolved) Nickel (Dissolved) Selenium (Dissolved) Silver (Dissolved) Thallium (Dissolved) Vanadium (Dissolved) Zinc (Dissolved)
Other
Total Organic Carbon (TOC) Ammonia as N Nitrate as N Nitrite as N Phenols Sulfate Total Dissolved Solids (TDS) Chemical Oxygen Demand (COD) (Active Landfill Only) Turbidity
Organics
Volatile Organics (EPA 8260 <u>and</u> EPA 504 for EDB & DBCP)

TABLE 3
SUMMARY OF ANALYTICAL RESULTS (mg/L)
May 1990 through April 2009

ANALYTE	DATE	DOWNGRADIENT WELLS [1]: MW-4A (1A(1))	MW-5A	MW-5A (date)	MW-6A (E-26)	MW-7A (E-25)	MW-8A (E27)	UPGRADIENT WELLS: MW-1A (ET-O)	MW-2A (EE(E))	MW-3A (2)	F
DISSOLVED METALS											
Antimony	05/25/90										
	05/04/92										
	09/30/92										
	04/28/93										
	12/03/93	< 0.0050			< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	
	01/07/94	< 0.0050			< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	
	02/04/94	< 0.0050			< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	
	03/10/94	< 0.0050			< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	
	04/19/94	< 0.0050			< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	
	05/31/94	< 0.0050	< 0.0050	(10/9/95)	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	
	06/22/94	< 0.0050	< 0.0050	(11/8/95)	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	
	07/27/94	< 0.0050	< 0.0050	(12/11/95)	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	
	10/10/94	< 0.0050	< 0.0050	(1/2/96)	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	
	06/13/95	< 0.0050	< 0.0050	(4/29/96)	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	
	10/04/95	< 0.0050	0.1000	(6/10/96)	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	
	04/29/96	< 0.0050	< 0.0050	(7/2/96)	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
	11/08/96	< 0.0050	< 0.0050	(11/8/96)	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
	05/09/97	< 0.0050	< 0.0050		< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
	10/21/97	< 0.0050	< 0.0050		< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
	05/04/98	< 0.0050	< 0.0050		< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
	10/07/98	< 0.0050	< 0.0050		< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
	05/27/99	< 0.0050	< 0.0050		< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
	10/13/99	< 0.0050	< 0.0050		< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
	04/17/00	< 0.0050	< 0.0050		< 0.0050	<	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
	10/19/00	< 0.0050	< 0.0050		< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	0.0053
	04/27/01	< 0.0050	< 0.0050		< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
	10/11/01	< 0.0050	< 0.0050		< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
	06/06/02	< 0.0050	< 0.0050		< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
	10/18/02	< 0.0050	< 0.0050		< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	<
	04/24/03	< 0.0050	< 0.0050		< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
	10/14/03	< 0.0050	< 0.0050		< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
	04/20/04	< 0.0050	< 0.0050		< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
	11/18/04	< 0.0050	< 0.0050		< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
	04/22/05	< 0.0050	< 0.0050		< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
	10/12/05	< 0.0050	< 0.0050		< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
	05/05/06	< 0.0050	< 0.0050		< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
	10/23/06	< 0.0050	< 0.0050		0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
	04/12/07	< 0.0050	< 0.0050		< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
	09/28/07	< 0.0050	< 0.0050		< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
	04/08/08	< 0.0010	< 0.0010		< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
	10/08/08	< 0.0010	< 0.0010		< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
	04/29/09	< 0.0010	< 0.0010		< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
	% detects	0	3		0	0	0	0	0	0	4
	Coeff. of Var(s.d./mean)	ND	ND		ND	ND	ND	ND	ND	ND	ND
Arsenic	05/25/90				< 0.0050	< 0.0050	0.0070				
	05/28/92							0.0100			
	06/04/92								0.1840		0.0200
	09/30/92								0.0290		0.0190
	11/19/92							0.0050			
	04/28/93	0.0060							< 0.0050	< 0.0050	< 0.0050
	12/03/93	< 0.0050			< 0.0050	< 0.0050	0.0050	< 0.0050	< 0.0050	< 0.0050	
	01/07/94	< 0.0050			< 0.0050	< 0.0050	< 0.0050	0.0110	< 0.0050	< 0.0050	
	02/04/94	< 0.0050			< 0.0050	< 0.0050	0.0050	0.0110	< 0.0050	< 0.0050	
	03/10/94	< 0.0050			< 0.0050	< 0.0050	< 0.0050	0.0090	< 0.0050	< 0.0050	
	04/19/94	< 0.0050			< 0.0050	< 0.0050	< 0.0050	0.0090	< 0.0050	< 0.0050	
	05/31/94	< 0.0050	< 0.0050	(10/9/95)	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	
	06/22/94	< 0.0050	< 0.0050	(11/8/95)	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	
	07/27/94	< 0.0050	< 0.0050	(12/11/95)	< 0.0050	< 0.0050	< 0.0050	0.0080	< 0.0050	< 0.0050	
	10/10/94	< 0.0050	< 0.0050	(1/2/96)	< 0.0050	< 0.0050	< 0.0050	0.0070	< 0.0050	< 0.0050	
	06/13/95	< 0.0050	< 0.0050	(4/29/96)	< 0.0050	< 0.0050	< 0.0050	0.0090	< 0.0050	< 0.0050	
	10/04/95	< 0.0050	< 0.0050	(6/10/96)	< 0.0050	< 0.0050	< 0.0050	0.0060	< 0.0050	< 0.0050	
	04/29/96	< 0.0050	< 0.0050	(7/2/96)	< 0.0050	< 0.0050	< 0.0050	0.0060	< 0.0050	< 0.0050	< 0.0050
	11/08/96	< 0.0050	< 0.0050	(11/8/96)	< 0.0050	< 0.0050	< 0.0050	0.0060	< 0.0050	< 0.0050	< 0.0050
	05/09/97	< 0.0050	< 0.0050		< 0.0050	< 0.0050	< 0.0050	0.0140	< 0.0050	< 0.0050	< 0.0050
	10/21/97	< 0.0050	< 0.0050		< 0.0050	< 0.0050	0.0060	< 0.0050	< 0.0050	< 0.0050	0.0060
	05/04/98	< 0.0050	< 0.0050		< 0.0050	< 0.0050	< 0.0050	0.0060	0.0090	< 0.0050	< 0.0050
	10/07/98	< 0.0050	< 0.0050		< 0.0050	< 0.0050	< 0.0050	0.0070	< 0.0050	< 0.0050	0.0170
	05/27/99	< 0.0050	0.0130		0.0110	0.0120	< 0.0050	0.0120	0.0130	0.0090	0.0120
	10/13/99	< 0.0050	< 0.0050		< 0.0050	< 0.0050	< 0.0050	0.0060	< 0.0050	< 0.0050	0.0080
	04/17/00	< 0.0050	< 0.0050		< 0.0050	<	< 0.0050	0.0090	< 0.0050	< 0.0050	0.0080
	10/19/00	< 0.0050	< 0.0050		< 0.0050	0.0080	< 0.0050	0.0080	< 0.0050	< 0.0050	0.0080
	04/27/01	< 0.0050	< 0.0050		< 0.0050	< 0.0050	< 0.0050	0.0140	< 0.0050	< 0.0050	0.0063
	10/11/01	< 0.0050	< 0.0050		<. 0.0050	< 0.0050	< 0.0050	0.0120	< 0.0050	< 0.0050	0.0071
	06/06/02	< 0.0050	< 0.0050		< 0.0050	< 0.0050	< 0.0050	0.0094	< 0.0050	< 0.0050	0.0060
	10/18/02	< 0.0050	< 0.0050		< 0.0050	< 0.0050	< 0.0050	0.0130	< 0.0050	< 0.0050	<
	04/24/03	< 0.0050	< 0.0050		< 0.0050	< 0.0050	< 0.0050	0.0110	< 0.0050	< 0.0050	< 0.0050
	10/14/03	< 0.0050	< 0.0050		< 0.0050	0.0071	< 0.0050	0.0140	< 0.0050	< 0.0050	< 0.0050
	04/20/04	< 0.0050	< 0.0050		< 0.0050	< 0.0050	< 0.0050	0.0090	< 0.0050	< 0.0050	< 0.0050
	11/18/04	< 0.0050	< 0.0050		< 0.0050	0.0099	< 0.0050	0.0150	< 0.0050	< 0.0050	< 0.0050
	04/22/05	< 0.0050	< 0.0050		< 0.0050	< 0.0050	< 0.0050	0.0110	0.0066	< 0.0050	< 0.0050
	10/12/05	< 0.0050	< 0.0050		< 0.0050	0.0060	< 0.0050	0.0140	< 0.0050	< 0.0050	0.0058
	05/05/06	< 0.0050	< 0.0050		< 0.0050	< 0.0050	< 0.0050	0.0110	< 0.0050	< 0.0050	0.0076
	10/23/06	< 0.0050	< 0.0050		< 0.0050	< 0.0100	0.0054	0.0085	< 0.0050	< 0.0050	0.0058
	04/12/07	< 0.0050	< 0.0050		< 0.0050	< 0.0050	< 0.0050	0.0081	< 0.0050	< 0.0050	< 0.0050
	09/28/07	< 0.0050	< 0.0050		< 0.0050	0.0082	0.0051	0.0160	< 0.0050	< 0.0050	0.0055
	04/08/08	0.00086	0.00097		0.0022	0.0012	0.0047	0.0083	0.0029	0.00096	0.0038
	10/08/08	0.00120	0.00180		0.0027	0.0058	0.0042	0.0120	0.0032	0.00190	0.0052
	04/29/09	0.0011	0.0022		0.0024	0.0031	0.0051	0.013	0.0059	0.0034	0.0040
	% detects	8	12		11	24	21	89	16	11	59
	Coeff. of Var(s.d./mean)	ND	ND		ND	ND	ND	0.342	ND	ND	0.458

TABLE 3
SUMMARY OF ANALYTICAL RESULTS (mg/L)
May 1990 through April 2009

ANALYTE	DATE	DOWNGRADIENT WELLS [1] MW-4A (1A(1))	MW-5A	MW-6A (E-26)	MW-7A (E-25)	MW-8A (E27)	UPGRADIENT WELLS MW-1A (ET-O)	MW-2A (EE(E))	MW-3A (2)	F
Barium	05/25/90			0.0780	0.0880	0.1400				
	05/28/92						0.0950			
	06/04/92							0.1100		0.0700
	09/30/92							0.1080		0.0750
	11/19/92						0.0560			
	04/28/93	0.0980						0.0990	0.0750	0.0570
	12/03/93	0.1400		0.0080	0.0860	0.0730	0.0960	0.1300	0.0620	
	01/07/94	0.1300		0.0740	0.0760	0.0580	0.0950	0.1100	0.0600	
	02/04/94	0.1400		0.0820	0.0820	0.0680	0.0960	0.0730	0.1100	
	03/10/94	0.1300		0.0730	0.7400	0.0650	0.0910	0.1100	0.0710	
	04/19/94	0.1400		0.0770	0.0750	0.0590	0.1100	0.1200	0.0320	
	05/31/94	0.1400	0.1000 (10/9/95)	0.0810	0.0800	0.0650	0.1000	0.1100	0.0440	
	06/22/94	0.1400	0.1100 (11/8/95)	0.0760	0.0790	0.0620	0.0930	0.1100	0.0450	
	07/27/94	0.1500	0.0800 (12/11/95)	0.7600	0.0770	0.0600	0.0930	0.1100	0.0510	
	10/10/94	0.1400	0.0930 (1/2/96)	0.0770	0.0710	0.0600	0.0890	0.0920	0.0480	
	06/13/95	0.1500	0.1300 (4/29/96)	0.0710	0.0670	0.0580	0.1200	0.0890	0.0320	
	10/04/95	0.1300	0.1200 (6/10/96)	0.0860	0.1000	0.0850	0.0850	0.0760	0.0330	
	04/29/96	0.1800	0.1300 (7/2/96)	0.0870	0.0880	0.0840	0.1400	0.0840	0.0580	0.0570
	11/08/96	0.1700	0.0920 (11/8/96)	0.0730	0.0760	0.0630	0.1600	0.0840	0.0530	0.0510
	05/09/97	0.1600	0.1700	0.0760	0.0790	0.0800	0.1400	0.0620	0.0600	0.0430
	10/21/97	0.1800	0.1000	0.0810	0.5100	0.0700	0.1100	0.0950	0.0710	0.0690
	05/04/98	0.1300	0.1900	0.0600	0.2400	0.0500	0.1300	0.0340	0.0200	0.0360
	10/07/98	0.1400	0.0900	0.0510	0.1900	0.0360	0.1300	0.0660	0.0920	0.0140
	05/27/99	0.1100	0.0750	0.0100	0.1200	0.0030	0.0960	< 0.0020	0.0990	0.0500
	10/13/99	0.1800	0.0990	0.0800	0.1900	0.0660	0.1200	0.0810	0.0970	0.1000
	04/17/00	0.1900	0.1300	0.0980	<	0.0510	0.0880	0.0530	0.1100	0.0640
	10/19/00	0.1700	0.0980	0.0800	0.2500	0.0650	0.1100	0.0680	0.0860	0.0770
	04/27/01	0.1600	0.1300	0.0820	0.3200	0.0700	0.0770	0.0610	0.0930	0.0710
	10/11/01	0.1700	0.1000	0.0810	0.2800	0.0680	0.0970	0.0760	0.0890	0.0810
	06/06/02	0.1700	0.1100	0.0910	0.2300	0.0670	0.1000	0.0580	0.0860	0.0730
	10/18/02	0.1500	0.0940	0.0780	0.1700	0.0640	0.0910	0.0500	0.0820	<
	04/24/03	0.1400	0.1000	0.0780	0.1600	0.0610	0.1100	0.0500	0.0920	0.0920
	10/14/03	0.1400	0.0970	0.0800	0.1500	0.0630	0.1200	0.0540	0.1000	0.1100
	04/20/04	0.1300	0.1100	0.0860	0.1700	0.0630	0.0900	0.0470	0.1300	0.0910
	11/18/04	0.1100	0.0850	0.0770	0.1500	0.0920	0.1300	0.0430	0.0920	0.1200
	04/22/05	0.1300	0.1400	0.0940	0.1600	0.0830	0.0990	0.0390	0.1200	0.0920
	10/14/05	0.1300	0.1000	0.0840	0.1400	0.0680	0.1000	0.0940	0.0520	0.1000
	05/05/06	0.1300	0.1400	0.0940	0.1500	0.0910	0.0940	0.1400	0.1300	0.0970
	10/23/06	0.1200	0.0950	0.0900	0.1400	0.0800	0.1000	0.0450	0.1300	0.1100
	04/12/07	0.1100	0.1000	0.0820	0.1200	0.0790	0.1100	0.0440	0.1400	0.0980
	09/28/07	0.12	0.089	0.098	0.130	0.087	0.11	0.053	0.14	0.10
	04/08/08	0.11	0.130	0.083	0.12	0.064	0.10	0.052	0.13	0.10
	10/08/08	0.098	0.085	0.072	0.11	0.063	0.11	0.049	0.13	0.10
	04/29/09	0.094	0.18	0.076	0.11	0.060	0.10	0.033	0.083	0.11
	% detects	100	100	100	97	100	100	97	100	96
	Coeff. of Var(s.d./mean)	0.140	0.245	1.308	0.838	0.247	0.183	0.396	0.388	0.390
Beryllium	05/25/90									
	06/04/92									
	09/30/92									
	04/28/93									
	12/03/93	< 0.0050		< 0.0050	< 0:0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	
	01/07/94	< 0.0050		< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	
	02/04/94	< 0.0050		< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	
	03/10/94	< 0.0050		< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	
	04/19/94	< 0.0050		< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	
	05/31/94	< 0.0050	< 0.0050 (10/9/95)	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	
	06/22/94	< 0.0050	< 0.0050 (11/8/95)	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	
	07/27/94	< 0.0050	< 0.0050 (12/11/95)	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	
	10/10/94	< 0.0050	< 0.0050 (1/2/96)	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	
	06/13/95	< 0.0050	< 0.0050 (4/29/96)	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	
	10/04/95	< 0.0050	< 0.0050 (6/10/96)	0.0090	0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	
	04/29/96	< 0.0040	< 0.0040 (7/2/96)	< 0.0040	< 0.0040	< 0.0040	< 0.0040	< 0.0040	< 0.0040	< 0.0040
	11/08/96	< 0.0010	< 0.0010 (11/8/96)	< 0.0010	0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
	05/09/97	< 0.0010	< 0.0010	< 0.0010	0.0020	0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
	10/21/97	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	0.0010	< 0.0010	< 0.0010
	05/04/98	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
	10/07/98	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	0.0030	< 0.0010	< 0.0010	< 0.0010
	05/27/99	0.0020	< 0.0010	0.0010	0.0010	0.0030	0.0020	0.0010	< 0.0010	0.0020
	10/13/99	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	0.0010	< 0.0010	< 0.0010
	04/17/00	< 0.0010	< 0.0010	< 0.0010	<	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
	10/19/00	< 0.0010	0.0020	0.0020	< 0.0010	0.0020	< 0.0010	0.0020	< 0.0010	< 0.0010
	04/27/01	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
	10/11/01	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
	06/06/02	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
	10/18/02	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	<
	04/24/03	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
	10/14/03	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
	04/20/04	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
	11/18/04	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
	04/22/05	< 0.0020	< 0.0020	< 0.0020	< 0.0020	< 0.0020	< 0.0020	< 0.0020	< 0.0020	< 0.0020
	10/14/05	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
	05/05/06	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
	10/23/06	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
	04/12/07	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
	09/28/07	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
	04/08/08	< 0.00060	< 0.00060	< 0.00060	< 0.00060	< 0.00060	< 0.00060	< 0.00060	< 0.00060	< 0.00060
	10/08/08	< 0.00060	< 0.00060	< 0.00060	< 0.00060	< 0.00060	< 0.00060	< 0.00060	< 0.00060	< 0.00060
	04/29/09	< 0.00060	< 0.00060	< 0.00060	< 0.00060	< 0.00060	< 0.00060	< 0.00060	< 0.00060	< 0.00060
	% detects	3	3	8	11	8	5	11	0	4
	Coeff. of Var(s.d./mean)	ND	ND	ND	ND	ND	ND	ND	ND	ND

TABLE 3
SUMMARY OF ANALYTICAL RESULTS (mg/L)
May 1990 through April 2009

ANALYTE	DATE	DOWNGRADIENT WELLS[1] MW-4A (1A(1))	MW-5A		MW-6A (E-26)	MW-7A (E-25)	MW-8A (E27)	UPGRADIENT WELLS MW-1A (ET-O)	MW-2A (EE(E))	MW-3A (2)	F
	05/25/90				0.0030	< 0.0020	< 0.0020				
	05/28/92							< 0.0040			
	06/04/92								< 0.0010		< 0.0010
	09/30/92								< 0.0030		< 0.0030
	11/19/92							< 0.0040			
	04/28/93	< 0.0040							< 0.0040	< 0.0040	< 0.0040
	12/03/93	0.0110			< 0.0040	0.0210	0.0160	< 0.0040	0.0180	0.0060	
	01/07/94	0.0060			0.0120	0.0100	0.0070	< 0.0040	0.0110	< 0.0040	
	02/04/94	< 0.0040			0.0040	< 0.0040	< 0.0040	< 0.0040	< 0.0040	0.0040	
	03/10/94	< 0.0040			< 0.0040	< 0.0040	< 0.0040	< 0.0040	0.0050	0.0040	
	04/19/94	< 0.0040			< 0.0040	0.0050	< 0.0040	< 0.0040	0.0100	0.0130	
	05/31/94	< 0.0040	< 0.0040	(10/9/95)	0.0070	0.0080	0.0070	< 0.0040	0.0090	< 0.0040	
	06/22/94	< 0.0040	0.0040	(11/8/95)	0.0040	0.0040	< 0.0040	< 0.0040	0.0090	< 0.0040	
	07/27/94	< 0.0040	< 0.0040	(12/11/95)	< 0.0040	< 0.0040	< 0.0040	< 0.0040	< 0.0040	< 0.0040	
	10/10/94	< 0.0040	< 0.0040	(1/2/96)	< 0.0040	< 0.0040	< 0.0040	< 0.0040	< 0.0040	< 0.0040	
	06/13/95	< 0.0040	< 0.0040	(4/29/96)	< 0.0040	< 0.0040	< 0.0040	< 0.0040	< 0.0040	< 0.0040	
	10/04/95	< 0.0040	< 0.0040	(6/10/96)	0.0080	0.0050	< 0.0040	< 0.0040	< 0.0040	< 0.0040	
	04/29/96	< 0.0040	0.0040	(7/2/96)	0.0050	0.0050	< 0.0040	< 0.0040	0.0060	< 0.0040	< 0.0040
	11/08/96	< 0.0040	< 0.0040	(11/8/96)	< 0.0040	< 0.0040	< 0.0040	< 0.0040	< 0.0040	< 0.0040	< 0.0040
	05/09/97	< 0.0040	< 0.0040		< 0.0040	< 0.0040	< 0.0040	< 0.0040	< 0.0040	< 0.0040	< 0.0040
	10/21/97	< 0.0040	< 0.0040		< 0.0040	< 0.0040	< 0.0040	< 0.0040	< 0.0040	< 0.0040	< 0.0040
	05/04/98	< 0.0040	< 0.0040		< 0.0040	< 0.0040	< 0.0040	< 0.0040	< 0.0040	0.0040	< 0.0040
Cadmium	10/07/98	0.0060	0.0040		0.0050	0.0080	0.0120	< 0.0040	< 0.0040	0.0060	0.0110
	05/27/99	< 0.0040	0.0060		< 0.0040	0.0050	< 0.0040	< 0.0040	< 0.0040	< 0.0040	< 0.0040
	10/13/99	< 0.0040	< 0.0040		< 0.0040	< 0.0040	< 0.0040	< 0.0040	< 0.0040	< 0.0040	0.0050
	04/17/00	< 0.0040	< 0.0040		< 0.0040	<	< 0.0040	< 0.0040	< 0.0040	< 0.0040	< 0.0040
	10/19/00	0.0120	0.0160		0.0150	0.0080	0.0130	0.0070	0.0060	0.0060	0.0150
	04/27/01	< 0.0040	< 0.0040		< 0.0040	< 0.0040	< 0.0040	< 0.0040	< 0.0040	< 0.0040	< 0.0040
	10/11/01	< 0.0040	< 0.0040		< 0.0040	< 0.0040	< 0.0040	< 0.0040	< 0.0040	< 0.0040	< 0.0040
	06/06/02	< 0.0040	< 0.0040		< 0.0040	< 0.0040	< 0.0040	< 0.0040	< 0.0040	< 0.0040	< 0.0040
	10/18/02	< 0.0040	< 0.0040		< 0.0040	< 0.0040	< 0.0040	< 0.0040	< 0.0040	< 0.0040	<
	04/24/03	< 0.0040	< 0.0040		< 0.0040	< 0.0040	< 0.0040	< 0.0040	< 0.0040	< 0.0040	< 0.0040
	10/14/03	< 0.0040	< 0.0040		< 0.0040	< 0.0040	< 0.0040	< 0.0040	< 0.0040	< 0.0040	< 0.0040
	04/20/04	< 0.0040	0.0048		0.0050	0.0048	0.0041	< 0.0040	0.0047	0.0053	0.0052
	11/18/04	< 0.0040	< 0.0040		< 0.0040	< 0.0040	< 0.0040	< 0.0040	< 0.0040	< 0.0040	< 0.0040
	04/22/05	< 0.0040	< 0.0040		< 0.0040	< 0.0040	< 0.0040	< 0.0040	< 0.0040	< 0.0040	< 0.0040
	10/14/05	< 0.0040	< 0.0040		< 0.0040	< 0.0040	< 0.0040	< 0.0040	< 0.0040	< 0.0040	< 0.0040
	05/05/06	< 0.0040	< 0.0040		< 0.0040	< 0.0040	< 0.0040	< 0.0040	< 0.0040	< 0.0040	< 0.0040
	10/23/06	< 0.0040	< 0.0040		< 0.0040	< 0.0040	< 0.0040	< 0.0040	< 0.0040	< 0.0040	< 0.0040
	04/12/07	< 0.0040	< 0.0040		< 0.0040	< 0.0040	< 0.0040	< 0.0040	< 0.0040	< 0.0040	< 0.0040
	09/28/07	< 0.0040	< 0.0040		< 0.0040	< 0.0040	< 0.0040	< 0.0040	< 0.0040	< 0.0040	< 0.0040
	04/08/08	< 0.00018	< 0.00018		< 0.00018	< 0.00018	< 0.00018	0.00042	0.00028	< 0.00018	0.00086
	10/08/08	< 0.00018	< 0.00018		< 0.00018	0.00018	< 0.00018	0.00050	0.00037	< 0.00018	< 0.00018
	04/29/09	0.00040	< 0.00018		< 0.00018	< 0.00018	< 0.00018	0.00051	0.00036	0.0022	0.0032
	% detects	13	18		24	32	16	11	32	24	22
	Coeff. of Var(s.d./mean)	ND	ND		ND	0.636	ND	ND	0.575	ND	ND
	05/25/90				297	657	421				
	06/04/92								611.8		287.1
	09/30/92								668		342
	04/28/93	450							840	220	380
	12/03/93	450			740	700	520	190	880	230	
	01/07/94	530			760	780	580	180	960	220	
	02/04/94	430			680	700	490	170	200	890	
	03/10/94	410			710	720	520	170	1100	270	
	04/19/94	430			860	860	630	240	1400	400	
	05/31/94	470	780	(10/9/95)	820	820	580	200	820	270	
	06/22/94	430	750	(11/8/95)	780	820	600	160	1300	230	
	07/27/94	500	710	(12/11/95)	790	770	560	210	1300	280	
	10/10/94	550	720	(1/2/96)	760	820	580	190	950	190	
	06/13/95	490	830	(4/29/96)	740	770	610	180	1100	340	
	10/04/95	430	710	(6/10/96)	710	720	590	190	950	240	
	04/29/96	510	800	(7/2/96)	820	820	680	240	1000	300	430
	11/08/96	500	730	(11/8/96)	720	730	610	290	1300	210	350
	05/09/97	450	650		620	620	560	240	920	270	290
	10/21/97	470	680		710	650	560	210	1200	220	440
	05/04/98	480	760		690	700	580	280	560	360	310
	10/07/98	420	660		620	650	540	380	930	350	74
Calcium	05/27/99	440	690		630	670	570	260	780	500	350
	10/13/99	410	610		620	800	530	320	1200	260	370
	04/17/00	380	640		590	<	540	260	760	240	320
	10/19/00	400	690		680	140	660	290	1200	250	320
	04/27/01	470	780		750	800	1100	210	1500	360	370
	10/11/01	400	670		680	610	560	270	1200	260	400
	06/06/02	370	660		640	620	550	240	890	290	370
	10/18/02	380	730		690	710	530	220	880	230	<
	04/24/03	370	690		660	670	520	270	610	240	480
	10/14/03	350	650		630	650	550	310	610	250	540
	04/20/04	340	660		640	640	480	220	570	500	510
	11/18/04	380	730		710	730	520	190	660	330	490
	04/22/05	320	640		620	620	540	180	340	330	490
	10/14/05	300	600		610	590	500	180	340	680	510
	05/05/06	280	640		620	620	530	160	360	360	510
	10/23/06	290	620		640	630	520	240	540	370	570
	04/12/07	290	660		680	640	570	260	550	380	510
	09/28/07	280	650		640	600	520	290	580	350	510
	04/08/08	260	620		620	590	510	250	580	370	550
	10/08/08	250	610		610	620	500	250	670	480	660
	04/29/09	270	690		650	640	520	200	600	580	660
	% detects	100	100		100	97	100	100	100	100	96
	Coeff. of Var(s.d./mean)	0.125	0.078		0.098	0.187	0.188	0.225	0.309	0.440	0.286

TABLE 3
SUMMARY OF ANALYTICAL RESULTS (mg/L)
May 1990 through April 2009

		DOWNGRADIENT WELLS [1]						UPGRADIENT WELLS			
ANALYTE	DATE	MW-4A (1A(1))	MW-5A		MW-6A (E-26)	MW-7A (E-25)	MW-8A (E27)	MW-1A (ET-O)	MW-2A (EE(E))	MW-3A (2)	F
Chromium	05/25/90				< 0.005	< 0.005	< 0.005				
	05/28/92							< 0.010			
	06/04/92								< 0.007		< 0.007
	09/30/92								< 0.030		< 0.030
	11/19/92							0.010			
	04/28/93	0.030							0.050	0.020	0.020
	12/03/93	0.040			< 0.010	0.070	0.060	0.020	0.070	0.020	
	01/07/94	0.030			0.040	0.050	0.030	0.020	0.050	< 0.010	
	02/04/94	0.020			0.030	0.030	0.030	< 0.010	< 0.010	0.040	
	03/10/94	< 0.010			0.010	0.010	< 0.010	< 0.010	0.010	0.010	
	04/19/94	< 0.010			< 0.010	0.010	0.010	< 0.010	0.010	< 0.010	
	05/31/94	0.020	< 0.010	(10/9/95)	0.040	0.040	0.030	0.020	0.050	0.020	
	06/22/94	0.010	0.020	(11/8/95)	0.010	0.020	0.010	< 0.010	0.010	< 0.010	
	07/27/94	< 0.010	< 0.010	(12/11/95)	0.040	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	
	10/10/94	< 0.010	< 0.010	(1/2/96)	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	
	06/13/95	< 0.010	0.030	(4/29/96)	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	
	10/04/95	< 0.010	0.010	(6/10/96)	0.010	0.010	< 0.010	< 0.010	< 0.010	< 0.010	
	04/29/96	0.020	0.010	(7/2/96)	0.030	0.030	0.030	0.020	0.050	0.020	0.020
	11/08/96	0.010	< 0.010	(11/8/96)	< 0.010	0.010	0.010	0.010	< 0.010	< 0.010	0.010
	05/09/97	< 0.010	< 0.010		< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
	10/21/97	< 0.010	< 0.010		< 0.010	< 0.010	< 0.010	< 0.010	0.220	0.020	< 0.010
	05/04/98	0.010	< 0.010		< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	0.020	< 0.010
	10/07/98	0.030	0.030		0.040	0.050	0.050	0.020	0.040	0.030	0.030
	05/27/99	0.020	0.040		0.040	0.040	0.020	< 0.010	0.030	0.030	0.010
	10/13/99	< 0.010	< 0.010		< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
	04/17/00	< 0.010	< 0.010		< 0.010	<	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
	10/19/00	0.030	0.040		0.040	0.040	0.040	0.020	0.020	0.030	0.040
	04/27/01	< 0.010	< 0.010		< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
	10/11/01	< 0.010	< 0.010		< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
	06/06/02	< 0.010	< 0.010		< 0.010	< 0.010	0.023	< 0.010	< 0.010	< 0.010	0.020
	10/18/02	< 0.010	< 0.010		< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	<
	04/24/03	< 0.010	< 0.010		< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
	10/14/03	< 0.010	< 0.010		< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
	04/20/04	< 0.010	< 0.010		< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
	11/18/04	< 0.010	< 0.010		< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
	04/22/05	< 0.010	< 0.010		< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
	10/14/05	< 0.010	< 0.010		< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	0.014	< 0.010
	05/05/06	< 0.010	< 0.010		< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
	10/23/06	< 0.010	< 0.010		< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
	04/12/07	< 0.010	< 0.010		< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
	09/28/07	< 0.010	< 0.010		< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
	04/08/08	< 0.010	< 0.010		< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
	10/08/08	< 0.010	< 0.010		< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
	04/29/09	< 0.010	< 0.010		< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	0.012	< 0.010
	% detects	29	21		29	34	32	18	29	32	22
	Coeff. of Var(s.d./mean)	0.571	ND		0.723	0.839	0.767	ND	1.604	0.559	ND
Cobalt	05/25/90										
	06/04/92										
	09/30/92										
	04/28/93										
	12/03/93	0.010			< 0.010	0.030	0.030	< 0.010	0.030	< 0.010	
	01/07/94	< 0.010			0.020	0.020	< 0.010	< 0.010	0.020	< 0.010	
	02/04/94	< 0.010			< 0.010	0.020	< 0.010	< 0.010	< 0.010	< 0.010	
	03/10/94	< 0.010			< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	
	04/19/94	< 0.010			< 0.010	< 0.010	< 0.010	< 0.010	0.010	0.010	
	05/31/94	< 0.010	< 0.010	(10/9/95)	0.010	0.010	0.010	< 0.010	0.010	< 0.010	
	06/22/94	< 0.010	< 0.010	(11/8/95)	< 0.010	< 0.010	< 0.010	< 0.010	0.010	< 0.010	
	07/27/94	< 0.010	< 0.010	(12/11/95)	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	
	10/10/94	< 0.010	< 0.010	(1/2/96)	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	
	06/13/95	< 0.010	< 0.010	(4/29/96)	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	
	10/04/95	< 0.010	< 0.010	(6/10/96)	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	
	04/29/96	< 0.010	< 0.010	(7/2/96)	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
	11/08/96	< 0.010	< 0.010	(11/8/96)	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
	05/09/97	< 0.010	< 0.010		< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
	10/21/97	0.010	< 0.010		< 0.010	< 0.010	< 0.010	< 0.010	0.030	< 0.010	< 0.010
	05/04/98	0.010	< 0.010		< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
	10/07/98	< 0.010	< 0.010		< 0.010	0.020	0.020	0.020	< 0.010	0.010	0.020
	05/27/99	< 0.010	< 0.010		< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
	10/13/99	< 0.010	< 0.010		< 0.010	< 0.010	< 0.010	< 0.010	0.010	< 0.010	< 0.010
	04/17/00	< 0.010	< 0.010		< 0.010	<	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
	10/19/00	< 0.010	0.010		0.010	0.010	0.010	< 0.010	< 0.010	< 0.010	0.010
	04/27/01	< 0.010	< 0.010		< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
	10/11/01	< 0.010	< 0.010		< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
	06/06/02	0.014	< 0.010		< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
	10/18/02	< 0.010	< 0.010		< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	<
	04/24/03	< 0.010	< 0.010		< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
	10/14/03	< 0.010	< 0.010		< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
	04/20/04	< 0.010	< 0.010		< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
	11/18/04	< 0.010	< 0.010		< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
	04/22/05	< 0.010	< 0.010		< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
	10/14/05	< 0.010	< 0.010		< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
	05/05/06	< 0.010	< 0.010		< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
	10/23/06	< 0.010	< 0.010		< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
	04/12/07	< 0.010	< 0.010		< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
	09/28/07	< 0.010	< 0.010		< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
	04/08/08	< 0.0012	0.0024		0.0025	0.0023	0.0020	< 0.0012	0.0025	< 0.0015	0.0019
	10/08/08	0.0020	0.0025		0.0024	0.0024	0.0020	0.0013	0.0065	0.0022	0.0026
	04/29/09	0.0013	0.0035		0.0034	0.0033	0.0014	< 0.0012	0.0019	0.0026	0.0033
	% detects	16	12		16	24	18	5	26	11	19
	Coeff. of Var(s.d./mean)	ND	ND		ND	ND	ND	ND	0.460	ND	ND

TABLE 3
SUMMARY OF ANALYTICAL RESULTS (mg/L)
May 1990 through April 2009

		DOWNGRADIENT WELLS [1]						UPGRADIENT WELLS			
ANALYTE	DATE	MW-4A (1A(1))	MW-5A		MW-6A (E-26)	MW-7A (E-25)	MW-8A (E27)	MW-1A (ET-O)	MW-2A (EE(E))	MW-3A (2)	F
	05/25/90				<0.01	<0.01	<0.01				
	05/28/92							<0.0040			
	06/04/92								<0.0100		< 0.0100
	09/30/92								0.0400		< 0.0500
	11/19/92							<0.0040			
	04/28/93	0.0080							0.0190	0.0180	0.0090
	12/03/93	0.0190			0.0050	0.0290	0.0240	< 0.0040	0.0270	0.0100	
	01/07/94	0.0100			0.0200	0.0200	0.0100	0.0070	0.0190	< 0.0040	
	02/04/94	0.0130			0.0230	0.0220	0.0180	0.0050	0.0060	0.0220	
	03/10/94	0.0060			0.0100	0.0130	0.0070	< 0.0040	0.0230	0.0120	
	04/19/94	0.0070			0.0070	0.0140	0.0070	< 0.0040	0.0200	0.0140	
	05/31/94	0.0090	< 0.0040	(10/9/95)	0.0190	0.0210	0.0190	0.0090	0.0220	0.0090	
	06/22/94	0.0110	0.0170	(11/8/95)	0.0160	0.0320	0.0150	0.0090	0.0230	0.0060	
	07/27/94	< 0.0040	< 0.0040	(12/11/95)	0.0060	0.0090	0.0040	< 0.0040	< 0.0040	< 0.0040	
	10/10/94	< 0.0040	< 0.0040	(1/2/96)	0.0040	< 0.0040	< 0.0040	< 0.0040	< 0.0040	< 0.0040	
	06/13/95	< 0.0040	< 0.0040	(4/29/96)	0.0120	0.0080	0.0120	< 0.0040	< 0.0040	< 0.0040	
	10/04/95	< 0.0040	< 0.0040	(6/10/96)	0.0040	0.0050	< 0.0040	< 0.0040	0.0050	< 0.0040	
	04/29/96	< 0.0040	< 0.0040	(7/2/96)	< 0.0040	< 0.0040	< 0.0040	< 0.0040	< 0.0040	< 0.0040	< 0.0040
	11/08/96	< 0.0040	< 0.0040	(11/8/96)	< 0.0040	< 0.0040	< 0.0040	< 0.0040	< 0.0040	< 0.0040	< 0.0040
	05/09/97	0.0160	0.0190		0.0150	0.0160	0.0100	< 0.0040	0.0150	0.0060	< 0.0040
	10/21/97	< 0.0040	< 0.0040		< 0.0040	< 0.0040	< 0.0040	< 0.0040	< 0.0040	< 0.0040	< 0.0040
	05/04/98	< 0.0040	< 0.0040		< 0.0040	< 0.0040	< 0.0040	< 0.0040	< 0.0040	< 0.0040	< 0.0040
Copper	10/07/98	0.0080	0.0080		0.0100	0.0160	0.0210	< 0.0040	0.0100	0.0090	0.0180
	05/27/99	0.0050	0.0050		< 0.0040	0.0040	0.0060	< 0.0040	< 0.0040	< 0.0040	0.0050
	10/13/99	0.0040	< 0.0040		< 0.0040	< 0.0040	< 0.0040	< 0.0040	< 0.0040	< 0.0040	0.0050
	04/17/00	< 0.0040	< 0.0040		< 0.0040	<	< 0.0040	< 0.0040	0.0090	< 0.0040	< 0.0040
	10/19/00	0.0100	0.0160		0.0100	0.0100	0.0160	0.0050	0.0100	0.0070	0.0140
	04/27/01	< 0.0040	< 0.0040		< 0.0040	< 0.0040	< 0.0040	< 0.0040	0.0061	< 0.0040	< 0.0040
	10/11/01	0.0088	0.0092		0.0090	0.0084	0.0061	0.0056	0.0150	0.0076	0.0056
	06/06/02	0.0042	0.0059		< 0.0040	0.0048	0.0110	< 0.0040	0.0170	0.0047	0.0350
	10/18/02	0.0068	0.0110		0.0066	0.0330	0.0069	< 0.0040	0.0110	< 0.0040	<
	04/24/03	0.0048	0.0059		0.0055	0.0054	0.0068	0.0058	0.0120	0.0056	< 0.0040
	10/14/03	0.0088	0.0110		0.0090	0.0071	< 0.0040	< 0.0040	< 0.0040	0.0073	< 0.0040
	04/20/04	0.0051	0.0074		0.0091	0.0120	0.0054	0.0076	0.0190	0.0150	0.0064
	11/18/04	0.0068	0.0110		< 0.0040	< 0.0040	0.0048	0.0079	0.0400	< 0.0040	0.0051
	04/22/05	0.0048	0.0120		< 0.0040	0.0040	< 0.0040	0.0084	0.0130	0.0040	< 0.0040
	10/14/05	< 0.0080	< 0.0080		< 0.0080	< 0.0080	< 0.0080	< 0.0080	0.0089	< 0.0080	< 0.0080
	05/05/06	< 0.0080	< 0.0080		< 0.0080	0.0160	< 0.0080	< 0.0080	< 0.0080	< 0.0080	< 0.0080
	10/23/06	< 0.0080	< 0.0080		< 0.0080	< 0.0080	< 0.0080	< 0.0080	0.0120	< 0.0080	< 0.0080
	04/12/07	< 0.0080	< 0.0080		< 0.0080	< 0.0080	< 0.0080	0.0099	0.0170	< 0.0080	< 0.0080
	09/28/07	< 0.0080	< 0.0080		< 0.0080	0.0084	< 0.0080	< 0.0080	< 0.0080	< 0.0080	< 0.0080
	04/08/08	0.0041	0.0059		0.0053	0.0065	0.0048	0.0056	0.0170	0.0066	0.0048
	10/08/08	0.0014	0.0440		0.0028	0.0210	0.0024	0.0025	0.0055	0.0036	0.0025
	04/29/09	0.0042	0.0077		0.0066	0.0067	0.0022	0.0030	0.0095	0.011	0.0066
	% detects	61	48		58	68	58	37	68	47	41
	Coeff. of Var(s.d./mean)	0.552	0.636		0.664	0.784	0.688	0.327	0.758	0.642	1.054
	05/25/90				0.140	3.120	0.530				
	05/28/92							0.850			
	06/04/92								1.960		0.250
	09/30/92								2.020		0.420
	11/19/92							0.590			
	04/28/93	0.700							0.250	0.300	0.210
	12/03/93	0.080			0.840	2.300	0.680	0.020	1.200	0.290	
	01/07/94	0.020			0.210	0.190	0.030	< 0.010	0.480	0.010	
	02/04/94	0.020			0.210	0.300	0.040	0.020	0.020	0.190	
	03/10/94	0.040			0.210	0.160	0.020	0.010	0.050	0.030	
	04/19/94	0.020			0.027	0.110	0.026	0.024	0.051	0.050	
	05/31/94	0.030	< 0.010	(10/9/95)	0.780	0.450	0.050	0.040	0.510	0.030	
	06/22/94	0.020	0.040	(11/8/95)	0.910	0.660	0.020		0.560	0.020	
	07/27/94	< 0.010	0.670	(12/11/95)	0.420	0.300	< 0.010	< 0.010	< 0.010	< 0.010	
	10/10/94	< 0.010	< 0.010	(1/2/96)	< 0.010	0.350	< 0.010	0.010	0.210	< 0.010	
	06/13/95	< 0.010	0.060	(4/29/96)	0.180	0.520	0.030	< 0.010	0.010	0.010	
	10/04/95	< 0.010	0.040	(6/10/96)	1.300	1.600	0.470	< 0.010	0.030	0.020	
	04/29/96	0.070	0.070	(7/2/96)	0.260	0.880	0.090	0.020	0.070	0.030	0.030
	11/08/96	< 0.010	0.150	(11/8/96)	0.070	1.100	0.470	< 0.010	0.110	< 0.010	< 0.010
	05/09/97	0.030	0.030		0.260	0.320	0.050	0.020	0.040	0.020	0.020
	10/21/97	< 0.010	< 0.010		0.820	< 0.010	0.190	< 0.010	< 0.010	< 0.010	0.070
	05/04/98	< 0.010	< 0.010		0.530	0.130	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Iron	10/07/98	< 0.010	< 0.010		0.030	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
	05/27/99	0.020	0.030		0.580	0.510	0.030	0.010	0.050	0.030	0.020
	10/13/99	0.020	0.020		0.030	0.020	0.020	< 0.010	0.020	0.020	0.020
	04/17/00	< 0.010	< 0.010		0.010	<	0.010	0.010	0.010	< 0.010	< 0.010
	10/19/00	0.010	< 0.010		0.010	0.010	< 0.010	< 0.010	< 0.010	0.010	0.020
	04/27/01	< 0.010	0.019		0.450	0.019	0.053	0.043	< 0.010	0.030	< 0.010
	10/11/01	0.011	0.036		0.950	0.490	0.099	0.013	0.810	0.018	0.016
	06/06/02	< 0.010	< 0.010		0.700	0.047	< 0.010	<0.010	< 0.010	< 0.010	< 0.010
	10/18/02	< 0.010	< 0.010		0.210	0.470	0.063	0.018	0.026	< 0.010	<
	04/24/03	< 0.010	< 0.010		0.340	1.900	0.012	0.018	< 0.010	0.010	< 0.010
	10/14/03	0.012	0.090		0.860	1.300	< 0.010	0.092	< 0.010	< 0.010	0.160
	04/20/04	0.130	< 0.010		0.034	0.800	0.013	0.021	< 0.010	< 0.010	< 0.010
	11/18/04	< 0.010	0.011		0.380	0.740	0.073	< 0.010	< 0.010	< 0.010	0.010
	04/22/05	0.020	0.025		0.019	0.020	0.018	< 0.010	0.016	0.012	0.021
	10/14/05	< 0.050	< 0.050		0.210	0.300	< 0.050	< 0.050	< 0.050	< 0.050	0.120
	05/05/06	< 0.050	< 0.050		0.080	0.072	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050
	10/23/06	< 0.050	0.099		0.990	2.200	0.190	< 0.050	< 0.050	< 0.050	< 0.050
	04/12/07	< 0.050	< 0.050		< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050
	09/28/07	< 0.050	0.094		0.21	< 0.050	< 0.050	< 0.050	0.32	< 0.050	< 0.050
	04/08/08	< 0.050	< 0.050		0.85	< 0.050	0.096	< 0.050	< 0.050	0.050	0.15
	10/08/08	0.190	< 0.050		0.96	0.120	< 0.050	< 0.050	0.270	0.073	0.56
	04/29/09	< 0.10	< 0.10		0.39	< 0.10	0.43	< 0.10	< 0.10	< 0.10	0.12
	% detects	45	48		95	82	68	45	55	53	52
	Coeff. of Var(s.d./mean)	1.156	2.350		0.893	1.067	1.817	0.927	1.910	1.851	1.428

TABLE 3
SUMMARY OF ANALYTICAL RESULTS (mg/L)
May 1990 through April 2009

		DOWNGRADIENT WELLS[1]						UPGRADIENT WELLS			
ANALYTE	DATE	MW-4A (1A(1))	MW-5A		MW-6A (E-26)	MW-7A (E-25)	MW-8A (E27)	MW-1A (ET-O)	MW-2A (EE(E))	MW-3A (2)	F
	05/25/90				< 0.0020	0.0040	< 0.0020				
	05/28/92							< 0.0500			
	06/04/92								0.0040		< 0.0010
	09/30/92								0.0020		< 0.0010
	11/19/92							< 0.0500			
	04/28/93	< 0.0500							< 0.0500	< 0.0500	< 0.0500
	12/03/93	< 0.0050			< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	
	01/07/94	< 0.0050			< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	
	02/04/94	< 0.0050			< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	
	03/10/94	< 0.0050			< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	
	04/19/94	< 0.0050			0.0070	< 0.0050	< 0.0050	< 0.0050	0.0090	< 0.0050	
	05/31/94	< 0.0050	< 0.0050	(10/9/95)	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	
	06/22/94	< 0.0050	< 0.0050	(11/8/95)	< 0.0050	0.0070	< 0.0050	< 0.0050	< 0.0050	< 0.0050	
	07/27/94	< 0.0050	< 0.0050	(12/11/95)	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	
	10/10/94	< 0.0050	< 0.0050	(1/2/96)	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	
	06/13/95	< 0.0050	0.0070	(4/29/96)	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	
	10/04/95	< 0.0050	< 0.0500	(6/10/96)	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	
	04/29/96	0.0090	< 0.0050	(7/2/96)	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	0.0130	< 0.0050
	11/08/96	< 0.0050	< 0.0050	(11/8/96)	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
	05/09/97	< 0.0050	< 0.0050		< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
	10/21/97	< 0.0050	0.0140		0.0100	< 0.0050	< 0.0050	< 0.0050	0.0070	< 0.0050	0.0050
	05/04/98	< 0.0050	< 0.0050		< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
Lead	10/07/98	< 0.0050	< 0.0050		< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
	05/27/99	< 0.0050	< 0.0050		< 0.0050	< 0.0050	0.0070	< 0.0050	< 0.0050	< 0.0050	< 0.0050
	10/13/99	< 0.0050	< 0.0050		< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
	04/17/00	< 0.0050	< 0.0050		< 0.0050	<	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
	10/19/00	< 0.0050	< 0.0050		< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
	04/27/01	< 0.0050	< 0.0050		< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
	10/11/01	< 0.0050	< 0.0050		< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
	06/06/02	< 0.0050	< 0.0050		< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
	10/18/02	< 0.0050	< 0.0050		< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	<
	04/24/03	< 0.0050	< 0.0050		< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
	10/14/03	< 0.0050	< 0.0050		< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
	04/20/04	< 0.0050	< 0.0050		< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
	11/18/04	< 0.0050	< 0.0050		< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
	04/22/05	< 0.0050	< 0.0050		< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
	10/14/05	< 0.0050	< 0.0050		< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
	05/05/06	< 0.0050	< 0.0050		< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
	10/23/06	< 0.0050	< 0.0050		< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
	04/12/07	< 0.0050	< 0.0050		< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
	09/28/07	< 0.0050	< 0.0050		< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
	04/08/08	< 0.00040	< 0.00040		< 0.00040	< 0.00040	< 0.00040	< 0.00040	< 0.00040	< 0.00040	< 0.00040
	10/08/08	< 0.00040	< 0.00040		< 0.00040	< 0.00040	< 0.00040	< 0.00040	< 0.00040	< 0.00040	< 0.00040
	04/29/09	< 0.00040	< 0.00040		< 0.00040	< 0.00040	< 0.00040	< 0.00040	< 0.00040	< 0.00040	< 0.00040
	% detects	3	6		5	3	3	0	5	3	4
	Coeff. of Var(s.d./mean)	ND	ND		ND	ND	ND	ND	ND	ND	ND
	05/25/90				99	201	142				
	05/28/92							100			
	06/04/92								184.6		145.3
	09/30/92								194		157.0
	11/19/92							52			
	04/28/93	170							300	100	170
	12/03/93	180			230	230	160	100	290	110	
	01/07/94	190			240	240	190	98	330	100	
	02/04/94	160			210	230	170	93	99	340	
	03/10/94	160			220	220	170	91	380	230	
	04/19/94	170			250	250	200	130	510	550	
	05/31/94	170	240	(10/9/95)	230	240	190	110	560	220	
	06/22/94	160	230	(11/8/95)	230	240	180	85	480	150	
	07/27/94	190	220	(12/11/95)	250	240	190	110	460	230	
	10/10/94	170	220	(1/2/96)	240	260	190	98	330	81	
	6/13/1995	190	250	(4/29/96)	230	240	200	130	500	400	
	10/04/95	170	220	(6/10/96)	220	220	190	100	370	210	
	04/29/96	200	250	(7/2/96)	240	240	220	170	510	230	210
	11/08/96	190	230	(11/8/96)	220	230	200	180	670	89	170
	05/09/97	170	200		210	220	180	170	470	150	140
	10/21/97	160	210		200	200	190	110	580	81	170
	05/04/98	190	220		220	230	200	210	290	190	180
Magnesium	10/07/98	170	200		200	210	190	270	500	160	40
	05/27/99	170	220		200	220	190	190	470	240	140
	10/13/99	170	210		200	210	190	210	810	100	160
	04/17/00	140	200		180	<	180	180	480	90	130
	10/19/00	150	200		200	44	190	190	690	92	130
	04/27/01	160	200		200	200	230	130	890	140	150
	10/11/01	170	220		210	180	190	180	600	94	160
	06/06/02	130	200		190	190	190	160	420	210	140
	10/18/02	150	230		220	230	190	160	400	99	<
	04/24/03	140	200		210	210	170	190	230	98	170
	10/14/03	130	200		200	200	180	220	240	99	190
	04/20/04	130	210		210	200	170	160	270	490	190
	11/18/04	140	230		230	230	180	150	270	150	180
	04/22/05	120	200		200	200	180	160	190	140	170
	10/14/05	120	190		200	200	180	150	190	300	180
	05/05/06	110	200		200	200	180	130	150	150	180
	10/23/06	110	200		210	200	180	190	230	160	210
	04/12/07	110	200		210	200	190	190	200	160	180
	09/28/07	100	190		200	200	170	210	250	150	180
	04/08/08	100	190		200	190	170	190	280	160	190
	10/08/08	93	190		190	200	170	200	250	230	190
	04/29/09	100	190		210	210	180	170	330	740	230
	% detects	100	100		100	97	100	100	100	100	96
	Coeff. of Var(s.d./mean)	0.120	0.074		0.083	0.179	0.077	0.313	0.390	0.650	0.241

TABLE 3
SUMMARY OF ANALYTICAL RESULTS (mg/L)
May 1990 through April 2009

		DOWNGRADIENT WELLS[1]						UPGRADIENT WELLS			
		MW-4A			MW-6A	MW-7A	MW-8A	MW-1A	MW-2A	MW-3A	
ANALYTE	DATE	(1A(1))	MW-5A		(E-26)	(E-25)	(E27)	(ET-O)	(EE(E))	(2)	F
Manganese	05/25/90				0.3260	0.7310	0.9720				
	05/28/92							0.3800			
	06/04/92								0.7500		0.3400
	09/30/92								0.7200		0.5300
	11/19/92							0.1900			
	04/28/93	0.6400							0.5300	0.3300	0.1500
	12/03/93	0.7400			0.6400	0.7900	0.8300	0.3500	0.9600	0.2800	
	01/07/94	0.6500			0.6900	0.7400	0.7400	0.3400	0.8700	0.2300	
	02/04/94	0.6000			0.7200	0.7700	0.7900	0.3700	0.2800	0.9600	
	03/10/94	0.5300			0.6800	0.7200	0.7300	0.3500	0.9400	0.4200	
	04/19/94	0.6200			0.7300	0.7600	0.8000	0.4100	1.1000	0.4100	
	05/31/94	0.5700	0.7600	(10/9/95)	0.7100	0.7300	0.7800	0.3800	0.9800	0.3000	
	06/22/94	0.5800	0.7500	(11/8/95)	0.7100	0.7700	0.8000	0.3900	1.1000	0.2400	
	07/27/94	0.5700	0.6400	(12/11/95)	0.7100	0.7500	0.7600	0.3600	1.1000	0.3400	
	10/10/94	0.5200	0.6500	(1/2/96)	0.7100	0.7600	0.7500	0.3700	0.9300	0.2200	
	06/13/95	0.4800	0.8400	(4/29/96)	0.6000	0.6100	0.7100	0.3500	0.7100	0.1700	
	10/04/95	0.4400	0.7600	(6/10/96)	0.6700	0.6900	0.8100	0.3300	0.7700	0.2200	
	04/29/96	0.6200	0.7100	(7/2/96)	0.7400	0.9700	0.8600	0.5600	0.7400	0.3000	0.0740
	11/08/96	0.5900	0.7700	(11/8/96)	0.6800	0.7800	0.9100	0.6700	1.2000	0.2000	0.3500
	05/09/97	0.5500	0.6800		0.6800	0.7400	0.8600	0.6600	0.7600	0.3000	0.1400
	10/21/97	0.5700	0.7600		0.7200	1.1000	0.8700	0.4900	1.2000	0.2500	0.7300
	05/04/98	0.4500	0.6600		0.7100	0.9500	0.8300	0.6600	0.5600	0.0840	0.0060
	10/07/98	0.5100	0.6300		0.6200	0.8000	0.7100	0.9000	0.8800	0.4300	0.0660
	05/27/99	0.5000	0.6600		0.6800	0.8700	0.7900	0.6700	0.7400	0.6100	0.6100
	10/13/99	0.5500	0.7200		0.6800	0.8600	0.8800	0.6100	1.2000	0.3400	0.9400
	04/17/00	0.5700	0.8500		0.8200	<	0.7000	0.5600	0.7400	0.3600	0.5900
	10/19/00	0.5600	0.7800		0.7700	0.7700	0.9200	0.7700	0.7800	0.3000	0.9100
	04/27/01	0.5100	0.7100		0.7200	0.9300	0.8400	0.4300	1.0000	0.3000	0.5600
	10/11/01	0.5200	0.7400		0.7300	1.0000	0.8800	0.6200	1.4000	0.2700	0.9100
	06/06/02	0.4400	0.6400		0.6600	0.8100	0.8500	0.5700	0.6100	0.3000	0.4000
	10/18/02	0.4700	0.7000		0.7100	0.8700	0.8300	0.5500	2.5000	0.2700	<
	04/24/03	0.4800	0.7200		0.7500	0.9600	0.8400	0.7500	0.6300	0.3100	0.8900
	10/14/03	0.4900	0.7400		0.7600	0.9200	0.8800	0.9100	0.5800	0.3400	1.5000
	04/20/04	0.4200	0.6700		0.7200	0.9600	0.7700	0.5600	0.3400	0.4500	0.5700
	11/18/04	0.3500	0.5600		0.6200	0.7900	0.8800	0.6400	0.2800	0.2900	1.0000
	04/22/05	0.3500	0.5700		0.6000	0.7000	0.7400	0.4100	0.1700	0.3500	0.7000
	10/14/05	0.3900	0.6500		0.6700	0.7900	0.7900	0.5600	0.4000	0.7500	0.9000
	05/05/06	0.3900	0.6500		0.7500	0.8300	0.8100	0.5300	0.4900	0.4600	0.7000
	10/23/06	0.3700	0.6700		0.7400	0.8400	0.9100	0.7100	0.6800	0.4900	0.9500
	04/12/07	0.3600	0.6500		0.7300	0.7400	0.8200	0.6800	0.3600	0.5100	0.6900
	09/28/07	0.33	0.65		0.67	0.75	0.80	0.78	0.65	0.46	0.87
	04/08/08	0.31	0.50		0.63	0.64	0.69	0.60	0.27	0.46	0.52
	10/08/08	0.28	0.51		0.55	0.63	0.66	0.62	0.60	0.53	0.92
	04/29/09	0.34	0.57		0.69	0.80	0.69	0.52	0.091	0.29	1.1
	% detects	100	100		100	97	100	100	100	100	96
	Coeff. of Var(s.d./mean)	0.147	0.095		0.067	0.134	0.076	0.317	0.466	0.477	0.870
Mercury	05/25/90				< 0.0005	< 0.0005	< 0.0005				
	05/28/92							< 0.0010			
	06/04/92								< 0.0005		< 0.0005
	09/30/92								< 0.0005		< 0.0005
	11/19/92							< 0.0010			
	04/28/93	< 0.0010							< 0.0010	< 0.0010	< 0.0010
	12/03/93	< 0.0010			< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	
	01/07/94	< 0.0010			< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	
	02/04/94	< 0.0010			< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	
	03/10/94	< 0.0010			< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	
	04/19/94	< 0.0010			< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	
	05/31/94	< 0.0010	< 0.0010	(10/9/95)	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	
	06/22/94	< 0.0010	< 0.0010	(11/8/95)	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	
	07/27/94	< 0.0010	< 0.0010	(12/11/95)	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	
	10/10/94	< 0.0010	< 0.0010	(1/2/96)	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	
	06/13/95	< 0.0010	< 0.0010	(4/29/96)	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	
	10/04/95	< 0.0010	< 0.0010	(6/10/96)	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	
	04/29/96	< 0.0010	< 0.0010	(7/2/96)	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
	11/08/96	< 0.0010	< 0.0010	(11/8/96)	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
	05/09/97	< 0.0010	< 0.0010		< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
	10/21/97	< 0.0010	< 0.0010		< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
	05/04/98	< 0.0010	< 0.0010		< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
	10/07/98	< 0.0010	< 0.0010		< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
	05/27/99	< 0.0010	< 0.0010		< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
	10/13/99	< 0.0010	< 0.0010		< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
	04/17/00	< 0.0010	< 0.0010		< 0.0010	<	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
	10/19/00	< 0.0010	< 0.0010		< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
	04/27/01	< 0.0010	< 0.0010		< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
	10/11/01	< 0.0010	< 0.0010		< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
	06/06/02	< 0.0010	< 0.0010		< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
	10/18/02	< 0.0002	< 0.0002		< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	<
	04/24/03	< 0.0010	< 0.0010		< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
	10/14/03	< 0.0010	< 0.0010		< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
	04/20/04	< 0.0010	< 0.0010		< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
	11/18/04	< 0.0010	< 0.0010		< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
	04/22/05	< 0.0010	< 0.0010		< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
	10/14/05	< 0.0010	< 0.0010		< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
	05/05/06	< 0.0010	< 0.0010		< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
	10/23/06	< 0.0010	< 0.0010		< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
	04/12/07	< 0.0010	< 0.0010		< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
	09/28/07	< 0.0010	< 0.0010		< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
	04/08/08	< 0.0010	< 0.0010		< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
	10/08/08	< 0.0002	< 0.0010		< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
	04/29/09	< 0.0010	< 0.0010		< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
	% detects	0	0		0	0	0	0	0	0	0
	Coeff. of Var(s.d./mean)	ND	ND		ND	ND	ND	ND	ND	ND	ND

TABLE 3
SUMMARY OF ANALYTICAL RESULTS (mg/L)
May 1990 through April 2009

		DOWNGRADIENT WELLS [1]						UPGRADIENT WELLS			
		MW-4A			MW-6A	MW-7A	MW-8A	MW-1A	MW-2A	MW-3A	
ANALYTE	DATE	(1A(1))	MW-5A		(E-26)	(E-25)	(E27)	(ET-O)	(EE(E))	(2)	F
	05/25/90				< 0.0200	< 0.0200	< 0.0200				
	05/28/92							< 0.0050			
	06/04/92								< 0.0100		< 0.0100
	09/30/92								< 0.0300		< 0.0300
	11/19/92							< 0.0050			
	04/28/93	< 0.0050							0.0130	< 0.0050	< 0.0050
	12/03/93	0.0270			< 0.0050	0.0620	0.0520	0.0090	0.0550	0.0120	
	01/07/94	0.0120			0.0340	0.0290	0.0140	0.0120	0.0350	< 0.0050	
	02/04/94	< 0.0050			0.0120	0.0100	0.0090	< 0.0050	< 0.0050	0.0170	
	03/10/94	< 0.0050			< 0.0050	0.0060	< 0.0050	< 0.0050	0.0190	0.0170	
	04/19/94	< 0.0050			< 0.0050	0.0150	0.0070	< 0.0050	0.0310	0.0430	
	05/31/94	0.0060	< 0.0050	(10/9/95)	0.0240	0.0250	0.0220	0.0050	0.0340	0.0120	
	06/22/94	0.0070	< 0.0050	(11/8/95)	0.0110	0.0150	0.0110	< 0.0050	0.0310	< 0.0050	
	07/27/94	< 0.0050	0.0080	(12/11/95)	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	
	10/10/94	< 0.0050	< 0.0050	(1/2/96)	0.0190	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	
	08/13/95	< 0.0050	0.0140	(4/29/96)	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	
	10/04/95	< 0.0050	< 0.0050	(6/10/96)	0.0080	0.0050	< 0.0050	< 0.0050	0.0080	< 0.0050	
	04/29/96	< 0.0050	< 0.0050	(7/2/96)	0.0130	0.0170	0.0130	0.0070	0.0220	0.0110	0.0100
	11/08/96	0.0140	0.0110	(11/8/96)	0.0050	0.0100	0.0080	0.0160	0.0140	< 0.0050	0.0110
	05/09/97	0.0320	0.0340		0.0290	0.0330	0.0200	0.0120	0.0490	0.0190	0.0120
	10/21/97	0.0190	0.0110		0.0110	0.0130	0.0160	0.0220	0.0400	0.0090	0.0150
	05/04/98	0.0090	0.0110		0.0080	< 0.0050	0.0120	< 0.0050	< 0.0050	0.0100	0.0060
Nickel	10/07/98	0.0200	0.0130		0.0180	0.0360	0.0490	0.0130	0.0130	0.0210	0.0520
	05/27/99	0.0060	0.0120		0.0060	0.0160	0.0110	< 0.0050	0.0070	0.0070	0.0110
	10/13/99	0.0070	0.0130		<	0.0080	< 0.0050	< 0.0050	0.0070	< 0.0050	0.0090
	04/17/00	0.0050	< 0.0050		< 0.0050	<	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
	10/19/00	0.0200	0.0400		0.0340	0.0350	0.0230	0.0090	0.0100	0.0100	0.0250
	04/27/01	< 0.0050	< 0.0050		< 0.0050	0.0054	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
	10/11/01	0.0050	0.0056		0.0058	0.0060	< 0.0050	< 0.0050	0.0081	< 0.0050	0.0130
	06/06/02	< 0.0050	< 0.0050		< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
	10/18/02	< 0.0050	< 0.0050		< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	<
	04/24/03	< 0.0050	< 0.0050		< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
	10/14/03	< 0.0050	< 0.0050		< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
	04/20/04	< 0.0050	< 0.0050		< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
	11/18/04	0.0150	0.0250		0.0270	0.0210	0.0270	0.0150	0.0260	0.0120	0.0360
	04/22/05	0.0190	0.0350		0.0330	0.0350	0.0310	0.0270	0.0210	0.0190	0.0280
	10/14/05	0.0230	0.0420		0.0400	0.0430	0.0340	0.0210	0.0250	0.0450	0.0290
	05/05/06	0.0190	0.0300		0.0400	0.0440	0.0320	0.0160	0.0210	0.0270	0.0280
	10/23/06	0.0200	0.0390		0.0480	0.0500	0.0530	0.0210	0.0440	0.0240	0.0370
	04/12/07	0.0200	0.0420		0.0440	0.0420	0.0220	0.0150	0.0360	0.0250	0.0310
	09/28/07	0.016	0.035		0.033	0.039	0.032	0.023	0.033	0.020	0.031
	04/08/08	0.025	0.055		0.057	0.054	0.046	0.026	0.055	0.032	0.047
	10/08/08	0.024	0.051		0.049	0.053	0.058	0.031	0.066	0.057	0.053
	04/29/09	0.029	0.075		0.070	0.070	0.046	0.022	0.053	0.054	0.068
	% detects	63	64		66	74	63	50	68	58	74
	Coeff. of Var(s.d./mean)	0.785	0.880		0.814	0.930	0.979	0.592	0.924	0.832	0.953
	05/25/90				24	49	40				
	06/04/92								56		54
	09/30/92								57		56
	04/28/93	57							68	44	57
	12/03/93	59			60	67	45	30	74	56	
	01/07/94	59			67	69	56	32	78	52	
	02/04/94	59			69	64	57	36	53	80	
	03/10/94	46			68	58	47	26	63	67	
	04/19/94	61			130	130	120	44	140	150	
	05/31/94	48	70	(10/9/95)	61	58	47	36	120	61	
	06/22/94	53	63	(11/8/95)	61	61	57	33	83	57	
	07/27/94	46	60	(12/11/95)	59	55	47	31	77	61	
	10/10/94	47	61	(1/2/96)	64	57	47	38	78	44	
	08/13/95	63	69	(4/29/96)	85	74	71	75	110	120	
	10/04/95	56	58	(6/10/96)	67	65	59	35	89	80	
	04/29/96	59	60	(7/2/96)	67	64	52	69	98	79	67
	11/08/96	50	58	(11/8/96)	64	60	51	54	100	44	60
	05/09/97	52	59		59	56	55	69	84	56	54
	10/21/97	50	56		56	55	50	43	84	42	56
	05/04/98	49	66		62	59	54	88	67	65	62
	10/07/98	49	58		60	56	46	77	86	66	35
Potassium	05/27/99	46	53		53	50	49	75	70	62	50
	10/13/99	47	53		57	54	49	68	120	43	54
	04/17/00	48	49		48	<	45	66	80	37	46
	10/19/00	47	56		59	28	56	67	120	45	52
	04/27/01	49	59		61	67	69	62	150	54	48
	10/11/01	45	54		57	49	49	57	110	41	50
	06/06/02	32	51		49	57	64	54	84	66	38
	10/18/02	27	59		45	29	13	29	57	25	<
	04/24/03	53	67		64	61	57	85	110	53	56
	10/14/03	44	55		57	54	54	79	61	44	52
	04/20/04	44	57		61	55	50.0	78	68	130	52
	11/18/04	48	61		63	61	48	80	74	55	46
	04/22/05	38	50		51	49	50	85	56	48	42
	10/14/05	53	68		70	69	64	110	79	84	63
	05/05/06	42	72		68	58	62	100	78	60	74
	10/23/06	45	66		68	63	60	86	72	62	59
	04/12/07	47	74		73	68	64	90	66	62	47
	09/28/07	39	53		52	46	45	73	61	53	46
	04/08/08	38	54		61	59	52	83	70	54	49
	10/08/08	35	56		53	53	68	99	60	92	50
	04/29/09	39	61		59	56	57	98	100	210	53
	% detects	100	100		100	97	100	100	100	100	97
	Coeff. of Var(s.d./mean)	0.158	0.091		0.235	0.283	0.299	0.360	0.275	0.441	0.154

TABLE 3
SUMMARY OF ANALYTICAL RESULTS (mg/L)
May 1990 through April 2009

ANALYTE	DATE	DOWNGRADIENT WELLS[1] MW-4A (1A(1))	MW-5A		MW-6A (E-26)	MW-7A (E-25)	MW-8A (E27)	UPGRADIENT WELLS MW-1A (ET-O)	MW-2A (EE(E))	MW-3A (2)	F
	05/25/90				< 0.0050	< 0.0050	< 0.0050				
	05/28/92							< 0.0050			
	06/04/92								< 0.0020		0.0040
	09/30/92								< 0.0020		< 0.0020
	11/19/92							< 0.0050			
	04/28/93	< 0.0050							< 0.0050	< 0.0050	< 0.0050
	12/03/93	< 0.0050			< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	
	01/07/94	< 0.0050			< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	
	02/04/94	< 0.0050			< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	
	03/10/94	< 0.0050			< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	
	04/19/94	< 0.0050			< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	
	05/31/94	< 0.0050	< 0.0050	(10/9/95)	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	
	06/22/94	< 0.0050	< 0.0050	(11/8/95)	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	
	07/27/94	< 0.0050	< 0.0050	(12/11/95)	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	
	10/10/94	< 0.0050	< 0.0050	(1/2/96)	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	
	06/13/95	< 0.0050	< 0.0050	(4/29/96)	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	
	10/04/95	< 0.0050	< 0.0050	(6/10/96)	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	
	04/29/96	< 0.0050	< 0.0050	(7/2/96)	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	0.0060
	11/08/96	< 0.0050	< 0.0050	(11/8/96)	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
	05/09/97	< 0.0050	< 0.0050		< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
	10/21/97	< 0.0050	< 0.0050		< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
	05/04/98	< 0.0050	< 0.0050		< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	0.0160
Selenium	10/07/98	< 0.0050	< 0.0050		< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
	05/27/99	< 0.0050	< 0.0050		< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
	10/13/99	< 0.0050	0.0300		< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	0.0290
	04/17/00	< 0.0050	< 0.0050		< 0.0050	<	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
	10/19/00	< 0.0050	< 0.0050		< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
	04/27/01	< 0.0050	< 0.0050		< 0.0050	< 0.0050	< 0.0050	< 0.0050	0.0080	< 0.0050	< 0.0050
	10/11/01	< 0.0050	< 0.0050		< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
	06/06/02	< 0.0050	< 0.0050		< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
	10/18/02	< 0.0050	< 0.0050		< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	<
	04/24/03	< 0.0050	< 0.0050		< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
	10/14/03	< 0.0050	< 0.0050		< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
	04/20/04	< 0.0050	< 0.0050		< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	0.0290	< 0.0050
	11/18/04	< 0.0050	< 0.0050		< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
	04/22/05	< 0.0050	< 0.0050		< 0.0050	< 0.0050	< 0.0050	< 0.0050	0.0058	< 0.0050	< 0.0050
	10/14/05	< 0.0050	< 0.0050		< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
	05/05/06	< 0.0050	< 0.0050		< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	0.0069
	10/23/06	< 0.0050	< 0.0050		< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
	04/12/07	< 0.0050	< 0.0050		< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
	09/28/07	< 0.0050	< 0.0050		< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
	04/08/08	< 0.00080	< 0.00080		< 0.00080	< 0.00080	< 0.00080	< 0.00080	0.00450	< 0.00080	< 0.00080
	10/08/08	< 0.00080	< 0.00080		< 0.00080	< 0.00080	< 0.00080	< 0.00080	< 0.00080	< 0.00080	< 0.00080
	04/29/09	< 0.00080	< 0.00080		< 0.00080	< 0.00080	< 0.00080	< 0.00080	0.0091	0.065	< 0.00080
	% detects	0	3		0	0	0	0	11	5	15
	Coeff. of Var(s.d./mean)	ND	ND		ND	ND	ND	ND	ND	ND	ND
	05/25/90				< 0.0100	< 0.0100	< 0.0100				
	05/28/92							< 0.0100			
	06/04/92								0.0100		< 0.0010
	09/30/92								< 0.0100		< 0.0100
	11/19/92							< 0.0100			
	04/28/93	< 0.0100							0.0300	< 0.0100	0.0100
	12/03/93	< 0.0100			< 0.0100	< 0.0100	< 0.0100	< 0.0100	< 0.0100	< 0.0100	
	01/07/94	< 0.0100			< 0.0100	< 0.0100	< 0.0100	< 0.0100	< 0.0100	< 0.0100	
	02/04/94	< 0.0100			< 0.0100	< 0.0100	< 0.0100	< 0.0100	< 0.0100	< 0.0100	
	03/10/94	< 0.0100			< 0.0100	< 0.0100	< 0.0100	< 0.0100	< 0.0100	< 0.0100	
	04/19/94	< 0.0100			< 0.0100	< 0.0100	< 0.0100	< 0.0100	< 0.0100	< 0.0100	
	05/31/94	0.0200	< 0.0100	(10/9/95)	0.0300	< 0.0100	< 0.0100	< 0.0100	0.0500	0.0200	
	06/22/94	< 0.0100	< 0.0100	(11/8/95)	< 0.0100	< 0.0100	< 0.0100	< 0.0100	< 0.0100	< 0.0100	
	07/27/94	< 0.0100	< 0.0100	(12/11/95)	< 0.0100	< 0.0100	< 0.0100	< 0.0100	< 0.0100	< 0.0100	
	10/10/94	< 0.0100	< 0.0100	(1/2/96)	< 0.0100	< 0.0100	< 0.0100	< 0.0100	< 0.0100	< 0.0100	
	06/13/95	< 0.0100	< 0.0100	(4/29/96)	< 0.0100	< 0.0100	< 0.0100	< 0.0100	< 0.0100	< 0.0100	
	10/04/95	< 0.0100	< 0.0100	(6/10/96)	< 0.0100	< 0.0100	< 0.0100	< 0.0100	< 0.0100	< 0.0100	
	04/29/96	< 0.0100	< 0.0100	(7/2/96)	< 0.0100	< 0.0100	< 0.0100	< 0.0100	< 0.0100	< 0.0100	< 0.0100
	11/08/96	< 0.0100	< 0.0100	(11/8/96)	< 0.0100	< 0.0100	< 0.0100	< 0.0100	< 0.0100	< 0.0100	< 0.0100
	05/09/97	< 0.0100	< 0.0100		< 0.0100	< 0.0100	< 0.0100	< 0.0100	< 0.0100	< 0.0100	< 0.0100
	10/21/97	< 0.0100	< 0.0100		< 0.0100	< 0.0100	< 0.0100	< 0.0100	< 0.0100	< 0.0100	< 0.0100
	05/04/98	0.0300	< 0.0100		< 0.0100	< 0.0100	< 0.0100	< 0.0100	< 0.0100	0.0200	< 0.0100
Silver	10/07/98	< 0.0100	< 0.0100		< 0.0100	0.0200	0.0300	0.0100	< 0.0100	< 0.0100	0.0300
	05/27/99	< 0.0100	< 0.0100		< 0.0100	< 0.0100	< 0.0100	< 0.0100	< 0.0100	< 0.0100	< 0.0100
	10/13/99	<	<		<	<	<	<	<	<	<
	04/17/00	< 0.0100	< 0.0100		< 0.0100	<	< 0.0100	< 0.0100	< 0.0100	< 0.0100	0.0100
	10/19/00	< 0.0100	0.0200		0.0100	0.0100	0.0300	0.0100	< 0.0100	< 0.0100	0.0300
	04/27/01	< 0.0100	< 0.0100		< 0.0100	< 0.0100	< 0.0100	< 0.0100	< 0.0100	< 0.0100	< 0.0100
	10/11/01	< 0.0100	< 0.0100		< 0.0100	< 0.0100	< 0.0100	< 0.0100	< 0.0100	< 0.0100	< 0.0100
	06/06/02	< 0.0100	< 0.0100		< 0.0100	< 0.0100	< 0.0100	< 0.0100	< 0.0100	< 0.0100	< 0.0100
	10/18/02	< 0.0100	< 0.0100		< 0.0100	< 0.0100	< 0.0100	< 0.0100	< 0.0100	< 0.0100	<
	04/24/03	< 0.0100	< 0.0100		< 0.0100	< 0.0100	< 0.0100	< 0.0100	< 0.0100	< 0.0100	< 0.0100
	10/14/03	< 0.0100	< 0.0100		< 0.0100	< 0.0100	< 0.0100	< 0.0100	< 0.0100	< 0.0100	< 0.0100
	04/20/04	< 0.0100	< 0.0100		< 0.0100	< 0.0100	< 0.0100	< 0.0100	< 0.0100	< 0.0100	< 0.0100
	11/18/04	< 0.0050	< 0.0050		< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
	04/22/05	< 0.0050	< 0.0050		< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
	10/14/05	< 0.0050	< 0.0050		< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
	05/05/06	< 0.0050	< 0.0050		< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
	10/23/06	< 0.0050	< 0.0050		< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
	04/12/07	< 0.0050	< 0.0050		< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
	09/28/07	< 0.0050	< 0.0050		< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
	04/08/08	< 0.00040	< 0.00040		< 0.00040	< 0.00040	< 0.00040	< 0.00040	< 0.00040	< 0.00040	< 0.00040
	10/08/08	< 0.00040	< 0.00040		< 0.00040	< 0.00040	< 0.00040	< 0.00040	< 0.00040	< 0.00040	< 0.00040
	04/29/09	< 0.00040	< 0.00040		< 0.00040	< 0.00040	< 0.00040	< 0.00040	< 0.00040	0.0034	< 0.00040
	% detects	5	3		5	5	5	5	3	8	11
	Coeff. of Var(s.d./mean)	ND	ND		ND	ND	ND	ND	ND	ND	ND

TABLE 3
SUMMARY OF ANALYTICAL RESULTS (mg/L)
May 1990 through April 2009

		DOWNGRADIENT WELLS [1]						UPGRADIENT WELLS			
ANALYTE	DATE	MW-4A (1A(1))	MW-5A		MW-6A (E-26)	MW-7A (E-25)	MW-8A (E27)	MW-1A (ET-O)	MW-2A (EE(E))	MW-3A (2)	F
Sodium	05/25/90				1490	3080	2300				
	05/28/92							930			
	06/04/92								3244.9		3691.4
	09/30/92								3620		3020.0
	11/19/92							590			
	04/28/93	2700							5100	1800	3200
	12/03/93	2600			4100	3800	2900	880	4000	1800	
	01/07/94	2600			3900	3900	2900	1100	4600	1600	
	02/04/94	1700			2500	2600	1900	590	1100	3300	
	03/10/94	2300			3700	3600	2700	900	5500	2600	
	04/19/94	2600			3900	3900	2900	1100	6300	6200	
	05/31/94	2500	3900	(10/9/95)	4100	4000	3000	980	7300	2800	
	06/22/94	2400	3800	(11/8/95)	3900	4000	3000	930	6900	2100	
	07/27/94	2700	3800	(12/11/95)	4100	4100	3300	980	6300	2900	
	10/10/94	2500	3800	(1/2/96)	4200	4400	3200	920	5100	1600	
	06/13/95	2700	4200	(4/29/96)	4000	4200	3300	1600	6400	4500	
	10/04/95	2300	3700	(6/10/96)	3700	3600	3000	910	5100	2700	
	04/29/96	2800	3800	(7/2/96)	4200	4100	3300	1600	7100	3000	4200
	11/08/96	2600	3600	(11/8/96)	3700	3500	2900	1400	7400	1500	3100
	05/09/97	2100	3300		3300	3000	2800	1500	5600	2200	3000
	10/21/97	2100	3100		3200	2800	2500	960	6300	1300	2700
	05/04/98	2400	3700		3500	3400	2900	1900	3700	2300	3900
	10/07/98	2200	3400		3200	3200	2900	1700	6000	1900	2000
	05/27/99	2200	3400		3200	3300	2900	1900	5300	2300	2800
	10/13/99	2200	3400		3400	3400	2900	1900	8900	1500	3100
	04/17/00	2000	3200		2900	<	2700	1600	5400	1400	2900
	10/19/00	2100	3300		3100	710	2800	1600	7600	1400	2700
	04/27/01	2200	3400		3300	2800	2800	1500	5900	1700	2500
	10/11/01	2200	3400		3300	2700	2700	1300	7000	1400	2400
	06/06/02	2100	3400		3200	3100	2800	1500	5300	2600	2400
	10/18/02	2000	3500		3300	3200	2600	1500	5100	1400	<
	04/24/03	2100	3400		3200	3200	2700	1800	3700	1600	2400
	10/14/03	2000	3400		3100	3300	2700	1900	3900	1500	2500
	04/20/04	2000	3400		3200	3100	2500	1900	3900	4600	2300
	11/18/04	2300	3800		3600	3500	2800	1800	4300	1800	2200
	04/22/05	2000	3200		3100	3000	2800	2000	2800	1700	2200
	10/14/05	1800	3200		3100	3000	2700	1800	2000	4200	2200
	05/05/06	1800	3200		3100	3000	2800	1800	1900	1800	2400
	10/23/06	1800	3300		3200	3100	2800	1900	3500	1800	2400
	04/12/07	1600	2900		2900	2600	2500	1900	2800	1500	2300
	09/28/07	1800	3700		3500	3000	2700	2200	4200	1700	2300
	04/08/08	1500	2900		3000	2800	2500	2200	3300	1600	2100
	10/08/08	2000	3400		3200	2900	2500	2200	4200	2300	2600
	04/29/09	2100	3800		3900	4000	3200	3000	4600	7400	3000
	% detects	100	100		100	97	100	100	100	100	96
	Coeff. of Var(s.d./mean)	0.117	0.073		0.124	0.211	0.098	0.288	0.282	0.490	0.208
Thallium	05/25/90										
	06/04/92										
	09/30/92										
	04/28/93										
	12/03/93	< 0.0050			< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	
	01/07/94	< 0.0050			< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	
	02/04/94	< 0.0050			< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	
	03/10/94	< 0.0050			< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	
	04/19/94	< 0.0050			< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	
	05/31/94	< 0.0050	< 0.0050	(10/9/95)	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	
	06/22/94	< 0.0050	< 0.0050	(11/8/95)	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	
	07/27/94	< 0.0050	< 0.0050	(12/11/95)	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	
	10/10/94	< 0.0050	< 0.0050	(1/2/96)	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	
	06/13/95	< 0.0050	< 0.0050	(4/29/96)	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	
	10/04/95	< 0.0050	< 0.5000	(6/10/96)	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	
	04/29/96	< 0.0020	< 0.0020	(7/2/96)	< 0.0020	< 0.0020	< 0.0020	< 0.0020	< 0.0020	< 0.0020	< 0.0020
	11/08/96	< 0.0010	< 0.0010	(11/8/96)	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
	05/09/97	< 0.0010	< 0.0010		< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
	10/21/97	< 0.0010	< 0.0010		< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
	05/04/98	< 0.0010	< 0.0010		< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
	10/07/98	< 0.0010	< 0.0010		< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
	05/27/99	< 0.0010	< 0.0010		< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
	10/13/99	< 0.0010	< 0.0010		< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
	04/17/00	< 0.0010	< 0.0010		< 0.0010	<	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
	10/19/00	< 0.0012	< 0.0010		< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
	04/27/01	< 0.0010	< 0.0010		< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
	10/11/01	< 0.0010	< 0.0010		< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
	06/06/02	< 0.0010	< 0.0010		< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
	10/18/02	< 0.0020	< 0.0020		< 0.0020	< 0.0020	< 0.0020	< 0.0020	< 0.0020	< 0.0020	<
	04/24/03	< 0.0020	< 0.0020		< 0.0020	< 0.0020	< 0.0020	< 0.0020	< 0.0020	< 0.0020	< 0.0020
	10/14/03	< 0.0020	< 0.0020		< 0.0020	< 0.0020	< 0.0020	< 0.0020	< 0.0020	< 0.0020	< 0.0020
	04/20/04	< 0.0020	< 0.0020		< 0.0020	< 0.0020	< 0.0020	< 0.0020	< 0.0020	< 0.0020	< 0.0020
	11/18/04	< 0.0010	< 0.0010		< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
	04/22/05	< 0.0010	0.0027		0.0010	< 0.0010	< 0.0010	0.0024	< 0.0010	< 0.0010	< 0.0010
	10/14/05	< 0.0010	< 0.0010		< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
	05/05/06	< 0.0010	< 0.0010		< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
	10/23/06	< 0.0010	< 0.0010		< 0.0010	< 0.0010	< 0.0010	< 0.0100	< 0.0010	< 0.0010	< 0.0010
	04/12/07	< 0.0010	< 0.0010		< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
	09/28/07	< 0.0010	< 0.0010		< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
	04/08/08	< 0.00040	0.0013		< 0.00040	< 0.00040	< 0.00040	< 0.00040	< 0.00040	< 0.00040	< 0.00040
	10/08/08	< 0.00040	< 0.00040		< 0.00040	< 0.00040	< 0.00040	< 0.00040	< 0.00040	< 0.00040	< 0.00040
	04/29/09	< 0.00040	< 0.00040		< 0.00040	< 0.00040	< 0.00040	< 0.00040	< 0.00040	< 0.00040	< 0.00040
	% detects	0	6		3	0	0	3	0	0	0
	Coeff. of Var(s.d./mean)	ND	ND		ND	ND	ND	ND	ND	ND	ND

TABLE 3
SUMMARY OF ANALYTICAL RESULTS (mg/L)
May 1990 through April 2009

		DOWNGRADIENT WELLS [1]						UPGRADIENT WELLS			
ANALYTE	DATE	MW-4A (1A(1))	MW-5A		MW-6A (E-26)	MW-7A (E-25)	MW-8A (E27)	MW-1A (ET-O)	MW-2A (EE(E))	MW-3A (2)	F
	05/25/90										
	06/04/92										
	09/30/92										
	04/28/93										
	12/03/93	0.0240			0.0050	0.0360	0.0310	0.0090	0.0380	0.0130	
	01/07/94	0.0190			0.0270	0.0260	0.0180	0.0090	0.0270	<0.005	
	02/04/94	0.0130			0.0200	0.0190	0.0180	0.0060	0.0070	0.0260	
	03/10/94	0.0080			0.0120	0.0150	0.0100	< 0.0050	0.0240	0.0170	
	04/19/94	0.0110			0.0140	0.0160	0.0120	< 0.0050	0.0260	0.0270	
	05/31/94	0.0120	0.0100	(10/9/95)	0.0200	0.0190	0.0180	0.0080	0.0270	0.0130	
	06/22/94	0.0120	0.0170	(11/8/95)	0.0160	0.0180	0.0140	< 0.0050	0.0260	0.0070	
	07/27/94	< 0.0050	0.0120	(12/11/95)	0.0070	0.0080	0.0050	< 0.0050	0.0150	< 0.0050	
	10/10/94	< 0.0050	< 0.0050	(1/2/96)	0.0090	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	
	06/13/95	< 0.0050	0.0190	(4/29/96)	0.0070	0.0050	0.0070	< 0.0050	0.0110	0.0100	
	10/04/95	0.0080	0.0140	(6/10/96)	0.0190	0.0160	0.0100	< 0.0050	0.0160	0.0090	
	04/29/96	0.0100	0.0160	(7/2/96)	0.0180	0.0180	0.0120	< 0.0050	0.0230	0.0110	0.0120
	11/08/96	0.0160	0.0160	(11/8/96)	0.0130	0.0160	0.0140	< 0.0050	0.0220	< 0.0050	0.0140
	05/09/97	0.0210	0.0240		0.0200	0.0240	0.0190	< 0.0050	0.0290	0.0120	0.0100
	10/21/97	0.0060	< 0.0050		< 0.0050	< 0.0050	0.0060	0.0090	0.0100	< 0.0050	< 0.0050
	05/04/98	0.0120	< 0.0050		< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	0.0130	< 0.0050
	10/07/98	0.0160	0.0170		0.0150	0.0250	0.0260	0.0110	0.0170	0.0160	0.0260
Vanadium	05/27/99	0.0120	0.0240		0.0200	0.0220	0.0170	0.0050	0.0170	0.0160	0.0110
	10/13/99	0.0110	0.0160		0.0130	0.0140	0.0120	< 0.0050	0.0160	0.0080	0.0110
	04/17/00	< 0.0050	< 0.0050		< 0.0050	<	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
	10/19/00	0.0120	0.0250		0.0250	0.0250	0.0200	0.0100	0.0140	0.0110	0.0200
	04/27/01	< 0.0050	< 0.0050		< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
	10/11/01	< 0.0050	< 0.0050		< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
	06/06/02	< 0.0050	< 0.0050		< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
	10/18/02	0.0067	< 0.0050		< 0.0050	< 0.0050	< 0.0050	0.0072	0.0090	< 0.0050	<
	04/24/03	0.0066	< 0.0050		< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
	10/14/03	< 0.0050	< 0.0050		< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
	04/20/04	< 0.0050	< 0.0050		< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
	11/18/04	< 0.0050	< 0.0050		< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
	04/22/05	0.0062	< 0.0050		< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
	10/14/05	< 0.0050	< 0.0050		< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
	05/05/06	< 0.0050	< 0.0050		< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
	10/23/06	< 0.0050	< 0.0050		< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
	04/12/07	< 0.0050	< 0.0050		< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
	09/28/07	< 0.0050	< 0.0050		< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
	04/08/08	< 0.0050	< 0.0050		< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
	10/08/08	< 0.0050	< 0.0050		< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
	04/29/09	< 0.0050	< 0.0050		< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
	% detects	53	36		47	45	47	24	50	42	26
	Coeff. of Var(s.d./mean)	0.540	0.638		0.614	0.661	0.644	ND	0.659	0.672	0.683
	05/25/90				0.030	0.010	0.040				
	05/28/92							< 0.005			
	06/04/92								< 0.001		< 0.001
	09/30/92								0.007		< 0.005
	11/19/92							0.031			
	04/28/93	0.029							0.040	0.031	0.027
	12/03/93	0.011			0.064	0.022	0.016	< 0.005	0.011	0.010	
	01/07/94	< 0.005			0.005	< 0.005	< 0.005	0.007	< 0.005	< 0.005	
	02/04/94	0.007			0.009	0.007	0.008	0.008	0.009	0.015	
	03/10/94	0.008			0.010	0.009	0.007	0.010	0.015	0.017	
	04/19/94	0.012			0.009	0.010	0.022	0.008	0.024	0.032	
	05/31/94	0.010	< 0.005	(10/9/95)	0.009	0.016	0.019	0.019	0.024	0.008	
	06/22/94	< 0.005	< 0.005	(11/8/95)	< 0.005	0.008	< 0.005	< 0.005	< 0.005	< 0.005	
	07/27/94	0.034	< 0.005	(12/11/95)	< 0.005	0.031	0.007	0.060	0.020	0.007	
	10/10/94	0.017	< 0.005	(1/2/96)	0.081	0.006	< 0.005	< 0.005	< 0.005	< 0.005	
	06/13/95	< 0.005	0.006	(4/29/96)	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	
	10/04/95	< 0.005	0.022	(6/10/96)	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	
	04/29/96	< 0.005	< 0.005	(7/2/96)	< 0.005	< 0.005	< 0.005	< 0.005	0.006	0.009	< 0.005
	11/08/96	< 0.005	< 0.005	(11/8/96)	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
	05/09/97	< 0.005	< 0.005		< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
	10/21/97	0.008	0.026		0.016	0.038	0.013	0.013	0.020	0.007	0.012
	05/04/98	< 0.005	0.008		< 0.005	0.006	0.008	0.006	< 0.005	< 0.005	0.009
Zinc	10/07/98	0.008	< 0.005		< 0.005	< 0.005	< 0.005	0.009	< 0.005	0.013	0.008
	05/27/99	< 0.005	< 0.005		< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
	10/13/99	< 0.005	< 0.005		0.011	0.014	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
	04/17/00	0.028	0.033		0.032	<	0.027	0.022	0.050	0.025	0.029
	10/19/00	< 0.005	< 0.005		< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
	04/27/01	< 0.005	< 0.005		< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
	10/11/01	< 0.005	< 0.005		< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
	06/06/02	0.032	0.040		0.035	0.040	0.031	0.030	0.048	0.031	0.034
	10/18/02	0.025	0.029		0.031	0.045	0.031	0.020	0.050	0.023	<
	04/24/03	0.035	0.041		0.041	0.044	0.037	0.036	0.053	0.031	0.033
	10/14/03	0.046	0.050		0.055	0.055	0.050	0.042	0.065	0.035	0.053
	04/20/04	0.060	0.080		0.075	0.099	0.077	0.056	0.084	0.091	0.072
	11/18/04	0.017	0.017		0.010	0.022	0.033	0.110	0.037	0.016	0.043
	04/22/05	< 0.010	0.019		< 0.010	0.021	0.013	0.048	0.020	< 0.010	0.016
	10/14/05	0.031	0.026		0.030	0.072	0.044	0.045	0.032	0.010	0.039
	05/05/06	0.030	0.020		0.049	0.019	0.031	0.035	0.017	0.045	0.046
	10/23/06	< 0.010	< 0.010		0.017	0.027	0.023	< 0.010	< 0.010	< 0.010	< 0.010
	04/12/07	< 0.010	< 0.010		< 0.010	< 0.010	< 0.010	< 0.010	0.023	< 0.010	< 0.010
	09/28/07	< 0.010	< 0.010		< 0.010	< 0.010	< 0.010	< 0.010	0.43	< 0.010	< 0.010
	04/08/08	0.0073	0.0093		< 0.0050	0.013	< 0.0050	0.0064	0.014	0.0057	0.0058
	10/08/08	0.0130	0.0094		0.0400	0.130	0.0097	0.0130	0.020	0.0130	0.0070
	04/29/09	0.0074	0.0059		< 0.0050	0.012	< 0.0050	0.0059	0.010	0.014	0.0098
	% detects	55	52		53	63	53	58	61	55	56
	Coeff. of Var(s.d./mean)	0.993	1.122		1.188	1.185	1.089	1.313	1.094	1.174	1.060

TABLE 3
SUMMARY OF ANALYTICAL RESULTS (mg/L)
May 1990 through April 2009

		DOWNGRADIENT WELLS [1]						UPGRADIENT WELLS			
ANALYTE	DATE	MW-4A (1A(1))	MW-5A		MW-6A (E-26)	MW-7A (E-25)	MW-8A (E27)	MW-1A (ET-O)	MW-2A (EE(E))	MW-3A (2)	F
MINERALS											
Alkalinity	05/25/90				95	60	66.000				
	05/28/92							160			
	06/04/92								126		173
	09/30/92								134		154
	11/19/92							180			
	04/28/93	170							140	200	140
	12/03/93	190			120	110	130	180	220	240	
	01/07/94	140			120	120	120	150	170	200	
	02/04/94	150			120	130	120	140	190	170	
	03/10/94	150			110	110	100	150	190	190	
	04/19/94	140			140	130	140	220	210	200	
	05/31/94	120	120	(10/9/95)	110	100	110	150	230	180	
	06/22/94	160	130	(11/8/95)	120	120	120	160	220	210	
	07/27/94	160	120	(12/11/95)	120	120	120	160	200	200	
	10/10/94	160	130	(1/2/96)	120	120	120	240	170	200	
	06/13/95	150	120	(4/29/96)	130	130	95	290	330	200	
	10/04/95	150	120	(6/10/96)	120	120	120	160	210	200	
	04/29/96	150	110	(7/2/96)	120	120	130	290	310	200	240
	11/08/96	140	130	(11/8/96)	120	120	120	200	200	200	200
	05/09/97	140	130		120	120	120	290	320	210	190
	10/21/97	150	120		120	120	120	190	210	200	160
	05/04/98	150	120		120	120	120	360	290	200	260
	10/07/98	150	130		120	130	120	250	260	190	390
	05/27/99	140	98		110	120	120	430	330	170	230
	10/13/99	140	120		120	120	110	320	290	190	170
	04/17/00	140	120		120	<	120	460	260	200	190
	10/19/00	160	130		120	160	120	480	310	210	190
	04/27/01	150	130		130	140	140	600	320	210	180
	10/11/01	160	140		130	140	130	480	280	210	160
	06/06/02	160	120		130	120	120	500	300	220	140
	10/18/02	140	130		130	120	120	540	270	200	<
	04/24/03	160	140		140	140	130	480	220	220	120
	10/14/03	160	130		120	120	120	420	220	200	120
	04/20/04	160	130		130	130	130	530	400	220	130
	11/18/04	150	120		110	120	140	470	310	200	120
	04/22/05	150	120		120	120	130	520	380	200	120
	10/14/05	170	140		130	120	130	320	230	360	140
	05/05/06	160	130		130	130	140	360	210	210	130
	10/23/06	160	120		120	120	140	430	340	210	130
	04/12/07	160	120		120	130	150	520	230	200	140
	09/28/07	160	120		120	140	140	460	220	200	160
	04/08/08	170	130		240	220	150	540	340	200	130
	10/08/08	160	120		120	120	120	440	260	200	130
	04/29/09	160	110		120	120	140	540	350	220	120
	% detects	100	100		100	97	100	100	100	100	96
	Coeff. of Var(s.d./mean)	0.081	0.073		0.063	0.091	0.083	0.463	0.228	0.071	0.358
Ammonia	05/25/90				0.730	2.170	1.920				
	05/28/92							2.100			
	06/04/92								0.840		0.060
	09/30/92								2.000		0.320
	11/19/92							1.100			
	04/28/93	1.400							1.400	1.200	0.130
	12/03/93	1.400			1.800	1.800	1.200	1.000	1.500	1.200	
	01/07/94	1.500			1.800	1.800	1.200	0.970	1.200	1.200	
	02/04/94	1.600			2.000	1.800	1.400	0.970	0.660	1.200	
	03/10/94	1.500			2.000	1.900	1.300	1.100	1.200	1.300	
	04/19/94	1.400			1.900	1.800	1.300	1.000	1.200	0.840	
	05/31/94	1.400	2.000	(10/9/95)	1.900	1.800	1.300	1.000	1.100	0.980	
	06/22/94	1.600	1.900	(11/8/95)	2.000	1.800	1.300	1.000	1.200	1.200	
	07/27/94	1.500	0.840	(12/11/95)	1.900	1.800	1.400	1.100	1.400	1.200	
	10/10/94	1.400	1.800	(1/2/96)	1.900	1.800	1.300	1.100	1.600	1.200	
	06/13/95	1.600	1.900	(4/29/96)	1.900	1.800	1.400	0.860	1.200	0.980	
	10/04/95	1.600	1.900	(6/10/96)	2.000	1.900	1.600	1.200	1.600	1.300	
	04/29/96	1.500	1.800	(7/2/96)	1.800	1.700	1.500	0.880	0.500	1.100	<0.05
	11/08/96	1.500	1.800	(11/8/96)	1.700	1.700	1.400	1.100	1.400	1.200	<0.05
	05/09/97	1.500	1.700		1.800	1.600	1.500	0.980	0.870	1.300	0.070
	10/21/97	1.600	1.900		1.800	1.700	1.500	0.950	1.400	1.300	0.460
	05/04/98	1.500	1.800		1.800	1.700	1.500	0.920	0.880	1.300	< 0.050
	10/07/98	1.600	1.800		1.600	1.800	1.800	1.300	1.600	1.700	< 0.050
	05/27/99	1.300	1.500		1.800	1.600	1.500	0.850	1.000	1.500	0.260
	10/13/99	1.700	2.000		1.900	1.800	1.600	1.200	1.500	1.600	0.620
	04/17/00	1.500	1.600		1.700	<	1.400	0.450	0.930	1.400	0.300
	10/19/00	2.900	1.700		1.700	0.860	1.400	1.400	0.780	1.300	0.390
	04/27/01	1.100	1.300		1.300	1.300	1.200	0.620	0.830	1.000	0.098
	10/11/01	1.500	1.900		1.800	1.700	1.500	1.100	1.500	1.400	0.600
	06/06/02	1.300	1.900		1.700	1.200	1.600	0.960	1.000	1.200	0.200
	10/18/02	1.400	1.900		1.700	1.600	1.500	1.200	1.500	1.500	<
	04/24/03	1.400	1.900		1.900	1.800	1.200	1.300	0.860	1.400	0.800
	10/14/03	1.300	1.700		1.700	1.600	1.200	1.100	1.100	1.500	0.750
	04/20/04	1.100	1.500		1.400	1.300	1.400	0.780	0.740	0.940	0.390
	11/18/04	1.100	1.300		1.600	1.500	1.100	0.750	0.880	1.400	0.680
	04/22/05	0.970	1.200		1.600	0.120	1.200	0.590	0.300	1.400	0.660
	10/14/05	1.300	1.500		1.800	1.600	1.200	0.710	1.600	1.500	0.780
	05/05/06	0.740	0.640		1.500	0.920	0.960	0.600	1.600	1.300	0.580
	10/23/06	1.100	1.400		1.600	1.500	1.200	0.730	1.100	1.700	0.730
	04/12/07	0.970	0.780		1.400	1.100	1.100	0.890	0.240	1.500	0.330
	09/28/07	1.1	1.6		1.5	1.6	1.2	1.2	1.0	1.6	0.84
	04/08/08	0.91	0.52		1.6	1.3	1.3	0.85	0.40	1.5	0.47
	10/08/08	1.10	1.80		1.7	1.6	1.3	1.00	1.10	1.4	0.88
	04/29/09	0.27	0.43		1.4	1.4	1.2	0.65	0.063	0.34	0.21
	% detects	100	100		100	97	100	100	100	100	89
	Coeff. of Var(s.d./mean)	0.209	0.157		0.093	0.142	0.112	0.201	0.275	0.159	0.821

TABLE 3
SUMMARY OF ANALYTICAL RESULTS (mg/L)
May 1990 through April 2009

ANALYTE	DATE	DOWNGRADIENT WELLS[1]						UPGRADIENT WELLS			
		MW-4A (1A(1))	MW-5A		MW-6A (E-26)	MW-7A (E-26)	MW-8A (E27)	MW-1A (ET-O)	MW-2A (EE(E))	MW-3A (2)	F
Bicarbonate (as CaCO3)	05/25/90				95	60	66				
	05/28/92							160			
	06/04/92								126		172.5
	09/30/92								134		153.6
	11/19/92							180			
	04/28/93	170							140	200	140
	12/03/93	190			120	110	130	180	220	240	
	01/07/94	140			120	120	120	150	170	200	
	02/04/94	150			120	130	120	140	190	170	
	03/10/94	150			110	110	100	150	190	190	
	04/19/94	140			140	130	140	220	210	200	
	05/31/94	120	120	(10/9/95)	110	100	110	150	230	180	
	06/22/94	160	130	(11/8/95)	120	120	120	160	220	210	
	07/27/94	160	120	(12/11/95)	120	120	120	160	200	200	
	10/10/94	160	130	(1/2/96)	120	120	120	240	170	200	
	06/13/95	150	120	(4/29/96)	130	130	95	290	330	200	
	10/04/95	150	120	(6/10/96)	120	120	120	160	210	200	
	04/29/96	150	110	(7/2/96)	120	120	130	290	310	200	240
	11/08/96	140	130	(11/8/96)	120	120	120	200	200	200	200
	05/09/97	140	130		120	120	120	290	320	210	190
	10/21/97	150	120		120	120	120	190	210	200	160
	05/04/98	150	120		120	120	120	360	290	200	260
	10/07/98	150	130		120	130	120	250	260	190	390
	05/27/99	140	98		110	120	120	430	330	·170	230
	10/13/99	140	120		120	120	110	320	290	190	170
	04/17/00	140	120		120	<	120	460	260	200	190
	10/19/00	160	130		120	160	120	480	310	210	190
	04/27/01	150	130		130	140	140	600	320	210	180
	10/11/01	160	140		130	140	130	480	280	210	160
	06/06/02	160	120		130	120	120	500	300	220	140
	10/18/02	140	130		130	120	120	540	270	200	<
	04/24/03	160	140		140	140	130	480	220	220	120
	10/14/03	160	130		120	120	120	420	220	200	120
	04/20/04	160	130		130	130	130	530	400	220	130
	11/18/04	180	140		140	140	170	580	380	240	150
	04/22/05	150	120		120	120	130	520	380	200	120
	10/14/05	170	140		130	120	130	320	230	360	140
	05/05/06	160	130		130	130	140	360	210	210	130
	10/23/06	160	120		120	120	140	430	340	210	130
	04/12/07	160	120		120	130	150	520	230	200	140
	09/28/07	160	120		120	140	140	460	220	200	160
	04/08/08	170	130		240	220	150	540	340	200	130
	10/08/08	160	120		120	120	120	440	260	200	130
	04/29/09	160	110		120	120	140	540	350	220	120
	% detects	100	100		100	97	100	100	100	100	96
Coeff. of Var(s.d./mean)		0.088	0.076		0.066	0.094	0.107	0.474	0.240	0.079	0.346
Carbonate (as CaCO3)	05/25/90										
	05/28/92							< 10			
	06/04/92								< 0.01		0.5
	09/30/92								0.3		0.5
	11/19/92							< 10			
	04/28/93	< 10	0						< 10		< 10
	12/03/93	< 10	0		< 10	< 10	< 10	< 10	< 10	< 10	0
	01/07/94	< 10	0		< 10	< 10	< 10	< 10	< 10	< 10	0
	02/04/94	< 10	0		< 10	< 10	< 10	< 10	< 10	< 10	0
	03/10/94	< 10	0		< 10	< 10	< 10	< 10	< 10	< 10	0
	04/19/94	< 10	0		< 10	< 10	< 10	< 10	< 10	< 10	0
	05/31/94	< 10	< 10	(10/9/95)	< 10	< 10	< 10	< 10	< 10	< 10	0
	06/22/94	< 10	< 10	(11/8/95)	< 10	< 10	< 10	< 10	< 10	< 10	0
	07/27/94	< 10	< 10	(12/11/95)	< 10	< 10	< 10	< 10	< 10	< 10	0
	10/10/94	< 10	< 10	(1/2/96)	< 10	< 10	< 10	< 10	< 10	< 10	0
	06/13/95	< 10	< 10	(4/29/96)	< 10	< 10	< 10	< 10	< 10	< 10	0
	10/04/95	< 10	< 10	(6/10/96)	< 10	< 10	< 10	< 10	< 10	< 10	0
	04/29/96	< 10	< 10	(7/2/96)	< 10	< 10	< 10	< 10	< 10	< 10	< 10
	11/08/96	< 10	< 10	(11/8/96)	< 10	< 10	< 10	< 10	< 10	< 10	< 10
	05/09/97	< 10	< 10		< 10	< 10	< 10	< 10	< 10	< 10	< 10
	10/21/97	< 10	< 10		< 10	< 10	< 10	< 10	< 10	< 10	< 10
	05/04/98	< 10	< 10		< 10	< 10	< 10	< 10	< 10	< 10	< 10
	10/07/98	< 10	< 10		< 10	< 10	< 10	< 10	< 10	< 10	< 10
	05/27/99	< 10	< 10		< 10	< 10	< 10	< 10	< 10	< 10	< 10
	10/13/99	< 10	< 10		< 10	< 10	< 10	< 10	< 10	< 10	< 10
	04/17/00	< 10	< 10		< 10	<	< 10	< 10	< 10	< 10	< 10
	10/19/00	< 10	< 10		< 10	< 10	< 10	< 10	< 10	< 10	< 10
	04/27/01	< 10	< 10		< 10	< 10	< 10	< 10	< 10	< 10	< 10
	10/11/01	< 10	< 10		< 10	< 10	< 10	< 10	< 10	< 10	< 10
	06/06/02	< 10	< 10		< 10	< 10	< 10	< 10	< 10	< 10	< 10
	10/18/02	< 10	< 10		< 10	< 10	< 10	< 10	< 10	< 10	<
	04/24/03	< 10	< 10		< 10	< 10	< 10	< 10	< 10	< 10	< 10
	10/14/03	< 10	< 10		< 10	< 10	< 10	< 10	< 10	< 10	< 10
	04/20/04	< 10	< 10		< 10	< 10	< 10	< 10	< 10	< 10	< 10
	11/18/04	< 1	< 1		< 1	< 1	< 1	< 1	< 1	< 1	< 1
	04/22/05	< 10	< 10		< 10	< 10	< 10	< 10	< 10	< 10	< 10
	10/14/05	< 10	< 10		< 10	< 10	< 10	< 10	< 10	< 10	< 10
	05/05/06	< 10	< 10		< 10	< 10	< 10	< 10	< 10	< 10	< 10
	10/23/06	< 10	< 10		< 10	< 10	< 10	< 10	< 10	< 10	< 10
	04/12/07	< 10	< 10		< 10	< 10	< 10	< 10	< 10	< 10	< 10
	09/28/07	< 10	< 10		< 10	< 10	< 10	< 10	< 10	< 10	< 10
	04/08/08	< 10	< 10		< 10	< 10	< 10	< 10	< 10	< 10	< 10
	10/08/08	< 10	< 10		< 10	< 10	< 10	< 10	< 10	< 10	< 10
	04/29/09	< 10	< 10		< 10	< 10	< 10	< 10	< 10	< 10	< 10
	% detects	0	0		0	0	0	0	0	0	0
Coeff. of Var(s.d./mean)		ND	ND		ND	ND	ND	ND	ND	ND	ND

TABLE 3
SUMMARY OF ANALYTICAL RESULTS (mg/L)
May 1990 through April 2009

		DOWNGRADIENT WELLS [1]					UPGRADIENT WELLS			
ANALYTE	DATE	MW-4A (1A(1))	MW-5A	MW-6A (E-26)	MW-7A (E-25)	MW-8A (E27)	MW-1A (ET-O)	MW-2A (EE(E))	MW-3A (2)	F
	05/25/90			2670	6580	5280				
	05/28/92						1900			
	06/04/92							6875		5340
	09/30/92							7080		5180
	11/19/92						1700			
	04/28/93	4600						8600	2800	5100
	12/03/93	4100		6700	6400	4800	1500	6400	2700	
	01/07/94	4100		6100	6600	4500	1600	7300	2300	
	02/04/94	3400		5400	6100	4300	1500	2300	7900	
	03/10/94	4800		7300	7300	4700	1400	13000	4100	
	04/19/94	4000		6600	6400	4500	1800	15000	7900	
	05/31/94	3900	6300 (10/9/95)	6400	6400	4500	1500	10000	3600	
	06/22/94	3800	6600 (11/8/95)	6600	6700	4900	1500	11000	2900	
	07/27/94	4300	6400 (12/11/95)	6400	6600	4800	1500	10000	3900	
	10/10/94	3800	6500 (1/2/96)	6600	6600	4600	1400	8200	2200	
	06/13/95	4000	7400 (4/29/96)	6200	6300	5100	2100	9400	5700	
	10/04/95	3900	7000 (6/10/96)	6200	6200	5000	1500	8300	3800	
	04/29/96	5000	7700 (7/2/96)	7400	7300	6100	3100	9400	5200	6300
	11/08/96	4600	6800 (11/8/96)	7000	6800	5800	2700	14000	2600	5600
	05/09/97	4900	7200	7000	7100	5900	3200	11000	3800	5300
	10/21/97	4500	7000	7000	7000	5700	2100	13000	2600	5100
	05/04/98	4600	7600	7500	6700	5500	3100	7200	3600	6000
Chloride	10/07/98	4700	7500	6900	6900	6000	3900	12000	3900	2800
	05/27/99	3700	7500	6400	6500	5500	3400	9900	4600	4100
	10/13/99	3500	5800	6000	6000	5000	2600	14000	2300	4900
	04/17/00	5000	7300	6100	<	6700	3600	12000	3500	6000
	10/19/00	4200	7000	6500	1900	5600	2700	15000	2400	4700
	04/27/01	5600	8900	8200	7400	7000	2900	18000	4000	5900
	10/11/01	5700	9200	8600	7400	8500	4400	17000	3800	6500
	06/06/02	4100	6400	6600	7000	5200	2800	9400	4700	4300
	10/18/02	3700	5700	5500	5500	5700	2000	9500	2600	<
	04/24/03	4200	7000	7100	6400	5200	2800	6900	2600	5000
	10/14/03	3600	6400	6100	6300	5100	3300	6500	2500	5100
	04/20/04	4000	7000	6800	6500	5800	3400	6700	8300	5200
	11/18/04	4900	7800	6400	7400	4400	2600	9500	3900	4600
	04/22/05	3700	7000	7300	7500	5400	3000	4200	2700	5300
	10/14/05	3300	5800	6200	5800	5400	2700	3300	7200	4400
	05/05/06	3500	6700	4400	5600	5300	2600	3100	3000	4500
	10/23/06	3200	6500	6800	6600	5900	3100	6100	3300	5100
	04/12/07	3400	6900	6800	6400	6500	4800	6300	3500	5100
	09/28/07	3000	6100	4800	5200	4500	3100	6000	2800	4000
	04/08/08	3400	6800	5500	4900	4300	900	5900	3400	4600
	10/08/08	3200	6800	6600	6600	5300	3900	7400	4600	5300
	04/29/09	3200	6700	6400	6200	5500	3900	6500	12000	5400
	% detects	100	100	100	97	100	100	100	100	96
	Coeff. of Var(s.d./mean)	0.138	0.117	0.104	0.156	0.167	0.349	0.338	0.428	0.177
	06/04/92									225
	09/30/92									35
	04/28/93									< 5.0
	05/09/97	< 5.0	100	120	99	45	< 5.0	250	31	< 5.0
	10/21/97	100.0	260	240	230	150	88.0	520	70	120
	05/05/98	160	360	290	390	230	140	330	140	260
	10/07/98	38	120	110	110	89	40	88	34	62
	05/28/99	130	99	150	100	740	120	< 5	54	790
	10/13/99	52	400	97	93	100	34	1500	29	110
	04/17/00	680	960	2600	<	1500	630	2800	300	1400
	10/19/00	1000	1100	1400	250	1400	150	3000	110	540
	04/27/01	130	360	300	440	390	95	1600	96	130
	10/11/01	170	440	390	310	76	43	1000	100	45
	06/06/02	89	310	300	280	280	67	770	110	< 10
COD	10/18/02	40	560	300	280	71	35	940	19	<
	04/24/03	150	360	310	330	60	110	330	110	35
	10/14/03	36	120	120	110	70	33	360	28	78
	04/20/04	38	97	120	120	83	38	330	520	70
	11/18/04	15	130	120	140	69	24	140	20	54
	04/22/05	40	160	150	140	120	38	40	18	54
	10/14/05	40	92	120	220	80	48	28	460	65
	05/05/06	52	120	130	110	90	57	89	29	190
	10/23/06	37	120	100	86	73	42	89	36	76
	04/12/07	42	99	95	75	69	52	95	49	56
	09/28/07	15	110	120	100	100	38	380	13	76
	04/08/08	31	320	110	140	83	33	340	35	78
	10/08/08	54	130	130	110	42	40	120	29	51
	04/29/09	16	120	97	110	110	44	120	810	120
	% detects	96	100	100	96	100	96	96	100	88
	Coeff. of Var(s.d./mean)	1.528	0.828	1.506	0.534	1.407	1.426	1.057	1.171	1.563

TABLE 3
SUMMARY OF ANALYTICAL RESULTS (mg/L)
May 1990 through April 2009

ANALYTE	DATE	DOWNGRADIENT WELLS[1] MW-4A (1A(1))	MW-5A		MW-6A (E-26)	MW-7A (E-25)	MW-8A (E27)	UPGRADIENT WELLS MW-1A (ET-O)	MW-2A (EE(E))	MW-3A (2)	F
Nitrate	05/25/90				3.000	< 1.000	<				
	05/28/92							< 0.010			
	06/04/92								< 0.100		< 0.100
	09/30/92								< 0.100		< 0.100
	11/19/92							< 0.010			
	04/28/93	0.240							0.240	0.110	0.180
	12/03/93	< 0.010			< 0.010	< 0.010	< 0.010	< 0.010	0.090	< 0.010	
	01/07/94	0.040			0.020	< 0.010	0.030	0.020	< 0.010	0.020	
	02/04/94	0.040			< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	
	03/10/94	0.020			< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	
	04/19/94	0.020			< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	
	05/31/94	< 0.010	0.020	(10/9/95)	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	
	06/22/94	< 0.010	< 0.010	(11/8/95)	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	
	07/27/94	0.030	0.760	(12/11/95)	< 0.010	< 0.010	0.030	< 0.010	0.030	< 0.010	
	10/10/94	0.020	< 0.010	(1/2/96)	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	
	06/13/95	< 0.010	0.020	(4/29/96)	< 0.010	< 0.010	< 0.010	< 0.010	0.180	< 0.010	
	10/04/95	0.020	0.020	(6/10/96)	0.030	0.030	0.030	0.020	0.020	0.030	
	04/29/96	0.030	0.020	(7/2/96)	< 0.010	< 0.010	0.020	< 0.010	0.220	0.020	0.250
	11/08/96	0.020	0.010	(11/8/96)	0.030	0.020	< 0.010	0.020	0.060	0.020	0.030
	05/09/97	0.020	0.020		< 0.010	< 0.010	< 0.010	0.020	0.800	< 0.010	0.050
	10/21/97	0.030	0.010		0.020	0.020	0.030	0.020	0.150	0.030	0.020
	05/04/98	0.030	0.040		0.340	0.020	0.010	0.030	0.060	0.040	3.200
	10/07/98	< 0.010	< 0.010		0.010	< 0.010	< 0.010	< 0.010	0.020	< 0.010	0.620
	05/27/99	0.020	0.060		0.020	< 0.010	< 0.010	< 0.010	0.010	0.120	0.170
	10/13/99	0.010	0.020		0.050	0.020	0.030	< 0.010	0.050	< 0.010	0.070
	04/17/00	0.093	0.056		0.110	<	0.018	0.490	0.068	0.052	0.130
	10/19/00	0.100	0.099		0.190	0.080	0.140	0.092	< 0.010	0.072	0.260
	04/27/01	0.034	0.017		0.070	0.140	0.030	< 0.010	0.071	0.027	0.340
	10/11/01	0.020	0.022		0.013	0.014	< 0.010	< 0.010	0.029	0.022	0.016
	06/06/02	0.050	< 0.010		< 0.010	0.160	0.020	0.060	0.100	0.030	0.300
	10/18/02	< 0.010	< 0.010		< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	<
	04/24/03	< 0.010	< 0.010		< 0.010	0.020	0.030	< 0.010	< 0.010	< 0.010	0.090
	10/14/03	< 0.010	0.040		< 0.010	< 0.010	0.013	0.010	0.020	< 0.010	0.060
	04/20/04	0.170	0.100		0.230	0.020	< 0.010	0.020	0.270	0.080	0.240
	11/18/04	0.093	0.140		0.063	0.053	< 0.010	< 0.010	0.100	0.082	0.120
	04/22/05	0.150	0.130		0.018	1.100	< 0.010	0.011	0.016	0.120	0.120
	10/14/05	0.067	0.075		< 0.010	0.010	0.017	< 0.010	< 0.010	< 0.010	0.100
	05/05/06	0.200	0.130		< 0.010	0.092	< 0.010	0.110	0.043	0.110	0.160
	10/23/06	0.053	0.170		0.010	0.022	< 0.010	0.023	0.046	< 0.010	0.160
	04/12/07	0.052	0.190		< 0.010	0.280	< 0.010	0.085	0.320	0.051	< 0.010
	09/28/07	< 0.010	0.039		0.025	0.035	0.013	< 0.010	0.064	0.017	0.120
	04/08/08	0.095	0.31		< 0.010	< 0.010	< 0.010	0.051	0.19	0.026	0.29
	10/08/08	< 0.010	< 0.010		< 0.010	< 0.010	< 0.010	< 0.010	0.01	< 0.010	0.10
	04/29/09	0.42	0.40		0.038	< 0.010	0.017	0.036	0.19	0.21	0.45
	% detects	74	79		47	47	42	45	71	53	93
	Coeff. of Var(s.d./mean)	1.064	2.381		1.681	1.406	1.204	2.642	1.820	1.019	2.169
Nitrite	05/25/90										
	05/28/92							< 0.010			
	06/04/92								0.050		0.050
	09/30/92								0.020		< 0.010
	11/19/92							< 0.010			
	04/28/93	< 0.010							< 0.010	< 0.010	< 0.010
	12/03/93	< 0.010			< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	
	01/07/94	0.010			< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	
	02/04/94	< 0.010			< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	
	03/10/94	< 0.010			< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	
	04/19/94	< 0.010			< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	
	05/31/94	< 0.010	< 0.010	(10/9/95)	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	
	06/22/94	< 0.010	< 0.010	(11/8/95)	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	
	07/27/94	< 0.010	< 0.010	(12/11/95)	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	
	10/10/94	0.010	0.010	(1/2/96)	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	
	06/13/95	< 0.010	< 0.010	(4/29/96)	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	
	10/04/95	0.020	< 0.010	(6/10/96)	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	
	04/29/96	< 0.010	< 0.010	(7/2/96)	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
	11/08/96	0.020	0.020	(11/8/96)	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	0.020	< 0.010
	05/09/97	0.010	< 0.010		< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
	10/21/97	0.020	0.010		< 0.010	< 0.010	< 0.010	< 0.010	0.040	< 0.010	< 0.010
	05/04/98	0.030	0.010		0.020	< 0.010	0.020	< 0.010	< 0.010	0.010	< 0.010
	10/07/98	0.040	0.030		0.020	0.010	0.040	0.020	0.040	0.070	0.090
	05/27/99	0.020	< 0.010		< 0.010	0.020	0.040	0.010	0.090	< 0.010	< 0.010
	10/13/99	0.020	0.010		0.030	0.010	0.010	< 0.010	< 0.010	0.030	0.020
	04/17/00	0.028	0.075		< 0.010	<	< 0.010	< 0.010	0.021	0.094	< 0.010
	10/19/00	< 0.010	< 0.010		< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
	04/27/01	< 0.010	< 0.010		< 0.010	< 0.010	< 0.010	0.010	< 0.010	< 0.010	< 0.010
	10/11/01	0.015	0.012		< 0.010	< 0.010	0.015	< 0.010	< 0.010	< 0.010	0.022
	06/06/02	< 0.010	< 0.010		< 0.010	0.010	< 0.010	< 0.010	< 0.010	< 0.010	0.012
	10/18/02	< 0.010	< 0.010		< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	<
	04/24/03	< 0.010	< 0.010		< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	0.010
	10/14/03	< 0.010	< 0.010		< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	0.600	0.060
	04/20/04	< 0.010	< 0.010		< 0.010	0.010	0.023	0.010	< 0.010	< 0.010	0.052
	11/18/04	< 0.010	< 0.010		< 0.010	0.010	0.065	0.034	< 0.010	< 0.010	0.083
	04/22/05	1.500	< 0.010		< 0.010	< 0.010	0.043	0.040	0.011	< 0.010	0.029
	10/14/05	< 0.010	0.018		0.016	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	0.013
	05/05/06	< 0.010	< 0.010		0.014	< 0.010	0.120	< 0.010	0.011	0.018	0.029
	10/23/06	< 0.010	< 0.010		0.026	< 0.010	0.067	0.019	< 0.010	< 0.010	0.019
	04/12/07	0.015	< 0.010		0.030	< 0.010	0.026	0.013	< 0.010	0.014	0.047
	09/28/07	< 0.010	< 0.010		0.017	< 0.010	0.099	< 0.010	< 0.010	< 0.010	0.016
	04/08/08	< 0.010	< 0.010		< 0.010	< 0.010	0.012	< 0.010	< 0.010	0.012	0.037
	10/08/08	< 0.010	< 0.010		< 0.010	0.010	0.015	< 0.010	< 0.010	< 0.010	0.029
	04/29/09	< 0.010	0.015		< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	0.078
	% detects	37	30		21	18	37	21	16	24	63
	Coeff. of Var(s.d./mean)	0.535	0.978		ND	ND	0.841	ND	ND	ND	1.060

TABLE 3
SUMMARY OF ANALYTICAL RESULTS (mg/L)
May 1990 through April 2009

		DOWNGRADIENT WELLS [1]						UPGRADIENT WELLS			
ANALYTE	DATE	MW-4A (1A(1))	MW-5A		MW-6A (E-26)	MW-7A (E-25)	MW-8A (E27)	MW-1A (ET-O)	MW-2A (EE(E))	MW-3A (2)	F
	05/25/90				< 0.010	< 0.010	< 0.010				
	05/28/92							< 0.050			
	06/04/92								< 0.020		< 0.020
	09/30/92								0.180		0.610
	11/19/92							< 0.050			
	04/28/93	< 0.050							< 0.050	< 0.050	< 0.050
	12/03/93	< 0.050				< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	
	01/07/94										
	02/04/94										
	03/10/94										
	04/19/94	< 0.050			< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	
	05/31/94		< 0.050	(10/9/95)							
	06/22/94		< 0.050	(11/8/95)							
	07/27/94			(12/11/95)							
	10/10/94	< 0.050		(1/2/96)	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	
	06/13/95	< 0.050		(4/29/96)	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	
	10/04/95	< 0.050		(6/10/96)	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	
	04/29/96	< 0.050		(7/2/96)	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050
	11/08/96	< 0.050	< 0.050	(11/8/96)	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050
	05/09/97	< 0.050	< 0.050		< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050
	10/21/97	< 0.050	< 0.050		< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050
	05/04/98	< 0.050	< 0.050		< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050
Phenolics	10/07/98	< 0.050	< 0.050		< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.010	< 0.050
	05/27/99	< 0.050	< 0.050		< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050
	10/13/99	< 0.050	< 0.050		< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050
	04/17/00	< 0.050	< 0.050		< 0.050	<	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050
	10/19/00	0.330	0.260		< 0.050	< 0.050	0.250	0.052	< 0.050	< 0.050	0.220
	04/27/01	< 0.050	< 0.050		0.410	0.070	< 0.050	< 0.047	0.060	< 0.050	< 0.052
	10/11/01	< 0.050	< 0.050		< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050
	06/06/02	< 0.050	< 0.050		< 0.050	0.078	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050
	10/18/02	< 0.050	< 0.050		< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	<
	04/24/03	< 0.050	< 0.050		< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050
	10/14/03	< 0.050	< 0.050		< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050
	04/20/04	< 0.050	< 0.050		0.095	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050
	11/18/04	< 0.050	< 0.050		< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050
	04/22/05	< 0.050	0.140		< 0.050	0.056	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050
	10/14/05	< 0.050	< 0.050		< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050
	05/05/06	0.120	0.070		< 0.050	0.130	0.077	0.090	< 0.050	0.070	< 0.050
	10/23/06	< 0.050	< 0.050		< 0.050	< 0.050	0.060	< 0.050	0.063	< 0.050	< 0.050
	04/12/07	< 0.050	< 0.050		< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050
	09/28/07	< 0.050	< 0.050		< 0.050	< 0.050	0.069	< 0.050	< 0.050	< 0.050	< 0.050
	04/08/08	< 0.050	0.074		< 0.050	< 0.050	0.069	< 0.050	< 0.050	0.051	< 0.050
	10/08/08	0.057	< 0.050		< 0.050	< 0.050	< 0.050	0.050	< 0.050	< 0.050	< 0.050
	04/29/09	< 0.050	< 0.050		< 0.050	< 0.050	< 0.050	< 0.050	0.062	< 0.050	0.053
	% detects	24	15		24	26	29	24	24	21	7
Coeff. of Var(s.d./mean)		ND	ND		ND	0.137	0.710	ND	ND	ND	ND
	05/25/90				198	346	248				
	05/28/92							66			
	06/04/92								360		475
	09/30/92								358		533
	11/19/92							180			
	04/28/93	300							680	290	510
	12/03/93	230			480	430	350	160	700	200	
	01/07/94	330			400	450	360	150	680	170	
	02/04/94	340			400	390	330	130	360	900	
	03/10/94	230			360	340	280	130	1200	830	
	04/19/94	290			430	390	340	330	3400	2600	
	05/31/94	300	350	(10/9/95)	450	450	350	190	1800	880	
	06/22/94	300	430	(11/8/95)	400	450	310	150	1600	580	
	07/27/94	260	450	(12/11/95)	350	400	350	150	1200	900	
	10/10/94	350	430	(1/2/96)	450	450	450	160	880	200	
	06/13/95	350	480	(4/29/96)	430	400	400	480	1600	1800	
	10/04/95	330	210	(6/10/96)	350	380	380	140	1100	730	
	04/29/96	350	380	(7/2/96)	430	430	380	550	2600	890	1300
	11/08/96	160	210	(11/8/96)	230	260	180	220	1100	95	460
	05/09/97	230	280		310	310	280	350	1600	430	600
	10/21/97	240	330		300	300	290	180	1600	200	550
	05/04/98	300	430		450	430	380	700	1500	630	1500
Sulfate	10/07/98	300	350		330	330	330	380	1700	350	750
	05/27/99	300	350		350	380	330	750	2000	700	630
	10/13/99	300	380		350	350	330	580	2300	280	600
	04/17/00	280	380		350	<	320	620	2200	250	720
	10/19/00	240	320		320	150	600	580	2200	220	560
	04/27/01	240	300		300	300	340	520	2500	420	520
	10/11/01	260	410		400	320	380	500	2200	250	550
	06/06/02	270	350		390	340	250	420	1800	750	380
	10/18/02	250	420		340	340	300	600	1,600	300	<
	04/24/03	260	380		380	380	320	680	1,000	380	350
	10/14/03	250	380		360	310	310	700	1,100	370	370
	04/20/04	180	300		240	240	220	550	1600	2000	270
	11/18/04	260	360		360	320	360	570	1400	480	290
	04/22/05	280	450		440	400	370	450	1500	480	340
	10/14/05	240	350		290	350	340	450	640	1300	220
	05/05/06	240	360		340	300	330	620	540	590	270
	10/23/06	240	400		380	360	360	660	1300	360	310
	04/12/07	230	360		350	310	330	760	850	600	280
	09/28/07	230	360		340	330	350	690	940	620	280
	04/08/08	240	370		350	300	310	260	1700	620	300
	10/08/08	250	390		380	370	330	660	1300	890	310
	04/29/09	250	370		360	330	330	780	2600	3700	310
	% detects	100	100		100	97	100	100	100	100	96
Coeff. of Var(s.d./mean)		0.173	0.189		0.165	0.201	0.219	0.535	0.424	0.907	0.539

TABLE 3
SUMMARY OF ANALYTICAL RESULTS (mg/L)
May 1990 through April 2009

		DOWNGRADIENT WELLS [1]						UPGRADIENT WELLS			
ANALYTE	DATE	MW-4A (1A(1))	MW-5A		MW-6A (E-26)	MW-7A (E-25)	MW-8A (E27)	MW-1A (ET-O)	MW-2A (EE(E))	MW-3A (2)	F'
	05/28/92				5910	12900	9300				
	06/04/92							3000			9440
	09/30/92								12478		9320
	11/19/92								12500		
	04/28/93	8500							16000	5500	8900
	12/03/93	8100			13000	13000	9500	3300	15000	5100	
	01/07/94	8600			13000	13000	9500	3400	16000	5000	
	03/10/94	7500			12000	12000	9100	3200	18000	8600	
	04/19/94	7800			13000	12000	9300	3700	20000	18000	
	05/31/94	7600	12000	(10/9/95)	12000	12000	9100	3100	21000	7600	
	06/22/94	7400	12000	(11/8/95)	12000	12000	9000	3300	20000	5800	
	07/27/94	8600	11000	(12/11/95)	13000	13000	9800	3400	21000	8500	
	10/10/94	7400	12000	(1/2/96)	13000	12000	9200	3100	16000	4500	
	06/13/95	8200	13000	(4/29/96)	12000	13000	10000	4600	20000	12000	
	10/04/95	7700	14000	(6/10/96)	12000	12000	9900	3100	17000	8300	
	04/29/96	8300	13000	(7/2/96)	13000	12000	11000	5200	21000	8500	12000
	11/08/96	8400	13000	(11/8/96)	12000	12000	10000	5300	25000	4500	10000
	05/09/97	8100	13000		12000	12000	10000	6000	21000	6900	10000
	10/21/97	8000	13000		12000	12000	10000	4300	25000	4600	9400
	05/04/98	7900	13000		12000	12000	9600	6500	13000	7100	11000
TDS	10/07/98	7700	12000		11000	12000	10000	7100	20000	6600	5700
	05/27/99	8300	12000		12000	12000	11000	6700	19000	9300	8900
	10/13/99	8500	13000		11000	12000	10000	6200	29000	5000	10000
	04/17/00	8500	11000		10000	<	9600	5800	20000	4500	9300
	10/19/00	8200	11000		11000	4400	11000	5800	29000	4400	8000
	04/27/01	8900	13000		13000	13000	12000	5600	31000	7000	9200
	10/11/01	7900	15000		13000	12000	11000	5900	32000	5000	9400
	06/06/02	8800	11000		11000	10000	9200	5900	18000	9600	1100
	10/18/02	7900	13000		13000	12000	10000	6600	20000	5400	<
	04/24/03	8100	13000		13000	13000	11000	6600	14000	5300	11000
	10/14/03	7600	16000		16000	14000	13000	7400	16000	5600	12000
	04/20/04	7900	15000		15000	13000	12000	7700	13000	19000	10000
	11/18/04	7000	13000		13000	12000	9900	5400	13000	5700	8800
	04/22/05	6600	13000		12000	12000	12000	6600	5800	6700	8700
	10/14/05	6700	13000		12000	12000	10000	6800	7300	15000	9300
	05/05/06	6400	12000		11000	12000	10000	5700	6200	5400	9200
	10/23/06	6100	11000		11000	11000	9800	6000	12000	6200	8600
	04/12/07	6000	12000		11000	11000	9600	8100	11000	6700	8900
	09/28/07	6300	12000		12000	11000	9000	7500	13000	6600	8700
	04/08/08	6100	12000		10000	11000	9500	7600	14000	7200	9200
	10/08/08	5800	11000		11000	11000	10000	8000	14000	9200	9400
	04/29/09	5800	13000		12000	12000	9000	8000	14000	24000	11000
	% detects	97	97		97	95	97	97	97	97	93
	Coeff. of Var(s.d./mean)	0.056	0.100		0.095	0.137	0.097	0.299	0.299	0.527	0.279
	05/25/90				2.4	1.2	0.6				
	05/28/92							30.0			
	06/04/92								0.5		1.3
	09/30/92								0.4		1.2
	11/19/92							< 1.0			
	04/28/93	5.1							10.0	8.0	< 1.0
	12/03/93	< 1.0			< 1.0	< 1.0	< 1.0	1.0	< 1.0	< 1.0	
	01/07/94	< 1.0			< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	
	02/04/94	< 1.0			< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	
	03/10/94	< 1.0			< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	1.3	
	04/19/94	< 1.0			< 1.0	< 1.0	< 1.0	1.7	< 1.0	1.5	
	05/31/94	< 1.0	< 1.0	(10/9/95)	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	
	06/22/94	< 1.0	< 1.0	(11/8/95)	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	
	07/27/94	< 1.0	< 1.0	(12/11/95)	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	
	10/10/94	< 1.0	< 1.0	(1/2/96)	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	
	06/13/95	< 1.0	< 1.0	(4/29/96)	< 1.0	< 1.0	< 1.0	2.8	2.7	1.8	
	10/04/95	< 1.0	< 1.0	(6/10/96)	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	
	04/29/96	< 1.0	< 1.0	(7/2/96)	< 1.0	< 1.0	< 1.0	1.0	8.0	< 1.0	4.1
	11/08/96	< 1.0	< 1.0	(11/8/96)	50.0	2.0	< 1.0	2.3	< 1.0	< 1.0	3.2
	05/09/97	< 1.0	< 1.0		1.2	1.4	< 1.0	2.6	3.8	< 1.0	3.9
	10/21/97	< 1.0	< 1.0		< 1.0	< 1.0	< 1.0	< 1.0	2.4	< 1.0	1.9
	05/04/98	< 1.0	< 1.0		< 1.0	< 1.0	< 1.0	6.0	40.7	< 1.0	2.1
TOC	10/07/98	< 1.0	< 1.0		< 1.0	< 1.0	< 1.0	1.4	3.5	< 1.0	18.0
	05/27/99	1.0	2***		< 1***	1***	4***	13***	6***	2***	5.0
	10/13/99	10.0	2.0		15.0	2.0	< 1.0	6.0	5.0	1.0	4.0
	04/17/00	< 1.0	1.8		2.5	1.4	< 1.0	5.4	3.6	< 1.0	3.1
	10/19/00	< 1.0	< 1.0		< 1.0	< 1.0	< 1.0	1.1	< 1.0	< 1.0	2.0
	04/27/01	1.2	< 1.0		< 1.0	1.7	1.4	9.3	9.3	1.2	3.1
	10/11/01	5.8	< 1.0		< 1.0	1.5	< 1.0	2.9	2.2	6.4	5.9
	06/06/02	7.5	< 1.0		< 1.0	< 1.0	< 1.0	1.2	5.7	7.0	1.3
	10/18/02	4.1	1.1		< 1.0	1.1	< 1.0	4.6	2.6	< 1.0	<
	04/24/03	7.6	1.9		1.9	1.9	1.2	9.1	7.3	9.0	1.2
	10/14/03	2.8	< 1.0		< 1.0	< 1.0	1.9	14.0	13.0	10.0	1.8
	04/20/04	4.2	1.5		< 1.0	2.8	< 1.0	12.0	6.5	8.9	3.9
	11/18/04	1.1	< 1.0		< 1.0	< 1.0	< 1.0	2.9	3.3	< 1.0	< 1.0
	04/22/05	< 1.0	< 1.0		< 1.0	< 1.0	< 1.0	8.4	4.4	1.3	1.1
	10/14/05	< 1.0	< 1.0		< 1.0	3.3	1.8	6.8	2.1	3.7	1.0
	05/05/06	< 1.0	< 1.0		1.1	< 1.0	1.6	14.0	1.7	2.2	< 1.0
	10/23/06	< 1.0	1.1		< 1.0	< 1.0	1.0	6.6	2.5	1.6	1.8
	04/12/07	4.8	< 1.0		< 1.0	< 1.0	1.1	6.2	< 1.0	1.6	< 1.0
	09/28/07	< 1.0	< 1.0		< 1.0	< 1.0	1.1	3.9	1.1	1.3	1.6
	04/08/08	26	21		29	33	33	110	54.0	33	22
	10/08/08	1.1	1.9		1.5	1.6	2.4	6.2	3.0	3.2	2.3
	04/29/09	1.1	< 1.0		< 1.0	1.1	< 1.0	7.4	< 1.0	6.1	< 1.0
	% detects	34	24		18	34	26	74	61	50	78
	Coeff. of Var(s.d./mean)	1.071	ND		ND	0.415	0.263	1.090	1.597	1.209	1.013

TABLE 3
SUMMARY OF ANALYTICAL RESULTS (mg/L)
May 1990 through April 2009

ANALYTE	DATE	DOWNGRADIENT WELLS[1]						UPGRADIENT WELLS			
		MW-4A (1A(1))	MW-5A		MW-6A (E-26)	MW-7A (E-25)	MW-8A (E27)	MW-1A (ET-O)	MW-2A (EE(E))	MW-3A (2)	F
Laboratory Turbidity (NTU)	04/08/08	4.6	5.2		33	18	230	55	36	38	6.6
	10/08/08	8.4	14.0		18	39	520	11	5	32	15.0
	04/29/09	2.8	2.7		14	8.4	32	5.7	2.0	1.1	10
VOCs	05/25/90	all ND			all ND	all ND	all ND				
	05/28/92							all ND			
	06/04/92								all ND		all ND
	09/30/92								all ND		all ND
	11/19/92							all ND			
	04/28/93								all ND	all ND	all ND
	12/03/93	all ND				all ND	all ND	all ND	all ND	all ND	
	01/07/94										
	02/04/94										
	03/10/94										
	04/19/94	all ND			all ND	all ND	all ND	all ND	all ND	all ND	
	05/31/94		all ND	(10/9/95)							
	06/22/94			(11/8/95)							
	07/27/94			(12/11/95)							
	10/10/94	all ND		(1/2/96)	all ND	all ND	all ND	all ND	all ND	all ND	
	06/13/95	all ND		(4/29/96)	all ND	all ND	all ND	all ND	all ND	all ND	
	10/04/95	all ND		(6/10/96)	all ND	all ND	all ND	all ND	all ND	all ND	
	04/29/96	all ND		(7/2/96)	all ND	all ND	all ND	all ND	all ND	all ND	all ND
	11/08/96	all ND	all ND	(11/8/96)	all ND	all ND	all ND	all ND	all ND	all ND	all ND
	05/09/97	all ND	all ND		all ND	all ND	all ND	all ND	all ND	all ND	all ND
	10/21/97	all ND	all ND		all ND	all ND	all ND	all ND	all ND	all ND	all ND
	05/04/98	all ND	all ND		all ND	all ND	all ND	all ND	all ND	**	all ND
	10/07/98	all ND	all ND		all ND	all ND	all ND	all ND	all ND	all ND	all ND
	05/27/99	all ND	all ND		all ND	all ND	all ND	all ND	all ND****	all ND	all ND
	10/13/99	all ND	all ND		all ND	all ND	all ND	all ND	all ND	all ND	all ND
	04/17/00	all ND	all ND		all ND		all ND	all ND	all ND	all ND	all ND
	10/19/00	all ND	all ND		all ND	all ND	all ND	all ND	all ND	all ND	all ND
	04/27/01	all ND	all ND		all ND	all ND	all ND	all ND	all ND	all ND	all ND
	10/11/01	all ND	all ND		all ND	all ND	all ND	all ND	all ND	all ND	all ND
	06/06/02	all ND	all ND		all ND	all ND	all ND	all ND	all ND	all ND	all ND
	10/18/02	all ND	all ND		all ND	all ND	all ND	all ND	all ND	all ND	NA
	04/24/03	all ND	all ND		all ND	all ND	all ND	all ND	all ND	all ND	toluene
	10/14/03	all ND	all ND		all ND	all ND	all ND	all ND	all ND	all ND	all ND
	04/20/04	all ND	all ND		all ND	all ND	all ND	all ND	all ND	all ND	toluene
	11/18/04	all ND	all ND		all ND	all ND	all ND	all ND	all ND	all ND	all ND
	04/22/05	all ND	all ND		all ND	all ND	all ND	all ND	all ND	all ND	all ND
	10/14/05	all ND	all ND		all ND	all ND	all ND	all ND	all ND	all ND	all ND
	05/05/06	all ND	acetone[3]		acetone[3]	acetone[3]	all ND	acetone[3]	all ND	all ND	all ND
	10/23/06	all ND	all ND		all ND	all ND	all ND	all ND	all ND	all ND	all ND
	04/12/07	all ND	all ND		all ND	all ND	all ND	all ND	all ND	all ND	all ND
	09/28/07	all ND	all ND		all ND	all ND	all ND	all ND	all ND	all ND	all ND
	04/08/08	all ND	all ND		all ND	all ND	all ND	all ND	all ND	all ND	all ND
	10/08/08	all ND	all ND		all ND	all ND	all ND	all ND	all ND	all ND	all ND
	04/29/09	all ND	all ND		all ND	all ND	all ND	all ND	all ND	all ND	all ND
FIELD MEASUREMENTS											
pH	05/25/90				7.18	7.10	7.08				
	05/28/92							7.50			
	06/04/92								7.20		7.50
	09/30/92								7.50		7.50
	11/19/92							7.80			
	04/28/93	7.50							7.40	7.50	7.50
	12/03/93	7.60			7.1*	7.50	7.50	7.50	7.00	7.40	
	01/07/94	7.60			6.90	7.20	7.20	7.60	6.80	7.40	
	02/04/94	7.50			7.30	7.40	7.40	7.60	6.90	7.60	
	03/10/94	7.60			7.60	7.50	7.50	7.60	6.90	7.50	
	04/19/94	7.28			7.32	7.41	7.44	7.31	6.86	7.30	
	05/31/94	7.48	7.30	(10/9/95)	7.18	7.32	7.42	7.52	6.41	7.41	
	06/22/94	7.29	7.40	(11/8/95)	7.36	7.06	7.44	7.41	6.79	7.48	
	07/27/94	7.41	7.20	(12/11/95)	7.34	7.42	7.44	7.56	6.86	7.45	
	10/10/94	7.40	7.50	(1/2/96)	7.10	7.40	7.30	6.60	6.60	7.10	
	06/13/95	NA	7.30	(4/29/96)	7.30	7.44	7.37	7.40	NA	NA	
	10/04/95	7.50	7.30	(6/10/96)	7.40	7.40	7.40	7.40	6.80	7.50	
	04/29/96	7.50	7.40	(7/2/96)	7.30	7.17	7.28	7.41	6.81	7.40	7.21
	11/08/96	7.55	7.50	(11/8/96)	7.56	7.31	7.29	7.45	6.69	7.65	7.31
	05/09/97	7.48	7.47		7.18	7.15	7.11	7.38	6.86	7.20	7.26
	10/21/97	7.33	6.65		6.90	7.04	7.10	7.15	6.60	7.22	7.13
	05/04/98	6.65	6.94		6.70	6.86	6.94	7.12	6.45	6.79	6.91
	10/07/98	7.00	7.09		6.59	6.82	6.88	6.89	6.55	6.81	7.27
	05/27/99	7.62	7.82		7.33	7.28	7.22	7.42	7.04	7.34	7.49
	10/13/99	7.82	7.60		7.62	7.44	7.39	7.25	7.02	7.72	7.31
	04/17/00	7.64	7.42		6.91		7.09	7.11	6.88	6.84	6.89
	10/19/00	7.50	7.32		7.27	7.37	7.39	7.43	6.63	7.56	7.35
	04/27/01	7.10	6.80		6.80	6.70	6.70	6.60	6.50	7.00	6.70
	10/11/01	8.53	7.75		8.11	8.44	8.69	8.74	7.52	8.75	8.84
	06/06/02	5.89	7.38		7.38	7.29	7.57	5.81	5.41	6.02	6.31
	10/18/02	7.87	7.80		7.77	7.72	7.91	7.95	7.39	7.91	
	04/24/03	7.50	7.37		7.33	7.25	7.20	7.57	7.11	7.64	7.33
	10/14/03	7.32	7.24		7.22	7.37	7.34	7.20	6.81	7.39	6.62
	04/20/04	8.43	8.24		8.12	8.13	8.25	7.56	6.89	7.33	7.93
	11/18/04	8.01	7.74		7.80	8.09	7.18	7.37	7.43	8.12	7.01
	04/22/05	7.62	7.43		7.41	7.31	7.40	7.59	7.56	7.21	6.44
	10/14/05	7.49	7.31		7.30	7.14	7.26	7.49	7.34	6.97	7.20
	05/05/06	7.26	7.13		6.89	7.15	7.13	7.48	7.28	7.31	6.04
	10/23/06	7.46	7.15		7.36	7.40	7.27	7.50	7.05	7.47	7.37
	04/12/07	8.03	7.74		7.68	7.37	7.84	8.17	7.53	8.01	5.57
	09/28/07	8.07	7.81		7.49	7.91	7.8	7.75	7.45	8.01	NR
	04/08/08	7.37	7.11		7.19	7.23	7.27	7.41	6.78	7.34	7.15
	10/08/08	7.33	7.28		7.23	7.3	7.22	7.21	6.74	7.09	6.91
	04/28/09	7.34	7.35		7.20	7.17	7.11	7.44	6.67	7.19	6.60

TABLE 3
SUMMARY OF ANALYTICAL RESULTS (mg/L)
May 1990 through April 2009

ANALYTE	DATE	DOWNGRADIENT WELLS [1]						UPGRADIENT WELLS			
		MW-4A (1A(1))	MW-5A		MW-6A (E-26)	MW-7A (E-25)	MW-8A (E27)	MW-1A (ET-O)	MW-2A (EE(E))	MW-3A (2)	F
Temperature (°C)	05/25/90				14.00	14.00	16.00				
	04/28/93	11.80							13.90	14.40	11.10
	12/03/93	13.00			16.90*	12.00	12.00	12.60	15.80	13.90	
	01/07/94	12.70			11.40	12.30	11.20	12.10	16.00	13.90	
	02/04/94	13.00			11.50	11.80	10.70	11.30	14.60	14.00	
	03/10/94	14.10			10.60	11.10	10.40	12.10	16.00	15.80	
	04/19/94	15.90			16.60	15.40	14.20	14.80	19.10	16.70	
	05/31/94	15.00	15.00	(10/9/95)	14.40	15.00	14.80	14.30	16.40	15.30	
	06/22/94	16.90	14.70	(11/8/95)	16.20	15.40	15.00	14.60	19.30	18.40	
	07/27/94	16.20	13.70	(12/11/95)	16.50	16.90	16.60	15.30	18.80	16.70	
	10/10/94	15.80	12.80	(1/2/96)	14.80	15.80	16.90	15.20	17.30	16.10	
	06/13/95	NA	13.60	(4/29/96)	16.00	15.90	16.30	14.70	NA	NA	
	10/04/95	13.00	16.10	(6/10/96)	12.90	13.70	13.40	14.30	17.10	14.80	
	04/29/96	14.70	18.40	(7/2/96)	13.70	13.30	14.60	12.90	17.40	16.00	12.50
	11/08/96	15.80	14.40	(11/8/96)	14.00	14.60	13.60	14.10	17.20	15.30	14.10
	05/09/97	15.80	14.80		14.60	13.50	13.80	13.10	16.60	16.70	13.00
	10/21/97	15.80	14.40		15.10	15.90	15.50	14.70	19.20	17.20	14.60
	05/04/98	14.90	13.20		13.20	14.30	14.00	11.70	16.40	15.60	11.10
	10/07/98	15.40	15.30		15.20	16.00	15.10	13.80	17.60	14.80	14.60
	05/27/99	16.70	16.30		16.60	14.90	15.30	13.00	17.00	16.50	14.40
	10/13/99	18.10	16.60		15.40	16.60	15.50	14.70	21.20	19.60	15.00
	04/17/00	12.90	12.20		14.80		12.30	12.90	14.60	15.00	13.70
	10/19/00	15.30	17.10		18.70	16.90	18.70	17.70	16.10	17.10	18.40
	04/27/01	20.14	18.02		18.12	17.76	16.84	13.12	20.14	18.58	15.25
	10/11/01	13.60	14.60			14.40	14.70	14.20	16.40	14.70	13.70
	06/06/02	20.90	17.80		18.60	18.10	19.10	16.50	21.00	20.20	17.90
	10/18/02	19.20	17.70		16.90	19.60	21.90	17.30	22.00	18.30	
	04/24/03	19.60	16.60		16.70	14.60	16.40	13.60	16.60	17.10	12.20
	10/14/03	17.90	17.90		17.00	16.50	18.40	17.00	20.50	18.30	15.30
	04/20/04	17.40	16.30		15.40	13.10	13.10	13.50	16.40	17.00	15.00
	11/18/04	15.81	13.13		14.65	8.60	15.80	16.35	16.69	17.16	15.91
	04/22/05	16.94	14.48		15.42	15.74	15.54	13.52	17.19	16.31	14.34
	10/14/05	19.80	17.60		16.40	21.90	20.30	15.66	19.38	20.14	15.66
	05/05/06	17.99	14.85		14.05	14.70	16.32	13.00	17.07	15.82	15.44
	10/23/06	17.72	15.98		16.85	17.71	18.51	16.24	19.51	17.57	14.99
	04/12/07	15.45	14.49		14.42	12.49	15.60	13.02	15.30	16.52	13.70
	09/28/07	19.77	18.25		17.01	21.36	22.40	17.55	21.76	19.63	NR
	04/08/08	15.96	13.44		19.17	13.19	17.75	13.89	17.68	19.17	13.760
	10/08/08	17.86	18.38		17.52	17.56	18.66	16.73	21.44	19.40	15.20
	04/29/09	13.37	14.17		14.45	12.04	14.20	11.64	13.99	16.46	13.75
Conductivity (mS/cm)	05/25/90				20223	20358	15408				
	05/28/92							5500			
	11/19/92							5300			
	04/28/93	15400							26000	8800	16200
	12/03/93	14.0			22.4*	22.0	17.0	5.6	24.0	9.8	
	01/07/94	15.4			22.3	22.9	17.1	5.7	24.7	9.8	
	02/04/94	14.1			21.8	21.9	16.9	5.5	28.1	9.6	
	03/10/94	13.7			21.9	21.8	16.7	5.6	31.6	16.0	
	04/19/94	14.9			22.1	22.4	16.8	6.4	35.2	29.9	
	05/31/94	15.2	23.8	(10/9/95)	22.7	21.8	16.6	5.5	36.2	15.1	
	06/22/94	14.4	23.9	(11/8/95)	22.8	22.7	16.8	5.4	35.1	12.1	
	07/27/94	15.3	21.2	(12/11/95)	22.7	22.6	17.3	5.6	32.5	14.4	
	10/10/94	14.1	21.4	(1/2/96)	22.4	22.3	16.9	5.6	27.4	8.0	
	06/13/95	NA	21.5	(4/29/96)	22.9	22.8	19.5	8.0	NA	NA	
	10/04/95	14.7	22.1	(6/10/96)	22.1	21.9	18.5	5.7	29.7	15.4	
	04/29/96	14.5	21.6	(7/2/96)	21.1	21.0	17.7	9.8	29.0	14.3	19.9
	11/08/96	14.7	21.6	(11/8/96)	20.7	20.9	17.4	9.4	39.9	7.6	17.9
	05/09/97	12.4	18.3		17.6	17.8	15.1	7.7	26.9	10.6	14.3
	10/21/97	17.2	25.4		25.0	24.1	20.8	6.5	44.4	10.5	19.7
	05/04/98	16.7	26.2		23.6	24.5	20.8	14.0	26.7	15.5	23.6
	10/07/98	21.1	31.1		29.4	30.1	26.2	18.0	47.6	18.4	15.4
	05/27/99	20.8	29.3		28.2	29.2	26.9	17.7	41.2	22.8	24
	10/13/99	19.9	29.6		28.8	29.7	26.6	17.0	63.4	13.8	25.1
	04/17/00	21.4	31.7		12.62		36.7	46.1	49	8.43	19.7
	10/19/00	20.6	30		28.4	0.016	25.3	15.6	63.7	13	22.3
	04/27/01	15.5	23.5		22.6	18.8	19.9	9.24	46.4	12.4	17.3
	10/11/01	20.3	30.1		28.8	25.9	25.1	14.3	54.5	13.2	21.4
	06/06/02	13.8	29.7		28.5	28.2	24.7	8.91	30.9	17.3	21.2
	10/18/02	14.6	23.5		20.6	21.5	19.5	11.2	29.9	9.06	
	04/24/03	14.5	23.2		22.3	21.7	18	12.2	23.3	10.2	15.4
	10/14/03	14.8	23.6		22.5	21.0	17.9	13.6	23.4	10.9	17.1
	04/20/04	13.6	21.7		21.0	20.8	17.5	11.8	22.9	30.8	16.5
	11/18/04	14.1	23.1		22.4	23	20.3	12.7	23.9	11.7	15.4
	04/22/05	13.8	23.7		22.6	22	20.4	11.3	12.5	16.7	17.8
	10/14/05	13.3	22.1		22.1	21.9	19.4	13.3	14.6	26.9	5.67
	05/05/06	12.2	20.7		20.0	20.8	18.1	11.0	11.6	12.1	14.1
	10/23/06	7.07	13.6		13.3	12.9	11.8	7.18	14.3	7.16	9.83
	04/12/07	13	23.2		22.8	21.8	20.4	15.50	22.4	13.7	16.6
	09/28/07	13.7	24.5		24.0	23.5	21.6	17.7	27.5	14.4	NR
	04/08/08	8.41	14.42		19.4	18.4	16.3	12.71	17.61	9.860	11.05
	10/08/08	10.46	19.99		19.37	19.08	16.40	13.17	22.62	15.82	15.69
	04/29/09	8.33	16.49		16.08	14.48	12.52	9.95	16.31	32.30	13.21

TABLE 3
SUMMARY OF ANALYTICAL RESULTS (mg/L)
May 1990 through April 2009

ANALYTE	DATE	DOWNGRADIENT WELLS [1]						UPGRADIENT WELLS			
		MW-4A (1A(1))	MW-5A		MW-6A (E-26)	MW-7A (E-25)	MW-8A (E27)	MW-1A (ET-O)	MW-2A (EE(E))	MW-3A (2)	F
Turbidity (NTU)	05/25/90				5.2	3.8	11.5				
	06/04/92								34.6		1.91
	09/30/92								30.1		3.19
	04/28/93	>999					311.0		450.0	110.0	70.0
	12/03/93	>999			800*	940	490	466	>999	>999	
	01/07/94	475			155	970	655	456	>999	>999	
	02/04/94	110			860	240		240	>999	675	
	03/10/94	10			185	558	822	342	>999	624	
	04/19/94	230			300	220	650	700	>999	750	
	05/31/94	50	311	(10/9/95)	350	697	795	880	>999	800	
	06/22/94	720	160	(11/8/95)	470	>999	>999	>999	>999	870	
	07/27/94	108	519	(12/11/95)	60	102	318	481	875	888	
	10/10/94	150	20	(1/2/96)	81	542	450	370	540	350	
	06/13/95	NA	255	(4/29/96)	600	219	>999	400	NA	NA	
	10/04/95	10	685	(6/10/96)	20	133	400	70	170	600	
	04/29/96	40	347	(7/2/96)	285	783	530	723	275	200	315
	11/08/96	4	200	(11/8/96)	134	92	129	316	59	369	8
	05/09/97	598	560		476	422	554	9	702	931	409
	10/21/97	228	49		140	999	999	147	197	257	220
	05/04/98	157	297		40	305	467	350	351	386	59
	10/07/98	23	58		7	143	205	153	23	66	7
	05/27/99	126	281		121	189	784	219	156	160	43
	10/13/99	10	5		69	8	95	25	2	3	10
	04/17/00	36	30		660		475	23	41	32	88
	10/19/00	2	7		70	2	303	6	96	213	1
	04/27/01	260	65		25	>990	>990	210	150	990	150
	10/11/01	5	15		0	-10	148	40	7	61	90
	06/06/02	15.8	7.98		27.1	47.8	134	5.59	3.96	13.6	7.29
	10/18/02	1.9	2.95		9.08	10	26.2	53.9	63.3	5.6	
	04/24/03	22.1	12		5.5	21.7	204	3.3	14.8	10.9	9
	10/14/03	61	0		2.0	20	360	0	0	0	44
	04/20/04	49.7	30.4		58.2	119	305	199	86.1	46.2	72.2
	11/18/04	51.1	13		50	1.4	390	10	34	21	1.4
	04/22/05	10.8	3.6		36.6	43.9	54.5	44.4	8.6	28	0.2
	10/14/05	9.4	6.3		59.6	25.1	999	9.4	5.8	38.9	3.6
	05/05/06	16.3	2.3		53.6	0.6	78.8	7.2	9.9	10.1	0.3
	10/23/06	7.6	2.0		6.9	20.6	82.7	10.05	3.2	13.8	8.6
	04/12/07	21.7	7.9		97.2	20.4	122.9	13.9	3.3	37.3	2.8
	09/28/07	2.3	-4.3		72.8	-2.2	195	2.7	-5.5	22	NR
	04/08/08	4.98	6.93		78.0	42.9	517	104	16.5	57.2	17.0
	10/08/08	8.21	4.52		21.6	13.1	>3500	-0.51	4.08	21.5	7.1
	04/29/09	7.11	4.13		17.8	9.61	43.1	11	3.63	2	9.72
D.O. (mg/L)	05/25/90										
	04/28/93	11.40							10.80	7.90	9.90
	12/03/93	6.00			1.60*	3.00	2.60	1.10	2.30	8.00	
	01/07/94	6.50			3.10	3.20	3.20	1.90	1.80	8.00	
	02/04/94	6.00			1.20	9.40	2.20	2.10	6.50	2.00	
	03/10/94	5.30			4.50	6.00	3.10	1.00	1.90	1.90	
	04/19/94	5.85			2.02	0.87	1.55	2.36	1.98	1.57	
	05/31/94	5.64	1.40	(10/9/95)	1.27	2.40	2.84	2.30	0.87	1.47	
	06/22/94	6.64	1.70	(11/8/95)	1.67	2.02	1.40		1.41	1.36	
	07/27/94	5.23	1.60	(12/11/95)	2.48	2.46	2.27	1.60	1.74	2.07	
	10/10/94	3.80	1.50	(1/2/96)	1.68	1.50	2.00	2.12	1.60	0.90	
	06/13/95	NA	1.40	(4/29/96)	1.30	0.50	1.50	1.70	NA	NA	
	10/04/95	5.60	2.00	(6/10/96)	1.50	1.50	2.03	0.80	2.20	1.80	
	04/29/96	4.50	2.40	(7/2/96)	0.74	2.04	1.56	1.82	1.80	1.40	4.15
	11/08/96	4.51	3.30	(11/8/96)	3.91	1.32	0.91	1.26	1.52	2.33	2.12
	05/09/97	5.12	2.39		1.44	1.54	2.12	1.95	2.34	1.88	3.40
	10/21/97	4.84	1.72		1.60	1.10	1.42	0.97	2.19	0.96	1.40
	05/04/98	5.70	2.75		2.50	2.38	1.60	2.08	2.89	1.82	5.60
	05/27/99	7.55	2.47		2.50	1.57	0.74	2.87	1.47	2.41	3.46
	10/13/99	7.25	1.65		1.89	1.78	5.15	1.24	5.75	5.85	1.66
	04/17/00	6.20	2.00		1.20		3.10	2.30	2.80	7.70	1.90
	10/19/00	0.94	0.86		0.80	0.88	0.79	0.84	0.89	0.86	0.81
	04/27/01	8.70	2.40		1.80	3.80	2.00	3.80	4.00	2.50	2.50
	10/11/01	8.98	9.66		10.60	11.00	10.82	11.05	7.73	8.44	11.44
	06/06/02	1.40	11.48		10.91	11.37	8.65	1.70	3.00	2.40	12.23
	10/18/02	2.41	1.04		1.07	1.30	1.48	1.96	1.63	2.19	
	04/24/03	2.46	2.41		2.47	3.56	1.98	5.75	5.69	5.24	6.37
	10/14/03	0.00	6.09		5.89	2.84	0.00	8.65	0.21	5.26	5.26
	04/20/04	0.71	5.21		6.31	1.78	0.00	0.00	4.09	2.67	3.57
	11/18/04	3.06	2.75		2.84	2.34	2.93	2.85	3.51	2.26	8.24
	04/22/05	4.99	7.17		5.93	6.46	7.02	5.83	7.27	7.01	12.80
	10/14/05	1.70	2.40		3.01	2.37	3.82	2.54	3.56	2.30	12.43
	05/05/06	1.50	0.68		1.10	0.10	0.19	0.01	5.80	0.11	8.30
	10/23/06	0.86	1.26		0.98	0.91	0.91	1.29	1.36	1.55	NR
	04/12/07	0.60	0.92		0.96	1.25	0.93	1.12	2.96	0.88	8.80
	09/28/07	0.99	1.02		1.30	4.87	1.19	1.78	0.68	0.70	NR
	04/08/08	0.18	0.24		0.23	0.50	0.15	0.23	0.16	0.13	1.21
	10/08/08	0.5	0.38		0.12	0.69	0.14	0.18	0.31	0.18	2.55
	04/28/09	0.51	0.37		0.45	0.57	0.42	0.60	1.18	0.66	4.13

*Well MW-6A was not accessible on 12/03/93. Because eight samples were required to establish the naturally-occuring concentrations of several parameters in each well, a sample was collected from Well MW-6A on 08/26/94.

**Well MW-3: The following volatile organic compounds were detected; Acetone (22 ug/l) and 2-Butanone (13 ug/l).

***Sample was analyzed outside of holding times.

****Well MW-2A : Benzene was detected at concentration of 2 ug/l.

NR: not recorded.

[1] Well MW-7A: Spring 2000 data are not representative due to possible surface water contamination and are therefore not included.

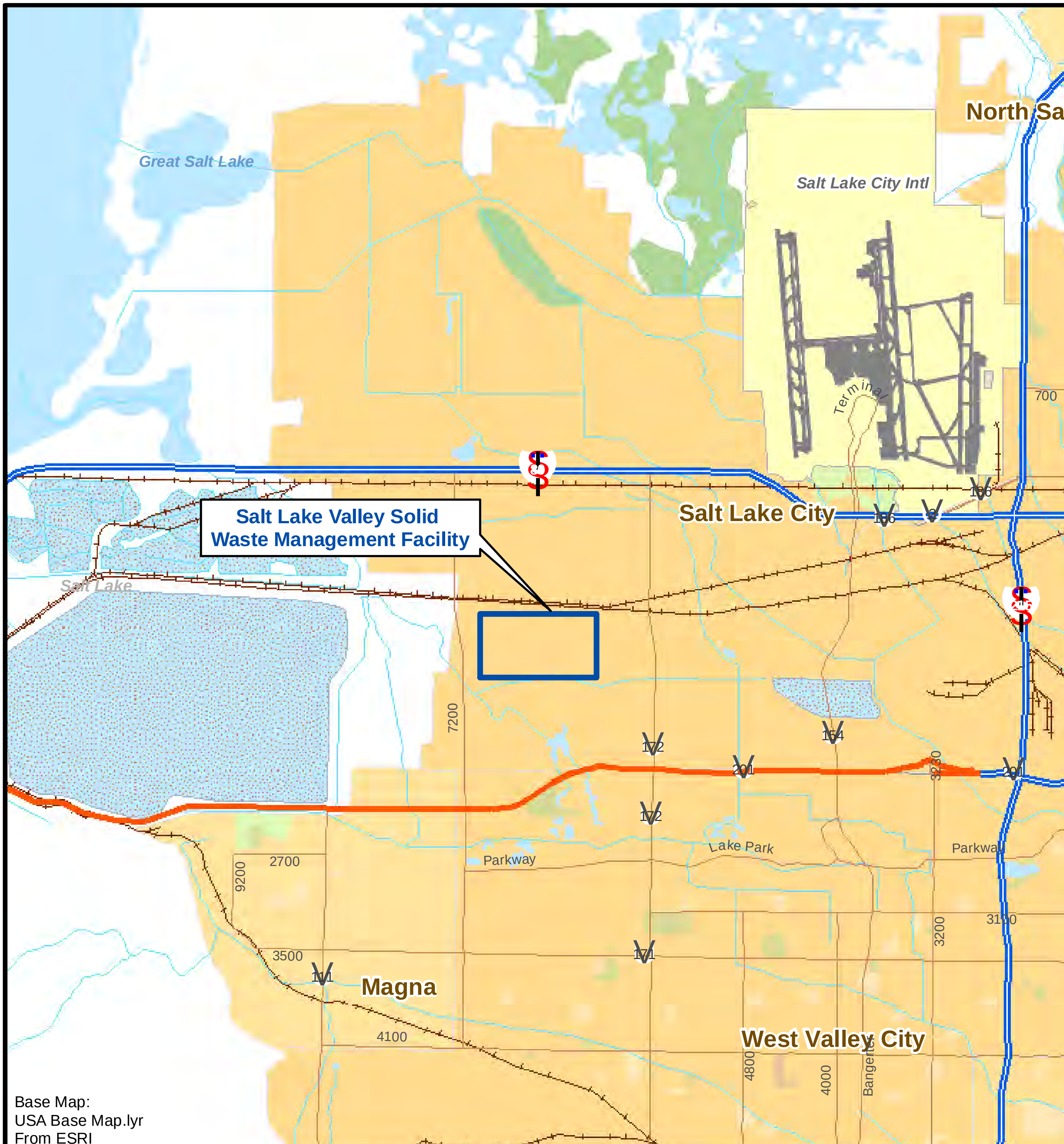
[2] Well MW -5A: Toluene was detected at the reporting limite of 2 ug/l.A1142

[3] Data rejected as laboratory error.

[4] Well F: Insuffienct water for sampling in Fall 2002

Blank Spaces: Data not available

FIGURES



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N

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SITE VICINITY MAP

GROUNDWATER MONITORING PLAN
SALT LAKE VALLEY SOLID WASTE MANAGEMENT FACILITY
SALT LAKE COUNTY, UTAH

FIGURE 1

Cartography By: S.C. | 07/21/2009 | Project Number: 54629.001 | File Name: SLC9A133

PLOTTED: 23 Jul 2009, 4:33pm, scontreras

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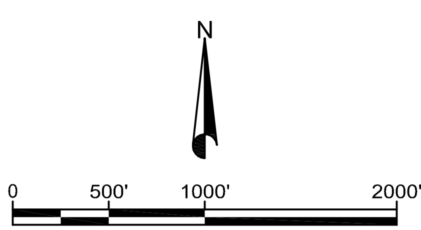

Approximate Scale: 1" = 1000"

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DRAWN BY:	S.C.
CHECKED BY:	N.J.
FILE NAME:	SLC9d066.dwg

MONITORING WELL LOCATION MAP

GROUNDWATER MONITORING PLAN
SALT LAKE VALLEY
SOLID WASTE MANAGEMENT FACILITY
SALT LAKE COUNTY, UTAH

FIGURE

2

N

State Plane Coordinate System - NAD 27 Central

150 75 0 150 300 Feet

UTAH

QUADRANGLE LOCATION

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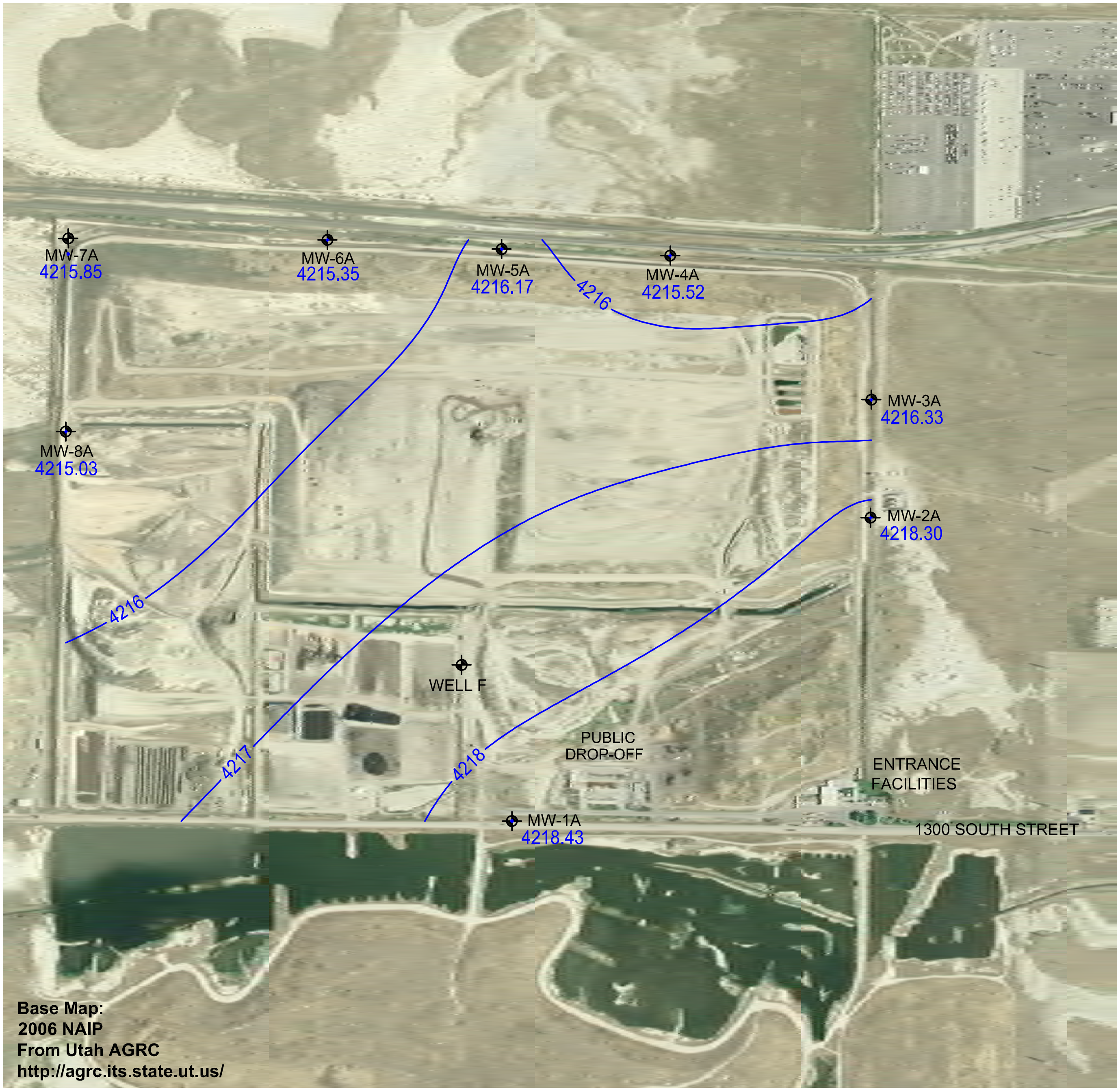
PROPOSED WELL LOCATIONS
NEW LEACHATE POND

GROUNDWATER MONITORING PLAN
SALT LAKE VALLEY SOLID WASTE MANAGEMENT FACILITY
SALT LAKE COUNTY, UTAH

FIGURE 3

Cartography By: S.C. | Date: 02/18/2009 | Project Number: 54629.001 | File Name: SLC9A117.mxd



EXPLANATION

Groundwater Contour

4218.43 Groundwater Elevation

N

0 500' 1000' 2000'

Approximate Scale: 1" = 1000"

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FILE NAME:	SLC9d066.dwg

FALL 2008
GROUNDWATER ELEVATIONS

GROUNDWATER MONITORING PLAN
SALT LAKE VALLEY
SOLID WASTE MANAGEMENT FACILITY
SALT LAKE COUNTY, UTAH

FIGURE

4

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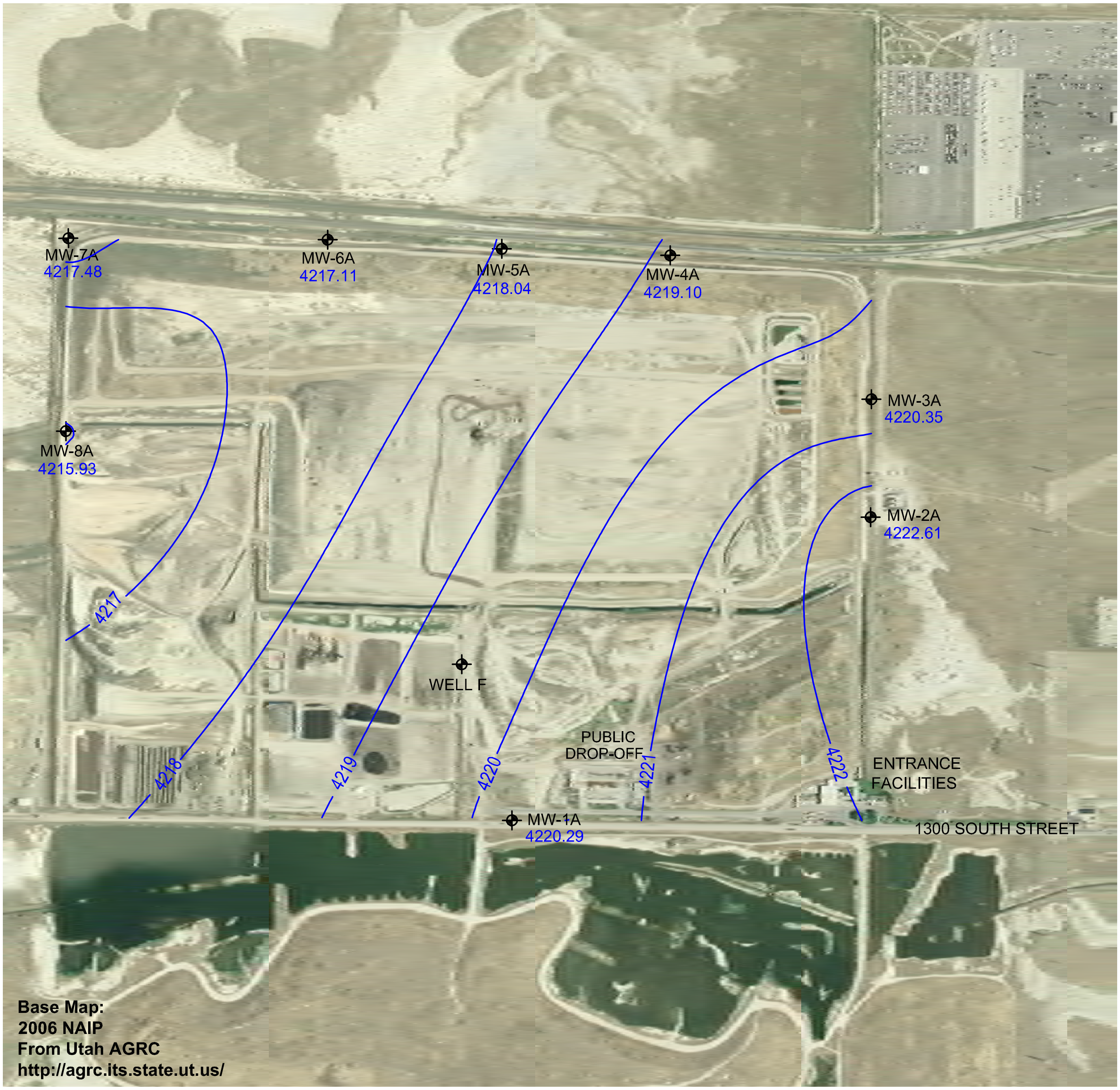

EXPLANATION

Groundwater Contour

4221.34 Groundwater Elevation

N

0 500' 1000' 2000'

Approximate Scale: 1" = 1000"

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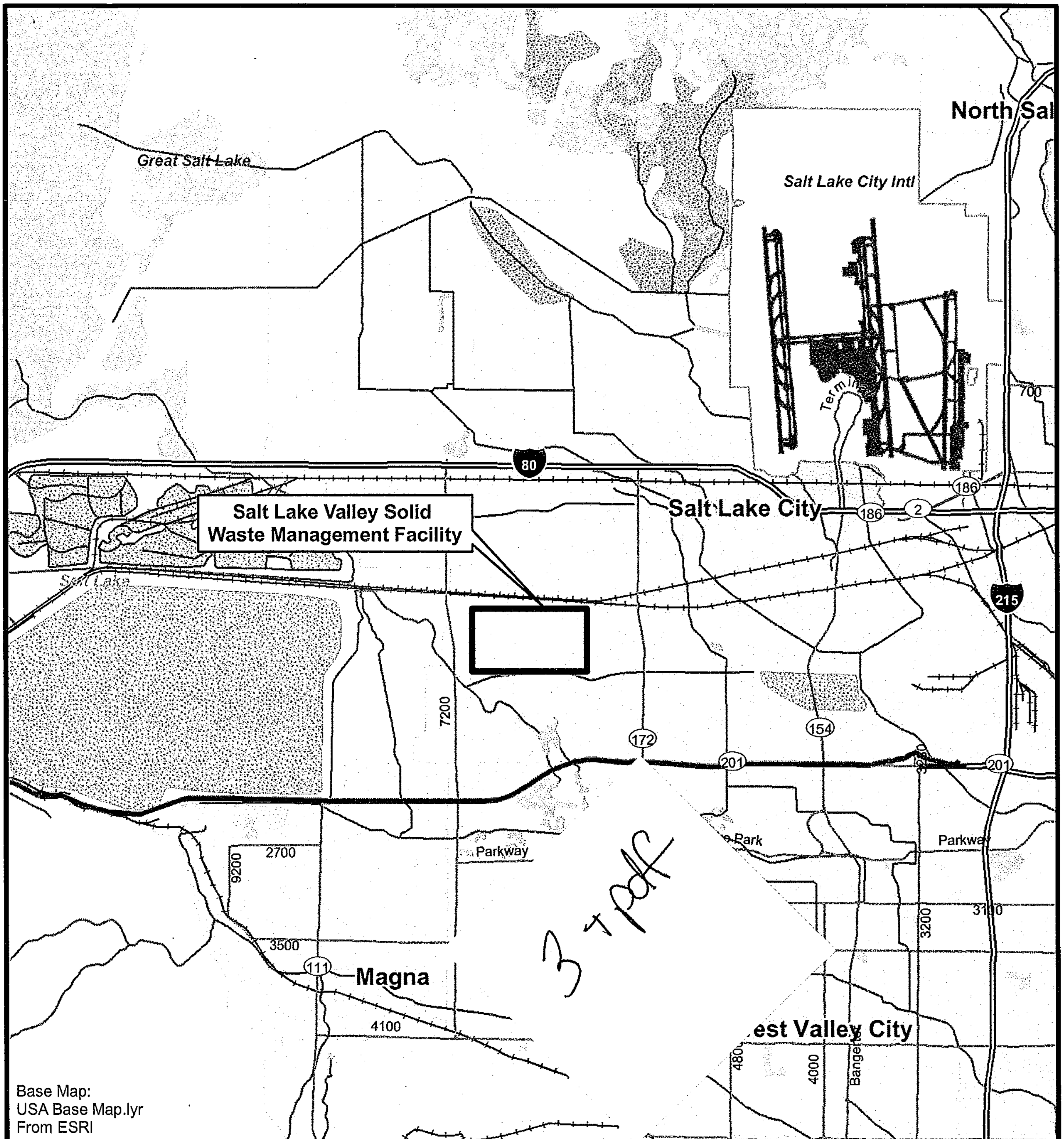
APRIL 27, 2009
GROUNDWATER ELEVATIONS

GROUNDWATER MONITORING PLAN
SALT LAKE VALLEY
SOLID WASTE MANAGEMENT FACILITY
SALT LAKE COUNTY, UTAH

FIGURE
5



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SITE VICINITY MAP

GROUNDWATER MONITORING PLAN
SALT LAKE VALLEY SOLID WASTE MANAGEMENT FACILITY
SALT LAKE COUNTY, UTAH

FIGURE 1

Cartography By: S.C. | 07/21/2009 | Project Number: 54629.001 | File Name: SLC9A133

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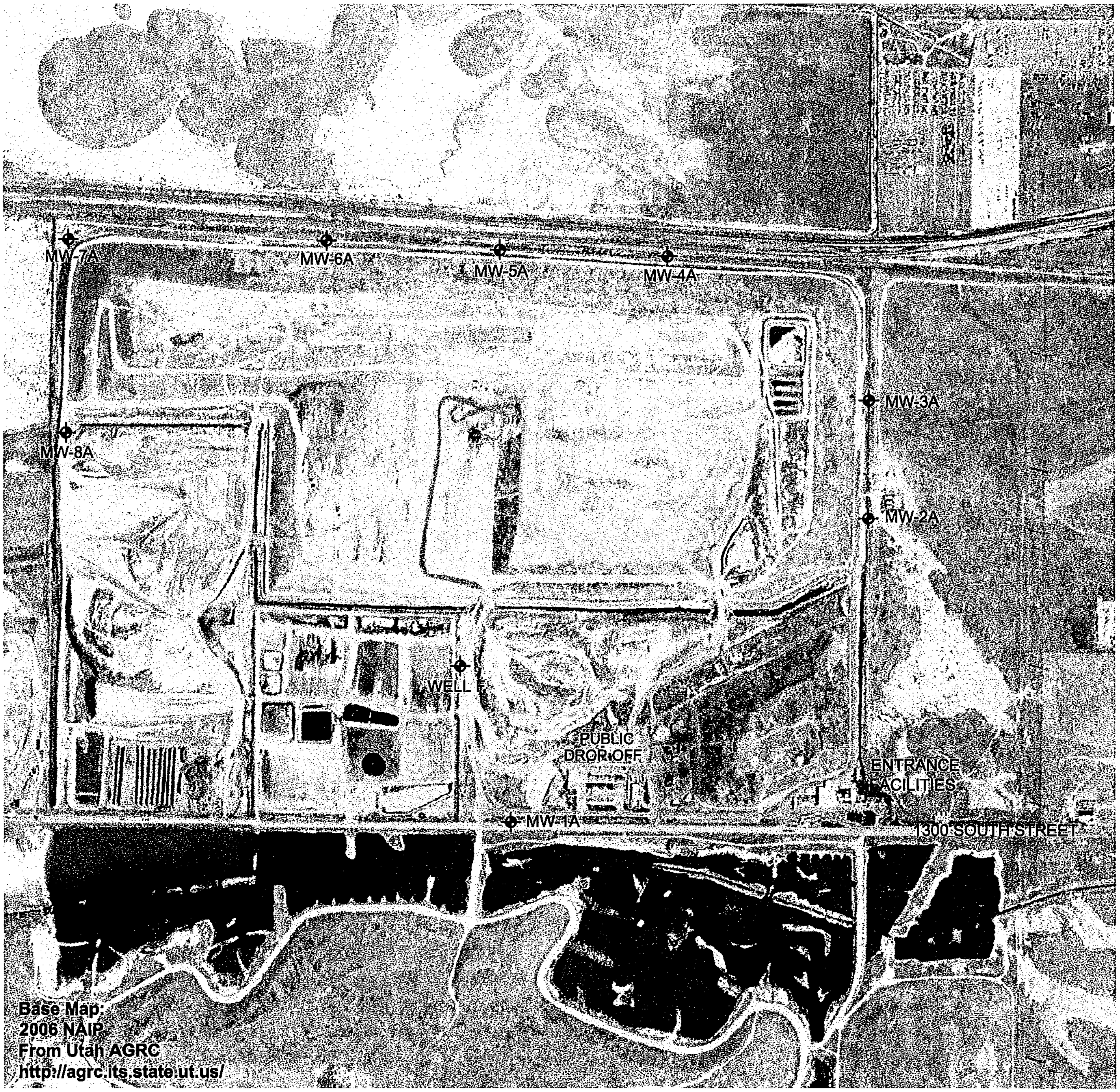

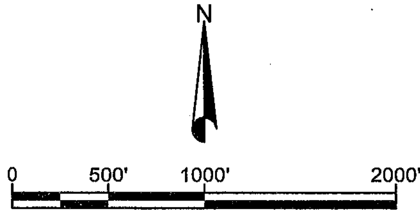

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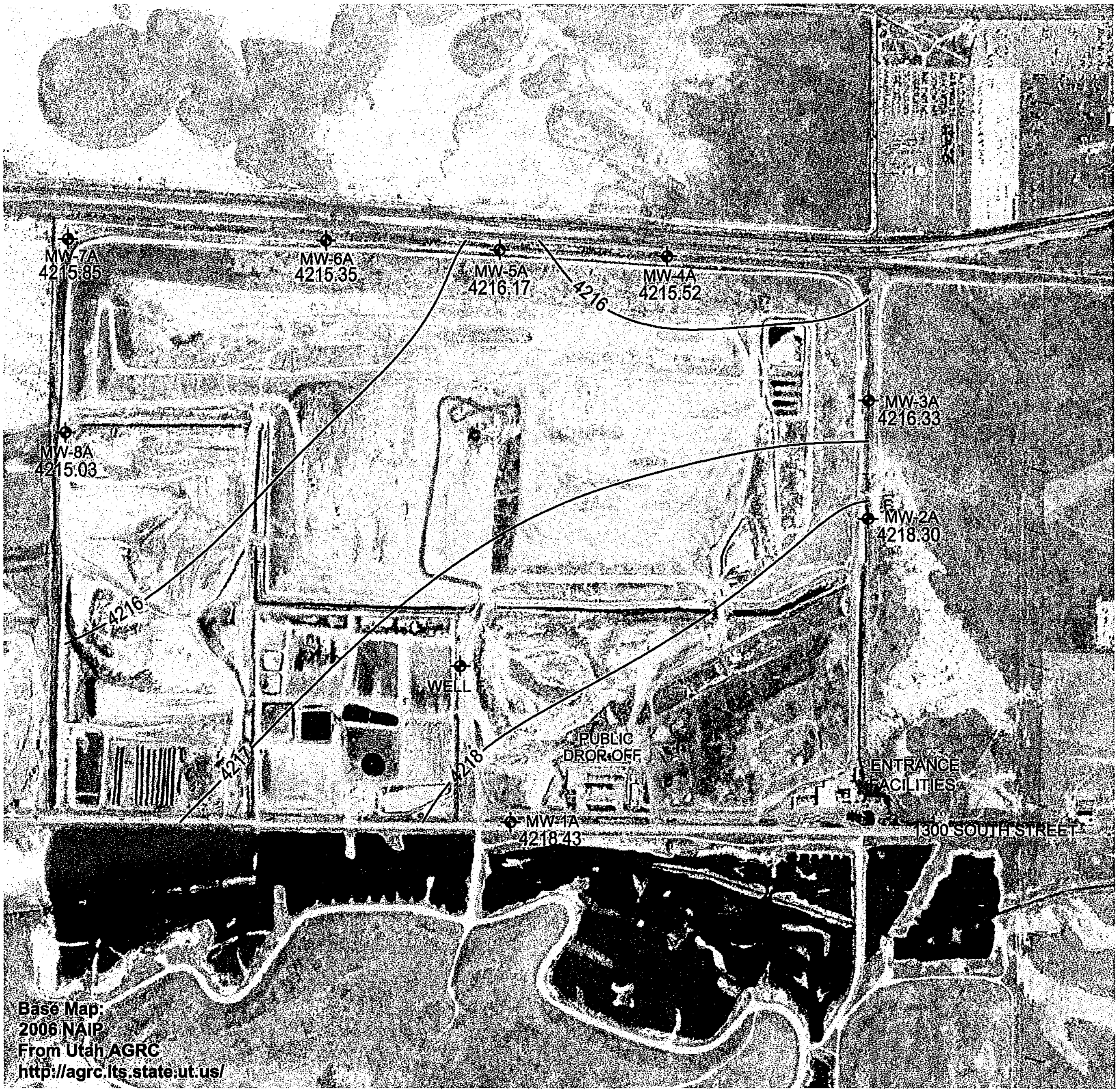
MONITORING WELL LOCATION MAP

GROUNDWATER MONITORING PLAN
SALT LAKE VALLEY
SOLID WASTE MANAGEMENT FACILITY
SALT LAKE COUNTY, UTAH

FIGURE
2



EXPLANATION

————	Groundwater Contour
4218.43	Groundwater Elevation

N

0 500' 1000' 2000'

Approximate Scale: 1" = 1000"

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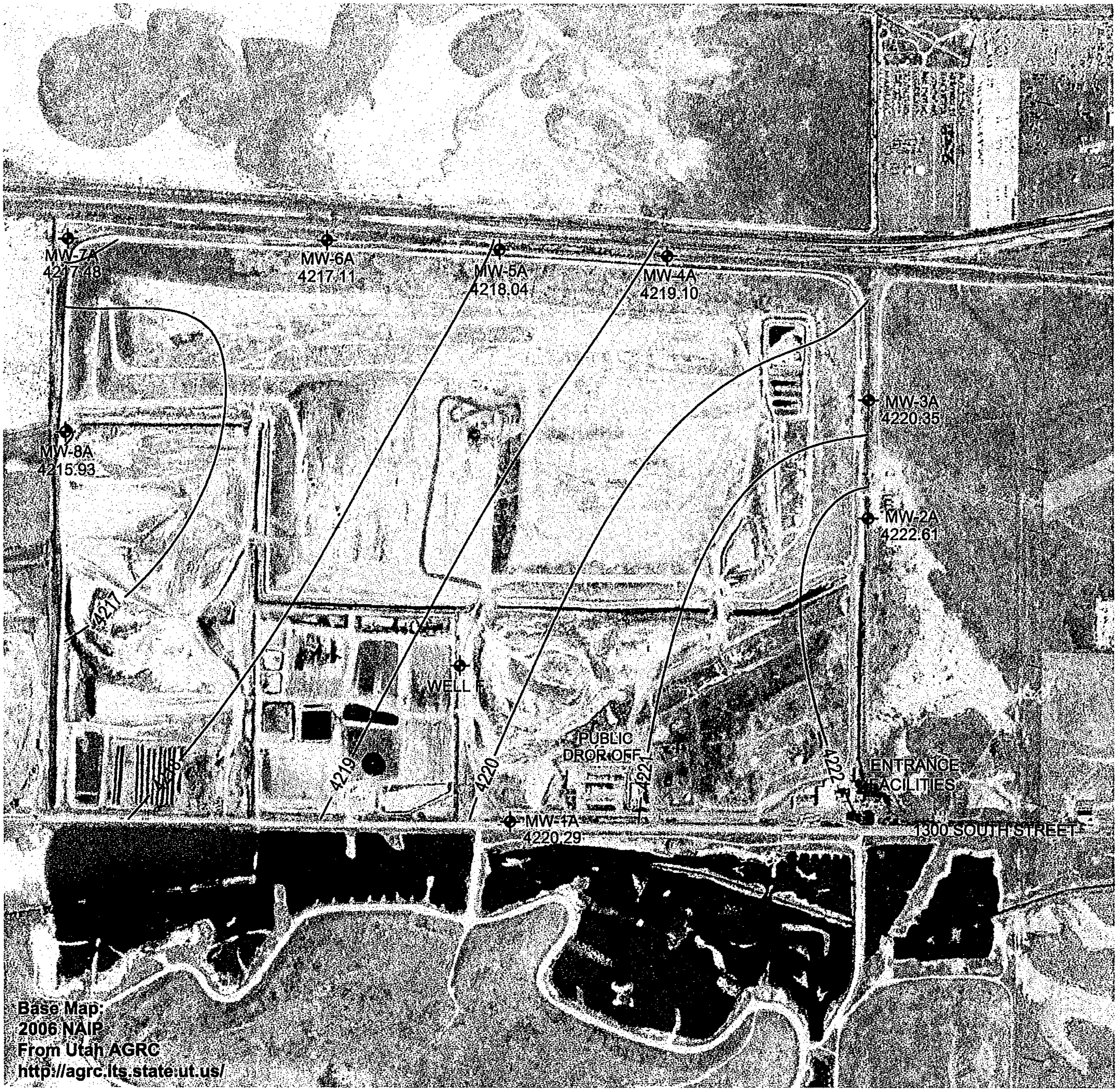
FALL 2008
GROUNDWATER ELEVATIONS

GROUNDWATER MONITORING PLAN
SALT LAKE VALLEY
SOLID WASTE MANAGEMENT FACILITY
SALT LAKE COUNTY, UTAH

FIGURE
4



EXPLANATION

————	Groundwater Contour
4221.34	Groundwater Elevation

N

0 500' 1000' 2000'

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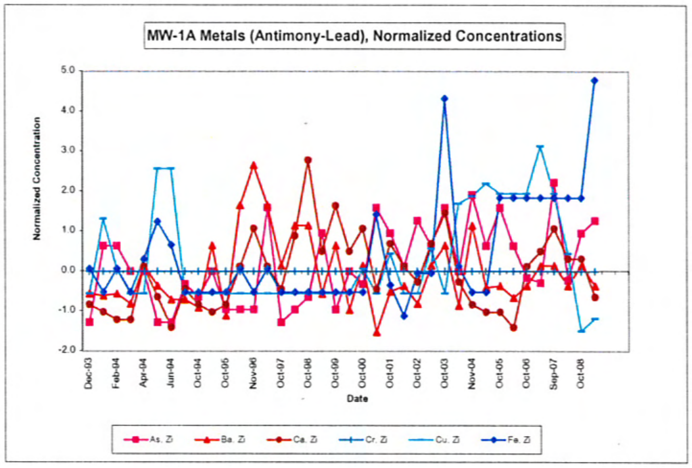
APRIL 27, 2009
GROUNDWATER ELEVATIONS

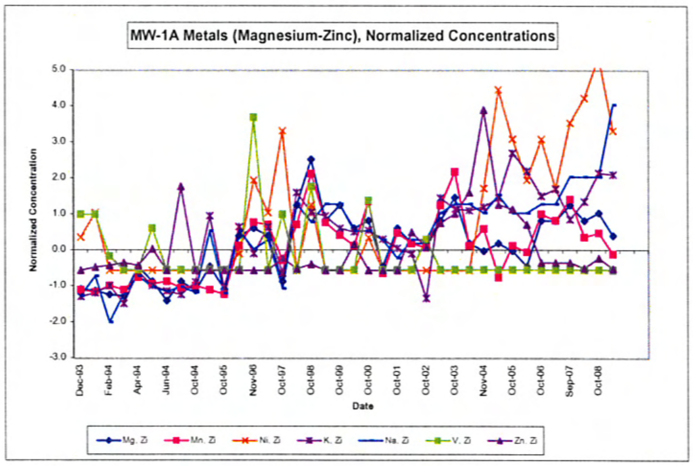
GROUNDWATER MONITORING PLAN
SALT LAKE VALLEY
SOLID WASTE MANAGEMENT FACILITY
SALT LAKE COUNTY, UTAH

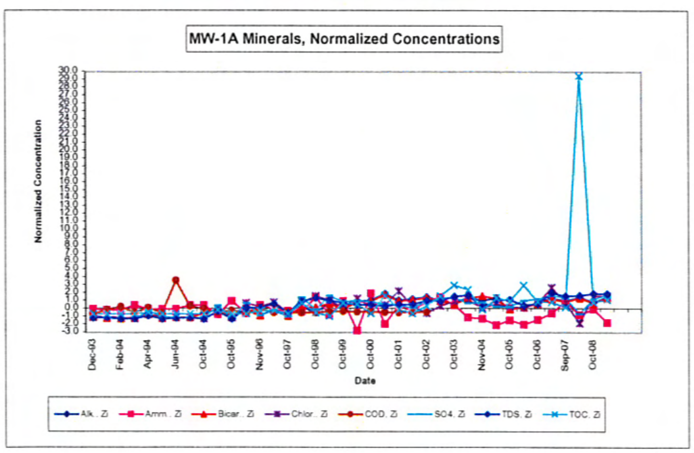
FIGURE
5

FIGURE 6

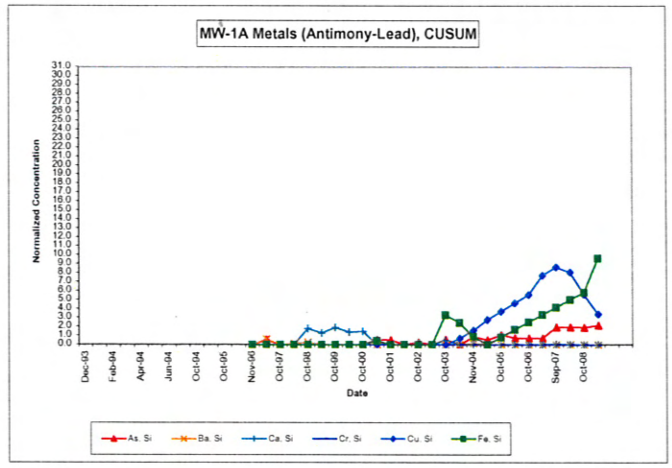
Normalized Concentrations, Fall 1993 through Spring 2009

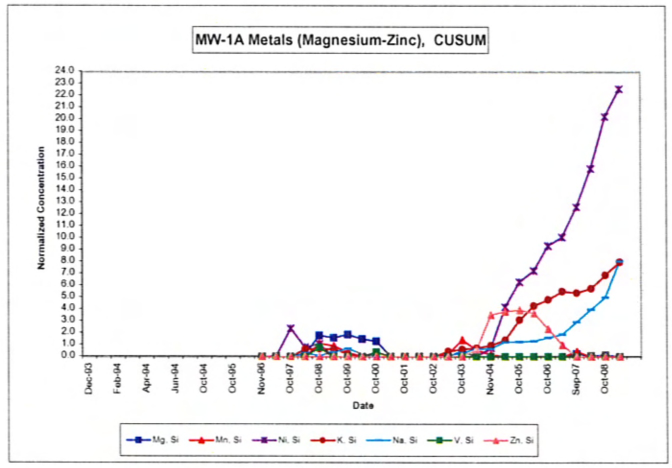


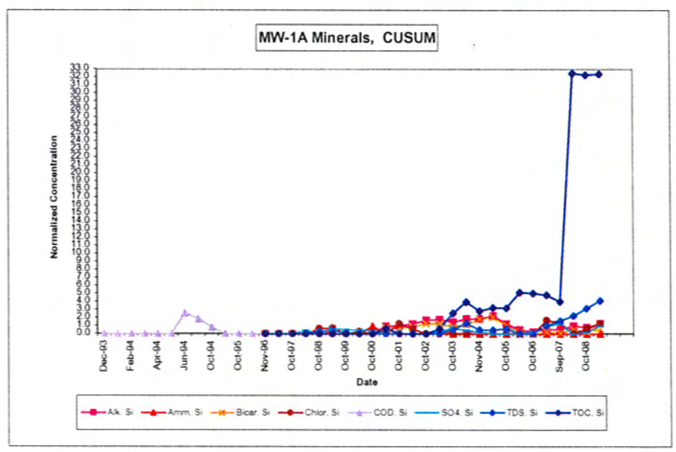




CUSUM Charts, Fall 1993 Through Spring 2009



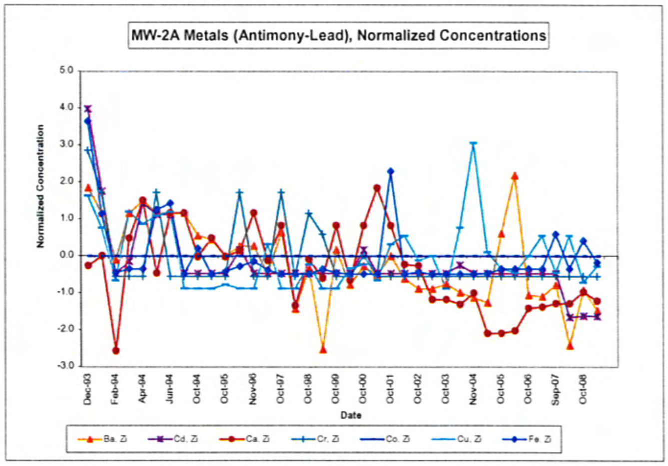


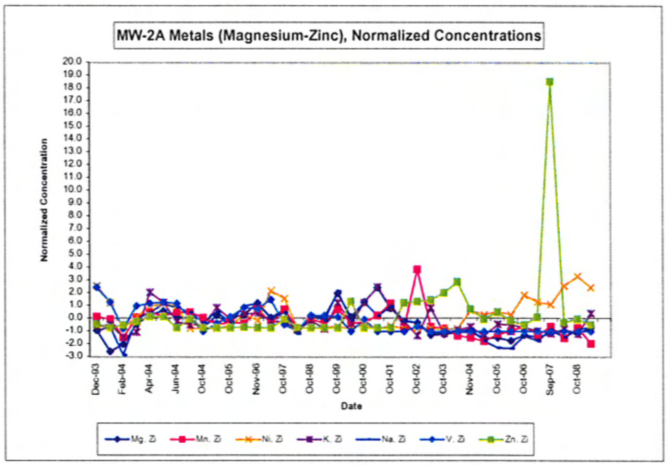


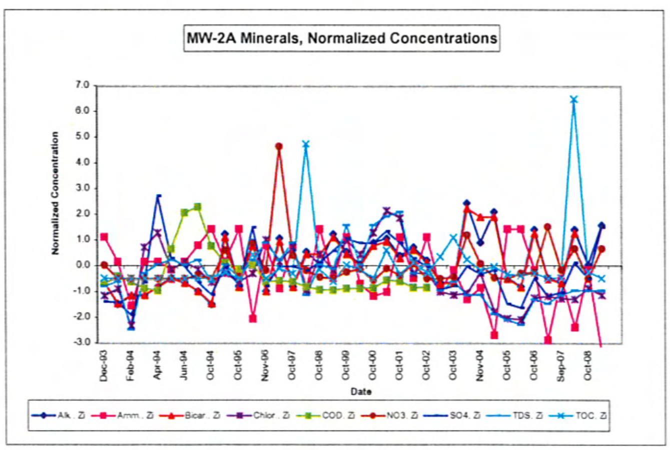
Note: Analytes with detections <25% are not plotted

FIGURE 6

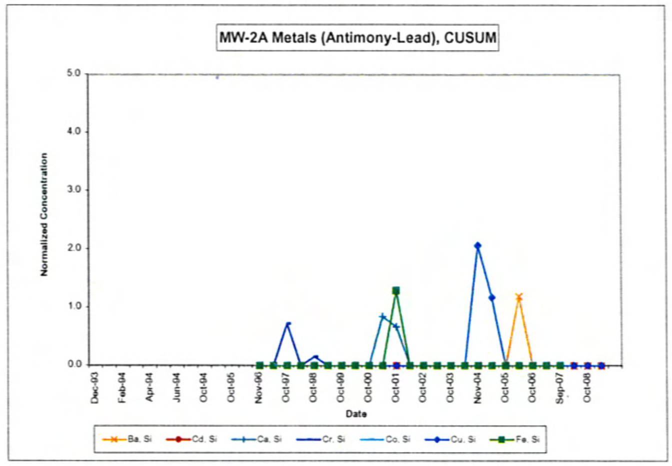
Normalized Concentrations, Fall 1993 through Spring 2009

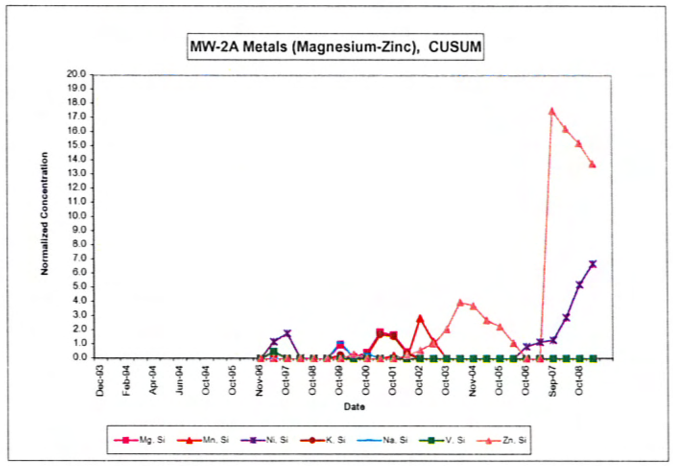


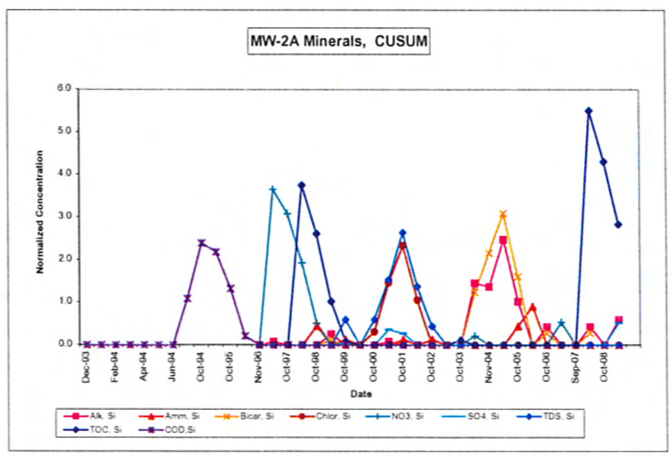




CUSUM Charts, Fall 1993 Through Spring 2009





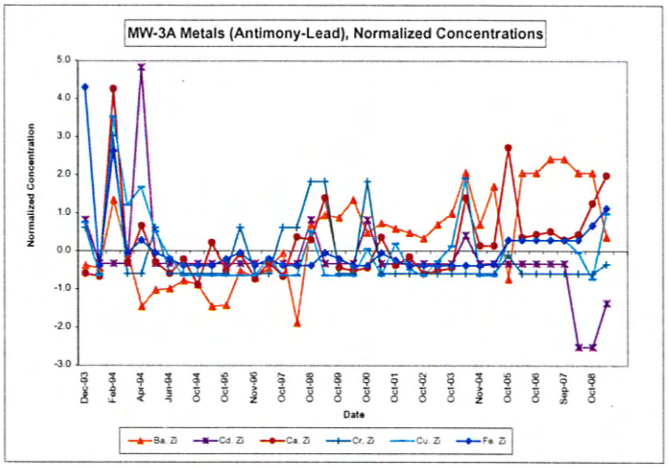


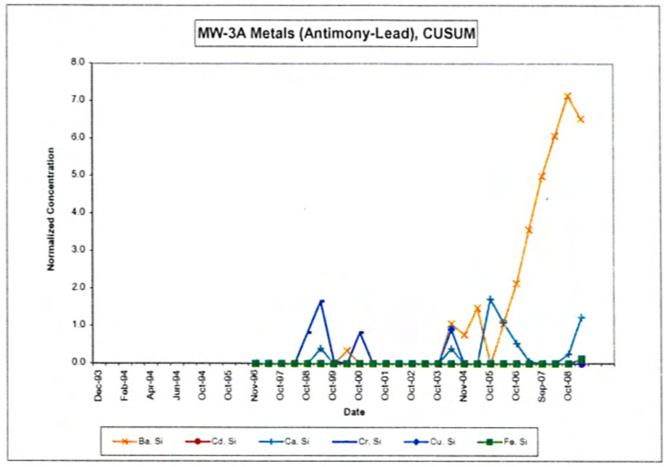
Note: Analytes with detections <25% are not plotted

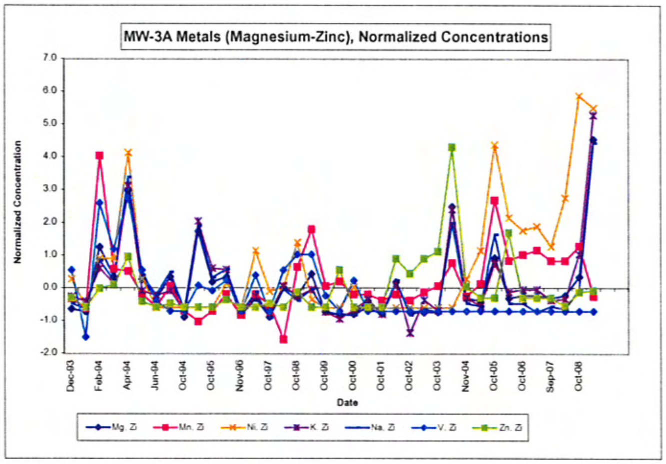
FIGURE 6

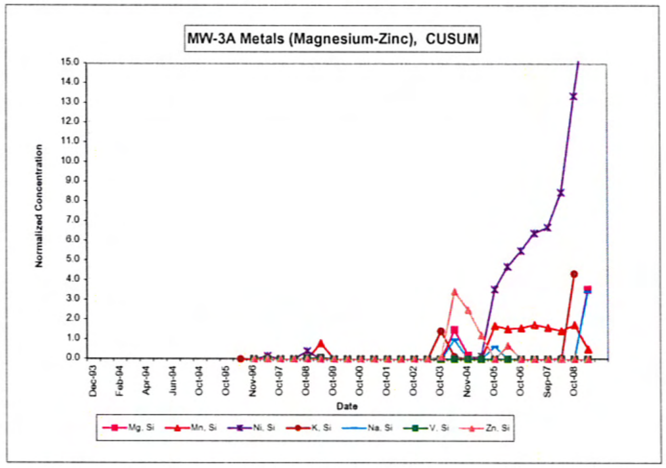
Normalized Concentrations, Fall 1993 through Spring 2009

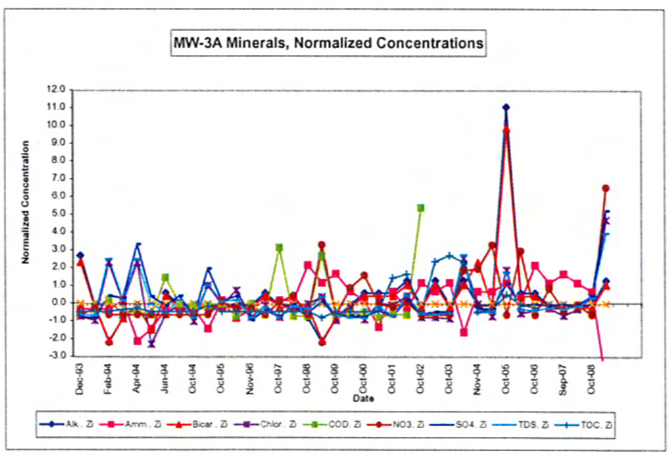
CUSUM Charts, Fall 1993 Through Spring 2009

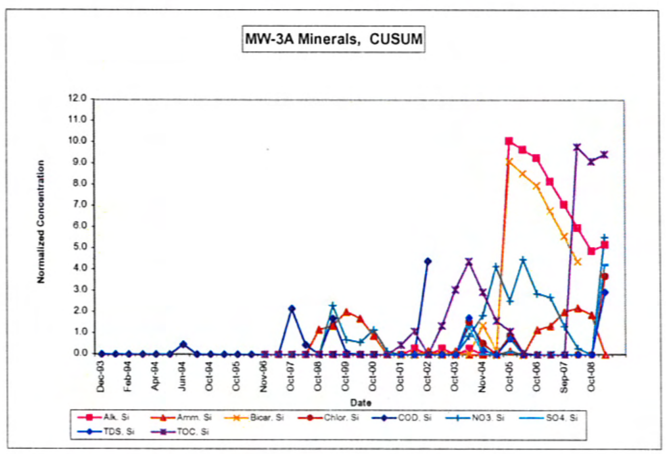










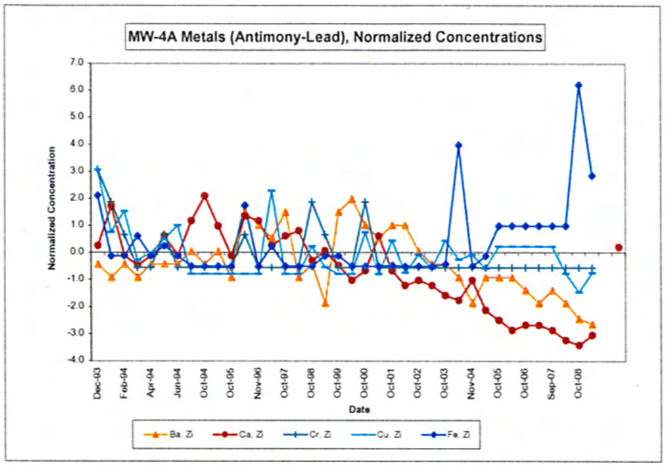


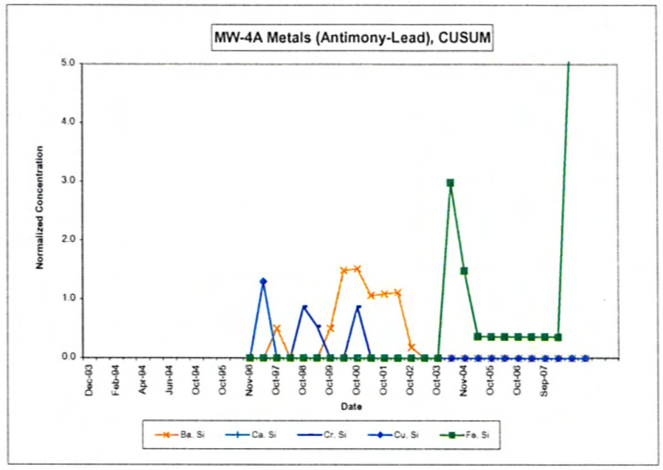
Note: Analytes with detections <25% are not plotted

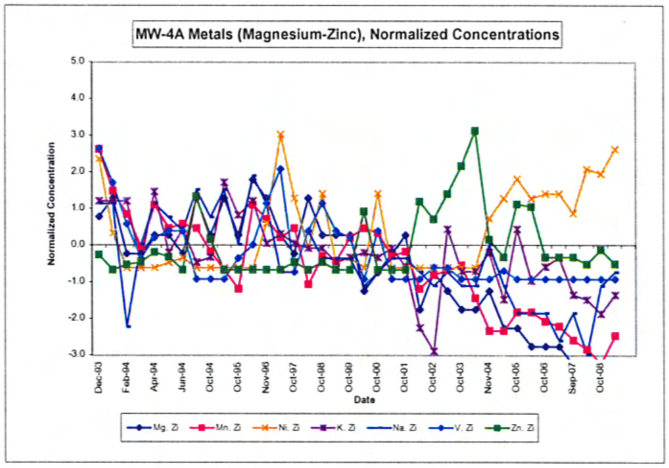
FIGURE 6

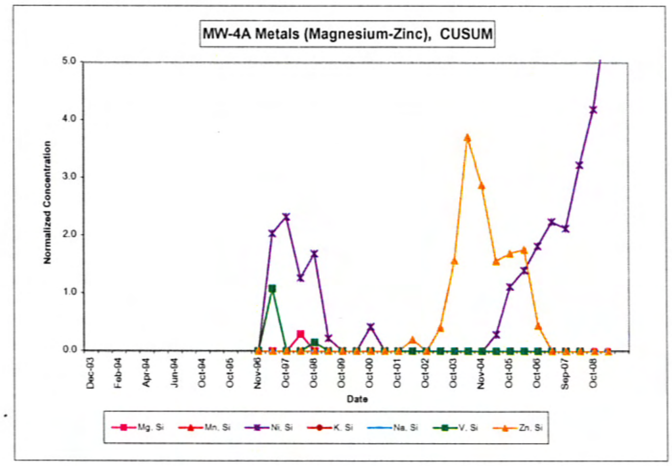
Normalized Concentrations, Fall 1993 through Spring 2009

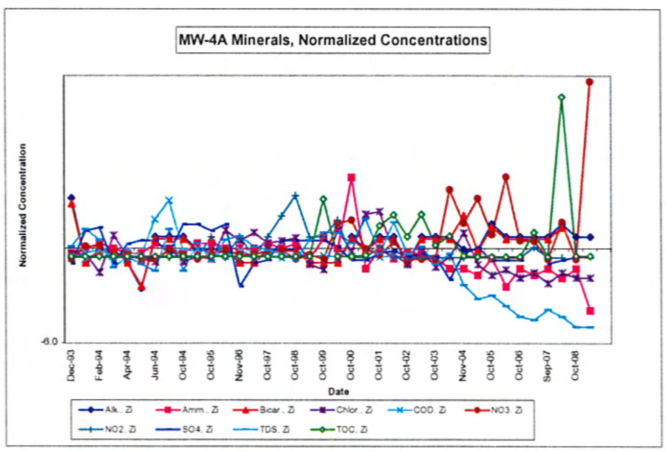
CUSUM Charts, Fall 1993 Through Spring 2009











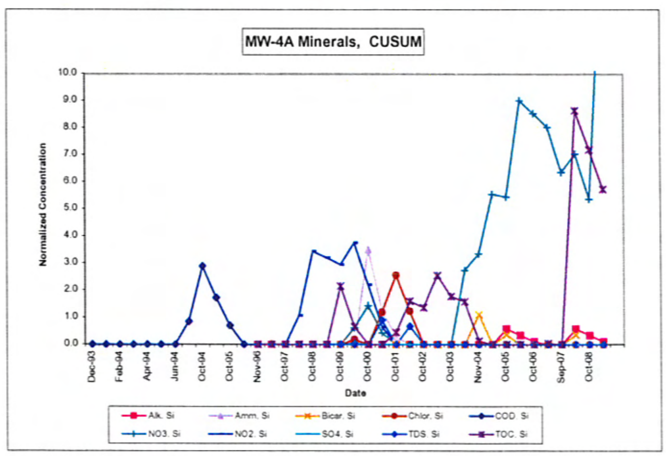


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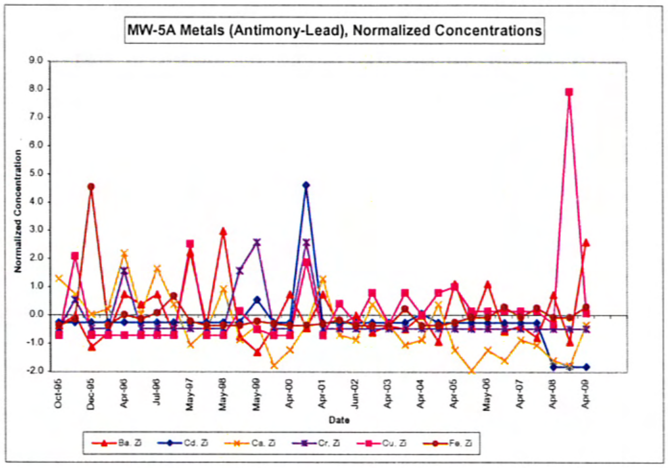
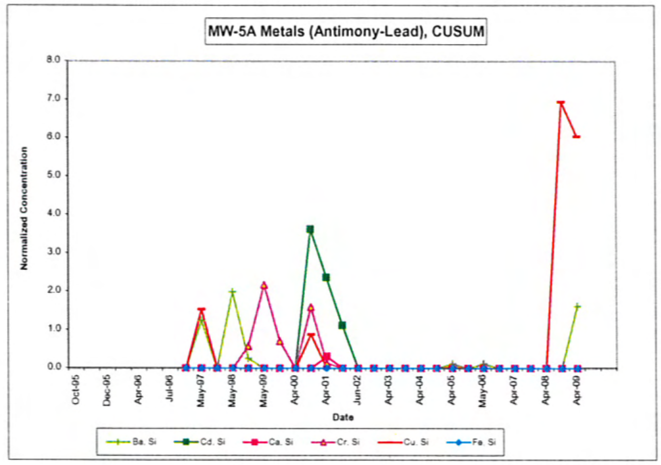
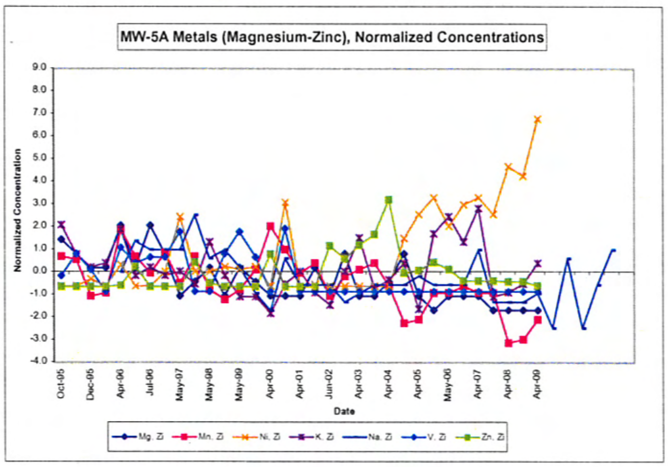
FIGURE 6

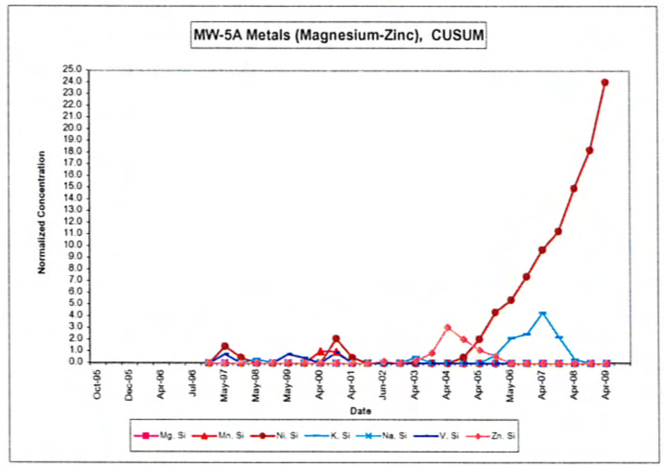
Normalized Concentrations, Fall 1993 through Spring 2009

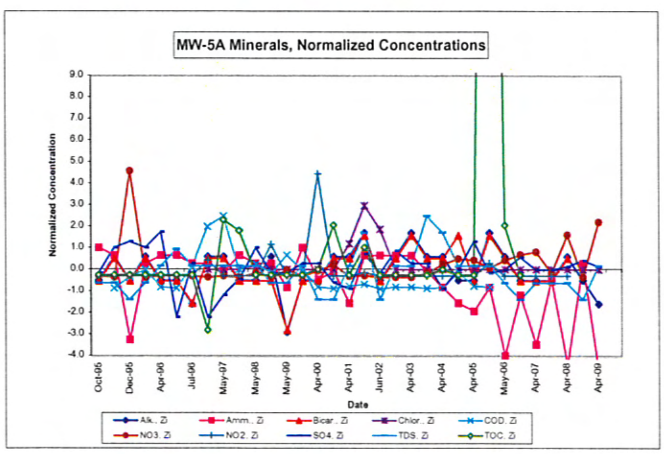
CUSUM Charts, Fall 1993 Through Spring 2009











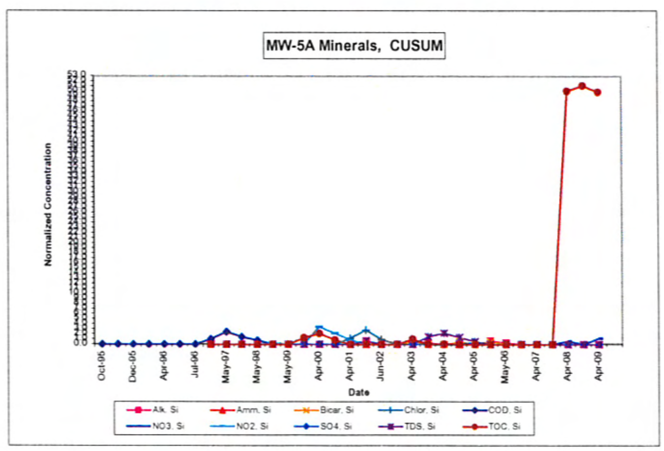


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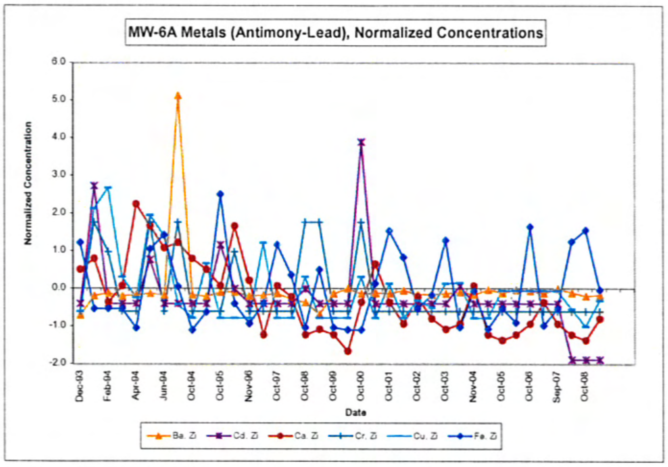
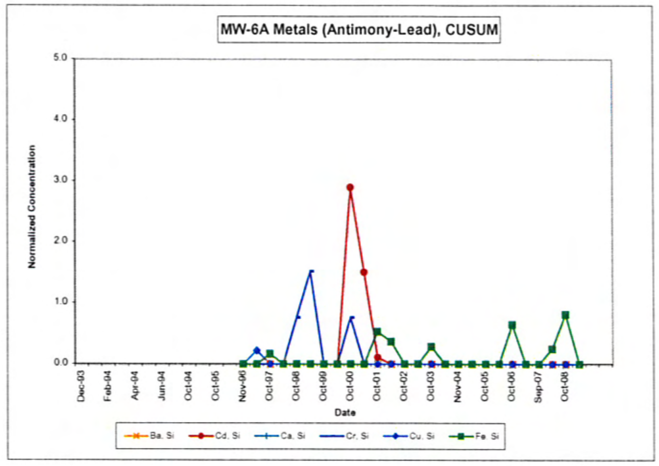
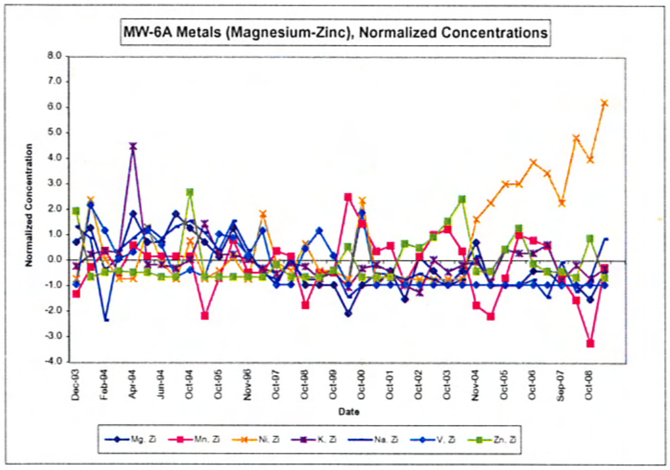
FIGURE 6

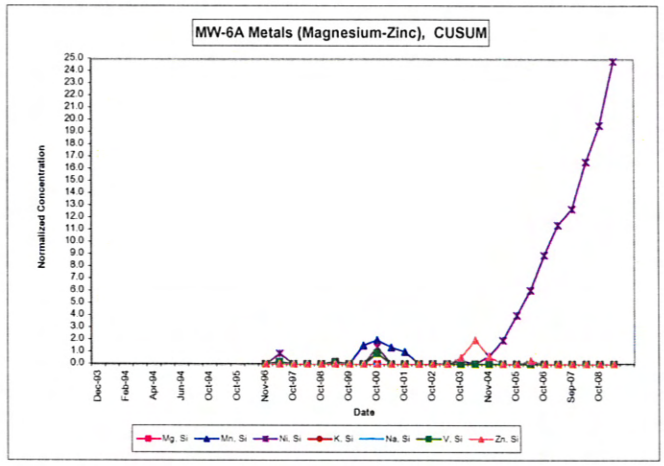
Normalized Concentrations, Fall 1993 through Spring 2009

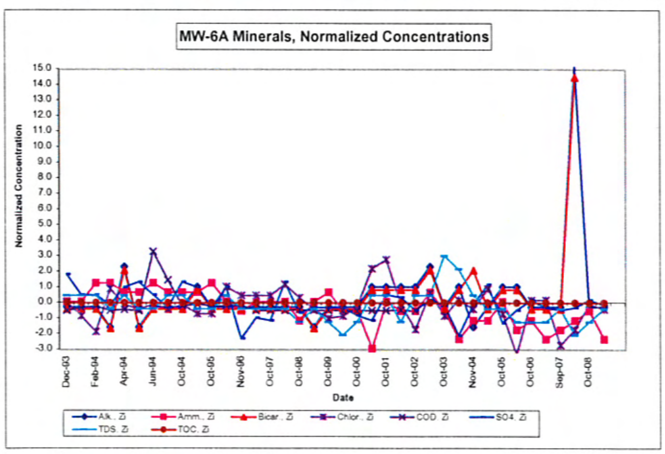
CUSUM Charts, Fall 1993 Through Spring 2009

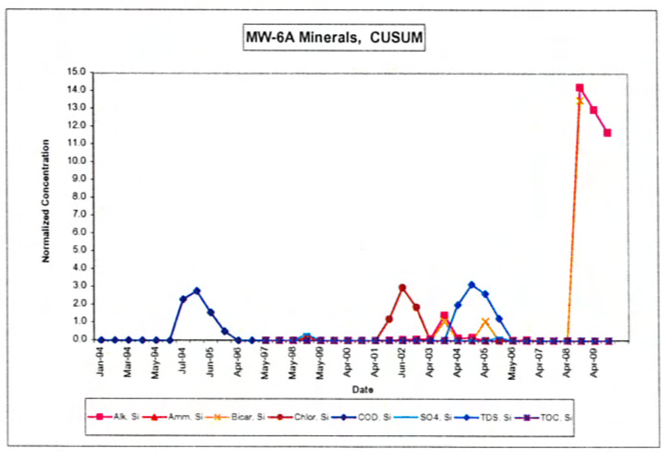








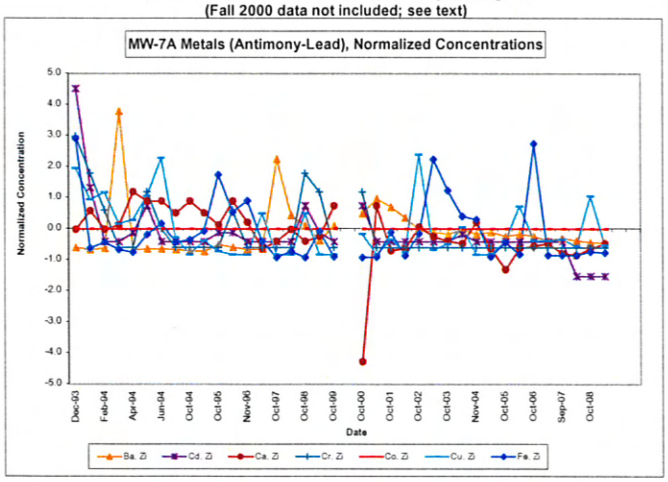


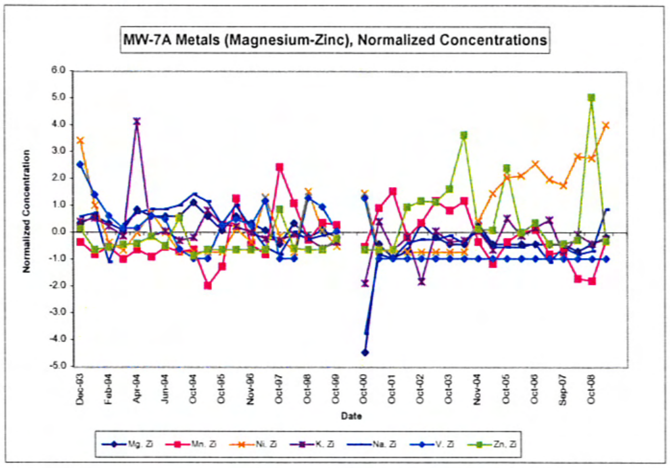


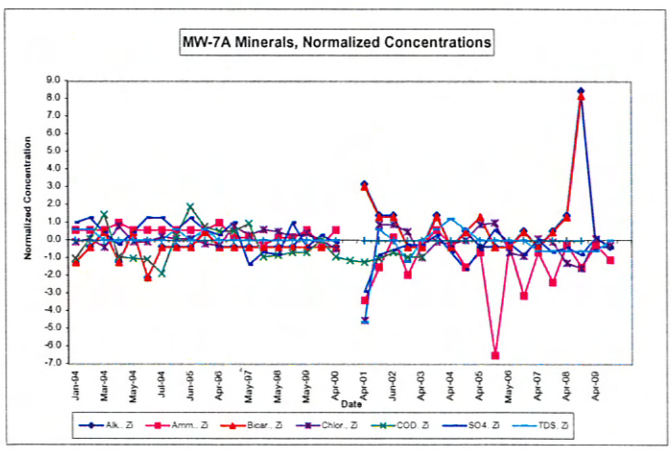
Note: Analytes with detections <25% are not plotted

FIGURE 6

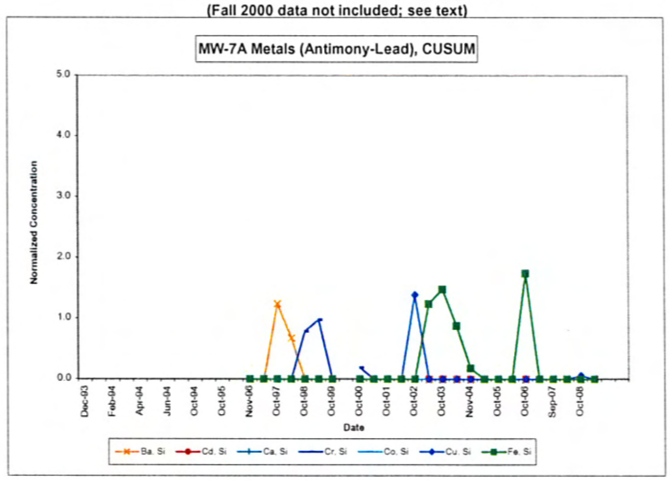
Normalized Concentrations, Fall 1993 through Spring 2009
(Fall 2000 data not included; see text)

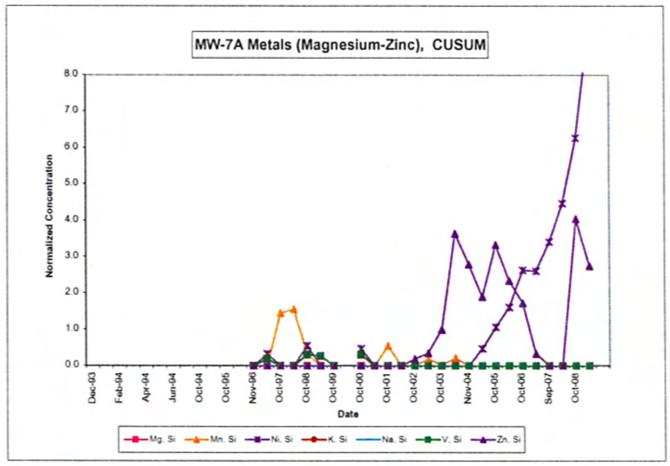


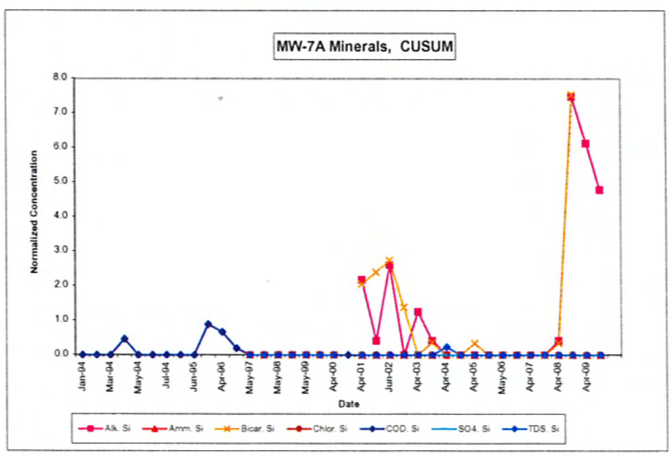




CUSUM Charts, Fall 1993 Through Spring 2009
(Fall 2000 data not included; see text)







Note: Analytes with detections <25% are not plotted

APPENDIX A

APPENDIX A
QUALITY ASSURANCE/QUALITY CONTROL PLAN
GROUNDWATER MONITORING WELL INSTALLATION

This quality assurance/quality control (QA/QC) plan has been prepared in accordance with the Salt Lake Valley Health Department, Health Regulation #1 (Regulation #1), which along with Utah Administrative Code (UAC) R315-308 regulate groundwater monitoring at the Salt Lake Valley Solid Waste Management Facility (SLVSWMF). Section 4.1.6.i.e. of Regulation #1 states a landfill is required to have an updated Groundwater Monitoring Plan and the plan will include a QA/QC plan for monitoring well construction. In addition to Regulation #1 and UAC R315-308 this plan incorporates Section 33 24 13 of the American Public Works Association's (APWA) Manual of Standard Specifications (Section 33 24 13) (Attached) and by reference ASTM D5092 and ASTM D5521.

1.0 WELL INSTALLATION PREPARATION

To insure proper well construction a professional geologist licensed in the state of Utah will be onsite during borehole advancement, well construction and well development activities at the SLVSWMF. The geologist's responsibilities will include:

- That each monitoring well as been marked in the appropriate location as detailed in the proposal for well installation.
- That the location of underground and overhead utilities are known and marked. This includes notifying blue stakes to coordinate a public utilities locate.
- That the contractor understands the preferred drilling method and is appropriately equipped for the well installation and development (Section 33 24 13; 2.1, specifies the use of hollow or solid stem auger drilling techniques for groundwater monitoring well installation).

- That for each detection groundwater monitoring well the screened interval spans the groundwater/vadose zone interface and is positioned to allow for maximum fluctuations in groundwater elevation; i.e. the current average groundwater elevation (calculated with groundwater elevations measured over the past couple of years) is located at the midpoint of the screen interval.

- That a well drillers report is submitted following installation activities for monitoring wells installed deeper than 30 feet below ground surface (bgs).

- That a State of Utah, Department of Water Rights Permit (for wells installed deeper than 30 feet) is procured prior to drilling.

- That a monitoring well proposed construction worksheet has been generated prior to well drilling activities and a final well construction worksheet is completed following development of the well. The well construction worksheet will, at a minimum, include; screen length, slot opening size, annular backfill material, and development details.

- Classifying soil types using per ASTM 2488 during borehole advancement and for wells installed greater than 30 feet bgs submitting logs for approval by the Bureau of Water Quality, Salt Lake County Health Department.

- That a report or log book is maintained to record field activities and to note well construction material inventories during construction activities. Field activities will be recorded in sufficient detail to allow field personnel to reconstruct events that transpired during the project.

2.0 WELL CONSTRUCTION MATERIALS

The materials used for monitoring well construction at the SLVSWMF will follow the specifications listed below unless stated in the proposed well construction worksheet.

Well Casing (Blank)

The blank (solid) well casing will be constructed of new, clean, 4-inch nominal diameter, schedule 40 APWA 16065 polyvinyl chloride (PVC) pipe with threaded fittings. The geologist will inspect each section of well casing to confirm and will record the total of section of well casing to confirm there is sufficient amount onsite to construct each well per the proposed well construction worksheet.

Well Screen

The well screen will be constructed of new, clean, 4-inch nominal diameter, machine slotted schedule 40 PVC with threaded PVC end caps. The well screen interval should be no less than 10 feet and some of the screen must be above the water table in the vadose zone. The slot opening size should be designed to retain 90 to 99 % of the filter pack material. The geologist will inspect each screen interval and record a tally of the well screen sections to confirm there is sufficient amount onsite to construct each well per the proposed well construction worksheet. The geologist will confirm the screen interval spans the groundwater/vadose zone interface and is positioned to allow for maximum fluctuations in the groundwater elevation with in the screened interval.

Filter Pack (sand)

Filter pack material will be comprised of clean, hard, durable, siliceous particles. The filter pack material size will be specified in the proposed well construction worksheet. The geologist will check filter pack materials and confirm appropriate grain size is used in combination with the appropriate slot size specified in the proposed well construction worksheet. Filter pack/slot size combinations used for monitoring wells at the

SLVSWMF have included 20/40 sand/0.010 slot screen or 10/20 sand/0.020 slot screen; both have produced adequate wells for groundwater monitoring at the SLVSWMF.

Bentonite Seal (hydrated chips)

The type of bentonite used for sealing each well annulus space will be specified in the proposed well construction worksheet. The geologist will inspect the bentonite material to confirm compliance with the well construction worksheet and that it is dry prior to placement.

Grout

The material used to grout each well will be designated on the proposed well construction worksheet. The Geologist will the check the material is in compliance with the well construction worksheet and has remained dry prior to placement.

Cement

Cement material is to be dry and is composed of one of the five Portland cement varieties. The use of quick setting cements containing additives is not recommended for use in monitoring wells as additives may leach and influence the chemistry of the groundwater samples. The geologist will confirm appropriate cement is used.

Calculations of the various anticipated annular volumes should be done by the geologist to confirm there is an adequate supply of each material onsite to complete well construction.

3.0 BOREHOLE ADVANCEMENT

Prior to drilling the geologist will inspect each drill rig for fuel or hydraulic leaks that could impact well installation. If any leaks are observed and cannot be mitigated onsite installation will be postponed until a clean fully functioning rig is mobilized. The geologist will also inspect the drilling auger flights and check with the driller to check each flight has been properly decontaminated. The length and number of onsite auger flights will be recorded to help settle any discrepancies in depth during borehole advancement. The onsite geologist will inform the drill crew as to any overhead or underground utility issues prior commencing work.

The drill rig will then be located over the designated well location, leveled and drilling will commence. As the borehole is advanced the geologist will track the total borehole depth bgs and the number of auger flights used. The drill cuttings generated during auger advancement will be inspected by the geologist to classify soil. If any additional soil sampling has been requested by the proposed drill plan the geologist will collect and log the samples, using the appropriate sampling method and equipment (i.e. split spoon, modified California tubes, Shelby tubes) as they are produced. The geologist will also communicate with the driller as to changing soil conditions encountered and indications of the water table location as the borehole is advanced.

The geologist is responsible for creating a borehole log from the soils observed and/or sampled during borehole advancement. The borehole log will contain all pertinent information regarding the personnel onsite, drilling techniques, the soil classification (as per ASTM 2488), the depth to water and if a well installation occurred (well construction details will be included on the final well construction worksheet).

No additives will be introduced into the borehole by the drill crew except water, if necessary. If water is used it will come from a known potable source. Drill cuttings will be spread evenly around the site following completion of the borehole.

4.0 WELL INSTALLATION

When the borehole has been advanced to the designed depth, the well will be constructed inside the hollow stem auger flights. Due to the geology of the subsurface solid auger flights should not be used when installing groundwater monitoring wells at the SLVSWMF. Clean well construction materials will be mobilized to the borehole and, wearing new nitrile gloves, the drill crew will begin threading the sections of end-cap, screen, and casing together and tightening them by hand or with chain wrenches until no threads are visible. The well string will be lowered down the borehole using the drill rig winch line and casing clamps or other appropriate methods that maintain the casing's integrity during its lowering. The geologist will record a tally of the pre-measured pieces as they are added to the well string. Once the well string reaches the borehole bottom and the geologist indicates the material tally is correct the well string will be lifted off the bottom so that the annular fill materials are placed with the well string in suspense. This eliminates bowing of the well casing and insures that the well is straight and plumb.

With the well casing centered in the borehole, the drill crew will begin placement of the annular backfill materials for the well while concurrently extracting the auger flights. The volume of the annular space for the length of each particular type of material lift will be calculated and recorded for comparison to the actual materials used. This will give an indication of borehole wall integrity and weather bridging of the annular materials has occurred inside the auger flights. To limit borehole collapse or bridging the auger flights should be lifted until the bit is 2 to 5 feet above the last lift of materials before removing each flight. Care should be taken to avoid lifting the well casing with the withdrawal of each auger flight. The depth of the top of the placed materials should be monitored regularly using a weighted measuring tape (sounding) to record the length of each material lift in the annulus is as per the well design. While the driller traditionally does the material sounding during construction the geologist will also handle the tape at the final measurement of each material type and will record that depth on the well construction worksheet.

When placing the filter pack the sand can be poured in the annulus between the auger flight wall and the well casing from the surface but must be added slowly to allow the individual grains of sand time to sink through the water column and to avoid bridging and/or locking the well casing inside the auger flights. The sand should be given adequate time to sink before sounding the top of the sand to ensure an accurate measurement is achieved. When the top of the designed filter pack interval is reached the geologist will tally and record the number of sand bags used and record the actual volume of materials placed.

The drill crew and geologist will repeat this process while placing the bentonite seal. If any part of the annular seal is anticipated to be below the water table, the saturated section of the annulus should be sealed with a coated time released bentonite pellet. Above the water table bentonite chips should be used. The chips will be hydrated with five gallons of potable water after each two foot lift is placed. While ASTM D 5092-8.6 recommends using granular bentonite in the unsaturated zone, experience with this method has proven there to be a high potential for bridging during hydration with little improvement of the seal. When the top of the designed bentonite seal interval is reached the geologist will tally and record the number of bentonite chip bags used and record the actual volume of materials placed.

Section 33 24 13 discusses the use of a cement-bentonite mix slurry for sealing the annular space above the bentonite seal. Typically monitoring wells at the SLVSWMF are shallow and have little remaining annular length above the bentonite seal for placing slurry. The remaining annulus can be completed by continuing to place bentonite pellets to 3 feet bgs where the concrete completion will begin. If grout is specified in the well design it should consist of about 6 gallons of water per 94 pound bag of type 1 Portland cement with 3 to 8 percent (by dry weight) of bentonite powder added after the initial mixing of the cement and water to retard shrinkage and provide plasticity. The grout can be pumped into the annulus from the surface if in unsaturated conditions. If the grout is being placed below the water table it must be pumped to the bottom of the open annular space through a tremmie pipe displacing water at the surface until grout appears. An ample volume of grout should be mixed on site to compensate for unexpected losses to the formation. Grout will typically settle with time and need to be topped off as settling or slow formation loss occurs. When the top of the designed grout interval is reached the geologist will tally and record the number of grout batches used and record the actual volume of materials placed.

5.0 DEVIATIONS FOR WELL CONSTRUCTION DESIGN

The geologist is responsible for noting any subsurface conditions that might affect the performance of the monitoring well as it is designed according to the proposed well construction worksheet. If subsurface conditions exist requiring a deviation from the well construction worksheet the geologist is to notify the project manager in charge and note the deviation on the final well construction worksheet. In addition the geologist will record the deviation in well construction in the daily field report with an explanation to why the deviation was required.

6.0 SURFACE COMPLETION

The monitoring well must be completed with an installation at the ground surface that will deter unauthorized entry to the well, prevent damage or destruction of the well, and prevent surface water from entering the annulus. A steel protective casing will be set in the borehole that has a diameter that is less than the diameter of the borehole and extends to the top of the bentonite or grout seal. This depth should be below frost line which is approximately 3 feet at the SLVSWMF. The steel casing should extend to approximately 6 inches above the top of the well casing. The steel casing will then be sealed and immobilized in concrete placed around the outside of the protective casing from above the bentonite or grout seal to the ground surface. A 1/4 inch weep hole should be drilled in the protective casing approximately 6 inches above the ground surface to permit water to drain out of the annular space between the steel casing and the well casing. Dry bentonite chips should then be placed in the annulus up to the ground surface. Coarse sand or pea gravel should then be placed in the annulus to a level above the weep hole to prevent insects from entering and nesting in the protective casing. A tight fitting locking steel cover will be affixed to the top of the steel casing. A 2 foot by 2 foot concrete pad extending 3 inches below and above the ground surface will then be constructed around the outside of the steel casing. The surface of the pad will slope gently away from the casing to provide water drainage. The steel casing and lid will be painted inside and out with a rust prohibitive primer and two blue scuff resistant enamel surface coats. The well cover surface will be braised or stamped with at least 1-inch tall letters reading "WATER MONITOR WELL NO.___". The geologist will provide the well number and document on the well construction worksheet that all materials used are as per the approved well design.

7.0 WELL DEVELOPMENT

Development of recently installed wells is necessary to remove fine grain material from the well screen and filter pack that may otherwise interfere with water quality analysis. Well development also restores the formation properties disturbed during the drilling process, and improves the hydraulic characteristics of the filter pack and hydraulic communication between the well and the adjacent formation. The ultimate goal of well development is to create a filter pack that will deliver groundwater with low turbidity and that is as indicative of groundwater water in the well's vicinity.

Groundwater monitoring wells at the SLVSWMF will be developed by a combination of bailing/surging and pumping methods. Initially the well should be bailed (surged) repeatedly with a 3 inch plus diameter stainless steel bailer until the groundwater is free of visible free floating sediment. All development water may be discharged to the ground surface in the vicinity of the recently installed wells. Once the groundwater clears and appears cloudy versus muddy a submersible pump will be lowered to within a few feet of the bottom of the well. Pumping will begin at a flow rate greater than the rate used to sample wells. The groundwater will be continuously monitored with a turbidity meter. When turbidity readings have dropped below 5 nephelometric turbity units (NTUs) for three consecutive readings, collected at least three minutes apart, well development will be considered complete.

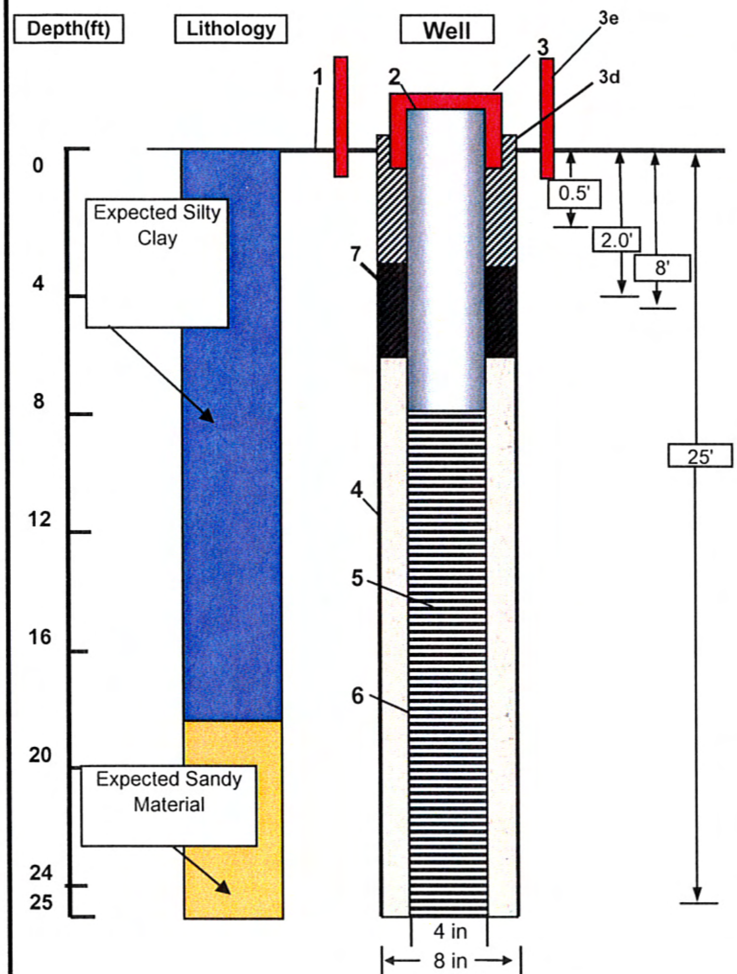
WELL NUMBER

Proposed Monitoring Wells (MW-11A, MW-12A and MW-13A)

SLVSWMF

MONITORING WELL CONSTRUCTION WORKSHEET

PROJECT : **SLVSWMF Leachate Pond Monitoring Wells** LOCATION : **NE Corner SLVSWMF**
DRILLING SUBCONTRACTOR : DRILLER:
DRILLING METHOD AND EQUIPMENT: **Hollow Stem Auger** DIAMETER: 8" OD HELPERS:
WATER LEVEL : **Expected 8-12 feet bgs** START: END: GEOLOGIST:



DRAWING NOT TO SCALE

1- Ground elevation at well : Document in field

2- Survey location : to be conducted

3- Surface completion casing :
- a) type / diameter (ID/ OD) Steel, 6 inch OD
- b) height above ground 3 feet
- c) length below ground 3 feet
- d) type / quantity of sealant Portland cement tally bags/lbs in field
- e) protective bollards Install and document in field

4- Well casing :
- a) type / diameter (ID/ OD) Schedule 40 PVC / 4 inch diameter
- b) height above ground 2.5 feet (6" below top of protective casing)
- c) length below ground 8 feet
- d) well centralizers none

5- Well screen :
- a) type / diameter (ID/ OD) Schedule 40 PVC / 2 inch
- b) slot size .020 inch
- c) lengths 17 ft (8 to 25 ft bgs)

6- Well screen filter pack :
- a) type Colorado Silica Sand
- b) quantity used ? - 50 lb. bags
- c) method of placement poured from surface
- d) length 19 feet (6 to 25) ft bgs

7- Bentonite seal :
- a) type/ quantity Chips, document lbs/bags in field
- b) length 1.0 to 2.0 feet bgs

Pumping tests :
- a) drawdown / time
- b) pumping rate

Well development :
- a) method Bail (Surge) and Pump
- b) time day of installation

Notes: 4-inch sealing (Gripper) cap to be placed on top of PVC casing

SECTION 33 24 13
GROUND WATER MONITORING WELLS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Water monitoring well materials and installation requirements.

1.2 REFERENCES

A. ASTM D 5092: Standard Practice for Design and Installation of Ground Water Monitoring Wells in Aquifers.

1.3 SUBMITTALS

A. Well driller's progress record at completion of drilling operations.

B. Copy of monitoring well permit if well is deeper than 30-feet. Secure permit from State of Utah, Department of Water Rights. Phone 538-7240.

C. Copy of the Monitoring Well Construction Worksheet. The worksheet is available from the State of Utah, Division of Water Resources, Appropriation Section, 1636 West North Temple Street, Salt Lake City, Utah 84116. Telephone No. 538-7240.

D. Approved copy of geologist professional's monitoring well log. Secure approval from Bureau of Water Quality and Hazardous Waste, Salt Lake City-County Health Department, 610 South 200 East, Salt Lake City, Utah 84111. Person to contact: Mary Pat Buckman.

E. Dimensions of screen including length, slot opening size, and filter pack gradation analysis.

1.4 QUALITY ASSURANCE

A. Driller Qualification: Thoroughly experienced and competent.

B. Geologist professional: Person who is licensed in accordance with Utah law; to provide monitoring well logs.

C. Abandoning Existing Monitoring Wells: Conform to the State of Utah regulations for Water Well Drillers and the Supplemental rules and regulations for Permanent Abandonment of Wells adopted by the State Engineer.

PART 2 PRODUCTS

2.1 DRILLING EQUIPMENT

A. Drilling rig equipped with hollow or solid stem auger.

B. Tools, bits, and all other necessary equipment.

2.2 MATERIALS

A. **Riser Pipe**: New, clean, 4-inch nominal diameter schedule 40 APWA 33 05 07 PVC. All Joints threaded. Do NOT use solvent weld.

B. **Screen**: New, clean, machine slotted schedule 40 PVC.

   1. Nominal Diameter: 4-inches.
   2. Length: 10-feet minimum. (*The length of the slotted area should reflect the interval to be monitored.*)
   3. Slot Opening: Sized by CONTRACTOR to retain 90 to 99% of the filter pack.
   4. End Fitting: Threaded PVC cap.

C. **Filter Pack (Sand)**: Uniformly graded, comprised of hard durable siliceous particles washed and screened with a particle size distribution determined by CONTRACTOR to comply with ASTM D 5092.

D. **Bentonite Seal**: Coarse ground bentonite slurry.

   1. Set to a Plastic Consistency: Approximately 20 minutes.
   2. Non-toxic, non-fermenting, anionic polymer to control the time of set.
   3. Dry uncompacted bulk density of 71 pounds per cubic foot.
   4. Mixed with fresh water in the proportion and manner recommended by the manufacturer.

E. **Grout**: Cement-bentonite mix for sealing the annular space between riser pipe and the bore hole above the bentonite seal.

PART 3 EXECUTION

3.1 PREPARATION

A. Stake locations of monitoring wells prior to drilling. Well locations may be adjusted by the ENGINEER.

B. Coordinate the start of drilling with ENGINEER.

3.2 INSTALLATION

A. **Monitoring Well**: Follow drilling and installation methods specified in ASTM D 5092.

B. **Head Assemblies**: Secure all joints and fittings. Repair any damage which result from construction operations.

C. **Grading**: Grade benches or platforms to drain away from well.

D. **Vault**:

   1. Non-reinforced concrete annular ring supporting a steel casing cover and a lockable lid.
   2. Stamp or braze on each cover in letters not less than 1-inch high the words: "WATER MONITOR WELL No. _____". ENGINEER to provide number of well.
   3. Paint casing cover and lid (inside and outside) with a rust inhibitive primer and two BLUE scuff resistant enamel surface coats.

3.3 **CLEANING**

A. Develop well in accordance with ASTM D 5092.

END OF SECTION

APPENDIX B

State of Utah

JON M. HUNTSMAN, JR.
Governor

GARY HERBERT
Lieutenant Governor

Department of
Environmental Quality

Amanda Smith
Acting Executive Director

DIVISION OF SOLID AND
HAZARDOUS WASTE
Dennis R. Downs
Director

July 9, 2009

Mr. Tom Burrup, Environmental Manager
Salt Lake Valley Solid Waste Management Facility
6030 West California Avenue
Salt Lake City, Utah 84104

Subject: Notice of Permit Review Completion and Request to Review Draft Permit #9429R1

Dear Mr. Burrup:

The Division has received the statistical analysis for the upgradient arsenic levels in the groundwater monitoring network of Salt Lake Valley Solid Waste Management Facility. The proposed new upgradient action level for arsenic is based on the historical concentrations and represents a three sigma level based on the historical mean and standard deviation of arsenic concentration. Based on a 99% probability that the upgradient concentration would not be exceeded based on a random sample, three sigma represent an arsenic concentration of 0.020 mg/l. The Division accepts this concentration as the action concentration for the SLVSWMF groundwater.

With submittal of the arsenic action concentration, the permit renewal is complete and a DRAFT PERMIT has been prepared. This DRAFT PERMIT is included with this letter for your review. Please respond in writing that you have reviewed and approved this DRAFT PERMIT. After your review, the Division will publish the public notice to indicate the beginning of the 30-day public participation period as required by the Solid Waste Permitting and Management Rules, R315-301 through 320.

If you have any questions regarding the letter, please contact either Ralph Bohn or Roy Van Os at (801) 538-6715.

Sincerely,

Dennis R. Downs, Executive Secretary
Utah Solid and Hazardous Waste Control Board

DRD/rvo/kk

Enclosure: DRAFT Permit #9429R1

c: Gary Edwards, MS, Health Officer, Salt Lake Valley Health Department
Royal DeLegge, MPA, EHS, Environmental Health Director, Salt Lake Valley Health Department
Mary Pat Buckman, Salt Lake Valley Health Department

TN200900791.DOC

Attachment #6

Landfill Gas Monitoring Plan

DRAFT FINAL

Salt Lake Valley Landfill Gas Plan

Prepared for

Salt Lake Valley Solid Waste Management Facility

November 2016

ch2m

4246 S. Riverboat Road
Suite 215
Taylorsville, UT 84123

Contents

Section Page

Appendices

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Acronyms and Abbreviations

cfm	cubic feet per minute
CFR	*Code of Federal Regulations*
EG	Emissions Guidelines
EPA	United States Environmental Protection Agency
ET	Evapotranspiration
GCCS	Gas Collection and Control System
gpd	gallons per day
HDPE	High Density Polyethylene
LFG	large diameter landfill gas
MSW	Municipal Solid Waste
Na	not applicable
NMOC	Nonmethane Organic Carbon
NSPS	New Source Performance Standards
PVC	Polyvinyl Chloride
RCRA	Resource Conservation and Recovery Act
SLVSWMF	Salt Lake Valley Solid Waste Management Facility
UAC	Utah Administrative Code
UDAQ	Utah Division of Air Quality
UV	Ultra Violet

Certification

This Master Plan report for the landfill gas collection and control system for the Salt Lake Valley Solid Waste Management Facility (SLVSWMF) has been prepared by CH2M, as authorized by the Salt Lake Valley Solid Waste Management Council.

I certify the landfill gas collection and control system design for the SLVSWMF, as described herein, meets the design requirements of the New Source Performance Standards for Municipal Solid Waste Landfills found in 40 *Code of Federal Regulations* (*CFR*) Title 60 Subpart WWW, 60 CFR Subpart XXX and the Utah Administrative Code (UAC) R307-221, Emission Standards: Emission Controls for Existing Municipal Solid Waste Landfills. I further certify that this report was prepared by me or under my direct supervision and that I am a registered Professional Engineer in the State of Utah.

____

Jared Carling, P.E.

UT License # 5735065-2202

SECTION 1

Introduction

This document is a Gas Collection and Control System (GCCS) Master Design Plan for the SLVSWMF, pursuant to 40 *CFR* 60 Subparts WWW and Cc, New Source Performance Standards (NSPS) and Emissions Guidelines (EG) for Municipal Solid Waste Landfills. Implementation and enforcement of the NSPS and EG is administered by the Utah Division of Air Quality (UDAQ). The objectives of the Master Design plan are to:

- Update the previous Design Master plan dated March 7, 2006.
- Describe the current GCCS as installed and propose future GCCS expansions.
- Demonstrate the Master Design meets the minimum requirements of the NSPS and EG.
- Integrate future GCCS designs with the SLVSWMF Development Plans.
- Propose alternatives to the operational standards, test methods, procedures, compliance measures, monitoring, and recordkeeping pursuant to 40 *CFR* 60.759.

This Master Design Plan demonstrates the current and proposed designs for the GCCS are compliant with the NSPS and EG. This Master Design Plan is a working document, intended to be used as a general guideline for maintaining ongoing compliance with the NSPS and EG and used in reference when considering any future design and construction of the GCCS.

1.1 Summary of Updates

The GCCS system has been significantly expanded since the original design and the refuse capacity of the landfill has been increased since the last update to the Gas Master Plan. This section summarizes the modifications done to the GCCS.

1.1.1 Permitted GCCS Changes

The permit for the GCCS system with UDAQ was modified in November 2015 to incorporate an increase an allowable waste placement to 53,400,000 tons of refuse. As part of this permitting action, a new header, additional horizontal collectors, and upgraded condensate collection sumps were proposed and installed. The permitted changes completed and incorporated into the GCCS are shown in Appendix A and include:

- Installation of a new north header underneath the perimeter road of the landfill.
- Separation of the north and south headers and the neighboring landfill-gas-energy plant via a series of four valves.
- Installation of 24 horizontal collectors on the east and north portions of the landfill.
- Connect all existing collectors serviced by the new north header.
- Perform an official source test of the biogas flare and obtain a new minimum operating temperature.
- Installation of a new flow meter at the biogas flare.

1.1.2 Proposed GCCS Changes

This Master Plan Design also summarizes expansions of the GCCS proposed over the operating life of the SLVSWMF. The proposed GCCS expansions consist of ongoing extensions of the GCCS into active disposal modules and completion of the GCCS in modules at or near final grade. Proposed GCCS additions include:

- Multiple layers of horizontal collector trenches in each module spaced approximately 40 feet vertically or two lifts of refuse. The layers will have staggered spacing of approximately 250 feet, on center.
- Extension of large diameter landfill gas (LFG) conveyance headers around the perimeter of the landfill for connection of the LFG collectors to the biogas flare.
- Vertical LFG extraction wells installed at near final grade to provide continued compliance and maintain adequate collection efficiency through landfill closure and post-closure.
- Future expansion of the LFG treatment device capacity by the addition of another biogas flare or alternative control device.

1.2 Compliance Summary Table

A summary of the applicable NSPS/EG regulations and the SLVSWMF's implementation of the GCCS designs to comply with these regulations are provided in Table 1-1.

Table 1-1. SLVSWMF Cross Reference Summary of GCCS Regulatory Requirements

Regulatory Citation	Report Reference	Regulatory Requirement	Implementation of Requirement at SLVSWMF
§60.759(a)(1)	Section 4.1	The collection devices within the interior and along the perimeter areas shall be certified to achieve comprehensive control of surface gas emissions by a professional engineer.	The GCCS design is certified, signed, and sealed by a professional engineer.
§60.759(a)(1)	Section 4.1	The following issues shall be addressed in the design: depths of refuse, refuse gas generation rates and flow characteristics, cover properties, gas system expandability, leachate and condensate management, accessibility, compatibility with filling operations, integration with closure end use, air intrusion control, corrosion resistance, fill settlement, and resistance to the refuse decomposition heat.	The GCCS addresses each design requirement of Section §60.759(a)(1) the NSPS.
§60.759(a)(2)	Section 4.2	The sufficient density of gas collection devices determined in paragraph (a)(1) of this section shall address landfill gas migration issues and augmentation of the collection system through the use of active or passive systems at the landfill perimeter or exterior.	All future expansions of the GCCS will be designed to maintain emissions and LFG migration control as set forth under the NSPS.
§60.759(a)(3)(i)	Section 4.3.1	Any segregated area of asbestos or nondegradable material may be excluded from collection if documented as provided under §60.758(d).	A designated asbestos area exists and is fenced off from the rest of the landfill per the requirements of 40 *CFR* 61 Subpart M – National Emission Standards for Asbestos.

Table 1-1. SLVSWMF Cross Reference Summary of GCCS Regulatory Requirements

Regulatory Citation	Report Reference	Regulatory Requirement	Implementation of Requirement at SLVSWMF
§60.759(a)(3)(ii)	Section 4.3.2	Any nonproductive area of the landfill may be excluded from control, provided the total of all excluded areas can be shown to contribute less than 1 percent of the total amount of NMOC emissions from the landfill.	No such areas of the landfill are excluded from the coverage of the GCCS at this time.
§60.759(b)(1)	Section 4.4.1	The landfill gas extraction components shall be constructed of polyvinyl chloride (PVC), high density polyethylene (HDPE) pipe, fiberglass, stainless steel, or other nonporous corrosion resistant material of suitable dimensions to: convey projected amounts of gases; withstand installation, static, and settlement forces; and withstand planned overburden or traffic loads.	GCCS system components are constructed primarily of HDPE and PVC and other nonporous corrosion resistant materials. The GCCS components will be designed to accommodate the maximum landfill gas flow rate anticipated at various development stages and installed to withstand installation, static, settlement forces, and withstand planned overburden or traffic loads.
§60.759(b)(1)	Section 4.4.1	Collection devices such as wells and horizontal collectors shall be perforated to allow gas entry without head loss sufficient to impair performance across the intended extent of control. Perforations shall be situated with regard to the need to prevent excessive air infiltration.	The GCCS collectors will be perforated to minimize head loss and excess air infiltration into the system.
§60.759(b)(2)	Section 4.4.2	Vertical wells shall be placed so as not to endanger underlying liners and shall address the occurrence of water within the landfill.	Vertical extraction wells are designed and installed to extend from the landfill surface to no more than 75 percent of the refuse depth. Liquids in the refuse are addressed by the leachate and condensate management systems.
§60.759(b)(2)	Section 4.4.2	Holes and trenches constructed for piped wells and horizontal collectors shall be of sufficient cross-section so as to allow for their proper construction and completion including, for example, centering of pipes and placement of gravel backfill.	Boreholes and trenches will be constructed with sufficient cross section to allow for the proper operation of the collection elements.
§60.759(b)(2)	Section 4.4.2	Collection devices shall be designed so as not to allow indirect short circuiting of air into the cover or refuse into the collection system or gas into the air.	Control of air intrusion and landfill gas offsite migration will be accomplished by maintaining the GCCS under vacuum and maintaining an effective cover. Surface monitoring will detect areas of excessive landfill gas escape and these areas will be rectified per 40 *CFR* 60 Subpart WWW.
§60.759(b)(2)	Section 4.4.2	Any gravel used around pipe perforations should be of a dimension so as not to penetrate or block perforations.	Gravel backfill of sufficient size will be placed to limit entry or blockage of the collector perforations.

Table 1-1. SLVSWMF Cross Reference Summary of GCCS Regulatory Requirements

Regulatory Citation	Report Reference	Regulatory Requirement	Implementation of Requirement at SLVSWMF
§60.759(b)(3)	Section 4.4.3	Collection devices may be connected to the collection header pipes below or above the landfill surface. The connector assembly shall include a positive closing throttle valve, any necessary seals and couplings, access couplings and at least one sampling port.	Collectors will be connected to the header pipe and include a positive closing throttle valve, necessary seals and couplings, access couplings and at least one sampling port.
§60.759(c)	Section 4.5	The gas mover equipment shall be sized to handle the maximum gas generation flow rate expected over the intended use period of the gas moving equipment.	The header pipe will be sized to collect the maximum expected landfill gas flow rates for the life of the components.
§60.752(b)(2)(A)(2)	Section 4.7.3	Collect gas from each area, cell, or group of cells in the landfill in which the initial solid waste has been placed for a period of 5 years or more if active; or 2 years or more if closed or at final grade.	Cells where solid waste has been placed for a period of 5 years or more if active; or 2 years or more if closed or at final grade will have a GCCS installed before exceeding the regulatory timeframe.
§60.752(b)(2)(A)(3)	Section 4.7.3	Collect gas at a sufficient extraction rate.	Sampling ports at each collector will be checked at least monthly to verify the system is under vacuum and gas is being collected at a sufficient rate for the collector in question.
§60.752(b)(2)(A)(4)	Section 4.7.3	Be designed to minimize offsite migration of subsurface gas.	The GCCS will be designed to control subsurface migration, to be verified by the monitoring of existing perimeter probes and onsite structures. At least one perimeter monitoring location per Module is required to adequately satisfy this requirement.

SECTION 2

Existing Site Conditions

2.1 Landfill Description

The SLVSWMF is located in Salt Lake County and is situated due west of Salt Lake City, Utah. The landfill is designated a Class V landfill and accepts primarily residential and commercial municipal solid waste (MSW).

The landfill is an area-fill type landfill consisting of eight partially completed fill modules and four future modules yet to be developed. The total permitted landfill capacity is approximately 53,400,000 tons of refuse. Approximately two thirds of the permitted footprint has received waste fill to date. A geocomposite liner system is constructed under the active landfill footprint except for the original Module W in the southeast corner of the site. A prescriptive single composite liner was constructed under active Modules 1-7.

2.2 Landfill Gas Collection and Control System

Currently, a GCCS is in place and operational throughout all areas of the landfill. The SLVSWMF has consistently installed and operated GCCS components as needed to maintain LFG control compliance since initiating the GCCS construction. 15 new collectors were added in 2016 to rectify collection deficiencies discovered during routine monitoring. The header running the length of the north side of the landfill was replaced at this time to add additional capacity needed for the life of the landfill. LFG collectors, conveyance piping, and LFG control equipment have been added, in accordance with applicable UDAQ permits. The current GCCS wellhead and collector locations are included in Appendix A along with the most recent design drawings and specifications from the 2016 expansion.

2.2.1 LFG Control Devices

The existing John Zink enclosed biogas flare system was permitted through UDAQ. Existing control devices and conveyance equipment are described below. All specified LFG flow measurements and capacities assume a concentration of approximately 50 percent by volume at standard temperature and pressure of 68 degrees Fahrenheit and one atmosphere, absolute. Actual LFG flow throughputs will vary, depending on the methane content of the extracted LFG.

The blower/flare facility includes:

- One (1) enclosed ground flare, John Zink Model ZTOF, with a capacity of 2,600 cubic feet per minute (cfm)
- Two (2) Hartzell Model A07T1 blowers with capacity of 2,600 cfm each
- Two (2) condensate injection guns with a capacity of 1 gallon per minute, each.

This LFG treatment equipment appears to have sufficient capacity for the developing landfill site through approximately year 2026, assuming the waste placement rate increases 1 percent year over year. Actual LFG projections should be recalculated annually based on actual waste in place to better predict when additional control capacity is required.

2.2.2 LFG Energy Utilization

The SLVSWMF has an LFG Rights and Collection Facility Lease Agreement with Aria Energy. The current flow of LFG to Aria is about 1,200 cfm at 50 percent methane, which can generate up to 3 megawatts of electrical power to provide energy for approximately 3,000 homes. Aria operates three reciprocating internal combustion engine generators with an estimated 90 percent continuous prime output. Aria has an electrical power wheeling agreement with Rocky Mountain Power and Murray City Power for utilization of the electricity. Aria also has a wellfield operations and maintenance agreement with the landfill, in which Aria operates and maintains the GCCS and performs routine services.

2.2.3 LFG Collectors

The GCCS well field has been expanded in concert with ongoing landfill operations. The current GCCS consists of 58 LFG gas wells monitored monthly. The existing GCCS is shown in Appendix A and components are described in detail in the Design Basis (Appendix B).

The existing GCCS design has been effective in controlling both landfill emissions and perimeter subsurface gas migration. This appears to be primarily due to:

- Low gas concentration rates due to low moisture content
- Relatively high waste permeability and large collector radius of influence, due to low moisture content
- Geocomposite liners and a high groundwater table preventing LFG migration

The existing horizontal collectors are typically constructed of perforated HDPE pipe, 6 or 8 inches in diameter and surrounded by gravel.

2.2.4 LFG Conveyance Piping

The existing conveyance piping varies in size from 4- to 24-inch nominal diameter. These pipes are generally installed by being buried on the grades perimeter slopes of the landfill or beneath the perimeter road, with sufficient depth to provide cold weather protection.

2.2.5 Condensate Collection System

The bulk of the LFG condensate generation is removed via buried knock-out stations that are located periodically along the main header pipe at low points. These knock-out stations on the south header self-drain into the landfill waste modules, while the condensate collected in the knock-outs on the north header is pumped into the landfill waste area.

SECTION 3

Future Site Development

3.1 Landfill Development Plan

A Landfill Master Plan has been developed concurrently by CH2M (November 2016). Future fill operations of the landfill modules will proceed through a sequence of seven existing modules and four future modules. The expansion will extend horizontally (into newly-lined areas bordering the current footprint) and vertically to a finish grade of 4,435 feet above mean sea level, an increase of 85 feet from the previous plan. At the current projected filling rate, where waste placement increases 1 percent year over year, waste capacity is expected to be available through the year 2082. This is an increase of 30 years from the previous plan.

Currently, the eastern and northern areas of the landfill (Modules 1-7) are being filled where Modules 1 and 2 are planned to be raised to a final grade of 4,435 feet. As Modules 1 and 2 are completed, filling will continue westward into Module 8 and double back along the southern edge of the landfill through Modules 11, 10, and 9, respectively.

3.2 Landfill Closure

None of the landfill areas have been closed to date. Intermediate cover soil has been placed over inactive portions of the landfill, as required by the Federal Resource Conservation and Recovery Act (RCRA) Subtitle D regulations.

Final cover placement will proceed in phases as fill elevations reach final grades in each module. Cover design and construction will be in accordance with RCRA Subtitle D. An evapotranspiration (ET) cover has been designed and tentatively approved by UDEQ for use as the final cover. The cover will consist of 4 feet of silty material and is discussed in greater detail in the Landfill Master Plan Volume 2, *Closure and Postclosure Maintenance Plan.*

3.3 GCCS Expansion

The following sections are a summary of the proposed concepts for GCCS development over the remaining life of the landfill. Detailed discussions of the proposed GCCS compliance with NSPS/EG requirements are provided in Section 4.

3.3.1 General Concepts

The landfill development sequence is generally a linear progression of module development (liner construction) and filling to final grade. Each module takes from 8 to 22 years to fill to final grade, depending on capacity and current waste in place. The large variation in module filling times is due to the recently approved vertical expansion to 4,435 feet and the accommodations to existing modules filling sequencing in relation to this change. This process facilitates future GCCS expansion using the current combination of a horizontal trench collector installation during active module filling and vertical wells after final subgrades are attained. In general, the horizontal collectors provide schedule compliance with the NSPS requirement for LFG collection within 5 years of the first waste placement in active modules. Vertical wells can also be installed during active disposal operations as needed to maintain surface emissions compliance.

The wells will be connected as completed, to either the permanent header beneath the perimeter road or temporary headers located in the center or top deck of the landfill. A new header was installed in 2016 and designed with capacity to connect the enclosed combustor to all collectors servicing

Modules 1 through 8. This new header is 24 inches in diameter at the largest section near the control device and tapers down to 16 inches in diameter west of Module 5. As Modules 9, 10, and 11 are developed, the header servicing the south sides of Modules 6 and 7 will be replaced with a permanent header along the south side of the landfill that connects with the existing header creating one closed loop header system. The location of this proposed header is along the perimeter road alignment similar to the existing header.

The existing enclosed flare system has a capacity of 2,600 cfm of LFG. Based on the revised LFG model of estimated recovery, and the waste stream growth projection of 1 percent year over year, this capacity should be sufficient until approximately 2026.

As the landfill is expanded vertically and horizontally, expansion of the GCCS will be completed in accordance with NSPS/EG requirements. Provisions included in the GCCS for future expansion include:

- Installation of LFG collectors within 2 years in closed areas or uncontrolled areas containing over 1 million tons of waste.
- Installation of LFG collectors within 5 years in active landfill areas.
- Piping sized for anticipated future flow rates.
- Equipment sized to handle maximum expected LFG flow rates.
- Space provided for additional equipment, if required.
- Location of flow controls within the piping at the landfill perimeter to maintain system balance and aid in isolated area system maintenance.

3.3.2 LFG Collectors

Horizontal collector trenches will be installed for LFG extraction until Modules reach final grade. Detailed collector specifications are provided in Appendix A. The horizontal collectors are proposed for landfill areas scheduled to receive deeper filling. The horizontal collectors are designed in two layers, with staggered horizontal spacing of approximately 250 feet and vertical spacing of approximately 40 feet.

Vertical extraction wells will be installed concurrent with final cover construction. The preliminary design spacing is approximately 300 feet on center. Additional LFG extraction wells may be installed as required during filling operations, to augment collection efficiency and to meet regulatory standards. Both horizontal collectors and vertical extraction wells will typically be in place before any final landfill cap, thus preventing LFG accumulation and pressure build-up underneath the cap.

3.3.3 LFG Control Equipment

The existing enclosed flare station has sufficient control device capacity to process the anticipated peak LFG extraction rates through approximately 2026. The control device will reach its capacity within the next 11 years and planning for additional control capacity will need to commence before reaching capacity. Because permitting, procurement, and installation of additional control equipment may take considerable time, it is recommended that the SLVSWMF begin exploring options and develop a plan for additional control capacity beginning in early 2024.

Aria Energy has constructed and operates a gas-to-energy facility adjacent to the landfill and processes approximately 1,200 cfm of LFG. Simultaneously, the landfill's enclosed combustor processes the excess LFG that exceeds Aria's capacity. In 2016, the enclosed combustor averaged approximately 600 cfm of LFG making the total current extraction of LFG approximately 1,800 cfm.

3.3.4 GCCS Vacuum

The blower at the flare station is able to produce approximately -40 inches of water column vacuum at a 2,600 scfm flow rate, which is sufficient for the anticipated, near term LFG extraction estimates and proposed pipe sizing. The proposed GCCS header sizes and vacuum will be sufficient to accommodate the peak LFG extraction flow rates at landfill closure.

3.3.5 LFG Conveyance Piping

The LFG collectors will be connected to the LFG flare facility via large diameter main headers. The nominal pipe diameter sizes for the future main header will vary from 24-inch to 16-inch, depending on location from the flare facility. Lateral pipe diameters connecting the LFG collectors to the header will range from 4-inch to 6-inch.

The primary design strategy for the future GCCS conveyance piping is to provide a continuous large capacity perimeter header loop that is able to convey sufficient vacuum to all LFG collectors under anticipated operating conditions. The loop would not be completely closed until Module 10 is nearly complete. A temporary header exists running between Modules 6 and 7 and future Modules 10 and 11. This will continue to be used where possible and a temporary sub header or “jumper” will be used as needed to efficiently convey LFG flow to the flare facility until landfill buildout warrants completion of the final perimeter header design.

3.3.6 UDAQ Compliance Notifications

To fully implement the construction and operating procedures proposed in this Master Design Plan and required by current permits, the SLVSWMF anticipates providing required additional information and notifications to UDAQ, including:

- LFG collector status notification and LFG collector inventory summary for start-up of new LFG collectors or use of stand-by collectors
- Notifications at start-up of newly constructed equipment
- Modifications to the LFG collection system will be provided in semiannual Title V monitoring reports.

Compliance Review and Evaluation

4.1 Compliance with §60.759(a)(1)

> ***§60.759(a)(1)*** *The collection devices within the interior and along the perimeter areas shall be certified to achieve comprehensive control of surface gas emissions by a professional engineer. The following issues shall be addressed in the design: depths of refuse, refuse gas generation rates and flow characteristics, cover properties, gas system expandability, leachate and condensate management, accessibility, compatibility with filling operations, integration with closure end use, air intrusion control, corrosion resistance, fill settlement, and resistance to the refuse decomposition heat.*

This GCCS design is certified, sealed, and signed by a professional engineer. Issues related to compliance with §60.759(a)(1) are discussed in the following sections.

Applicable information used in the design of the GCCS is included in Appendix A (GCCS Drawings) and Appendix B (Basis of Design).

4.1.1 Control of Surface Emissions

The GCCS was designed to reduce both subsurface lateral migration and surface emissions of LFG from the landfill. The GCCS design is certified by a professional engineer as able to achieve comprehensive control of surface LFG emissions. Issues related to design compliance with §60.759(a)(1) are discussed in the following sections.

4.1.2 Emissions Compliance Verification

The facility operator monitors the surface of the landfill for LFG emissions in accordance with NSPS/EG requirements. If the GCCS at the landfill does not meet the measures of performance for surface emissions required by the NSPS, the GCCS will be adjusted or modified in accordance with NSPS/EG requirements.

4.1.3 Depths of Refuse

Refuse elevations at final closure are estimated to be from 90 to 180 feet above the current landfill surface elevations in most developed areas. Future LFG vertical extraction wells will be designed to extend from the surface of the landfill to approximately 75 percent of the landfill depth, with a maximum of 190 feet. Vertical wells installed to augment horizontal collector extraction efficiency will be drilled to the elevation of the first operational level of horizontal collectors. The depths of the refuse at the LFG well locations will be determined based on the difference between the surface elevation of the landfill during GCCS design and the elevation of the landfill liner. The current landfill surface elevations will be determined from the most recent aerial survey. Bottom elevations will be derived from the earlier topographic surveys and the landfill development and extraction plans.

4.1.4 Landfill Gas Generation Rates and Flow Characteristics

40 *CFR* Section 60.759(c)(1) requires that an existing GCCS be sized for the maximum flow rate based on actual flow data. The existing GCCS is currently in operation and is successfully collecting and combusting the LFG generated at the site as illustrated by the nominal amounts of surface emission

exceedance locations discovered since commissioning the 2016 GCCS upgrades and expansion. The LFG flow rates to the LFG flare and Aria Energy have recently averaged 1,800 cfm.

LFG generation estimates over time were estimated using the United States Environmental Protection Agency's (EPA) LFG generation model, LandGEM Version 3.02. The equations used in the model are provided in 40 *CFR* 60.755. For estimating LFG generation, waste placement was assumed to increase 1 percent year over year and LFG capture efficiency was assumed 70 percent. LFG generation and extraction estimates are provided in Table 4-1.

Table 4-1. LFG Generation and Extraction Estimates

Year	LFG Generation (cfm)	70% LFG Recovery (cfm)	Actual LFG Extraction (cfm)
2016	2,956	2,069	1,800
2020	3,275	2,292	NA
2030	4,065	2,846	NA
2040	4,857	3,399	NA
2050	5,665	3,965	NA
2060	6,503	4,552	NA
2064	6,414	4,490	NA

Note:
cfm = cubic feet per minute
LFG = landfill gas
NA = Not applicable
[1]The LandGEM model has a design life limitation of 80 years. Due to the size and filling rate at the SLVSWMF, the design life of the facility exceeds 80 years. The numbers above are an estimate of LFG generated over the first 80 years of the landfill beginning in 1984

4.1.5 Landfill Cover Properties

The UDEQ Subtitle D regulations (R315-303-5[4][b]) require covering the landfill daily with a minimum 6-inch-thick layer of compacted soil or other suitable material approved by the Executive Secretary. When additional waste material will not be placed in an area for an extended length of time, the compacted soil layer (interim cover) must be increased to 12 inches in accordance with the Salt Lake City County Health Department regulations. The purpose of daily soil cover is to prevent propagation or attraction of flies, rodents, or other vectors and to prevent the creation of nuisances. However, studies have determined propagation and attraction of flies, rodents and other vectors, and creation of nuisances can be minimized without daily soil cover in a well-run landfill, such as the SLVSWMF. Because of the cost and lost capacity associated with daily soil cover, alternatives to daily soil cover are being used at many landfills. The UDEQ Subtitle D regulations recognize this and provide for alternatives to daily soil cover. Currently, automobile shredder fluff and Posi-shell are approved for use by UDEQ and are currently being used for daily cover at the SLVSWMF.

Final cover will be constructed over all refuse fill areas after reaching final design grades. The prescriptive final cover for the landfill, after final contouring, is (from bottom to top):

- Minimum 2-foot-thick foundation layer, 1 foot of which will be placed as intermediate cover during landfill operations
- 60-mil HDPE geomembrane
- Geocomposite drainage layer, if required

- Minimum of 1.5 foot of soil suitable for plant growth

An ET cover has been designed and tentatively approved by UDEQ for use as the final cover. The cover will consist of 4 feet of silty material and is discussed in greater detail in Volume 2, *Closure and Post Closure Maintenance Plan.*

The 1-foot-thick intermediate cover layer will be placed over the refuse as part of the landfill operations before the final cover is placed. The final cover will provide moisture removal through ET to prevent liquid from entering the waste.

4.1.6 GCCS Expandability

Recently (Spring and Summer 2016), the existing GCCS system was expanded with 24 new horizontal collector trenches, a new north header aligned with the perimeter road, and valves near the flare station and Aria Energy to better control flows. These upgrades were required to meet minimum collection efficiency requirements of the NSPS. Additions, or extensions, of the GCCS conveyance piping will be routed from the collector to the perimeter header to allow for continued waste placement in each Module. As the landfill is expanded vertically and horizontally, expansion of the GCCS will be completed in accordance with NSPS/EG requirements. Provisions included in the GCCS for future expansion include:

- Installation of the LFG collectors within 2 years in closed landfill areas or uncontrolled areas containing over 1 million tons of waste.
- Installation of LFG collectors within 5 years in active landfill areas.
- Piping sized for anticipated future flow rates.
- Equipment sized to handle the maximum expected LFG flow rate.
- Location of flow controls and header piping in the landfill perimeter areas.

Future expansions of the GCCS will include a header pipe installed along the southern perimeter at the limits of the refuse footprint and connected to the new header installed in 2016. The size of the header pipe will be sufficient to convey the maximum estimated LFG extraction rates from the entire landfill. The temporary terminations of the perimeter header stages will be capped with blind flanges. This will facilitate expansion to the subsequent stages.

4.1.7 Condensate Management

The existing GCCS was constructed to minimize condensate accumulations in the piping system. Table 4-2 presents the estimates of condensate generation quantities based on the extracted LFG quantity estimates. The existing GCCS drains LFG condensate from the collection field piping back into the waste via electric pumps located at each condensate trap on the perimeter header. Where temporary headers are aligned within the landfill liner footprint, condensate is gravity-drained directly from the condensate traps into the waste area.

LFG condensate in the GCCS expansion will be collected by sloping LFG piping and collectors to encourage gravity drainage to low points in the perimeter header. Condensate collection pump stations will be located at the low points to collect the condensate drainage from the conveyance piping.

Table 4-2. LFG Condensate Generation Estimates

Year	70% LFG Recovery (cfm)	Estimated Condensate Generation (gpd)
2020	2,292	978
2030	2,846	1,214
2040	3,399	1,450
2050	3,965	1,691
2060	4,552	1,942

Notes:
cfm = cubic feet per minute
gpd = gallons per day
LFG = landfill gas

Due to the semi-arid location and topographic considerations, leachate generation and accumulation in the waste is not a significant issue at this landfill. Currently, leachate is pumped from the two central individual collections sumps and conveyed to holding ponds, constructed on top of Modules 6 and 7. Generally, the collected leachate is handled through evaporation and through spraying on lined areas of the landfill for dust control. In the future, the existing leachate ponds will be relocated as required to allow for additional waste placement. A lined pond was constructed on the County-owned parcel adjacent to the landfill for future use.

4.1.8 Accessibility

All existing GCCS components are readily accessible. Most of the existing laterals, headers, and LFG extraction wellheads are installed at or above grade or have access points to areas that may require maintenance.

The existing perimeter header is installed in a backfilled trench aligned along the landfill perimeter access road. The future perimeter header will be built in a similar manner and connected to the existing header. This installation facilitates vehicle and technician access in most areas. The main header isolation valves, sample ports, and condensate pumps will be installed within valve boxes and levelled to grade. All wellheads will be located above grade or within shallow vaults that are easily and safely accessible for frequent monitoring. Buried valves will be provided with permanent handle extensions.

4.1.9 Compatibility with Refuse Filling Operations

In the proposed design, critical GCCS system components have been isolated from the impacts of refuse filling operations. LFG header pipes will be installed along the edge of the landfill, away from daily fill and cover operations. The proposed primary GCCS component and horizontal collectors, will be constructed below grade at interim fill elevations, to minimize operational interference. In areas where additional refuse filling will be completed to near final grade, wells generally will be installed after refuse placement has ceased. Using this method allows the GCCS to be installed in the landfill in accordance with §60.752(b)(2)(ii)(A)(2), while minimizing the interference of the GCCS with ongoing fill operations.

4.1.10 Integration with Closure End Use

Currently, the closure end use for the site is unspecified, but will likely be open space with the potential for recreational use. The GCCS will be installed primarily below grade and along the perimeter road alignment, and these locations likely will not be disturbed in the future. Changes to the closure end use will be reviewed to evaluate compatibility with the GCCS. Items of concern will be mitigated by either modifying the proposed closure end use or modifying the GCCS in accordance with NSPS/EG requirements.

4.1.11 Air Intrusion Control

Air intrusion will be controlled through maintenance of the landfill cover and periodic monitoring and adjustment of the GCCS, in accordance with NSPS/EG requirements. Air intrusion control measures include the following:

- Rapid vertical development of waste depth over horizontal collectors
- Effective trench seal designs and perforation setbacks from the slope daylight points for horizontal collector trenches
- Timely construction of final cover in applicable areas
- Deeper extraction zones and effective well seal designs for vertical extraction wells
- Regular collector monitoring and balancing operations, to optimize fuel quality, as well as meet routine compliance requirements

The low permeability final cover will be an effective means of minimizing air intrusion due to LFG extraction. The final cover includes a 4-foot-thick soil cover that acts as an effective seal while promoting vegetative evapotranspiration. Low permeability soils will be used for the final cover.

Monitoring and balancing of the GCCS system to minimize air intrusion is a major aspect of routine landfill operations. To minimize the potential of air intrusion, the LFG at the landfill will be monitored periodically for decreases in methane content, or increases in nitrogen or oxygen content, which are indicators of air intrusion. If monitoring results fail to meet the NSPS/EG or approved alternative standards, the GCCS will be modified in accordance with the NSPS/EG and procedures approved within this Master Design Plan. In addition, the LFG collector flows will be monitored for high gas temperatures, which also may indicate air intrusion.

4.1.12 Corrosion Resistance

Corrosion resistance of the GCCS will be achieved through the use of corrosion resistant materials, or materials with a corrosion resistant coating. All GCCS and condensate piping will be constructed of HDPE or PVC. These thermoplastics are inherently resistant to corrosion from chemicals commonly found in LFG and LFG condensate. HDPE pipe pigments are also inherently resistant to ultraviolet (UV) degradation. Exposed PVC pipe will be painted with exterior latex coatings to minimize UV and ozone degradation rates. Metal components will be galvanized, stainless, or epoxy coated. Coated components will be inspected during routine GCCS monitoring for abrasion, chipping, or cracking of the coating. If significant damage to the coating material is observed, the coated component will be replaced or repaired.

4.1.13 Fill Settlement

Refuse settlement will be minimized at the site through the use of standard compaction practices in the fill areas. However, some settlement will still occur due to the decomposition of the refuse. The GCCS components are designed and installed with several features to account for this settlement including:

- The construction of the vertical wellheads above the landfill final cover will minimize stress to the wellhead and the final cover barrier layer due to settlement of waste around the well casing.
- LFG extraction wellheads will be connected to the LFG transmission piping via a flexible connection. This allows the LFG piping to accommodate changes in the orientations of both the LFG transmission piping and extraction well.

- Main header piping will be installed with substantial gravity drainage grades, (minimum 1 percent in native soils and minimum 3 percent in landfill waste), which should not reverse due to differential settlement.
- Horizontal collectors will be installed with substantial gravity drainage grades (4 percent or greater), so that reasonable amounts of differential settlement may occur without grade reversal or significant disruption to LFG flow by liquid accumulation.
- Gas collectors will be constructed from HDPE piping of sufficient wall thickness to minimize significant deformations due to settlement loads, which would impact operability.

4.1.14 Resistance to Decomposition Heat

Resistance of the GCCS to the heat generated as a result of refuse decomposition will be achieved through the use of materials tested and proven to withstand temperatures well above those typically found in landfills. The exposed GCCS components will be inspected for heat damage and wellhead gas temperatures will be recorded during routine monitoring. If heat damage of the GCCS components or abnormally high gas temperatures are observed, the cause of the damage or high temperatures will be investigated and the GCCS will be repaired, adjusted, or modified in accordance with NSPS/EG requirements and standard industry practices.

Perforations in the HDPE collector pipe will be of sufficient size and appropriate configuration to minimize performance reductions due to combined long-term temperature and pressure deformations.

4.2 §60.759(a)(2) Compliance

> ***§60.759(a)(2)*** *The sufficient density of gas collection devices determined in paragraph (a)(1) of this section shall address landfill gas migration issues and augmentation of the collection system through the use of active or passive systems at the landfill perimeter or exterior.*

Based on the surface emission and perimeter migration monitoring to date, the existing gas collection components appear to be installed in "sufficient density" to achieve the landfill gas migration control goals. Twenty-four additional collectors were installed in 2016 to ensure compliance with this requirement. Per the definition stated in §60.751, "sufficient density" means "any number, spacing, and combination of collection system components necessary to maintain emission and migration control as determined by measures of performance set forth in this part."

The original LFG design provided horizontal collectors, with an average of 250-foot spacing, distributed over the landfill area. This spacing appears appropriate for this site, based on the extensive use of silty and clayey cover soils, the low permeability of the subsoil, and the dry refuse conditions. The quarterly LFG migration monitoring results provided in the semiannual Title V monitoring reports indicate no difficulty in maintaining consistent long-term control of lateral migration at the monitoring probe locations and building monitoring locations.

The landfill operator will conduct LFG migration compliance monitoring in accordance with NSPS/EG and other applicable requirements. If the GCCS at the landfill does not meet the measurements of performance set forth in the NSPS, the GCCS will be adjusted or modified in accordance with the NSPS/EG requirements.

4.3 §60.759(a)(3) Compliance

> ***§60.759(a)(3)*** *The placement of gas collection devices determined in paragraph (a)(1) of this section shall control all gas producing areas, except as provided by paragraphs (a)(3)(i) and (a)(3)(ii) of this section.*

Based on the surface emissions monitoring to date, the existing gas collection components appear to be installed in "sufficient density" to achieve the LFG surface emission control goals in all LFG producing areas, as previously discussed in regards to §60.759(a)(2).

Issues related to compliance with §60.759(a)(3) are discussed in the following sections.

4.3.1 Asbestos and Nondegradable Materials

> ***§60.759(a)(3)(i)*** *Any segregated area of asbestos or nondegradable material may be excluded from collection if documented as provided under §60.758(d). The documentation shall provide the nature, date of deposition, location and amount of asbestos or nondegradable material deposited in the area, and shall be provided to the Administrator upon request.*

The landfill has a designated asbestos collection area that is segregated from the rest of the landfill. The GCCS does not extend to this area. Documentation of all asbestos load placements are kept in accordance to this rule and 40 *CFR* 61. Records are provided to regulators upon request.

4.3.2 Nonproductive Areas

> ***§60.759(a)(3)(ii)*** *Any nonproductive area of the landfill may be excluded from control, provided that the total of all excluded areas can be shown to contribute less than 1 percent of the total amount of NMOC emissions from the landfill. The amount, location, and age of the material shall be documented and provided to the Administrator upon request. A separate NMOC emissions estimate shall be made for each section proposed for exclusion, and the sum of all such sections shall be compared to the NMOC emissions estimate for the entire landfill…*

No specific area of the landfill has been designated as nonproductive at this time.

4.4 §60.759(b) Compliance

> ***§60.759(b)*** *Each owner or operator seeking to comply with §60.752(b)(2)(i)(A) shall construct the gas collection devices using the following equipment or procedures:*

4.4.1 Landfill Gas Extraction Component Construction

> ***§60.759(b)(1)*** *The landfill gas extraction components shall be constructed of polyvinyl chloride (PVC), high density polyethylene (HDPE) pipe, fiberglass, stainless steel, or other nonporous corrosion resistant material of suitable dimensions to: convey projected amounts of gases; withstand installation, static, and settlement forces; and withstand planned overburden or traffic loads. The collection system shall extend as necessary to comply with emission and migration standards. Collection devices such as wells and horizontal collectors shall be perforated to allow gas entry without head loss sufficient to impair*

> *performance across the intended extent of control. Perforations shall be situated with regard to the need to prevent excessive air infiltration.*

Issues related to compliance with §60.758(b)(1) are discussed in the following sections.

4.4.1.1 Materials

The existing GCCS components are, and future expansions and upgrades will be, constructed of HDPE and PVC pipe; fiberglass; stainless steel; and other nonporous, corrosive resistant materials.

4.4.1.2 Component Sizing

The GCCS components installed, as well as future expansions of the GCCS, will be sized to the maximum LFG flow rate for the design life of the component as described in Section 4.1.4 of this design plan.

4.4.1.3 Component Loading

Below grade GCCS components will consist primarily of LFG trench collectors and LFG header piping located beneath the landfill perimeter road. Below grade LFG pipe components in the perimeter road will be designed and installed to withstand the estimated installation, static, settlement, overburden, and traffic loads per pipe manufacturers' recommendations. Corrugated metal casing or concrete backfill will be provided for vulnerable equipment road crossings subject to severe vehicle loads.

The loads and settlement forces applied to the GCCS components within the landfill cannot be accurately predicted due to the nonhomogenous nature of the refuse within the landfill. However, below grade components within the landfill have been designed consistent with industry accepted GCCS design and construction practices.

The flare and other equipment foundations were designed to meet the Uniform Building Code requirements for maximum expected static, dynamic, and thermal loads.

4.4.1.4 System Expansion

The GCCS will be expanded in conjunction with the increasing in place area and volume of MSW and as necessary to maintain compliance with emissions and migration standards, NSPS/EG requirements, and this design plan. The landfill will conduct periodic monitoring and document compliance of the GCCS in accordance with NSPS/EG requirements and this design plan. If the GCCS at the landfill does not meet the measures of performance set forth in the NSPS, the GCCS will be adjusted or modified in accordance with NSPS/EG requirements.

4.4.1.5 Component Perforation

Vertical wells are, and will be, perforated to allow LFG entry without inducing head losses sufficient to impair performance. Horizontal collectors will be designed to maximize uniform vacuum distribution along the full collector length. A LFG horizontal collector perforation detail used for collector installation in 2016 is included in Appendix A.

4.4.1.6 Air Infiltration

Air intrusion control is provided in the landfill GCCS, as previously discussed in detail in Section 4.1.11.

4.4.2 Landfill Gas Extraction Component Installation

> ***§60.759(b)(2)*** *Vertical wells shall be placed so as not to endanger underlying liners and shall address the occurrence of water within the landfill. Holes and trenches constructed for piped wells and horizontal collectors shall be of sufficient cross-section so as to allow for their proper construction and completion including, for example, centering of*

> *pipes and placement of gravel backfill. Collection devices shall be designed so as not to allow indirect short circuiting of air into the cover or refuse into the collection system or gas into the air. Any gravel used around pipe perforations should be of a dimension so as not to penetrate or block perforations.*

4.4.2.1 Component Placement

Vertical wells at the landfill will be designed to avoid endangerment to the underlying base liner(s). Depths of refuse at LFG wellhead locations will be determined based on the difference between the current surface elevation of the landfill before the GCCS construction and the base elevation of landfill waste. The landfill surface elevations will be determined from a current aerial survey. Bottom elevations will be derived from landfill development and excavation plans. LFG extraction wells are, and will be, designed to extend from the landfill surface to no more than 75 percent of the landfill depth.

4.4.2.2 Water

The occurrence of water within the landfill is addressed by the leachate and condensate management systems as stated in Section 4.1.7 of this design plan. Due to its semi-arid location, the site experiences a net positive annual rate of evapotranspiration. The site historically has not experienced leachate seeps or other common indicators of moisture accumulations in the waste. In addition, no significant moisture was noted in excavations during recent construction of the GCCS.

Condensate management will be accomplished by collecting condensate at low points in the header piping and conveying it to an adjacent condensate drain within the landfill liner. LFG well laterals will be sloped to drain to the perimeter header to minimize condensate recirculation to the waste near the wellheads. Any condensate or leachate reaching the landfill base liners will be collected in the leachate sumps and pumped into evaporation ponds on the surface.

4.4.2.3 Holes and Trenches

Vertical bore holes and horizontal trenches constructed for LFG collection elements are, and will be, of sufficient cross section to allow for proper construction and completion of gas collector piping. This includes centering of pipes and careful placement of gravel backfill.

4.4.2.4 Component Short Circuiting

LFG collection elements have been designed to control air infiltration through the cover, refuse contamination of the collection elements, and direct venting of the LFG to the atmosphere. Air intrusion control is verified by monitoring the GCCS gas flows for oxygen in accordance with NSPS/EG requirements. Contamination of the collection elements by the refuse is limited by placing gravel backfill of adequate size (1 to 1-1/2 inch) in the hole or trench, acting as a filter pack between the refuse and the LFG collection elements. Direct venting of LFG to the atmosphere is controlled by operating the GCCS under vacuum. Thus, leaks will result in air entering the GCCS, as opposed to the LFG being released to the atmosphere. Future expansions of the GCCS will be constructed in accordance with the NSPS.

4.4.2.5 Gravel Backfill

Gravel of sufficient size was, and will be, used to minimize penetration or blockages of the pipe perforations in the LFG collection wells. The typical perforation diameter is 5/8-inch. Gravel is specified to be 1 to 1-1/2-inch rounded gravel for both the wells and collector trenches. Future expansions of the current GCCS will maintain compliant with the NSPS/EG requirements. In the future, alternative porous backfill materials, such as recycled tire chips or crushed concrete, may be substituted for rounded gravel, based on availability and design engineer approval.

4.4.3 LFG Extraction Component Connections to LFG Transmission Piping

> ***§60.759(b)(3)*** *Collection devices may be connected to the collection header pipes below or above the landfill surface. The connector assembly shall include a positive closing throttle valve, any necessary seals and couplings, access couplings and at least one sampling port. The collection devices shall be constructed of PVC, HDPE, fiberglass, stainless steel, or other nonporous material of suitable thickness.*

In general, the collection devices are, and will be, connected to the collection header pipes via lateral piping. The LFG collector casings are connected to the lateral piping via wellhead assemblies. The LFG collector casings are connected to the lateral piping via wellhead assemblies. The lateral piping connects the wellhead assemblies to the main LFG headers. The wellhead assemblies include positive closing throttle valves, necessary seals and couplings, and a sampling port. The collection devices are constructed of PVC, HDPE, fiberglass, stainless steel, and other nonporous material of suitable thickness. The GCCS components, have been designed and installed to withstand installation, static and settlement forces, and to withstand planned overburden or traffic loads.

4.5 §60.759(c) Compliance

> ***§60.759(c)*** *Each owner or operator seeking to comply with §60.752(b)(2)(i)(A) shall convey the landfill gas to a control system in compliance with §60.752(b)(2)(iii) through the collection header pipe(s). The gas mover equipment shall be sized to handle the maximum gas generation flow rate expected over the intended use period of the gas moving equipment using the following procedures:*
>
> *(1) For existing collection systems, the flow data shall be used to project the maximum flow rate. If no flow data exists, the procedures in paragraph (c)(2) of this section shall be used.*

The existing GCCS gas mover equipment is capable of discharging 2,600 cfm at the current discharge pressure. The existing gas mover equipment should provide sufficient vacuum and flow capacity until at least 2026. New blowers and/or additional flare capacity may be installed at that point, if necessary. New blower and flare sizing will be consistent with NSPS/EG requirements.

4.5.1 Future Landfill Gas Flow Rate Estimates

> ***§60.759(c)(2)*** *For new collection systems, the maximum flow rate shall be in accordance with §60.755(a)(1).*

The future landfill GCCS design is based on the EPA AP-42 Fifth Edition Chapter 2.4 emission equations using default kinetic parameters for arid conditions. The LFG flow estimates of this model for current, 10 year intervals, and site maximum are summarized in Table 4-1. The complete model outputs for the 2016 GCCS expansion are included in the Design Basis in Appendix B. In the future, the gas generation model parameters may be adjusted based on actual flow rate data.

4.6 §60.753(d) Compliance

> ***§60.753(d)*** *Operate the collection system so that the methane concentration is less than 500 parts per million above background at the surface of the landfill. To determine if this level is exceeded, the owner or operator shall conduct surface testing around the perimeter of the collection area and along a pattern that traverses the landfill at*

> *30 meter intervals and where visual observations indicate elevated concentrations of landfill gas, such as distressed vegetation and cracks or seeps in the cover. The owner or operator may establish an alternative traversing pattern that ensures equivalent coverage. A surface monitoring design plan shall be developed that includes a topographical map with the monitoring route and the rationale for any site-specific deviations from the 30 meter intervals. Areas with steep slopes or other dangerous areas may be excluded from the surface testing.*

LFG surface emissions and LFG component leak emissions are monitored quarterly in accordance with regulatory requirements. Routine surface emission monitoring indicates that surface emissions and component leaks from the landfill are within NSPS/EG compliance limits.

The landfill surface cover integrity is monitored monthly for potential areas of LFG emissions by visual and olfactory inspection. Potential emission areas are further inspected using a flame ionization detector (or other EPA Method 21 approved instrument calibrated with methane) to locate LFG emission point sources. LFG emission points approaching or exceeding standards for surface emission monitoring will be mitigated.

4.7 §60.752 Standards for Landfill Air Emissions

The UDAQ is the State agency that administers the provisions in the NSPS/EG for municipal solid waste landfills. UDAQ compliance requirements are consistent with the NSPS/EG as discussed in Sections 4.1 through 4.7 of this design plan. Emission standards for landfills are implemented based on design capacity and nonmethane organic carbon (NMOC) emissions potential. Any landfill with a design capacity greater than 2.5 million megagrams by mass or volume and has an NMOC annual emissions potential greater than 35 megagrams must install a GCCS compliant with §60.752(b)(2) to reduce emissions to the atmosphere. The GCCS must comply with the design, operation, monitoring, and recordkeeping requirements of the NSPS.

4.7.1 Submit a Design Plan

> ***§60.752(b)(2)(i)*** *Submit a collection and control system design plan prepared by a professional engineer to the Administrator within 1 year.*

The initial design plan and the upgrades designed and installed in 2016 were prepared and certified by a professional engineer. The initial design plan was submitted to UDAQ in December 2000, assigned Application Number 1648, and approved by UDAQ in November 2003. The 2016 GCCS design upgrades and additions were supplied to UDAQ in the semiannual Title V monitoring certification report submitted in April 2016. The 2016 expansion and upgrades are consistent with the original 2006 and 2016 updates to this plan; therefore, the initial approval from UDAQ is still valid. Design and construction drawings and specifications are provided to UDAQ for review before installation for informational purposes.

4.7.2 Specifications for Active Collection Systems

A stated is Sections 4.1 through 4.6 of this design plan, the GCCS installed at the landfill will comply with the specifications for an active GCCS as stipulated in §60.759 of the NSPS. Future expansions of the GCCS will be designed to comply with similar NSPS/EG requirements or approved alternatives.

4.7.3 GCCS Installation

> ***§60.752(b)(2)(ii)*** *Install a collection and control system that captures the gas generated within the landfill as required by paragraphs (b)(2)(ii)(A) or (B) and (b)(2)(iii) of this section within 30 months after the first annual report in which the emission rate equals or exceeds 50 megagrams per year, unless Tier 2 or Tier 3 sampling demonstrates that the emission rate is less than 50 megagrams per year, as specified in §60.757(c)(1) or (2).*
>
> *(A) An active collection system shall:*
>
> *(1) Be designed to handle the maximum expected gas flow rate from the entire area of the landfill that warrants control over the intended use period of the gas control or treatment system equipment.*

The GCCS is designed to handle the maximum expected gas flow rate over the design life of the specified equipment.

> ***§60.752(b)(2)(ii)(A)(2)*** *Collect gas from each area, cell, or group of cells in the landfill in which the initial solid waste has been placed for a period of:*
>
> *(i) 5 years or more if active; or*
>
> *(ii) 2 years or more if closed or at final grade.*

A GCCS has been installed in all portions of the landfill that have had waste in place in excess of 5 years in accordance with NSPS requirements. No areas of the landfill have reached final grade or are permanently closed.

> ***§60.752(b)(2)(ii)(A)(3)*** *Collect gas at a sufficient extraction rate;*
>
> ***§60.752(b)(2)(ii)(A)(4)*** *Be designed to minimize off-site migration of subsurface gas*.

In compliance with §60.752(b)(2)(ii)(A)(3) and (4), the GCCS was, and future expansions will be, designed to extract LFG at a sufficient rate so as to minimize the subsurface lateral migration of surface emissions of LFG. This is achieved by sizing and installing sufficient collection elements, transmission piping, blowers, and control devices for the estimated maximum rate of LFG to be generated within the refuse. The GCCS will be operated to collect LFG at a sufficient rate (per the definition in §60.751) by maintaining a negative pressure at all wellheads without causing air infiltration.

Application of a negative gauge pressure and minimization of air infiltration will be verified by monitoring the static pressure and nitrogen or oxygen concentrations of the LFG at the wellhead. The SLVSWMF personnel will continue to monitor the GCCS wells for static pressure and for nitrogen or oxygen in accordance with NSPS/EG requirements. SLVSWMF personnel will continue to monitor perimeter LFG migration probes and occupied buildings. If LFG offsite migration is detected, SLVSWMF personnel will take necessary actions in accordance with NSPS/EG and other applicable regulatory requirements.

4.7.4 Control Systems

> ***§60.752(b)(2)(iii)*** *Route all the collected gas to a control system that complies with the requirements in either paragraph (b)(2)(iii) (A), (B) or (C) of this section.*
>
> ***§60.752(b)(2)(iii)(B)*** *A control system designed and operated to reduce NMOC by 98 weight-percent, or, when an enclosed combustion device is used for control, to either reduce NMOC by 98 weight percent or reduce the outlet NMOC concentration to less than 20 parts per million by volume, dry basis as hexane at 3 percent oxygen. The reduction efficiency or parts per million by volume shall be established by an initial performance test to be completed no later than 180 days after the initial startup of the approved control system using the test methods specified in §60.754(d).*

The enclosed LFG flare at the landfill is designed to reduce the concentration of NMOCs present in the LFG delivered to the flare by at least 98 percent (by weight) or reduce outlet NMOC concentrations to less than 20 parts per million by volume (ppmv). The destruction efficiency is supported by periodic emissions source testing. Periodic flare performance tests will be conducted in accordance with the requirements of the UDAQ permit. The most recent performance test was conducted in 2016 and results of the test are provided in Appendix C.

In the future, the collected gases may be processed in emission control devices other than a flare. If required, the enclosed flare or other control operation will be modified to meet NSPS/EG standards.

4.7.5 Continuous Temperature Monitor

In accordance with §60.756(b)(1) of the NSPS, the flare stack temperature and LFG flow rate are monitored and recorded continuously. The flare stack temperature is monitored using thermocouples installed within the enclosed flare shell.

4.7.6 Gas Flow Meter

The LFG flow rate is monitored using a thermal mass flow meter installed within the LFG piping leading to the enclosed flare. All facility LFG flow monitors meet the NSPS maximum recording interval requirements.

4.7.7 Equipment Removal Report

An equipment removal report will be submitted to UDAQ at least 30 days before any wells being capped or GCCS equipment being removed or decommissioned.

SECTION 5

Limitations

The requirements of this Master Design Plan, or any permit issued consequent to this Master Design Plan, shall not be interpreted or enforced be any more restrictive than currently applicable to federal, state, or local requirements.

The services described in this report were performed consistent with generally accepted professional consulting principles and practices. No other warranty, express or implied, is made. These services were performed consistent with our agreement with our client. This report is solely for the use and information of our client unless otherwise noted. Any reliance on this report by a third party is at such party's sole risk.

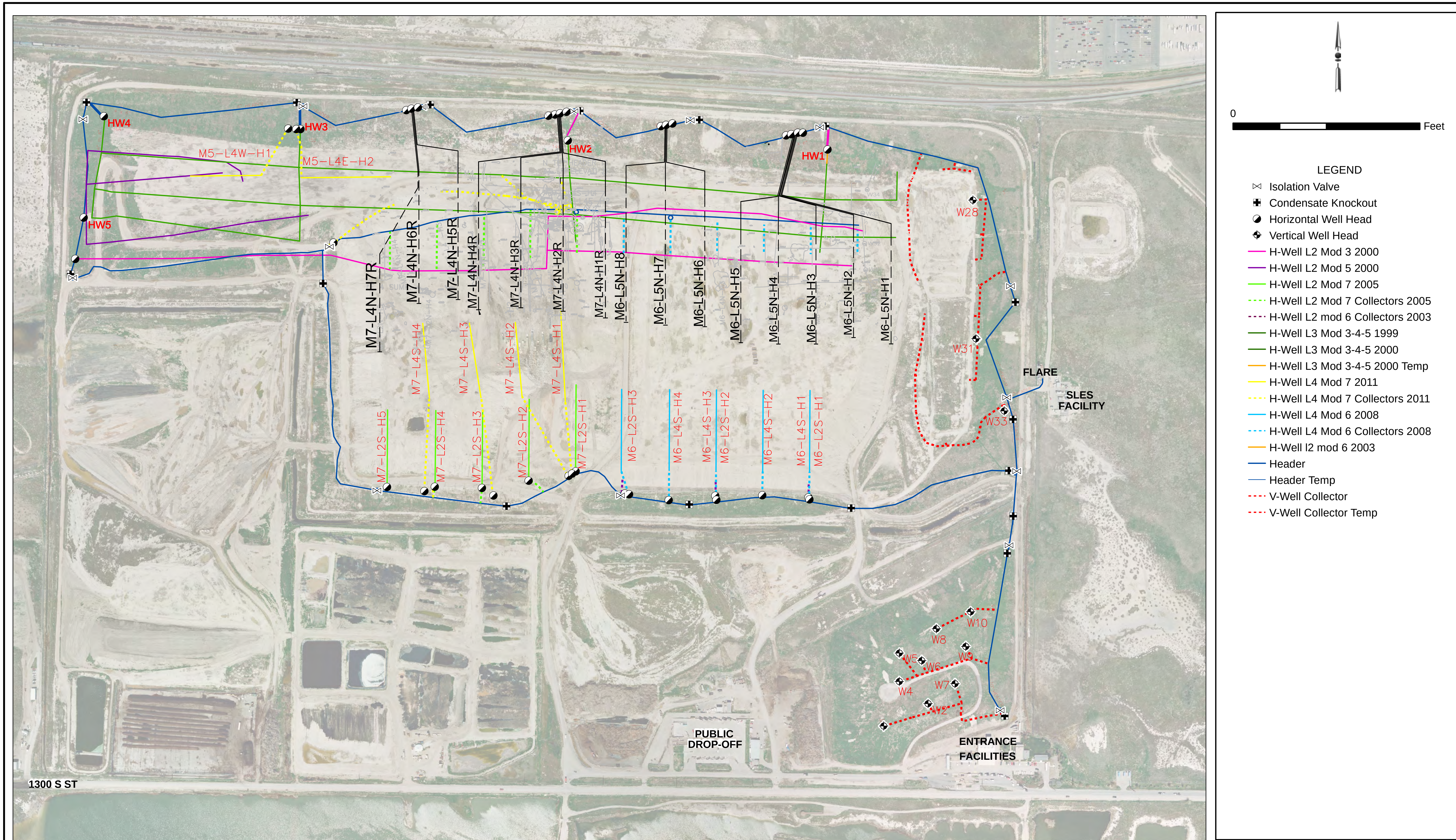
Opinions and recommendations contained in this report apply to conditions existing when services were performed and are intended only for the client, purposes, locations, timeframes, and project parameters indicated. We are not responsible for the impacts of any changes in environmental standards, practices, or regulations subsequent to performance of services. We do not warranty the accuracy of information supplied by others, nor the use of segregated portions of this report.

References

CH2M. Landfill Master Plan Volume 2, *Salt Lake Valley Landfill Closure and Postclosure Maintenance Plan*. November 2016.

United States Environmental Protection Agency (EPA) AP-42 Fifth Edition Chapter 2.4 https://www3.epa.gov/ttn/chief/ap42/ch02/index.html EPA, 1998. AP-42 Volume 1 Fifth Edition, *Chapter 2.4: Municipal Solid Waste Landfills*.

Appendix A
GCCS Drawings and Specifications



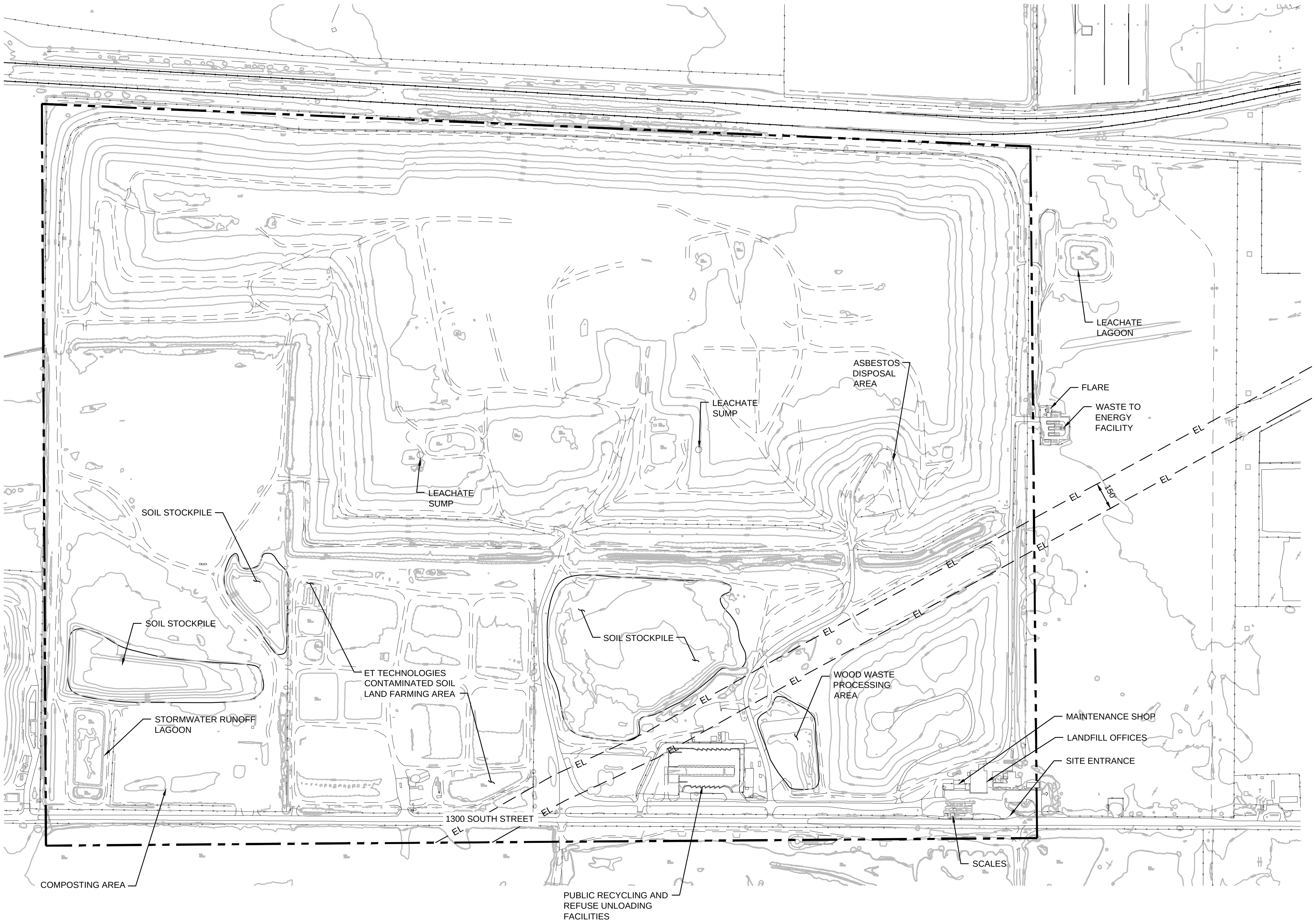
ch2m SM

LANDFILL GAS COLLECTION SYSTEM WELLS

SLVSWMF - ACTIVE LANDFILL

GENERAL NOTES

1. AERIAL SURVEY PROVIDED BY SALT LAKE COUNTY (FLOWN JUNE 5, 2016). HORIZONTAL DATUM: NAD 27, VERTICAL DATUM: NGVD 29, PROJECTION: UTAH CENTRAL ZONE STATE PLANE, US FEET.
2. CONTOURS DISPLAYED IN 10' INTERVALS.



LEGEND

- PROPERTY LINE
- UNION PACIFIC RAILROAD
- PAVED ROADS
- GRAVEL/DIRT ROADS
- FENCE
- UTAH POWER AND LIGHT EASEMENT

N

0 300 600 900

1"=300'

NO.	DATE	REVISION	BY	APVD

DSGN J CARLING | DR B BUTTERFIELD | CHK D WAITE | APVD D WAITE

Landfill Gas Development Plan
Salt Lake Valley Landfill
Salt Lake Valley Solid Waste Management Council
Salt Lake City, Utah

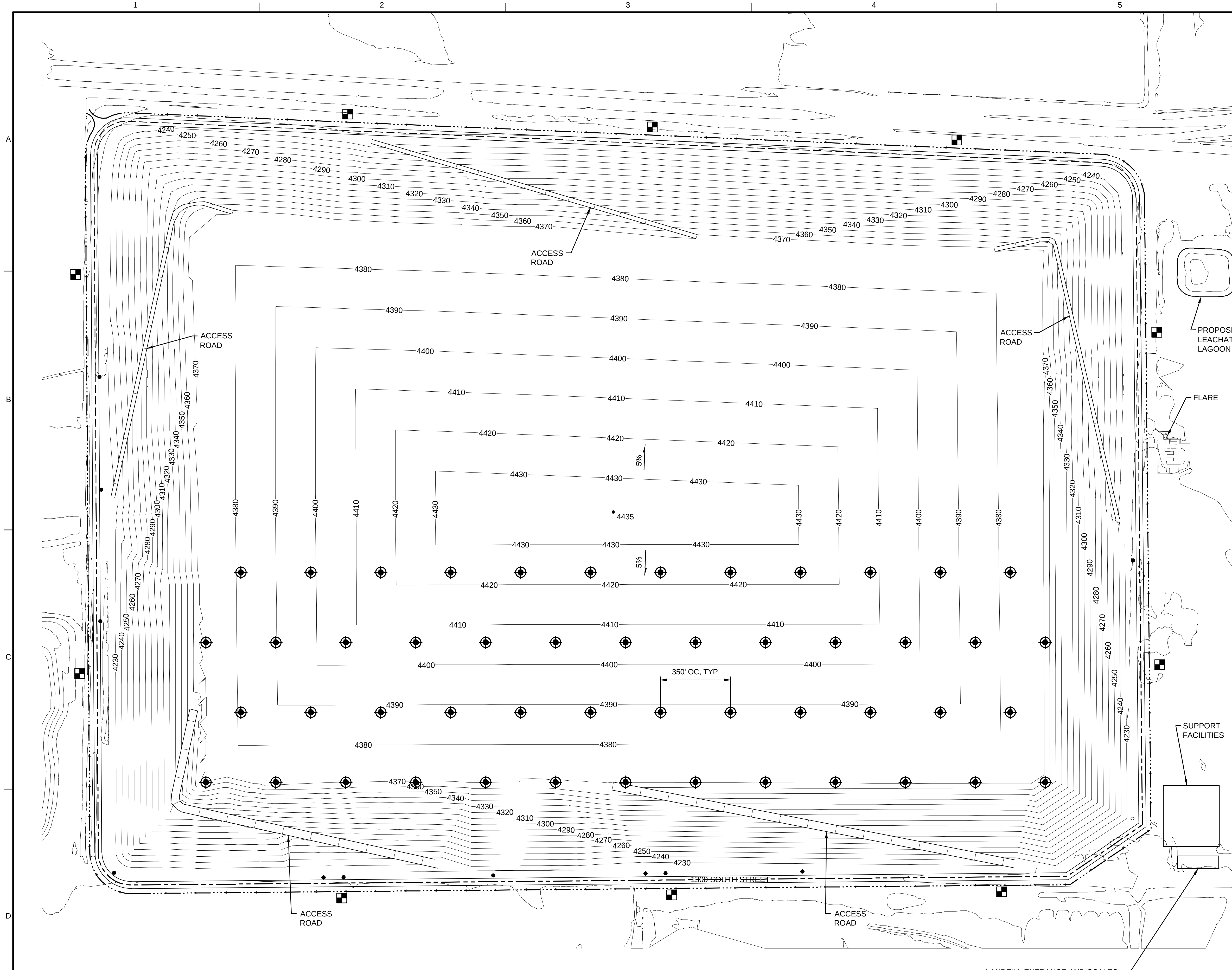
ch2m:

CIVIL
EXISTING SITE CONDITIONS PLAN

VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING.
0 1"

DATE	NOVEMBER 2016
PROJ	497443
DWG	FIGURE 1
SHEET	of

1 2 3 4 5 6



LEGEND

— — — —	EXISTING LFG HEADER
— - — -	PROPOSED LFG HEADER
—··—··—	STORMWATER DRAINAGE
⊕	PROPOSED LFG EXTRACTION WELL
▣	PROPOSED MONITORING PROBE

N

0 250 500 750

1"=250'

NO.	DATE	REVISION	BY	APVD

DSGN J.CARLING · DR B.BUTTERFIELD · CHK D WAITE · APVD D WAITE

Landfill Gas Development Plan
Salt Lake Valley Landfill
Salt Lake Valley Solid Waste Management Council
Salt Lake City, Utah

ch2m:

CIVIL

FINAL GRADING AND DRAINAGE

VERIFY SCALE

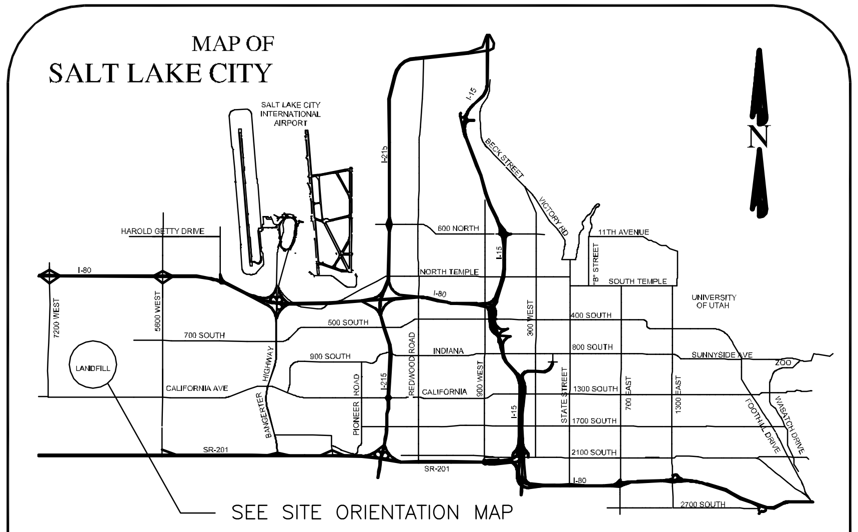
BAR IS ONE INCH ON ORIGINAL DRAWING.

0 1"

DATE	NOVEMBER 2016
PROJ	497443
DWG	FIGURE 2
SHEET	of

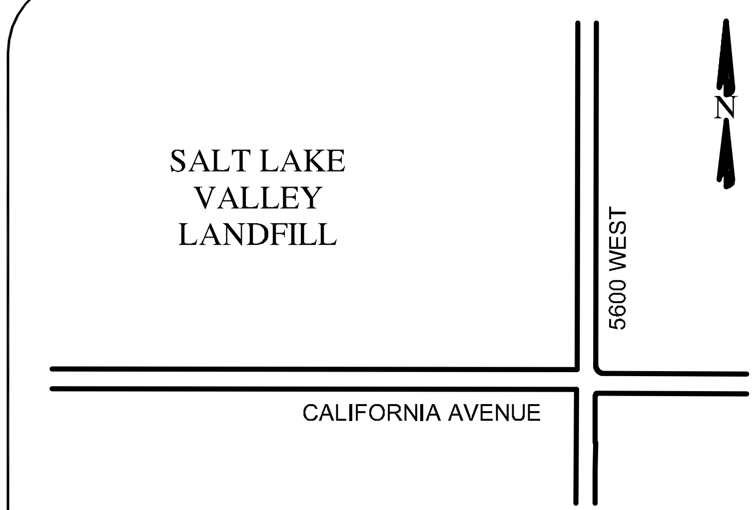
SALT LAKE CITY CORPORATION

SALT LAKE VALLEY SOLID WASTE FACILITY
NORTH LANDFILL GAS HEADER
JOB NO. 810218



VICINITY MAP

SHEET SET ASSEMBLY ORDER



SITE ORIENTATION MAP

OWNER

DEPARTMENT OF:
COMMUNITY AND ECONOMIC DEVELOPMENT
ENGINEERING DIVISION
DIRECTOR - JILL LOVE
CITY ENGINEER - JEFF SNELLING, S.E.

349 SOUTH 200 EAST, SUITE 100
SALT LAKE CITY, UTAH 84111
OFFICE - 801.535.7961
FAX - 801.535.6093

DESIGNER

ch2m:
4246 SOUTH RIVERBOAT RD, SUITE 210
TAYLORSVILLE, UT 84123
(385) 474-8500
www.ch2mhill.com

CITY OFFICIALS

	MAYOR	RALPH BECKER
CITY COUNCIL	DIST. 1	JAMES ROGERS
	DIST. 2	KYLE LAMALFA
	DIST. 3	STAN PENFOLD
	DIST. 4	LUKE GARROTT
	DIST. 5	ERIN MENDENHALL
	DIST. 6	CHARLIE LUKE
	DIST. 7	LISA ADAMS

PROFESSIONAL ENGINEER No. 4778330-2202 MARK WILSON STATE OF UTAH 8/11/15

CITY ENGINEER		CITY PROJECT MANAGER		SUSTAINABILITY PROGRAM DIRECTOR		LANDFILL DIRECTOR		DESIGN ENGINEER	
JEFF SNELLING, S.E.	DATE	JOHN M. COYLE, P.E.	DATE	DEBBIE LYONS	DATE	YIANNI IOANNOU	DATE	MARK WILSON, P.E.	DATE 8/11/15

SALT LAKE VALLEY SOLID WASTE FACILITY
NORTH LANDFILL GAS HEADER
JOB NO. 810218

Attachment #7

Monitoring and Inspection Forms

Material Analysis Report by Material

Inbound and outbound materials for the period 07/10/2019 - 07/10/2019
Summary Report for Sites: 1, 2, 3, 4, 5, 6, 7, 8, 9, 17, 71
Accounts 0 - 999999 Customer Types - Z Materials - ZZZZZZZZZZ Material Types - ZZ

Date	Material	Type	Customer	Type	Tickets	Count	Est. vol.	Act. Vol.	Est. Wt.	Actual Wt.	Charge
	1			Total	30	0	1584960	0	792.48	792.48	0.00
				Average		0	52832	0	26.42	26.42	0.00
	COM 1 YD			Total	4	9	0	0	3.60	0.00	135.00
				Average		2	0	0	0.90	0.00	33.75
	COM 37.5			Total	1	2	0	0	2.40	0.00	75.00
				Average		2	0	0	2.40	0.00	75.00
	COM BKT1			Total	1	3	0	0	0.00	0.00	3.00
				Average		3	0	0	0.00	0.00	3.00
	COM COMM			Total	2	5	0	0	6.00	0.00	150.00
				Average		3	0	0	3.00	0.00	75.00
	COM PVT			Total	4	6	10	0	7.20	0.00	270.00
				Average		2	2	0	1.80	0.00	67.50
	CON ASBEST			Total	3	0	15920	0	7.96	7.96	3,980.00
				Average		0	5307	0	2.65	2.65	1,326.67
	CON CON<12			Total	3	0	28420	0	14.21	14.21	140.00
				Average		0	9473	0	4.74	4.74	46.67
	CVR 2"/FLF			Total	1	0	18860	0	9.43	9.43	94.30
				Average		0	18860	0	9.43	9.43	94.30
	CVR CONTAM			Total	3	0	170820	0	85.41	85.41	854.10
				Average		0	56940	0	28.47	28.47	284.70
	CVR FILL			Total	36	0	309220	0	154.61	154.61	1,539.70
				Average		0	8589	0	4.29	4.29	42.77
	CVR NO CHG			Total	57	0	3001440	0	1500.72	1500.72	0.00
				Average		0	52657	0	26.33	26.33	0.00
	ET NON HAZ			Total	10	0	271160	0	135.58	135.58	0.00
				Average		0	27116	0	13.56	13.56	0.00
	HHW			Total	34	34	0	0	0.00	0.00	0.00
				Average		1	0	0	0.00	0.00	0.00

Material Analysis Report by Material

Inbound and outbound materials for the period 07/10/2019 - 07/10/2019
Summary Report for Sites: 1, 2, 3, 4, 5, 6, 7, 8, 9, 17, 71
Accounts 0 - 999999 Customer Types - Z Materials - ZZZZZZZZZZ Material Types - ZZ

Date	Material	Type	Customer	Type	Tickets	Count	Est. vol.	Act. Vol.	Est. Wt.	Actual Wt.	Charge
	MATTRESS			Total	30	62	0	0	0.00	0.00	900.00
				Average		2	0	0	0.00	0.00	30.00
	MSW COM-TS			Total	81	0	1140880	0	570.44	570.44	17,741.89
				Average		0	14085	0	7.04	7.04	219.04
	MSW COM/TS			Total	80	0	447280	0	223.64	223.64	8,280.68
				Average		0	5591	0	2.80	2.80	103.51
	MSW COMM			Total	206	0	837560	0	418.78	418.78	12,318.60
				Average		0	4066	0	2.03	2.03	59.80
	ORGANICS			Total	1	0	0	0	2.16	2.16	34.56
				Average		0	0	0	2.16	2.16	34.56
	PLASTIC TS			Total	1	0	0	0	0.70	0.70	0.00
				Average		0	0	0	0.70	0.70	0.00
	REFRIG			Total	7	8	0	0	0.00	0.00	96.00
				Average		1	0	0	0.00	0.00	13.71
	SAL CARDB			Total	2	0	1540	0	0.77	0.77	0.00
				Average		0	770	0	0.39	0.39	0.00
	SAL STEEL			Total	1	0	2580	0	1.29	1.29	0.00
				Average		0	2580	0	1.29	1.29	0.00
	SPC SPEC			Total	5	0	31340	0	15.67	15.67	1,567.00
				Average		0	6268	0	3.13	3.13	313.40
	T1			Total	269	269	188300	0	94.15	0.00	4,020.70
				Average		1	700	0	0.35	0.00	14.95
	T1C			Total	3	3	3000	0	1.50	0.00	30.00
				Average		1	1000	0	0.50	0.00	10.00
	T1D			Total	8	8	8000	0	4.00	0.00	80.00
				Average		1	1000	0	0.50	0.00	10.00
	T1G			Total	92	92	0	0	46.00	0.00	920.00

Material Analysis Report by Material

Inbound and outbound materials for the period 07/10/2019 - 07/10/2019
Summary Report for Sites: 1, 2, 3, 4, 5, 6, 7, 8, 9, 17, 71
Accounts 0 - 999999 Customer Types - Z Materials - ZZZZZZZZZZ Material Types - ZZ

Date	Material	Type	Customer	Type	Tickets	Count	Est. vol.	Act. Vol.	Est. Wt.	Actual Wt.	Charge
				Average		1	0	0	0.50	0.00	10.00
	TIRES			Total	3	12	0	0	0.00	0.00	36.00
				Average		4	0	0	0.00	0.00	12.00
	WOOD COMM			Total	71	0	341700	0	170.85	170.85	2,963.68
				Average		0	4813	0	2.41	2.41	41.74
				Report Total	**1049**	**513**	**8402990**	**0**	**4269.55**	**4104.70**	**56,230.21**
				Report Average		**0**	**8010**	**0**	**4.07**	**3.91**	**53.60**

ASBESTOS WASTE SHIPMENT RECORD

SALT LAKE COUNTY

GENERATOR SECTION

	Reference Number:	
1) Site Name:		
Site Address:	City:	zip Code:
Site Owner's Name:	Telephone:	
2) Operator's Name:		
Address:	City:	Zip Code:
Project Contact:	Telephone:	
3) Waste Disposal Facility Name: Salt Lake Valley Landfill		
Physical Location: 6030 W California Ave	City: Salt Lake City, UT	zip Code: 84104
Facility Contact Name: Environmental Manager	Telephone: 385-468-6370	
Mailing Address: 6030 W California Ave	City: Salt Lake City, UT	zip Code: 84104

4) Responsible Agency: Utah Division of Air Quality 195 N 1950 W, Salt Lake City, UT 84114 (801) 536-4000

5) Description of Materials	Container Tvpe and Count	Total Quantity in Cubic Yards
	I	
	I	
	I	
	I	

6) Special Handling: Instructions and Additional Information:

7) Generator's Certification: I hereby declare that the contents of this consignment are fully and accurately described above by proper shipping name and are classified, packed, marked/labeled, and are in all respects in proper condition for transport by highway according: to applicable international and government regulations.

Signature:	Date:	Printed Name and Title:

TRANSPORTER SECTION

8) Transporter 1 (Acknowledgment of receipt of materials)

Transporter Name:	Telephone:	
Address:	City:	zip Code:
Signature:	Date:	Printed Name:

Transoorter 2(Acknowlede:ment of receiot of materials)

Transporter Name:	Telephone:	
Address:	City:	zip Code:
Signature:	Date:	Printed Name:

DISPOSAL SITE SECTION

9) Authorized Representative of the waste disposal facility: Certification of receipt of asbestos materials covered by this Waste Shipment Record except for any noted discrepancies listed below.

Salt Lake Valley Landfill

Signature:	Date:	Printed Name:
Title:		Manifest Number:

SALT LAKE COUNTY

Salt Lake Valley Landfill
Daily Load Inspection Sheet

Date______________ Inspected by________________________ Location______________

Time_____________ License #________________ Commercial ___ or Residential ___

__ Appliances	__ Furniture	__ Roofing Materials
__ Cardboard	__ Glass	__ Sheet rock
__ Carpet – Pad	__ Insulation	__ Sod - Dirt
__ Household Waste	__ Metal	__ Wood
__ Concrete – Rock	__ Paper	__ Yard Waste / Green
__ Food	__ Plastic	__ Other: mattress

____

____

Time_____________ License #________________ Commercial ___ or Residential ___

Waste Description

__ Appliances	__ Furniture	__ Roofing Materials
__ Cardboard	__ Glass	__ Sheet rock
__ Carpet – Pad	__ Insulation	__ Sod - Dirt
__ Household Waste	__ Metal	__ Wood
__ Concrete – Rock	__ Paper	__ Yard Waste / Green
__ Food	__ Plastic	__ Other

____

____

Time_____________ License #________________ Commercial ___ or Residential ___

Waste Description

__ Appliances	__ Furniture	__ Roofing Materials
__ Cardboard	__ Glass	__ Sheet rock
__ Carpet – Pad	__ Insulation	__ Sod - Dirt
__ Household Waste	__ Metal	__ Wood
__ Concrete – Rock	__ Paper	__ Yard Waste / Green
__ Food	__ Plastic	__ Other

____

____

SALT LAKE CITY-COUNTY HEALTH DEPARTMENT
REJECTED WASTE SHIPMENT FORM № 2251

Waste Management Facilities must complete and submit this form following the rejection of a waste shipment from their facility. Transporters are required to notify the Health Department of the final destination of the rejected shipment within 5 working days. Contact the Health Department at 801-313-6707 or 801-313-6714 if you have any questions regarding the proper disposal method for this waste shipment.

Date__________ **Waste Management Facility** __________

Generator Information

Company Name __________ Phone __________

Address __________ Contact Name __________

Transporter Information

Company Name __________ Phone __________

Address __________

Driver's Name __________

Vehicle Type __________ License Plate # ***(REQUIRED)*** __________

Waste Shipment Description

Waste Type __________ Quantity __________

Description of Waste __________

Reason for Shipment Rejection

Alternate Destination of Waste Shipment

Inspector's Signature __________

Original: Health Department *Copy 1: Transporter* *Copy 2: Waste Management Facility*

SALT LAKE VALLEY SOLID WASTE MANAGEMENT COUNCIL

Environmental and Technical Services
6030 West California Ave (1300 South)
Salt Lake City, Utah 84104

SALT LAKE COUNTY

John Ioannou
Executive Director

Thomas Burrup
Environmental Manager
tburrup@slco.org

CERTIFICATION OF DESTRUCTION AND DISPOSAL

This certifies that on (date) ____________________

(Company Name)____

Delivered for Destruction/Disposal ____________ Weight of (product)________________

Scalehouse Receipt Number ___________________________

This certifies that on the above date the Solid Waste Landfill received the above noted materials for destruction and disposal. The materials were disposed of according to established procedures.

Solid Waste Facility Employee______________________________ Time:___________

Delivery Person____ Time:___________

White copy – Customer
Yellow copy - Landfill

SALT LAKE VALLEY SOLID WASTE MANAGEMENT FACILITY
Environmental Services
(385) 468-6370

DATE: ____________

Clean Fill Manifest

Project Identification

Site Name	Contact Name	Project Address	Phone #

Hauler Information

License Plate	Contact Name	Company Name and Address	Phone #

Project / Material Information

Project and Material Description	Estimated Volume
	Number of Trucks
	Project Duration

Certification

Completion of this form certifies that the above referenced material from the above named project or location is properly classified, described and designated as "CLEAN FILL", as defined by the Salt Lake Valley Solid Waste Management Facility. **This further certifies that the material does not come from a known hazardous waste site cleanup nor has the material been impacted with any hazardous or regulated chemical(s).**
Call before you deliver @ 468-6376. Cleanfill is accepted daily – weather permitting.

______________________________ ______________________
Signature of Responsible Party Date

________________________ ____________ ____________________
Printed Name DL # Telephone #

This material has been inspected and (**DOES / DOES NOT**) meet the outlined physical requirements for "clean fill". **CLEAN FILL: YES** ☐ **NO** ☐

______________________________ ______________________
SLV Landfill Inspector Date

LANDFILL VISUAL INSPECTION (weekly)

DATE _________ TIME _________ Inspector ______________________________

Litter ____

Public Access/Road Conditions ____

Surface Water or Liquid Waste ____

Hazardous Waste or Suspicious Loads ____

Stormwater Outfalls (3) ____

Fences/Gates ____

Asbestos Site ____

Daily Cover _______ Type: (Soil / ADC / Other) **______________ Est. Thickness __________**

Active Tipping Face Location: (Module) ______________**______________________________**

Intermediate Cover ____

Vector Control ____

Dust Levels _______________________________ _________________________________

Fuel Tanks (diesel) ____
(check for leaks, general condition)

Propane Gas Tanks (5) ____
(check for leaks, general condition)

Stormwater and other Issues ____

Odor Observation: Y / N Location: ____________ Wind Direction: _____________

Signed: ______________________________________

July 10, 2019
formlandfill

KLEINFELDER
Bright People. Right Solutions.

EXPLOSIVE GAS MONITORING FORM

Site: Salt Lake County Landfill ____________ Sampling Personnel: ____________

Date: ____________ Time: ____________ Equipment: TVA 2020

Cal Gas Cylinder Number (Zero Air): ____________ Cylinder Expiration Date: ____________

Cal Gas Cylinder Number (500 ppm CH4): ____________ Cylinder Expiration Date: ____________

Downwind Background Reading: ____________ Weather: ____________

Monitoring Location[1]	Time	Methane Reading (ppm)	Percent of Methane in Air (%)	Percent of Lower Explosive Limit (LEL)	Comments
Probe GM-1					
Probe GM-2					
Probe GM-3					
Probe GM-5					
Probe GM-6					
Probe GM-7					
Probe GM-8					
Probe GM-9					
Probe GM-10					
Education Center					
Main Office Building					
Scale House 1					
Scale House 2					
Scale House 3					

Notes:

1. Once per quarter, all structures on the landfill are monitored with a handheld instrument to determine the methane concentration. Spaces within and below structures are monitored. In addition, monitoring locations along the landfill perimeter are monitored once per quarter to determine concentration of methane at the landfill boundary.

2. For all landifll buildings, if the methane concentration exceeds 25% of the LEL for methane (12,500 ppm) then corrective action must be initiated immediately as prescribed by applicable regulations. For the landfill perimeter probes/wells, if the methane concentration exceeds 100% of the LEL (50,000 ppm) then the landfill must implement corrective measures as per applicable regulations.

KLEINFELDER
Bright People. Right Solutions.

pH +- 0.2 units DO +- 10%
Temp +- 1 deg C Turbidity +- 10 NTU
Conductivity +- 5%

Project: ______________________________

GROUNDWATER SAMPLING FIELD DATA SHEET

Job No.: ______________________________

Well No.

Casing Diameter (in.)

Total Well Depth (ft.)

Static Water Level (ft.)

Water Thickness (ft.)

Casing Volume (gal.)

Stick-up (ft.) **Screen Int.** (ft.)

Purge Containerized: _____ Yes _____ No

Destination:

Purge Equipment
- ______ Disposable Bailer
- ______ Stainless Bailer
- ______ Peristaltic Pump
- ______ Other : ______

Serial Number:

Sample Equipment
- ______ Disposable Bailer
- ______ Stainless Bailer
- ______ Peristaltic Pump
- ______ Other : ______

Serial Number:

Filtration Equipment:
______ micron filter
Brand:

Water Level Meter:
- ______ Solinst
- ______ Other:

Serial No.

Analytical Equipment

pH meter (temp):
- ______ Horiba U-22
- ______ YSI PRO DSS
- ______ Other:

Serial No.:

Cond. Meter (temp):
- ______ Horiba U-22
- ______ YSI PRO DSS
- ______ Other:

Serial No.:

Dissolved Oxygen Meter:
- ______ YSI PRO DSS
- ______ Other

Serial No.

Turbidity Meter:
- ______ Horiba U-22
- ______ YSI PRO DSS
- ______ Hach 2000

Serial No.

Sampler's Initials	Time	Date

Meter Calibration

Time: Manual Calibrations? Yes / No
pH _____ D.O. _____ Turbidty _____

pH __________ = __________ at __________ °C

pH __________ = __________ at __________ °C

Conductance Standard: 4.49 S / m Other: ___________
Measured Reading after calibration:

Dissolved Oxygen:
Calibrated to ____________ mg/l at __________ °C

Redox:
Calibrated to ____________ mV at __________ °C

Turbidity:
Standard 1: ______ Reading : ______
Standard 2: ______ Reading : ______
Standard 3: ______ Reading : ______

Casing Volume multipliers: 1"=(.04) 2"=(.16) 3"=(.37) 4"=(.65)

Sample Depth (feet) Time:

Time	Number of Casing Volumes Removed	Liters Removed	Temp ºC	Dissolved 0_2 (mg / L)	Conductivity (mS / cm)	pH	Turbidity (NTU'S)	Water Level (ft. bgs)	Pump Rate ml /min	Approx. Pump Depth (ft. bgs)	Visual Description

Full Suite Y / N
#
Partial Suite Y / N
#

QC Samples:

Duplicate	Y / N	#
Rinsate	Y / N	#
Trip Blank	Y / N	#

PID/FID Readings	*Initial Readings:*	*Sample Readings:*
MiniRae	TOC:	TOC
OVA	BZ	BZ
MicroFID	Bkgd	Bkgd

Serial No.:

Additional Comments:

Condition of Well:
Well secured after activity? Y / N

PPE Level: B | C | D (circle one)

Signature:

KLEINFELDER SAMPLE CONTROL LOG

PROJECT NAME: PROJECT NUMBER:

SAMPLE DESCRIPTION				SAMPLE CONTAINER		
DATE	TIME	FIELD SAMPLE NUMBER	SAMPLE LOCATION	MATRIX (soil, etc)	# of CONTAINERS	NOTES

Laboratory:______________________ Chain - of - Custody No.: ___________________

Sampler:________________________ Page ___ of ___

KLEINFELDER
Bright People. Right Solutions.

Record of Visual Opacity

Project #: ______ **Date:** ______ **Time:** ______ **Source Type :** **Mobile** **Stationary** (circle one)

Site Location / Source ID: ______

Activity /Equipment Type : ______

Emission controls :				
	☐ None	☐ Water truck (frequency) :		☐ Sweeper (frequency) :
	☐ Grating / Cobbles	☐ Reduce speed	☐ Stand-down	☐ Other :

Field Conditions	Intial	Final
Observer location		Check if no change
Distance to emission point (ft.)		☐
Height of observation point (ft.)		☐
Direction to emission point		☐
Observation background		☐
Weather conditions		
Wind direction (from)		☐
Wind speed (mph) ☐ Beaufort ☐ Measured		☐
Ambient Temperature (℉)		☐
Sky conditions		☐
Plume description		
Origination point		☐
Height of emission point (ft.)		☐
Plume color (circle one)	Dust White Black	Dust White Black

Observation Diagram

Wind Direction

North Arrow

Sun = **Observation point =** **Emission point with plume =**

Mobile			
Time	**Reading #**	**Opacity %**	**Six Point Average**
	1		
	2		
	3		
	4		
	5		
	6		

Stationary					
Time	**Poirit #**	**0:00**	**0:15**	**0:30**	**0:45**
	1				
	2				
	3				
	4				
	5				
	6				

Comments

Note: if initial 180 minute observation, start observations on Page 2.

Signed: ______

Certified Opacity Observer

Attachment #8

Closure and Post-Closure Plan

VOLUME 2

Salt Lake Valley Landfill Closure and Postclosure Maintenance Plan

Prepared for

Salt Lake Valley Solid Waste Management Council

December 2016

CH2M HILL, Inc.
4246 Riverboat Road
Suite 210
Taylorsville, UT 84123

Document Revisions

Document origination – EMCOM Associates, November 1991

Revision 1 - EMCOM Associates February, 2006, Full Plan Update

Revision 2 – CH2M, December 2016, Partial Plan Update

Contents

Acronyms and Abbreviations

cm/sec	centimeters per second
the County	Salt Lake County
CPMP	Closure and Postclosure Maintenance Plan
CQA	Construction Quality Assurance
ECS	environmental control system
EMCON	EMCON Associates, Inc.
ET	evapotranspiration
GCCS	gas collection and control system
HDPE	high-density polyethylene
HELP	Hydrologic Evaluation of Landfill Performance (computer model)
LCRS	leachate collection and removal system
LEL	lower explosive limit
LFG	landfill gas
LFGTE	landfill gas to energy
NSPS/EG	New Source Performance Standards/Emission Guidelines
PCMP	postclosure maintenance program
QA/QC	quality assurance and quality control
SLVL	Salt Lake Valley Landfill
UAC	Utah Administrative Code
UDEQ	Utah Department of Environmental Quality

SECTION 1

Introduction

1.1 Background

The Salt Lake Valley Landfill (SLVL) is located approximately 9 miles west of the center of the City of Salt Lake (Figure 1). The landfill currently provides disposal services for approximately 70 percent of the businesses and residents of Salt Lake County (the County). The landfill has been operating since 1979 under an agreement between Salt Lake City and the County. The County provides planning and operating services for the landfill, and the City provides engineering services for the landfill.

The existing landfill comprises four parcels: designated Parcels III, VI, VII, and VIII (Figure 1). These parcels are located at 6030 West California Avenue. Parcel III was developed consistent with a 1981 plan prepared by EMCON Associates, Inc. (EMCON).. Parcels VI, VII and VIII have been developed consistent with the 1991 Master Plan prepared by EMCON.

This report, Salt Lake Valley Landfill Closure and Postclosure Maintenance Plan (CPMP), has been prepared in conjunction with the updated Salt Lake Valley Landfill Master Plan, (CH2M 2016), which contains guidance for developing the landfill in accordance with the Salt Lake Valley Health Department Regulation #1 and the Utah Department of Environmental Quality (UDEQ), Solid Waste Division Program requirements. The updated Master Plan is presented in Volume 1. This CPMP is Volume 2. For convenience, Volume 3 contains the appendices for both the CPMP and the updated Master Plan. Additionally, CH2M has prepared an updated Salt Lake Valley Landfill Gas (LFG) Plan, which is presented separately.

1.2 Report Submittal

This CPMP was prepared to update existing documents and for the continued development of the SLVL. This document (1) describes how the County will close and maintain the landfill consistent with current regulations, (2) allows the County to prepare an estimate of closure and postclosure maintenance costs for the landfill, and (3) enables the regulatory agencies to assess the reasonableness of the cost estimates.

Section 2 of this report presents the closure plan for the landfill, which identifies and describes tasks involved in closing the landfill in a manner consistent with applicable regulations and acceptable standards to protect public health and safety and the environment. The contents of the plan are consistent with the requirements of Health Regulation #1 and Utah Administrative Code (UAC) Section R315-302-3 (UAC R315-302-3).

Section 3 of this report describes the tasks associated with implementing the postclosure maintenance activities. The contents of this portion of the report are consistent with the requirements of Health Regulation #1 and UAC R315-302-3.

Section 4 describes the closure and postclosure maintenance cost estimates and funding mechanism consistent with the requirements of Health Regulation #1 and UAC R315- 309.

SECTION 2

Closure Plan

2.1 Introduction

This section presents the closure plan to be implemented at the SLVL that complies with the requirements of the Health Regulation #1 and UAC R315-302- 3(3). This section describes the currently-approved closure activities, removal of landfill structures, final cover, final grading and drainage, environmental control systems (ECSs) at closure, and decommissioning, if required, of existing ECSs. The landfill will be closed based on the stipulations in the current permit, and any subsequent amendments. Any changes to the current permit, such as modifying the permitted final cover to a water balance (evapotranspirative) cover, will require future revisions to this CPMP. The site will be closed in a manner that:

- Minimizes unnecessary maintenance
- Protects the human health and environment from postclosure release of contaminants/pollutants to the environment
- Prepares the facility for the postclosure maintenance period
- Accommodates proposed end-use development

2.2 Monitoring and Control Systems

The current monitoring and control systems at the SLVL consist of a leachate monitoring and control system, a groundwater monitoring system, surface water monitoring system, and a LFG monitoring and control system. The current monitoring and control systems are described in the following sections:

- Section 2.5 - Leachate Monitoring and Control System
- Section 2.6 -Groundwater Monitoring System
- Section 2.7 - Surface Water Monitoring System
- Section 2.8 - LFG Monitoring System
- Section 2.9 - LFG Control System

2.3 Closure Schedule

The remaining air space was initially estimated by measuring the volume between the contours of the Final Grading Plan (Appendix A, Drawing C-210) and the April 23, 2014 topographic map. The remaining air space as of end of year 2014, was approximately 58.3 million cubic yards. Approximately 1.0 million cubic yards of soil is required for the final cover, and an additional 1.3 million cubic yards are required for intermediate cover, equating to an effective (usable) air space remaining for waste of 55.4 million cubic yards. As of the date this document was developed (December 2016), it is estimated that an additional 1.8 million cubic yards of air space had been utilized for waste and daily/intermediate cover placed between April 2014 and December 2016 (see Table 3 from the Master Plan for estimated annual volumes of incoming waste). The remaining usable air space as of December 2016 is therefore estimated at about 53.6 million cubic yards, which is calculated by subtracting 1.8 million yards from the air space that was available in April 2014 (55.4 million yards).

To determine the waste capacity in tons, a capacity utilization factor was calculated by determining the airspace that the incoming waste has taken up (from liner plans and the 2014 topographic survey). This utilization factor was determined to be 0.60 tons per cubic yard. Although the capacity utilization factor is expressed as a density, it does not represent waste density. The capacity utilization factor is a composite value that accounts for initial waste density, refuse-to-soil ratio and waste settlement, and represents how efficiently the landfill capacity is being used. Based on projected waste disposal quantities and a capacity utilization factor of 0.58 tons per cubic yard, the remaining fill capacity is estimated to provide service to approximately 2082.

The actual landfill service life will be dependent on the waste quantity received at the landfill. The actual waste disposal quantity and, therefore, the actual landfill service life is influenced by factors such as other landfills opening and closing, waste generation rates, waste diversion rates, and development activity.

Estimates of the remaining landfill air space, fill capacity, and landfill service life are presented in Table 1. Table 2 presents projected waste disposal quantities and module service life.

Closure activities will be conducted as areas of the landfill are filled to final grades consistent with the final grading plan (Appendix A, Drawing C-210). The closure activities will include the placement of final cover, vegetation of the completed areas, construction of permanent drainage features, removal of landfill structures (if necessary), and provisions for site security.

Implementation of closure activities for any unit of the landfill will begin after the last shipment of waste to the landfill unit has been received and in accordance with the closure schedule in the approved closure plan. Regulatory agencies will be notified that closure activities are being initiated.

Table 3 presents a preliminary schedule for closure based on the landfill capacity and waste stream discussed in Section 2.3. The schedule could vary depending on the fill sequence employed by the County. Initial closure activities will include placement of the final cover.

Placement of a portion of the cover may have already occurred prior to closure activities as part of the intermediate soil cover requirements during landfill operations. Fine grading and verifying the intermediate soil cover thickness may, however, be required prior to placement of additional soil, to ensure the minimum 4-foot cover soil thickness is met.

2.4 Description of Closure

The following general activities will be performed associated with any closure activities at the SLVL.

Based on Health Regulations # 1

- Review current CPMP for completeness.
- Notify the Salt Lake Valley Health Department within 90 days prior to closure of the landfill, or landfill unit.
- Notify users of the landfill at least 30 days prior to closure of the landfill, or landfill unit.
- Begin closure activities based on approved closure plan within 30 days of final receipt of waste at the landfill, or landfill unit.
- Extensions of the deadline to begin closure may be granted at the discretion of the Director provided that the owner or operator can demonstrate that the landfill will not pose a threat to human health or the environment.
- Following closure, submit to the Salt Lake Valley Health Department a certification verifying that closure has been completed in accordance with the approved closure plan. Certification will be completed by the owner or operator or an independent Utah-registered professional engineer.

Based on UAC R315- 302-3(4)

- Notify the UDEQ Executive Secretary within 60 days prior to the projected final receipt of waste for any unit of the landfill specified in the approved closure plan.
- Implement closure plan within 30 days of receipt of final volume of waste and when final elevation is attained for any unit of the landfill as identified in the approved closure plan.
- Complete closure activities within 180 days. Extensions of the closure period may be granted by the UDEQ Executive Secretary based on reasonable request by the owner or operator.
- Upon completion of closure construction, within 90 days, or as required by the UDEQ Executive Secretary:
  - Record drawings showing as-built changes to the construction plans as approved in the closure plan, signed by a Utah-registered professional engineer
  - Certification by the owner or operator, signed by a Utah-registered professional engineer, that the unit of the landfill has been closed in accordance with the approved closure plan

The following sections describe proposed closure activities.

2.4.1 Removal of Landfill Structures

Numerous structures on the site support the landfill operation and resource recovery activities. They include the following:

- Scalehouse
- Maintenance building
- Landfill office building
- Public education facility
- Public unloading facility
- Composting and finished product areas
- Temporary hazardous waste storage area
- LFG flare facility
- Landfill gas to energy (LFGTE) facility
- Leachate evaporation pond
- Water storage tank

As part of the landfill development, it is proposed to relocate the scale house, maintenance building, landfill office building, public unloading facility and hazardous waste storage area from their existing locations.

2.4.1.1 Scalehouse

The scalehouse, at the landfill entrance, is equipped with two inbound and one outbound vehicle scales. This facility is used not only to collect tipping fees, but also to process each vehicle, to collect data on the type and number of vehicles, to weigh the volume of refuse per vehicle, and for other miscellaneous functions. Site information signs are displayed along the site entrance road. Signs display the operator's name, hours the landfill is open to the public, and unacceptable disposal materials. Directional signs to various onsite facilities are located throughout the property. A scalehouse will continue to be used after landfill closure by the customers of the public unloading facility.

2.4.1.2 Maintenance Building

Landfill equipment is repaired and maintained in this building. This facility is also used for storage of tools and other items needed to support work at the landfill. It is anticipated a maintenance building will remain after closure to support postclosure maintenance activities and end-use development.

2.4.1.3 Landfill Office Building

Landfill supervisory staff has offices in the landfill office building located at the entrance area. Restrooms, showers, lockers, and a meeting/lunch room are also provided in this building. It is anticipated a landfill office building will remain after closure to support postclosure maintenance activities and end-use development.

2.4.1.4 Public Education Facility

The public education facility is located adjacent to the landfill office building. The public education facility is used for tour and school groups, and for meetings. It is anticipated a public education facility will remain after closure to support landfill end-use development.

2.4.1.5 Public Unloading Facility

The public unloading facility provides a convenient location for customers to unload their waste away from the landfill working face. The facility also provides an opportunity for persons delivering waste to the landfill to drop off recyclable materials. Waste is transported to the landfill working face on a regular basis. Collected recyclable materials are periodically hauled off site for processing. It is anticipated a public unloading facility will remain after landfill closure. The collected waste will be transported to an appropriate disposal site.

2.4.1.6 Composting and Finished Product Areas

The SLVL uses two areas of the site for processing yard and wood waste (green waste) and selling compost finished products (see Appendix A, Drawing C-001). The first area designated as the composting area is located at the southwest comer of the site. The second area is the finished product area just east of the public unloading facility.

The composting area includes yard waste drop-off area, processing area, compost material windrows and equipment maneuvering area, a runoff retention basin, and access roads. This area is paved to minimize surface water infiltration to natural subsoil and to improve driving conditions in the area. When the curing process is completed, the composted material is hauled to the finished product area where it is processed further for sale to the public.

Composting operations will continue concurrent with landfill operations and may have to be moved several times based on available land at the site or available closed area of the landfill.

It is anticipated the composting area will be removed during landfill closure. The finished product area may remain to provide a distribution point for compost.

2.4.1.7 Temporary Hazardous Waste Storage Area

In case prohibited materials are discovered by landfill crews and the owners of the materials cannot be identified; for example, they have unloaded the prohibited materials and left the site, the prohibited materials will be separated and temporarily stored in the hazardous waste storage area.

2.4.1.8 Landfill Gas to Energy and Flare Facility

The LFGTE and LFG flare is used to combust LFG collected from the landfill. The flare is located on an equipment skid which includes blowers, condensate knock-out trap, monitoring equipment, and motor control center. The LFGTE facility includes blowers, engines, monitoring, and control equipment. Both facilities are located on the County-owned parcel adjacent to the east of the landfill. The facilities are outside the footprint of the landfill and will remain in operation during the postclosure maintenance period until it is demonstrated LFG no longer poses a threat to human health or the environment.

2.4.1.9 Leachate Evaporation Pond

Currently, leachate is pumped from the two central individual collections sumps and conveyed to holding ponds, constructed on top of Modules 6 and 7. Generally, the collected leachate is handled through evaporation and through spraying on lined areas of the landfill for dust control. During particularly wet periods of the year, the quantity of leachate conveyed to the ponds can exceed the ponds' capacity. In this instance, leachate is conveyed to the sanitary sewer system via a tanker truck. In the future, the existing leachate ponds will be relocated as required to allow for filling. A lined pond was constructed on the County-owned parcel adjacent to the landfill, as shown on Appendix A, Drawing C-001, for future use. The leachate evaporation pond is outside the footprint of the landfill and will remain in operation after landfill closure. In the future, when leachate generation ceases, the leachate evaporation pond will be decommissioned.

2.4.1.10 Water Storage Tank

A water storage tank is located near the landfill entrance. The water storage tank provides water for fire control. The water storage tank will remain after landfill closure to support postclosure maintenance activities and landfill end-use development.

The structures identified to be removed will be done so accordingly in a cost-effective manner and either disposed, sold, or used at another landfill site. Structures to be removed will be dismantled and made available for reuse or resale. Material not considered reusable will be disposed of appropriately in accordance with applicable state regulations.

2.4.2 Decommissioning of Environmental Control Systems

The ECS utilized at the landfill currently consist of groundwater monitoring wells, leachate collection and monitoring system, and LFG monitoring and control system.

It is anticipated that all ECS existing at closure will remain in place upon closure and during the postclosure maintenance period, a minimum of 30 years, or until landfill by-products, such as leachate and LFG, are demonstrated to no longer pose a threat to the environment and when proper regulatory agency approval for decommissioning has been obtained. The accessible portions of the ECS will then be decommissioned, if necessary.

ECS to be decommissioned during the postclosure maintenance period will either be abandoned in place or be dismantled and disposed of at another authorized solid waste disposal site. Well abandonment techniques for decommissioning the groundwater monitoring system will be consistent with procedures applicable at the time of decommissioning. Underground pipe components of the leachate control system and the LFG monitoring system will be cut off at the surface, capped, and buried to minimize the disturbance of the landfill final cover. Aboveground components will be dismantled, decontaminated, and salvaged for reuse or discarded in a permitted, active waste disposal site. Transportation and disposal will be consistent with federal, state, and local laws and accomplished in a manner that prevents the introduction of leachate or waste constituents into the environment. Materials intended for reuse may be cleaned by the following methods:

- Washing with water, detergent, or chemical solvents
- Steam-cleaning
- Scrubbing with abrasives
- Sand blasting

The residues produced as a result of cleaning reusable components will be disposed of consistent with applicable federal, state, and local laws.

The decommissioning of each ECS is discussed further in the following sections:

- Section 2.5 -Leachate Monitoring and Control System
- Section 2.6 - Groundwater Monitoring System
- Section 2.7 - LFG Monitoring System
- Section 2.8 - LFG Control System

2.4.3 Security at Closed Sites

Entry onto the landfill during business hours is controlled by site personnel at the entrance facility, which is the single point of public access to the site. Unauthorized access to the site is controlled by perimeter fencing and lockable entrance gates at the point of public access along 1300 West California Street.

Proper warning signs will be posted at the entrance area and any closed unit of the landfill for unauthorized entry and/or illegal disposal of waste.

2.4.4 Final Cover

Background and Present Conditions. Currently, the site uses an intermediate cover of at least 12 inches of soil over the waste where additional landfilling is not expected to occur within 180 days.

Regulatory Requirements. The final cover at landfill closure will have a minimum thickness and quality of cover material consistent with the requirements of Health Regulation #1 and UAC R315-303-3(4) or approved alternative. The prescribed cover consists of the following layers, from bottom to top:

2.4.4.1 Infiltration Layer

- A minimum 18 inches compacted soil, or equivalent with a permeability of 1 x 10^{-5} centimeters per second (cm/sec) or less, or equivalent, will be placed over the final waste lift
- A 20-mil reinforced or 40-mil non-reinforced synthetic liner will be placed over the compacted soil layer
- The final cover infiltration layer will be no more permeable than the bottom liner system or natural subsoils present in the unit

2.4.4.2 Erosion Layer

- A minimum 6 inches of soil layer capable of sustaining vegetation over the compacted soil cover or synthetic liner
- Other suitable materials may be used based on approval by the UDEQ Executive Secretary

An evapotranspiration (ET) cover has been designed and tentatively approved by UDEQ for use as the final cover. The cover will consist of 4 feet of silty material. The 1-foot-thick intermediate cover layer will be placed over the refuse as part of the landfill operations before the final cover is placed. The final cover will provide moisture removal through ET to prevent liquid from entering the waste.

Proposed Final (ET) Cover. The proposed final cover design for the SLVL consists of the following materials, from bottom to top:

- 4-foot-thick ET layer, 1 foot of which may be placed as intermediate cover during landfill operations

ET Layer. Per UAC R315-303, the ET final cover must show a rate of percolation below the cover of no greater than 3 millimeters per year during any year of the simulation. Furthermore, this level of performance must be maintained throughout the five wettest consecutive years on record at the site. The ET cover system will consist of several feet of fine-grained (most likely silty to clayey loam), vegetated soil to provide soil moisture storage above the waste material. The cover system is designed to limit infiltration of precipitation and to retain the water that does infiltrate into the cover material, so that it can be removed by transpiration through vegetation or soil evaporation before it percolates into the underlying waste material. The cover system uses the water storage capacity of the soil layers rather than lower permeability physical characteristics of traditional cover materials (for example, clays or synthetic liners) to minimize infiltration. The ET layer, described above, is proposed to be constructed of onsite soil.

Vegetation. The final cover will be vegetated. The vegetation selected for the site will be compatible with the soils used for the vegetative layer, should require minimum establishment irrigation, must not compromise the structural integrity of the final cover, and must be compatible with any end-use development. Vegetation will be selected on the basis of rooting depth not exceeding cover layer depth, soil type, resistance, climate, rapidity of germination and growth, self-persistence, and maintenance requirements. The quantity of ET final cover soil materials required for the landfill is summarized in Table 1. The quantity of final cover soils and geosynthetic materials required for each module for the prescribed cover is presented in Appendix R, Financial Policy. Final cover soils will be obtained from onsite sources. A preliminary Construction Quality Assurance (CQA) program for the currently approved final cover, including geomembrane installation, is presented in Appendix L. A final CQA plan will be developed as part of the final closure design. Final cover construction will be conducted under the supervision of a Utah-registered professional engineer.

2.4.5 Final Grading

Background and Existing Conditions. The final landfill grades are configured to maximize refuse fill while addressing existing topographic features, drainage requirements, and postclosure end-use development. The existing side slopes of the landfill have been constructed with a maximum slope of approximately 4:1 (horizontal : vertical).

Regulatory Requirements. Based on the Health Regulation #1 and UAC R315-303- 3(4), the final grades of the landfill must be designed to promote surface runoff at a minimum 2 percent slope on the top surface and a maximum 3:1 (horizontal:vertical) on the side slopes.

Proposed Final Grades. The proposed final grades are designed consistent with regulatory requirements. The final grades on the top deck will be constructed with slopes no flatter than 5 percent to provide sufficient slope for continued stormwater runoff after refuse consolidation and settlement, and to prevent the potential for ponding in the event of differential settlement. Sideslopes will be 3:1, or flatter. The maximum permitted elevation is 4435 feet, after settlement. The proposed final grades for the SLVL are shown in Appendix A, Drawing C-210. The proposed final grades can support a variety of future end-use development.

The final grades are controlled by surrounding topography, existing waste fill, anticipated refuse settlement, minimum gradients for adequate drainage of the completed fill, and future end-use development. Final landfill grades are designed to prevent ponding, to accommodate anticipated future settlement, and to reduce runoff velocities to minimize erosive conditions. The final landfill grades, shown in Appendix A, Drawing C-210, represent presettlement grades. Refuse settlement after closure is estimated to be approximately 11 to 20 feet, at the center and near the landfill perimeter, respectively. Postclosure settlement calculations are presented in Appendix O. This estimate is based on the method of landfill operation, effects of surcharging, refuse composition, and landfill settlement experienced at other sites with similar characteristics.

2.4.6 Final Drainage

Present Conditions. The landfill is located in an area of flat topography. Drawing C-001 depicts existing site topography. Runoff from the site is routed around the active fill area by ditches to the northwest and to an offsite stormwater pond just south of the site. In excavated areas, runoff is directed towards a dewatering trench where the surface water can be removed as necessary. Inactive portions of the landfill are graded to direct surface water off the landfill.

The landfill site is above the 100-year floodplain as identified by the Federal Emergency Management Agency Flood Insurance Rate Map for Salt Lake County, Utah (Flood Insurance Rate map No. 49035C0120E and 49035C0275E).

Regulatory Requirements. The final drainage system will be designed consistent with the Health Regulation #1 and UAC R315-303-3(l)(c), which includes the following:

- Surface run-on and runoff will be prevented from flowing onto the active portion of the landfill during peak discharges from a 25-year storm
- The landfill will be constructed to adequately control the runoff from the landfill resulting from the 25-year, 24-hour storm event
- The landfill will be equipped with channeling devices, including, but not limited to, ditches, berms or dikes, to divert surface water from the land area contiguous to the landfill
- Runoff not contaminated by solid waste or leachate will be routed to a settling basin or will be controlled by other equally effective measures to remove sediment before discharge to a receiving stream

Proposed Drainage System. To minimize run-on to the landfill site, runoff from adjacent areas outside the landfill will be directed around the landfill site perimeter. The Final Grading and Drainage Plan shows all permanent drainage structures to be utilized on the landfill (Appendix A, Drawing C-210).

The completed landfill will be provided with permanent drainage facilities designed to divert run-on and runoff away from the landfill while minimizing erosion. Diversion berms constructed on the flatter surface area of the landfill will be provided with drainage ditches to convey runoff to overside drain. Roadside drainage ditches and drainage diversion berms will prevent run-on to the landfill. The vegetative layer of the final soil cover will be seeded with grasses to protect the upper layer of soil, and to minimize erosion and visual impacts.

The proposed landfill final drainage system is designed to carry the peak discharge from the landfill resulting from the 25-year, 24-hour storm event. A previously prepared drainage analysis is included in Appendix I. Stormwater runoff volumes and final stormwater drainage control facilities were sized using the Rational Method.

The drainage control facilities feature a network of diversion berms, drainage ditches, and overside drains for surface drainage management of the completed landfill. Ancillary drainage structures such as drop inlets and catch basins will also be used for proper conveyance of storm runoff into the drainage system. Drainage ditches constructed over refuse fill areas will be underlain by a compacted soil layer, and lined or vegetated to minimize erosion.

Facilities necessary for collecting and diverting stormwater runoff from the site and its surrounding tributary drainages include drainage diversion berms, various drainage ditches, corrugated steel pipe or high-density polyethylene (HDPE) overside drains and inlets, and energy dissipators. Rock-lined channels may also be used for overside drains. This drainage network for the completed landfill is designed to carry stormwater at velocities that minimize ditch erosion.

2.5 Slope Protection and Erosion Control

Background and Present Conditions. Existing slopes in the landfill area are typically covered with grasses.

Current erosion control measures at the SLVL include the following:

- Construction of a perimeter drainage system along the interface of landfill and natural ground surface
- Collection and control of surface runoff
- Grading of top-deck areas to non-erosive grades
- Construction of temporary drainage facilities
- Utilization of temporary control measures (mulch, hay bales, fiber rolls, matting, etc.) until vegetation is established on finished areas

Regulatory Requirements. The slope protection and erosion control procedures will comply with current regulations. The requirements include the following:

- Implementation of procedures to protect the integrity of the final cover and enhance its ability to minimize and prevent erosion during postclosure care period
- Establishment and maintenance of the vegetative cover according to the postclosure land use
- Slope stabilization to prevent soil erosion

Proposed Method of Slope Protection and Erosion Control. The completed landfill will be provided with permanent drainage facilities designed to divert run-on and runoff away from the landfill while minimizing erosion damage. Roadside drainage ditches and drainage diversion berms will prevent direct run-on around the landfill. Locations and details of the drainage facilities are shown on Appendix A, Drawing C-210.

Additionally, final landfill surfaces will be vegetated with grasses and other shallow-rooted vegetation after final cover has been placed. A revegetation plan will be developed as part of the final closure plan and will describe the appropriate methodologies and technical guidelines to design and implement a comprehensive revegetation program that will mitigate potential significant impacts.

Erosion control measures include the following:

- Collection and control of runoff, diverting it away from high-erosion areas
- Grading future final areas to achieve maximum slopes of 3:1
- Reseeding of intermediate and finished areas, as necessary
- Calculations based on the Universal Soil Loss Equation (Appendix P) show that final cover erosion (soil loss) will be minimal. The annual soil erosion rate is less than the EPA guideline of 2 tons per acre per year. This erosion rate is based on relatively conservative parameters for the final cover section as follows:
- Evaluation of a simplified average section of exposed surface
- Discounting beneficial effect of the diversion berms in the completed top deck and interceptor benches in the sideslopes to minimize sheet flow

2.6 Leachate Monitoring and Control System

Present Conditions. Leachate generated at the SLVL is managed through a leachate collection and recovery system (LCRS) installed at the base of the landfill. Each module has its own leachate collection sump as shown on Appendix A, Drawing C-002.

Leachate monitoring at the active modules of the landfill is conducted in accordance with the Health Regulation #1 and UAC R315-302-2(c). Monitoring activities include a survey of leachate content and sampling and analysis of leachate from each sump of the active landfill modules. Records of leachate monitoring activities are maintained at the site.

Proposed LCRS. Future modules will have a composite liner and LCRS, as shown on Appendix A, Drawing C-002. The LCRS is part of the landfill containment system that is consistent with the UAC R315-303-3(2). The LCRS for the SLVL lateral expansion will consist of perforated pipes and a granular drainage blanket constructed over the composite base liner system. Pipe spacing, size, minimum slopes, permeability of drainage blanket material, and riser sumps were designed based on leachate generation potential, base grade configuration, and strength of pipe material. Leachate that is produced in the landfill will be collected in the drainage blanket leachate collection pipes, and will drain to several leachate collection sumps. The sumps contain a riser pipe through which the leachate can be removed. The system is designed based on the initial landfill base slope to maintain less than 1 foot of leachate over the base liner. A conceptual design for the LCRS is shown on Appendix A, Drawing C-002 and detailed on Appendix A, Drawings C-501. Construction plans, which will be developed for each module prior to construction, will detail the configuration and placement of the LCRS within the module. Pipe spacing and size, and other elements of the LCRS will not change from the preliminary plan. The LCRS will not be constructed without the guidance of the detailed construction drawings.

The proposed liner and LCRS design at the SLVL consist of the following materials, from bottom to top:

- Geosynthetic clay liner
- Minimum 60-mil-thick single-sided textured HDPE geomembrane
- 1-foot gravel drainage layer
- Geotextile
- Minimum 1-foot-thick soil operations layer

System Operation. Currently, leachate that accumulates in the leachate collection sumps is pumped to the leachate evaporation pond, located in Modules 6 and 7. Leachate is evaporated and is also used for onsite dust control on lined modules. In the future, the existing leachate ponds will be relocated as required to allow for filling. A lined pond was constructed on the County-owned parcel adjacent to the landfill, as shown on Appendix A, Drawing C-001, for future use.

After closure, leachate will no longer be used for dust control. However, after placement of the final cover, the quantity of leachate requiring handling will decrease with time. The handling options that may be applicable for the site after closure include the following:

- Evaporation
- Conveyance to a wastewater treatment plant
- Recirculation to lined modules

As part of the LCRS design evaluation, leachate generation potential was analyzed using the Hydrologic Evaluation of Landfill Performance (HELP) computer simulation developed by the U.S. Army Corps of Engineers for the EPA (see Appendix G) for the currently permitted cap. At closure, the HELP model predicted no leachate generation. However, moisture in the waste mass will continue moving downward to the LCRS. Additionally, groundwater may enter the landfill generating leachate.

Monitoring Tasks and Frequency. As required by the existing monitoring program, the LCRS will be inspected for leachate generation. Leachate volumes will be measured monthly. Leachate samples will be analyzed semi-annually for the monitoring parameters specified in the current monitoring program.

Consistent with the current monitoring program, the LCRS will be monitored by periodic observation and sampling of collected leachate. The leachate pumps will be inspected for evidence of wear or operational problems. LCRS testing will consist of visually monitoring the physical condition of the aboveground components and any leachate in the sump via the sump riser pipe.

Reporting Requirements. As required by UAC R315-302-2(4), quantities of leachate pumped from the landfill will be included in the annual report submitted to the UDEQ.

System Decommissioning. The LCRS will remain in operation during the closure and postclosure maintenance periods or until leachate is demonstrated to no longer pose a threat to the environment and proper regulatory agency approval is obtained, at which time the system will be decommissioned. Most of the components of the LCRS will be underground and remain in place at the time of closure. Underground pipe components will be cut off just below the surface, capped, and buried to minimize the disturbance of the landfill final cover. Aboveground components will be dismantled, decontaminated, and salvaged for sale, reuse, or discarded in a permitted, active waste disposal site.

2.7 Groundwater Monitoring System

Present Conditions. Groundwater monitoring at the landfill is conducted in accordance with the Health Regulation #1 and the requirements of UAC R315-308.

Monitoring of underlying groundwater is performed semiannually. There are currently eight (8) groundwater detection monitoring wells around the landfill expansion area (MW-IA through MW-8A), as shown on Figure 2. A ninth well (Well F) is located within the Technologies land farming area. Well F currently is being monitored as required by Salt Lake Valley Health Department.

Proposed Monitoring System. The groundwater monitoring well network at the landfill expansion area will consist of the existing monitoring wells and a sufficient number of additional monitoring wells that will yield the following information about the uppermost aquifer:

- The background water quality
- Water quality at the points of compliance

A groundwater monitoring plan (Kleinfelder, 2005b) has been prepared in response to UDEQ Subtitle D regulations (R315-308). The plan is presented in Appendix M and is summarized in this section.

There are currently eight detection monitoring wells around the landfill boundary (MW-1A through MW-8A). Well F will be abandoned during development of Module 10. Two additional wells will be installed during landfill development. Monitoring wells will be constructed in a manner that maintains the integrity of the drill hole and prevents cross-contamination of saturated zones. Bollards will be installed to protect the monitoring wells.

Information from existing wells will be used to establish background water quality data. Consistent with Health Regulation #1 and UDEQ Subtitle D regulations, groundwater samples will be collected on a semiannual basis. Semi-annual samples will be analyzed for a variety of parameters including metals, volatile organic compounds, and leachate indicators as specified in the Health Regulation #1 and the UDEQ Subtitle D regulations.

If a statistically significant change in any of the monitoring parameters is noted during subsequent sampling events, the landfill will begin a program of verification monitoring to determine the source of the groundwater impact and the extent of the impact. If verification monitoring conclusively identifies the landfill as the source of the groundwater impact, a corrective action program, as may be required by the appropriate regulatory agency, will be implemented and will continue until it can be demonstrated that such a program is no longer necessary.

Monitoring Tasks and Frequency. The current monitoring parameters and sampling and analysis procedures will be continued as approved by the regulatory agencies. Groundwater samples from detection monitoring wells are currently collected and analyzed semiannually. The monitoring parameters for each groundwater sample are listed in the current groundwater monitoring plan, presented in Appendix M. The samples are analyzed at a state-certified analytical laboratory.

In addition to collecting water samples from the monitoring wells, other tasks are performed for a typical monitoring event. These tasks include measuring the depth to water in each well; field measuring the pH, specific conductance, and water temperature; performing and documenting quality assurance and quality control (QA/QC) procedures; and visually inspecting the wells to see that they are in proper working order. Groundwater flow at the landfill is evaluated based on the water levels measured in the sampled wells as well as the groundwater elevation monitoring wells. A potentiometric surface map is constructed, and the groundwater flow direction and gradient are estimated.

Reporting Requirements. Current regulations require groundwater monitoring and response programs be performed according to the compliance schedule established by regulatory agencies. In general, the compliance period is the active life of the landfill, including the closure period, and the postclosure maintenance period. The compliance period is the minimum period of water quality monitoring required subsequent to a release from the unit. If a corrective action program is in progress at the scheduled end of the compliance period, then the compliance period will be extended until the unit has been in continuous compliance with its water quality protection standard for a period of 3 consecutive years or an alternative length of time specified by the UDEQ Executive Secretary.

Currently, monitoring reports are prepared semiannually after the spring and fall periods. Based on the UAC R315-302-2(4)(a), an annual groundwater monitoring report must be prepared and placed in the facility operating record. In addition, an annual groundwater monitoring report must be submitted to the UDEQ Executive Secretary by March 1 of each year for the most recent calendar year of facility operation.

System Decommissioning. The groundwater monitoring system will remain in service throughout the closure and postclosure maintenance periods or until landfill by-products, such as leachate and LFG, are demonstrated to no longer pose a threat to the environment and regulatory agencies agree that groundwater monitoring is no longer necessary. The system will then be decommissioned. The wells will be decommissioned using appropriate well abandonment techniques consistent with the procedures enforced at the time of decommissioning.

2.8 Surface Water Monitoring System

Present Condition. Surface water monitoring at the landfill is conducted in accordance with Health Regulation #1 and the facility’s General Permit for Storm Water Discharges Associated with Industrial Activity, Permit No. UTR000074.

Monitoring of surface water is performed semiannually in the spring and fall. There are currently six surface water sampling locations (S-1, S-2, S-3, S-5, S-6, and S-7), as shown on Figure 2. A surface water monitoring plan (Kleinfelder, 2005a) has been prepared and is contained in Appendix N.

Proposed Monitoring System. With the closure of the landfill, several of the current surface water monitoring locations will no longer be sampled. For example, surface water sample locations S-5, S-6, and S-7, which are associated with the active landfill operation, will not be sampled. Surface water sample location, S-3, which is surface water from the public unloading area, will be relocated to the new public unloading area on the County-owned parcel adjacent to the landfill.

After landfill closure, monitoring of surface water from the landfill is not required. However, it is anticipated that monitoring of surface water from the relocated public unloading area will continue. Also, monitoring of Lee Drain will continue.

Monitoring Tasks and Frequency. The current monitoring parameters and sampling and analysis procedures will be continued as approved by regulatory agencies. Surface water samples are currently collected semiannually in the spring and fall during or immediately after a storm event resulting in 0.1 inches, or more, of rainfall occurring at least 72 hours after a previous rainfall event of at least 0.1 inches. The monitoring parameters are listed in the current surface water monitoring program, presented in Appendix N. The samples are analyzed at a state-certified analytical laboratory.

In addition to collecting samples, other tasks are performed for a typical monitoring event. These tasks include field measuring temperature, pH, dissolved oxygen, conductivity, and turbidity; and performing and documenting QA/QC procedures.

Reporting Requirements. Semiannual reports will be prepared following the sampling event. The reports will include: a description of sampling activities; a discussion of data validity; a discussion of laboratory QA/QC; and presentation of field data and laboratory analytical results. Reports will be submitted to the DEQ Division of Water Quality.

2.9 Landfill Gas Monitoring System

Present Conditions. LFG monitoring is conducted at the landfill in accordance with Health Regulation #1 and the requirements of UAC R315-303-2(2)(a). Additionally, surface emissions monitoring is conducted in accordance with the requirements of the site's Title V permit.

The SLVL implements routine LFG monitoring to determine that concentrations of methane do not exceed 25 percent of the lower explosive limit (LEL) in facility structures or the LEL at the facility property boundary. The monitoring program is based on site- specific factors, including soil conditions, hydrogeologic and hydraulic conditions, and the location of facility structures and property boundaries.

The base liner at the SLVL provides a barrier to lateral subsurface LFG movement. The high ground-water levels and surface-water levels that surround the site, and clayey soils also minimize LFG migration to most areas adjacent to the landfill. Except for buildings at the entrance area and the public unloading facility, there are no structures within 1,000 feet of the landfill site boundaries.

There are four LFG probes currently used for monitoring LFG (see Figure 2). LFG probes are monitored quarterly using a hand-held gas detection instrument. Structures near the landfill area are also monitored to determine whether LFG may have migrated into them. If LFG is detected in a perimeter probe at a concentration exceeding the LEL, or in a structure at more than 25 percent of the LEL, onsite personnel will determine whether there is an imminent threat and take appropriate action. Monitoring of LFG at the SLVL is consistent with the requirements of the UAC R315-303-3(2)(a) and R315-303-4(5).

Proposed Monitoring System. Additional LFG monitoring probes will be installed as landfill modules are developed. The LFG monitoring network will be designed to account for the following specific site characteristics, including, but not limited to, the following:

- Local soil conditions
- Hydrogeological conditions surrounding the site

- Hydraulic conditions surrounding the site
- Locations of facility structures and property boundaries

Additional LFG monitoring probe locations are shown in the Salt Lake Valley Landfill Gas Plan (CH2M 2016). Construction documents to be prepared for future modules of the landfill will include location and details of LFG monitoring probes.

Surface emission monitoring will be expanded as the landfill expands. At closure, the entire landfill surface will be monitored for surface emissions.

Monitoring Tasks and Frequency. UAC R315-303-2(2)(a) requires quarterly LFG monitoring during the active life of the landfill and the postclosure maintenance period of the site. In accordance with the site's Title V permit, surface emission monitoring is performed quarterly.

Reporting Requirements. The quarterly results of the perimeter LFG probes and structure monitoring are placed in the site's operating record. Each report includes the following:

- Date, time, and name of monitoring personnel
- Barometric pressure, atmospheric temperature, general weather conditions, and probe pressures
- Type of monitoring apparatus used and description of monitoring procedures
- Methane concentrations measured at each monitoring probe and within onsite structures

As per UAC R315-302-2(4), an annual gas monitoring report is prepared and submitted to the UDEQ Executive Secretary by March 1 of each year for the most recent calendar year of facility operation.

Semiannual monitoring reports, including results of surface emissions monitoring, are submitted to the DEQ Division of Air Quality, as required by the site's Title V permit. Additionally, an annual compliance report is submitted to the DEQ Division of Air Quality and the U.S. Environmental Protection Agency documenting compliance with the site's Title V permit and Subparts WWW and AAA of the Clean Air Act.

System Decommissioning. When LFG is no longer produced in significant quantities, the gas monitoring system will not be necessary and, with regulatory agency approval, will be decommissioned. The LFG probes will be filled with bentonite grout. Access vaults and locking devices will be cleaned, if necessary, and salvaged for reuse at other sites or discarded in a permitted, active waste disposal site.

2.10 Landfill Gas Control System

Present Conditions. Regulations promulgated under the Clean Air Act (40 CFR Part 60, 40 CFR Part 62) establish New Source Performance Standards/Emission Guidelines (NSPS/EG) for landfills. The SLVL is an existing landfill under NSPS/EG regulations as it received waste after December 1987 and has a design capacity greater than 2.5 million megagrams. Under NSPS/EG, an existing landfill with an estimated non-methane organic compound emission rate of greater than 50 megagrams per year must install a gas collection and control system (GCCS).

The SLVL has an active GCCS that is currently operating including the LFG flare and LFGTE facility. The GCCS is designed to comply with the NSPS/EG, Health Regulation #1, UAC R315-303-3(5), and UAC R307-221 requirements. The GCCS is described in greater detail in the Salt Lake Valley Landfill Gas Plan (CH2M 2016).

The landfill and the GCCS are also subject to the conditions of Title V Operating Permit Number 3500536001, last revised June 23, 2015. Specifically, Conditions in II.B.2.a apply to LFG design, operations, and compliance activities. These conditions are in general conformance with the requirements of UAC R307-221 and the NSPS/EG requirements. Site-specific elements of the Title V Operating Permit are summarized and discussed in the Salt Lake Valley Landfill Gas Plan (CH2M 2016).

Proposed Control System. The LFG control system expansion will occur during the active life of the landfill. Therefore, it is not anticipated that additions to the LFG control system will be required after closure. Ultimately, the GCCS is proposed to consist of a combination of horizontal collectors during active module filling and vertical wells after final elevations are attained. The horizontal and vertical collectors will be constructed of HDPE pipe. HDPE laterals will connect the vertical collection wells to HDPE headers. In areas to receive additional waste, temporary header pipes will be used. Condensate will either flow back into the LFG collection wells, or be collected in condensate traps located along the main header which are automatically pumped back into the landfill. Condensate can also be injected into the LFG combustion flare.

The LFG control system will be operated until it is demonstrated that LFG does not present a threat to the environment and regulatory agencies approve shutting down the LFG control system.

System Operation. Collected LFG is combusted at the LFGTE facility and in the enclosed LFG flare. Both facilities are regulated by the UDEQ, Division of Air Quality. The flare operating temperature is monitored and recorded, and is maintained as required by the operating permit. The temperature criterion is specified to maximize hydrocarbon destruction efficiency and minimize the production of nitrogen oxides. The flare operating temperature is regulated by automatic adjustments of combustion airflow dampers.

The SLVSWMF has an LFG Rights and Collection Facility Lease Agreement with Aria Energy whom operates the LFGTE facility. The current flow of LFG to Aria is about 1,200 cfm at 50 percent methane, which can generate up to 3 megawatts of electrical power to provide energy for approximately 3,000 homes. Aria operates three reciprocating internal combustion engine generators with an estimated 90 percent continuous prime output. Aria has an electrical power wheeling agreement with Rocky Mountain Power and Murray City Power for utilization of the electricity. Aria also has a wellfield operations and maintenance agreement with the landfill, in which Aria operates and maintains the GCCS and performs routine services.

To maintain proper gas flows to the flare and LFGTE facility, the LFG collection wells and piping system are inspected on a regular basis. Wells and piping are inspected for leaks that may allow air to mix with LFG. The piping is inspected to correct any low spots in the pipe that could allow LFG condensate to collect and potentially block gas flows. The LFG collection wells are "balanced" to equalize flows from the wells and efficiently distribute available vacuum.

Monitoring Tasks and Frequencies. The LFG control system is inspected regularly for containment and system integrity. The system is tested annually to demonstrate proper operation. LFG extraction volumes are measured continuously.

The destruction efficiency of the flare will be determined by flare emission source testing, to be performed in accordance with NSPS/EG requirements. The source testing results will be submitted to the UDEQ Executive Secretary.

If regulatory limits are exceeded as determined by any of the above monitoring procedures, the gas control system and operation will be evaluated and modified to meet compliance requirements.

Reporting Requirements. Gas control system monitoring data will be reported to the UDEQ Executive Secretary as required by the operating permit. The results of perimeter gas migration compliance monitoring will be submitted to the UDEQ Executive Secretary. Any changes in control system configuration or operation deviating from permitted, condition will require approval from the UDEQ Executive Secretary.

System Decommissioning. After LFG generation ceases, or decreases to a level that control becomes unnecessary, and approval has been obtained from regulatory agencies, the gas control system will be decommissioned. Many components of the LFG control system will be underground at the time of closure. Underground pipe components will be cut off from surface access, capped, and buried to minimize disturbance of the landfill final cover.

Aboveground components, such as access vaults and valves, will be cleaned, if possible, and salvaged for reuse at other sites, sold, or disposed in a permitted, active waste disposal site. Equipment such as blowers, flare, electrical control panel, and fencing will be dismantled, steam-cleaned, and salvaged for reuse, or sold as scrap. Pipes, conduits, anchor bolts, and other protrusions will be removed from the concrete slab, which will remain in place. Soil surrounding the concrete slab will be graded to blend with the edges of the slab.

SECTION 3

Postclosure Maintenance Plan

3.1 Introduction

A postclosure maintenance program (PCMP) will be implemented at the SLVL after closure and will continue for a minimum of 30 years after final closure of the facility. This section describes the responsibilities, resources, and inspection frequency for carrying out the postclosure maintenance plan. Specific inspection and maintenance activities are described in subsequent sections.

An emergency response plan is presented in Appendix Q.

3.2 Current Monitoring and Control Systems

The leachate, groundwater, and LFG monitoring and collection systems are described in detail in the following sections of this PCMP:

- Section 2.6 -Leachate Monitoring and Control System
- Section 2.7 - Groundwater Monitoring System
- Section 2.8 - Surface Water Monitoring System
- Section 2.9 - LFG Monitoring System
- Section 2.10 - LFG Control System

3.3 Postclosure Land Use

Several preliminary alternatives are being considered for postclosure end use at the site. In general, the landfill end use should provide a regional park with both sports fields and natural/remote destination activities.

A “loop road” will be constructed around the top deck of the closed landfill. One of the alternatives for land use after closure, according to the Emcon Master Plan (1991) is hiking and jogging trails, picnic areas/overlooks, moto-cross and BMX tracks developed outside of the loop road where the slope and topography varies. Views of the surrounding Salt Lake Valley will be best from outside the loop road. The combination of active and passive recreation areas will benefit future residential and commercial developments in the area of the landfill.

Access to the loop road would be from West California Avenue at two locations. Spur roads from the loop road to the various activity areas would be provided.

Natural vegetation and native plantings, such as sumac, dogwood, and greasewood, will be considered for change of elevation between each activity area. Selection of plants will be made in accordance with the requirements of the permitted final cover.

It is recommended that an integrated team, consisting of a landscape architect, traffic engineer, civil engineer, and landfill engineer, be assembled to develop an overall end-use design, including grading plan, for the landfill. This should be done before any closure work takes place so that the final grading plan and final cover design incorporate the proposed end use.

3.4 Final Cover Inspection and Maintenance Program

A PCMP will be conducted at the SLVL to verify that the landfill final cover retains its integrity and effectiveness. The final cover, including the perimeter access road and internal haul roads, will be routinely evaluated and inspected at least semi-annually for any evidence of the following:

- Soil erosion
- Settlement and subsidence
- Exposed refuse
- Cracks
- Ponded water
- Vegetation stress
- Odor
- Slope failure
- Leachate seeps

Deficiencies such as cracks, erosion damage, or settlement in the final cover will be evaluated regarding their extent and depth. The evaluation will include determining the severity of the problem, prioritizing the repair, and determining the best method of repair. Repairs and restoration will be consistent with the final cover construction specifications. If necessary, temporary berms, ditches, and straw mulch will be used to prevent further erosion damage or ponding on damaged soil cover areas until the site conditions permit the final cover areas and vegetation to be re-established. Preventive maintenance for the final cover should preclude problems arising from potential leachate generation from infiltration of surface water causing potential leachate generation or from unplanned release of waste from the landfill.

Erosion, cracks, or areas with exposed refuse will be repaired using clean, appropriate soil material which will be placed and compacted to meet original final cover soil specifications. Repaired areas will be reseeded to establish vegetation.

Areas that have ponded water or have settled will be filled to re-establish the proper grade. These areas will be filled with clean soil, free of deleterious material. After filling and regrading, the areas will be reseeded.

Should a slope failure occur, the area will be closed off to prevent damage to equipment or harm to individuals. The site's engineering consultant will be notified to assess the failure and recommend appropriate corrective action. Specific corrective action will be dependent on the extent, nature, and location of the failure.

Leachate seeps, if they occur, will be contained by constructing a temporary berm/sump in the vicinity of the seep. Samples of the seep will be taken for analysis. Based on the analytical results, and an evaluation of the source and location of the seep, a program and schedule will be developed to handle the leachate seep.

A record of final cover maintenance activities will be kept by the site. The record will include the date, location, and extent and nature of the maintenance activity. Regulatory agencies will be notified as required by the site's permits and approvals.

3.5 Drainage System Inspection and Maintenance Program

Drainage control system problems can result in accelerated erosion of the landfill. Differential settlement of drainage control structures can limit their usefulness and may result in failure of the drainage structure.

A PCMP will be implemented to maintain the integrity and effectiveness of the final drainage system throughout the postclosure maintenance period. The final drainage system will be inspected and evaluated semi-annually for the following:

- Evidence of erosion
- Standing water
- Formation of gullies
- Settlement, blockage, and damage to drainage channels, structures, swales, and culverts

Damage to the drainage system will be addressed immediately after it is identified. The reason for the damage will be determined, if possible. If the damage was due to a design deficiency, the drainage system design will be evaluated by a Utah-registered professional engineer and the drainage system will be re-designed, if warranted.

Permanent repairs and restoration will be made consistent with final closure construction specifications. Temporary repairs may be utilized until permanent repairs can be scheduled. Culverts and inlet and outlet structures will be cleaned of sediment regularly before their flow capacities are impaired. Drainage inlet grates will be kept free of debris, and drainage channels will be maintained to permit free flow.

Results of the inspections and a summary of maintenance performed will be compiled following the inspection and reported as required by applicable permits and regulations.

3.6 Vegetative Cover Inspection and Maintenance Program

A PCMP will be implemented at the SLVL to verify that the vegetative cover of the landfill maintains its integrity. The vegetative cover will be inspected and evaluated quarterly for the same conditions described in Section 3.4, Final Cover Inspection and Maintenance Program. Vegetation will also be inspected and evaluated semiannually for the following:

- Signs of stress
- Stunted growth
- Wilting
- Color changes
- Bare spots

Vegetative cover problems identified will be evaluated with regard to their extent and severity. A program will be initiated to determine the best method of restoration. If necessary, repairs and restoration will be consistent with the final cover construction specifications. Temporary erosion control measures may be used to prevent further erosion damage until the vegetative cover is re-established.

If an area greater than 500 square feet is noted to have less than 80 percent vegetative cover, the area will be hand seeded and fertilized to reestablish plant growth.

Periodic inspection and follow-up maintenance will be provided by the County.

3.7 Leachate Control System Inspection and Maintenance Program

The LCRS will be designed and operated to function without clogging during the postclosure maintenance period. The discharger will note, as a part of each regularly scheduled monitoring report, the total volume of leachate discharged each month since the previous monitoring report.

The LCRS for the landfill will be visually inspected in conjunction with the regulatory monitoring schedule in force at the time, but no less than semi-annually. Pumps and other equipment that are part of the LCRS will be maintained in accordance with the manufacturer's recommendations. The system will be closely inspected for indications of deterioration.

3.8 Landfill Gas Monitoring System Inspection and Maintenance Program

The LFG monitoring system will be inspected in conjunction with other scheduled monitoring tasks. The minimum frequency of gas monitoring will be performed based on the monitoring schedule in force at the time, but no less than quarterly. System components will be repaired and replaced as required to maintain full system capabilities, as intended at initial installation.

The gas monitoring system inspection and maintenance program will be performed for the duration of the 30-year postclosure maintenance period, or until an operating exemption is granted by the regulatory agencies.

3.9 Landfill Gas Control System Inspection and Maintenance Program

In conjunction with routine LFG extraction monitoring, a landfill technician will inspect the GCCS. The minimum inspection frequency will be semi-annually. Inspection will primarily be for damage, leaks, and other types of visible failure. Inspection activities will include:

- Checking exposed portions of the gas collection system (pipes, flexible hoses, fittings, valves, etc.) for LFG and condensate leaks
- Confirming proper functioning of valves and other moving parts
- Checking foundation and anchorage components, for differential settlement and structural integrity

Treatment device maintenance will be in accordance with the equipment manufacturer's recommended schedules. The treatment equipment O&M manuals provide further detail on required inspection and preventive maintenance. The manuals:

- Describe items requiring routine inspection and maintenance
- Explain specific inspection and maintenance procedures
- Provide an inspection and maintenance schedule
- Explain recommended or required follow-up actions if an inspection indicates a potential problem

Equipment breakdowns will be noted in the system log and corrected within the time periods required by applicable regulations. Damaged components will be repaired and replaced as required to maintain required system capabilities, as intended at initial installation. The GCCS inspection and maintenance program will be performed for the duration of the 30-year postclosure maintenance period, or until an operating exemption is granted by the applicable regulatory agencies.

3.10 Groundwater Monitoring System Inspection and Maintenance Program

A monitoring well preventative maintenance program will be developed as part of the final closure plan. The program will be developed to maintain the integrity and effectiveness of monitoring wells at all times. Elements of this program include periodic visual inspections of well integrity, and if necessary, pump removal and inspection. Additionally, the groundwater monitoring system will be inspected semi-annually in conjunction with the scheduled monitoring tasks.

All groundwater monitoring wells will be inspected for signs of failure or deterioration during each sampling event. If damage is discovered, the nature and extent of the problem will be recorded. A decision will be made to replace or repair the well. Possible repairs include partial casing replacement or repair, resealing the annulus, desilting, and chemical treatment. If a well needs to be replaced, it will be properly decommissioned. Damaged wells will be scheduled for repair or replacement within 3 months after problem identification.

3.11 Final Grading Inspection and Maintenance Program

A maintenance program will be implemented at the SLVL to maintain final grades, preserve final cover integrity, prevent ponding, and minimize infiltration. The final grading will be inspected semi-annually. Inspection and maintenance of the landfill's final grades will include the items specified m the Final Cover Inspection and Maintenance Program, Section 3.4.

Grading repairs or improvements will be performed consistent with final cover construction specifications. Temporary measures or repairs may be utilized until permanent repairs can be implemented.

3.12 Persons Responsible for Postclosure Maintenance

A postclosure maintenance plan will be implemented to monitor and maintain the landfill for a period of not less than 30 years after closure. This section describes the responsibilities, resources, and inspection frequency for carrying out the postclosure maintenance plan. Specific inspection and maintenance activities are detailed in subsequent sections.

3.12.1 Responsibilities

The County and Salt Lake City Corporation, as joint owners of the landfill, will have primary responsibility for implementing the postclosure maintenance plan. They may contract with an experienced engineering consultant or other firm, if necessary, to assist in implementing the landfill postclosure maintenance plan.

3.12.2 Inspection Responsibilities and Frequencies

Routine and periodic inspection will be conducted under the direction of the County. A landfill inspection checklist is presented in Table 4.

For each inspection, any damage discovered and repairs should be documented and included in a report following the inspection. When possible, the cause of any damage will be determined and included in the documentation. Photographs should also be taken of the damage and the photographs labeled with the location of the damage and the time and date taken.

SECTION 4

Cost Estimates

4.1 Introduction

This section presents the closure and postclosure maintenance cost estimates, financial mechanism, and associated supporting documentation for the SLVL. The costs are based on the updated *Master Plan* and the closure and postclosure maintenance requirements described in the previous sections.

4.2 Closure Cost Estimate

The closure cost estimate for each unit of landfill to be closed, as described in Section 2, was prepared based on the closure activities described in the Closure Plan. The estimate is based on 2015 dollars and hiring a third party to perform closure activities. It includes the cost of materials, equipment, labor, administration, and quality assurance. Table 5 summarizes the closure cost estimate.

4.3 Postclosure Maintenance Cost Estimate

The postclosure maintenance cost estimate was prepared based on the activities described in the Postclosure Plan. The postclosure maintenance cost estimate includes the cost of materials, equipment, labor, and administration. The cost of maintenance and monitoring anticipated during the postclosure maintenance period was estimated for 30 years, as required by the Health Regulation #1 and the UAC R315-302-3(5), to determine the amount to be covered by the financial assurance mechanism.

The estimate is based on 2015 dollars and the hiring of a third party to maintain, monitor, and inspect the entire closed landfill. Table 6 summarizes the postclosure maintenance cost estimate.

4.4 Financial Responsibility for Closure and Postclosure Maintenance

The landfill is jointly owned by the County and Salt Lake City Corporation and both retain responsibility for closure and postclosure maintenance. This section documents the operator's certification for the establishment of a financial mechanism.

Based on UAC R315-309 requirements, the owner or operator of any solid waste facility will establish a financial assurance to assure adequate funding for closure and postclosure care, and any corrective action, if required. Based on the closure and postclosure maintenance cost estimates, the County is setting aside funds for closure and postclosure maintenance in a dedicated fund.

Financial assurance is discussed further in Appendix R, Financial Plan.

SECTION 5

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SECTION 6

Limitations

The services described in this report were performed consistent with generally accepted professional consulting principles and practices. No other warranty, express or implied, is made. These services were performed consistent with our agreement with our client. This report is solely for the use and information of our client unless otherwise noted. Any reliance on this report by a third party is at such party's sole risk.

Opinions and recommendations contained in this report apply to conditions existing when services were performed and are intended only for the client, purposes, locations, time frames, and project parameters indicated. We are not responsible for the impacts of any changes in environmental standards, practices, or regulations subsequent to performance of services. We do not warrant the accuracy of information supplied by others, nor the use of segregated portions of this report.

Tables

Table 1. Site Capacity and Service Life

Salt Lake Valley Landfill

Service	Quantity
Net Waste Airspace[a] (cy)	53,560,970
Waste Airspace[b] (tons)	32,136,582
Landfill Service Life[c]	65 years
Landfill End Year	2082

Notes:

[a] Airpsace remaining after liner and final cap quantities are removed as detailed in Table 6 of Master Plan.

Net Waste Airspace estimated at 55,360,970 as of April 2014, minus 1.8 mcy of waste placed since that time

[b] Based on a capacity utilization factor of 0.60 tons/yd^3.

[c] As of end of year 2016, based on 312 operating days per year and projected disposal tonnages shown in Table 2 of Master Plan.

Table 2. Module Service Life

Salt Lake Valley Landfill

Year	Incoming Waster Per Year (yd^3)	Fill Sequence 1 Wedge Fill	Fill Sequence 2 Modules 1-4, 6 and 7 to El. 4370	Fill Sequence 3 Module 8 to El. 4300	Fill Sequence 4 Modules 5 and 8 to El. 4370	Fill Sequence 5 Module 11 to El. 4320	Fill Sequence 6 Modules 10 and 11 to El. 4370	Fill Sequence 7 Modules 4-5, 7-8, 10-11 to El. 4435	Fill Sequence 8 Module 9 to El. 4370	Fill Sequence 9 Modules 1-3, 6 and 9 to El. 4435
		474,442	7,762,385	898,451	5,383,857	4,343,978	3,663,775	3,711,884	20,058,654	7,263,544
2015	582,938	-108,496	7,653,889							
2016	588,768		7,065,121							
2017	594,655		6,470,466							
2018	600,602		5,869,864							
2019	606,608		5,263,256							
2020	612,674		4,650,582							
2021	618,801		4,031,781							
2022	624,989		3,406,792							
2023	631,239		2,775,553							
2024	637,551		2,138,002							
2025	643,927		1,494,076							
2026	650,366		843,710							
2027	656,870		186,840							
2028	663,438		-476,598							
2029	670,073		-1,146,670							
2030	676,773		-1,823,444	-924,993						
2031	683,541			-1,608,534						
2032	690,376			-2,298,911	3,084,946					
2033	697,280				2,387,666					
2034	704,253				1,683,413					
2035	711,296				972,117					
2036	718,409				253,709					
2037	725,593				-471,884					
2038	732,849				-1,204,732					
2039	740,177				-1,944,909	2,399,069				
2040	747,579					1,651,490				
2041	755,055					896,436				
2042	762,605					133,831				
2043	770,231					-636,401				
2044	777,933					-1,414,334				
2045	785,713					-2,200,047	1,463,728			
2046	793,570						670,158			
2047	801,506						-131,347			
2048	809,521						-940,868			
2049	817,616						-1,758,484			
2050	825,792						-2,584,276	1,127,608		
2051	834,050							293,558		
2052	842,390							-548,832		
2053	850,814							-1,399,647		
2054	859,323							-2,258,969	17,799,685	
2055	867,916								16,931,769	

Table 2. Module Service Life

Salt Lake Valley Landfill

Year	Incoming Waster Per Year (yd^3)	Fill Sequence 1 Wedge Fill	Fill Sequence 2 Modules 1-4, 6 and 7 to El. 4370	Fill Sequence 3 Module 8 to El. 4300	Fill Sequence 4 Modules 5 and 8 to El. 4370	Fill Sequence 5 Module 11 to El. 4320	Fill Sequence 6 Modules 10 and 11 to El. 4370	Fill Sequence 7 Modules 4-5, 7-8, 10-11 to El. 4435	Fill Sequence 8 Module 9 to El. 4370	Fill Sequence 9 Modules 1-3, 6 and 9 to El. 4435
2056	876,595								16,055,174	
2057	885,361								15,169,813	
2058	894,214								14,275,599	
2059	903,157								13,372,442	
2060	912,188								12,460,254	
2061	921,310								11,538,944	
2062	930,523								10,608,421	
2063	939,828								9,668,592	
2064	949,227								8,719,366	
2065	958,719								7,760,647	
2066	968,306								6,792,340	
2067	977,989								5,814,351	
2068	987,769								4,826,582	
2069	997,647								3,828,935	
2070	1,007,623								2,821,312	
2071	1,017,699								1,803,613	
2072	1,027,876								775,736	
2073	1,038,155								-262,419	
2074	1,048,537								-1,310,956	
2075	1,059,022								-2,369,978	4,893,566
2076	1,069,612									3,823,954
2077	1,080,308									2,743,645
2078	1,091,112									1,652,534
2079	1,102,023									550,511
2080	1,113,043									-562,532
2081	1,124,173									-1,686,705
2082	113,295									-1,800,000

Table 3. Module Closure Schedule

Salt Lake Valley Landfill

Module	Year
Module 1 through 4, slopes	2030
Modules 5 and 8, slopes	2039
Modules 10 and 11, slopes	2050
Modules 4 and 5, 7 and 8, and 10 and 11	2054
Module 9, slopes	2075
Modules 1 through 3, 6 and 9	2082

Table 4
SALT LAKE VALLEY LANDFILL
INSPECTION CHECKLIST

Inspected by __________________________ Date___________

Weather ____ Page __ of __

ITEM	FOCUS OF INSPECTION	SATISFACTORY CONDITION	NEEDS REPAIRS
Final Cover Deck - M	Check for ponding, erosion, non-vegetative areas, burrowing animals, cracking	☐	☐
Final Cover Slopes - M	Check for ponding, erosion, non-vegetative areas, burrowing animals, cracking	☐	☐
Surface Water - M	Check ditches for sedimentation, debris, erosion, damage to lining, overflow	☐	☐
Leachate - M	Check for top deck and slopes for leachate seeps, odors	☐	☐
GW Monitoring Wells - Q	Check for integrity of locks and casings, sedimentation	☐	☐
LFG System - Q	Check extraction wells, piping, flare station, and perimeter probe	☐	☐
Roads - S	Check for condition/repairs	☐	☐
Gates and Fences - S	Check for integrity and security	☐	☐
Survey Monuments - A	Check for integrity	☐	☐
Other		☐	☐

A -Annual; M – monthly, during and after heavy rain events; Q – Quarterly; S – Semi-annual; W – Weekly

REMARKS: Note any repairs or improvements needed

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Table 5. Closure Cost Estimate

Salt Lake Valley Landfill

Closure Items	Unit	Unit Cost[a]	Quantity	Cost
Bonds & Insurance	Lump sum	$612,569.45	1	$612,569
Submittals	Lump sum	$115,200.10	1	$115,200
Mobilization	Lump sum	$150,483.83	1	$150,484
Demobilization	Lump sum	$107,379.30	1	$107,379
Survey	Lump sum	$195,888.73	1	$195,889
Dust Control	Lump sum	$39,455.41	1	$39,455
Stormwater Control	Lump sum	$311,056.66	1	$311,057
Building Demolition	Lump sum	$578,734.42	1	$578,734
Final Cover Placement and Compaction	yd^3	$2.88	1,022,000	$2,943,360
Grading	yd^2	$1.16	2,042,000	$2,368,720
Fertilizing/Seeding/Mulching	acre	$3,538.00	422	$1,493,036
First Year Irrigation	acre	$417.70	422	$176,269
			Closure Cost Subtotal	**$9,092,153**
Engineering and CQA				$909,215
Contingency				$1,818,431
			Closure Cost Total	**$11,819,799**

Note:

[a] Lump sum unit costs were determined for closing modules 1-7. A price per acre was determined from those costs and applied to the closure for all modules.

Table 6. Post-Closure Cost Estimate

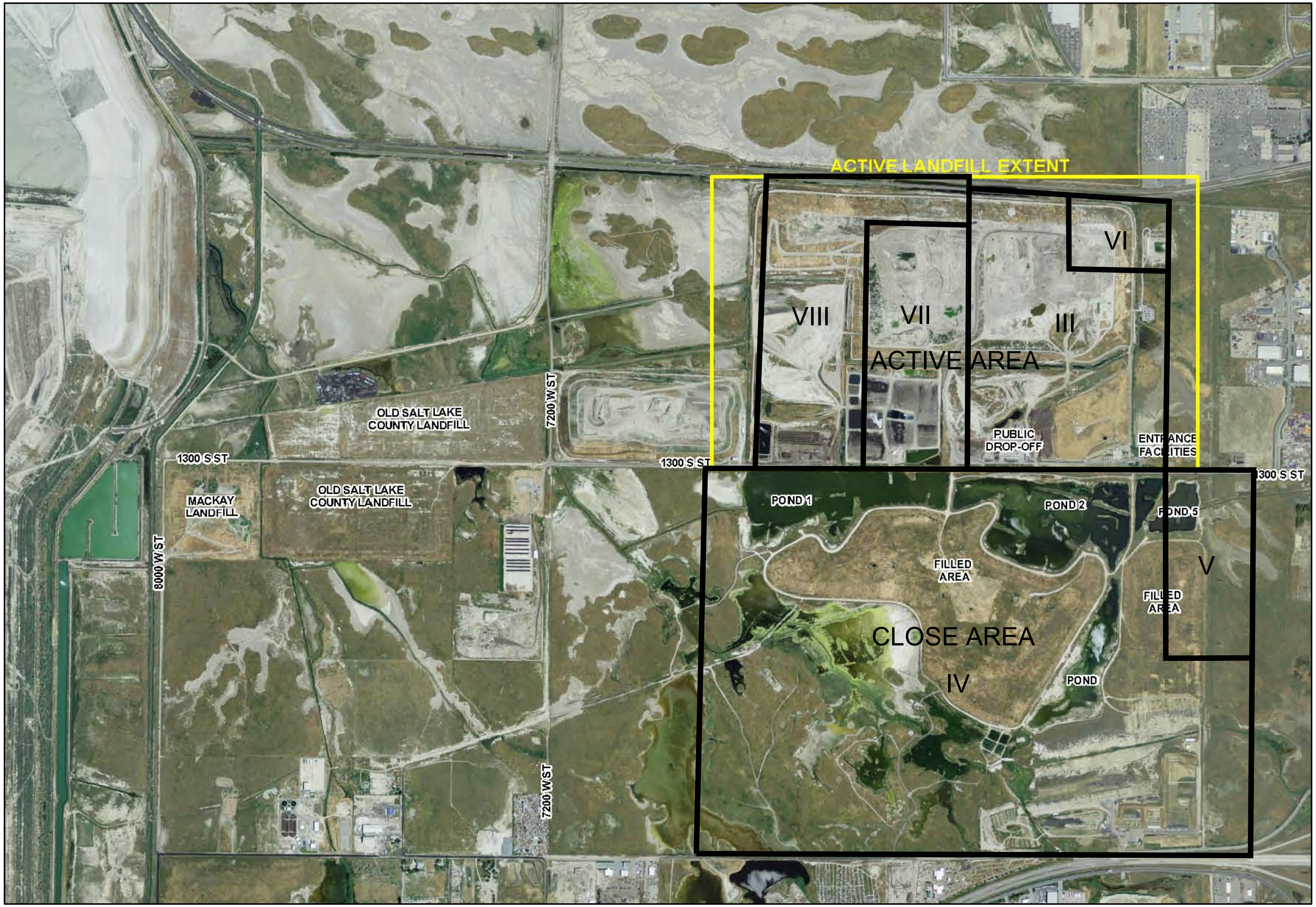
Salt Lake Valley Landfill

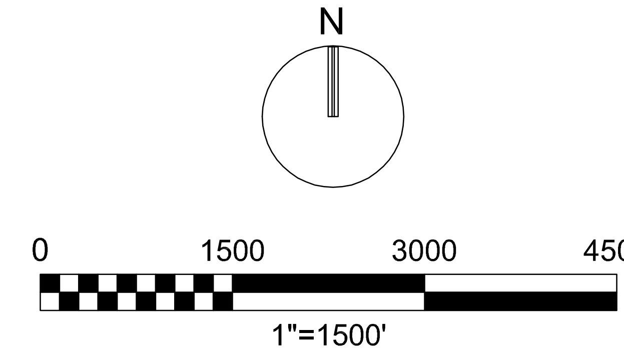
Closure Items	Unit	Unit Cost	Quantity	Cost
Groundwater Monitoring	Per year	$60,066.00	30	$1,801,980
Leachate Monitoring	Per year	$27,890.00	30	$836,700
Landfill Gas Monitoring and Control[a]	Per year	$257,617.00	30	$7,728,510
Cover Stabilization - Initial[a]	Per year	$303,512.00	5	$1,517,560
Cover Stabilization - Follow-up[a]	Per year	$116,092.00	25	$2,902,300
			Post-Closure Cost Total	**$14,787,050**

Note:

[a] Lump sum unit costs were determined for closing Modules 1 through 7. A price per acre was determined from those costs and applied to the closure for all modules.

Figures





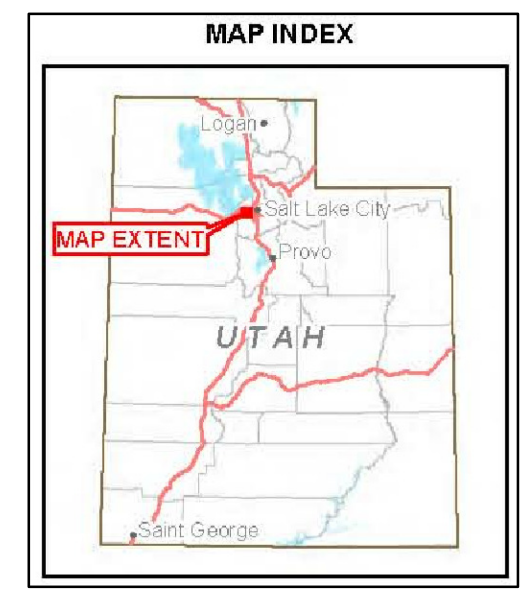
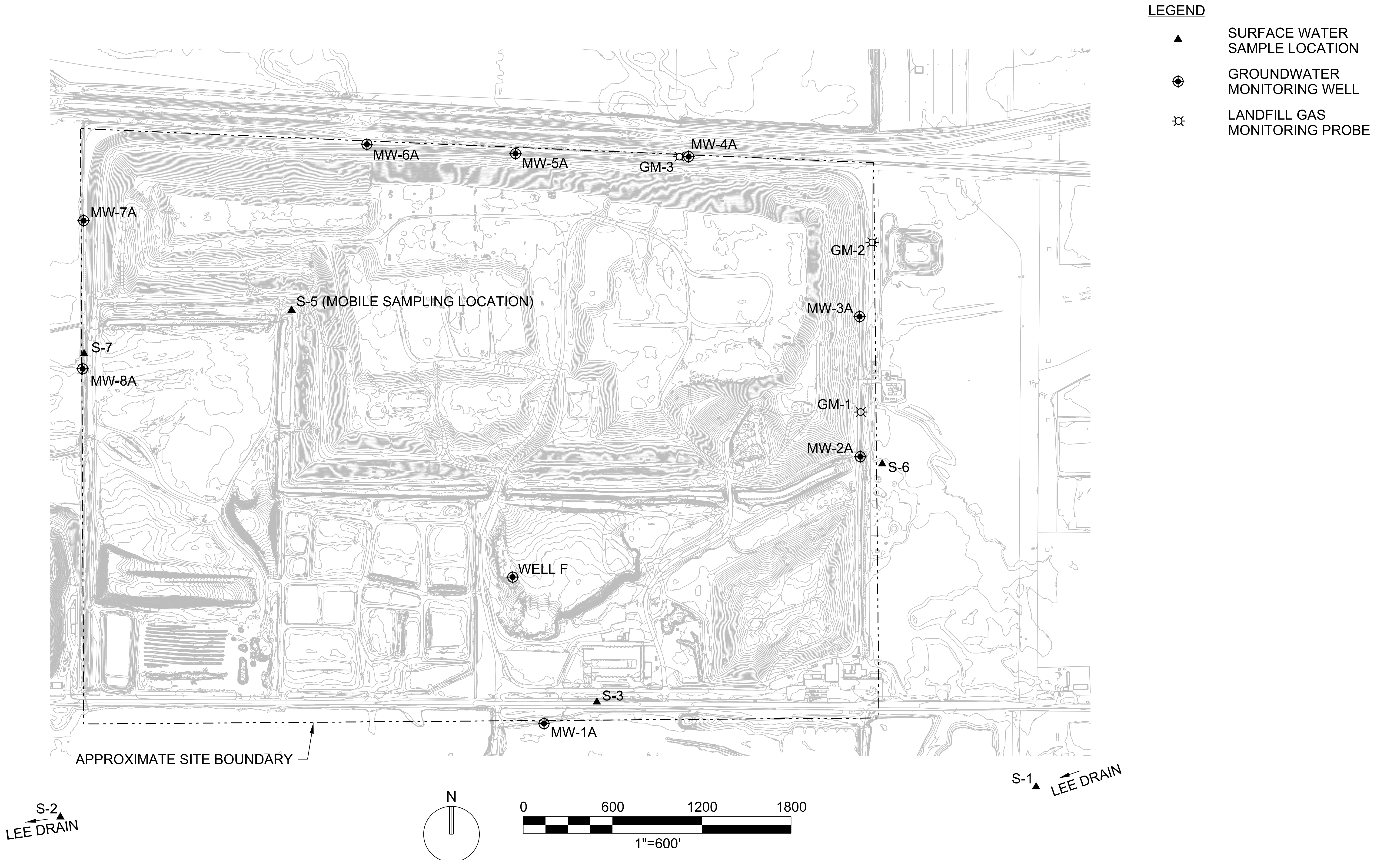


FIGURE 1

SALT LAKE SOLID WASTE MANAGEMENT COUNCIL
SALT LAKE VALLEY LANDFILL
SALT LAKE CITY, UTAH


LEGEND
SURFACE WATER SAMPLE LOCATION
GROUNDWATER MONITORING WELL
LANDFILL GAS MONITORING PROBE
MW-6A
MW-5A
MW-4A
GM-3
MW-7A
GM-2
S-5 (MOBILE SAMPLING LOCATION)
MW-3A
S-7
MW-8A
GM-1
MW-2A
S-6
WELL F
S-3
MW-1A
APPROXIMATE SITE BOUNDARY
S-1
LEE DRAIN
S-2
LEE DRAIN
N
0
600
1200
1800
1"=600'

ch2m

Attachment #9

Closure and Post-Closure Cost Estimates

KLEINFELDER
Bright People. Right Solutions.

Attachment B

Table 10. Post-Closure Cost Estimate

Salt Lake Valley Landfill

Closure Items	Unit	Unit Cost	Quantity	Cost
Groundwater Monitoring	Per year	$60,000	30	$1,800,000
Leachate Monitoring	Per year	$28,000	30	$840,000
Landfill Gas Monitoring, Maintenance and Control	Per year	$394,000	30	$11,820,000
Cover Stabilization - Initial	Per year	$304,000	5	$1,520,000
Cover Stabilization - Follow-up	Per year	$116,000	25	$2,900,000
			Post-Closure Cost Total	**$18,880,000**

Note:

Groundwater monitoring performed at 12 existing monitoring wells semi-annually.

Leachate monitoring performed at 2 existing leachate risers (Modules 6 and 7) semi-annually.

Level of effort (LOE) required for landfill gas monitoring and control is consistent with current LOE.

Landfill gas to energy plant remains in operation during post-closure.

Average of $100,000 will be needed annually for maintenance of the landfill gas system.

Initial five years of cover stabilization requires more extensive repair than the following 25 years.

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Attachment C

ATTACHMENT C: SLVSWMF Closure and Post-closure Care Estimates for UDEQ Includes Current Landfill (Modules 1 through 7) and Current ET SRS

Year	(UDWMRC) Inflation Factor[1]	Estimated Total for Landfill (Modules 1 through 7)		Estimated Total for Current ET SRS	Estimated Total (Closure + Post-closure Care) Cost
	%	Closure Cost[2]	Post-closure Care Cost[2,3]	Closure Cost[4]	
2015	1.0%	$ 7,058,961	$ 11,197,720	N/A	$ 18,256,681
2016	1.3%	$ 7,150,727	$ 11,343,290	N/A	$ 18,494,017
2017	1.8%	$ 7,279,441	$ 11,547,469	N/A	$ 18,826,910
2018	2.4%	$ 7,453,346	$ 11,823,338	N/A	$ 19,276,685
2019	1.8%	$ 7,587,507	$ 12,036,158	N/A	$ 19,623,665
2020	1.2%	$ 7,678,557	$ 12,180,592	N/A	$ 19,859,149
2021	2.0%	$ 7,832,128	$ 12,424,204	$ 480,277	$ 20,736,609

NOTES:

1. Using 2015 as a 'base year', annual estimates were projected using UDWMRC-provided inflation factor values for years 2016 through 2020. For 2021, a conservative inflation factor of 2 percent was used.
2. Data for use in this spreadsheet was obtained from the memorandum (hereby referred to as the 2015 Memo, included as Attachment A) titled 'Basis of Estimate for Salt Lake Valley Solid Waste Management Facility Permit #9429R1 Closure and Post-Closure Cost Estimate' submitted by CH2M to UDEQ on May 8, 2015. In February 2017, CH2M has provided revised post-closure care cost estimates that include additional costs for maintenance of the landfill gas system. Data has been used 'as-is' from these sources and Kleinfelder has made (and detailed in the notes below) assumptions about the data provided and made necessary extrapolations to generate additional data needed to complete the spreadsheet.

   2a. The 2015 Memo to UDEQ assumes the use of an evapotranspiration (ET) cover as final cover for closure of current modules (Modules 1 through 7).

   Note: The Landfill's (UDEQ-issued) solid waste permit has been modified to include the use of ET cover. The permit modification was granted final approval by UDEQ in April 2017.
3. Revised post-closure care cost estimates were provided by CH2M in February 2017 (see Attachment B). CH2M's revisions include addition of average of $100,000 that are expected to be needed annually for maintenance of the landfill gas system. Since CH2M's revised post-closure care cost estimate was for the entire Landfill (all 11 Modules), Kleinfelder has used a pro-rated cost estimate for the current modules (Modules 1 through 7). This additional annual cost is estimated to be $63,636 (annually) for the current seven modules. The post-closure cost estimate presented above now includes $9,288,628.7 from the 2015 Memo and an additional $63,636 per year for 7 modules.
4. The Landfill has worked with ET to develop closure cost estimates for the current SRS in the amount of $480,577. This amount has been calculated based on the caveat that soils "in-process" at the SRS would be processed to completion in order to be used for beneficial use (final soil cover) at the Landfill. Additionally, none of the "in-process" materials would be required to be disposed of at the Landfill, or any other applicable disposal locations, because the "in-process" soils would not be moved until they have been processed to completion. Additionally, none of the "in-process" materials would be required to be disposed of at the Landfill, or any other applicable disposal locations.

Attachment #10

Compost Plan of Operation

COMPOSTING PLAN
SALT LAKE VALLEY SOLID WASTE MANAGEMENT

The SLVSWMF has an ongoing composting program on property owned by the facility. The purpose of the program is to remove yard and wood waste, curbside-collected, from the waste stream to extend the life of the landfill, as well as to provide a quality product to area citizens. The composting facility is operated in accordance with requirements of UAC R315-312-2.

LOCATION OF COMPOSTING OPERATIONS

The facility uses one area for the processing and selling of the products, as shown in Figure 1. The processing area is just off California Avenue and near the west property boundary of the facility; this compost area is also called the "Pad #6" area. Pad #6 has a berm surrounding the perimeter so no run-off liquids can leave the site. A major portion of the site pad is asphaltedto provide containment and to improve the driving surface

OPERATION OF COMPOSTJNG FACILITY

Curbside collection green waste only trucks unload directly into process windrows at Pad #6. Compost windrows are approximately 150-feet long, 10-feet tall and 15-feet wide. Water is added to the windrows to assist in the composting process. The windrows are turned weekly with the loader to keep the process aerobic. During this time the compost produces heat that varies between 104 and 149 degrees Fahrenheit. The temperature must be maintained for a period of at least five (5) days and a temperature of not less than 131 degrees Fahrenheit must be maintained for not less than four (4) consecutive hours during the five days. Windrow temperatures will be tested and recorded periodically (at least weekly) throughout the compost process. Records will be kept on site. The material will be allowed to cure into compost over an 8 to 16-week period until the compost is "finished". The goal is to have mature, quality compost.

R315-312-3

(1) Facility Location:

(a) The area is not wetlands, watercourses, or floodplains.

(b) The area is not within 500 feet of any permanent residence, school, hospital, institution, office building, restaurant, or church.

(2) (a) Manufacturers performance data for all equipment is kept in individual files on each respective piece of equipment which is available for review.

(b) The facility scales are used to measure the inbound and outbound materials. All mixing of materials is donewith the front-end loaders. The proportioning of input materials is done manually to keep the materials separate.

(c) All monitoring equipment is located in the on-site building near the asphalt composting pad. Monitoring is done on a regular basis.

(d) The only added material is water. Water, from the facility well, is added on a regular basis. The amount of water added to the windrows varies with the weather and seasons.

(e) Special precautions for the driving surface (asphalt pad) have been taken to assure year round operation. During windy weather, it may not be possible to operate the trommel screen. Appropriate adjustments in operations for weather factors such as rain, snow, or freezing temperatures are made.

(f) The estimated time to complete the compost process varies from 8 to 16 weeks.

(g) A windrow system of composting is used. Windrows are approximately 150 feet long, 10 feet tall, and 15 feet wide. The composting process reduces the volume by approximately 50%, so actual sizes may vary.

(h) The windrows are aerated by turning approximately weekly with a rubber tired loader. Weather affects the turning frequency requirements.

(i) The ultimate use of the compost is a product that is sold to both private citizens and commercial companies. The residual product (overs) is used for pad building purposes or mud control at the landfill tipping face.

(3) (a) The scale house records of incoming and out-going materials are on permanent file. The temperature data is maintained in the office.

(b) All materials are processed within one year.

(c) All materials not destined for processing are disposed of within a permitted landfill module.

(d) Windrows are turned frequently enough to maintain an aerobic condition.

(e) The temperature of the in-process windrows is maintained between 104 and 149 degrees Fahrenheit for not less than 5 days.

(f) Hazardous waste or waste containing PCBs is not accepted for composting. Employees are assigned to watch for, and remove any items unacceptable for the compost process. No sewage treatment sludge nor water treatment sludgeis used in the composting process.

(g) No sludge, sewage waste or manure is used in the composting process.

(i) The compost windrows are on an asphalt pad that lies on top of the natural clay soil in the area. The soil beneath the asphalt pad and the berm surrounding the area are sufficient to protect the groundwater.

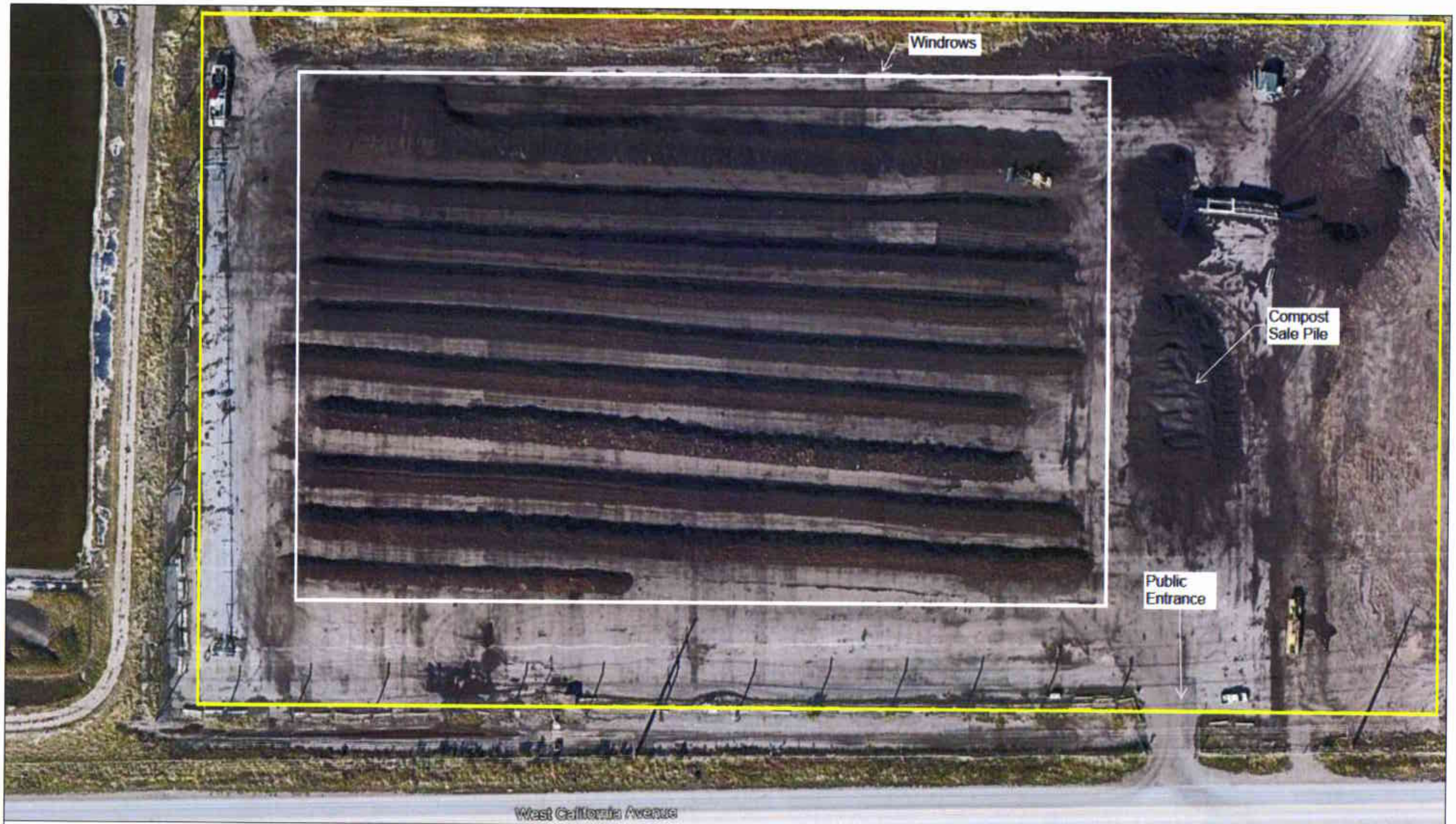
(ii) The berm surrounding the area is sufficient to handle the run-off from a 25 year storm event.

(iii) Any collected water is used on site.

(iv) The dirt berms are sufficient to divert the run-on from a 25-year storm event.

(h) The finished compost does not contain any sharp inorganic objects and is sufficiently stable so that it can be applied to land without creating a nuisance, environmental threat, or hazard to the public.

(4) Closure and post closure. The facility intends to continue to operate the composting site for a number of years. Prior to closure, the facility will obtain all regulations for closure and post closure care, and follow them. The long-term plans are to use the Pad #6 compost location as an MSW module for landfilling solid waste.



Explanation:

Approximate Compost Facility Boundary

COMPOST FACILITY MAP	FIGURE
SALT LAKE VALLEY SOLID WASTE MANAGEMENT FACILITY (SLVSWMF) SALT LAKE CITY, UTAH	1