Five-Year Review Report

First Five-Year Review Report
for
Midway Landfill Site
Kent, Washington

Final

September 19, 2005

Prepared By
Washington State Department of Ecology
Northwest Regional Office
Bellevue, Washington

Approved by: Date:

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Acronyms and Abbreviations

AGI	AGI Technologies
CAP	Cleanup Action Plan
CERCLA	Comprehensive Environmental Response Compensation Liability Act
City	City of Seattle
COCs	contaminants of concern
DCA	Dichloroethane
DCE	Dichloroethene
EA	Endangerment Assessment
Ecology	Washington State Department of Ecology
EPA	Environmental Protection Agency
FS	Feasibility Study
HDPE	high-density polyethylene membrane
MCLs	Maximum Contaminant Levels
MTCA	Model Toxics Control Act
NCP	National Contingency Plan
NGA	Northern Gravel Aquifer
NPL	National Priorities List
O&M	Operations and maintenance
PCE	Tetrachlorethene
PQL	Practical quantification limit
RCRA	Resource Conservation and Recovery Act
RCW	Revised Code of Washington
RI	Remedial investigation
ROD	Record of decision
ROW	Right of way
SA	Sand Aquifer
SG/SR	Shallow Groundwater/Saturated Refuse
SGA	Southern Gravel Aquifer
TCE	Trichloroethene
TCA	Trichloroethane
UGA	Upper Gravel Aquifer
USEPA	U.S. Environmental Protection Agency
VOCs	Volatile organic compounds
WAC	Washington Administrative Code
WSDOT	Washington State Department of Transportation

Executive Summary

The purpose of this periodic review is to determine whether the cleanup remedy at the City of Seattle's Midway Landfill Superfund site in Kent, Washington continues to be protective of human health and the environment. The review focuses on answering three questions. The answers to these questions are summarized below.

Question A: Is the remedy functioning as intended by the decision documents?

- The remedy has greatly reduced impacts, but it has not brought the landfill into compliance with respect to 1,2-dichloroethane and vinyl chloride in one upgradient well and four downgradient wells. Manganese exceeds the cleanup level in one downgradient well. The sources of these contaminants are the waste placed in the landfill and upgradient off site.

- Fluid levels in most of the SG/SR wells have continued to substantially decline over the past five years, demonstrating the continuing effectiveness of engineering controls.

- Concentrations of Record of Decision (ROD) contaminants of concern (COCs) in the SGA have generally remained stable or decreased over the past five years, although levels of some COCs remain above cleanup levels (1,2-dichloroethane and vinyl chloride in one upgradient well and four downgradient wells and manganese in one downgradient well).

- The SGA does not serve as a current source of drinking water and institutional controls prohibit future drinking water uses. Therefore, despite the existing levels of contaminants, the remedy continues to be protective of human health and the environment.

- Upgradient sources of VOCs in groundwater continue to be present and will limit the potential for the COCs in the SGA to decrease below the ROD cleanup levels. Vinyl chloride is a daughter product of the ethenes and ethanes detected in upgradient wells, and both vinyl chloride and 1,2-dichloroethane are also present upgradient of the landfill.

Question B: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives used at the time of the remedy still valid?

The exposure assumptions, toxicity data, and remedial action objectives used at the time of the remedy selection are still valid. The cleanup levels established for the site in the ROD are still appropriate and protective considering the current and likely future use of the site. There have been no regulatory or statutory changes that would call into question the protectiveness of the remedy.

The clean up levels selected in the ROD are also still valid. However, because of changes to the Model Toxics Control Act (MTCA) regulations, the vinyl chloride ground water cleanup level is updated to reflect revisions to the state cleanup levels. The cleanup level for vinyl chloride was established at the state MTCA level of 0.02 µg/L instead of the federal maximum contaminant level of 2 µg/L. The Record of Decision specified the state cleanup standard of 0.02 µg/L with the caveat that the practical quantification limit of 0.2 µg/L would be used as an alternative because the cleanup level was lower than the practical quantification limit.

Revisions to the MTCA implemented in 2001, changed the requirements for developing ground water cleanup standards (Washington State Department of Ecology, 2001a, b; respectively). The MTCA regulations require adjustment of concentrations based on applicable state and federal law to the $1E^{-5}$ risk level.

The revised state cleanup level for vinyl chloride is 0.29 µg/L, using the MTCA adjusted cancer risk of $1E^{-5}$.

With the change of the vinyl chloride state cleanup standard from 0.02 to 0.29 µg/L, the use of the practical quantification limit of 0.2 µg/L as an alternative cleanup is no longer relevant.

The revisions to the vinyl chloride cleanup standard as described above are agreed upon by the City of Seattle and the Washington Department of Ecology. The City of Seattle will issue a revision to Midway Landfill Monitoring Plan (Parametrix 2000a) to document the history of changes to the cleanup

standards for vinyl chloride. The new vinyl chloride standard will be utilized in future evaluations of ground-water conditions at the Midway Landfill.

Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

The presence of low concentrations of 1,2-dichloroethane and vinyl chloride in one upgradient and four downgradient wells in the Southern Gravel Aquifer is of concern. In addition, other volatile organic compounds have also been detected upgradient of the landfill. The Washington Department of Ecology will be contacting the owners of properties in the vicinity of the upgradient sources to encourage the property owners to voluntarily investigate and cleanup any contamination that may affect the landfill.

At the request of the US EPA, 1, 4 dioxane testing, will be conducted during the next sampling event at upgradient monitoring wells 17B and 21B in the Sand Aquifer and a third well, MW-14, a downgradient well in the Southern Gravel Aquifer. Well 21B has shown a slight, but steady increase over time of volatile organic compounds. Well 17B has shown a decrease in concentration over time for volatile organic compounds. This is a precautionary step advised by the US EPA for all sites undergoing 5-year periodic review where certain other solvents are present.

The Washington Department of Transportation, in cooperation with the City of Seattle and the Washington Department of Ecology will be expanding Interstate 5 into the highway right-of-way on the eastern side of the landfill. Investigations of the refuse in the right-of-way show that this expansion will not adversely affect the landfill. Gas probes in this portion of the landfill have been devoid of any gases for the past several years. These gas probes will be abandoned prior to expansion of the interstate.

The City of Seattle will to continue to operate and maintain remedial systems, including access controls, constructed under the consent decree. In addition, the monitoring programs will need to continue in compliance with the approved monitoring plan. This includes continuing the fluid elevation monitoring program, groundwater chemistry monitoring program, and landfill gas monitoring program in accordance with the Monitoring Plan, and evaluate the results on an ongoing basis.

Specific recommendations and follow-up actions include:

- Annually assess the results of the ongoing monitoring program to determine if additional work is needed.
- During the next schedule ground-water sampling round, test for 1,4, dioxane at monitoring wells 14B, 17B and 21B. If 1,4-dioxane is not detected, and then discontinue testing for this compound. If detected, however, the monitoring program will be adjusted to monitor the trend of this compound.
- Reassess the scope of monitoring on a 5-year interval depending on monitoring results.

Change the cleanup level for vinyl chloride from 0.2 µg/L to 0.29 µg/L.

Periodic Review Summary

SITE IDENTIFICATION		
Site Name *(from WasteLAN)*: Midway Landfill		
EPA ID *(from WasteLAN)*: WAD WAD 980638910		
Region: 10	State: WA	City/County: Kent/King
SITE STATUS		
NPL status: ☒ Final ☐ Deleted ☐ Other (specify)		
Remediation status (choose all that apply): ☐ Under construction ☒ Operating ☐ Complete		
Multiple OUs?* ☐ yes ☒ no	Construction completion date: 2000	
Has site been put into reuse? ☐ yes ☒ no		
Review Status		
Lead Agency: ☐ EPA ☒ State ☐ Other Federal Agency _____		
Author Name: Ching-Pi Wang		
Author Title: Remedial Project Manager	Author Affiliation: WA State Dept. of Ecology	
Review Period: January 2005 to September 2005		
Dates of site inspection: May 2, 2005		
Type of Review: x Post-SARA ☐ Pre-SARA ☐ NPL – Removal Only ☐ Non-NPL Remedial Action Site ☒ NPL State/Tribe-lead ☐ Regional Discretion		
Review Number: x First Second ☐ Third ☐ Other (specify)		
Triggering Action: ☐ Actual RA on-site Construction at OU# _____ ☐ Actual RA Start at OU# _____ ☐ Construction Completion Previous Five-Year Review Report x Other (ROD issuance date)		
Triggering action date *(from WasteLAN)*: September 6, 2000		
Due date *(five years after triggering action date)*: September 6, 2005		

* ["OU" refers to operable unit.]

1.0 Introduction

The purpose of this periodic review is to determine whether the cleanup remedy at the City of Seattle's Midway Landfill Superfund Site continues to be protective of human health and the environment.

The Midway Landfill was placed on the National Priorities List (NPL) in May, 1986. It is a state-lead site. The Washington State Department of Ecology (Ecology) is responsible for the oversight management of the site as stipulated by an agreement with Region 10 of the Environmental Protection Agency (EPA). The cleanup is managed by Ecology under the authority of the Model Toxics Control Act [Chapter 70.105D RCW], the Water Pollution Control Act [Ch. 90.48 RCW], and all other applicable state and federal laws.

WAC 173-340-420 provides for periodic review of post-cleanup conditions at sites where institutional controls are required as part of the cleanup action. Institutional controls are required at the landfill because waste is contained on site.

Reviews must be conducted at least every five years after the initiation of the cleanup action. Because most of the cleanup action at this site occurred prior to the ROD, and thus the ROD did not require further construction, the ROD signature date is the trigger for the CERCLA five year review at this site. This review has been conducted by the Toxics Cleanup Program, Northwest Regional Office, Washington State Department of Ecology.

2.0 Site Chronology

September 2005	First 5-year review completed by Washington State Department of Ecology and the EPA.
September 2000	EPA completes a Record of Decision.
1991	Landfill cap and cover system construction completed
1990	Consent decree between Ecology and City of Seattle
1989	Landfill cap and cover system designed and construction started
September 1988	City of Seattle and Washington Department of Ecology sign Response Order on Consent.
May 1986	Landfill Placed on National Priorities List.
October 1984	Landfill nominated to the National Priorities List.
1985	Removal action begun to extract migrating landfill gases.
1984	Methane gas discovered in surrounding residential area.
Fall 1983	City of Seattle closed the landfill.
1966-1983	Site leased by City of Seattle for use as a landfill.
1945-1968	Site operated as a gravel pit.

3.0 Background

3.1 Location and Climate

The Midway Landfill is in King County, Washington, Between Interstate-5 (I-5) and Highway 99, and between South 252nd Street and South 246th Street in Kent, Washington 98032. Figure 1 shows the regional site location.

The location is in a geographic area known as the Puget Sound Lowland. The area has been glaciated several times and is underlain by a sequence of glacio-fluvial sediments. The area has a maritime climate characterized by cool, wet winters and drier, mild summers. Annual rainfall is about 40 inches per year, which falls mainly between November and June.

3.2 History and Regulatory Synopsis

The City of Seattle (City) operated the Midway Landfill from 1966 to 1983. When the City closed the Midway Landfill in 1983, extensive testing for landfill gas and analysis of groundwater in and around the landfill began. The presence of contaminants with a potential for off-site migration was indicated and the Washington State Department of Ecology (Ecology) began to investigate the site.

In 1986, the site was placed on the National Priorities List (NPL) by the Environmental Protection Agency (EPA) for groundwater conditions at the site. As required by the EPA, the City completed a remedial investigation (RI), an Endangerment Assessment (EA), and a Feasibility Study (FS).

In May 1990, prior to completion of the RI and FS studies, the City and Ecology entered into a consent decree pursuant to the State of Washington Model Toxics Control Act [MTCA], (Washington State Department of Ecology, 1996). This legal agreement set forth Ecology's determination that undertaking certain remedial actions, prior to a Cleanup Action Plan (CAP), would provide immediate protection to human health and the environment. The remedial actions were completed by 1992.

Under MTCA, the decision document that selects the cleanup action and cleanup levels is called the CAP (similar to an EPA Record of Decision [ROD]).

Ecology and the City had been working on a CAP since 1992. In September 2000, the EPA completed a Comprehensive Environmental Response Compensation Liability Act (CERCLA) ROD for the landfill so that a determination of CERCLA construction completion could be made (USEPA 2000). Ecology then decided to utilize the ROD as a CAP for a final MTCA remedy, pursuant to WAC 173-340-360(13).

3.3 Physical and Geographical Characteristics

The Midway Landfill is located near the crest of a narrow north-south trending glacier feature known as the Des Moines Drift Plain. This area, referred to as "upland" because of its location above adjacent valleys and sea level, is bordered by Puget Sound on the west and the Green River valley on the east. Maximum elevations along the crest of the upland generally range from 400 to 450 feet above mean sea level. Puget Sound is at sea level, and the Green River valley floor typically averages about 30 feet above mean sea level.

The Midway Landfill occupies a shallow, bowl-shaped depression near the crest of the upland. The surface of the landfill generally ranges from 360 to 400 feet above mean sea level and slopes upward to the south and east. West of the landfill, the land surface is nearly flat across Highway 99 and then drops steeply downward approximately 100 feet to the Parkside Wetland.

The upland area is cut with a number of steep-sided stream valleys. Midway Creek is located northeast of the landfill, and two other streams, the north and south forks of McSorley Creek, are located to the west and southwest, respectively.

There is no major surface water body in the immediate vicinity of the Midway Landfill. The closest are Lake Fenwick, located approximately one mile to the southeast, and Star Lake, located approximately 1.5 miles to the south.

3.4 Land and Resource Use

3.4.1 Land Use

Currently the landfill is capped and fenced. No public access is allowed. Future land use has been the subject of an extensive but preliminary 1992 study by community representatives, the City of Kent, and the City of Seattle. Some possible uses considered desirable by the Midway Citizens Advisory Committee include open space uses such as a passive park, a sports complex with ball fields, or garden center. Less desirable but potentially possible future uses would be a golf driving range or a park and ride facility. All uses would be designed to protect the integrity of the cap and other containment systems.

Occasionally there are inquiries from buyers of properties adjacent to or near the Midway Landfill. The inquiries request information on any environmental impacts to the property that the buyer may be interested in purchasing. Whenever such inquiries are received, the City of Seattle reviews the current environmental data with respect to the location of the property of interest. An example information letter from the City of Seattle to prospective purchasers of adjacent or nearby properties is provided in Appendix A.

3.4.2 Ground-Water Use

To the best of Ecology's and the City's knowledge, no one is drinking the groundwater from any aquifer within almost a mile of the landfill, and there are no current plans to use the groundwater near the landfill for drinking water. The closest wells currently in use for drinking water are the Lake Fenwick wells almost 1 mile southeast of the Midway Landfill.

There are three public wells in the Midway Landfill area. Two are operated by the Highline Water District near the two intersections of South 209th Street and 31st Avenue South, and South 208th Street and 12th Avenue South, respectively. These two wells are screened in the second confined aquifer, at over 120 feet below sea level. Both are over two miles north and northwest from the landfill in an area that is up gradient of the landfill, and are completed in aquifers that are not connected to the affected aquifers.

The third well is operated by the Kent Water District at South 212th Street and Valley Freeway and is used to satisfy peak summer demands. None of these municipal wells draw water from affected aquifers, and all are more distant from the landfill than are the Lake Fenwick wells.

Neither water district has future plans to develop groundwater supplies from any aquifers within an one-mile radius of the Midway Landfill. The wellhead protection areas delineated by these utilities do not include the Midway Landfill site.

State regulations (WAC 173-160 -171) do not allow any new private drinking water wells within 1000 feet of a solid waste landfill or 100 feet of all other sources or potential sources of contamination, and notice is required to be given to Ecology prior to the construction of any well. However, the NCP is more stringent and requires EPA to consider all groundwater as drinking water except directly under a waste management area. The landfill area with refuse is a waste management area and thus is not considered a future drinking water source by EPA. All other areas downgradient of the landfill are considered to be potential future drinking water sources. However, it is likely that all future developments lie within water district service areas and, therefore, are not likely to rely on private wells for their potable water supply.

3.5 History of Contamination

From 1945 to 1966, the site of the current Midway Landfill was operated as a gravel pit. Originally, the pit was adjacent to a natural drainage basin often used as a settling pond. This basin, known as Lake Meade, was located northeast from the center of the present landfill. As the pit was mined, water was drawn from Lake Meade to wash silt and clay from the gravel and sand, and then returned to the lake. This silt and clay settled on the lake bottom. Near the end of the gravel pit operation, the lake was drained into the southern end of the gravel pit, depositing a layer of clay and silt into the bottom of the pit. This layer of fine materials currently underlies much, but not all, of the present landfill.

In 1966, the City of Seattle leased the site and began using it as a landfill. From 1966 to 1983, approximately three million cubic yards of solid waste

were deposited there. The exact dimensions of the bottom of the landfill are not known. However, existing boreholes indicate that the solid waste extends as deep as 130 feet in some places.

The Midway Landfill was created primarily to accept demolition materials, wood waste and other slowly decomposing materials. However, some hazardous wastes and industrial wastes, including approximately two million gallons of bulk industrial liquids from a single source, were also placed in the landfill. In 1980, a state-mandated screening process administered by the Seattle-King County Department of Public Health was initiated to eliminate the disposal of any hazardous waste into Midway Landfill.

When the City closed the landfill in the fall of 1983, it began extensive testing of water and gas in the landfill and its vicinity. Samples of groundwater from monitoring wells in and around the landfill, and gas samples from gas probes, indicated the presence of organic and inorganic contaminants outside the landfill boundary. In 1985, Ecology also began investigating the site and found methane gas in nearby residences. Beginning in September 1985, the City of Seattle constructed gas migration control wells within the landfill property and gas extraction wells beyond the landfill property to control the subsurface migration of gas. Gas was found to have migrated up to 2600 feet beyond the landfill prior to installation of the gas extraction system.

3.6 Synopsis of Hydrogeology Setting

The ground water conditions beneath the landfill are very complex. A brief synopsis is provided to describe the important hydrogeologic features of the landfill.

Groundwater movement within and below the landfill has been characterized to an approximate depth of 300 to 350 ft below ground surface (50 to 100 ft above mean sea level. Several aquifers have been identified within this interval, including (from shallowest to deepest)

- Perched Aquifer (also referred to as Shallow Groundwater)
- Landfill Aquifer (also referred to as Saturated Refuse)

- Upper Gravel Aquifer (UGA)
- Sand Aquifer (SA)
- Southern Gravel Aquifer (SGA)
- Northern Gravel Aquifer (NGA)

The line of the generalized cross section of the monitored units is shown in Figure 2, and the cross section itself is shown in Figure 3.

The Perched Aquifer was named during the RI when it was believed to represent shallow, discontinuous lenses of groundwater perched on low permeability deposits above the UGA. Field work and data analysis since completion of the RI indicate that while this groundwater is shallow and discontinuous, it is not always perched. The majority of these shallow zones are found north of the landfill. The Perched Aquifer is referred to as Shallow Groundwater in the remainder of this report.

The Saturated Refuse consists of leachate within the landfill. Its occurrence and movement are largely functions of the former gravel pit topography. Flow in the Saturated Refuse is generally from the north and west toward the south central section of the landfill, where the pit excavations were deepest. Leachate likely discharges vertically throughout much of the landfill base, but the greatest volume of vertical flow is in the south central area. Leachate discharging from the landfill enters the underlying UGA.

A generalized potentiometric surface map of the UGA for March 2005 is presented as Figure 4. The UGA occurs immediately below the base of the landfill, is limited in lateral extent and is composed of silty and sandy gravel. The aquifer is typically semi-confined, although some parts are unconfined. Groundwater flow in the UGA is generally from both the north and south inward toward an area beneath the southern end of the landfill where the groundwater appears to discharge downward into the underlying SA.

The UGA and SA are separated by the Upper Silt Aquitard, a discontinuous layer of fine-grained silt, clayey silt, and silty fine sand. Vertical flow from the UGA into the SA is most pronounced in places where the aquitard is absent.

A generalized potentiometric surface map of the SA for March 2005 is presented as Figure 5. The SA occurs as a widespread deposit of interbedded sands and silts. Flow in this aquifer in the vicinity of the landfill is generally from the north and west to the southeast toward an apparent hydraulic sink. The sink occurs across a broad area beneath the southern part of the landfill and extends several hundred feet to the east. Groundwater south of this sink also flows towards the sink. Groundwater entering this sink appears to flow downward into the SGA. Some vertical flow outside the sink area also occurs from the SA downward into the SGA and NGA.

The SA and SGA are separated by the Lower Silt Aquitard. Like the Upper Silt Aquitard, the Lower Silt Aquitard is discontinuous and likely controls downward flow from the SA into the SGA.

The deepest stratigraphic units studied are the NGA and SGA; they occur at about the same elevation, but hydraulic heads in the NGA are typically 100 ft higher than heads in the SGA. A generalized potentiometric surface map of the SGA for March 2005 is presented in Figure 6.

The SGA is found beneath the southern half of the landfill and extends to the east, south, and west. It consists of permeable sands and gravel interbedded with silts and silty gravel. The SGA appears to be recharged by the SA and by lateral flow from the south. A groundwater mound in the SGA, below the hydraulic sink in the SA, is believed to be an expression of flow through the sink. Groundwater flow from the mound is to the east and west; flow to the north is blocked by higher potentiometric heads within the NGA. Groundwater in the SGA eventually discharges west to Puget Sound and east to the Green River Valley.

The NGA is found beneath the northern half of the landfill and extends to the north and northeast. Like the SGA, the NGA consists of permeable sands and gravel interbedded with silts and silty gravel. Flow from the NGA is generally from north to south toward the SGA. Like the SGA, the NGA eventually discharges to Puget Sound and the Green River Valley.

Flow rates within the aquifers and along critical flow paths are very difficult to estimate at Midway Landfill because of the complex stratigraphy and the

strong vertical gradients. Based on evidence from calculated hydraulic conductivities, estimated porosities, and measured hydraulic heads, flow rates in the aquifers beneath Midway Landfill range from less than 0.01 to 10 ft per day. Given that flow rates of 0.1 to 1 foot per day are most likely, actions affecting leachate discharge or quality would be detectable in the groundwater monitoring network between 3 months and 30 years after they occurred. Note that the groundwater monitoring wells were selected in representative upgradient and downgradient sampling locations based on flow directions within each aquifer. Monitoring has been conducted at the site for over 15 years. Over this period, flow rates have been sufficient to allow observation of substantial changes in fluid level and chemical monitoring data in response to remedial actions.

4.0 Pre-ROD Remedial Actions

4.1 Remedy Selection and Implementation

In May 1990, prior to completion of the remedial investigation and feasibility studies, the City and Ecology entered into a consent decree pursuant to State of Washington Model Toxics Control Act (MTCA.) This legal agreement set forth Ecology's determination that undertaking certain remedial actions at Midway Landfill, prior to a Cleanup Action Plan (a MTCA decision document, similar to a Superfund ROD) would provide immediate protection to public health and the environment. In this consent decree, the City of Seattle agreed to finance and perform specific cleanup work. This cleanup work, or remedial action, consisted of the elements described in the following sections.

4.2 System Operations/Operation and Maintenance (O&M)

4.2.1 Gas Control

An active gas control system was installed at the Midway Landfill. It originally included 87 gas extraction wells, 31 of which were located off the landfill in native soil. The off-landfill wells have since been abandoned or capped. In addition, approximately 70 off-landfill gas monitoring probes were installed to provide information on gas concentrations; about half of these probes have since been abandoned. The gas is extracted through the control

wells at the landfill and routed to a permanent blower/flare system. Construction of the gas migration control system began in September 1985 and was completed in March 1991.

4.2.2 Landfill Surface Filling and Grading

The landfill surface was regraded which increased the soil cover over the landfill by 2 to 14 feet. The engineered grades improved surface water runoff and decreased infiltration. The fill was also compacted to reduce permeability and prepare the surface for the cover system. The work began in August 1988 and was competed in June 1989.

4.2.3 Storm Water Detention Pond

The storm water detention pond includes the landfill dewatering and discharge system. A lined detention pond was constructed to the north of the landfill. Re-grading of the landfill surface redirected surface water to the new detention pond. Previously, the surface water infiltrated into the landfill. The detention pond is a 3 acre structure, lined with a 60-millimeter high-density polyethylene membrane (HDPE) to eliminate infiltration. The bottom of the pond was constructed below localized groundwater; therefore, a permanent dewatering system was also installed. Construction of the storm water detention pond began in August 1988 and was completed in June 1989.

4.2.4 Landfill Cap Installation

Construction of the final landfill cover began in October 1989 and was completed in May 1991. It consists of the following layers from bottom to top: a 12-inch thick layer of low permeability (1 x 10-7 cm/sec) soil/clay material; a 50 millimeter HDPE flexible membrane; drainage net; filter fabric; 12-inch-thick drainage layer; and a 12-inch-thick topsoil layer.

4.2.5 Linda Heights Park Storm Water Diversion

The Linda Heights Park drain, a 30-inch culvert that drained directly into the landfill, was blocked. Storm water is now routed through a pump station and a pipeline to the detention pond. The old discharge line to the landfill is still in place and functions as an overflow in the event of a pump station failure. The construction of this rerouting began in August 1989 and was completed in

1991. The pump station and associated diversion of storm water was activated in January 1992.

4.2.6 Operations and Maintenance (O&M) Plan

A comprehensive operation and maintenance manual for both short-term and long-term operation and maintenance for the systems constructed under the consent decree was prepared by the City of Seattle, and was approved by Ecology in April 1992.

The 1990 consent decree also required the City to place a notice in the records of real property kept by the county auditor stating that the landfill was on the NPL, and serve a copy of the consent decree upon any prospective purchaser, lessee, transferee, assignee, or other successor in interest to the property prior to the transfer of any legal or equitable interest in all or any portion of the landfill.

4.3 Record of Decision Remedy

A final remedy for Midway Landfill was selected by EPA with Ecology's concurrence in September 2000. The selected remedy consisted of:

1. Monitoring to :

   (a) Determine if the remedial systems are working as designed,

   (b) Determine the progress towards meeting the groundwater cleanup standards,

   (c) Determine if adequate containment is maintained when and if major changes are approved by the Department of Ecology in the operation of the site, such as turning off or scaling down the gas collection system, and

   (d) Demonstrate that the cleanup levels have been achieved.

   The monitoring will be done by the City of Seattle, while Ecology will continue to be the lead cleanup regulatory agency at the site. The details of the monitoring requirements have been set out by the City of Seattle in an Ecology-approved compliance monitoring plan.

Monitoring, including installation of new monitoring wells, is among the activities EPA expects at sites even after EPA determines that construction has been "completed" at a site. Through the procedures outlined in the agreements between Ecology and the City of Seattle, Ecology may require the City of Seattle to install and monitor new monitoring wells if needed.

If necessary, the monitoring program may also address the issue of the source of turbidity in North McSorley Creek raised by the City of Des Moines in their comment letter on the proposed plan. The City of Des Moines requested that the City of Seattle continue to monitor the S. 250th Street outfall for turbidity during storm events (on a periodic basis) and provide the results to the City of Des Moines Engineering Department.

2. Continuing to operate and maintain all remedial elements required in the 1990 consent decree. Ecology will continue to oversee the City's operation and maintenance activities. Operational changes can be approved by Ecology when such changes ensure that the site and remedy will remain protective. The Seattle King County Public Health Department should be given the opportunity to review requested operational changes.

3. Implementing institutional controls. Institutional controls are legal or administrative actions that help ensure the long-term protectiveness of the remedy. At this site, the selected remedy consists of three types of institutional controls. Variations of the first two types of institutional controls are already required in the 1990 consent decree.

   (a) First, the City of Seattle will place a notice in the records of real property kept by the King County auditor, alerting any future purchaser of the landfill property, in perpetuity, that this property had been used as a landfill and was on EPA's National Priorities List, and that future use of the property is restricted. The use restriction shall comply with the post-closure use restrictions under the State of Washington's Criteria for Municipal Solid Waste Landfills (WAC 173-351-500(1)(I) and (2)(c)(iii). The City has recorded this note with King County on July 13, 2005.

(b) Second, the City needs to ensure continued operation and maintenance of the containment and monitoring systems if any portion of the property is sold, leased, transferred or otherwise conveyed. This requirement is an element of the 1990 consent decree.

(c) Third, notices are needed so that no water supply wells are constructed and used in areas with groundwater contamination emanating from the landfill. These notices shall include at a minimum the following:

- The City will annually notify the Seattle-King County Department of Public Health, Ecology, the local water districts (currently, the Kent and Highline Water Districts) and locally active well drillers in writing of groundwater conditions in the affected areas downgradient of the landfill. This notice will include a map showing the location of the affected areas and indicate which aquifers are affected and their elevations. This information shall be updated annually and can be part of an annual groundwater monitoring report. Locally active well drillers are all well drillers that have drilled wells within King County in the year prior to the notice. Ecology will provide the list of locally active well drillers to the City. This requirement for annual notices can be removed or modified by Ecology after groundwater cleanup standards have been met in the groundwater monitoring wells downgradient from the landfill. A copy of the 2005 notice to local drillers is provided in Appendix D.

- The City of Seattle will also annually notify owner of Well #37 in writing of groundwater conditions in the area of the well. Alternatively, the City of Seattle can provide to Ecology adequate assurances that this well has been properly abandoned.

As an additional protection, state regulations forbid any private drinking water wells within 1,000 feet of a municipal landfill or 100 feet from all other sources or potential sources of contamination (WAC 173-160-171). State regulations (WAC 173-160-151) also require a property owner, agent of that owner, or a water well operator to notify Ecology of their intent to begin well construction prior to beginning work. This notification can provide notice to Ecology if anyone plans to build a new water well too near Midway Landfill.

Ecology will continue to be the lead regulatory agency overseeing the performance of the selected remedial action by the City of Seattle. However, if necessary, EPA could use its statutory authority to ensure that actions selected by this ROD are implemented.

The groundwater cleanup standards for the current contaminants of concern can be found in Table 1. If other contaminants resulting from releases from the landfill are found in any down gradient monitoring well, cleanup levels, if necessary, will be established for these additional contaminants using the federal drinking water standards and MTCA.

The point of compliance for the groundwater will be at the edge of the landfill waste as specified in a Compliance Monitoring Plan approved by Ecology. Under MTCA, this location is considered a "conditional point of compliance." All groundwater downgradient of this point of compliance will need to meet these cleanup levels for contaminants resulting from releases from the landfill before the Midway Landfill is removed from the Superfund National Priorities List.

> One of the City of Seattle's concerns is that contaminated groundwater is coming into the landfill from up gradient sources, and that this in-coming contaminated groundwater will never allow the groundwater leaving the landfill to meet the groundwater cleanup standards. Because of the major improvements in downgradient water quality in the last ten years, EPA believes it is possible that the groundwater leaving the landfill will eventually meet the groundwater cleanup standards. However, if in the future the City wants to demonstrate that it is technically impracticable for them to meet the cleanup standards at every downgradient well because of the up gradient sources, EPA and Ecology will work together with the City to determine what information is needed to support such a demonstration.

Because the selected remedy will result in hazardous substances remaining on-site above levels that allow for unlimited use and unrestricted exposure, a statutory review will be conducted under CERCLA within five years of this Record of Decision to ensure that the remedy continues to be protective of human health and the environment. Because Ecology is expected to continue

to be the lead regulatory agency for this cleanup, EPA would expect Ecology to perform the five year review at this site.

The City of Seattle estimates that the closure costs of Midway Landfill amounted to about $56.5 million as of 1995. This does not include the ancillary costs associated with the landfill such as the "Good Neighbor Policy". In recent years, the budgeted and actual operation and maintenance costs have ranged from $432,000 to $535,600 annually. This amount includes monitoring costs.

Groundwater Cleanup Standards

Table 1. List of Contaminants of Concern and Cleanup Standards

Contaminant	Cleanup Level	Basis of the Cleanup Level
Manganese	2.2 mg/L	MTCA Method B
1,2-dichloroethane	5 µg/L	Federal Drinking Water Standard (MCL)
vinyl chloride	.02 µg/L*	MTCA Method B.

NOTES:

(*) Pursuant to WAC 173-340-707(2), Ecology will utilize the practical quantification limit (PQL) of 0.2 µg/L to determine compliance with this cleanup standard because the cleanup standard is lower than the PQL.

(1) 1,2-Dichloroethane and vinyl chloride are solvents. Vinyl chloride can also be formed in groundwater during the natural breakdown of other solvents. Manganese is a natural mineral in soil that dissolves into the groundwater because of the chemistry of the water leaving the landfill.

(2) If other contaminants resulting from releases from the landfill are found in any downgradient monitoring well, cleanup levels, if necessary, will be established for these additional contaminants using the federal drinking water standards and MTCA.

(3) The point of compliance for the groundwater will be at the edge of the landfill waste as specified in a Compliance Monitoring Plan to be approved by Ecology. Under MTCA, this location is considered a "conditional point of compliance." All groundwater downgradient

of this point of compliance will need to meet these cleanup levels for contaminants resulting from releases from the landfill before the Midway Landfill is removed from the Superfund National Priorities List.

5.0 Ongoing Environmental Monitoring Programs and O&M Requirements

To evaluate the effectiveness of the remediation measures described above, the City has conducted performance and compliance monitoring programs at the Midway Landfill since 1989. These include fluid level monitoring, groundwater chemistry monitoring, and landfill gas monitoring that are performed on an ongoing basis. The current monitoring program is described in the Midway Landfill Monitoring Plan (Parametrix 2000a).

The O&M requirements for Midway Landfill are described in Midway Landfill Operation and Maintenance Manual completed in 1992, (Parametrix). This document is a comprehensive operation and maintenance manual for both short-term and long-term operation and maintenance for the systems constructed under the consent decree was prepared by the City of Seattle, and was approved by Ecology in April 1992. The manual addresses operation and maintenance of all components of the remedy including; gas system, surface water systems, pump stations, landfill cover system, roadway and site control.

5.1 Fluid Level Monitoring

An extensive formal fluid level monitoring program began in October 1989 and has been conducted monthly, quarterly, or semi-annually through sampling Round 47, March 2005. In 1993 the monitoring frequency was reduced to a semi-annual schedule. Fluid level monitoring was previously referred to as "Performance Monitoring" and is intended to track response of landfill leachate levels and shallow groundwater levels to remedial actions required by the consent decree. It includes collection of groundwater level and oil thickness measurements within the saturated portion of Midway Landfill (termed Saturated Refuse) and groundwater levels in the shallow groundwater surrounding the landfill (Shallow Groundwater). The fluid level monitoring network for the Shallow Groundwater and Saturated Refuse is shown in Figure 7. Fluid level monitoring is currently being conducted on a biannual basis and the current program (Parametrix 2002) consists of:

- Monitoring seven wells from the key hydraulic areas (south end, hydraulic sink, west side, central mound, Linda Heights, north end, north end shallow) of the landfill twice a year beginning in 2002 during Round 41. These wells monitor the Shallow Groundwater/Saturated Refuse (SG/SR). The measurements from these wells are being compared to historical data to evaluate continued effectiveness of the closure measures.
- Monitoring 61 additional wells from the SG/SR once every other year beginning in 2003 (Round 43). Measurements from these wells are being compared to historical data as described above, and used to evaluate groundwater flow within the SG/SR and oil thickness trends.

5.2 Groundwater Chemistry Monitoring

Groundwater chemistry monitoring was initiated in February 1990 with Round 1 (QM-1) and has been conducted on a quarterly or semi-annual basis through sampling Round 46 in 2004. Groundwater chemistry monitoring has also been referred to as "Compliance Monitoring" in previous documents and is intended to track the presence, concentrations, and migration of groundwater contaminants, both upgradient and downgradient of the landfill, to assess the effectiveness of the remedial actions.

The first semi-annual groundwater chemistry event was Round 34 (QM-34). The current groundwater chemistry monitoring program includes collection and qualitative analysis of groundwater samples collected from monitoring wells located upgradient and downgradient of the landfill and groundwater flow determination. The well locations currently used for groundwater level measurements are shown in Figure 8. The well locations currently used for groundwater chemistry monitoring are shown in Figure 9.

5.3 Landfill Gas Monitoring

Gas monitoring is conducted on a biweekly, weekly, monthly, or quarterly basis; it consists of checks for concentration, composition, temperature, flow, and velocity of gases.

Monitoring and a monitoring plan are not specifically identified as required activities in the 1990 consent decree. An amendment to the consent decree will specify a requirement to implement a compliance monitoring plan approved by Ecology, as well as to implement an operations and maintenance plan. The City of Seattle and Ecology agreed upon a long-term monitoring plan in April 2005 and amended the consent decree to include the monitoring plan.

6.0 Monitoring Results

6.1 Groundwater Flow Determination

Potentiometric contour maps have been generated regularly with each monitoring round for the Upper Gravel Aquifer, the Sand Aquifer, and the Southern Gravel Aquifer. The monitoring well locations are shown in Figure 8. The most current results are shown in the 2004 Annual Groundwater Monitoring Report and the 2005 Groundwater Remediation Status Report 5-Year Review. (Parametrix 2005a, 2005b).

Flow patterns in the Upper Gravel Aquifer and Sand Aquifer have remained relatively stable during the period of record. Flow patterns in the Southern Gravel Aquifer have also remained relatively stable, although recent data in the vicinity of well MW-30C indicate that the flow direction in that area is more northeast/northwest instead of east/west as measured during the remedial investigation. This change has not affected the upgradient and downgradient relationships within the SGA, except that well MW-30C appears to be in a cross-gradient direction relative to the influence of the landfill.

In general, the fluid levels in the shallow groundwater and saturated refuse have declined over time and the overall shape of the potentiometric surface has undergone little change over the last 15 years. The overall flow patterns within and directly under the landfill have generally remained constant over time.

6.2 Water Quality Monitoring

The most recent groundwater quality results are published in the 2004 Annual Groundwater Monitoring Report (Parametrix, 2005a). Summary tables of

groundwater quality data and trend plots of key downgradient and upgradient wells are attached in Appendix C.

The cleanup levels were exceeded for 1,2-dichloroethane and vinyl chloride in samples collected from one upgradient well in the Sand Aquifer (MW-17B) and in samples collected from all five downgradient wells in the Southern Gravel Aquifer (MW-14B, MW-20B, MW-23B, MW-29B, and MW-30C) during the 2004 sampling rounds.

Three additional volatile organic compounds (1,1-DCE; tetrachloroethene [PCE]; and Trichloroethene [TCE]) have shown steadily increasing trends in well MW-21B. Concentrations of these VOCs are above applicable standards (federal Maximum Contaminant Levels (MCLs) for drinking water, and Model Toxics Control Act (MTCA) Method B groundwater cleanup levels), and have shown increases over time.

Manganese has exceeded the cleanup level in one downgradient well (MW-20B) during the 2004 sampling rounds.

Examples of time-series plots illustrating the levels of volatile organic compounds and trends over time in monitoring wells are attached in Appendix C.

The source(s) of upgradient contamination of the Midway Landfill in the Sand Aquifer is still present as indicated by data from upgradient monitoring well MW-21B. The results from these two wells show two different time-concentration trends. The concentrations of several volatile organic compounds detected in MW-17B are decreasing while the concentrations of several volatile organic compounds in MW-21B are increasing. Downgradient groundwater concentrations of volatile organic compounds in the Sand Aquifer and the Southern Gravel Aquifer continue to be affected by this undetermined contamination source.

Upgradient sources of VOCs in groundwater will continue to limit the potential for the chemicals of concern in the Southern Gravel Aquifer to decrease below the ROD cleanup levels, especially because the concentrations of volatile organic compounds in upgradient Sand Aquifer well MW-21B are

increasing over time. Vinyl chloride is a daughter product of the ethenes and ethanes detected in upgradient wells, and both vinyl chloride and 1,2-DCA are also present upgradient of the landfill.

The chemical 1,4-dioxane will be added to the next sampling round at monitoring wells 14B, 17B, and 21B; both wells are upgradient wells with concentrations of volatile organic compounds in the Sand Aquifer at those locations.

6.3 Nature and Extent of Gas Migration

The Upper Gravel Aquifer beneath the landfill is under vacuum from the landfill gas collection system. In 1984, following the initial detection of widespread gas migration outside of the landfill boundary, numerous actions were initiated to extract and control gas migration. Currently 136 offsite gas probes and 139 on-site gas extraction wells are monitored regularly for landfill gas. In the past 6 years (1999-2004), there have been no exceedances of the regulatory value for methane concentrations outside of the landfill.

As of 1997, none of the off-landfill property gas extraction wells were still in use because of the significant decreases in off-property methane gas concentrations. All gas probes and gas monitoring locations surrounding the landfill are under the state's landfill gas regulatory limits and all such monitoring locations where the limit may be approached are under the influence of the gas collection system. During the remedial investigation, numerous hazardous substances were found in the extracted landfill gas including vinyl chloride, xylenes, toluene, benzene and other solvents.

6.4 Surface Water, Seeps, and Soil Contamination

Surface water, seeps and soils in areas around the landfill were sampled in the late 1980's as part of the RI and no contamination from the Midway Landfill was found. Sampling was discontinued for the lack of detection of contaminants.

Whenever there is sufficient flow, the storm water discharged from the stormwater detention pond is monitored for turbidity, dissolved oxygen, PH, temperature and conductivity five day a week during conditions of flow.

6.5 Non-Aqueous Phase Fluid Monitoring

Oil thicknesses in the Shallow Groundwater and Saturated Refuse have generally decreased over the history of monitoring. Only three wells (31, 39D, and 43D) continue to show oil thicknesses of approximately one foot or more. Rapid declines in the measured oil thickness in these wells were observed during the RI period in 1988 and 1989, followed by slight increases through the early 1990s. Since that time, oil thicknesses at 31 and 39D have declined from highs of approximately 8 feet, to approximately 3 feet, and 1 foot, respectively. The oil thickness is regularly measured.

7.0 Measured Effectiveness of Remediation on Fluid Levels

The remediation measures at the Midway Landfill have had a substantial measured effect on fluid elevations, as represented in the potentiometric surface maps, fluid level change maps, and hydrographs in the periodic monitoring reports. The landfill fluid levels have substantially declined from 1989 to 2005 due to the remedial actions. The effectiveness of the remedial actions on fluid levels in the landfill is summarized below.

7.1 Landfill Surface Filling and Detention Pond Construction

Infiltration to the Saturated Refuse from the former surface ponds is estimated to have been 30 to 45 million gallons per year (AGI 1988). Filling of the ponds and complete construction of the lined detention pond in June 1989 has reduced recharge from the surface in the northern and western areas of the landfill. Hydrographs for the west side wells and the fluid elevation change maps show a steady reduction in fluid levels since this time and are evidence of this reduced recharge. Hydrographs for the northern area reflect stable conditions.

7.2 Landfill Cap Installation

Pre-remediation recharge to the Saturated Refuse due to precipitation has been estimated to be approximately 50 to 70 million gallons per year (AGI, 1988). Completion of the cap has reduced recharge significantly. The downward trends seen in the hydrographs and the declines in fluid levels in the west side, south side, and central mound areas demonstrate cover effectiveness.

7.3 Linda Heights Park Storm Water Diversion

The estimated discharge from the Linda Heights Park drain to the landfill ranged from 14 to 55 million gallons per year (AGI, 1990). Analysis of the hydrographs for the Linda Heights Park and central mound areas and the fluid level change maps are evidence that the cut-off of this source of recharge has been very successful in reducing fluid levels in the landfill. Specifically, the hydrographs in the Linda Heights Park area no longer show large peaks during the rainy season, and hydrographs from the central mound area show a continued decrease in fluid levels.

8.0 Updated Review of Upgradient Sources

The ROD acknowledged that contaminated groundwater is flowing toward and under the landfill from upgradient sources, and that some contaminant levels exceed federal and state drinking water standards and MTCA cleanup levels. The upgradient contamination may impact the ability of current and future groundwater leaving the landfill to meet groundwater cleanup standards.

8.1 Background and Summary of Previous Investigations

A hazard assessment was conducted by Ecology in 1990 (SAIC 1991) to identify potential sources of groundwater contamination detected upgradient of the Midway Landfill during the RI. This study identified several potential sources for the chlorinated ethenes and ethanes northwest and upgradient of the landfill, in the vicinity of Pacific Highway South and South 248th Street.

In October 1998, Parametrix conducted a database search to identify sites upgradient of the landfill where historical contaminant releases have occurred (Parametrix 1998). In March 2000, Ecology files were reviewed for 16 of these sites that had confirmed releases to the environment or were properties of potential environmental concern (Parametrix 2000b). The results of the report confirmed the potential for area groundwater contamination from numerous sources upgradient of the Midway Landfill.

8.2 Findings of Updated Study

As part of this five-year review, a database search by EDR Environmental was conducted to assess the status of the properties previously identified, and to determine whether additional contaminated sites have been identified during the past five years (Parametrix, 2005b).

The 2005 EDR report continues to document the presence of many sites upgradient from the Midway Landfill where hazardous substances are present. These include sites without known releases such as RCRA small quantity generators and underground storage tanks sites with existing or former underground storage tanks, as well as sites where documented chemical releases have occurred.

In 2000, the 16 sites that were researched continued to be cited in the databases, and no change in status for any of these sites could be discerned from the available information.

In the 2005, the EDR report identified three additional sites with suspected or documented releases of organic solvents. Three sites (two of the additional sites and one of the previous 16 sites) with solvent releases are in the general vicinity of upgradient well MW-21B. This well has shown increasing concentrations of volatile organic compounds.

The Washington Department of Ecology will contact the owners of the sites identified as possible contaminant sources. The owners will be encouraged to work cooperatively with the Department of Ecology to voluntarily investigate and remediate contamination.

9.0 Institutional Controls

Institutional controls are legal or administrative actions that help ensure the long-term protectiveness of the remedy. At this site, the selected remedy in the ROD consists of three types of institutional controls.

(a) First, the City of Seattle placed a notice in the records of real property kept by the King County auditor, alerting any future purchaser of the landfill property, in perpetuity, that this property had been used as a landfill and was on EPA's National Priorities List, and that future use of the property is restricted. The use restriction shall comply with the post-closure use restrictions under the State of Washington's Criteria for Municipal Solid Waste Landfills (WAC 173-351-500(1)(I) and (2)(c)(iii). The deed notice was recorded in the King County records on July 13, 2005.

(b) Second, the City needs to ensure continued operation and maintenance of the containment and monitoring systems if any portion of the property is sold, leased, transferred or otherwise conveyed. This requirement is an element of the 1988 Response Order on Consent.

(c) Third, notices are needed so that no water supply wells are constructed and used in areas with groundwater contamination emanating from the landfill. These notices shall include at a minimum the following:

- The City will annually notify the Seattle-King County Department of Public Health, Ecology, the local water districts (currently, the Kent and Highline Water Districts) and locally active well drillers in writing of groundwater conditions in the affected areas downgradient of the landfill. This notice will include a map showing the location of the affected areas and indicate which aquifers are affected and their elevations. This information shall be updated annually and can be part of an annual groundwater monitoring report. Locally active well drillers are all well drillers that have drilled wells within King County in the year prior to the notice. Ecology will provide the list of locally active well drillers to the City. This requirement for annual notices can be removed or modified by

Ecology after groundwater cleanup standards have been met in the groundwater monitoring wells downgradient from the landfill.

- As an additional protection, state regulations forbid any private drinking water wells within 1,000 feet of a municipal landfill or 100 feet from all other sources or potential sources of contamination (WAC 173-160-171). State regulations (WAC 173-160-151) also require a property owner, agent of that owner, or a water well operator to notify Ecology of their intent to begin well construction prior to beginning work.

- The first annual notice was sent by the City of Seattle on July 22, 2005, to drilling companies holding active drilling licenses for operations in King County. See Appendix D for a copy of the annual notice statement.

9.1 Garbage Removal from Right of Way for State Route 509

Part of the Midway Landfill (waste and closure improvements) is within the Washington State Department of Transportation Right of Way (WSDOT ROW) under various franchise permits. Under the franchise permits, all of the City's improvements must be removed from the ROW in the event WSDOT requires the use of the area.

WSDOT will implement a State Route 509 (SR-509) project that will connect to Interstate Highway 5 (I-5) near Midway. WSDOT has informed the City of Seattle that additional ROW is needed for highway construction. WSDOT has been actively working on this project for over five years. The Environmental Impact Statement has been completed. ROW acquisition, construction of environmental controls, and design work is underway. Full construction is estimated at 95% probable by 2008.

The Washington State Departments of Transportation and Ecology have discussed this project with the City of Seattle. The discussions have useful in identifying impacts to the landfill due to widening of the highway.

This project will add two southbound lanes and one northbound lane to I-5 at Midway. All City facilities and waste within the limits of the new highway construction will need to be removed from the I-5 ROW.

The project elements that have been specifically identified to date are:

- Removal and disposal of approximately 25,000 cubic yards of waste that is in the ROW.
- Retention or re-sloping of the remaining waste to stabilize the eastern margin of the landfill.
- Modifications to the landfill cover system (to allow waste excavation from the ROW and possible disposal in the landfill), including related modifications to the surface water system and the landfill gas system.
- Removal of 11 landfill gas extraction wells that are in the ROW.
- Relocation/reconfiguration of City force main on the east side of I-5.
- Relocation of existing City storm drain lines on the west side of I-5.
- Evaluation of the capacity of the Midway storm water detention pond to accept additional runoff from the highway.
- Backfill required when the waste is removed.

Since 2002, the eleven landfill gas extraction wells have not been needed nor used for gas extraction. The valves to the wells have been closed. In addition, these eleven wells are part of the fluid level monitoring program. Since 2002, these wells have been dry and not useful for the fluid level monitoring program. These wells do not need to be replaced.

9.1.1 Evaluation of Remedy Performance

Site remediation at the Midway Landfill has focused on source control, with control measures installed between September of 1985 and January 1992.

Remediation activities have included landfill gas control, landfill surface filling and grading, storm water detention pond construction and associated permanent dewatering, landfill cap installation, Linda Heights Park storm water diversion, and ongoing environmental monitoring.

Environmental monitoring data collected in 2004 and 2005 continued to demonstrate that the source controls completed in 1992 have been effective in reducing the saturated thickness of the leachate in the landfill, resulting in overall improvements in groundwater chemistry.

Specific conclusions based on the five-year review are as follows:

- Substantial declines in fluid levels were noted between 1989 and 2005. In the past five years, the overall fluid levels in the landfill remained fairly stable, and in many cases continued to decline. Declining water levels within the landfill waste was a goal of the remedy.
- Groundwater flow directions in the Upper Gravel Aquifer and Sand Aquifer have not changed significantly compared to previous data. Groundwater flow directions have changed slightly in the Southern Gravel Aquifer compared to previous data, with MW-30C in a more cross-gradient position with respect to the landfill's influence.
- The overall groundwater chemistry monitoring network is still adequate for monitoring groundwater flow associated with the landfill. MW-30C was originally installed as a sentinel well between the landfill and the Lake Fenwick water supply wells. Over time the flow in this portion of the SGA has migrated slightly to the northeast, away from MW-30C and the Lake Fenwick wells.
- The fluid levels in the seven key hydraulic wells showed decreasing or stable trends. Historic low fluid level measurements were recorded for 2 of the 7 wells (Well 5 and Well 47D) during monitoring round R-46.
- Due to engineering controls, decreased water levels in monitoring wells in the Upper Gravel Aquifer and Sand Aquifer continued to be observed in 2005. This is a benefit to overall water quality at the

Midway Landfill, although individual water samples can no longer be evaluated from some of these wells.

Record of Decision cleanup levels were exceeded for one or more groundwater contaminants of concern in groundwater samples from one upgradient well in the Sand Aquifer (MW-17B) and the four downgradient wells in the Southern Gravel Aquifer (MW-14B, MW-20B, MW-23B, and MW-29B) during one or both of the 2004 sampling events. The Record of Decision cleanup level for vinyl chloride was exceeded one time in Southern Gravel Aquifer well MW-30C, which is located in a cross-gradient position relative to the landfill. A summary of exceedances are tabulated in Table 2. Time-series plots for ROD COCs for downgradient monitoring wells in the Southern Gravel Aquifer wells are attached in Appendix C to illustrate trends over time and the magnitude of concentrations compared to ROD cleanup levels.

- The time-series plot graphs show that most of the tested parameters are stable or decreasing in concentration over time, except for the volatile organic compounds that are steadily increasing in Sand Aquifer upgradient well MW-21B. The volatile organic compounds detected in well MW-21B that are increasing are 1, 1-DCE; tetrachloroethene [PCE]; and trichloroethene [TCE]. The source or sources of contamination upgradient of the Midway Landfill in the Sand Aquifer are still present as indicated by the data from MW-17B and MW-21B. The results from these two wells are showing two different trends over time. The concentrations of several VOCs detected in MW-17B are decreasing while the concentrations of several VOCs in MW-21B are increasing. Downgradient groundwater concentrations of volatile organic compounds in the Sand Aquifer and the Southern Gravel Aquifer continue to be affected by this contamination source.

Table 2. Comparison of 2004 Contaminants of Concern in Groundwater to ROD Cleanup Levels

				Upper Gravel Aquifer		Sand Aquifer						Southern Gravel Aquifer					
				MW-16	MW-21A	MW-8B	MW-8B (DUP)	MW-17B	MW-17B (DUP)	MW-21B	MW-21B (DUP)	MW-14B	MW-14B (DUP)	MW-20B	MW-23B	MW-29B	MW-30C
Analyte	Units	Cleanup Level[a]	Round ID	UP	UP	UP	UP	UP	UP	UP	UP	DOWN	DOWN	DOWN	DOWN	DOWN	see note 'b'
Manganese	mg/L	2.2	R-45	0.082	0.082	0.176	0.175	0.149	0.151	0.445		1.20		5.42	0.203	1.25	0.753
		.2	R-46					0.144		0.437	0.432	1.08	1.09	5.07	0.192	1.15	
1,2-Dichloroethane	µg/L	5	R-45	1 U	1 U	1 U	1 U	9.2	9.3	1 U		1 U		1 U	4.8	6.3	1 U
			R-46					7.9		1 U	1 U	1 U	1 U	1 U	4	6.5	1 U
Vinyl Chloride	µg/L	0.2*	R-45	0.2 U	0.2 U	0.2 U	0.2 U	0.58	0.59	0.2 U		0.51		0.24	0.62	1.0	0.2 U
			R-46					0.5		0.2 U	0.2 U	0.5	0.54	0.24	0.73	1.2	0.22

ROD = Record of decision

R-45 = Round 45, May 2004

R-46 = Round 46, November 2004

a = Clean up levels established in the Final EPA Record of Decision for the Midway Landfill Site, September 6, 2000.

Exceeds cleanup level established in the Final EPA Record of Decision for the Midway Landfill, September 6, 2000.

U = Indicates the compound was undetected at the reported concentration

DUP = Duplicate.

* = The actual cleanup level in the ROD (USEPA 2000) is 0.02 µg/L. However, pursuant to WAC 173-340-707(2), Ecology utilizes the practical quantification limit (PQL) of 0.2 µg/L to determine compliance with this cleanup standard because the cleanup standard is lower than the PQL.

Note: Up or Down in column title denotes whether the well is located upgradient or downgradient of the landfill's influence.

b = MW-30C is a downgradient well in the SGA, but is cross-gradient from the landfill's influence.

- The detected concentrations of vinyl chloride in downgradient Southern Gravel Aquifer wells are likely related to the chlorinated ethenes (PCE, TCE, 1,1-DCE, and cis-1,1-DCE), and ethanes (1,1,1-TCA) detected in upgradient Sand Aquifer wells MW-17B and MW-21B. These compounds are parent compounds that break down to the daughter product vinyl chloride through biological or chemical processes.

- An updated review of regulatory databases indicated four sites located within approximately one-half mile of the Midway Landfill that have confirmed or suspected releases of solvents to groundwater and/or soil. Three of these upgradient sources are in the vicinity of wells MW-17B and MW-21 where volatile organic compounds have been detected in the Sand Aquifer.

The groundwater quality in the Southern Gravel Aquifer appears to be generally stable or improving, except as noted. Increasing concentrations of some volatile organic compounds and inorganic parameters were observed in wells MW-20B and MW-29B until the 2001 to 2003 timeframe, respectively. Since that time, concentrations have slightly decreased. This may be a reflection of the predicted delay between the initiation of source control and improvements in downgradient groundwater quality.

10.0 Conclusions

- Fluid levels in most of the Shallow Groundwater/Saturated Refuse wells have continued to substantially decline over the past five years, demonstrating the continuing effectiveness of engineering controls.
- Concentrations of Record of Decision contaminants of concern in the Southern Gravel Aquifer have generally remained stable or decreased over the past five years, although levels of some contaminants of concern remain above cleanup levels.
- The Southern Gravel Aquifer does not serve as a current source of drinking water and institutional controls prohibit future drinking

water uses. Therefore, despite the existing levels of contaminants, the remedy continues to be protective of human health and the environment.

- Upgradient sources of volatile organic compounds in groundwater continue to be present and will limit the potential for the contaminants of concern in the Southern Gravel Aquifer to decrease below the Record of Decision cleanup levels. Vinyl chloride is a daughter product of the ethenes and ethanes detected in upgradient wells, and both vinyl chloride and 1,2-dichloroethane are also present upgradient of the landfill.

11.0 Progress since Last Review

This is the first five-year periodic review.

The main activities at this site since the ROD have been monitoring of landfill gases, groundwater, and surface water. The final revisions to the consent decree and restrictions to the deed of the landfill property were agreed upon between the City of Seattle and the Washington Department of Ecology.

The fluid level monitoring program was modified in 2002, with agreement by the Department of Ecology, to cease monitoring of ground water wells that have either gone dry or were not producing useful data.

12.0 Five-Year Review Process

This period review was performed by Ching-Pi Wang, Washington State Department of Ecology site manager for the Midway Landfill. Documents reviewed in preparation of this five year review included: recent annual ground water and landfill gas monitoring reports, the Record of Decision, and remediation status report for the landfill.

The five-year review was not reviewed by the Public Health Seattle & King County per their letter dated March 15, 2005 (see Appendix B). A copy of the final version of this review will be sent to the health district for their records.

The local community in the vicinity of the landfill was notified of the upcoming five year review by a notice in Ecology's Site Register in March 2005. No inquiries of Ecology received

A 30-day public comment period will be held in September, 2005. The comment period will include mailing a fact sheet to the interested public, placing the draft periodic review in public repositories for review, and placing the draft periodic review on the web.

13.0 Site Inspection

The site was visited on May 2, 2005, by Ching-Pi Wang and Sarah Good of the Washington Department of Ecology. Both the landfill cover and fence were in good repair and all systems appeared to be functioning normally. Conversations with Min Soon Yim, the Midway Landfill Closure Site Supervisor, and Jeff Neuner, the Midway Landfill Closure Program Manager of the City of Seattle, indicate landfill operations have been routine.

14.0 Technical Assessment

Question A: Is the remedy functioning as intended by the decision documents?

- The remedy has greatly reduced impacts, but it has not brought the landfill into compliance with respect to 1,2-dichloroethane and vinyl chloride in one upgradient well and four downgradient wells. Manganese exceeds the cleanup level in one downgradient well. The sources of these contaminants are the waste placed in the landfill and upgradient off site.

- Fluid levels in most of the SG/SR wells have continued to substantially decline over the past five years, demonstrating the continuing effectiveness of engineering controls.

- Concentrations of Record of Decision (ROD) contaminants of concern (COCs) in the SGA have generally remained stable or decreased over the past five years, although levels of some COCs remain above cleanup levels (1,2-dichloroethane and vinyl chloride in one upgradient well and four downgradient wells and manganese in one downgradient well).

- The SGA does not serve as a current source of drinking water and institutional controls prohibit future drinking water uses. Therefore, despite the existing levels of contaminants, the remedy continues to be protective of human health and the environment.

- Upgradient sources of VOCs in groundwater continue to be present and will limit the potential for the COCs in the SGA to decrease below the ROD cleanup levels. Vinyl chloride is a daughter product of the ethenes and ethanes detected in upgradient wells, and both vinyl chloride and 1,2-dichloroethane are also present upgradient of the landfill.

Question B: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives used at the time of the remedy still valid?

The exposure assumptions, toxicity data, and remedial action objectives used at the time of the remedy selection are still valid. The cleanup levels established for the site in the ROD are still appropriate and protective considering the current and likely future use of the site. There have been no regulatory or statutory changes that would call into question the protectiveness of the remedy.

The clean up levels selected in the ROD are also still valid. However, because of changes to the Model Toxics Control Act (MTCA) regulations, the vinyl chloride cleanup level is updated to reflect revisions to the state cleanup levels. The cleanup level for vinyl chloride was establish at the state MTCA level of 0.02 µg/L instead of the federal maximum contaminant level of 2 µg/L. The Record of Decision specified the state cleanup standard of 0.02 µg/L with the caveat that the practical quantification limit of 0.2 µg/L would be used as an alternative because the cleanup level was lower than the practical quantification limit.

Revisions to the MTCA implemented in 2001, changed the requirements for developing ground water cleanup standards (Washington State Department of Ecology, 2001a, b; respectively). The MTCA regulations require adjustment of concentrations based on applicable state and federal law to the $1E^{-5}$ risk level.

The revised state cleanup level for vinyl chloride is 0.29 µg/L, using the MTCA adjusted cancer risk of $1E^{-5}$.

With the change of the vinyl chloride state cleanup standard from 0.02 to 0.29 µg/L, the use of the practical quantification limit of 0.2 µg/L as an alternative cleanup is no longer relevant.

The revisions to the vinyl chloride cleanup standard as described above are agreed upon by the City of Seattle and the Washington Department of Ecology. The City of Seattle will issue a revision to Midway Landfill Monitoring Plan (Parametrix 2000a) to document the history of changes to the cleanup standards for vinyl chloride. The new vinyl chloride standard will be utilized in future evaluations of ground-water conditions at the Midway Landfill.

Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

The presence of low concentrations of 1,2-dichloroethane and vinyl chloride in one upgradient and four downgradient wells in the Southern Gravel Aquifer is of concern. In addition, other volatile organic compounds have also been detected upgradient of the landfill. The Washington Department of Ecology will be contacting the owners of properties in the vicinity of the upgradient sources to encourage the property owners to voluntarily investigate and cleanup any contamination that may affect the landfill.

At the request of the US EPA, 1, 4 dioxane testing, will be conducted during the next sampling event at upgradient monitoring wells 17B and 21B in the Sand Aquifer and a third well, MW-14, a downgradient well in the Southern Gravel Aquifer. Well 21B has shown a slight, but steady increase over time of volatile organic compounds. Well 17B has shown a decrease in concentration over time for volatile organic compounds. This is a precautionary step advised by the US EPA for all sites undergoing 5-year periodic review.

The Washington Department of Transportation, in cooperation with the City of Seattle and the Washington Department of Ecology will be expanding Interstate 5 into the highway right-of-way on the eastern side of the landfill. Investigations of the refuse in the right-of-way show that this expansion will not adversely affect the landfill. Gas probes in this portion of the landfill have been devoid of any gases for the past several years. These gas probes will be abandoned prior to expansion of the interstate.

15.0 Issues

The presence of low concentrations of 1,2-dichloroethane and vinyl chloride in one upgradient and four downgradient wells in the Southern Gravel Aquifer is of concern. The Washington Department of Ecology will be contacting the owners of properties in the vicinity of the upgradient sources to encourage the property owners to voluntarily investigate and cleanup any contamination that may affect the landfill.

16.0 Recommendations

The City of Seattle will to continue to operate and maintain remedial systems, including access controls, constructed under the consent decree. In addition, the monitoring programs will need to continue in compliance with the approved monitoring plan. This includes continuing the fluid elevation monitoring program, groundwater chemistry monitoring program, and landfill gas monitoring program in accordance with the Monitoring Plan, and evaluate the results on an ongoing basis.

Specific recommendations and follow-up actions include the following:

- Annually assess the results of the ongoing monitoring program to determine if additional work is needed.
- During the next scheduled ground-water sampling round, test for 1,4, dioxane at monitoring wells 14B, 17B and 21B. If 1,4-dioxane is not detected, and then discontinue testing for this compound. If detected, however, the monitoring program will be adjusted to monitor the trend of this compound.
- Reassess the scope of monitoring on a 5-year interval depending on monitoring results.
- Change the cleanup level for vinyl chloride from 0.2 µg/L to 0.29 µg/L.

- Investigate and cleanup upgradient sources of VOC contamination. Encourage upgradient property owners to voluntarily cleanup contamination. Ecology will send letters to the property owners in the upgradient area to alert them to the groundwater contamination

problem and to encourage them to voluntarily investigate sources and cleanup the contamination. September 2006 is the planned milestone date for notification and consultation with the property owners. September 2007 or 2008 is the target milestone date for substantive action on the upgradient source areas.

The recommendations and follow-up actions are summarized in Table 3.

Table 3: List of Recommendations and Follow-up Actions

Recommendations/ Follow-up Actions	Party Responsible	Oversight Agency	Milestone Date
Annual notice of groundwater contamination is sent to local licensed well drillers.	City of Seattle	Ecology	7/06/05
Assess the results of the ongoing monitoring program to determine if additional work is needed.	City of Seattle	Ecology	annual
Reassess the scope of monitoring on a 5-year interval depending on monitoring results.	City of Seattle	Ecology	annual
Change the cleanup level for vinyl chloride from 0.02 µg/L to 0.29 µg/L.	Ecology	EPA	October 2005
Test monitoring wells 14b, 17B and 21B to ensure 1,4 dioxane is not present	City of Seattle	Ecology	November 2005
Investigate and cleanup upgradient sources of VOC contamination. Encourage upgradient property owners to voluntarily cleanup contamination.	Ecology	Ecology	2010
Ecology will notify property owners by September 2006. Ecology will advise the property owners on cleanup requirements. September 2007 or 2008 is the planned time period for property owners to take substantive action on the upgradient source.	Ecology	Ecology	September 2006, 2007, 2008

17.0 Protectiveness Determination Summary

Based on the information reviewed and the site inspection, the remedial actions are protective of human health and the environment. There have been no changes in the physical conditions of the site that would affect the protectiveness of the remedial actions. Most of the cleanup levels for the contaminants of concern have been achieved. There is no other information that calls into question the protectiveness of the remedy.

The presence of low concentrations of 1,2-dichloroethane and vinyl chloride in one upgradient and four downgradient wells in the Southern Gravel Aquifer is of concern, do not affect the protectiveness of the remedial actions. The Washington Department of Ecology will be contacting the owners of properties in the vicinity of the upgradient sources to encourage the property owners to voluntarily investigate and cleanup any contamination that may affect the landfill.

18.0 Next Review

The next five-year periodic review is due in 2010. The US Environmental Protection Agency will continue to track these reviews on their tracking system.

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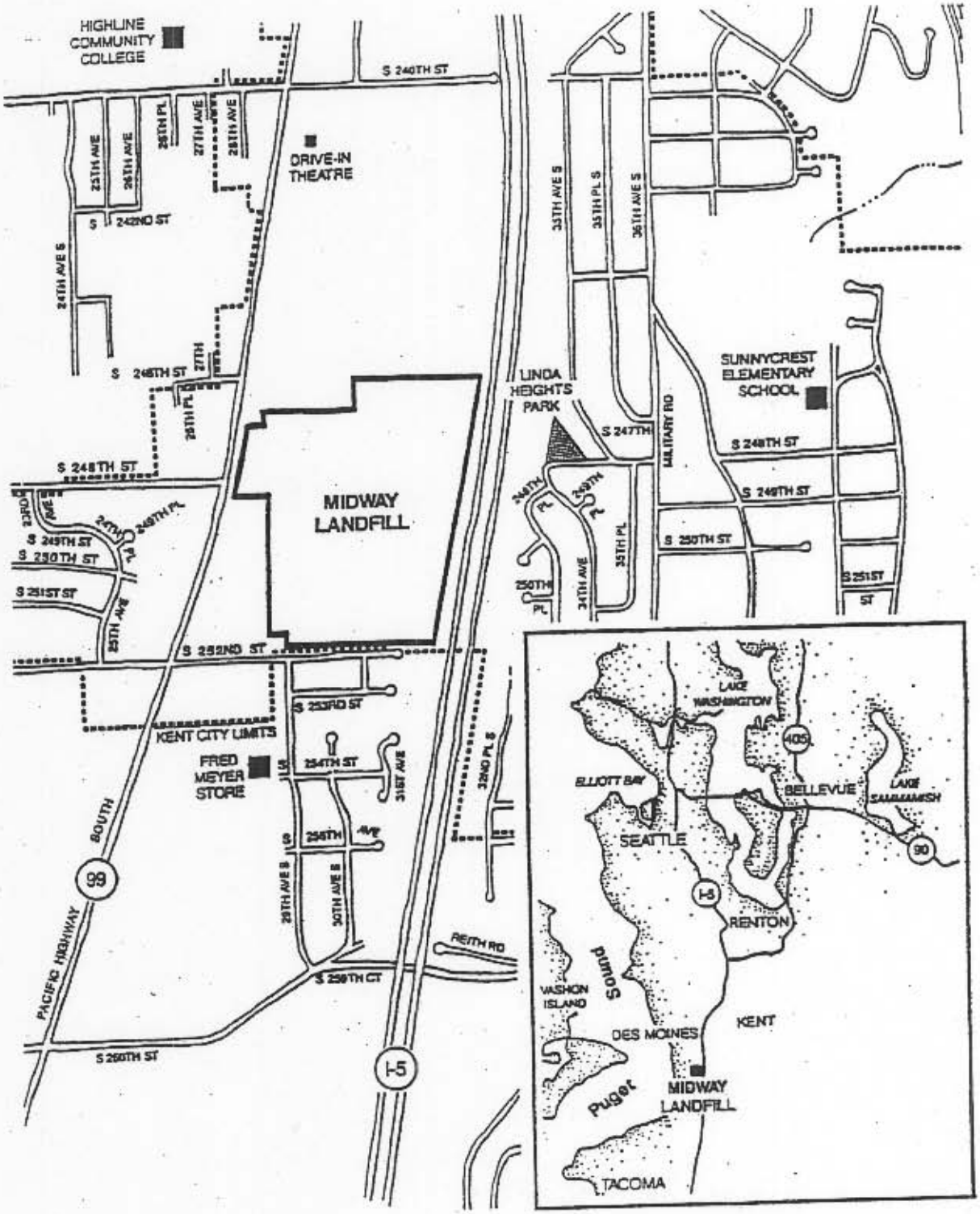

SCALE IN FEET
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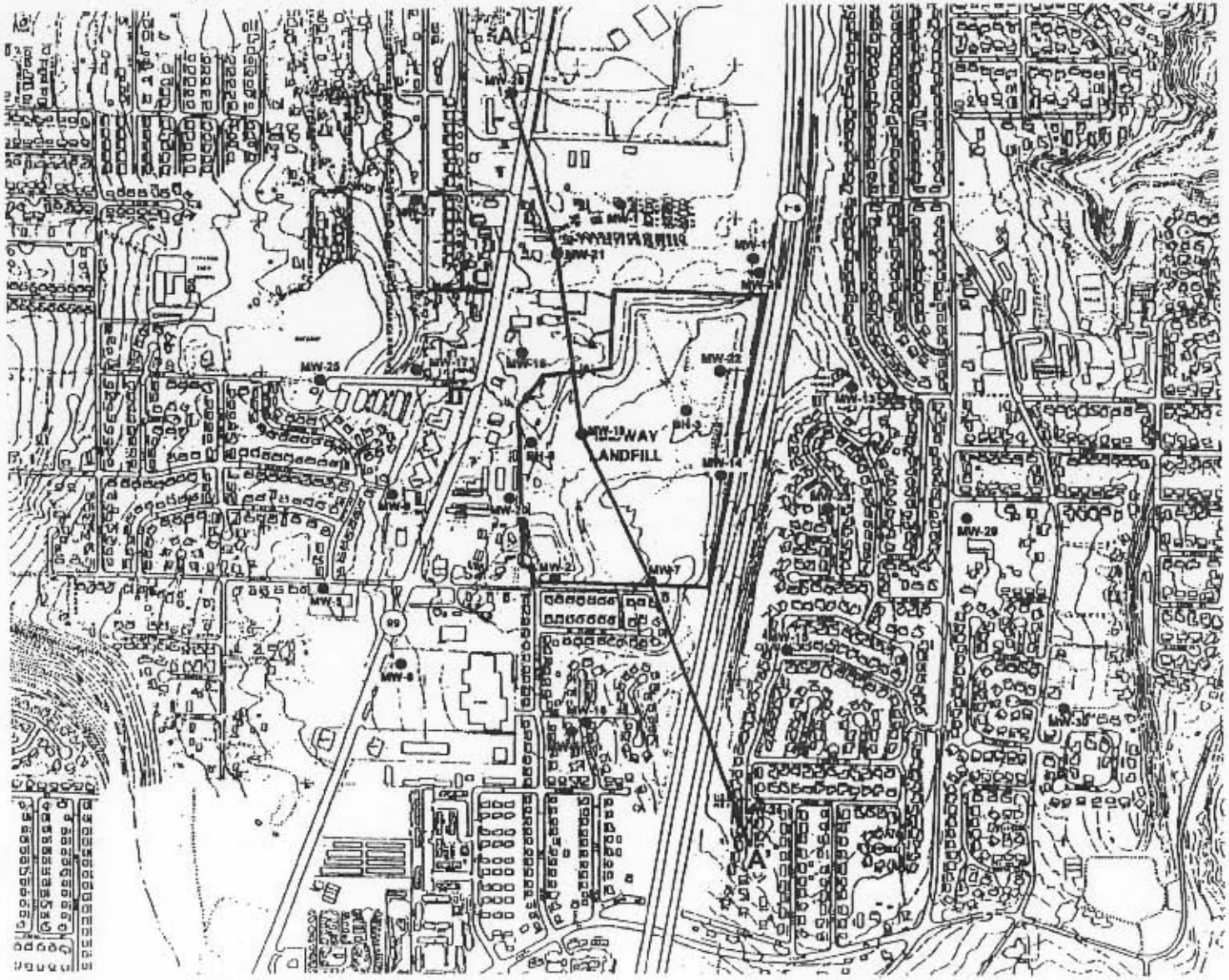
N

Figure 1
Site Location Map
Midway Landfill
Kent, Washington

Source: Parametrix, 2005b.



Source: Parametrix, 2005b

Figure 2
Line of Geologic Section Map
Midway Landfill
Kent, Washington

Base Map Source: AGI (1990)a

SCALE IN FEET
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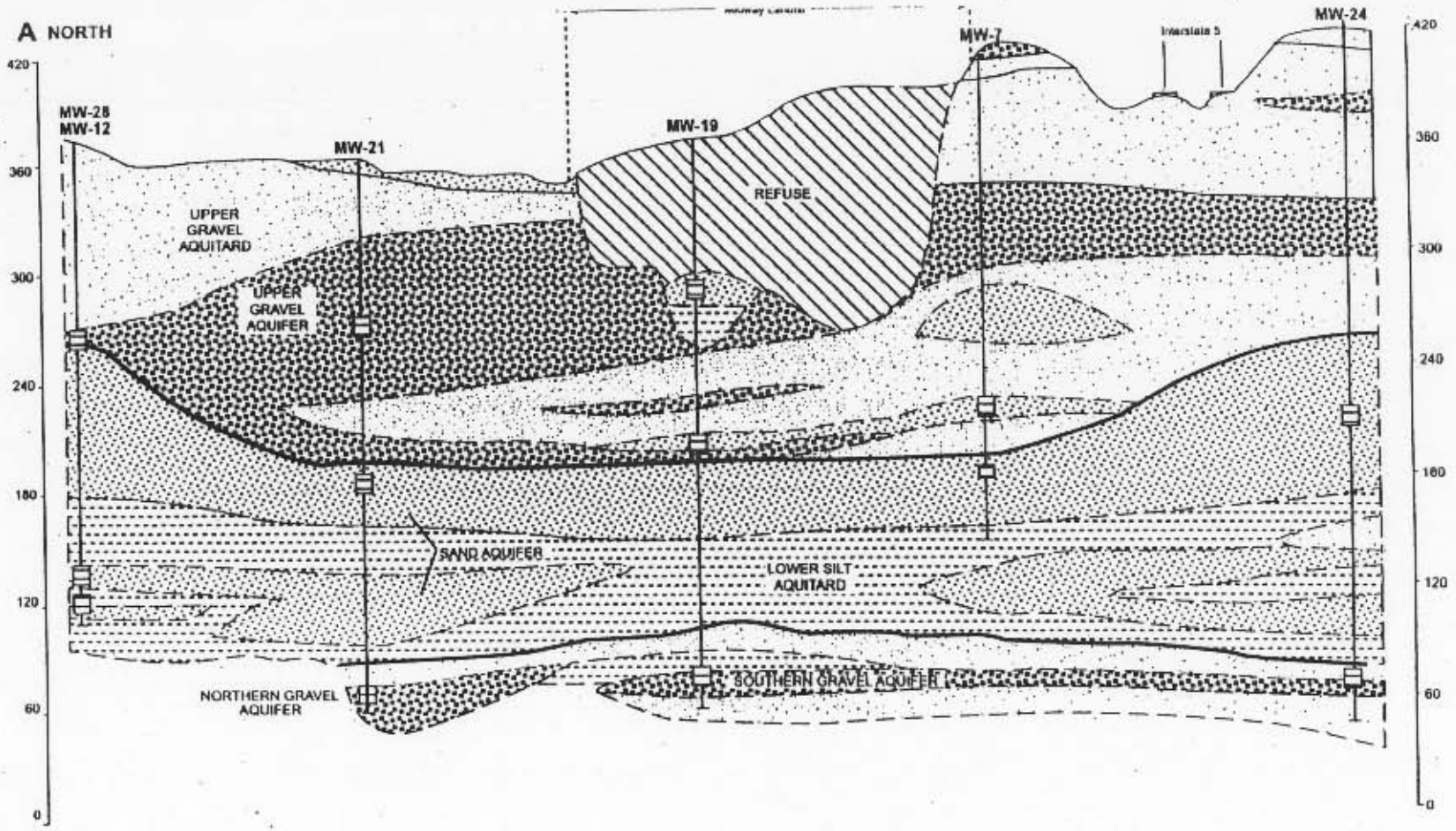
Midway Landfill 5565-1550 039 (01A2) 6/00 (K)



Midway/555-1550-037(04) 4/05 (K)

Source: Geology From AGI (1988)

MW-10 — Well number

Land surface — Approximate water elevation on 4/12/99 - 4/15/99

Screened interval

Major stratigraphic unit contact — Geologic contact

Base of boring

- Municipal landfill refuse
- Poorly sorted mixture of silt, sand, and gravel
- Sand and gravel
- Sand
- Silt, clay, and silty fine sand
- Organic sediments

HORIZONTAL SCALE IN FEET

0 200 400

NOTES: This cross section is a diagrammatic interpretation of sub-surface conditions based on interpolation and extrapolation between borings. Geologic and hydrologic conditions are substantially more complex than depicted.

Cross - Parametrix 2005

Figure 3
Generalized Cross Section of Monitoring Units
Midway Landfill
Kent, Washington

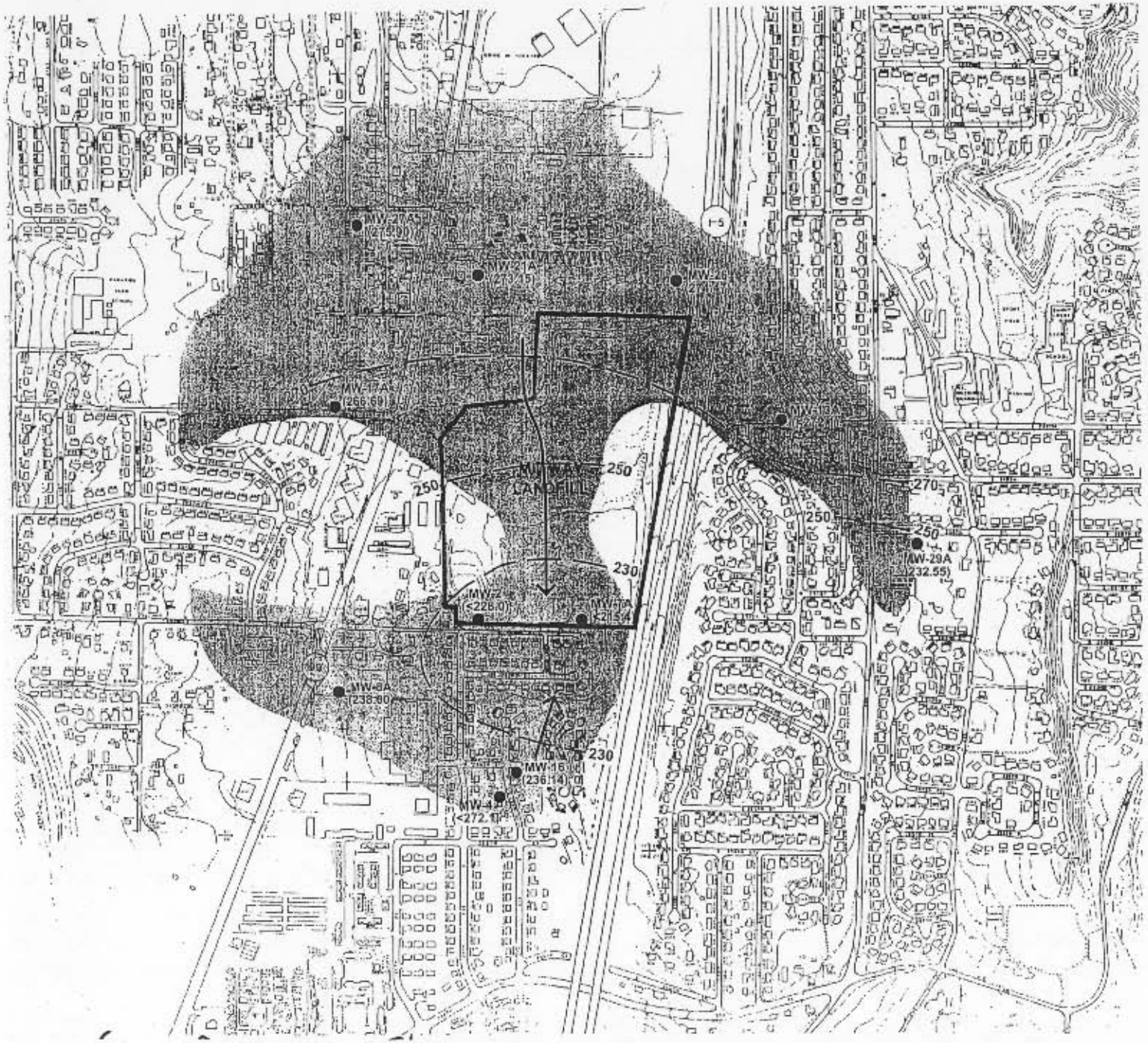


Figure 4
Generalized Upper Gravel Aquifer
Potentiometric Surface Map, March 2005
Midway Landfill
Kent, Washington

MW-7A ●	Upper Gravel Aquifer Monitoring Well Number and Approximate Location
—260—	Approximate Potentiometric Surface Contour (in feet)
(195.0)	Measured Groundwater Elevation in Feet March 28-29, 2005
←	General Direction of Groundwater Flow
NM	Water Level Not Measured
(<188.7)	Well was Dry, Elevation is Elevation of Bottom of Well
	Inferred Extent of Upper Gravel Aquifer

Base Map Source: Supplemental Hydrogeologic and Hydrochemical Investigation, AGI 1990

SCALE IN FEET
0 300 600
N

Parametrix M:\Midway Land\89555-1550.04 (M2)\[10] 4005 (0)

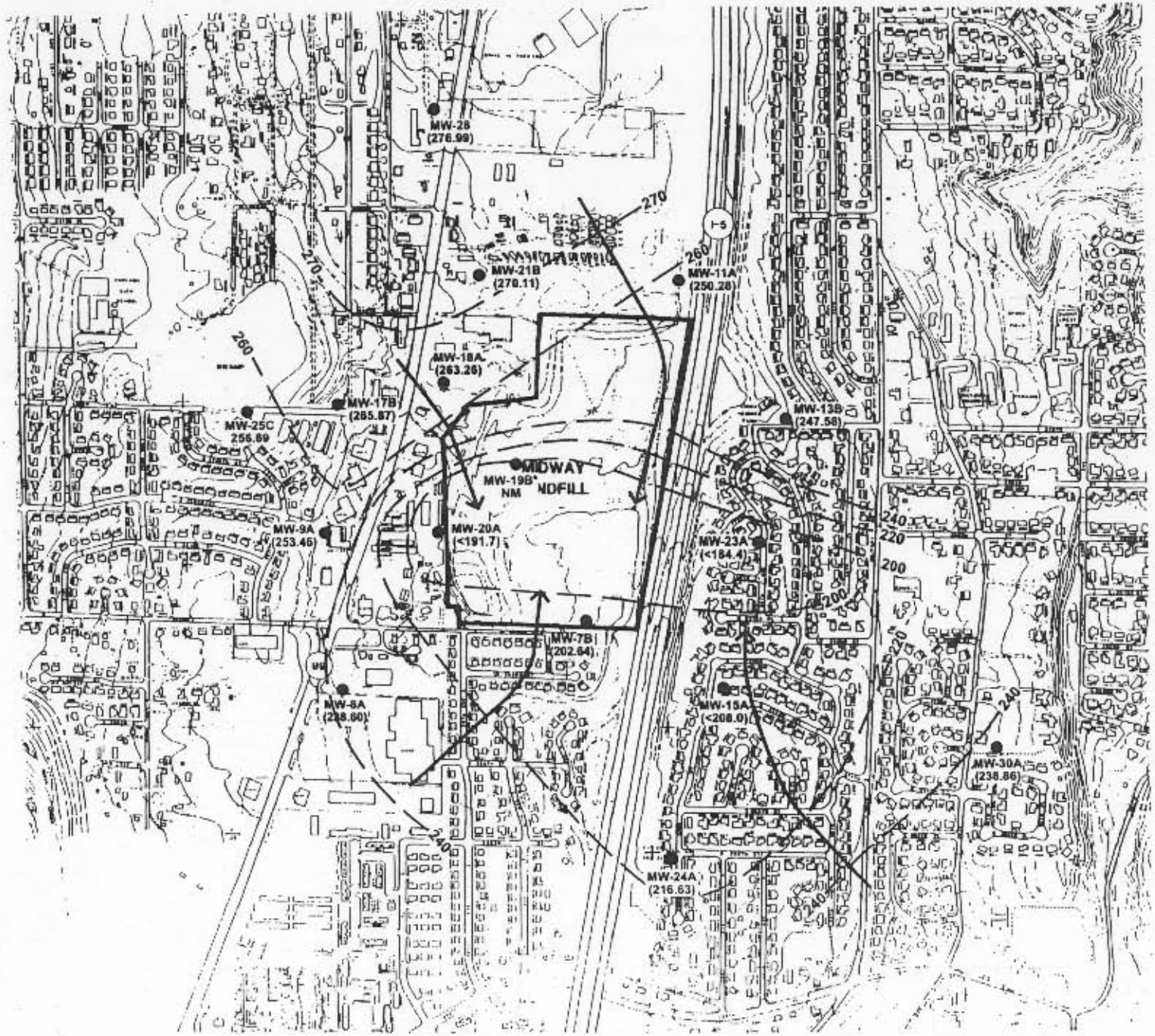


Figure 5
Generalized Sand Aquifer Potentiometric Surface Map, March 2005
Midway Landfill
Kent, Washington

MW-11A ●	Sand Aquifer Monitoring Well Number and Approximate Location
—220—	Approximate Potentiometric Surface Contour (in feet)
(195.0)	Measured Groundwater Elevation in Feet March 28-29, 2005
←	General Direction of Groundwater Flow
NM	Water Level Not Measured
(<184.0)	Well was Dry, Elevation is Elevation of Bottom of Well
*	Although MW-19B is Used for Groundwater Chemistry Monitoring in the UGA, Water Elevations in this Well are Considered Representative of the SA

Source: Parametrix, 2005b

Base Map Source: Supplemental Hydrogeologic and Hydrochemical Investigation, AGI 1990

SCALE IN FEET
0 300 600
N

Parametrix, Inc.

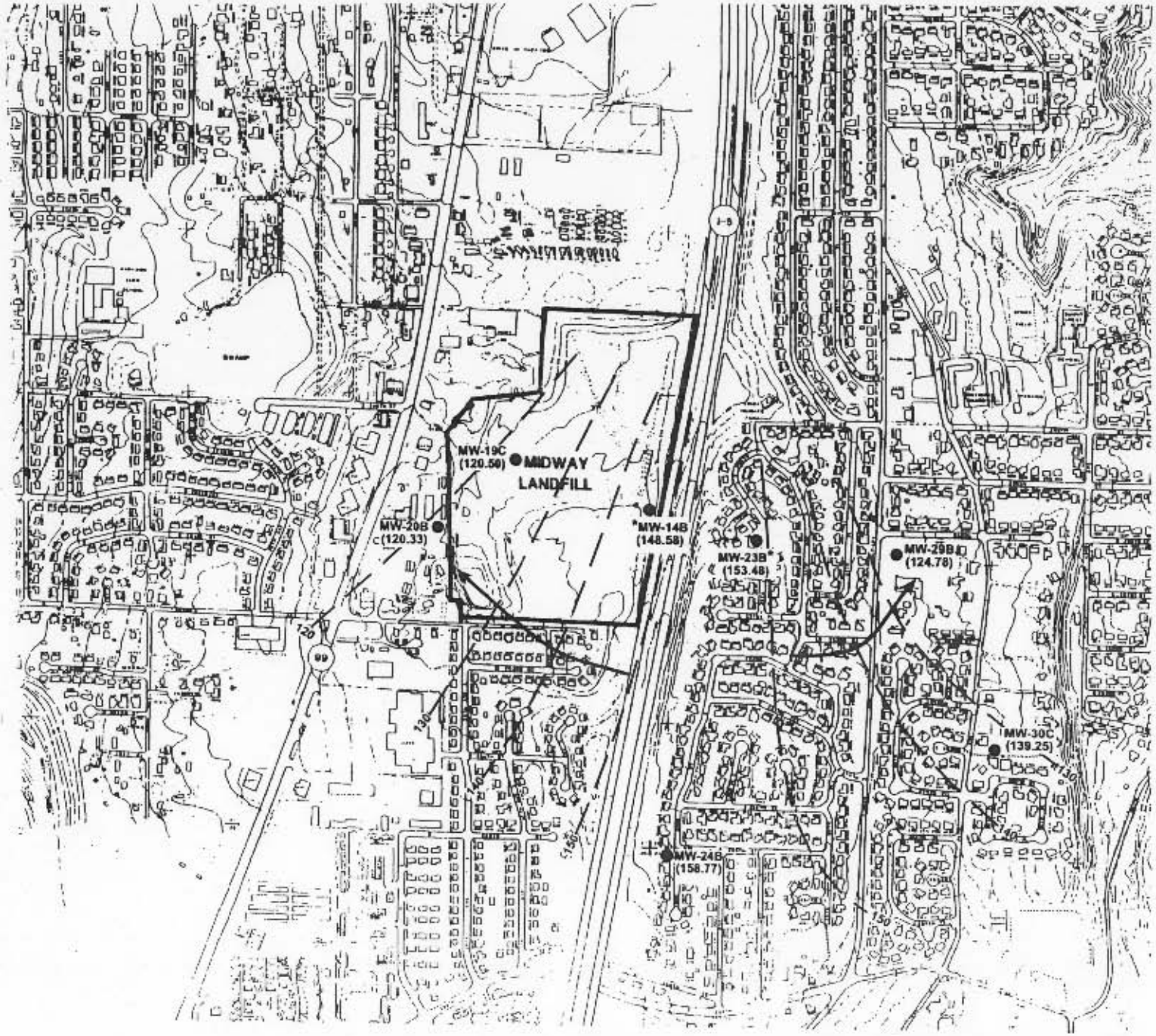


Figure 6
Generalized Southern Gravel Aquifer Potentiometric Surface Map March 2005
Midway Landfill
Kent, Washington

MW-14B ● Southern Gravel Aquifer Monitoring Well Number and Approximate Location

—220— Approximate Potentiometric Surface Contour (in feet)

(195.0) Measured Groundwater Elevation in Feet March 28-29, 2005

← General Direction of Groundwater Flow

* Groundwater Level in These Wells Calculated Using Air Pressure Measurements at the Wellheads

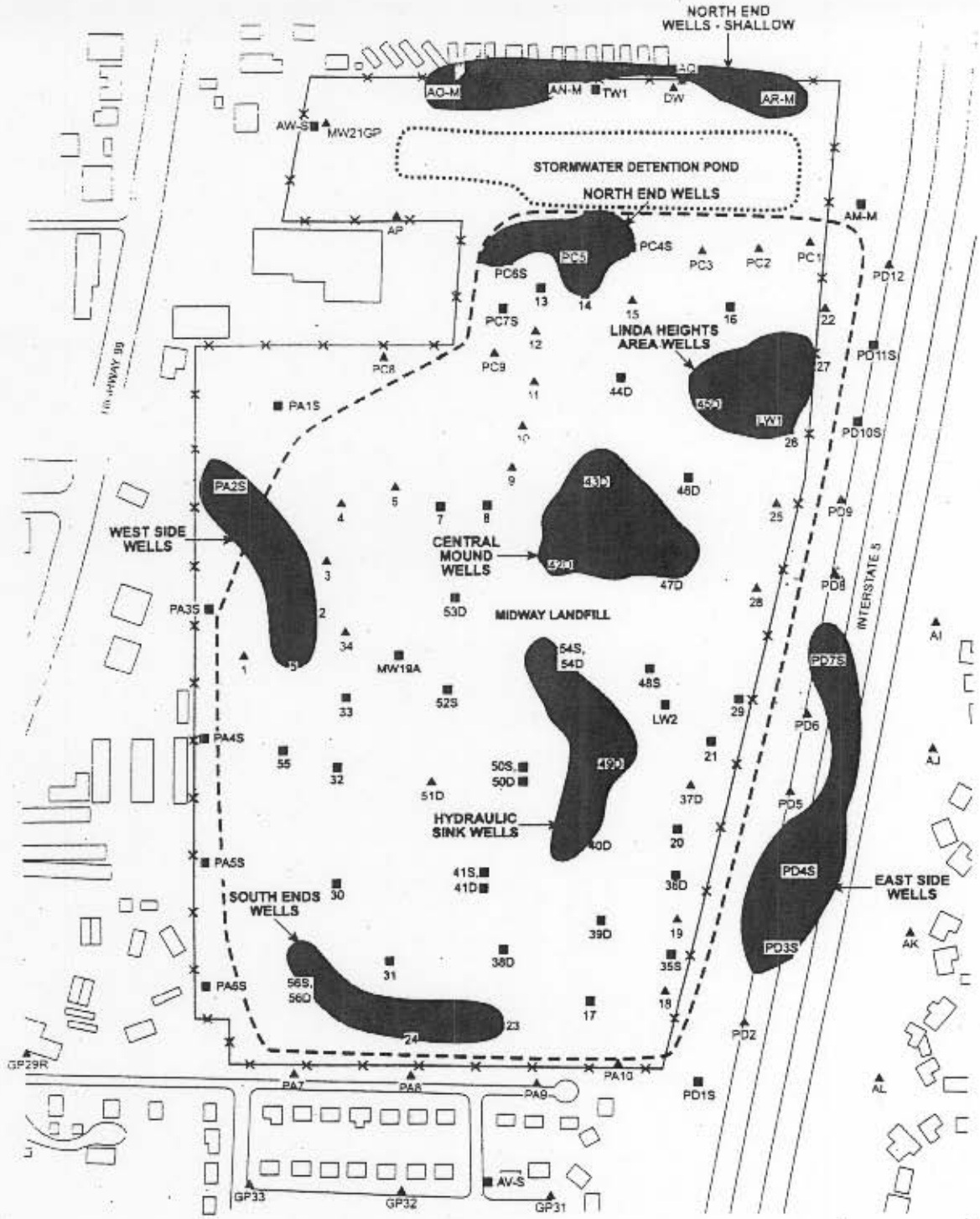
Source: Parametrix, 2005b

Base Map Source: Supplemental Hydrogeologic and Hydrochemical Investigation, AGI 1990

SCALE IN FEET
0 300 600

N

Parametrix



Base Map Source: City of Seattle Department of Engineering
Midway Landfill Vicinity Map, 5-15-86

Parametrix Midway Groundwater Monitoring Plan\555-1550-041\02(10) 4/05 (B)

- 23 — Gas probe, gas extraction well, or groundwater monitoring well number and location. Included in monitoring network. Monitoring frequency twice per year.
- GP33 — Gas probe, gas extraction well, or groundwater monitoring well number and location. Not included in monitoring network.
- 17 — Gas probe, gas extration well, or groundwater monitoring well number and location. Included in monitoring network. Monitoring frequency once every other year.
- Approximate limit of refuse
- Fenced site boundary

SCALE IN FEET
0 125 250

N

Figure 7
Shallow Groundwater/ Saturated Refuse Fluid Level Monitoring Network
Midway Landfill
Kent, Washington

Source: Parametrix, 2005b

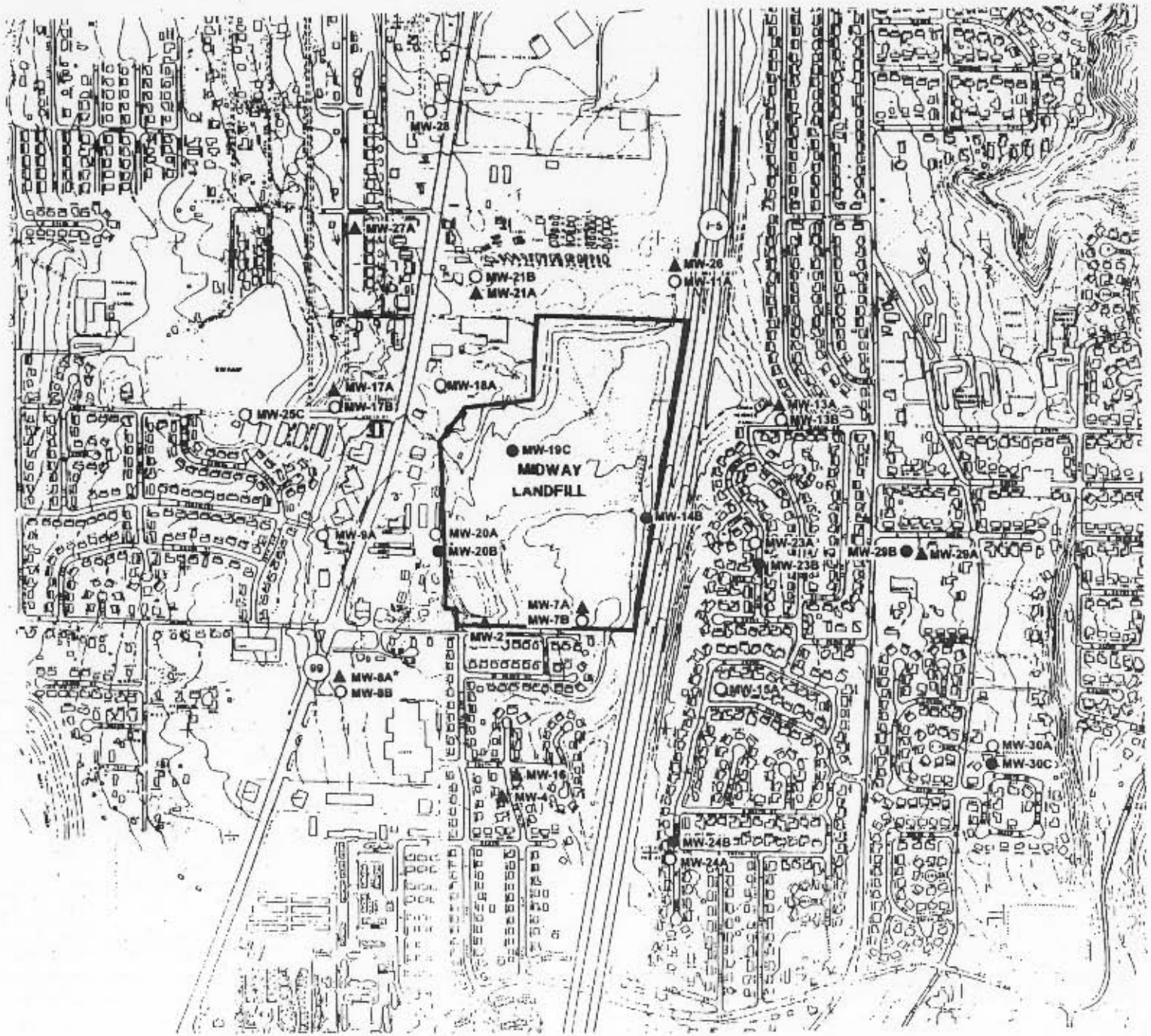


Figure 8
Upper Gravel Aquifer, Sand Aquifer and Southern Gravel Aquifer Fluid Level Monitoring Network
Midway Landfill
Kent, Washington

▲ Upper Gravel Aquifer Monitoring Well

○ Sand Aquifer Monitoring Well

● Southern Gravel Aquifer Monitoring Well

* MW-8A is screened at the contact between the UGA and SA. Fluid levels in this well are considered representative of the UGA and the SA.

Source: Parametrix, 2005b

Base Map Source: Supplemental Hydrogeologic and Hydrochemical Investigation, AGI 1990

SCALE IN FEET

0 300 600

N

Parametrix

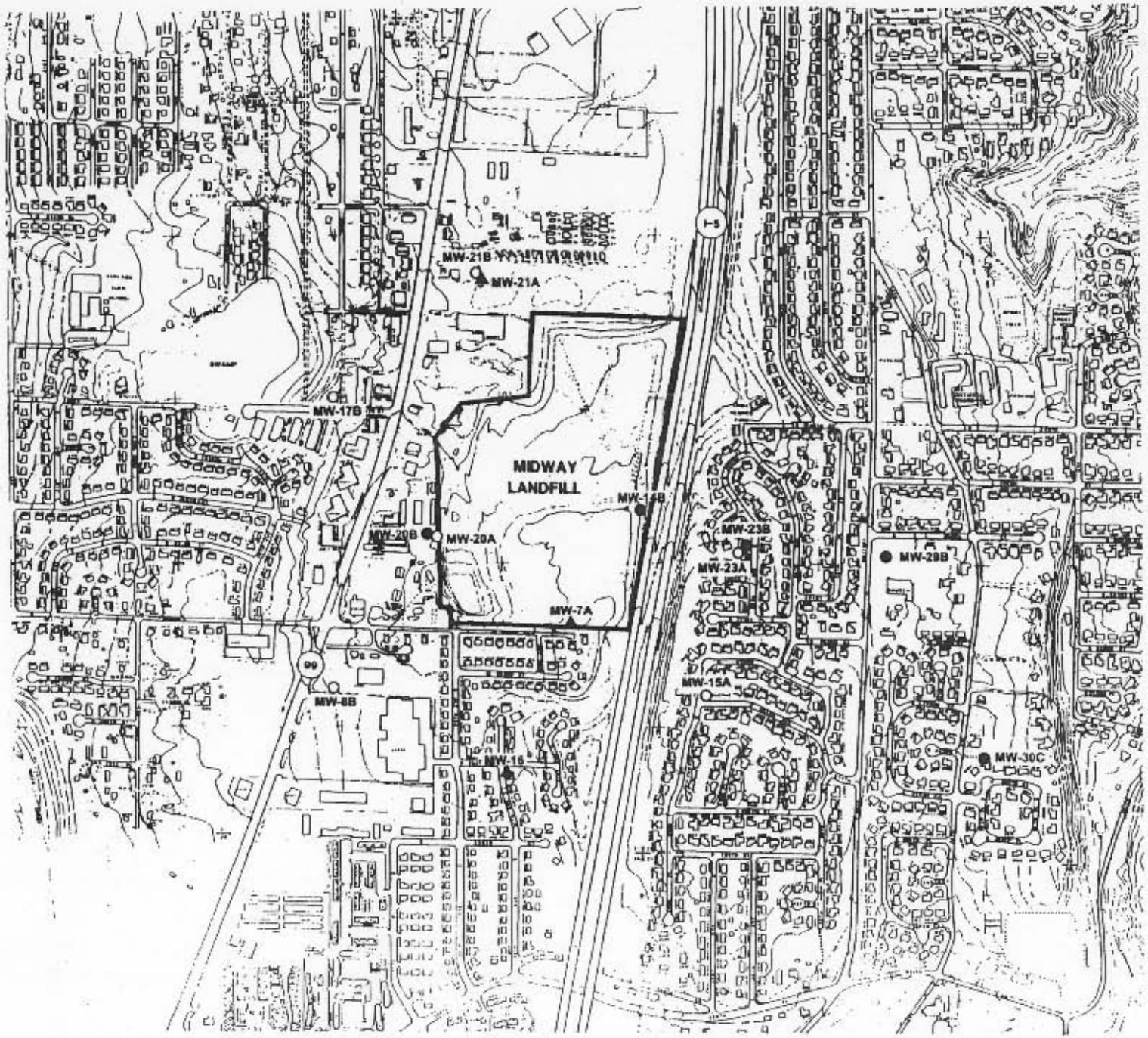


Figure 9
Well Locations for Groundwater Chemistry Monitoring
Midway Landfill
Kent, Washington

MW-16 ▲ Upper Gravel Aquifer Monitoring Well Number and Approximate Location

MW-17B ○ Sand Aquifer Monitoring Well Number and Approximate Location

MW-14B ● Southern Gravel Aquifer Monitoring Well Number and Approximate Location

Source: Parametrix, 2005b

Base Map Source: Supplemental Hydrogeologic and Hydrochemical Investigation, AGI, 1990

SCALE IN FEET
0 300 600

N

Parametrix, Inc. Midway Landfill555-1550 04/30/2010 4:05 PM

Appendix A

Example letter to inquiries about environmental conditions of the landfill for real estate transactions.

Exhibit A.

City of Seattle

Gregory J. Nickels, Mayor

Seattle Public Utilities
Chuck Clarke, Director

Solid Waste Field Operations

April 14, 2005

[redacted]

Dear M[redacted]i:

RE: Status of Cleanup at the Midway Landfill Superfund Site in Kent, Washington.

I am pleased to provide this information regarding the status of cleanup activities at the Midway Landfill. I have also provided specific information with regard to your residence in the Midway vicinity. This information can be found on page 3 of this letter.

Background. The Midway Landfill, located about 15 miles south of Seattle within the City of Kent, was operated by the City of Seattle from 1966 through October 1, 1983. The site was used primarily for disposal of demolition debris, wood waste and yard waste, although there was also the disposal of some industrial wastes at the site.

Landfill Gas. In the summer of 1985 it was discovered that landfill gas had migrated away from the landfill through underground soils. As a result, about 140 gas probes were installed in the Midway vicinity. These probes, which allow us to monitor soil gas, showed that, although landfill gas was detectable on all sides of the site, the most significant migration had occurred to the east and south. Seattle also began a program of monitoring for homes and businesses in the Midway vicinity; at one time more than 300 homes were being monitored. Eleven families were evacuated from their homes between November 1985 and February 1986.

In response to the landfill gas problem, Seattle began the construction of a gas extraction system to prevent gas from leaving the site and to remove gas that had already migrated from the site. Construction of the first thirty wells at the site perimeter began in late 1985. Additional wells were constructed in the interior of the site and around the outside perimeter starting in late 1986.

Nineteen individual wells were also constructed in residential areas east of the site to remove off-site pockets of gas beginning in the spring of 1986. Gas from the on-site wells was burned off through two large temporary flares. Gas from off-site wells was vented to the air after passing through large carbon filters.

The data indicate the gas extraction system was very effective in removing gas from soils in the Midway vicinity. The majority of shallow soils in the vicinity showed gas at or below background levels (200 to 400 ppm (parts per million)) by 1987. By August 1987, gas was no longer detectable in homes above the background level for ambient air (100 ppm). In fact, most homes showed 0 ppm of gas. Home monitoring was discontinued. Since that time we have continued to see significant improvements in the removal of gas from soils surrounding the site. At present, gas is above background levels in deeper levels (40 to 100 feet below ground surface) in only two off-site areas: about 1100 feet east of the southeastern side of the site and about 1000 feet east of the northeastern corner. Both areas are under the control of the gas extraction system. This means that the gas is under a vacuum and moving back towards the site rather than upwards. All of the nineteen off-site gas extraction wells have been shut down, and two are being used as gas probes. The gas pockets that these wells were constructed to evacuate have been eliminated.

Good Neighbor Program. In April 1986, Seattle established the "Good Neighbor Program" in response to citizen concerns about the value of their property. Through this program, the City guaranteed the fair market value of single family homes in a defined area around the landfill. The City agreed to maintain this program until at least 10 homes in the area had sold at fair market value or until two years after gas measured 100 ppm (0.01 percent) or less in nearby residences. The program ended in May 1988 when well over 10 homes had sold at or above fair market value. As stated above, gas in homes has been below 100 ppm since August 1987.

Participants in the program were required to actively list their homes for six months. If the City had not approved an offer on the home during that time period, the City then purchased the home at the agreed upon fair market value. During the course of the program, 349 homeowners participated, though 61 decided to drop out of the program. Of these residences, 122 sold within the six-month listing period with a City subsidy (to bring the total value up to the agreed upon fair market value), and the City purchased 166 homes. The homes purchased by the City were also listed and sold. By the end of 1988, only 22 homes remained to be sold. By December 1989, only one home remained, which was sold in 1990.

Superfund Status. In May 1986, the Midway Landfill was declared a federal "Superfund" site and listed on the National Priority List (NPL) for cleanup. As a result, Seattle conducted a detailed remedial investigation and feasibility study (RI/FS) under federal Superfund laws. Areas of investigation included geology and groundwater; surface water, seeps and soils; ambient air quality; and landfill gas. The RI was completed in September 1988.

Landfill gas was remediated by the measures described above. In regards to groundwater, the contamination extends up to about 2500 feet east/southeast of the site and about 1000 feet west at very deep levels (generally 300 to 400 feet below the ground surface). However, the contamination is at low levels (just above federal drinking water standards). No drinking water aquifers are affected by this contamination and no one comes into contact with this water. Residents in the vicinity get their water from a public supply system whose wells are several miles from the site.

The second part of the Superfund study, the Feasibility Study (FS), was completed in December 1990. The FS evaluated alternatives for cleanup of any existing or future contamination at the site. At this point in time, we are in the process of negotiating a "Cleanup Action Plan" (CAP) with the State Department of Ecology, which formalizes our cleanup/closure actions at Midway. The CAP is expected to be completed by the end of the year.

Remedial Actions. Thus far the following remedial actions have been completed at the site:

- Midway Landfill Temporary Landfill Gas Extraction System Construction

- Midway Landfill Onsite Grading and Drainage Construction (including the detention pond)
- Midway Landfill Permanent Flare Facility Construction
- Midway Landfill Downstream Drainage Improvement Project (surface water discharge pipeline to McSorley Creek and associated drainage improvements along Pacific Highway So.)
- Midway Landfill Upstream Drainage Improvement Project (I-5 pump station and associated stormwater conveyance pipeline to the Midway detention pond)
- Midway Landfill Final Cover and Permanent Gas Extraction System Project (including landfill capping and permanent gas system construction)

Specific Information. In an e-mail request to Jeff Neuner, specific information regarding the property delineated by shading on the enclosed map was requested. Enclosed are copies of the 2003/2004 monitoring data for the gas probes nearest this property. The data shows that the landfill gas in the soil zones near the property (Probe AO, probe AN, probe AQ, probe AR, and probe AW) is at zero parts per million.

The gas levels in the intermediate and deep levels of the probes also show no presence of landfill gas.

Levels of landfill gas in the vicinity of this property were never found to be above background levels. For that reason, off-site gas extraction wells were not located there. Also, no groundwater contamination has been found in this area as shown by the enclosed 2004 data for groundwater monitoring well MW-21. An extensive compilation of gas and groundwater data may be obtained at the Kent Public Library, in their public repository. These data are contained in the Remedial Investigation and Feasability Study Reports on the Midway Landfill. For more current information, you may call me at 684-7693.

The landfill gas extraction system at the Midway Landfill has been doing an excellent job of drawing off the combustible gas and harmlessly flaring it. Thus gas is no longer leaving the site. In addition, the amount of gas generated within the landfill has decreased dramatically over the last ten years. For these reasons, little gas has been detected in the surrounding neighborhoods for years. As a result, some of the gas probes that were used early in the program to establish the extent of the gas are no longer monitored because no gas has been detected in them. Because of this fact, the State Department of Ecology approved the removal of several of these old probes years ago. State law requires that abandoned wells/probes must be drilled out and sealed in a specific way, and that is the task that the City is undertaking at this time. Many probes remain in place to monitor the situation such as the two noted above. These will be monitored and studied for the foreseeable future.

The information provided in this letter, other than the gas monitoring and groundwater monitoring data, summarizes an extensive history relating to the closure of the Midway Landfill. Since this information is only general in nature, the City of Seattle does not intend that anyone reading this letter will rely solely on this information in forming a decision to purchase or finance real property. If you are concerned about the effect of the landfill closure on property values in the area of the Midway Landfill, you should contact a qualified appraiser or environmental consultant or independently review the scientific studies and other reports relating to the landfill. Further, this letter should not be construed or relied on by anyone as an endorsement or recommendation to invest, purchase or finance real property.

I hope that this information has been helpful. Please contact me at 206-684-7690 if you have any questions.

Sincerely,

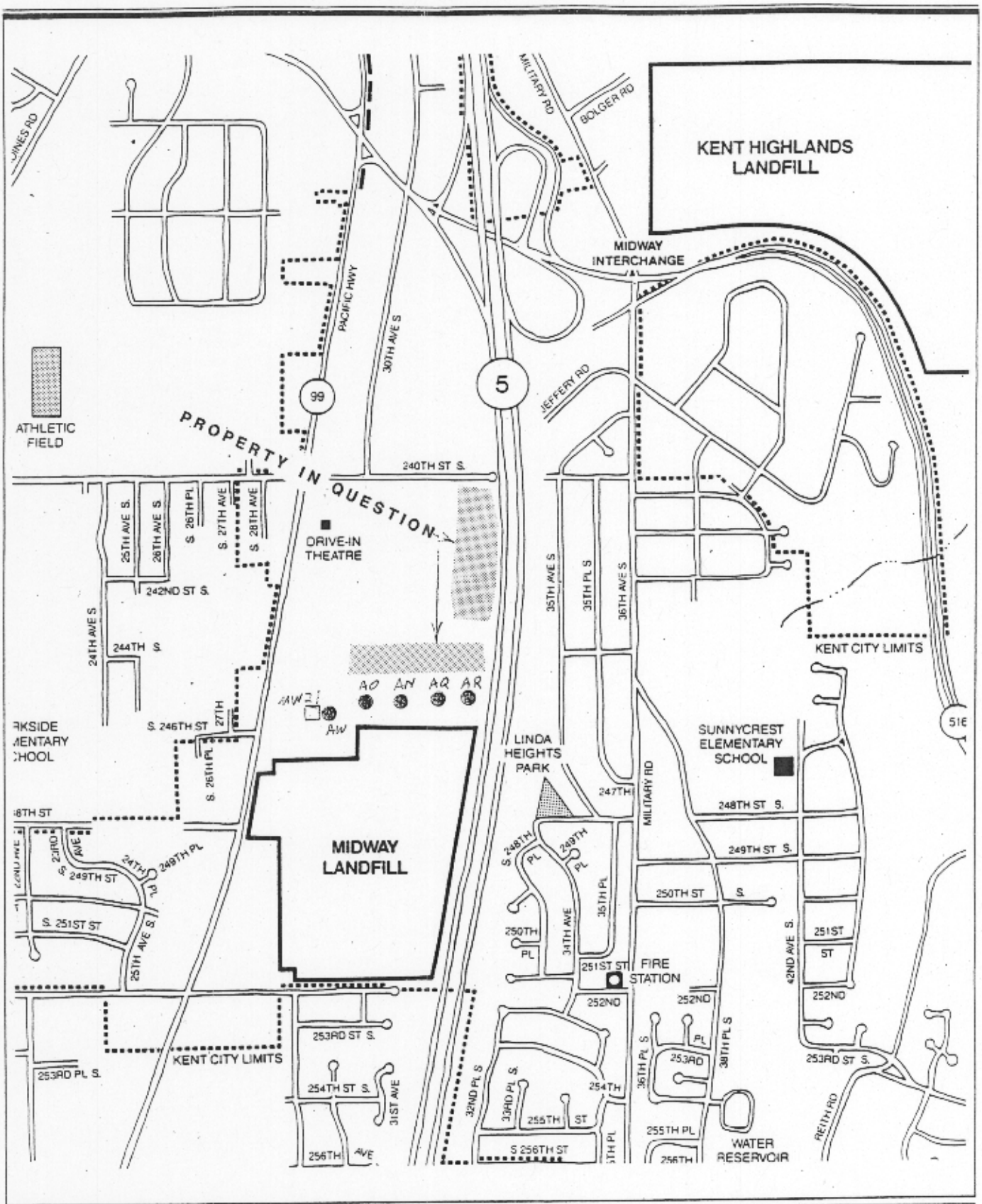
Philip R. Woodbourne //FOR//

Jeff Neuner
Landfill Manager

JHN/prw

Enclosures

cc: Sean McDonald
Jeff Neuner
Marya Silvernale
Midway Files



April 14, 2005

Figure I-2.
Midway Landfill vicinity map.

10205975

Appendix B

March 15, 2005 letter from Public Health - Seattle & King County regarding review and oversight activities at the Midway Landfill.

Exhibit B.

Public Health
Seattle & King County
HEALTHY PEOPLE. HEALTHY COMMUNITIES.
Alonzo L. Plough, Ph.D., MPH, Director and Health Officer

March 15, 2005

Steve Alexander
Northwest Regional Office Toxics Cleanup Program Section Manager
Washington State Department of Ecology
3190 160th Ave SE
Bellevue, WA 98008-5452

RE: Activities Related to Kent-Highlands and Midway Landfills

Dear Mr. Alexander:

Public Health – Seattle & King County (PHSKC) adopted revisions to its solid waste regulations, The Code of the King County Board of Health Title 10, effective December 21, 2003. The new code incorporates changes in program funding that made the PHSKC Solid Waste Program primarily permit fee supported. Traditionally PHSKC has provided regular periodic field inspections at and reviewed documents related to the Kent-Highlands and Midway landfills, despite the fact these facilities are not under PHSKC permits. Under our new fee structure, PHSKC is no longer able to perform field inspections or document reviews for these landfills unless a funding source becomes available to meet our costs for providing such services.

We are informing you of this because we understand that these facilities are CERCLA sites overseen by Department of Ecology (DOE). We understand that DOE already routinely reviews documents related to potential environmental/health impacts resulting from the two facilities. For this reason, it seems most appropriate that DOE rather than PHSKC perform any needed periodic inspections. Alternatively, PHSKC could inspect the facility under contract with DOE.

If you have questions or would like to discuss this matter please contact Bill Heaton, Solid Waste Program Supervisor, at (206) 205-4397 or bill.heaton@metrokc.gov.

Sincerely,

Bill Lawrence, Manager
Environmental Hazards Section

BL:sf

cc: Peter Christiansen, Department of Ecology, NW Regional Office
Bill Heaton, Supervisor, Solid Waste Program
Gordon Clemans, Health and Environmental Investigator III
Gary Criscione, Health and Environmental Investigator II

Environmental Health Services Division
999 Third Avenue, Suite 700 • Seattle, WA 98104-4039
T 206-205-4394 F 206-296-0189 TTY Relay: 711
www.metrokc.gov/health

Appendix C

Annual letter from the City of Seattle to local well drillers.

Annual Notice of Groundwater Conditions in Affected Areas Downgradient of the Midway Landfill[1]

The City of Seattle is the owner and previous operator of the Midway Landfill, located north of South 252nd Street between SR-99 and I-5 in Kent, Washington (Figure 1).

Extensive testing of groundwater within and surrounding the landfill area has indicated the presence of various contaminants that do not meet federal drinking water standards (MCLs) or state groundwater standards (MTCA Method B cleanup levels). The affected groundwater monitoring wells downgradient of the Midway Landfill are listed in Table 1 and their locations are shown in Figure 2. A summary of the contaminants of concern and their reported concentrations in groundwater are presented in Table 2. A summary of results for additional parameters is presented in Table 3.

In compliance with a Consent Decree between the City of Seattle and the Washington State Department of Ecology (Ecology), and in accordance with a Record of Decision between the City of Seattle and the United States Environmental Protection Agency (U.S. EPA), Ecology and all appropriate local health districts, water districts, and certified well drillers are hereby notified that no water supply wells are to be constructed or used in the areas of known groundwater contamination listed in Table 1 and shown on Figure 2.

This is an annual notification.

[1] The City will annually notify the Seattle-King County Department of Public Health, Ecology, the local water districts, and locally active well drillers in writing of groundwater conditions in the affected areas downgradient of the landfill.

Table 2. Comparison of Contaminants of Concern in Groundwater to ROD Cleanup Levels

				Upper Gravel Aquifer		Sand Aquifer						Southern Gravel Aquifer					
		Clean up	Round	MW-16	MW-21A	MW-8B	MW-8B (DUP)	MW-17B	MW-17B (DUP)	MW-21B	MW-21B (DUP)	MW-14B	MW-14B (DUP)	MW-20B	MW-23B	MW-29B	MW-30C
Analyte	Units	Level[a]	ID	UP	UP	UP	UP	UP	UP	UP	UP	DOWN	DOWN	DOWN	DOWN	DOWN	DOWN
Manganese	mg/L	2.2	R-45	0.082	0.062	0.176	0.175	0.149	0.151	0.445		1.20		5.42	0.203	1.25	0.753
			R-46					0.144		0.437	0.432	1.08	1.09	5.07	0.192	1.15	
1,2-Dichloroethane	µg/L	5	R-45	1 U	1 U	1 U	1 U	9.2	9.3	1 U		1 U		1 U	4.8	6.3	1 U
			R-46					7.9		1 U	1 U	1 U	1 U	1 U	4	6.5	1 U
Vinyl Chloride	µg/L	0.2*	R-45	0.2 U	0.2 U	0.2 U	0.2 U	0.58	0.59	0.2 U		0.51		0.24	0.62	1.0	0.2 U
			R-46					0.5		0.2 U	0.2 U	0.5	0.54	0.24	0.73	1.2	0.22

ROD= Record of decision

R-45= Round 45, May 2004

R-46= Round 46, November 2004

a = Clean up levels established in the Final EPA Record of Decision for the Midway Landfill Site, September 6, 2000.

[ ] = Exceeds cleanup level established in the Final EPA Record of Decision for the Midway Landfill, September 6, 2000.

U = Indicates the compound was undetected at the reported concentration

DUP= Duplicate.

* The actual cleanup level in the ROD (USEPA 2000) is 0.02 µg/L. However, pursuant to WAC 173-340-707(2), Ecology utilizes the practical quantitation limit (PQL) of 0.2 µg/L to determine compliance with this cleanup standard because the cleanup standard is lower than the PQL.

Notes: Up or Down in column title denotes whether the well is located upgradient or downgradient of the landfill's influence.

Table 3. Summary of Detected Groundwater Quality Parameters Not Included in the ROD and Comparison to Regulatory Standards (continued)

Analyte	Units	MCL[a]	MTCA B[b]	Round ID	Upper Gravel Aquifer		Sand Aquifer[c]						Southern Gravel Aquifer					
					MW-16	MW-21A	MW-8B	MW-8B (DUP)	MW-17B	MW-17B (DUP)	MW-21B	MW-21B (DUP)	MW-14B	MW-14B (DUP)	MW-20B	MW-23B	MW-29B	MW-30C
					UP	UP	UP	UP	UP	UP	UP	UP	DOWN	DOWN	DOWN	DOWN	DOWN	DOWN
Volatile Organics (continued)																		
Chloroethane	µg/L			R-45	1 U	1 U	1 U	1 U	6.7	6.1	1 U		1 U		1 U	1 U	1 U	1 U
				R-46					5		1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
PCE	µg/L	5*	0.658	R-45	1 U	1 U	1 U	1 U	1 U	1 U	62		1 U		1 U	1 U	1 U	1 U
				R-46					1 U		100	100	1 U	1 U	1 U	1 U	1 U	1 U
TCE	µg/L	5*	3.98	R-45	1 U	1 U	1 U	1 U	1 U	1 U	4.2		1 U		1 U	1 U	1 U	1 U
				R-46					1 U		4.4	4.3	1 U	1 U	1 U	1 U	1 U	1 U
Trichlorofluoro-methane	µg/L		2400	R-45	1 U	3.8	1 U	1 U	1 U	1 U	6.7		1 U		1 U	1 U	1 U	1 U
				R-46					1 U		7.2	7.5	1 U	1 U	1 U	1 U	1 U	1 U

= Exceeds Federal MCLs or MTCA Method B Groundwater Cleanup Level.

* = Primary MCL Standards; EPA National Primary Drinking Water Regulations (40 CFR 141 59 FR 34322).

** = Secondary MCL Standards; EPA National Primary Drinking Water Regulations (40 CFR 141 59 FR 34322).

[a] = MCL/Federal maximum contaminant level.

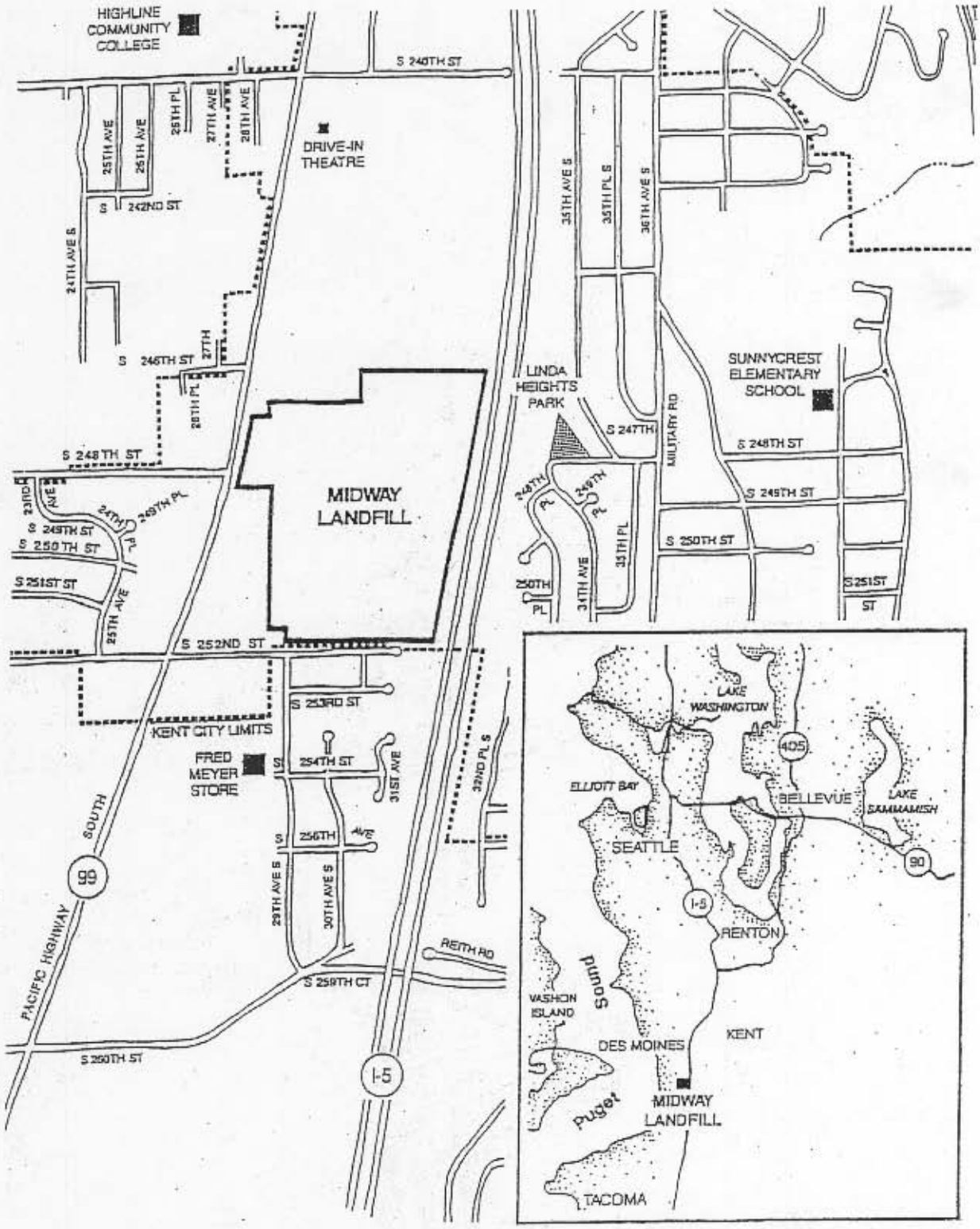
[b] = MTCA B/Model Toxics Control Act (WAC 173-340) Method B Cleanup Level. CLARC II Database, Ecology, February 1996.

[c] = Downgradient wells MW-20A and MW-23A not sampled due to the wells being dry or insufficient water for sample collection.

U = Indicates the compound was undetected at the reported concentration.

DUP= Duplicate.

Note: Up or Down in column title denotes whether the well is located upgradient or downgradient of the landfill's influence.



Parametrix, Inc. Midway Landfill/555-1550-039(01AR) 8/01 (K)

SCALE IN FEET

0 50 100

N

Figure 1
Site Location Map
Midway Landfill
Kent, Washington

ANNUAL MIDWAY DRILLER NOTIFICATION MAILING LIST

Highline Water District
23828 30th Avenue South
Kent, Washington 98032-2821

Lakehaven Utility District
P. O. Box 4249
Federal Way, WA, 98063

Victor R. Kring
802 11th Avenue
Milton, WA 98354

Sean W. Dornan
19511 226th Avenue NE
Woodinville, WA 98072

Curt R. Thompson
6524 31st Avenue NE
Seattle, WA 98115

Jeffrey R. Cross
20417 25th Lane South
Seatac, WA 98198

Paul D. Riley
10728 Lake City Way NE
Seattle, WA 98125

Roy Egon Jensen
8805NE 186th Place
Bothell, WA 98011

Douglas L Ewen
6260 139th Avenue NE #75
Redmond, WA 98052

Paul D Lodder
3644 Manchester Way
Kent, WA 98032

John Murnane
Cascade Drilling, Inc.
13528 34th Avenue South
Seattle, WA 98168

Chad N Gregory
Gregory Drilling, Inc.
17609 NE 70th Street
Redmond, WA 98052

Jack W Richardson
Cable Tool Well Drilling
11723 194th Avenue NE
Redmond, WA 98053

Alan P Morek
A & J Drilling
10410 NE 142nd Street
Bothell, WA 98011

Henry W Brenniman
13026 96th Place NE
Kirkland, WA 98034-2754

Nick Fadich
CN Drilling
204 NW 58th
Seattle, WA 98107

Jay A Graham
Holocene Drilling Company
6606 304th Street East
Graham, WA 98038

Jeffrey D Davies
Davies Drilling
15845 16th Avenue SW
Seattle, WA 98166

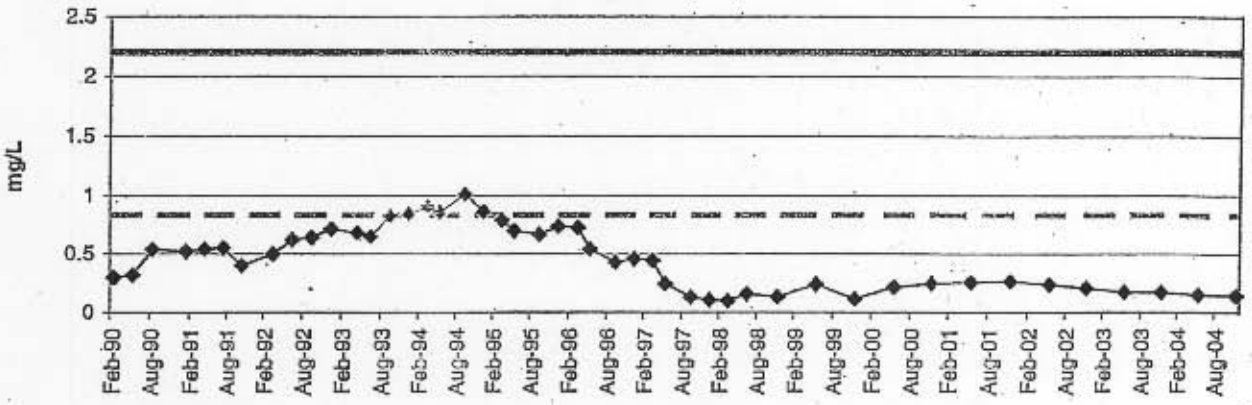
Appendix D

Concentration versus time plots for ground-water parameters.

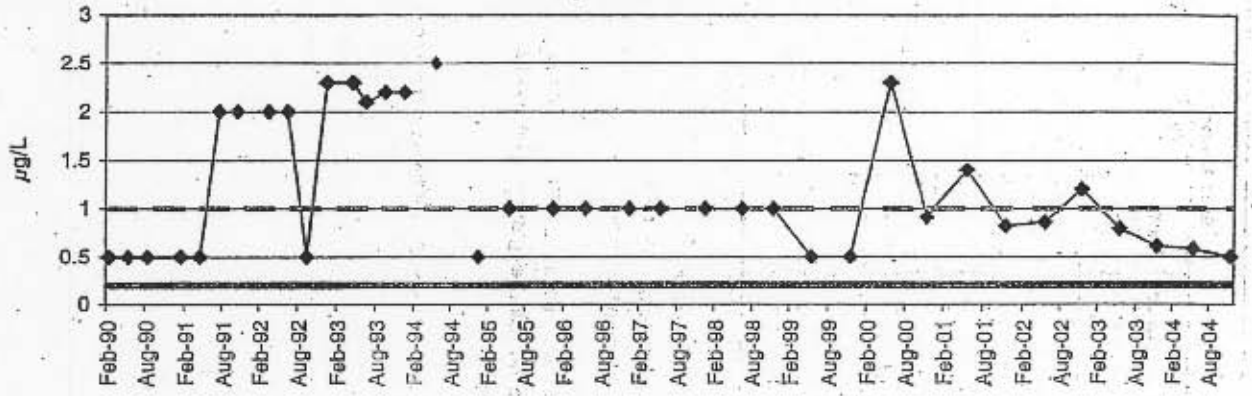
Midway Landfill
ROD Contaminants of Concern

Sand Aquifer
MW-17B

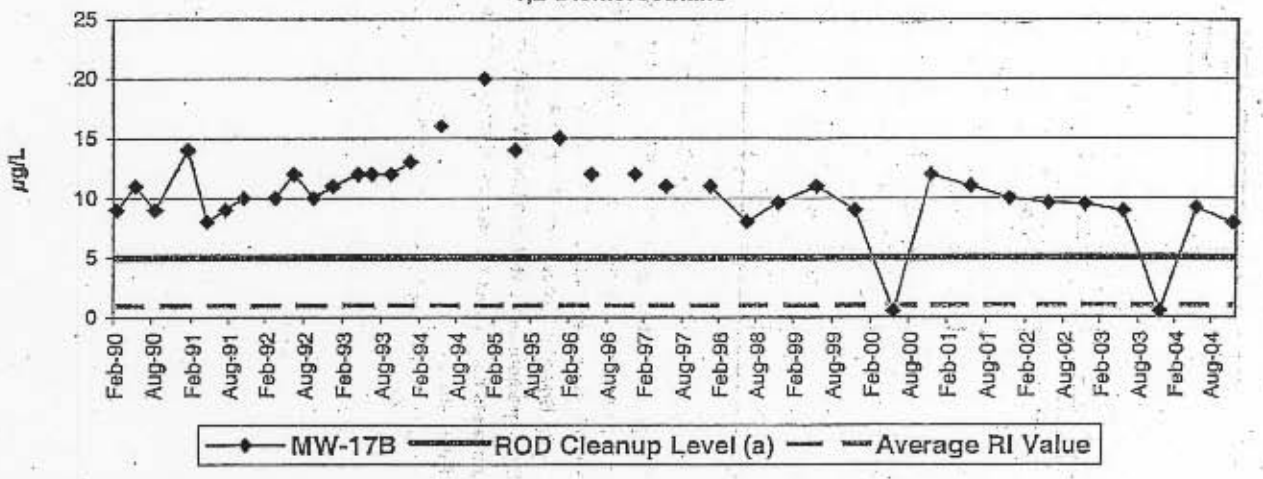
Manganese



Vinyl Chloride



1,2-Dichloroethane

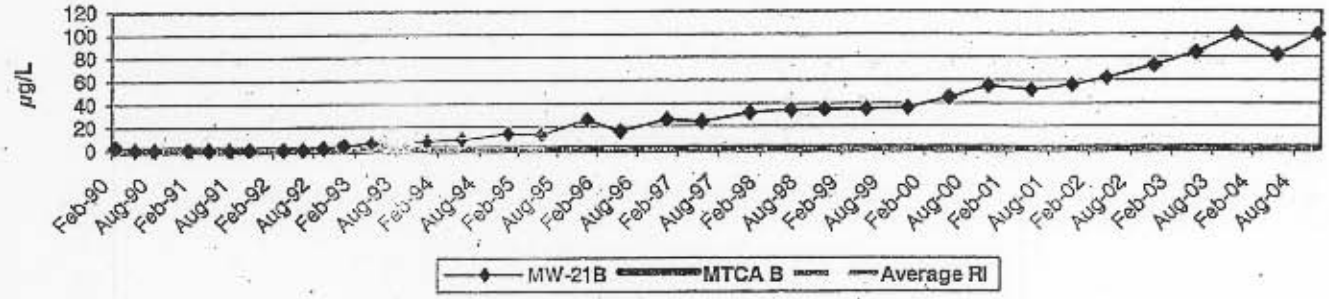


(a) Cleanup level established in the final EPA Record of Decision for the Midway Landfill, September 6, 2000.
Non-detected values are shown as 1/2 the detection limit.
RI = Remedial Investigation

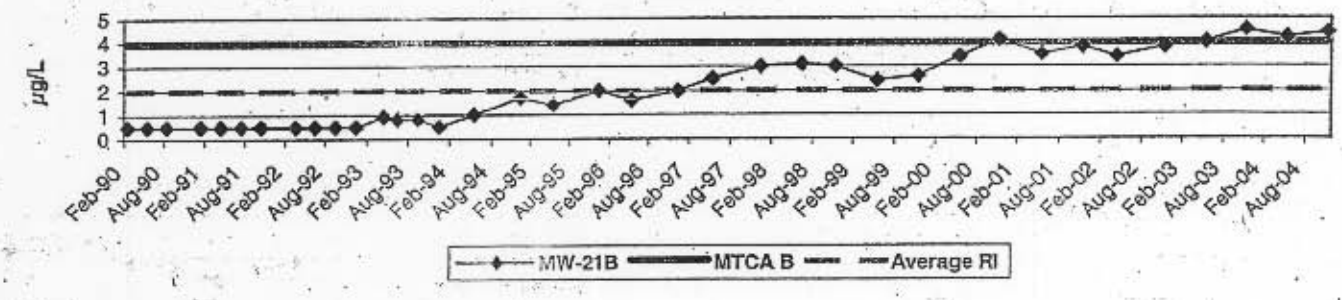
Midway Landfill
Groundwater Quality Parameters Not Included in the ROD

Sand Aquifer
MW-21B

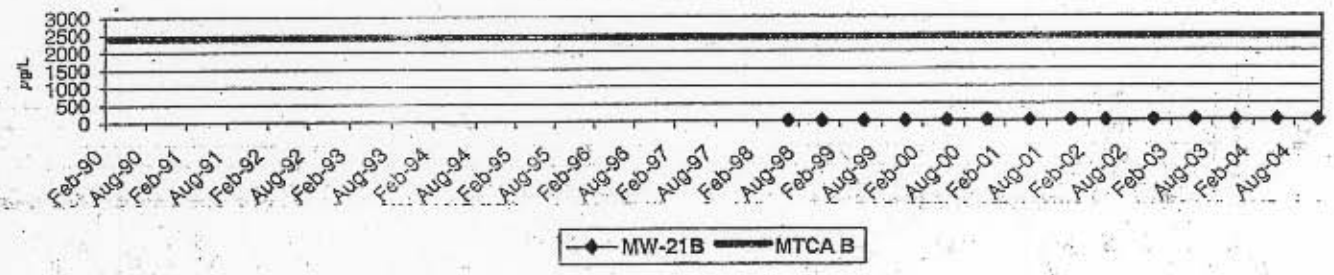
Tetrachloroethene



Trichloroethene



Trichlorofluoromethane

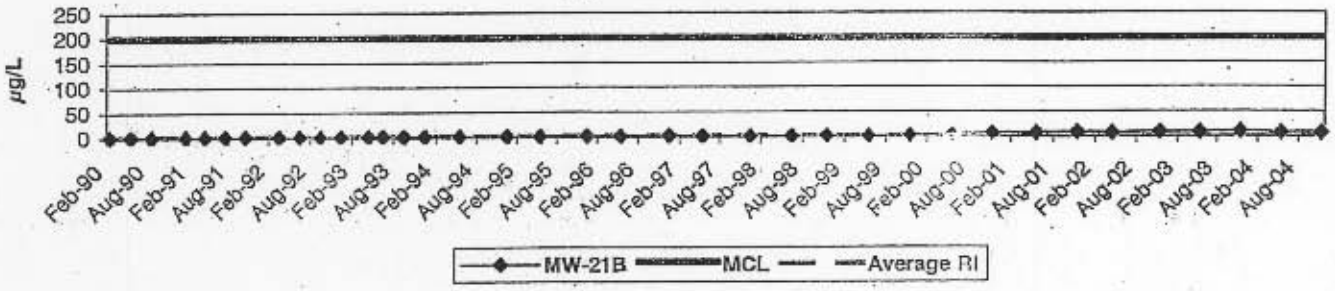


Non-detected values are shown as 1/2 the detection limit.
MCL = Primary or secondary maximum contaminat level standard.
MTCA B = MTCA B/Model Toxics Control Act (WAC 173-340) Method B cleanup level.
RI = Remedial Investigation

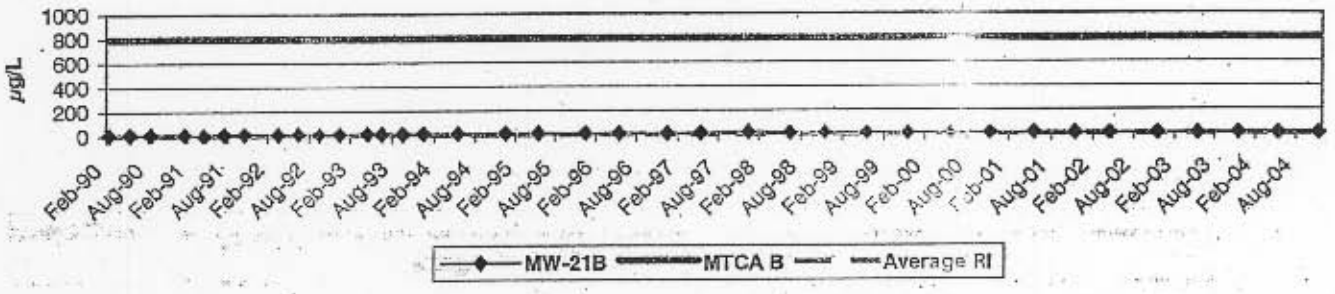
Midway Landfill
Groundwater Quality Parameters Not Included in the ROD

Sand Aquifer
MW-21B

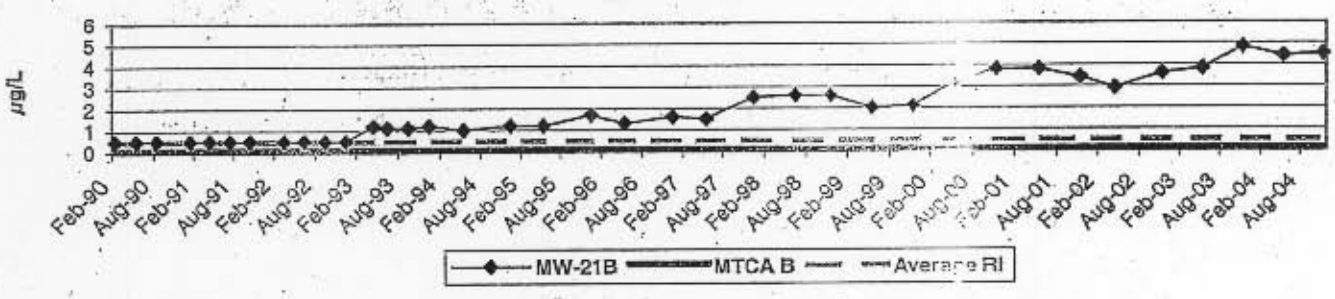
1,1,1-Trichloroethane



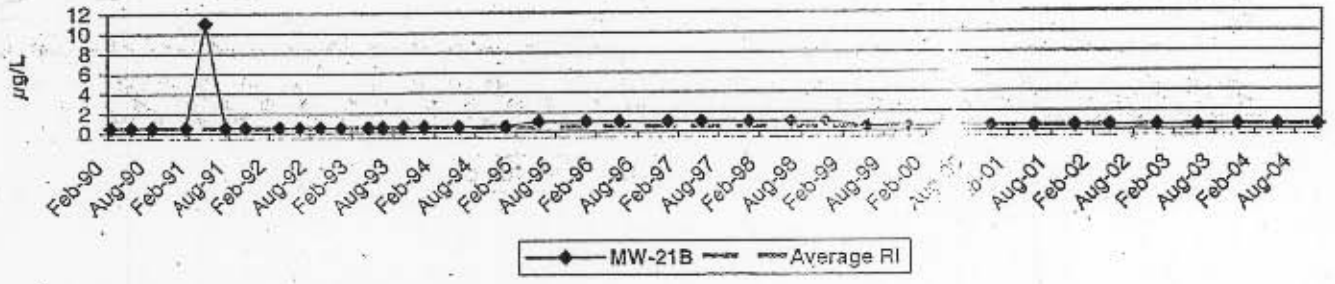
1,1-Dichloroethane



1,1-Dichloroethene



Chloroethane

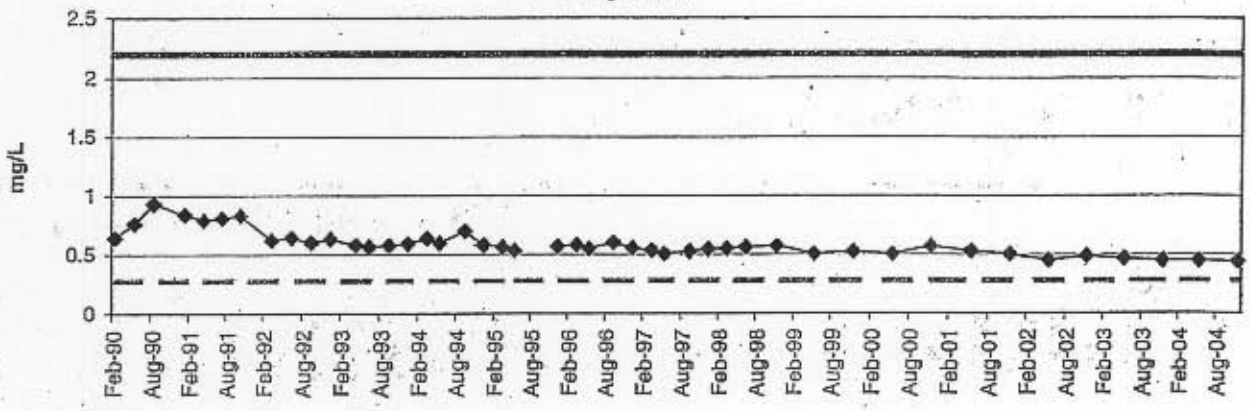


Non-detected values are shown as 1/2 the detection limit.
MCL = Primary or secondary maximum contaminat level standard.
MTCA B = MTCA B/Model Toxics Control Act (WAC 173-340) Method B cleanup level.
RI = Remedial Investigation

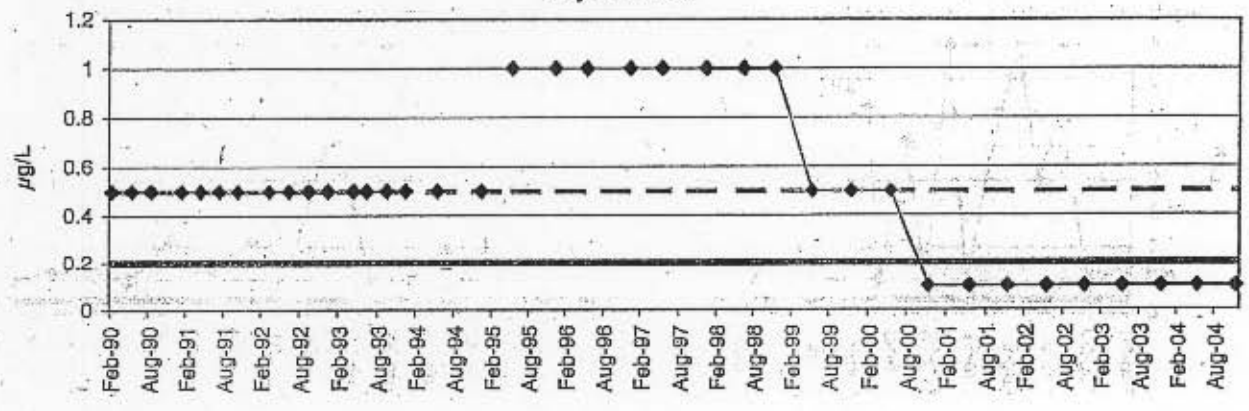
Midway Landfill
ROD Contaminants of Concern

Sand Aquifer
MW-21B

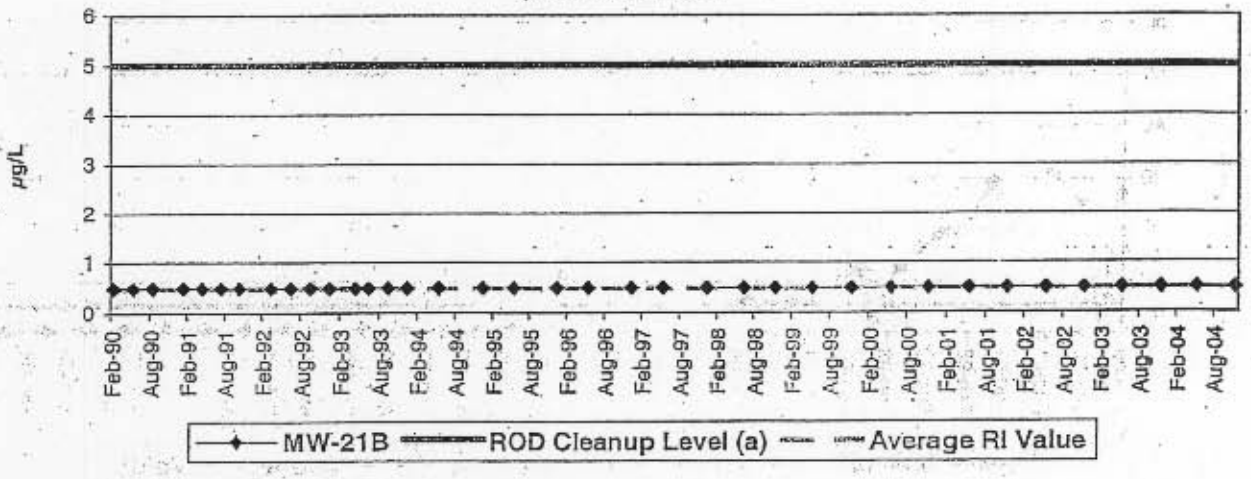
Manganese



Vinyl Chloride



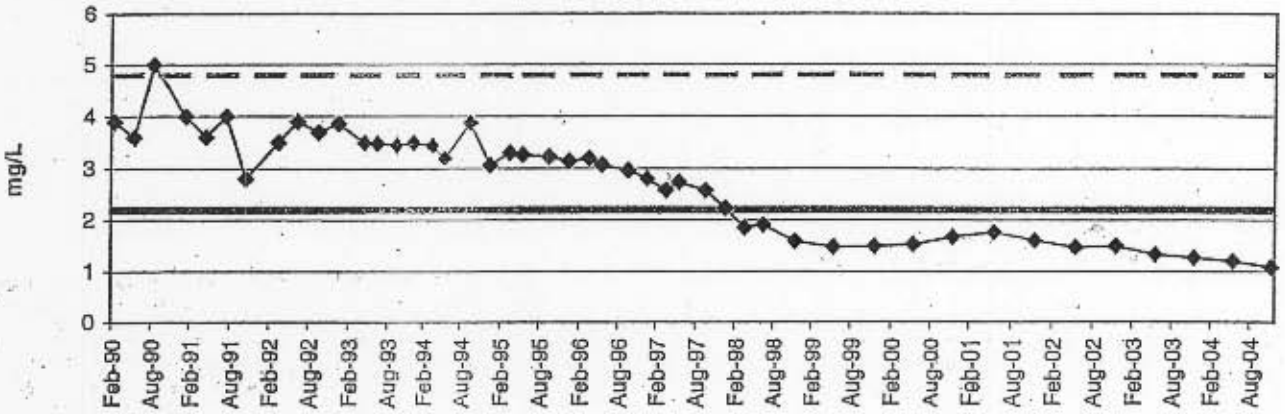
1,2-Dichloroethane



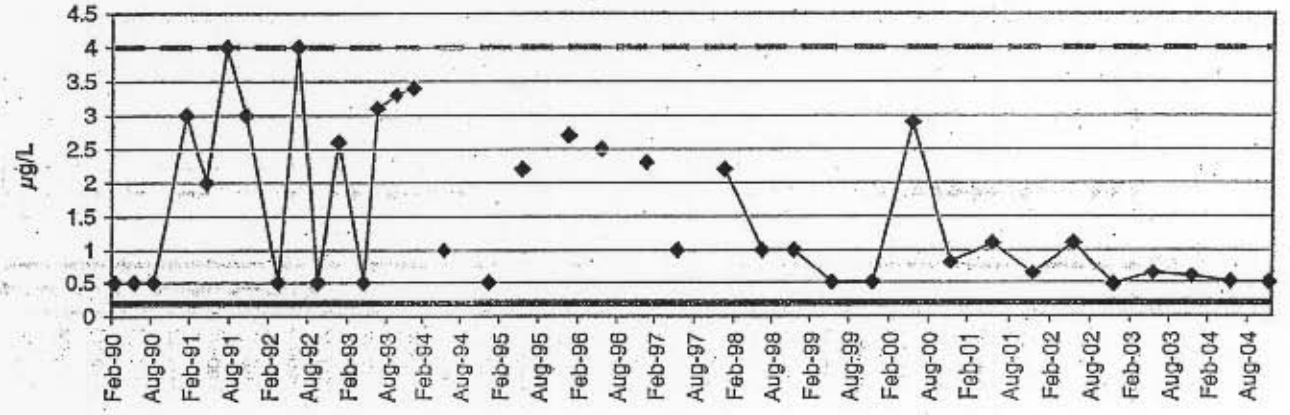
(a) Cleanup level established in the final EPA Record of Decision for the Midway Landfill, September 6, 2000.
Non-detected values are shown as 1/2 the detection limit.
RI = Remedial Investigation

Midway Landfill
ROD Contaminants of Concern
Southern Gravel Aquifer
MW-14B

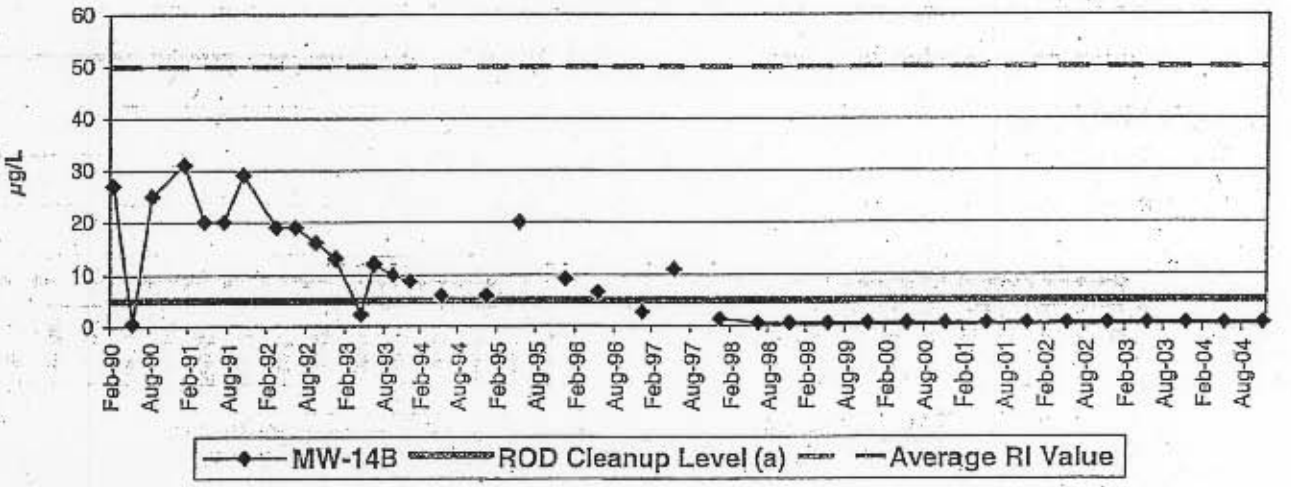
Manganese



Vinyl Chloride



1,2-Dichloroethane



(a) Cleanup level established in the final EPA Record of Decision for the Midway Landfill, September 6, 2000.
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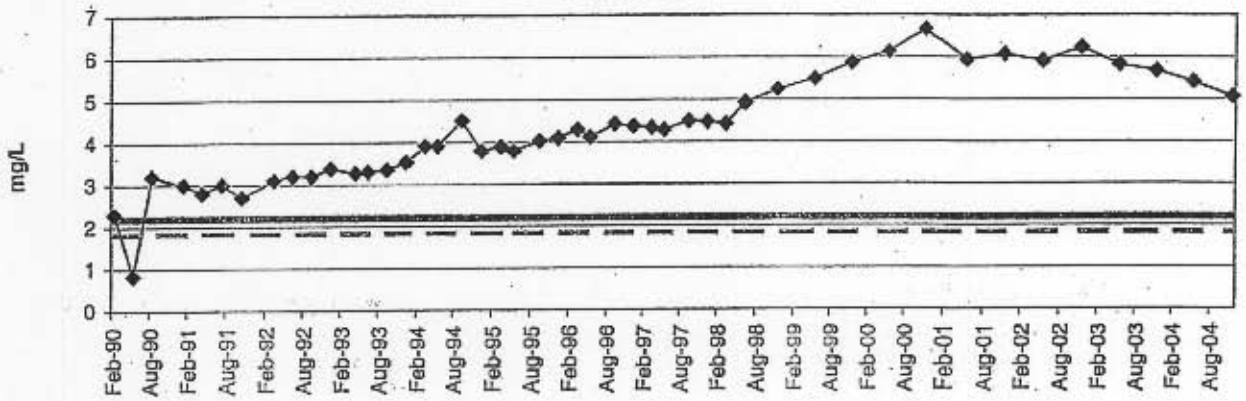
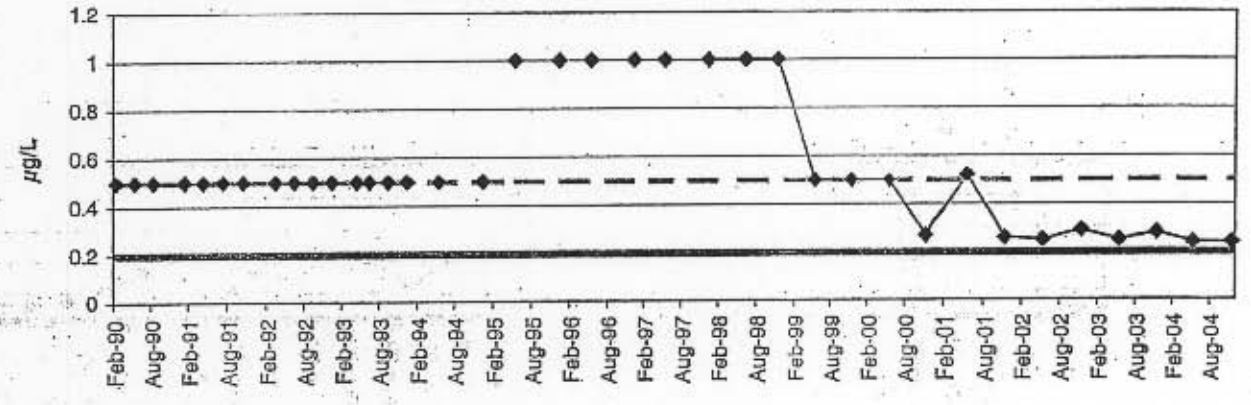
Midway Landfill
ROD Contaminants of Concern
Southern Gravel Aquifer
MW-20B

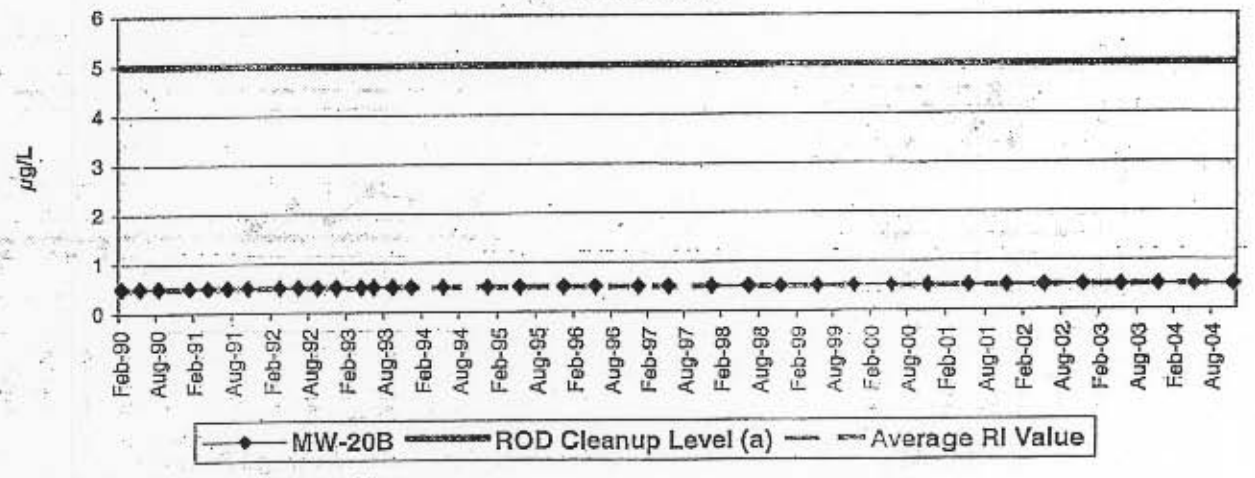
Manganese



Vinyl Chloride



1,2-Dichloroethane



(a) Cleanup level established in the final EPA Record of Decision for the Midway Landfill, September 6, 2000.
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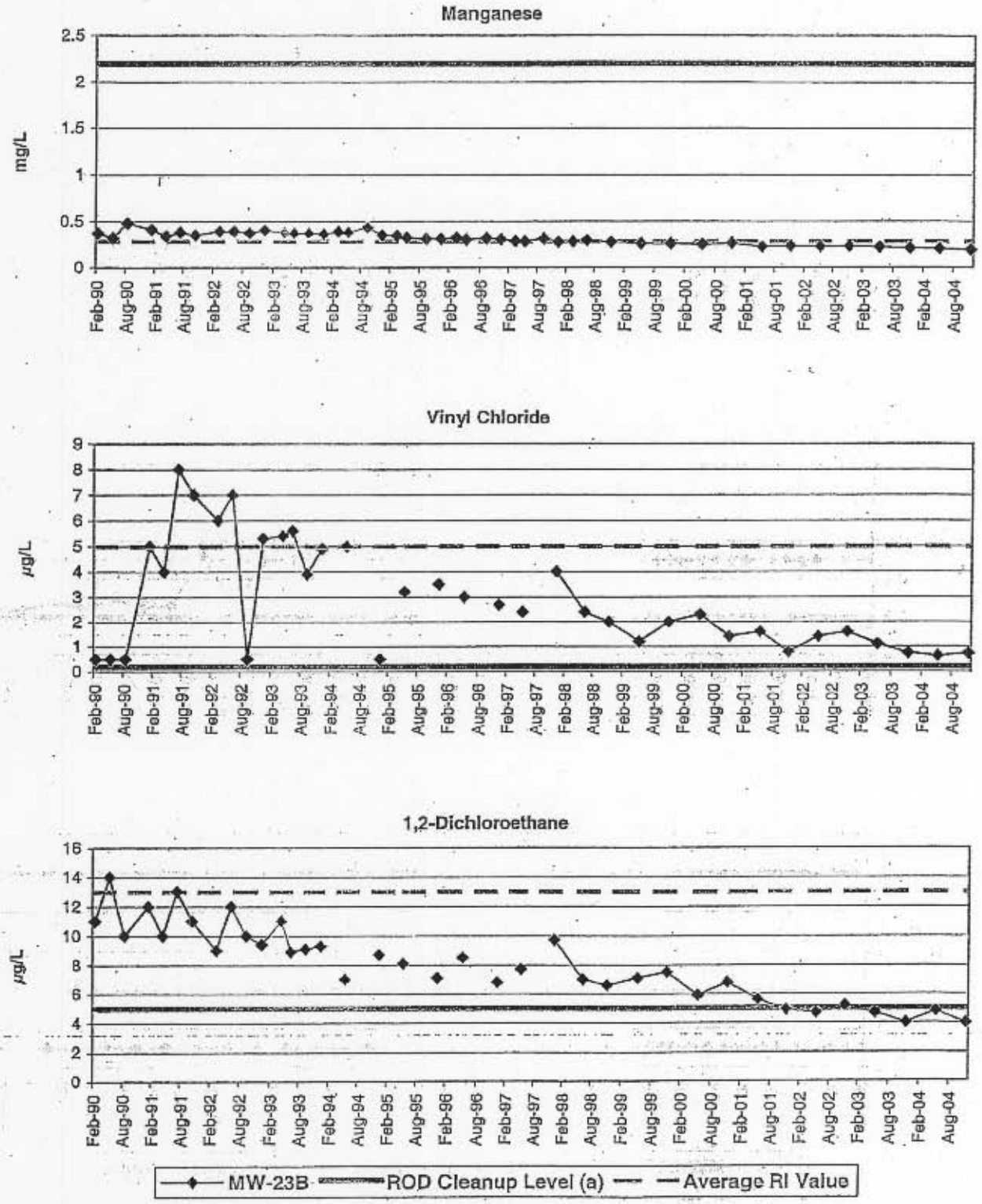
Midway Landfill
ROD Contaminants of Concern
Southern Gravel Aquifer
MW-23B



(a) Cleanup level established in the final EPA Record of Decision for the Midway Landfill, September 6, 2000.
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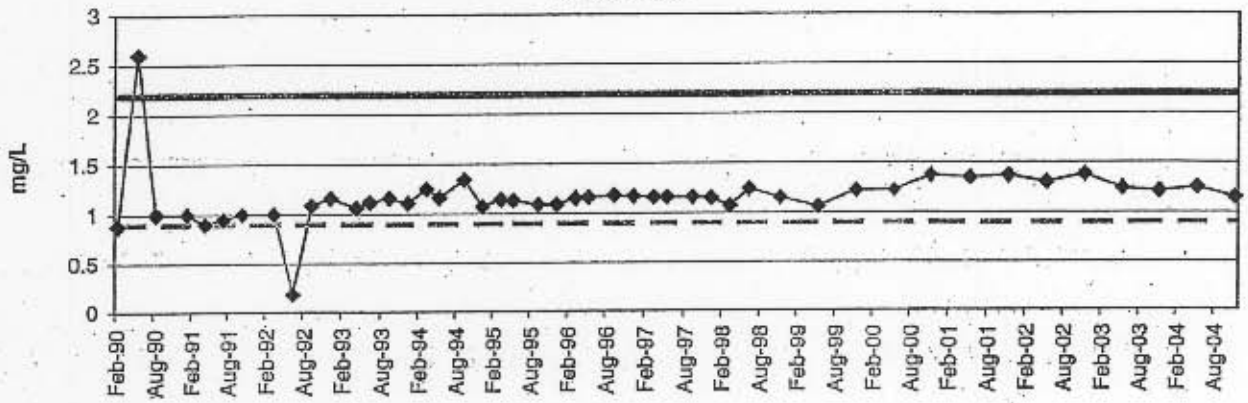
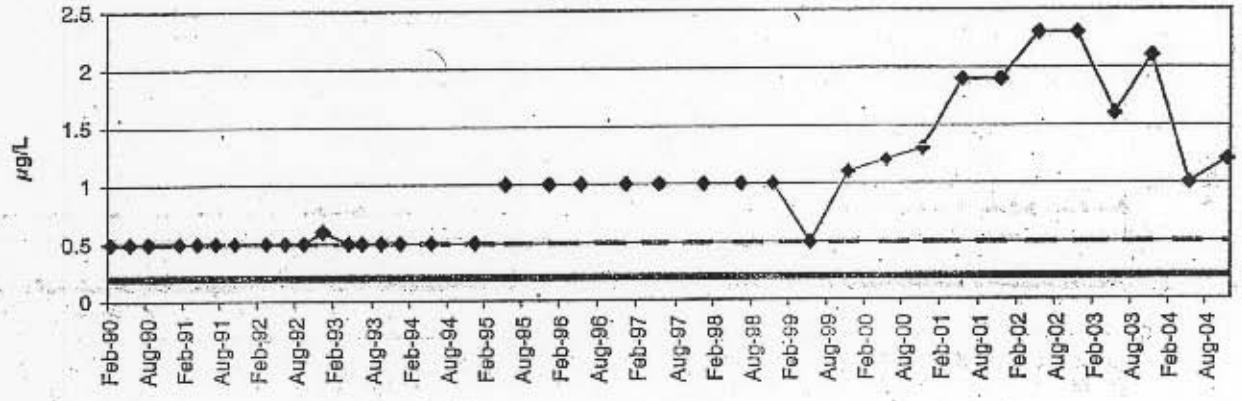
RI = Remedial Investigation

Midway Landfill
ROD Contaminants of Concern
Southern Gravel Aquifer
MW-29B

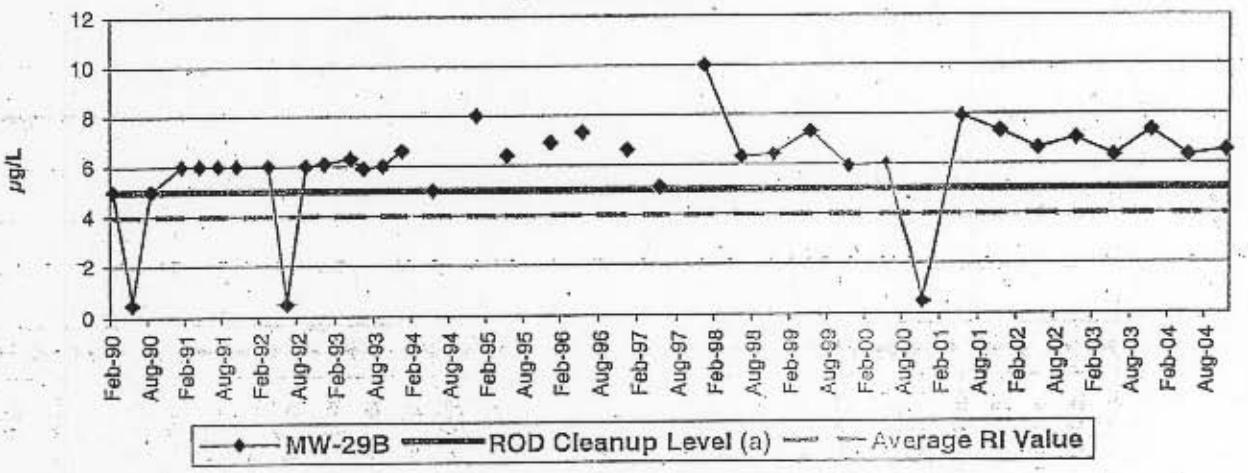
Manganese



Vinyl Chloride



1,2-Dichloroethane



(a) Cleanup level established in the final EPA Record of Decision for the Midway Landfill, September 6, 2000.
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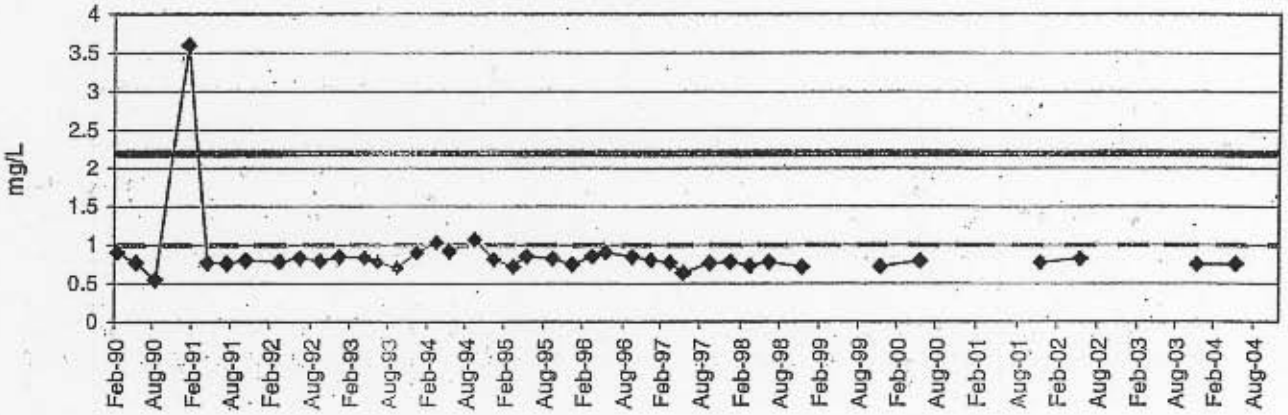
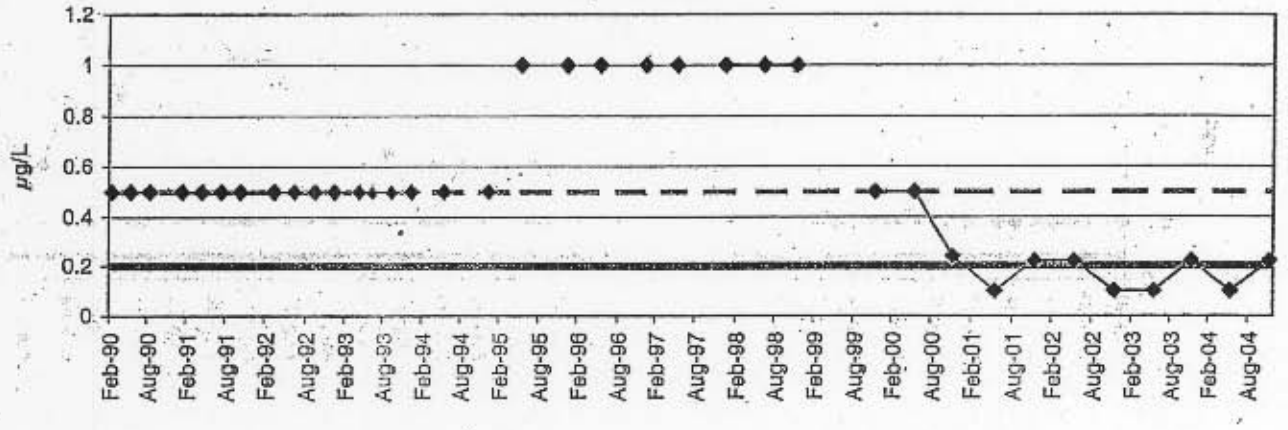
Midway Landfill
ROD Contaminants of Concern

Southern Gravel Aquifer
MW-30C

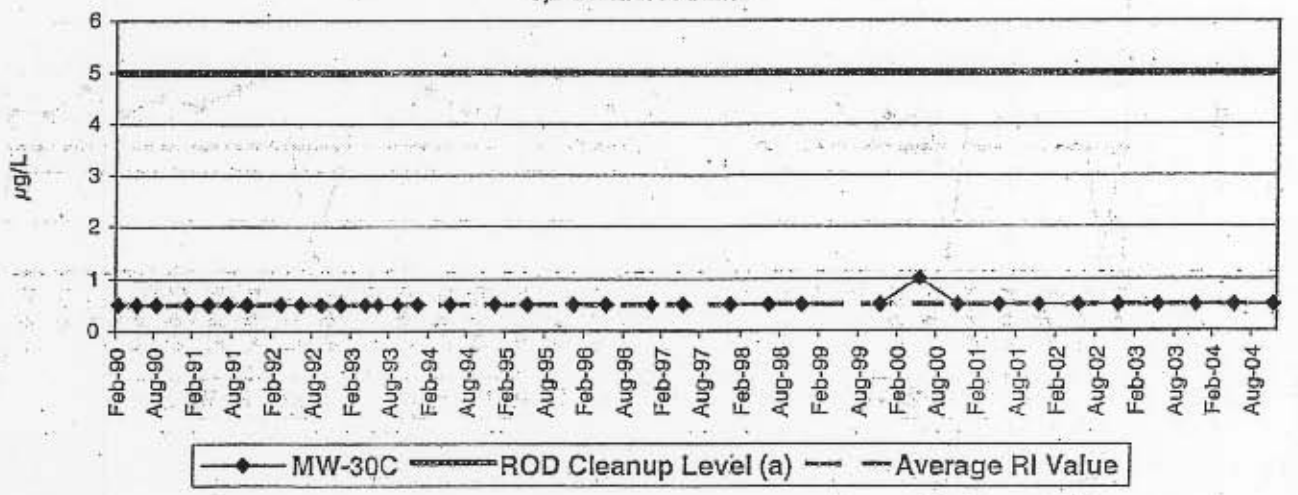
Manganese



Vinyl Chloride



1,2-Dichloroethane



(a) Cleanup level established in the final EPA Record of Decision for the Midway Landfill, September 6, 2000.
Non-detected values are shown as 1/2 the detection limit.
RI = Remedial Investigation

Table 3-1. Comparison of Contaminants of Concern in Groundwater to ROD Cleanup Levels

				Upper Gravel Aquifer		Sand Aquifer						Southern Gravel Aquifer					
		Clean up	Round	MW-16	MW-21A	MW-8B	MW-8B (DUP)	MW-17B	MW-17B (DUP)	MW-21B	MW-21B (DUP)	MW-14B	MW-14B (DUP)	MW-20B	MW-23B	MW-29B	MW-30C
Analyte	Units	Level*	ID	UP	UP	UP	UP	UP	UP	UP	UP	DOWN	DOWN	DOWN	DOWN	DOWN	DOWN
Manganese	mg/L	2.2	R-45	0.082	0.082	0.176	0.175	0.149	0.151	0.445		1.20		5.42	0.203	1.25	0.753
			R-46					0.144		0.437	0.432	1.08	1.09	5.07	0.192	1.15	
1,2-Dichloroethane	µg/L	5	R-45	1 U	1 U	1 U	1 U	9.2	9.3	1 U		1 U		1 U	4.8	6.3	1 U
			R-46					7.9		1 U	1 U	1 U	1 U	1 U	4	6.5	1 U
Vinyl Chloride	µg/L	0.2*	R-45	0.2 U	0.2 U	0.2 U	0.2 U	0.58	0.59	0.2 U		0.51		0.24	0.62	1.0	0.2 U
			R-46					0.5		0.2 U	0.2 U	0.5	0.54	0.24	0.73	1.2	0.22

ROD= Record of decision

R-45= Round 45, May 2004

R-46= Round 46, November 2004

a = Clean up levels established in the Final EPA Record of Decision for the Midway Landfill Site, September 6, 2000.

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Notes: Up or Down in column title denotes whether the well is located upgradient or downgradient of the landfill's influence.

Table 3-2. Summary of Detected Groundwater Quality Parameters Not Included in the ROD and Comparison to Regulatory Standards

Analyte	Units	MCL[a]	MTCA B[b]	Round ID	Upper Gravel Aquifer		Sand Aquifer[c]						Southern Gravel Aquifer					
					MW-16	MW-21A	MW-8B	MW-8B (DUP)	MW-17B	MW-17B (DUP)	MW-21B	MW-21B (DUP)	MW-14B	MW-14B (DUP)	MW-20B	MW-23B	MW-29B	MW-30C
					UP	UP	UP	UP	UP	UP	UP	UP	DOWN	DOWN	DOWN	DOWN	DOWN	DOWN
Field Parameters																		
pH		6.5-8.5*		R-45	7.97	7.07	7.73		6.85		7.14		6.7		6.92	6.59	6.67	7.29
				R-46					6.62		6.97		6.51		6.77	6.41	6.5	7.08
Specific Conductivity	µmhos/cm			R-45	220	377	170		656		749		861		1964	712	839	347
				R-46					613		755		828		1920	704	819	337
Temperature	C			R-45	11.1	11.3	10.8		11.3		10.9		13.6		11	11.6	10.1	10.9
				R-46					11.3		10.7		12.9		10.3	11.4	9.7	9.2
Conventional Parameters																		
Chloride	mg/L	250**		R-45	8.2	8.6	5.8	5.7	19	18.3	21.8		30.2		111	17.4	58.4	14.9
				R-46					18		19.7	19.4	24.1	24	107	15.6	52.3	
COD	mg/L			R-45	5 U	5 U	5 U	5 U	5 U	5 U	7.68		11.3		37.6	5 U	10	6.18
				R-46					5 U		5 U	5 U	11.6	9.3	32.3	5.96	6.97	
Sulfate	mg/L	250**		R-45	18.7	43.6	15.8	15.8	31.3	31.6	160		22.2		8.4	24.6	14.7	9.1
				R-46					29		153	154	23.8	24.1	6.5	25.3	15.1	
TOC	mg/L			R-45	1.5 U	1.5 U	1.5 U	1.5 U	2.19	2.21	1.68		3.87		11.8	2.56	3.52	1.5
				R-46					1.88		1.5 U	1.5 U	2.69	2.5	9.45	1.79	3.22	
Dissolved Metals																		
Iron	mg/L	0.3**		R-45	0.22	0.05 U	0.05 U	0.05 U	0.1	0.11	0.05 U		14.4		15.3	12.7	18.6	2.67
				R-46					0.08		0.05 U	0.05 U	12.9	13	14	11.6	17.2	
Volatile Organics																		
1,1,1-TCA	µg/L	200*	7200	R-45	1 U	1 U	1 U	1 U	1 U	1 U	7.2		1 U		1 U	1 U	1 U	1 U
				R-46					1 U		6.2	6.1	1 U	1 U	1 U	1 U	1 U	1 U
1,1-DCA	µg/L		800	R-45	1 U	1 U	1 U	1 U	76	83	6.3		1.7		1 U	1.2	1	1 U
				R-46					68		6.1	5.9	1.6	1.5	1 U	1.1	1.1	1 U
1,1-DCE	µg/L	7*	0.0729	R-45	1 U	1 U	1 U	1 U	4.8	5.1	4.4		1 U		1 U	1 U	1 U	1 U
				R-46					4.6		4.5	4.7	1 U	1 U	1 U	1 U	1 U	1 U
cis-1,2 DCE	µg/L	70*	80	R-45	1 U	1 U	1 U	1 U	4.3	4.4	1 U		4.8		1 U	5.6	1 U	1 U
				R-46					4.3		1 U	1 U	5	5	1 U	6	1	1 U

Table 3-2. Summary of Detected Groundwater Quality Parameters Not Included in the ROD and Comparison to Regulatory Standards (continued)

Analyte	Units	MCL[a]	MTCA B[b]	Round ID	Upper Gravel Aquifer		Sand Aquifer[c]						Southern Gravel Aquifer					
					MW-16	MW-21A	MW-8B	MW-8B (DUP)	MW-17B	MW-17B (DUP)	MW-21B	MW-21B (DUP)	MW-14B	MW-14B (DUP)	MW-20B	MW-23B	MW-29B	MW-30C
					UP	UP	UP	UP	UP	UP	UP	UP	DOWN	DOWN	DOWN	DOWN	DOWN	DOWN
Volatile Organics (continued)																		
Chloroethane	µg/L			R-45	1 U	1 U	1 U	1 U	6.7	8.1	1 U		1 U		1 U	1 U	1 U	1 U
				R-46					5		1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
PCE	µg/L	5*	0.858	R-45	1 U	1 U	1 U	1 U	1 U	1 U	82		1 U		1 U	1 U	1 U	1 U
				R-46					1 U		100	100	1 U	1 U	1 U	1 U	1 U	1 U
TCE	µg/L	5*	3.98	R-45	1 U	1 U	1 U	1 U	1 U	1 U	4.2		1 U		1 U	1 U	1 U	1 U
				R-46					1 U		4.4	4.3	1 U	1 U	1 U	1 U	1 U	1 U
Trichlorofluoro-methane	µg/L		2400	R-45	1 U	3.8	1 U	1 U	1 U	1 U	6.7		1 U		1 U	1 U	1 U	1 U
				R-46					1 U		7.2	7.5	1 U	1 U	1 U	1 U	1 U	1 U

= Exceeds Federal MCLs or MTCA Method B Groundwater Cleanup Level.

* = Primary MCL Standards; EPA National Primary Drinking Water Regulations (40 CFR 141 59 FR 34322).

** = Secondary MCL Standards; EPA National Primary Drinking Water Regulations (40 CFR 141 59 FR 34322).

[a] = MCL/Federal maximum contaminant level.

[b] = MTCA B/Model Toxics Control Act (WAC 173-340) Method B Cleanup Level. CLARC II Database, Ecology, February 1996.

[c] = Downgradient wells MW-20A and MW-23A not sampled due to the wells being dry or insufficient water for sample collection.

U = Indicates the compound was undetected at the reported concentration.

DUP= Duplicate.

Note: Up or Down in column title denotes whether the well is located upgradient or downgradient of the landfill's influence.