GROUNDWATER AND LEACHATE MONITORING PLAN

AT

IRON COUNTY MUNICIPAL LANDFILL
ARMSTRONG PIT
IRON COUNTY, UTAH

MAY 1999

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Prepared for

IRON COUNTY SOLID WASTE
3127 N Iron Springs Road
Cedar City, Utah 84720

Prepared By

BINGHAM ENVIRONMENTAL, INC
5160 Wiley Post Way
Salt Lake City, Utah 84116

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GROUNDWATER AND LEACHATE MONITORING PLAN

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SECTION ONE

INTRODUCTION

1 1 GENERAL

The Iron County Municipal Landfill (Armstrong Pit) is a Class I noncommercial municipal solid waste (MSW) landfill owned and operated by Iron County It is a solid waste disposal facility for both communities and unincorporated areas of Iron County The landfill is located west of Cedar City in Township 35 South, Range 12 West, Section 32 in an abandoned open pit iron mine on the east slope of Granite Mountain near Iron Springs The Armstrong Pit began accepting solid waste in September of 1994 and has a design capacity of 4 2 million cubic yards

This Groundwater and Leachate Monitoring Plan provides specific details on procedures and methods that will be used in the field and laboratory to meet project objectives for data quality of all groundwater monitoring required under R315-308-2 Specific statistical methods to be used in determining whether a significant change has occurred as compared to background will consist of the control chart approach

1 2 HYDROGEOLOGY

The geology and hydrogeology of this site has been studied for many years by government agencies and mining companies Previous work at Granite Mountain was compiled by MacKin, Nelson, and Rowley (1976) and was fully detailed by Tahoma Resources (1990) in the last application

The geology of the Iron Spring district, which contains the landfill, is complex The area is in the transition zone between the Colorado Plateau and the Basin and Range provinces, and has been structurally active since at least early Cretaceous time This activity has created several faults which influence the aquifers in the area These faults create fault controlled aquitards separating the bedrock mountains from the alluvial aquifers For example, the Blowout Pit, on the south flank of Iron Mountain has filled with water to approximately 6,275 feet above sea level while a water well five miles north of the Blowout Pit has static level of 5,120 feet above sea level, 1,155 feet lower than the water level at Blowout Pit The water well pump tests showed no significant drawdown indicating a highly transmissive alluvial aquifer The apparent difference between the two water levels is the presence of the Eight Mile Pass Fault Zone, located between them

At the landfill site, bedrock is exposed at the surface indicating the shallowest zones of groundwater occur in fractured quartz monzonite and sedimentary rocks These bedrock aquifers

have been explored by drilling The drilling indicated that at the landfill site, approximately 50 feet of iron ore is present at the surface of the pit bottom followed by a fault gouge encountered for the next 15 feet Immediately beneath the fault is a confined aquifer in quartzite and sandstone This aquifer is present through the site, however, it seems likely fault aquitards isolate sections from communicating one with another The Cory-Armstrong and Eight Mile Pass fault zones act as aquitards between the bedrock aquifer at the site and the potable water supply in Cedar City

The alluvial aquifer nearest to the site is the Iron Spring Creek water table aquifer This aquifer appears to be perched above the bedrock aquifers present at the site, and is distinctly different chemically, indicating the two aquifers are not interconnected

SECTION TWO

GROUNDWATER MONITORING NETWORK

2 1 MONITOR WELL NETWORK

The approved compliance monitor well network at the Iron County Municipal Landfill consists of three (3) monitoring wells identified as BH-2, BH-5 and BH-7 Locations of the wells are shown on Figure 1 Monitoring well completion details and survey information for the compliance monitor wells are summarized in Tables 1 and 2 respectively Details of the monitor wells are provided in Attachment 1

Table 1

MONITOR WELL COMPLETION DETAILS
Iron County Municipal Landfill

Well ID	Elevation Above Mean Sea Level (feet)			
	Screen		Pump Intake	Groundwater (Mar 1998)
	Top	Bottom		
BH-2	5,352 68	5,332 68	5,343 18	5,387 98
BH-5	5,464 03*	5,444 03*	5,449 13	5,483 03
BH-7	5,453 72*	5,433 72*	5,438 72	5,482 72

Estimated based on reported well specifications

Table 2

SUMMARY OF MONITOR WELL LOCATIONS AND ELEVATIONS
Iron County Municipal Landfill

Well ID	Northing (feet)	Easting (feet)	Elevation Ground Surface (feet)
BH-2	12,072 6	9,636 6	5,652 18
BH-5	10,703 4	8,707 9	5,857 03
BH-7	8,665 1	8,186 0	5,923 72

SECTION THREE

GROUNDWATER SAMPLING PROCEDURES

The following subsections detail specific sampling techniques and methodology to be used during all groundwater monitoring to provide consistent quality groundwater data Sampling personnel must have a copy of the approved Groundwater and Leachate Monitoring Plan in the field during each groundwater sampling event Groundwater monitoring network wells are required to be sampled semi-annually according to R315-308-2(4)(b) after background levels are established

3 1 GENERAL

The sampling procedures consist of obtaining groundwater samples from the compliance monitor wells, identified in Section 2 1, utilizing a dedicated bladder pump system and micro-purging techniques Coordination for conducting the sampling events will be established prior to sampling Sampling equipment will be prepared and properly calibrated prior to sampling each monitor well All information obtained in the field shall be recorded on a Groundwater Monitoring Data Sheet, similar to the one presented in Attachment 2

Upon arrival at a well, the condition of each of the monitor wells will be observed and noted on the field data sheet, i e , that the wells are secured with a lock, that the apron is intact, and the outer casing is in good repair Any required repairs will be noted on the field sampling sheets

The monitor wells shall be sampled using currently accepted and approved technology or approved equivalent techniques Groundwater sampling will be performed by competent personnel who are familiar with proper sampling techniques and health and safety procedures Groundwater samplers should also be knowledgeable in techniques of well purging, sample collection and preservation, decontamination, and quality assurance/quality control (QA/QC) The sampler will wear a new pair of latex gloves at each well for handling sampling equipment and containers

3 2 WATER LEVEL MEASUREMENTS

A special cap is installed on the protective casing of each well for installation of the dedicated bladder pump Water levels will be taken through the access hole in the cap and the depth to groundwater measured from the top of the cap An air line may be installed alongside the dedicated bladder pump to obtain depth to groundwater measurements The elevations of the caps will be determined by a registered engineer or licensed surveyor and reported to the nearest 0 01 foot Prior to and sampling, water level readings must be obtained using a conductivity-based water level indicator or equivalent instrument capable of obtaining measurements to the nearest

0 01 feet The probe will be decontaminated between use at each well by washing with a non-phosphate detergent and rinsing three times with deionized or distilled water The probe will then be lowered into the well casing until the level indicator alarm sounds or light goes on The depth to water is read from the top of the cap to the nearest 0 01 foot This measurement will be repeated until two consecutive readings agree to the nearest 0 01 foot The depth to groundwater will be recorded immediately on the Groundwater Monitoring Data Sheet to the nearest 0 01 feet Water levels should be measured every 5 minutes or every 5 pump cycles during purging to monitor for excessive drawdown The pumping rate should be decreased if the water level drops more than 0 2 feet below the initial water level measurement The water level should also be taken post sampling just prior to turning off the pump to determine if pumping has created excessive drawdown and adjustment of pumping rates are necessary

3 3 WELL MICROPURGING

Prior to sampling, the wells will be purged, using micro-purging techniques, to ensure the groundwater sample is representative of formation water The pump controller will be attached to the pump air supply line The oil-less compressor, if used, should be located downwind and away from the well, to minimize the potential for sample contamination from exhaust gases Compressed gas may be used and the air supply line attached to the pump controller The pump should be started and adjusted to a discharge rate at or below 0 5 liters per minute The groundwater which is being discharged from the well should be monitored for specific conductance dissolved oxygen, temperature, and pH All four parameters will be recorded on the field data sheets at 3 minute intervals The groundwater sample will be collected after all four parameters have stabilized (three consecutive measurements within 10%), indicating adequate purging At a minimum, the amount of water that can be contained by the tubing from the pump to the ground surface will be purged from the well to ensure sample quality

Purge water will be disposed of on the ground surface no closer than 20 feet from any well If any well produces water with constituents exceeding primary drinking water quality standards (determined from the most recent sampling event) all purge water from that well will be containerized and disposed of appropriately

3 4 FIELD MEASUREMENTS

Field parameters, including specific conductance, dissolved oxygen, temperature, and pH, will be monitored at three minute intervals and recorded on field data sheets After the parameters stabilize the groundwater sample will be collected Monitoring probes will not be placed into the sample containers which will be submitted to the laboratory for analysis After the water in the beaker is tested for field parameters it will be disposed of After samples have been collected for laboratory analysis, another beaker of water is to be retested for pH, temperature, dissolved oxygen, and specific conductance as a measure of purging efficiency and as a check of the stability of the water samples over time These readings, along with date, time, well ID, purge

volume, and presampling and post sampling water levels, will be recorded on the Groundwater Monitoring Data Sheet The instrument(s) used to perform field measurements will be calibrated prior to sampling each well

3 5 SAMPLE COLLECTION AND PRESERVATION

After the field parameters have stabilized (dissolved oxygen is considered to be the best indicator) the pump discharge rate will be adjusted to a low flow of approximately 0 1 liters per minute to minimize the potential for bottle overtopping The groundwater sampler will wear a new pair of disposable gloves to handle sampling equipment and sample containers at each well The groundwater samples will be collected directly from the pump discharge line into laboratory supplied bottles without filtering Table 3 summarizes the types of containers and associated preservatives that will be used for sample storage and transport Any required preservatives will be added to the containers in advance by the laboratory

Table 3

REQUIRED SAMPLE CONTAINERS AND PRESERVATIVES			
Parameter	**Sample Container**	**Preservative**	**Holding Time**
Volatile Organic Compounds (VOCs)	Five (5) 40 ml glass vials with Teflon-lined lid	HCL, 4°C	14 days
EDB, DBCP	Two (2) 40 ml glass vials with Teflon-lined lid	Na_2SO_4, 4°C	14 days
TOC and NH_3	One (1) 16 ounce HDPE	H_2SO_4, 4°C	28 days
Inorganics	One (1) ½ gallon HDPE	4°C	28 days
Metals	One (1) 16 ounce HDPE	HNO_3, 4°C	6 months

Sample containers will be filled in the following order to minimize degradation of sensitive parameters

1 VOCs
2 TOC and NH_3
3 Inorganics
4 Metals

Care should be taken to maintain the lids on the containers until the time to fill the container with the sample Once filled, the containers should be immediately capped to minimize contact with dust and ambient air, and to avoid volatilization of the sample The VOC vials will be completely filled with zero head space Samples will be labeled and immediately stored on ice in a cooler

until delivered to the laboratory for analysis under chain of custody Field blank and duplicate samples will be prepared as part of the QA/QC Plan outlined in Section Six

3 6 DECONTAMINATION

The water level indicator, field parameters instrument(s) and any other sampling equipment will be decontaminated between wells with a non-phosphate detergent, then triple rinsed with distilled (or deionized) water

3 7 SAMPLE HANDLING

Once collected, each sample will be immediately labeled, recorded on the Groundwater Monitoring Data Sheet, and placed in a sample cooler with ice for transport to the laboratory All samples will be delivered to the State of Utah Certified laboratory within a sufficient time frame to insure that project hold times will not be exceeded by the laboratory for the specified parameters Each sample will be accompanied by a chain-of-custody form filled out at the time of sample collection

3 8 DOCUMENTATION

An essential part of the sample collection activity is the documentation of the site measurements and ensuring the integrity of the sample from collection to data reporting The following records and actions will be taken

1 Sample Labels. All samples will be labeled with the sample identification, name of the sampler, date and time of collection, and type of preservative (if required) The sample label will be filled out completely and attached to each sample bottle or container at the time of collection

2 Chain-of-Custody. A chain-of-custody form will accompany all samples from the time of collection to completion of laboratory analysis The chain-of-custody record will establish the documentation necessary to trace sample possession from the time of collection through receipt by the analytical laboratory The original form will accompany the samples to the laboratory and copies will go into the project file Original forms will be returned with the analytical results from the laboratory

3 Sampling Record. Pertinent field measurements and observations noted during sampling will be recorded by the field technician on the Groundwater Monitoring Data Sheet (one for each well) and in his field notes

Examples of the Sample Labels, Chain-of-Custody, and Groundwater Monitoring Data Sheet forms are included in Attachment 2

3 9 SAMPLE IDENTIFICATION

Each sample will be given a unique identification consisting of the monitor well ID For example, groundwater sampled from monitor well BH-2 will be labeled "BH-2" The field duplicate sample will generally be obtained from BH-2 or BH-5 and will be labeled "BH-9" and field notes will verify from which monitor well it was obtained