PERIODIC REVIEW

Mica Landfill
Spokane, WA

December 2007
Washington Department of Ecology
Toxics Cleanup Program
Eastern Regional Office
Spokane, WA

1.0 INTRODUCTION

This report presents the Washington State Department of Ecology's periodic review for the Mica Landfill (Site). This periodic review is required as part of the site cleanup process under the Model Toxics Control Act (MTCA), Ch. 70.105D RCW, implemented by the Washington State Department of Ecology (Ecology). Periodic reviews evaluate post-cleanup site conditions and monitoring data to assure that human health and the environment are being protected, and are required for sites where an institutional control is part of the cleanup action.

Interim cleanup actions were conducted at the Site by Spokane County (County) in 1995. These actions included installation of a landfill cap and methane and leachate control systems. A review of these interim actions took place in 2001, and Ecology determined that they were performing as intended and would represent the final cleanup action for the Site.

2.0 SUMMARY OF SITE CONDITIONS

2.1 SITE DESCRIPTION AND HISTORY

Mica Landfill is a 161 acre municipal solid waste landfill located approximately 11 miles southeast of Spokane, WA and 1.5 miles north of the Town of Mica (Figure 1). The landfill was operated by Spokane County from 1972 until 1990, and jointly by Spokane County and the City of Spokane from 1990 through 1991. Mica Landfill stopped receiving waste in late 1991. The landfill received approximately 65,000 tons of waste per year in the form of residential and municipal solid waste, dewatered sewage treatment plant sludge, demolition debris and industrial wastes. Demolition debris was generally mixed with municipal waste, or used as base material for landfill roads. Industrial wastes included pesticides, fungicides, herbicides, fertilizers, electronics industry chemicals, petroleum products, degreaser solvents, dyes and paints, industrial sludges, baghouse dust wastes, and other miscellaneous chemicals. Also, approximately 24,000 tons of black dross, which is a byproduct of the aluminum production industry, was disposed of in a designated area of the landfill. Dross was disposed between 1974 and 1987. (CH2MHill, 1992)

In 1974, the "Mica" monitoring well was installed at the south end of the site to assess the impacts to groundwater from the south-central leachate pond. In 1975, leachate samples were collected from a drain line and analyzed to evaluate potential leachate impacts to groundwater.

In 1986, Spokane County purchased 24 acres of land immediately adjacent to the southwest corner of the landfill. This land was used to build an additional lined leachate pond for the southwest landfill drainage system. In conjunction, an additional monitoring well was installed to measure any potential groundwater impacts downgradient of the new leachate pond and existing leachate collection system.

2.2 SITE INVESTIGATIONS AND CLEANUP

Formal investigations were initiated by Spokane County in 1981 when volatile organic compounds were detected in the Mica well and in an off-site domestic well. An assessment of

Figure 1. Mica Location

potential groundwater contamination from the landfill was conducted by Spokane County. The assessment was completed in three phases ending in 1983 and involved field investigations and the installation of groundwater monitoring wells.

The landfill was added to the National Priorities List (NPL) in 1985 after an evaluation by the Environmental Protection Agency (EPA), and Ecology became the lead agency at the Site. A two-phase Remedial Investigation (RI) was completed in 1988 and 1992 under a consent decree. The RI included groundwater, landfill gas, sediment, and leachate sampling, and geophysical surveys. Work on a Feasibility Study was initiated but never completed.

In 1992, Ecology proposed that a major component of the remedial work be completed at the site by implementing an Interim Action (IA) (see Section 2.3). After completion of the construction components of the IA in February 1994, compliance monitoring began with collection of groundwater and leachate samples, and has continued since then with minor modifications.

At the end of the five year monitoring period, the data collected during the IA was reviewed to determine if the remedy was performing as planned. A Cleanup Action Plan was then prepared by Ecology in 2001 which established the IA as the final remedy for the site, established the parameters and schedule for all future site compliance monitoring, and required the placement of a deed restriction on the property. A consent decree was negotiated to implement the selected cleanup action.

2.3 Summary of Cleanup Action

A presumptive remedy was implemented for the landfill. Cleanup actions that were completed during the IA included:

- Capping of existing cells with a double-layered geosynthetic and engineered clay cap;
- Installation of a leachate collection system which originally discharged to leachate collection ponds, but currently is transported to and treated at the City of Spokane wastewater treatment plant;
- Installation of a landfill gas collection and treatment system using passive flares;
- Installation of a stormwater control system to facilitate the removal of water off the landfill surface and to minimize erosion.

The intent of the interim remedial action was to minimize precipitation infiltration and leachate generation, eliminate direct exposure to landfilled materials, and contain and treat landfill byproducts such as leachate and methane gas. During the five year Interim Action operation period, minor modifications were made to the system to correct or enhance operation. Generally, these involved the operation of the leachate collection system and the gas flare system.

3.0 Periodic review

3.1 Regulation

A periodic review of the cleanup action takes place at least every five years after the initiation of the cleanup action. A periodic review is required at sites where any of the following occur:

- The department conducts a cleanup action
- The department approves a cleanup action under an order, agreed order, or consent decree
- As resources permit, whenever the department issues a no further action opinion

AND one of the following conditions exist:

- An institutional control and/or financial assurance is required as part of the cleanup action
- The cleanup level is based on a practical quantitation limit as provided for under WAC 173-340-707
- Modifications to the default equations or assumptions using site-specific information would significantly increase the concentration of hazardous substances remaining at the site after cleanup or the uncertainty in the ecological evaluation or the reliability of the cleanup action is such that additional review is necessary to assure long-term protection of human health and the environment

Because Mica underwent a cleanup action approved by Ecology under a consent decree, and institutional controls were required as part of the cleanup action, periodic reviews are required at a frequency of at least every five years. The Cleanup Action Plan was finalized in 2001.

3.2 BASIS

This review is based on documents describing the actions listed in Section 2.2, and on five years of compliance monitoring reports documenting site conditions and contaminant concentrations.

3.3 THE EFFECTIVENESS OF ONGOING OR COMPLETED CLEANUP ACTIONS, INCLUDING THE EFFECTIVENESS OF ENGINEERED CONTROLS AND INSTITUTIONAL CONTROLS IN LIMITING EXPOSURE TO HAZARDOUS SUBSTANCES REMAINING AT THE SITE

An evaluation of the cleanup action effectiveness involves verifying the status of engineered and institutional controls and assessing contaminant levels and trends. Mica's cleanup action is a presumptive remedy which involves the use of engineering controls in the form of an engineered landfill cap, leachate collection system, and gas collection and treatment system. The cap has been in place for 13 years. The condition of engineered controls are measured by Spokane County staff on a weekly basis through inspections of the cap and physical barriers, including flares, leachate ponds, and fences. Any observances, such as erosional features, vegetative growth, or signs of vandalism, that may indicate a weakness or potential deficiency in the cap are monitored and/or repaired. Markers are established at points on the landfill cover to measure any settlement taking place. These are checked on a visual basis monthly and marker elevations are surveyed annually. Maintenance of flares and ponds is performed yearly; flare flame arrestors are removed, inspected, and cleaned and leachate ponds are drained so that liners can be inspected and repaired if needed. Leachate pond outfalls are also inspected and cleaned monthly. These actions provide reasonable assurance that engineered controls are effective.

Institutional controls in the form of deed restrictions are in place for the site. These restrictions limit or prohibit any activity that will interfere with the integrity of the cap or may cause a release, require the maintenance of fences and locked gates, and require any future owners to

also comply with them. In addition, state law prevents the installation of any groundwater supply wells within 1000 feet of the permitted landfill boundary.

Cap performance can be measured by the quantity of leachate generation, and the concentrations and trends of contaminants in groundwater. In the last five years, leachate quantities have shown a reducing trend, although groundwater still drives the leachate volumes. Quarterly groundwater sampling is performed for twenty conventional, inorganic, volatile and semi-volatile organic compounds. Twelve on-site monitoring wells and three off-site water supply wells are used to track contaminant movement in four "drainages." (Figure 2) A review of the past five years of data from these monitoring wells will help assess contaminant levels and trends.

Tables 1 and 2 show contaminant trends in the monitoring wells sampled under the CAP, organized by drainage. Increasing or decreasing trends can be viewed, along with any exceedances of established Method B cleanup levels. Although total dissolved solids, alkalinity, and chloride are not considered indicator analytes, they are commonly measured at landfills and show the influence of leachate on water quality. Table 3 summarizes the indicator analytes and cleanup levels used to evaluate groundwater quality data. A review of these tables shows that many contaminants have not been detected above cleanup levels during the monitoring period. Of the wells that are monitored, MW-16 and MW-23 show the largest numbers of contaminants above cleanup levels and the most contaminants with increasing trends. Graphs showing contaminant levels in these wells are presented in figures 3 through 5 (dashed lines indicate use of the alternate scale). In these two wells, chlorinated ethene reduction is occurring which indicates biodegradation; tetrachloroethene and trichloroethene show decreasing trends while cis-1,2-dichloroethene and vinyl chloride show increasing trends. Drinking water wells show no definitive landfill impacts, and will continue to be monitored on a quarterly basis to ensure that does not change.

3.4 NEW SCIENTIFIC INFORMATION FOR INDIVIDUAL HAZARDOUS SUBSTANCES OR MIXTURES PRESENT AT THE SITE

There is no new scientific information that affects the site.

3.5 NEW APPLICABLE STATE AND FEDERAL LAWS FOR HAZARDOUS SUBSTANCES PRESENT AT THE SITE

The Cleanup Action Plan was prepared in accordance with the 2001 revision of MTCA. No amendments have been implemented since then. No new federal laws have been enacted that would affect the site.

3.6 CURRENT AND PROJECTED SITE AND RESOURCE USES

In the original Cleanup Action Plan, the site was zoned Rural Residential 10 – General Agriculture, Mining. On June 1, 2004 the zoning changed for the landfill and it is now zoned Rural Conservation (RCV). This designation applies to environmentally-sensitive areas and wildlife corridors, and encourages low-impact uses and utilizes rural clustering to protect

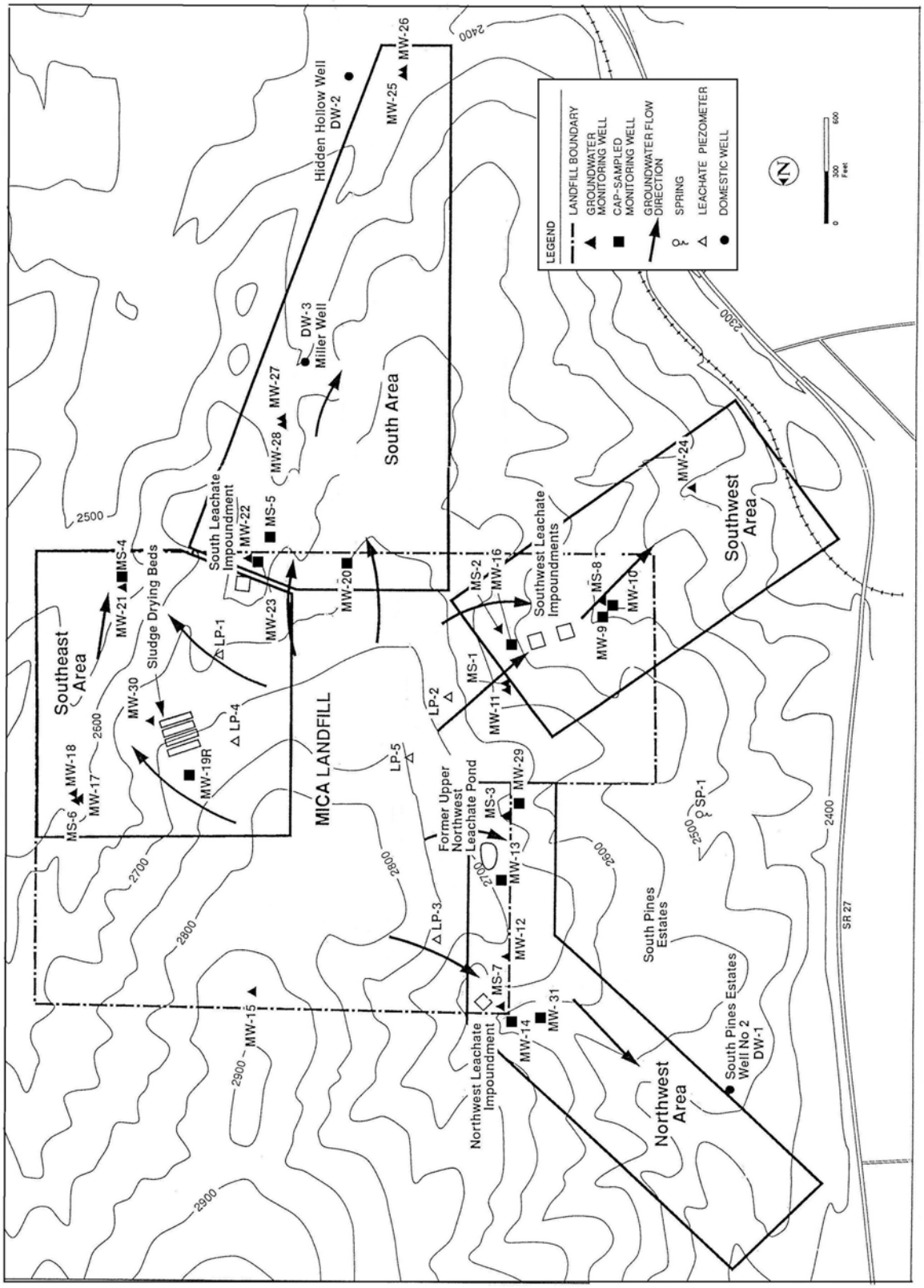

Figure 2. Well Locations and Drainages

Analyte	South Drainage															Southeast Drainage										Drinking Water Wells														
	MS-5					MW-20					MW-23					MS-4					MW-19R					DW-1					DW-2					DW-3				
total dissolved solids	↑	↑	↑	↑	↑	↑	↑	-	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
alkalinity	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↓	↓	↓	↓	↓	↑	↑	↑	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
chloride	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↓	↓	↓	-	-	↑	↑	↑	↑	-	-	↓	↓	-	-	↑	↑	-	↑	↑	-	-	↑	↓	-
ammonia	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	↑	-	-	-
nitrate	↓	↓	↓	↓	↓	↑	↑	-	↑	↑	↓	↓	↓	↓	↓	↑	↑	↑	↑	↑	-	-	↑	↑	↑	-	-	↑	-	↑	↓	↓	↓	↓	↓	-	-	-	-	↑
arsenic	-	-	-	-	-	-	-	-	-	-	-	↑	-	-	-	-	-	-	-	-	-	↑	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
barium	↑	↑	-	-	↑	↑	↑	-	-	-	↑	↑	-	↑	-	-	-	-	-	-	↓	↓	-	-	↓	-	-	-	-	-	-	-	-	-	-	↑	↓	-	-	-
lead	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
manganese	-	-	-	-	-	-	-	-	-	↓	-	↑	-	↑	↑	-	↑	-	-	↓	-	-	-	-	-	-	-	-	-	↓	-	↑	-	-	-	-	-	-	-	-
mercury	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
vanadium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
zinc	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	↓	-	↓	-	-	-	-	-	-	-	-	-	-	-	↓	↓	↓	-	-	-
1,2-dichloroethane	-	-	-	-	-	-	-	-	-	-	-	-	-	-	↓	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,2-dichloropropane	-	-	-	-	-	-	-	-	-	-	↑	↑	↑	↑	↑	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
acetone	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
benzene	-	-	-	-	-	-	-	-	-	-	↑	↑	↑	-	↑	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
cis-1,2-dichloroethene	↑	-	-	-	-	-	-	-	-	-	↑	-	-	↑	↑	-	-	-	-	-	-	-	-	↓	↓	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
methylene chloride	↓	-	-	-	-	-	-	-	-	-	↓	↓	↓	↓	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
tetrachloroethene	↓	↓	↓	↓	↓	-	-	-	-	-	↓	↓	↓	↓	↓	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
toluene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
trichloroethene	-	-	-	↓	↓	-	↑	-	-	-	-	-	-	↓	↓	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
vinyl chloride	↑	-	-	-	-	-	-	-	-	-	↑	↑	↑	↑	↑	-	-	-	-	-	-	↓	↓	-	↓	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
bis(2-ethylhexyl)phthalate	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

highlighted squares = at least half of the measuring points in the year were over cleanup levels

↑ = a statistically significant increasing trend for the year

↓ = a statistically significant decreasing trend for the year

Table 1. Trends and Exceedances in South, Southeast, and Drinking Water Wells

Analyte	Northwest Drainage																				Southwest Drainage														
	MW-13					MW-14					MW-29					MW-31					MW-9					MW-10					MW-16				
total dissolved solids	↑	↑	↑	↑	↑	-	-	-	-	-	↑	↑	↑	↑	↑	-	-	↓	↓	↓	↓	↓	↓	↓	↓	-	-	↑	-	-	↑	↑	↑	↑	↑
alkalinity	↑	↑	↑	↑	↑	-	-	-	-	-	↑	↑	↑	↑	↑	-	-	↓	↓	↓	↓	↓	↓	↓	↓	-	-	↑	↑	-	↑	↑	↑	↑	↑
chloride	↑	↑	↑	↑	↑	-	-	-	-	-	↑	↑	↑	↑	↑	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	-	-	-	-	-	↑	↑	↑	↑	↑
ammonia	-	-	-	-	-	-	↑	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	↑	↑	↑	↑
nitrate	↓	↓	↓	↓	↓	-	-	-	-	-	-	-	↑	↑	↑	-	-	-	-	-	-	-	-	-	-	-	-	↑	-	-	-	-	-	-	-
arsenic	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	↑	↑	↑	-	-
barium	↑	↑	-	-	↑	-	↑	-	-	-	-	↑	↑	↑	↑	-	-	-	-	-	↓	↓	-	-	-	-	-	-	-	-	↑	↑	↑	-	-
lead	-	-	-	-	↓	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
manganese	-	-	-	-	↓	-	↑	-	-	-	↓	↓	-	-	-	-	↓	-	↓	↓	↓	↓	-	-	-	-	-	-	-	-	↑	↑	↑	↓	↓
mercury	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
vanadium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
zinc	-	-	-	↓	↓	-	↑	-	-	-	-	↑	-	-	-	↑	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,2-dichloroethane	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	↑	↑	↑	↑	↑
1,2-dichloropropane	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	↑	↑	↑	↑	↑
acetone	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	↑	-	-	-	-	-	-	-	-	-	-	-	-	-	↑	↑	↑	↑	↑
benzene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	↑	↑	↑	↑	↑
cis-1,2-dichloroethene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	↑	-	-	↑	↑
methylene chloride	-	↑	-	-	-	-	↑	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	↓	↓	↓
tetrachloroethene	-	-	-	-	-	-	-	-	-	-	-	-	↑	-	↑	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	↓	↓	↓	↓	↓
toluene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	↑	↑	↑	↑	↑
trichloroethene	↑	↑	↑	↑	↑	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	↓	↓	↓	↓
vinyl chloride	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	↑	↑	↑	↑	↑
bis(2-ethylhexyl)phthalate	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

highlighted squares = at least half of the measuring points in the year were over cleanup levels

↑ = a statistically significant increasing trend for the year

↓ = a statistically significant decreasing trend for the year

Table 2. Trends and Exceedances in Northwest and Southwest Wells

Indicator Analyte	Method B Cleanup Level, µg/L
Conventionals	
n-ammonia	272,000
nitrate	800
Inorganics	
arsenic	5
barium	560
lead	15
manganese	1,926
mercury	0.4
vanadium	112
zinc	400
Volatile Organics	
1,2-dichloroethane	1.2
1,2-dichloropropane	0.643
acetone	688
benzene	0.795
cis-1,2-dichloroethene	33
methylene Chloride	5
tetrachloroethene	0.858
toluene	100
trichloroethene	3.98
vinyl Chloride	0.023
Semi-Volatile Organics	
bis(2-ethylhexyl)phthalate	6

Table 3. Indicator Analytes and Cleanup Levels

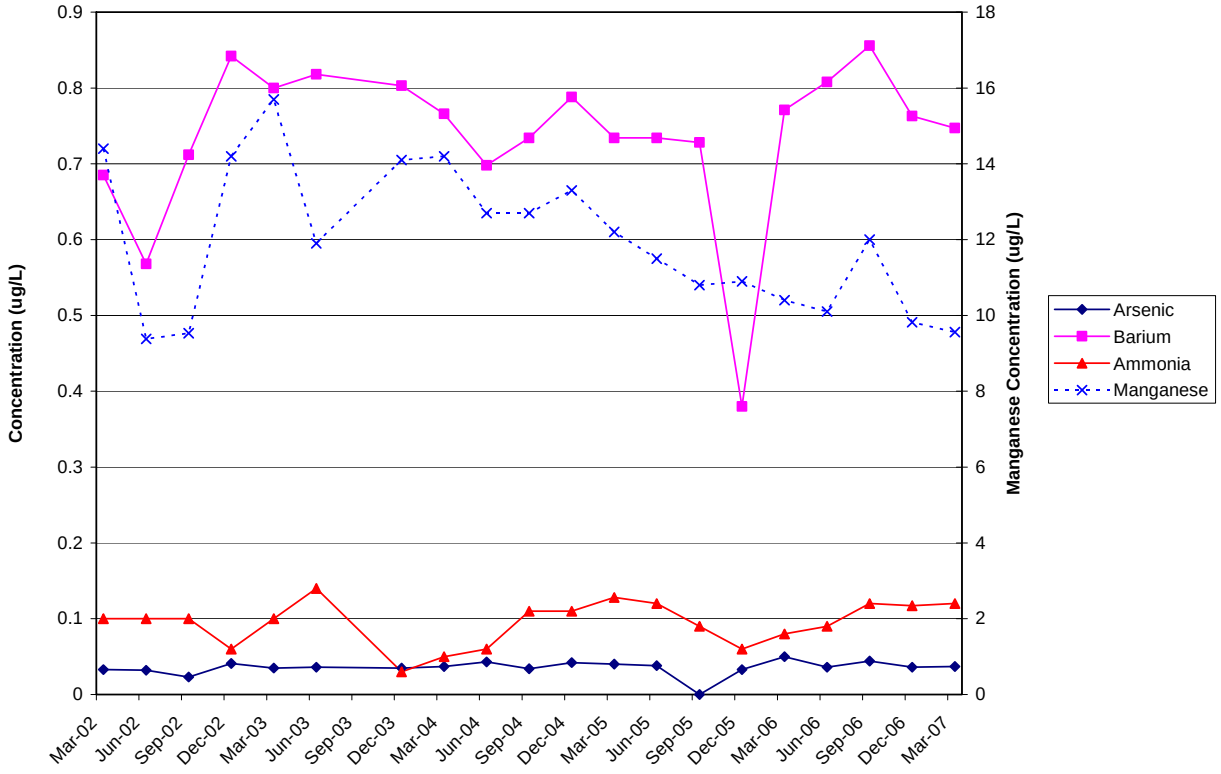

Figure 3. MW-16 Inorganic/Conventional Concentrations

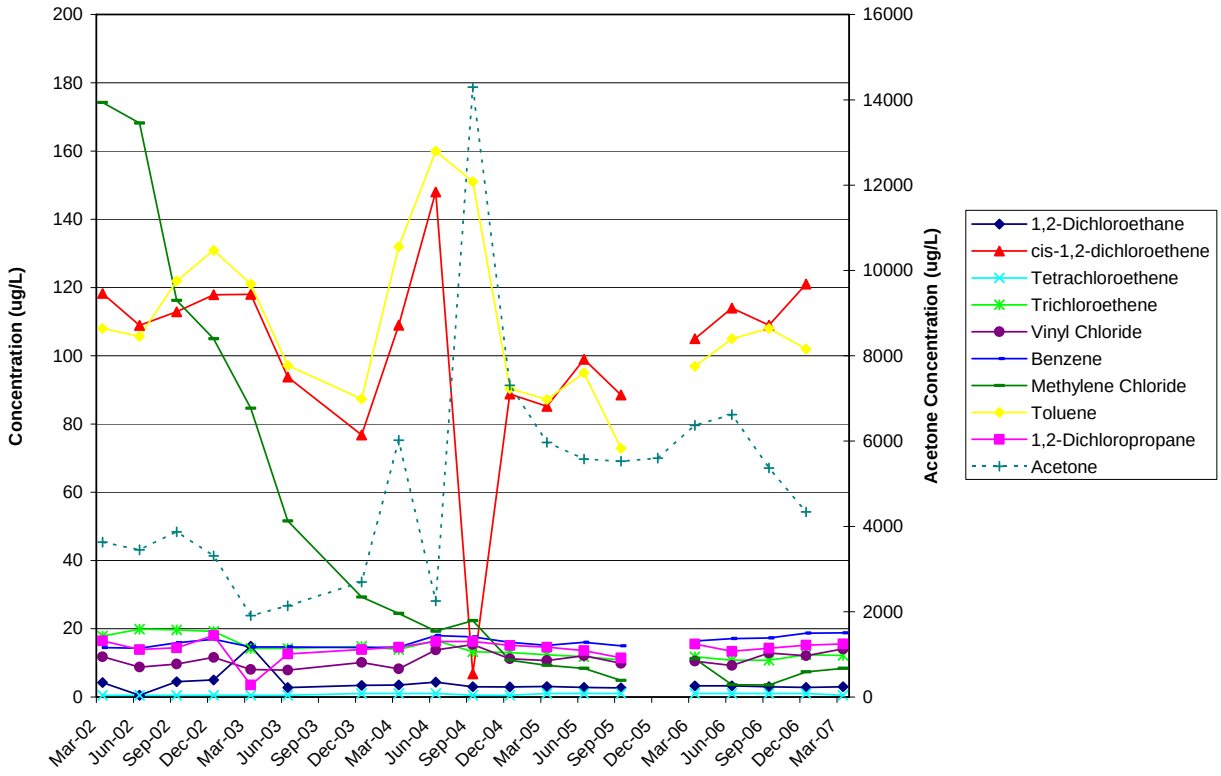

Figure 4. MW-16 VOC Concentrations

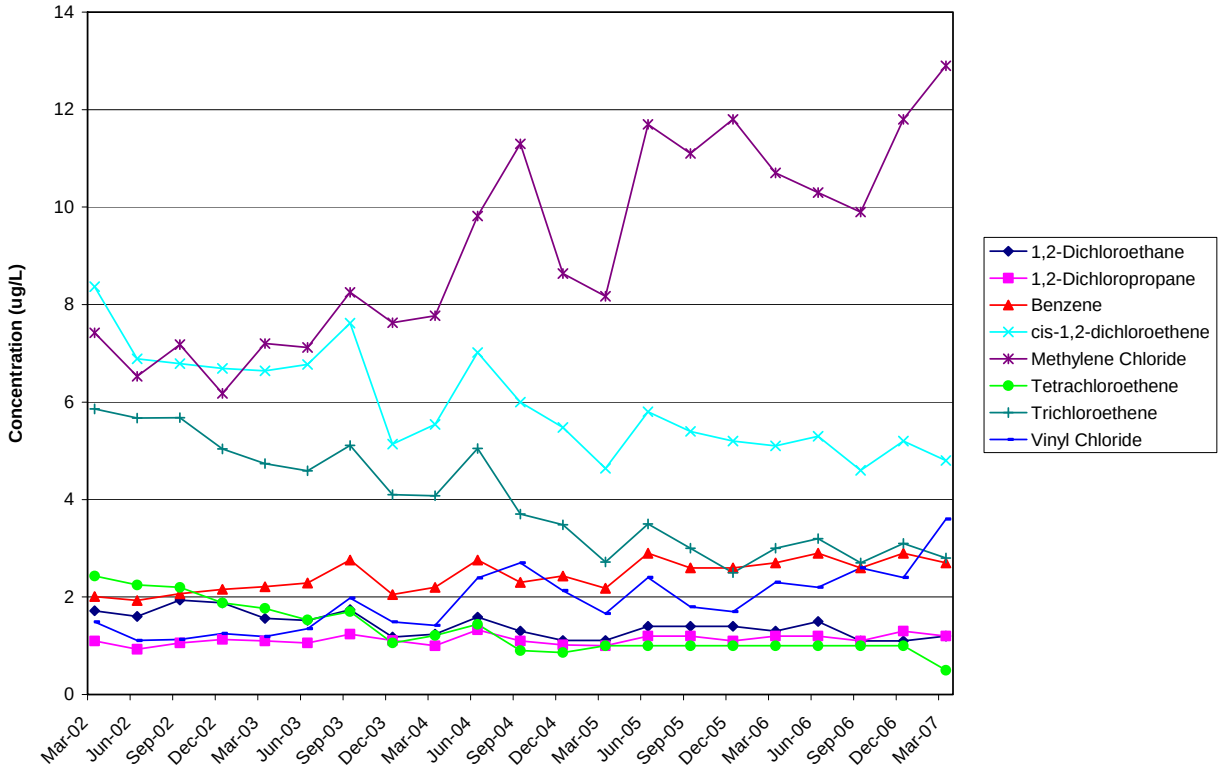

Figure 5. MW-23 VOC Concentrations

sensitive areas and preserve open space. The site has been in operation as a landfill for over 30 years. Deed restrictions currently in place at the property limit the property's current and future use. These restrictions limit or prohibit any activity that will interfere with the integrity of the cap, or may cause a release. Current zoning designation, the presence of deed restrictions, and the nature of the site (i.e., presence of landfill gas and active leachate discharge) all strongly support no change in future site use. These mechanisms all minimize the chance of a site use that would diminish the remedial action's effectiveness or cause a release.

3.7 THE AVAILABILITY AND PRACTICABILITY OF MORE PERMANENT REMEDIES

The cleanup action implemented a presumptive remedy for the site. An evaluation of other remedial options for the site was completed in the Cleanup Action Plan. Operation of a groundwater pump and treat system was evaluated as an enhancement to the current action and was determined to not provide a significant remedial benefit. Higher preference cleanup options such as source removal remain available, but are still not practicable.

3.8 THE AVAILABILITY OF IMPROVED ANALYTICAL TECHNIQUES TO EVALUATE COMPLIANCE WITH CLEANUP LEVELS

For the established contaminants present at the landfill, the techniques in use are Methods SM2320-NH3C and EPA 300.0 for inorganics, Methods EPA 6020B, EPA 6010B, and EPA 7040A for metals, Method EPA 8260B for volatiles, and Method EPA 8270C for semi-volatiles.

These methods are widely accepted for the analysis of groundwater contaminants. There are no improved analytical techniques available.

4.0 CONCLUSIONS

Ecology has determined that the remedy at Mica Landfill is generally protective of human health and the environment. The measures that were taken for the original cleanup action remain protective today. Continued compliance monitoring ensures that contamination remaining in site soils and groundwater does not migrate off-site. The existence of institutional controls in the form of deed restrictions confirms that site uses will remain consistent with the presence of contamination. Further periodic reviews will be required as long as institutional controls are in place at the site, in accordance with WAC 173-340-420(7).

5.0 REFERENCES CITED

Washington State Department of Ecology, 2001, Final Cleanup Action Plan, Mica Landfill Site

Washington State Department of Ecology, 2001, Model Toxics Cleanup Act Regulation Chapter 173-340 WAC