Midway Landfill
Groundwater Monitoring
2010 Annual Report

Prepared for

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ACRONYMS AND ABBREVIATIONS

CAP	Cleanup Action Plan
CERCLA	Comprehensive Environmental Response Compensation Liability Act
City	City of Seattle
COCs	Contaminants of Concern
1,1-DCE	1,1-Dichloroethene
1,2-DCA	1,2-Dichloroethane
Ecology	Washington State Department of Ecology
FS	Feasibility Study
MCLs	Maximum Contaminant Levels
MTCA	State of Washington Model Toxics Control Act
RI	Remedial Investigation
ROD	Record of Decision
SA	Sand Aquifer
SG/SR	Shallow Groundwater/Saturated Refuse
SGA	Southern Gravel Aquifer
SIM	Selective Ion Monitoring
UGA	Upper Gravel Aquifer
USEPA	United States Environmental Protection Agency
VOCs	Volatile Organic Compounds
WAC	Washington Administrative Code

1. COMPLIANCE STATUS SUMMARY

The compliance status for 2010 is summarized in the sections below, based upon the Record of Decision (ROD) that was finalized in September 2000. The selected remedy set cleanup standards for groundwater downgradient of the landfill where groundwater contaminants of concern (COCs) are compared to their respective cleanup levels established in the ROD. The groundwater data for the remaining tested parameters are compared to the federal Maximum Contaminant Levels (MCLs) for drinking water, and Model Toxics Control Act (MTCA) Method B groundwater cleanup levels.

1.1 ROD CONTAMINANTS OF CONCERN

The monitoring wells with detected concentrations that exceeded ROD cleanup levels are summarized below.

Southern Gravel Aquifer (SGA):

MW-14B: vinyl chloride

MW-20B: manganese

MW-29B: vinyl chloride

1.2 GROUNDWATER QUALITY PARAMETERS NOT INCLUDED IN THE ROD

The monitoring wells with detected concentrations for parameters not included in the ROD that exceeded regulatory standards are summarized below, along with the respective standards.

Sand Aquifer (SA):

MW-8B: pH (MCL)

MW-17B: pH (MCL); 1,1-dichloroethene (1,1-DCE) (MTCA B)

MW-21B: 1,1-DCE (MTCA B); tetrachloroethene (MCL and MTCA B); trichloroethene (MTCA B)

SGA:

MW-14B: pH (MCL); iron (MCL) MW-20B: iron (MCL)

MW-23B: pH (MCL); iron (MCL)

MW-29B: pH (MCL); iron (MCL)

MW-30C: iron (MCL)

1.3 SPECIAL SAMPLING FOR 1,4-DIOXANE

Sampling for 1,4-dioxane was conducted in two SA wells (MW-17B and MW-21B) and in one SGA well (MW-14B) as recommended by the Washington State Department of Ecology (Ecology) and the United States Environmental Protection Agency (USEPA). The monitoring well with a detected concentration of 1,4-dioxane that exceeded the MTCA B cleanup level of 7.95 µg/L is summarized below.

SGA:

MW-14B: (MTCA B)

2. INTRODUCTION

This groundwater compliance monitoring report presents the results of groundwater monitoring conducted at the City of Seattle (City) Midway Landfill in 2010. The report has been prepared to comply with post-closure groundwater monitoring requirements under the Minimum Functional Standards (WAC 173-304-407) and to be consistent with the Midway Landfill Monitoring Plan (Parametrix 2000), an appendix to the Operations and Maintenance Manual. This manual and its appendix are equivalent to the Operations, Monitoring, and Maintenance Plan required under the Minimum Functional Standards.

2.1 BACKGROUND

The City operated the Midway Landfill from 1966 to 1983. The Midway Landfill is located north of South 252nd Street between SR 99 and I-5 in Kent, Washington (Figure 2-1). 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 Ecology began to investigate the site. In 1986, the Midway Landfill was placed on the National Priorities List by the Environmental Protection Agency (USEPA) based on impacts to groundwater. As required by USEPA, the City completed a Remedial Investigation (RI), an Endangerment Assessment, 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). 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 and consisted of the following four landfill closure elements:

- Construction of landfill cover.
- Completion of gas extraction system.
- Completion of surface water management system.
- Preparation of a comprehensive Operations and Maintenance Manual.

Under MTCA, the decision document that selects the cleanup action and cleanup levels is called the CAP (similar to a USEPA ROD). Ecology and the City had been working on a CAP since 1992. In September 2000, the USEPA 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).

The Midway Landfill ROD documented and approved the selected remedial action for the site. The selected remedy incorporated elements required in the 1990 consent decree and added some elements to ensure long-term protectiveness of the remedy. The selected remedy consists of monitoring, continuing to operate and maintain all remedial elements in the 1990 consent decree, and implementing institutional controls. The selected remedy also sets cleanup standards for groundwater downgradient of the landfill. Table 2-1 lists the groundwater COCs and their respective cleanup levels established in the ROD.

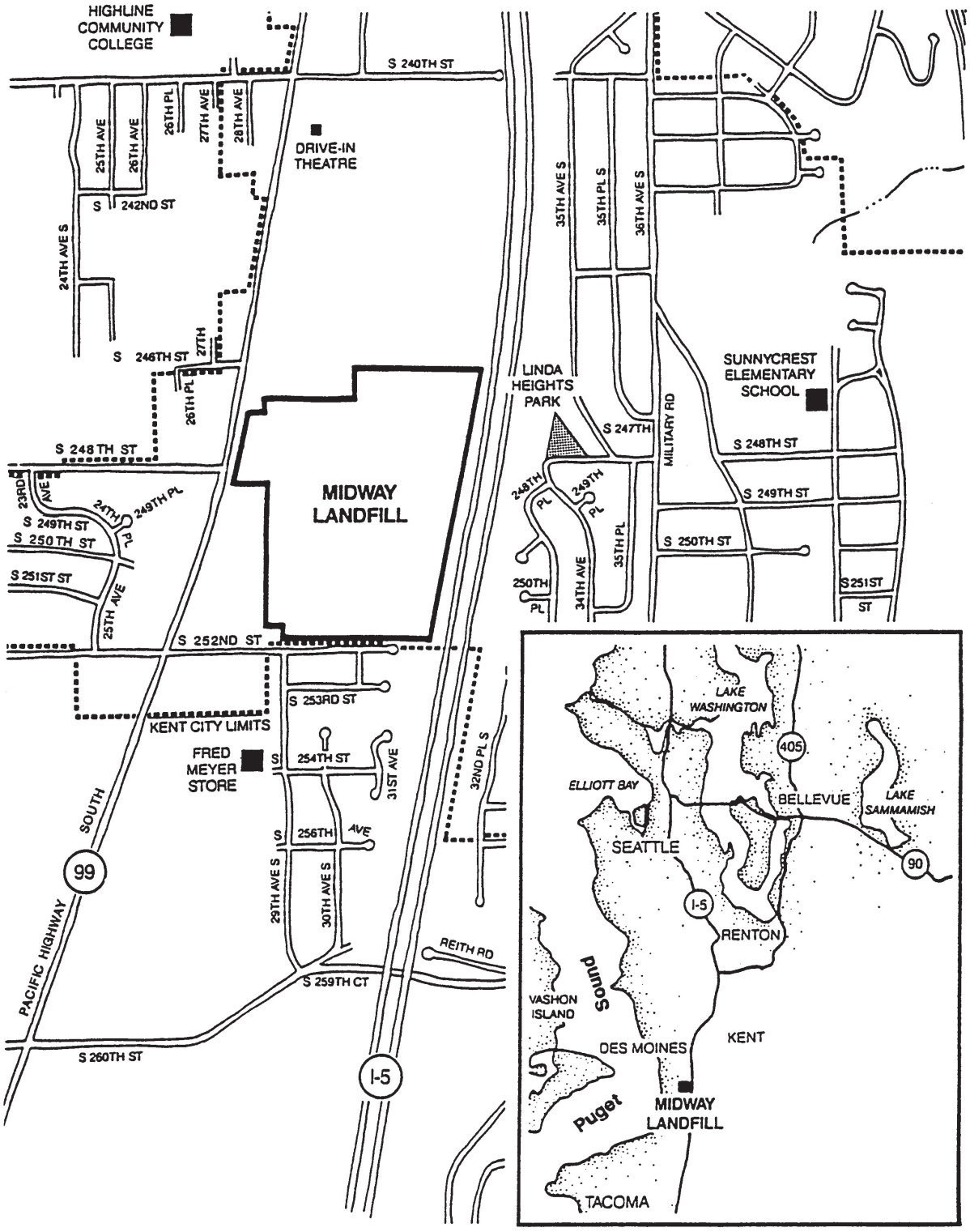

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Figure 2-1
Site Location Map
Midway Landfill
Kent, Washington

Table 2-1. Groundwater Contaminants of Concern and Cleanup Levels Established in the ROD

Contaminant	Cleanup Level
1,2-dichloroethane (1,2-DCA)	5.0 µg/L
vinyl chloride	0.29 µg/L[a]
manganese	2.2 mg/L

Source: USEPA 2000.

[a] The revised cleanup level for vinyl chloride is 0.29 µg/L, using the MTCA adjusted cancer risk of 1^{e-5}.

2.2 OBJECTIVES

The objectives of this report are as follows:

- To document the continued effectiveness of the selected remedy at the Midway Landfill, as demonstrated by fluid level and groundwater quality results.
- To comply with post-closure groundwater monitoring requirements under the Minimum Functional Standards (WAC 173-304-407) and with the Midway Landfill Monitoring Plan (Parametrix 2000).
- To describe the current regulatory status of the Midway Landfill as required by the ROD (USEPA 2000).

2.3 MONITORING PROGRAM SUMMARY

Groundwater monitoring involves both fluid level and groundwater chemistry monitoring, as described further in the following sections. The monitoring is conducted by trained City staff.

2.3.1 Fluid Level Monitoring

Fluid level monitoring has included collection of groundwater level and oil thickness measurements within the saturated portion of Midway Landfill and adjacent zones of shallow groundwater, termed collectively as Shallow Groundwater/Saturated Refuse (SG/SR). Fluid level monitoring has also been referred to as "performance monitoring" in previous documents. The fluid level monitoring program was initiated in December 1989 and has been conducted monthly, quarterly, semi-annually, and currently annually. The current monitoring network was developed due to falling and stable trends in wells with continued presence of groundwater, wells that are consistently dry, and a number of wells with obstructions and structural problems caused by settling of the refuse (Parametrix 2007).

The current fluid level monitoring program is summarized below.

- Conduct fluid-level monitoring once per year.
- Collect fluid level measurements from 22 wells located in the key hydraulic areas of the landfill.

2.3.2 Groundwater Chemistry Monitoring

Groundwater chemistry monitoring includes collection and analysis of groundwater samples from monitoring wells located upgradient and downgradient of the landfill. Groundwater chemistry monitoring has also been referred to as "compliance monitoring" in previous documents. Groundwater chemistry monitoring was initiated in February 1990 with

Round 1 (QM-1) and was conducted on a quarterly to semi-annual basis through May 2010 (Round 57). The first semi-annual groundwater chemistry event was Round 34 (QM-34).

The current groundwater chemistry monitoring program is summarized below.

- Sample groundwater annually (from annual event monitoring wells) during the second quarter.
- Analyze samples from all wells for field parameters, conventionals, metals, and volatile organic compounds, and for vinyl chloride by the Selective Ion Monitoring (SIM) method.

2.3.3 Reporting

The reporting procedures for the fluid level and groundwater chemistry monitoring are summarized in the following sections.

2.3.3.1 Annual Reports

Annual data reports are prepared including the following information:

- Summary tables of groundwater quality and groundwater levels,
- Compliance summary tables,
- Laboratory reports and chain-of-custody forms,
- Time-series plots for groundwater quality parameters, and
- Annual notice of groundwater conditions.

2.3.3.2 Groundwater Remediation Status Reports

Comprehensive groundwater remediation status reports are prepared every five data sets, the year prior to the next five-year review. The next groundwater remediation status report will include the 2010 through 2014 data in preparation for the 2015 five-year review.

Groundwater remediation status reports include the following additional groundwater flow information that is not presented in the annual reports:

- Potentiometric surface map for the SG/SR,
- Potentiometric surface maps for the Upper Gravel Aquifer (UGA), SA, and SGA, and
- Hydrographs showing groundwater level changes with time in selected monitoring wells.

2.4 YEAR 2010 ACTIVITIES

In 2010, the City implemented recommendations that were made in the 2008 Annual Report (Parametrix 2009) to reduce the frequency of groundwater sampling, fluid level monitoring, and reporting to annually. Additional changes to the fluid level monitoring program were implemented as recommended in Appendix H of the 2006 Annual Report (Parametrix 2007), including reducing the number of wells monitored to 22. A comprehensive annual report was completed through 2009 (Parametrix 2010) in anticipation of the second five-year review completed for the Midway Landfill by USEPA in 2010.

2.4.1 Second Five-Year Review

In 2010, USEPA prepared the Second Five-Year Review (USEPA 2010) to evaluate whether the cleanup remedy was still protective of human health and the environment. The issues, recommendations, follow-up actions, and protectiveness statement presented in the Second Five-Year Review are summarized in the sections below.

2.4.1.1 ISSUES:

- Upgradient sources of volatile organic compounds (VOCs) in groundwater will continue to limit the potential for the COCs in the SGA to decrease below the ROD cleanup levels, especially because the concentrations of VOCs in upgradient SA 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. Although this was a recommendation of the last five-year review, no efforts were made in the last five years by Ecology to identify the source of this contamination.
- Downgradient wells that were initially part of the groundwater monitoring network in the UGA and the SA have gone dry. There are currently no downgradient wells in these aquifers.
- 1,4-dioxane was added to the sampling round beginning in 2005, after the last five-year review. It was detected in the three wells that it was sampled in (upgradient wells MW-17B and MW-21B and downgradient well MW-14B). The current sampling in only three wells does not provide adequate data to develop a conceptual site model for 1,4-dioxane.

The following operation and maintenance issues which do not affect current or future protectiveness were also identified during the Five-Year Review:

- The Midway Landfill Operations and Maintenance Manual has not been updated since 1992 and does not have the current landfill gas sampling locations and schedule, and locations of operational gas extraction wells.

2.4.1.2 RECOMMENDATIONS AND FOLLOW-UP ACTIONS:

- Ecology should investigate upgradient sources of VOC contamination and encourage upgradient property owners to voluntarily clean up contamination.
- Ecology will notify property owners that have upgradient sources of contamination by September 2011. Ecology will advise the property owners on cleanup requirements. By September 2013, property owners need to take substantive action on the upgradient contamination sources.
- Add well MW-7B to the monitoring network to further evaluate groundwater contamination in the SA.
- Add 1,4-dioxane to be sampled in all wells in the monitoring network.
- If 1,4-dioxane is found in downgradient wells at levels greater than upgradient wells, and above cleanup levels, then the City and Ecology need to meet and reevaluate the remedy.

The following are operation and maintenance recommendations related to issues which do not affect current or future protectiveness identified during the Five-Year Review:

- Revise the Midway Landfill Operations and Maintenance Manual to include the current landfill gas sampling locations and schedule, and locations of operational gas extraction wells.

2.4.1.3 PROTECTIVENESS STATEMENT

Protectiveness deferred. A protectiveness determination of the remedy at the Midway Landfill cannot be made at this time until further information on 1,4-dioxane is obtained. Further information will be obtained by adding one well (MW-7B) to the monitoring network and adding 1,4-dioxane to be sampled in all monitoring wells. The City has agreed to incorporate this additional well and contaminant to the monitoring network. It is expected that the protectiveness determination can be made after two rounds of sampling are completed, which is estimated to be available by September 2012.

3. FLUID LEVEL AND GROUNDWATER LEVEL MONITORING RESULTS

3.1 FLUID LEVEL MONITORING

Fluid levels were measured in 22 wells located in the key hydraulic areas of the landfill (described in Appendix H of 2006 Annual Monitoring Report [Parametrix 2007]). The seven key hydraulic areas include wells screened in the SG/SR and are shown in Figure 3-1. The present fluid level monitoring program consists of once per year monitoring.

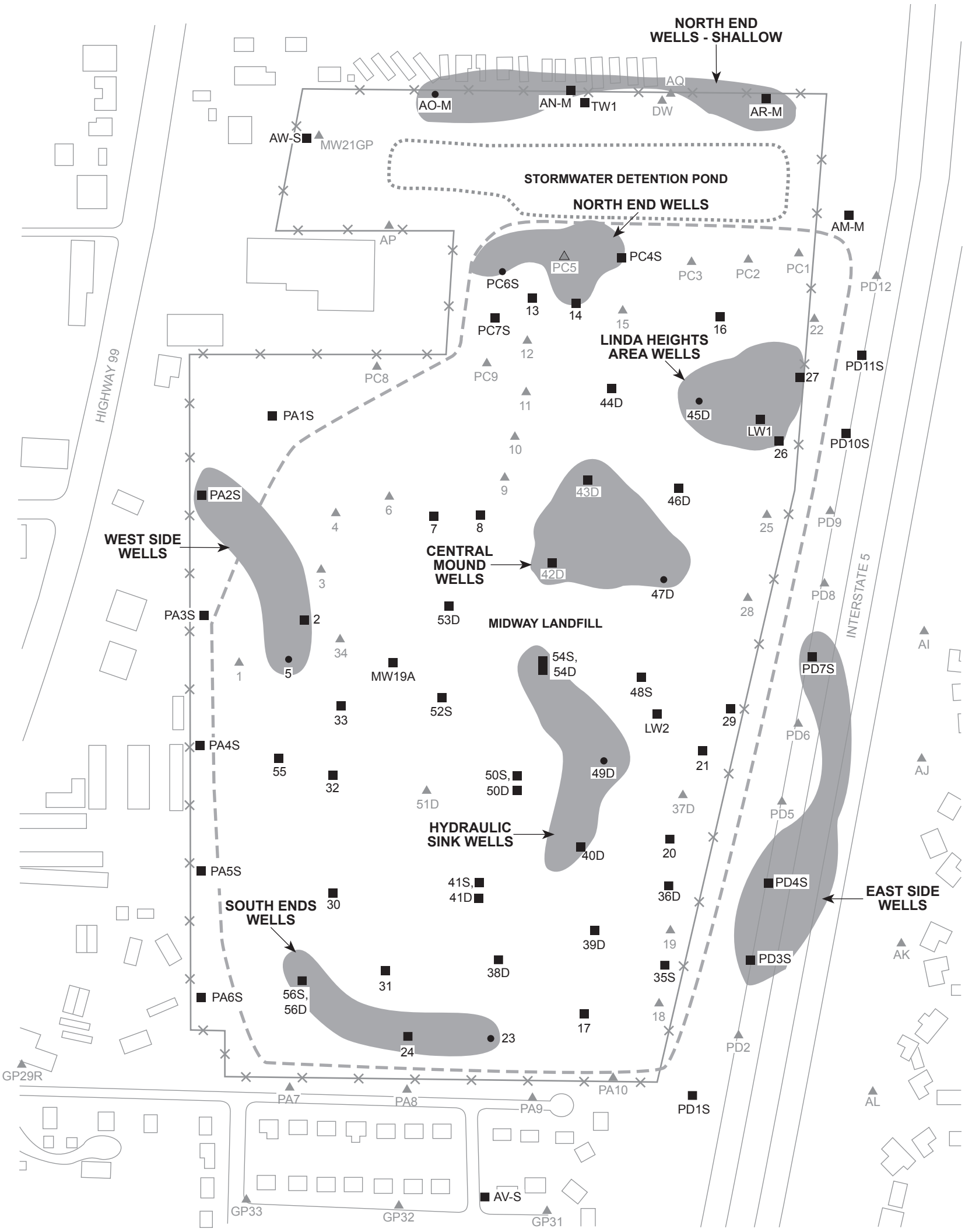
Groundwater flow within the SG/SR was last evaluated in March 2005 and reported in Sections 2 and 3 of the Midway Landfill 2005 Groundwater Remediation Status Report Five-Year Review (Parametrix 2005).

A summary of the measurements for the 2010 monitoring round (Round 57) is presented in Table A-1 of Appendix A. Free product was detected in well MW-43D. In general, the fluid levels within the refuse area are stable or decreasing.

3.2 GROUNDWATER LEVEL MONITORING

Water level measurements were also collected from 33 wells screened in the UGA, SA, and the SGA, to provide data for determining flow within these aquifers in the next Groundwater Remediation Status Report in 2014. A description of water level procedures, frequencies, and well designations is presented in the Midway Landfill Monitoring Plan (Parametrix 2000) and in the 2001 Annual Groundwater Monitoring Report Round 40 (Parametrix 2002).

The locations of the 33 groundwater monitoring points are shown in Figure 3-2. The water level data are presented in Table A-2 of Appendix A.



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

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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

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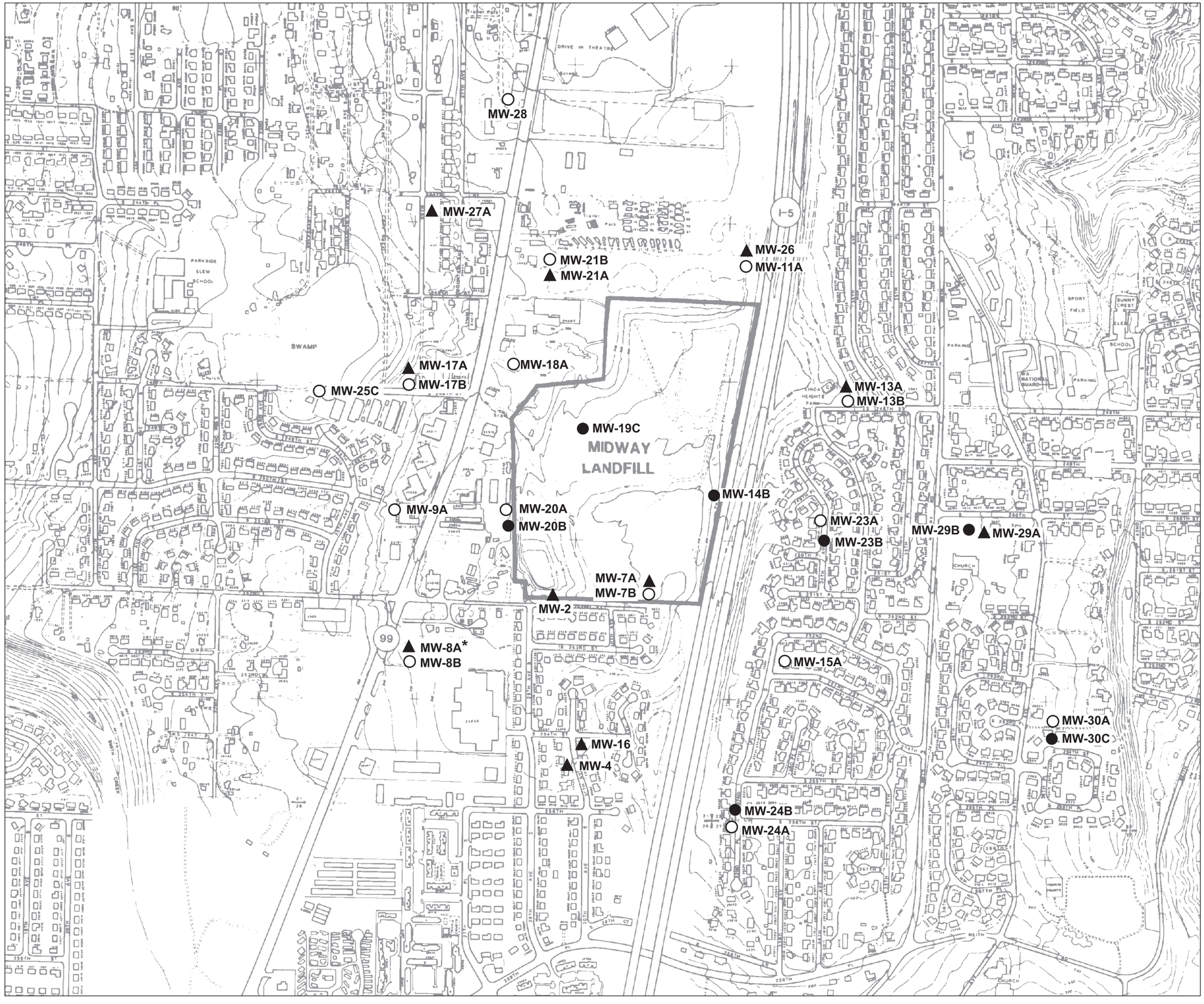
Figure 3-1
Shallow Groundwater/ Saturated Refuse Fluid Level Monitoring Network
Midway Landfill
Kent, Washington

Figure 3-2
Upper Gravel Aquifer, Sand Aquifer and Southern Gravel Aquifer Groundwater 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.

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

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4. GROUNDWATER CHEMISTRY MONITORING RESULTS

The annual event of the groundwater chemistry monitoring program for 2010 was conducted during May (R-57). Groundwater samples were collected by Seattle Public Utilities staff from 10 groundwater monitoring wells completed in the UGA, SA, and SGA (Figure 4-1). All samples were collected in accordance with the methods outlined in the approved Midway Landfill Monitoring Plan (Parametrix 2000).

4.1 GROUNDWATER CHEMISTRY MONITORING NETWORK

4.1.1 Upper Gravel Aquifer

The monitoring network in the UGA includes two upgradient wells (MW-16 and MW-21A) and one downgradient well (MW-7A). These three wells were selected because groundwater in the UGA flows in two general directions (north and south), and also discharges vertically into the underlying SA. The two upgradient monitoring points (MW-16 and MW-21A) provide information on groundwater quality entering the landfill. Downgradient monitoring well MW-7A is located where the UGA discharges into the SA. Previously, well MW-19B was part of the groundwater monitoring network in the UGA, but was eliminated because of pump problems and the inability to remove the pump for repairs.

Downgradient well MW-7A was not sampled during 2010 and has not been sampled since 1992 due to the declining groundwater levels in the UGA (the well has been dry). This confirms that the volume of leachate entering the UGA from the SG/SR has greatly decreased, resulting in lowering of the UGA potentiometric surface.

4.1.2 Sand Aquifer

The monitoring network in the SA includes three upgradient wells (MW-8B, MW-17B, and MW-21B) and three downgradient wells (MW-15A, MW-20A, and MW-23A) wells. These six wells were selected because groundwater in the SA flows inward toward a hydraulic sink that discharges downward into the SGA. The three upgradient wells (MW-8B, MW-17B, and MW-21B) provide information on groundwater quality outside the sink area, while two of the downgradient wells (MW-15A and MW-23A) provide information on groundwater quality in the hydraulic sink area. One additional downgradient well (MW-20A), located just west of the landfill, showed historical groundwater quality impacts and was also selected for groundwater chemistry monitoring.

Downgradient wells MW-15A, MW-20A, and MW-23A represent the quality of groundwater discharging from the UGA downward through the SA to the underlying SGA. Wells MW-15A, MW-20A, and MW-23A were not sampled during 2010 due to declining groundwater levels (the wells were dry), and have not been sampled since 2001, 1994, and 1993, respectively. Since the initiation of remedial measures at the landfill, the decrease in water levels in the SA is a result of decreased discharge from the UGA, which in turn has resulted in a reduction in leachate generation due to reduced saturated refuse. Therefore, groundwater quality in the SA is not directly measureable and is reflected by the groundwater in the underlying SGA.

4.1.3 Southern Gravel Aquifer

The monitoring network in the SGA consists of five downgradient wells (MW-14B, MW-20B, MW-23B, MW-29B, and MW-30C). Well MW-14B is located where SA groundwater discharges into the SGA. Wells MW-20B and MW-23B are downgradient of the landfill and provide information on groundwater quality in the west and east sections,

respectively, of the SGA. Well MW-29B is downgradient of the landfill and provides information on groundwater quality in the east section of the SGA. Well MW-30C is a downgradient well in the SGA, but is cross-gradient in relation to influence from the landfill.

4.2 GROUNDWATER SAMPLING AND ANALYSIS PROCEDURES

Groundwater samples were collected in conformance with the Midway Landfill Monitoring Plan (Parametrix 2000) under guidelines set in the State of Washington Minimum Functional Standards for Solid Waste Handling (Chapter 173-304 WAC).

One of the recommendations from the First Five-Year Review (USEPA 2005) was to test selected wells for 1,4-dioxane, which is a chemical additive commonly associated with solvents. The City agreed to test for 1,4-dioxane in groundwater samples collected from MW-17B and MW-21B (upgradient SA wells) and from MW-14B (downgradient SGA well), and began this testing in November 2005.

Groundwater samples were collected between May 3 through 7, 2010 and analyzed for the annual event chemical parameters, as outlined in Table 4-1.

Table 4-1. Groundwater Chemistry Analytical Schedule

Biannual[a] and Annual[b] Event	
• Temperature	• Dissolved manganese
• Specific conductivity	• Chemical oxygen demand
• pH	• Total organic carbon
• Chloride	• Volatile organic compounds (VOCs)
• Sulfate	• Total metals[d]
• Dissolved iron	• 1,4-dioxane[c]
• Vinyl chloride (SIM)	

[a] Biannual event monitoring wells = MW-7A, MW-14B, MW-15A, MW-17B, MW-20A, MW-20B, MW-21B, MW-23A, MW-23B, MW-29B and MW-30C.

[b] Annual event monitoring wells = biannual event wells listed above plus MW-8B, MW-16, and MW-21A.

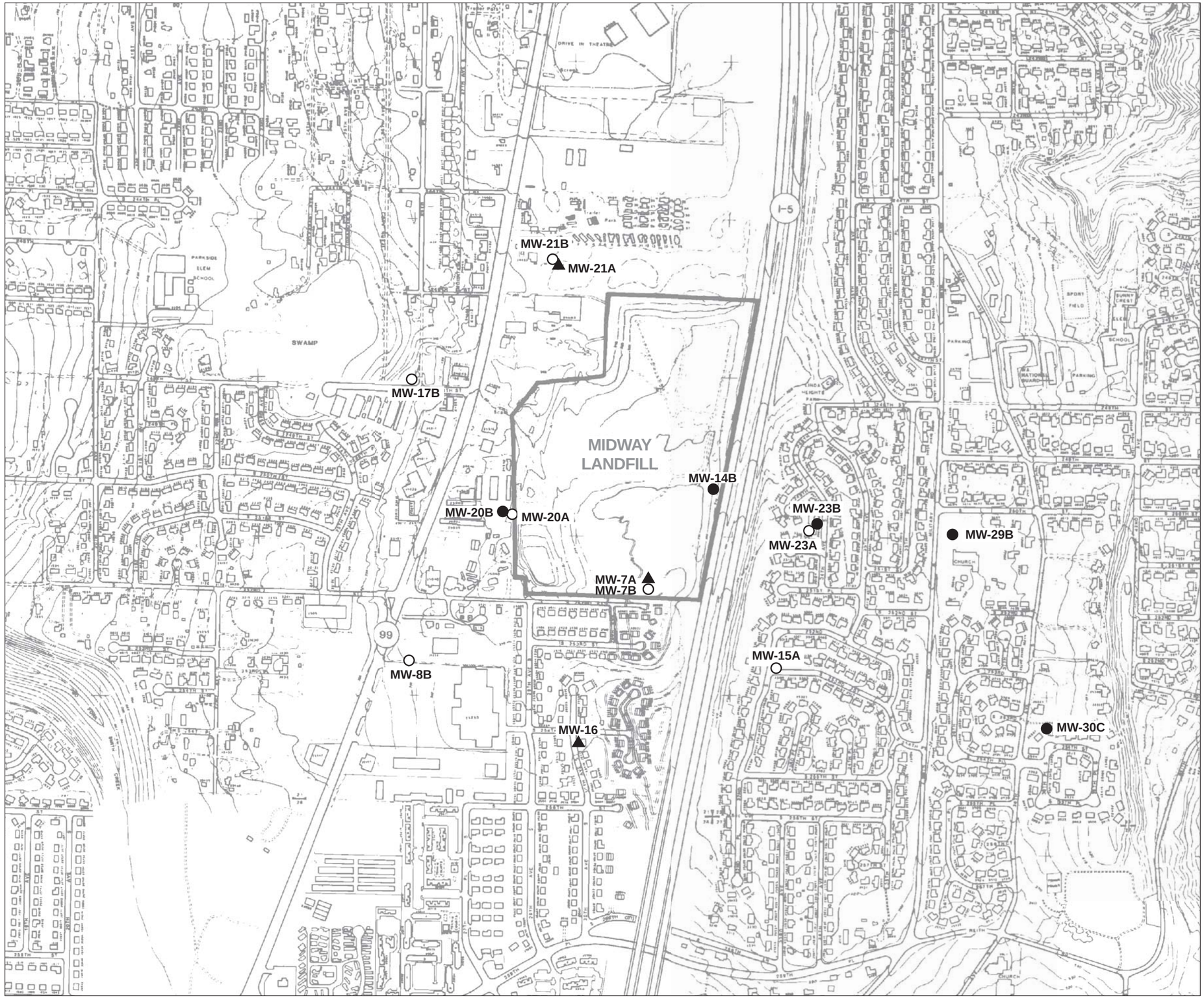
[c] Tested by USEPA 8270 (semi-volatile organic compounds) in groundwater samples collected from MW-17B, MW-21B, and MW-14B.

[d] Total metals for purge water sample only include chromium, cadmium, copper, lead, nickel, and zinc.

4.3 GROUNDWATER QUALITY MONITORING RESULTS

Results of the groundwater chemistry monitoring for May 2010 (R-57) are presented in Appendix B, including groundwater sampling field data sheets, and a data quality assurance summary. A summary table of chemical data is presented as Table B-1 of Appendix B and the laboratory report is presented in Appendix C.

Figure 4-1
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

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

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4.3.1 COMPARISON WITH ROD CLEANUP LEVELS

The 2010 groundwater data for the three COCs (manganese; 1,2-DCA; and vinyl chloride) were compared to the cleanup levels established in the ROD (Table 1-1). Groundwater data that exceeded the ROD cleanup levels are highlighted in Table B-2. The groundwater data for the remaining tested parameters were compared to "applicable" regulatory standards per the ROD. The applicable standards selected for this post-ROD monitoring were federal Maximum Contaminant Levels (MCLs) for drinking water, and MTCA Method B groundwater cleanup levels. Comparison of the R-57 data to these standards is presented in Table B-3.

The selected remedy in the ROD requires the City to submit annual notices to the appropriate agencies, water districts, and active well drillers so that water supply wells are not constructed in areas of groundwater contamination. The annual notification identifies the locations of the monitoring wells and summarizes groundwater quality results. A copy of the annual notification is included in Appendix F.

4.4 TIME-SERIES ANALYSIS

4.4.1 Time-Series Plots for ROD Contaminants of Concern

Time-series Plots for ROD COCs are presented in Appendix D.

4.4.1.1 In the Upper Gravel Aquifer:

- Manganese concentrations in upgradient wells MW-16 and MW-21A have shown stable to decreasing trends (respectively) since monitoring began in 1990. Manganese concentrations for both of these wells have always been below the ROD cleanup level. The manganese concentrations measured in MW-16 during 2009 and 2010 were slightly above the average RI value but within the historical range of values, and in MW-21A were the lowest reported concentrations since the beginning of monitoring. Vinyl chloride and 1,2-DCA have never been detected in these wells. It should be noted that the detection limits for these chemicals varied prior to 2001.

4.4.1.2 In the Sand Aquifer:

- Manganese concentrations have been stable or decreasing in upgradient wells MW-8B and MW-21B, with reported values below the ROD cleanup level. 1,2-DCA has never been detected in these wells, and vinyl chloride was detected only once in well MW-21B (May 2005). It should be noted that the detection limits for these chemicals varied prior to 2001.
- All three COCs have shown decreasing trends in upgradient well MW-17B. The concentration of vinyl chloride and 1,2-DCA were both detected below the ROD cleanup levels during the 2010 sampling event.

4.4.1.3 In the Southern Gravel Aquifer:

- All three COCs (manganese, vinyl chloride, 1,2-DCA) are showing stable or decreasing trends in downgradient wells MW-14B and MW-23B. Manganese and 1,2-DCA were below the ROD cleanup level and the average RI value in both wells. Historic low concentrations were reported in 2010 for manganese in MW-23B. 1,2-DCA remained undetected in well MW-14B. Vinyl chloride concentrations were

below the average RI value but above the ROD cleanup level in MW-14B. Vinyl chloride in MW-23B was below the ROD cleanup level.

- Manganese concentrations had historically shown an increasing trend in downgradient well MW-20B, with a high measured in 2000. However, since November 2000, concentrations have decreased to the lowest concentration since 1994, although still remaining above the ROD cleanup level. The highest detected vinyl chloride concentration in MW-20B was reported in May 2001. Vinyl chloride concentrations in MW-20B have decreased since that time and the 2010 concentration was below the ROD cleanup level. 1,2-DCA has never been detected in well MW-20B.
- Manganese concentrations in downgradient well MW-29B are relatively stable and have been below the ROD cleanup level since May 1990. Historic high concentrations of 1,2-DCA and vinyl chloride were reported in MW-29B during 1997 and 2002, respectively. Concentrations of these two parameters have shown steadily decreasing trends since that time, and 1,2-DCA was below the ROD cleanup level in 2010. Vinyl chloride remained above the ROD cleanup level.
- Manganese concentrations have been stable in cross-gradient well MW-30C, with concentrations reported below the ROD cleanup level and average RI values. The 2000 detection of vinyl chloride initiated additional testing during subsequent monitoring periods, and vinyl chloride has been intermittently detected in MW-30C 10 times since 2000. Vinyl chloride was not detected in 2010. 1,2-DCA has been detected only one time (May 2000) in MW-30C, at a concentration below the ROD cleanup level.

4.4.2 Time-Series Plots for Groundwater Quality Parameters Not Included in the ROD

Time-series plots for groundwater quality parameters not included in the ROD are presented in Appendix E.

4.4.2.1 In the Upper Gravel Aquifer:

Except as noted below, groundwater quality in upgradient wells MW-16 and MW-21A was relatively stable in 2010 or varied within a stable range.

- Specific conductivity and iron in well MW-16 have increased over time, but have stabilized since 2007.
- Specific conductivity in well MW-21A has decreased over time.

4.4.2.2 In the Sand Aquifer:

Except as noted below, groundwater quality in upgradient wells MW-8B, MW-17B, and MW-21B was relatively stable in 2010 or varied within a stable range.

- Specific conductivity, iron, 1,1-DCA, 1,1-DCE, and chloroethane continued to decrease in well MW-17B.
- Iron concentrations have decreased over time in well MW-21B, and have been below the regulatory standards and the average RI value since 2002. Three volatile organic compounds (1,1-DCE; tetrachloroethene; and trichloroethene) have shown steadily increasing trends in well MW-21B since 1994, with concentrations above the regulatory standards and the average RI value.

4.4.2.3 In the Southern Gravel Aquifer:

Except as noted below, groundwater quality in wells MW-14B, MW-20B, MW-23B, MW-29B, and MW-30C was relatively stable in 2010 or varied within a stable range.

- Specific conductivity and iron continued to decrease in wells MW-14B, MW-20B, and MW-23B.

4.5 SPECIAL SAMPLING FOR 1,4-DIOXANE

Sampling for 1,4-dioxane was conducted during 2010 in two SA wells (MW-17B and MW-21B) and in one SGA well (MW-14B), as recommended in the First Five-Year Review.

4.5.1 In the Sand Aquifer:

- 1,4-dioxane was detected in the groundwater samples collected from upgradient wells MW-17B (2.4 µg/L) and MW-21B (5.3 µg/L). The detected concentration in the Round 57 duplicate sample for MW-17B was 5.8 µg/L. None of the samples exceeded the MTCA B cleanup level of 7.95 µg/L.

4.5.2 In the Southern Gravel Aquifer:

- 1,4-dioxane was detected in the groundwater sample collected from downgradient well MW-14B at 17 µg/L. The detected concentration exceeded the MTCA B cleanup level of 7.95 µg/L.

5. SUMMARY

5.1 CONCLUSIONS

Specific conclusions based on the data presented in this report are listed below:

- ROD cleanup levels were exceeded for one of the three COCs in groundwater samples from the three downgradient wells in the SGA (MW-14B, MW-20B, and MW-29B) during the 2010 sampling event.
- The source or sources of contamination upgradient of the Midway Landfill in the SA were 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 VOCs in the SA and the SGA continue to be affected by these contamination sources.
- 1,4-dioxane was tested in groundwater samples from wells MW-14B, MW-17B, and MW-21B, as recommended by Ecology and the USEPA. The concentration of 1,4-dioxane in the sample from well MW-14B exceeded the MTCA B cleanup level during the 2010 sampling event.

5.2 RECOMMENDATIONS

In consideration of these conclusions, the City recommends the following for the Midway Landfill monitoring program:

- Continue monitoring and reporting at reduced frequency as detailed in the recommendations in the Round 54 Report (Parametrix 2009).

Implement the recommendations of the Second Five-Year Review:

- Add well MW-7B to the monitoring network to further evaluate groundwater contamination in the SA.
- Add 1,4-dioxane to the analyte list for all wells in the monitoring network.
- Revise the Midway Landfill Operations and Maintenance Manual to include the current landfill gas sampling locations and schedule and locations of operational gas extraction wells.

6. REFERENCES

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APPENDIX A

Fluid Level Measurements and Groundwater Elevations

Table A-1. Fluid Level Data for Shallow Groundwater/Saturated Refuse Monitoring Wells, April 2010, Midway Landfill, Kent, Washington

Area	Well #	Measuring Point Elevation* (ft.)	Fluid Depth (ft.)	Fluid Elev. (ft.)	Comments
West Side	2	366.13	Dry @ 62.54	<303.59	
	5	365.67	65.84	299.83	
North End	14	370.63	60.89	309.74	
	PC4S	349.16	35.48	313.68	
	PC6S	348.68	29.44	319.24	
Linda Heights Area	26	380.89	68.95	311.94	
	27	379	70.8	308.2	
	45D	379.82	72.34	307.48	
Hydraulic Sink	40D	400.27	128.04	272.23	
	49D	395.45	109.35	286.1	
	54D	385.98	Dry @ 95.25	<290.73	
	54S	385.97	45.62	340.35	
(area refuse)	38D	396.93	102.23	294.7	
South End	56D	383.11	84.3	298.81	
	56S	382.84	Dry @ 55.37	<327.47	
Central Mound	42D	380.32	73.65	306.67	
	43D	374.7	74.74	299.96	0.25 Oil thickness
	47D	381.58	Dry @ 90.10	<291.48	
(area refuse)	AM-M	368	54.5	313.5	
North End Shallow	AN-M	364.5	24.4	340.1	
	AO-M	356.2	22.08	334.12	
	AR-M	354.4	18.97	335.43	

NOTES:

All fluid depth measurements are to first encountered fluid.

* = Measuring point elevations updated April 1998.

DRY = Well was dry.

(area refuse) = Well not in a specific hydraulic area located between the two areas on the table.

Table A-2. Water Level Data for April 2010, Groundwater Monitoring Wells, Midway Landfill

Well ID	Date Measured	Aquifer	Reference Elevation (ft-MSL)	Depth to Water (ft)	Water Level Elevation (ft-MSL)
MW-2	4/26/2010	UGA	384.39	Dry @ 156.40	<227.99 (a)
MW-4	4/26/2010	UGA	362.82	Dry @ 91.59	<271.23 (a)
MW-7A	4/26/2010	UGA	412.73	Dry @ 197.30	<215.43 (a)
MW-7B	4/26/2010	SA	412.73	209.66	203.07
MW-8A	4/26/2010	UGA/SA	353.02 *	112.90	240.12
MW-8B	4/26/2010	SA	351.35	139.05	212.30
MW-9A	4/26/2010	SA	353.79	nm	
MW-11A	4/26/2010	SA	370.41	117.20	253.21
MW-13A	4/26/2010	UGA	382.68	108.18	274.50
MW-13B	4/26/2010	SA	382.68	132.50	250.18
MW-14B	4/26/2010	SGA	381.85	233.53	148.32
MW-15A	4/26/2010	SA	438.54	Dry @ 230.45	<208.09 (a)
MW-16	4/26/2010	UGA	362.80	124.93	237.87
MW-17A	4/26/2010	UGA	337.08	67.62	269.46
MW-17B	4/26/2010	SA	337.08	69.05	268.03
MW-18A	4/26/2010	SA	343.91	76.25	267.66
MW-19C	4/26/2010	SGA	370.20	OBST @ 60.05	
MW-20A	4/26/2010	SA	375.65	Dry @ 184.00	<191.65 (a)
MW-20B	4/26/2010	SGA	375.65	255.42	120.23
MW-21A	4/26/2010	UGA	359.95	81.58	278.37
MW-21B	4/26/2010	SA	359.95	85.05	274.90
MW-23A	4/26/2010	SA	424.42	Dry @ 239.64	<184.78 (a)
MW-23B	4/26/2010	SGA	424.42	270.54	153.88
MW-24A	4/26/2010	SA	418.58	199.95	218.63
MW-24B	4/26/2010	SGA	418.58	259.18	159.40
MW-25C	4/26/2010	SA	260.84	4.05	256.79
MW-26	4/26/2010	UGA	370.58	93.05	277.53
MW-27A	4/26/2010	UGA	330.05	48.47	281.58
MW-28	4/26/2010	SA	374.15	90.01	284.14
MW-29A	4/26/2010	UGA	428.50	194.20	234.30
MW-29B	4/26/2010	SGA	428.50	303.10	125.40
MW-30A	4/26/2010	SA	407.91	168.50	239.41
MW-30C	4/26/2010	SGA	407.91	267.83	140.08

(a) Well was dry during groundwater chemistry monitoring. Elevation shown is bottom of well.
Elevation datum NAVD 83
* = Measuring point elevation raised 1.67 ft
ft = Feet
MSL = Mean sea level
UGA = Upper Gravel Aquifer
SA = Sand Aquifer
SGA = Southern Gravel Aquifer
OBST =well is obstructed at noted depth
nm = Not measured, no access- locked gate

APPENDIX B

Groundwater Quality Monitoring Data

Parametrix ENGINEERING . PLANNING . ENVIRONMENTAL SCIENCES

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TECHNICAL MEMORANDUM

Date:	May 20, 2010
To:	Project File
From:	Annika Deutsch
Subject:	ARI Analytical Data Quality Assurance Review: Midway Landfill Groundwater Monitoring Event 57
cc:	Laura Lee, Sandra Matthews
Project Number:	555-1550-054 (01/01A2)
Project Name:	Midway Landfill

INTRODUCTION

Twelve groundwater samples (including two field duplicates), one field blank, and four trip blanks were collected at Midway Landfill between May 3 and 7, 2010 (Monitoring Event 57). The samples were submitted to Analytical Resources, Inc., (ARI) for Volatile Organics, General Chemistry, Metals, and Semivolatiles analyses, and were analyzed in four batches (QU99, QV22, QV41, QV70).

DATA QUALITY SUMMARY

The data results met the laboratory and PMX quality control specifications and are acceptable for qualitative and quantitative purposes as qualified. **Five results were qualified based on a field duplicate RPD out of control limits for COD.**

SAMPLE HOLDING TIMES

The holding times for volatile organics ranged from 1 to 3 days, which were unpreserved. The holding times for the general chemistry samples ranged from 1 to 9 days. The holding times for metals ranged from 3 t 7 days. The holding time for semivolatiles was 7 days. All samples were analyzed within the holding times (Table 1). Therefore, it was unnecessary to qualify any results based on holding times.

Table 1. Sample Identification and Holding Times for Midway, Monitoring Event 56

ARI Sample No.	PMX Sample No.	Date Sampled	VOCs	Metals	Semivolatiles	General
QU99A	MW-29B	5/3/10	5/5/10	5/6/10	N/A	5/3-12/10
QU99B	MW-31*					
QU99C	MW-16					
QU99D	MW-20B					
QV22A	MW-35**	5/4/10	5/5-6/10	5/11/10	5/11/10	5/6-12/10
QV22B	MW-17B					
QV22C	MW-14B					
QV22D	MW-21B					
QV22E	MW-21A					
QV22F	Field Blank					
QV41A	MW-8B	5/5/10	5/6/10 (unpreserved); 5/12/10 (vinyl chloride)	5/11/10	N/A	5/6-13/10
QV41B	MW-30C					
QV70A	MW-23B	5/7/10	5/10/10 (unpreserved); 5/12/10 (vinyl chloride)	5/11/10	N/A	5/10-13/10

* Field duplicate of MW-16
** Field duplicate of MW-21B
VOCs = volatile organic compounds
General = general chemistry parameters

Volatile Organics

No compounds were detected in any of the field or method blanks.

The surrogate recoveries were within acceptable limits.

The laboratory control sample percent recoveries were within acceptable QC limits for compounds for which ARI provides control limits.

The RPD results for the field duplicate MW-31 and sample MW-16 were all within acceptable limits. The RPD results for the field duplicate MW-35 and sample MW-21B were all within acceptable limits.

Two samples (MW-35 and MW-21B) required dilution to accurately quantify the tetrachloroethene concentration (lab qualified "E"). However, the "E" qualified initial results were equal to the results for the dilution. Therefore, the original results (without qualification) will be used.

Semivolatile Organics

Semivolatiles were analyzed for samples from wells MW-14B, MW-17B, MW-21A, MW-21B, a field duplicate (MW-35 for sample MW-21B), and a field blank.

No compounds were detected in the method blank or field blank.

Surrogate recoveries were within acceptable limits.

The laboratory control sample percent recoveries were within acceptable QC limits.

The RPD results for the field duplicate MW-35 and the sample MW-21B were within acceptable limits.

MINIMUM FUNCTIONAL STANDARDS

General Chemistry

No compounds were detected in any of the method blanks. Sulfate was detected in the field blank at 2.3 mg/L. All samples had detections of sulfate; however, they ranged from 8.9 to 133 mg/L (almost 4 to almost 48 times the field blank concentration). Therefore, no samples were qualified based on the field blank contamination.

The standard recovery results were within acceptable QC limits.

The RPD results for the general chemistry laboratory duplicate samples were all within limits.

The spike compound recoveries for the MS and MSD QC samples were all within acceptable control limits.

The RPD results for the field duplicate MW-31 and sample MW-16 were all within acceptable limits. The RPD results for the field duplicate MW-35 and sample MW-21B were all within acceptable limits, with the exception of COD. As a result, all detections of COD from samples collected May 4 (QV22), 5 (QV41), and 7 (QV70) were qualified as estimated "J".

Metals

No metals were detected in the method blanks or the field blank.

The RPD results for the metals laboratory duplicate samples were all within limits.

The spike compound recoveries from the MS and MSD QC samples were all within acceptable control limits.

The RPD results for the field duplicate MW-31 and sample MW-16 were all within acceptable limits. The RPD results for the field duplicate MW-35 and sample MW-21B were all within acceptable limits.

Table 2. Qualified Data, Monitoring Event 57

ARI Sample No.	PMX Sample No.	Lab Value	Analyte	Units	Qualified Value	Qualifier
QV22B	MW-17B	5.68	COD	mg/L	5.68	J
QV22D	MW-21B	11.8	COD	mg/L	11.8	J
QV22E	MW-21A	5.36	COD	mg/L	5.36	J
QV41B	MW-30C	6.00	COD	mg/L	6.00	J
QV70A	MW-23B	5.68	COD	mg/L	5.68	J

REFERENCES

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Tables

Table B-1. Minimum Functional Standard and Organic Parameters in Groundwater, Midway Landfill, Sand and Gravel Aquifers
Midway Landfill
Kent, Washington

			Upper Gravel Aquifer			Sand Aquifer				Southern Gravel Aquifer				
Compound	**Units**	**Round ID**	**MW-16 UP**	**MW-16 DUP UP**	**MW-21A UP**	**MW-8B UP**	**MW-17B UP**	**MW-21B UP**	**MW-21B DUP UP**	**MW-14B DOWN**	**MW-20B DOWN**	**MW-23B DOWN**	**MW-29B DOWN**	**MW-30C DOWN**
Field Parameters														
pH	s.u.	R-57	7.4	- -	6.51	6.45	6.34	6.79	- -	6.46	6.73	6.23	6.23	6.57
Conductivity	µmhos/cm	R-57	280	- -	331	155	335	681	- -	703	1303	569	705	320
Temperature	C	R-57	11.4	- -	11.8	11.0	11.5	11.1	- -	13.1	12.1	11.1	10.0	9.6
Conventional Parameters														
Chloride	mg/L	R-57	8.4	8.3	6.6	5.3	9.6	15	15.2	18	44.7	14.8	32.9	12.9
Chemical Oxygen Demand	mg/L	R-57	5 U	5 U	5.36 J	5 U	5.68 J	11.8 J	5 U	5 U	17	5.68 J	10.4	6 J
Sulfate	mg/L	R-57	28.4	27.9	39.1	17.9	23.7	133	133	30.9	8.9	33	23	12.9
Total Organic Carbon	mg/L	R-57	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U	2.3	6.47	1.9	2.37	1.5 U
Dissolved Metals														
Iron	mg/L	R-57	0.25	0.25	0.05 U	0.05 U	0.05	0.05 U	0.05 U	11.2	9.48	8.67	15	2.74
Manganese	mg/L	R-57	0.094	0.094	0.016	0.004	0.053	0.405	0.408	0.961	3.24	0.153	0.98	0.706
Semi-Volatile Organics														
1,4-Dioxane	µg/L	R-57	- -	- -	- -	- -	2.4	5.3	5.8	17	- -	- -	- -	- -
Volatile Organics														
1,1,1-Trichloroethane	µg/L	R-57	1 U	1 U	1 U	1 U	1 U	3.8	3.9	1 U	1 U	1 U	1 U	1 U
1,1,2,2-Tetrachloroethane	µg/L	R-57	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,1,2-Trichloro-1,2,2-trifluoroethane	µg/L	R-57	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
1,1,2-Trichloroethane	µg/L	R-57	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,1-Dichloroethane	µg/L	R-57	1 U	1 U	1 U	1 U	36	3.6	3.6	1.5	1 U	1 U	1 U	1 U
1,1-Dichloroethene	µg/L	R-57	1 U	1 U	1 U	1 U	2.6	3.6	3.6	1 U	1 U	1 U	1 U	1 U
1,2-Dichloroethane	µg/L	R-57	1 U	1 U	1 U	1 U	4.4	1 U	1 U	1 U	1 U	2.7	4.7	1 U
1,2-Dichloropropane	µg/L	R-57	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
2-Butanone	µg/L	R-57	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
2-Chloroethylvinylether	µg/L	R-57	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
2-Hexanone	µg/L	R-57	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
4-Methyl-2-Pentanone (MIBK)	µg/L	R-57	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Acetone	µg/L	R-57	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Benzene	µg/L	R-57	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Bromodichloromethane	µg/L	R-57	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Bromoform	µg/L	R-57	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Bromomethane	µg/L	R-57	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Carbon Disulfide	µg/L	R-57	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Carbon Tetrachloride	µg/L	R-57	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Chlorobenzene	µg/L	R-57	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Chloroethane	µg/L	R-57	1 U	1 U	1 U	1 U	1.4	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Chloroform	µg/L	R-57	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U

Table B-1. Minimum Functional Standard and Organic Parameters in Groundwater, Midway Landfill, Sand and Gravel Aquifers
Midway Landfill
Kent, Washington

			Upper Gravel Aquifer			Sand Aquifer				Southern Gravel Aquifer				
			MW-16	MW-16 DUP	MW-21A	MW-8B	MW-17B	MW-21B	MW-21B DUP	MW-14B	MW-20B	MW-23B	MW-29B	MW-30C
Compound	**Units**	**Round ID**	**UP**	**UP**	**UP**	**UP**	**UP**	**UP**	**UP**	**DOWN**	**DOWN**	**DOWN**	**DOWN**	**DOWN**
Volatile Organics continued														
Chloromethane	µg/L	R-57	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
cis-1,2-Dichloroethene	µg/L	R-57	1 U	1 U	1 U	1 U	3.8	1 U	1 U	4.5	1 U	3.4	1	1 U
cis-1,3-Dichloropropene	µg/L	R-57	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Dibromochloromethane	µg/L	R-57	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Ethylbenzene	µg/L	R-57	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
m,p-Xylene	µg/L	R-57	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Methylene Chloride	µg/L	R-57	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
o-Xylene	µg/L	R-57	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Styrene	µg/L	R-57	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Tetrachloroethene	µg/L	R-57	1 U	1 U	1 U	1 U	1 U	130	130	1 U	1 U	1 U	1 U	1 U
Toluene	µg/L	R-57	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
trans-1,2-Dichloroethene	µg/L	R-57	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
trans-1,3-Dichloropropene	µg/L	R-57	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Trichloroethene	µg/L	R-57	1 U	1 U	1 U	1 U	1 U	4.8	5.1	1 U	1 U	1 U	1 U	1 U
Trichlorofluoromethane	µg/L	R-57	1 U	1 U	2.5	1 U	1 U	4.4	4.3	1 U	1 U	1 U	1 U	1 U
Vinyl Acetate	µg/L	R-57	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Vinyl Chloride	µg/L	R-57	0.2 U	0.2 U	0.2 U	0.2 U	0.22	0.2 U	0.2 U	0.63	0.27	0.27	0.65	0.2 U

Note: UP or DOWN in column title denotes whether the well is located upgradient or down gradient of the landfills influence.
U: Indicated the compound was undetected at the reported concentration
J: Indicated the compound was detected at an estimated concentration
- -: Not ananlyzed
R-57: Round 57, May 2010

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

				Upper Gravel Aquifer			Sand Aquifer				Southern Gravel Aquifer				
Analyte	Units	Cleanup Level[a]	Round ID	MW-16 UP	MW-16 DUP UP	MW-21A UP	MW-8B UP	MW-17B UP	MW-21B UP	MW-21B DUP UP	MW-14B DOWN	MW-20B DOWN	MW-23B DOWN	MW-29B DOWN	MW-30C DOWN
Manganese	mg/L	2.2	R-57	0.094	0.094	0.016	0.004	0.053	0.405	0.408	0.961	3.24	0.153	0.98	0.706
1,2-Dichloroethane	µg/L	5	R-57	1 U	1 U	1 U	1 U	4.4	1 U	1 U	1 U	1 U	2.7	4.7	1 U
Vinyl Chloride	µg/L	0.29*	R-57	0.2 U	0.2 U	0.2 U	0.2 U	0.22	0.2 U	0.2 U	0.63	0.27	0.27	0.65	0.2 U

ROD =Record of Decision
R-57 =Round 57, May 2010
a =Cleanup levels established in the Final EPA ROD for the Midway Landfill Site, September 6, 2000.
[ ] =Exceeds cleanup level established in the Final ROD for the Midway Landfill Site, September 6, 2000.
U =Indicates the compound was undetected at the reported concentration.
DUP =Duplicate.
* =The revised cleanup level for vinyl chloride is 0.29 µg/L using the MTCA adjusted cancer risk of 1e-5.
Notes =Up or Down in column title denotes whether the well is located upgradient or downgradient of the landfill's influence.

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

					Upper Gravel Aquifer			Sand Aquifer				Southern Gravel Aquifer				
Compound	**Units**	**MCL[a]**	**MTCA B[b]**	**Round ID**	**MW-16 UP**	**MW-16 DUP UP**	**MW-21A UP**	**MW-8B UP**	**MW-17B UP**	**MW-21B UP**	**MW-21B DUP UP**	**MW-14B DOWN**	**MW-20B DOWN**	**MW-23B DOWN**	**MW-29B DOWN**	**MW-30C DOWN**
Field Parameters																
pH	s.u.	6.5-8.5		R-57	7.4	- -	6.51	6.45	6.34	6.79	- -	6.46	6.73	6.23	6.23	6.57
Specific Conductivity	µmhos/cm			R-57	280	- -	331	155	335	681	- -	703	1303	569	705	320
Temperature	C			R-57	11.4	- -	11.8	11.0	11.5	11.1	- -	13.1	12.1	11.1	10.0	9.6
Conventional Parameters																
Chloride	mg/L	250**		R-57	8.4	8.3	6.6	5.3	9.6	15	15.2	18	44.7	14.8	32.9	12.9
COD	mg/L			R-57	5 U	5 U	5.36 J	5 U	5.68 J	11.8 J	5 U	5 U	17	5.68 J	10.4	6 J
Sulfate	mg/L	250**		R-57	28.4	27.9	39.1	17.9	23.7	133	133	30.9	8.9	33	23	12.9
TOC	mg/L			R-57	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U	2.3	6.47	1.9	2.37	1.5 U
Dissolved Metals																
Iron	mg/L	0.3**		R-57	0.25	0.25	0.05 U	0.05 U	0.05	0.05 U	0.05 U	11.2	9.48	8.67	15	2.74
Volatile Organics																
1,1,1-Trichloroethane	µg/L	200*	7200	R-57	1 U	1 U	1 U	1 U	1 U	3.8	3.9	1 U	1 U	1 U	1 U	1 U
1,1-Dichloroethane	µg/L		800	R-57	1 U	1 U	1 U	1 U	36	3.6	3.6	1.5	1 U	1 U	1 U	1 U
1,1-Dichloroethene	µg/L	7*	0.0729	R-57	1 U	1 U	1 U	1 U	2.6	3.6	3.6	1 U	1 U	1 U	1 U	1 U
cis-1,2-Dichloroethene	µg/L	70*	80	R-57	1 U	1 U	1 U	1 U	3.8	1 U	1 U	4.5	1 U	3.4	1	1 U
Chloroethane	µg/L			R-57	1 U	1 U	1 U	1 U	1.4	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Tetrachloroethene	µg/L	5*	0.858	R-57	1 U	1 U	1 U	1 U	1 U	130	130	1 U	1 U	1 U	1 U	1 U
Trichloroethene	µg/L	5*	3.98	R-57	1 U	1 U	1 U	1 U	1 U	4.8	5.1	1 U	1 U	1 U	1 U	1 U
Trichlorofluoromethane	µg/L		2400	R-57	1 U	1 U	2.5	1 U	1 U	4.4	4.3	1 U	1 U	1 U	1 U	1 U
Semi-Volatile Organics																
1,4-Dioxane***	µg/L		7.95	R-57	- -	- -	- -	- -	2.4	5.3	5.8	17	- -	- -	- -	- -

R-57 =Round 57, May 2010

=Exceeds Federal MCL 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).

*** =Testing for 1,4-Dioxane in selected groundwater samples was recommended by Ecology and EPA.

[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

U: Indicated the compound was undetected at the reported concentration

J: Indicated the compound was detected at an estimated concentration

- - =Not ananlyzed

Field Sheets

Midway Groundwater Sampling 555-1550-052
Annual Monitoring Round 57

By Associate Environmental Analysts:
Valerie Thoma, Frank McKenzie, Randy Locke
May 3-7, 2010

The following wells were dry. No samples were taken:

MW7A, MW15A, MW20A, MW23A

The following wells and field blank were sampled:

DATE	WELL	PURGE TIME	SAMPLE TIME
5/03/10	MW29B	0735-0851	0855
5/03/10	MW31	duplicate of MW16	"0950"
5/03/10	MW16	1134-1205	1210
5/03/10	MW20B	1309-1404	1405
5/04/10	MW35*	duplicate of 21B	"0810"
5/04/10	MW17B*	0816-0921	0925
5/04/10	MW14B*	1024-1110	1115
5/04/10	MW21B*	1202-1238	1240
5/04/10	MW21A	1313-1342	1345
5/04/10	Field Blank*		1410
5/05/10	MW8B	0818-0905	0910
5/05/10	MW30C	1010-1102	1105
5/07/10	MW23B	0812-0850	0855

*Wells also being measured for Dioxane.

5/3/10: Bennett Pump SN 187-207 stopped working after purging 40+ gallons of water from MW30C. It was replaced today with Bennett Pump SN 187-208.

5/5/10: Water initially in air exhaust line at MW8B. Had to lift and shake pump to make it work.

5/5/10: MW30C sampling was re-done with no further problems. Of note, new home construction began on this property. There was a strong odor of kerosene on the boards used for foundation forms. Additionally, weeds across from the well were being sprayed with herbicides.

5/5/10: Bennett Pump SN 188-131 stopped working after purging 20+ gallons of water from MW23B. It was replaced early morning 5/6/10 with Bennett Pump SN 187-137.

5/7/10: MW23B sampling was re-done with no further problems.

MIDWAY LANDFILL
GROUNDWATER COMPLIANCE MONITORING PROGRAM
KENT, WA

GROUNDWATER SAMPLING
FIELD DATA SHEET
Well # MW 29B

Project Number:	555-1550-052	**Date:**	5/3/10
Project Name:	Midway Landfill	**Location:**	S. 250th & Military Rd. S.
Project Address:	24808 Pac Hwy S.	**Sampled By:**	VT, FM, RL
Client Name:	City of Seattle	**Purged By:**	Same as Above

Casing Diameter : 2" [X] 4" [ ] 6" [ ] Other [ ]

Depth to Water (Feet):	303.10	**Purge Volume Measurement Method:**	55 Gal.Drum
Depth of well (Feet):	377.00	**Purge Time (from/To):**	0735-0851
Reference Point (Surveyors Notch):	TOC	**Sample Time:**	0855

Purge Volume Calculation:(pr2h)(7.48 gal/ft3)(5 casing volume)
Purge volume (gallons) for: 2"= (0.80)(h); 4"=(3.26)(h); 6"=(7.40)(h)
Calculated Purge Volume (gallons): 59 Actual Purge Volume (gallons): 59

Time (2400 Hr)	Cumulative Volume(gal)	pH (Units)	Ec (µmhos/cm 25 °C)	Color (Visual)	Turbidity (Visual)	Odor	Temperature (°C)
0735	Initial	6.62	655	clear	clear	none	12.2
0803	Gal.	6.32	703	"	"	"	10.1
0827	Gal.	6.23	704	"	"	"	10.0
0851	Gal.	6.23	705	"	"	"	10.0
	Gal.						
	Gal.						

Purging Equipment: Bennett Pump **Sampling Equipment:** Dedicated teflon tube

Laboratory:	ARI	**Date Sent to Lab:**	5/3/10
Chain-of-Custody (yes/no):	Yes	**Field QC Sample Number:**	NA
Shipment Method:	Hand	**Split with (name/organization):**	NA

Well Integrity : OK
Comments or Note:

Signature : Thoma

MIDWAY LANDFILL
GROUNDWATER COMPLIANCE MONITORING PROGRAM
KENT, WA

GROUNDWATER SAMPLING
FIELD DATA SHEET
Well # MW 16 / 31

Project Number:	555-1550-052	**Date:**	5/3/10
Project Name:	Midway Landfill	**Location:**	S. 254th & 30th S.
Project Address:	24808 Pac Hwy S.	**Sampled By:**	VT, FM, RL
Client Name:	City of Seattle	**Purged By:**	Same as Above

Casing Diameter : 2" [X] 4" [ ] 6" [ ] Other [ ]

Depth to Water (Feet):	124.93	**Purge Volume Measurement Method:**	55 Gal. Drum
Depth of well (Feet):	166.90	**Purge Time (from/To):**	1134 - 1205
Reference Point (Surveyors Notch):	TOC	**Sample Time:**	1210

Purge Volume Calculation:(pr2h)(7.48 gal/ft3)(5 casing volume)
Purge volume (gallons) for: 2"= (0.80)(h); 4"=(3.26)(h); 6"=(7.40)(h)
Calculated Purge Volume (gallons): 34 Actual Purge Volume (gallons): 34

Time (2400 Hr)	Cumulative Volume(gal)	pH (Units)	Ec (µmhos/cm 25 °C)	Color (Visual)	Turbidity (Visual)	Odor	Temperature (°C)
1134	Initial	6.68	279	clear	clear	none	12.2
1144	11 Gal.	7.37	285	"	"	"	11.7
1154	22 Gal.	7.40	282	"	"	"	11.5
1205	34 Gal.	7.40	280	"	"	"	11.4
	Gal.						
	Gal.						

Purging Equipment: Bennett Pump **Sampling Equipment:** Dedicated teflon tube

Laboratory:	ARI	**Date Sent to Lab:**	5/3/10
Chain-of-Custody (yes/no):	Yes	**Field QC Sample Number:**	MW 31 ~~dup~~ duplicate
Shipment Method:	Hand	**Split with (name/organization):**	NA

Well Integrity : OK

Comments or Note:
Field duplicate MW 31 - sample time 0950

Signature : [signature]

MIDWAY LANDFILL
GROUNDWATER COMPLIANCE MONITORING PROGRAM
KENT, WA

GROUNDWATER SAMPLING
FIELD DATA SHEET
Well # MW 20B

Project Number:	555-1550-052	**Date:**	5/3/10
Project Name:	Midway Landfill	**Location:**	Sunset Motel
Project Address:	24808 Pac Hwy S.	**Sampled By:**	VT, FM, RL
Client Name:	City of Seattle	**Purged By:**	Same as Above

Casing Diameter : 2" [X] 4" [ ] 6" [ ] Other [ ]

Depth to Water (Feet):	255.42	**Purge Volume Measurement Method:**	55 Gal.Drum
Depth of well (Feet):	300.00	**Purge Time (from/To):**	1309 – 1404
Reference Point (Surveyors Notch):	TOC	**Sample Time:**	1405

Purge Volume Calculation:(pr2h)(7.48 gal/ft3)(5 casing volume)
Purge volume (gallons) for: 2"= (0.80)(h); 4"=(3.26)(h); 6"=(7.40)(h)
Calculated Purge Volume (gallons): 36 Actual Purge Volume (gallons): 36

Time (2400 Hr)	Cumulative Volume(gal)	pH (Units)	Ec (µmhos/cm 25 °C)	Color (Visual)	Turbidity (Visual)	Odor	Temperature (°C)
1309	Initial	7.27	1198	clear	clear	none	13.6
1322	12 Gal.	6.70	1314	"	"	"	12.5
1341	24 Gal.	6.74	1302	"	"	"	12.4
1404	36 Gal.	6.73	1303	"	"	"	12.1
	Gal.						
	Gal.						

Purging Equipment:	Bennett Pump	**Sampling Equipment:**	Dedicated teflon tube

Laboratory:	ARI	**Date Sent to Lab:**	5/3/10
Chain-of-Custody (yes/no):	Yes	**Field QC Sample Number:**	NA
Shipment Method:	Hand	**Split with (name/organization):**	NA

Well Integrity : OK
Comments or Note:

Signature : [signature]

MIDWAY LANDFILL
GROUNDWATER COMPLIANCE MONITORING PROGRAM
KENT, WA

GROUNDWATER SAMPLING
FIELD DATA SHEET
Well # MW 17B

Project Number:	555-1550-052	**Date:**	5/4/10
Project Name:	Midway Landfill	**Location:**	S. 248th & Pac Hwy S.
Project Address:	24808 Pac Hwy S.	**Sampled By:**	VT, FM, RL
Client Name:	City of Seattle	**Purged By:**	Same as Above

Casing Diameter : 2" [X] 4" [ ] 6" [ ] Other [ ]

Depth to Water (Feet):	69.05	**Purge Volume Measurement Method:**	55 Gal.Drum
Depth of well (Feet):	133.00	**Purge Time (from/To):**	0816-0921
Reference Point (Surveyors Notch):	TOC	**Sample Time:**	0925

Purge Volume Calculation:(pr2h)(7.48 gal/ft3)(5 casing volume)
Purge volume (gallons) for: 2"= (0.80)(h); 4"=(3.26)(h); 6"=(7.40)(h)
Calculated Purge Volume (gallons): 51 Actual Purge Volume (gallons): 51

Time (2400 Hr)	Cumulative Volume(gal)	pH (Units)	Ec (µmhos/cm 25 °C)	Color (Visual)	Turbidity (Visual)	Odor	Temperature (°C)
0816	Initial	6.34	288	clear	clear	none	11.1
0835	17 Gal.	6.16	309	"	"	"	11.4
0900	34 Gal.	6.24	330	"	"	"	11.4
0921	51 Gal.	6.34	335	"	"	"	11.5
	Gal.						
	Gal.						

Purging Equipment: Bennett Pump **Sampling Equipment:** Dedicated teflon tube

Laboratory:	ARI	**Date Sent to Lab:**	5/4/10
Chain-of-Custody (yes/no):	Yes	**Field QC Sample Number:**	NA
Shipment Method:	Hand	**Split with (name/organization):**	NA

Well Integrity : OK
Comments or Note:

Signature : [signature]

MIDWAY LANDFILL
GROUNDWATER COMPLIANCE MONITORING PROGRAM
KENT, WA

GROUNDWATER SAMPLING
FIELD DATA SHEET
Well # MW 14B

Project Number:	555-1550-052	**Date:**	5/4/10
Project Name:	Midway Landfill	**Location:**	Midway Landfill
Project Address:	24808 Pac Hwy S.	**Sampled By:**	VT, FM, RL
Client Name:	City of Seattle	**Purged By:**	Same as Above

Casing Diameter : 2" [X] 4" [ ] 6" [ ] Other [ ]

Depth to Water (Feet):	233.53	**Purge Volume Measurement Method:**	55 Gal.Drum
Depth of well (Feet):	307.50	**Purge Time (from/To):**	1024 – 1110
Reference Point (Surveyors Notch):	TOC	**Sample Time:**	1115

Purge Volume Calculation:(pr2h)(7.48 gal/ft3)(5 casing volume)
Purge volume (gallons) for: 2"= (0.80)(h); 4"=(3.26)(h); 6"=(7.40)(h)
Calculated Purge Volume (gallons): 59 Actual Purge Volume (gallons): 59

Time (2400 Hr)	Cumulative Volume(gal)	pH (Units)	Ec (µmhos/cm 25 °C)	Color (Visual)	Turbidity (Visual)	Odor	Temperature (°C)
1024	Initial	6.52	676	clear	clear	none	17.8
1042	20 Gal.	6.52	694	"	"	"	14.2
1056	40 Gal.	6.47	700	"	"	"	13.0
1110	59 Gal.	6.46	703	"	"	"	13.1
	Gal.						
	Gal.						

Purging Equipment: Bennett Pump **Sampling Equipment:** Dedicated teflon tube

Laboratory:	ARI	**Date Sent to Lab:**	5/4/10
Chain-of-Custody (yes/no):	Yes	**Field QC Sample Number:**	NA
Shipment Method:	Hand	**Split with (name/organization):**	NA

Well Integrity : OK
Comments or Note:

Signature : Thoma

MIDWAY LANDFILL
GROUNDWATER COMPLIANCE MONITORING PROGRAM
KENT, WA

GROUNDWATER SAMPLING
FIELD DATA SHEET
Well # MW 21B / 35

Project Number:	555-1550-052	**Date:**	5/4/10
Project Name:	Midway Landfill	**Location:**	Al's Acres
Project Address:	24808 Pac Hwy S.	**Sampled By:**	VT, FM, RL
Client Name:	City of Seattle	**Purged By:**	Same as Above

Casing Diameter : 2" [X] 4" [ ] 6" [ ] Other [ ]

Depth to Water (Feet):	85.05	**Purge Volume Measurement Method:**	55 Gal.Drum
Depth of well (Feet):	180.40	**Purge Time (from/To):**	1202 – 1238
Reference Point (Surveyors Notch):	TOC	**Sample Time:**	1240

Purge Volume Calculation:(pr2h)(7.48 gal/ft3)(5 casing volume)
Purge volume (gallons) for: 2"= (0.80)(h); 4"=(3.26)(h); 6"=(7.40)(h)
Calculated Purge Volume (gallons): 76 Actual Purge Volume (gallons): 76

Time (2400 Hr)	Cumulative Volume(gal)	pH (Units)	Ec (µmhos/cm 25 °C)	Color (Visual)	Turbidity (Visual)	Odor	Temperature (°C)
1202	Initial	6.82	681	clear	clear	none	11.8
1214	25 Gal.	6.76	680	"	"	"	11.2
1228	50 Gal.	6.78	681	"	"	"	11.2
1238	76 Gal.	6.79	681	"	"	"	11.1
	Gal.						
	Gal.						

Purging Equipment: Bennett Pump **Sampling Equipment:** Dedicated teflon tube

Laboratory:	ARI	**Date Sent to Lab:**	5/4/10
Chain-of-Custody (yes/no):	Yes	**Field QC Sample Number:**	MW 35 NA duplicate
Shipment Method:	Hand	**Split with (name/organization):**	NA

Well Integrity : OK
Comments or Note:

Field duplicate MW 35- sample time 0810

Signature :

MIDWAY LANDFILL
GROUNDWATER COMPLIANCE MONITORING PROGRAM
KENT, WA

GROUNDWATER SAMPLING
FIELD DATA SHEET
Well # MW 21A

Project Number:	555-1550-052	**Date:**	5/4/10
Project Name:	Midway Landfill	**Location:**	Al's Acres
Project Address:	24808 Pac Hwy S.	**Sampled By:**	VT, FM, RL
Client Name:	City of Seattle	**Purged By:**	Same as Above

Casing Diameter : 2" [X] 4" [ ] 6" [ ] Other [ ]

Depth to Water (Feet):	81.58	**Purge Volume Measurement Method:**	55 Gal.Drum
Depth of well (Feet):	95.40	**Purge Time (from/To):**	1313 - 1342
Reference Point (Surveyors Notch):	TOC	**Sample Time:**	1345

Purge Volume Calculation:(pr2h)(7.48 gal/ft3)(5 casing volume)
Purge volume (gallons) for: 2"= (0.80)(h); 4"=(3.26)(h); 6"=(7.40)(h)
Calculated Purge Volume (gallons): 11 Actual Purge Volume (gallons): 11

Time (2400 Hr)	Cumulative Volume(gal)	pH (Units)	Ec (µmhos/cm 25 °C)	Color (Visual)	Turbidity (Visual)	Odor	Temperature (°C)
1313	Initial	6.64	324	clear	clear	none	11.8
1322	4 Gal.	6.54	328	"	"	"	11.7
1331	8 Gal.	6.50	328	"	"	"	11.8
1342	11 Gal.	6.51	331	"	"	"	11.8
	Gal.						
	Gal.						

Purging Equipment: Bennett Pump **Sampling Equipment:** Dedicated teflon tube

Laboratory:	ARI	**Date Sent to Lab:**	5/4/10
Chain-of-Custody (yes/no):	Yes	**Field QC Sample Number:**	NA
Shipment Method:	Hand	**Split with (name/organization):**	NA

Well Integrity : OK
Comments or Note:

Signature : [signature]

MIDWAY LANDFILL
GROUNDWATER COMPLIANCE MONITORING PROGRAM
KENT, WA

GROUNDWATER SAMPLING
FIELD DATA SHEET
Well # MW 8B

Project Number:	555-1550-052	**Date:**	5/5/10
Project Name:	Midway Landfill	**Location:**	Fred Meyer
Project Address:	24808 Pac Hwy S.	**Sampled By:**	VT, FM, RL
Client Name:	City of Seattle	**Purged By:**	Same as Above

Casing Diameter : 2" [X] 4" [ ] 6" [ ] Other [ ]

Depth to Water (Feet):	139.05	**Purge Volume Measurement Method:**	55 Gal.Drum
Depth of well (Feet):	207.97	**Purge Time (from/To):**	0818 – 0905
Reference Point (Surveyors Notch):	TOC	**Sample Time:**	0910

Purge Volume Calculation:(pr2h)(7.48 gal/ft3)(5 casing volume)
Purge volume (gallons) for: 2"= (0.80)(h); 4"=(3.26)(h); 6"=(7.40)(h)
Calculated Purge Volume (gallons): 55 Actual Purge Volume (gallons): 55

Time (2400 Hr)	Cumulative Volume(gal)	pH (Units)	Ec (µmhos/cm 25 °C)	Color (Visual)	Turbidity (Visual)	Odor	Temperature (°C)
0818	Initial	6.62	136	clear	clear	none	12.7
0834	18 Gal.	6.32	150	"	"	"	11.3
0851	36 Gal.	6.39	151	"	"	"	10.9
0905	55 Gal.	6.45	155	grey	cloudy	"	11.0
	Gal.						
	Gal.						

Purging Equipment: Bennett Pump **Sampling Equipment:** Dedicated teflon tube

Laboratory:	ARI	**Date Sent to Lab:**	5/5/10
Chain-of-Custody (yes/no):	Yes	**Field QC Sample Number:**	NA
Shipment Method:	Hand	**Split with (name/organization):**	NA

Well Integrity : OK
Comments or Note:

Water initially in air exhaust line. had to lift and shake pump to make it work.
Small amount of sediment in sample.

Signature : Thomas

MIDWAY LANDFILL
GROUNDWATER COMPLIANCE MONITORING PROGRAM
KENT, WA

GROUNDWATER SAMPLING
FIELD DATA SHEET
Well # MW 30C

Project Number:	555-1550-052	**Date:**	5/5/10
Project Name:	Midway Landfill	**Location:**	S. 253rd & 38th S.
Project Address:	24808 Pac Hwy S.	**Sampled By:**	VT, FM, RL
Client Name:	City of Seattle	**Purged By:**	Same as Above

Casing Diameter : 2" [X] 4" [ ] 6" [ ] Other [ ]

Depth to Water (Feet):	267.83	**Purge Volume Measurement Method:**	55 Gal.Drum
Depth of well (Feet):	350.00	**Purge Time (from/To):**	1010 - 1102
Reference Point (Surveyors Notch):	TOC	**Sample Time:**	1105

Purge Volume Calculation:(pr2h)(7.48 gal/ft3)(5 casing volume)
Purge volume (gallons) for: 2"= (0.80)(h); 4"=(3.26)(h); 6"=(7.40)(h)
Calculated Purge Volume (gallons): 66 Actual Purge Volume (gallons): 66

Time (2400 Hr)	Cumulative Volume(gal)	pH (Units)	Ec (µmhos/cm 25 °C)	Color (Visual)	Turbidity (Visual)	Odor	Temperature (°C)
1010	Initial	6.65	294	clear	clear	none	10.7
1028	22 Gal.	6.48	307	"	"	"	9.8
1046	44 Gal.	6.53	314	"	"	"	9.6
1102	66 Gal.	6.57	320	"	"	"	9.6
	Gal.						
	Gal.						

Purging Equipment: Bennett Pump **Sampling Equipment:** Dedicated teflon tube

Laboratory:	ARI	**Date Sent to Lab:**	5/5/10
Chain-of-Custody (yes/no):	Yes	**Field QC Sample Number:**	NA
Shipment Method:	Hand	**Split with (name/organization):**	NA

Well Integrity : OK
Comments or Note:

Construction in area surrounding well - odor of kerosene on boards. Herbicides being sprayed on weeds 10 feet away from well.

Signature : [signature]

MIDWAY LANDFILL
GROUNDWATER COMPLIANCE MONITORING PROGRAM
KENT, WA

GROUNDWATER SAMPLING
FIELD DATA SHEET
Well # MW 23B

Project Number:	555-1550-052	**Date:**	5/7/10
Project Name:	Midway Landfill	**Location:**	S. 250th & 34th S.
Project Address:	24808 Pac Hwy S.	**Sampled By:**	VT, FM, RL
Client Name:	City of Seattle	**Purged By:**	Same as Above

Casing Diameter : 2" [X] 4" [ ] 6" [ ] Other [ ]

Depth to Water (Feet):	270.54	**Purge Volume Measurement Method:**	55 Gal.Drum
Depth of well (Feet):	330.30	**Purge Time (from/To):**	0812 - 0850
Reference Point (Surveyors Notch):	TOC	**Sample Time:**	0855

Purge Volume Calculation:(pr2h)(7.48 gal/ft3)(5 casing volume)
Purge volume (gallons) for: 2"= (0.80)(h); 4"=(3.26)(h); 6"=(7.40)(h)
Calculated Purge Volume (gallons): 48 Actual Purge Volume (gallons): 48

Time (2400 Hr)	Cumulative Volume(gal)	pH (Units)	Ec (µmhos/cm 25 °C)	Color (Visual)	Turbidity (Visual)	Odor	Temperature (°C)
0812	Initial	6.33	565	grey	cloudy	none	11.7
0827	16 Gal.	6.21	568	clear	clear	"	11.1
0838	32 Gal.	6.22	568	"	"	"	11.1
0850	48 Gal.	6.23	569	"	"	"	11.1
	Gal.						
	Gal.						

Purging Equipment:	Bennett Pump	**Sampling Equipment:**	Dedicated teflon tube

Laboratory:	ARI	**Date Sent to Lab:**	5/7/10
Chain-of-Custody (yes/no):	Yes	**Field QC Sample Number:**	NA
Shipment Method:	Hand	**Split with (name/organization):**	NA

Well Integrity : OK

Comments or Note:
Very small amount of sediment in sample.

Signature : Thoma

MIDWAY LANDFILL
GROUNDWATER COMPLIANCE MONITORING PROGRAM
KENT, WA

GROUNDWATER SAMPLING
FIELD DATA SHEET
Well # MW 7A

Project Number:	555-1550-052	**Date:**	
Project Name:	Midway Landfill	**Location:**	South of Landfill
Project Address:	24808 Pac Hwy S.	**Sampled By:**	
Client Name:	City of Seattle	**Purged By:**	Same as Above

Casing Diameter : 2" [X] 4" [ ] 6" [ ] Other [ ]

Depth to Water (Feet):	DRY @ 197.30	**Purge Volume Measurement Method:**	55 Gal.Drum
Depth of well (Feet):	197.80	**Purge Time (from/To):**	
Reference Point (Surveyors Notch):	TOC	**Sample Time:**	

Purge Volume Calculation:(pr2h)(7.48 gal/ft3)(5 casing volume)
Purge volume (gallons) for: 2"= (0.80)(h); 4"=(3.26)(h); 6"=(7.40)(h)
Calculated Purge Volume (gallons): _____ Actual Purge Volume (gallons): _____

Time (2400 Hr)	Cumulative Volume(gal)	pH (Units)	Ec (µmhos/cm 25 °C)	Color (Visual)	Turbidity (Visual)	Odor	Temperature (°C)
	Initial						
	Gal.						
	Gal.						
	Gal.						
	Gal.						
	Gal.						

NO SAMPLING - DRY

Purging Equipment: - **Sampling Equipment:** -

Laboratory: - **Date Sent to Lab:** -
Chain-of-Custody (yes/no): - **Field QC Sample Number:** -
Shipment Method: - **Split with (name/organization):** -

Well Integrity :
Comments or Note:

Signature :

MIDWAY LANDFILL
GROUNDWATER COMPLIANCE MONITORING PROGRAM
KENT, WA

GROUNDWATER SAMPLING
FIELD DATA SHEET
Well # MW 15A

Project Number:	555-1550-052	**Date:**	—
Project Name:	Midway Landfill	**Location:**	S. 253rd & 32nd Pl. S.
Project Address:	24808 Pac Hwy S.	**Sampled By:**	
Client Name:	City of Seattle	**Purged By:**	Same as Above

Casing Diameter : 2" [X] 4" [ ] 6" [ ] Other [ ]

Depth to Water (Feet):	DRY @ 230.45	**Purge Volume Measurement Method:**	55 Gal.Drum
Depth of well (Feet):	234.30	**Purge Time (from/To):**	
Reference Point (Surveyors Notch):	TOC	**Sample Time:**	

Purge Volume Calculation:(pr2h)(7.48 gal/ft3)(5 casing volume)
Purge volume (gallons) for: 2"= (0.80)(h); 4"=(3.26)(h); 6"=(7.40)(h)
Calculated Purge Volume (gallons): _____ Actual Purge Volume (gallons): _____

Time (2400 Hr)	Cumulative Volume(gal)	pH (Units)	Ec (µmhos/cm 25 °C)	Color (Visual)	Turbidity (Visual)	Odor	Temperature (°C)
	Initial						
	Gal.						
	Gal.						
	Gal.						
	Gal.						
	Gal.						

NO SAMPLING - DRY

Purging Equipment: - **Sampling Equipment:** -

Laboratory: - **Date Sent to Lab:** -
Chain-of-Custody (yes/no): - **Field QC Sample Number:** -
Shipment Method: - **Split with (name/organization):** -

Well Integrity :
Comments or Note:

Signature : [signature]

MIDWAY LANDFILL
GROUNDWATER COMPLIANCE MONITORING PROGRAM
KENT, WA

GROUNDWATER SAMPLING
FIELD DATA SHEET
Well # MW 20A

Project Number:	555-1550-052	**Date:**	—
Project Name:	Midway Landfill	**Location:**	Sunset Motel
Project Address:	24808 Pac Hwy S.	**Sampled By:**	
Client Name:	City of Seattle	**Purged By:**	Same as Above

Casing Diameter : 2" [X] 4" [ ] 6" [ ] Other [ ]

Depth to Water (Feet):	DRY @ 184.00	**Purge Volume Measurement Method:**	55 Gal.Drum
Depth of well (Feet):	195.00	**Purge Time (from/To):**	
Reference Point (Surveyors Notch):	TOC	**Sample Time:**	

Purge Volume Calculation:(pr2h)(7.48 gal/ft3)(5 casing volume)
Purge volume (gallons) for: 2"= (0.80)(h); 4"=(3.26)(h); 6"=(7.40)(h)
Calculated Purge Volume (gallons): _____ Actual Purge Volume (gallons): _____

Time (2400 Hr)	Cumulative Volume(gal)	pH (Units)	Ec (µmhos/cm 25 °C)	Color (Visual)	Turbidity (Visual)	Odor	Temperature (°C)
	Initial						
	Gal.						
	Gal.						
	Gal.						
	Gal.						
	Gal.						

NO SAMPLING - DRY

Purging Equipment: - **Sampling Equipment:** -

Laboratory: - **Date Sent to Lab:** -
Chain-of-Custody (yes/no): - **Field QC Sample Number:** -
Shipment Method: - **Split with (name/organization):** -

Well Integrity :
Comments or Note:

Signature : D Thoma

MIDWAY LANDFILL
GROUNDWATER COMPLIANCE MONITORING PROGRAM
KENT, WA

GROUNDWATER SAMPLING
FIELD DATA SHEET
Well # MW 23A

Project Number:	555-1550-052	**Date:**	—
Project Name:	Midway Landfill	**Location:**	
Project Address:	24808 Pac Hwy S.	**Sampled By:**	
Client Name:	City of Seattle	**Purged By:**	Same as Above

Casing Diameter : 2" [X] 4" [ ] 6" [ ] Other [ ]

Depth to Water (Feet):	DRY @ 23.64	**Purge Volume Measurement Method:**	55 Gal.Drum
Depth of well (Feet):	240.00	**Purge Time (from/To):**	
Reference Point (Surveyors Notch):	TOC	**Sample Time:**	

Purge Volume Calculation:(pr2h)(7.48 gal/ft3)(5 casing volume)
Purge volume (gallons) for: 2"= (0.80)(h); 4"=(3.26)(h); 6"=(7.40)(h)
Calculated Purge Volume (gallons): _____ Actual Purge Volume (gallons): _____

Time (2400 Hr)	Cumulative Volume(gal)	pH (Units)	Ec (µmhos/cm 25 °C)	Color (Visual)	Turbidity (Visual)	Odor	Temperature (°C)
	Initial						
	Gal.						
	Gal.						
	Gal.						
	Gal.						
	Gal.						

DRY
NO SAMPLING

Purging Equipment: - **Sampling Equipment:** -

Laboratory: - **Date Sent to Lab:** -
Chain-of-Custody (yes/no): - **Field QC Sample Number:** -
Shipment Method: - **Split with (name/organization):** -

Well Integrity :
Comments or Note:

Signature : S Thoma

Chain of Custody Record & Laboratory Analysis Request

ARI Assigned Number:	Turn-around Requested:
ARI Client Company: City of Seattle	Phone: 206-233-2629
Client Contact: Min Soon Ujim	
Client Project Name: Midway Landfill	
Client Project #: 555-1550-052	Samplers: V. Thoma, F. McKenzie, R Locke

Page: 1 of 1	
Date: 5/3/10	Ice Present?
No. of Coolers:	Cooler Temps:

Analytical Resources, Incorporated
Analytical Chemists and Consultants
4611 South 134th Place, Suite 100
Tukwila, WA 98168
206-695-6200 206-695-6201 (fax)

Sample ID	Date	Time	Matrix	No. Containers	Analysis Requested: Sulfate, Chloride	TOC, COD	Dissolved Metals Fe, Mn	VOA	Vinyl Chloride				Notes/Comments
MW29B	5/3/10	0855	W	8	1	1	1	3	2				metals are field filtered
MW 31	5/3/10	0950	W	8	1	1	1	3	2				
MW 16	5/3/10	1210	W	8	1	1	1	3	2				
MW 20B	5/3/10	1405	W	8	1	1	1	3	2				
Trip Blank	—	—		4				2	2				

Comments/Special Instructions	Relinquished by: (Signature)	Received by: (Signature)	Relinquished by: (Signature)	Received by: (Signature)
	Printed Name: Valerie Thoma	Printed Name: Tikka Mulumba	Printed Name:	Printed Name:
	Company: City of Seattle	Company: ARI	Company:	Company:
	Date & Time: 5/3/10 1517	Date & Time: 5/3/10 1517	Date & Time:	Date & Time:

Limits of Liability: *ARI will perform all requested services in accordance with appropriate methodology following ARI Standard Operating Procedures and the ARI Quality Assurance Program. This program meets standards for the industry. The total liability of ARI, its officers, agents, employees, or successors, arising out of or in connection with the requested services, shall not exceed the Invoiced amount for said services. The acceptance by the client of a proposal for services by ARI release ARI from any liability in excess thereof, not withstanding any provision to the contrary in any contract, purchase order or co-signed agreement between ARI and the Client.*

Sample Retention Policy: All samples submitted to ARI will be appropriately discarded no sooner than 90 days after receipt or 60 days after submission of hardcopy data, whichever is longer, unless alternate retention schedules have been established by work-order or contract.

Chain of Custody Record & Laboratory Analysis Request

ARI Assigned Number:	Turn-around Requested:
ARI Client Company: City of Seattle	Phone: 206-233-2629
Client Contact: Mun Soon Yim	
Client Project Name: Midway Landfill	
Client Project #: 555-1550-052	Samplers: V. Thoma, F. McKenzie, R. Locke

Page: 1	of 1
Date: 5/4/10	Ice Present? Y
No. of Coolers: 2	Cooler Temps: 1.7, 3.9

Analytical Resources, Incorporated
Analytical Chemists and Consultants
4611 South 134th Place, Suite 100
Tukwila, WA 98168
206-695-6200 206-695-6201 (fax)

Sample ID	Date	Time	Matrix	No. Containers	Analysis Requested: Sulfate, Chloride	TOC, COD	Dissolved metals Fe, Mn	VOA	Vinyl Chloride	Dioxane			Notes/Comments
MW 35	5/4/10	0810	W	10	1	1	1	3	2	2			Metals are field filtered
MW 17B	5/4/10	0925	W	10	1	1	1	3	2	2			
MW 14B	5/4/10	1115	W	10	1	1	1	3	2	2			
MW 21B	5/4/10	1240	W	10	1	1	1	3	2	2			
MW 21A	5/4/10	1345	W	8	1	1	1	3	2				
Field Blank	5/4/10	1410	W	10	1	1	1	3	2	2			
Trip Blank	—	—		4				2	2				

Comments/Special Instructions

Relinquished by: (Signature)	Valerie Thoma	Received by: (Signature)	
Printed Name:	Valerie Thoma	Printed Name:	A. Volgardsen
Company:	City of Seattle	Company:	ARI
Date & Time:	5/4/10 1617	Date & Time:	5/4/10 1617

Relinquished by: (Signature)		Received by: (Signature)	
Printed Name:		Printed Name:	
Company:		Company:	
Date & Time:		Date & Time:	

Chain of Custody Record & Laboratory Analysis Request

ARI Assigned Number:	Turn-around Requested:	Page: 1 of 1	
ARI Client Company: City of Seattle	Phone: 206-233-2629	Date: 5/5/10	Ice Present? Y
Client Contact: Min Soon Yim		No. of Coolers: 1	Cooler Temps: 1.8
Client Project Name: Midway Landfill			
Client Project #: 555-1550-052	Samplers: V. Thoma, F. McKenzie, R Locke		

Analytical Resources, Incorporated
Analytical Chemists and Consultants
4611 South 134th Place, Suite 100
Tukwila, WA 98168
206-695-6200 206-695-6201 (fax)

Sample ID	Date	Time	Matrix	No. Containers	Analysis Requested: Sulfate, Chloride	TOC, COD	Dissolved metals Fe, Mn	VOA	Vinyl Chloride				Notes/Comments
MW8B	5/5/10	0910	W	8	1	1	1	3	2				metals are field filtered
MW30C	5/5/10	1105	W	8	1	1	1	3	2				
Trip Blank	—	—		4				2	2				

Comments/Special Instructions	Relinquished by: (Signature)	Received by: (Signature)	Relinquished by: (Signature)	Received by: (Signature)
	Printed Name: Valerie Thoma	Printed Name: A. Valgardson	Printed Name:	Printed Name:
	Company: City of Seattle	Company: ARI	Company:	Company:
	Date & Time: 5/5/10 1512	Date & Time: 5/5/10 1512	Date & Time:	Date & Time:

Limits of Liability: *ARI will perform all requested services in accordance with appropriate methodology following ARI Standard Operating Procedures and the ARI Quality Assurance Program. This program meets standards for the industry. The total liability of ARI, its officers, agents, employees, or successors, arising out of or in connection with the requested services, shall not exceed the Invoiced amount for said services. The acceptance by the client of a proposal for services by ARI release ARI from any liability in excess thereof, not withstanding any provision to the contrary in any contract, purchase order or co-signed agreement between ARI and the Client.*

Sample Retention Policy: All samples submitted to ARI will be appropriately discarded no sooner than 90 days after receipt or 60 days after submission of hardcopy data, whichever is longer, unless alternate retention schedules have been established by work-order or contract.

Chain of Custody Record & Laboratory Analysis Request

ARI Assigned Number:	Turn-around Requested:	Page: 1 of 1	
ARI Client Company: City of Seattle	Phone: 206-233-2629	Date: 5/7/10	Ice Present? Yes
Client Contact: Min Soon Yim		No. of Coolers: 1	Cooler Temps: 0.4
Client Project Name: Midway Landfill			
Client Project #: 555-1550-052	Samplers: V. Thoma, F. McKenzie, R. Locke		

Analytical Resources, Incorporated
Analytical Chemists and Consultants
4611 South 134th Place, Suite 100
Tukwila, WA 98168
206-695-6200 206-695-6201 (fax)

Sample ID	Date	Time	Matrix	No. Containers	Sulfate, Chloride	TOC, COD	Dissolved metals Fe, Mn	VOA	Vinyl Chloride				Notes/Comments
					Analysis Requested								
MW23B	5/7/10	0855	W	8	1	1	1	3	2				metals are field filtered
Trip Blank	—	—		4				2	2				

Comments/Special Instructions	Relinquished by: (Signature)	Received by: (Signature)	Relinquished by: (Signature)	Received by: (Signature)
	Printed Name: Valerie Thoma	Printed Name: S. Peterson	Printed Name:	Printed Name:
	Company: City of Seattle	Company: ARI	Company:	Company:
	Date & Time: 5/7/10 1351	Date & Time: 5/7/10 1351	Date & Time:	Date & Time:

Limits of Liability: *ARI will perform all requested services in accordance with appropriate methodology following ARI Standard Operating Procedures and the ARI Quality Assurance Program. This program meets standards for the industry. The total liability of ARI, its officers, agents, employees, or successors, arising out of or in connection with the requested services, shall not exceed the Invoiced amount for said services. The acceptance by the client of a proposal for services by ARI release ARI from any liability in excess thereof, not withstanding any provision to the contrary in any contract, purchase order or co-signed agreement between ARI and the Client.*

Sample Retention Policy: All samples submitted to ARI will be appropriately discarded no sooner than 90 days after receipt or 60 days after submission of hardcopy data, whichever is longer, unless alternate retention schedules have been established by work-order or contract.

FLUID LEVEL MEASUREMENTS

Date: 4/26/2010 **Job No:** 555-1550-052

Present at Site: E. McKenzie, R. Locke **Location:** Midway Landfill

DATE	WELL NO.	DEPTH TO WATER	WELL DEPTH	MEASURING POINT	COMMENTS
04/26/10	MW-2	DRY @	156.40	TOC	
04/26/10	MW-4	DRY @	91.59	TOC	4TH POLE / CRACK IN ROAD
04/26/10	MW-7A	DRY @	197.30	TOC	
04/26/10	MW-7B	209.66	N.M.	TOC	LOWER CASING
04/26/10	MW-8A	112.90	N.M.	TOC	
04/26/10	MW-8B	139.05	N.M.	TOC	LOWER CASING
04/26/10	MW-9A	NO ACCESS		TOC	FENCE LOCKED
04/26/10	MW-11A	117.20	N.M.	TOC	
04/26/10	MW-13A	108.18	N.M.	TOC	USE OLD CASING FOR TOC
04/26/10	MW-13B	132.50	N.M.	TOC	SAME AS ABOVE - REMOVE TUBE
04/26/10	MW-14B	233.53	N.M.	TOC	251.22 - (7.67 x 2.307 = 17.69) = 233.53
04/26/10	MW-15A	DRY @	230.45	TOC	
04/26/10	MW-16	124.93	N.M.	TOC	
04/26/10	MW-17A	67.62	N.M.	TOC	
04/26/10	MW-17B	69.05	N.M.	TOC	LOWER CASING
04/26/10	MW-18A	76.25	N.M.	TOC	
04/26/10	MW-20A	DRY @	184.00	TOC	
04/26/10	MW-20B	255.42	N.M.	TOC	
04/26/10	MW-21A	81.58	N.M.	TOC	
04/26/10	MW-21B	85.05	N.M.	TOC	
04/26/10	MW-23A	DRY @	239.64	TOC	
04/26/10	MW-23B	270.54	N.M.	TOC	289.53 - (8.23 x 2.307 = 18.99) = 270.54
04/26/10	MW-24A	199.95	N.M.	TOC	
04/26/10	MW-24B	259.18	N.M.	TOC	WITH GREEN TOP - LOWER ONE
04/26/10	MW-25C	4.05	N.M.	TOC	
04/26/10	MW-26	93.05	N.M.	TOC	
04/26/10	MW-27A	48.47	N.M.	TOC	
04/26/10	MW-28	90.01	N.M.	TOC	16TH POLE DOWN W/WATER
04/26/10	MW-29A	194.20	N.M.	TOC	
04/26/10	MW-29B	303.10	N.M.	TOC	335.81 - (14.18 x 2.307 = 32.71) = 303.10
04/26/10	MW-30A	168.50	N.M.	TOC	
04/26/10	MW-30C	267.83	N.M.	TOC	290.92 - (10.01 x 2.307 = 23.09) = 267.83

Copies to PMX

Signed: D. Thoma

FLUID LEVEL MEASUREMENTS

Date: 4/26-27/2010 Job No: 555-1550-052

Present at Site: F. McKenzie R. Locke Location: Midway Landfill

DATE	WELL NO.	DEPTH TO WATER	WELL DEPTH	MEASURING POINT	COMMENTS
04/26/10	MW19-B	OBSTRUCTION		TOC	
04/26/10	MW19-C	OBSTR. @	60.05	TOC	
04/26/10	AM-M	54.50	N.M.	TOM	
04/26/10	AN-M	24.40	N.M.	TOM	
04/26/10	AO-M	22.08	N.M.	TOM	
04/26/10	AR-M	18.97	N.M.	TOC	
04/26/10	2	DRY @	62.54	TOCp	INTO BLACK MUD
04/26/10	5	65.84	N.M.	TOCp	
04/26/10	14	60.89	N.M.	TOCp	
04/26/10	26	68.95	N.M.	TOCp	
04/26/10	27	70.80	N.M.	TOCp	LOWER SENSITIVITY BE EXTRA CAREFUL
04/26/10	38D	102.23	N.M.	TOCp	
04/26/10	40D	128.04	N.M.	TOCp	
04/26/10	42D	73.65	N.M.	TOCp	former oil well NO OIL
04/27/10	43D	74.74	N.M.	TOCp	former oil well .25 oil thickness
04/26/10	45D	72.34	N.M.	TOCp	LOWER SENSITIVITY vvv
04/26/10	47D	DRY @	90.10	TOCp	former oil well INTO MUD
04/26/10	49D	109.35	N.M.	TOCp	LOWER SENSITIVITY vv
04/26/10	54S	45.62	N.M.	TOCp	former oil well
04/26/10	54D	DRY @	95.25	TOCp	MUD ON TIP
04/26/10	56S	DRY @	55.37	TOCp	MUD ON TIP
04/26/10	56D	84.30	N.M.	TOCp	
04/26/10	PC4S	35.48	N.M.	TOCp	MEASURED @ TOC
04/26/10	PC6S	29.44	N.M.	TOCp	

Copies to PMX

Signed: D. Thoma

APPENDIX C

Laboratory Reports and Chain-of-Custody Documentation

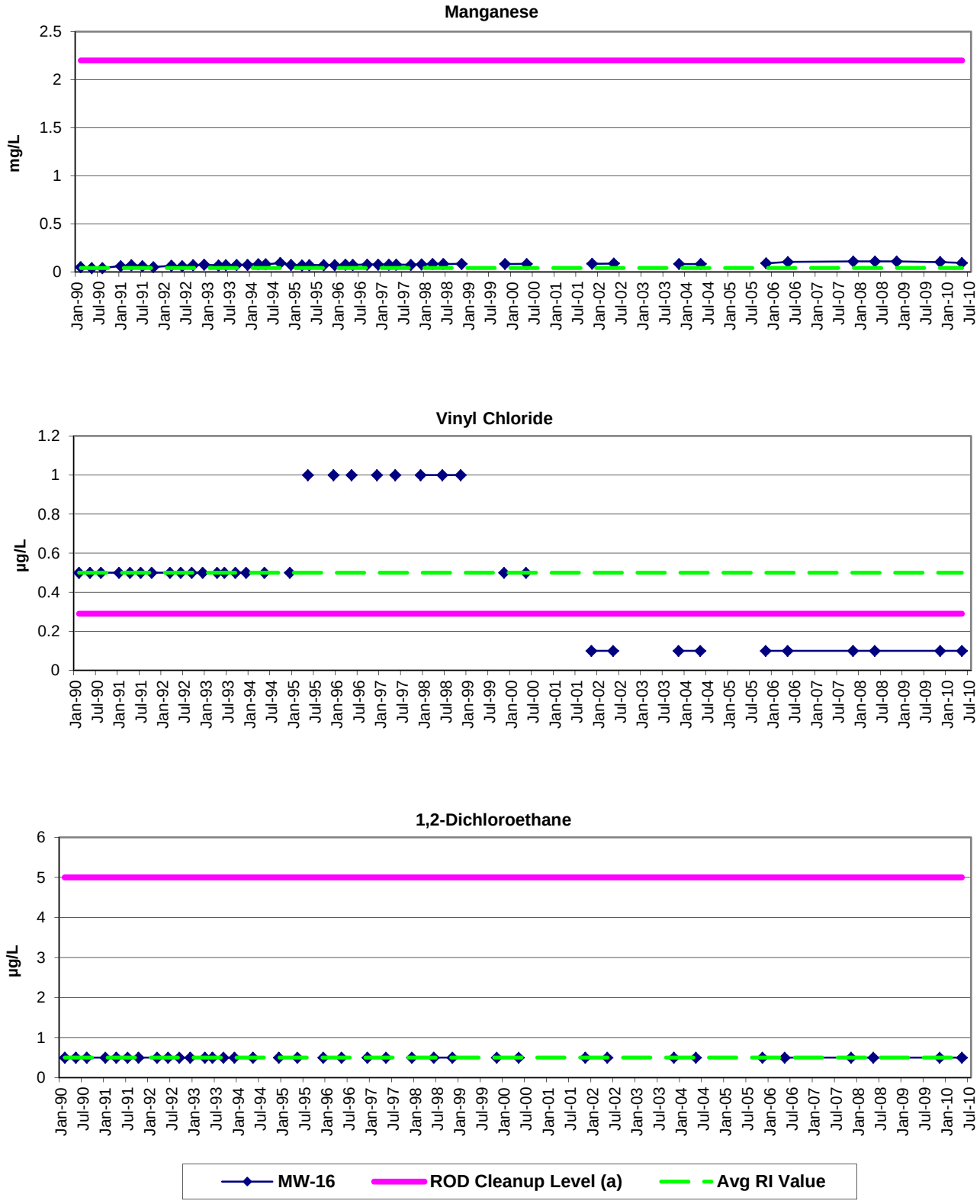
(Available Upon Request)

APPENDIX D

Time-Series Plots for ROD Contaminants of Concern

Midway Landfill
ROD Contaminants of Concern

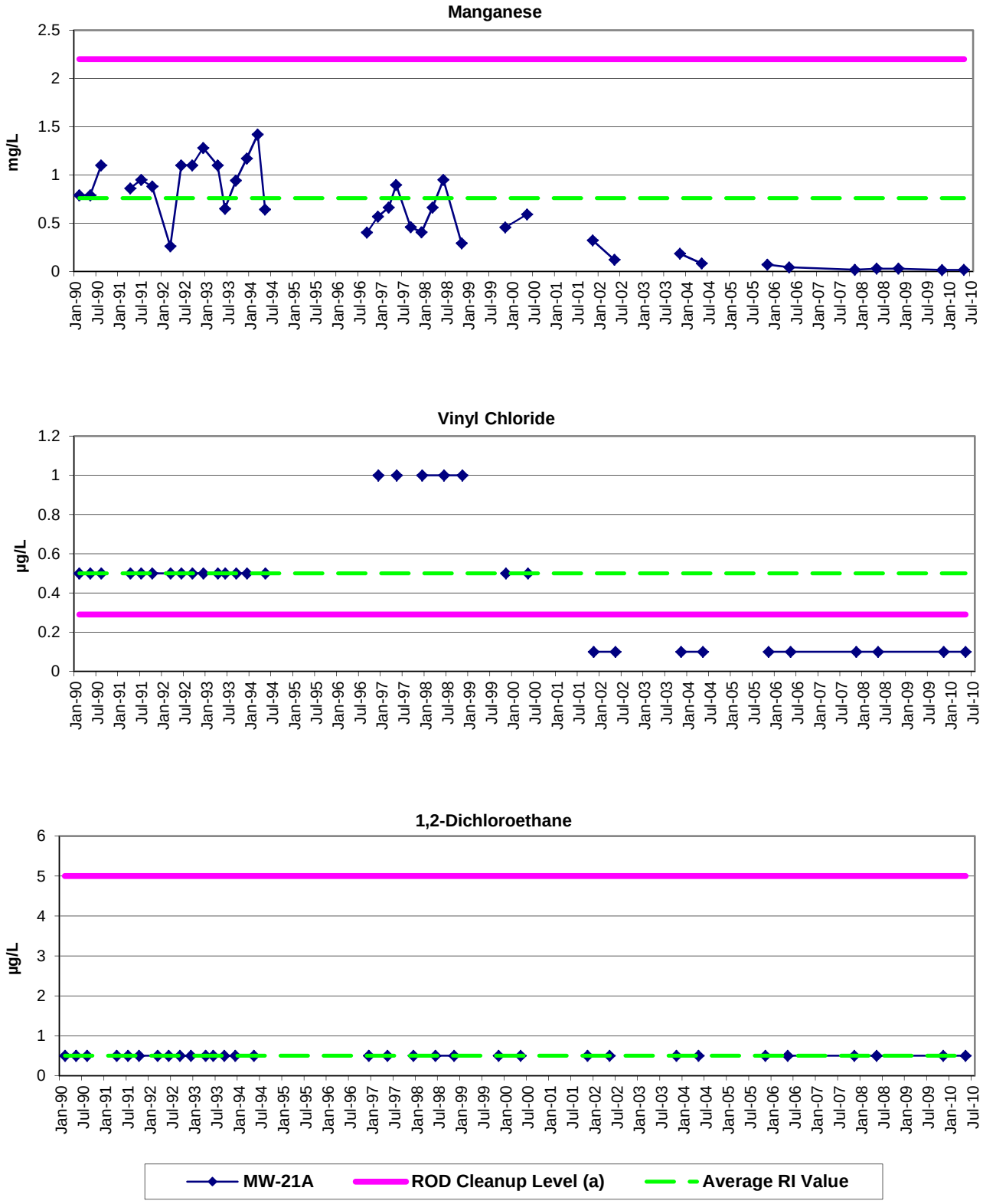
Upgradient Upper Gravel Aquifer Well
MW-16



(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

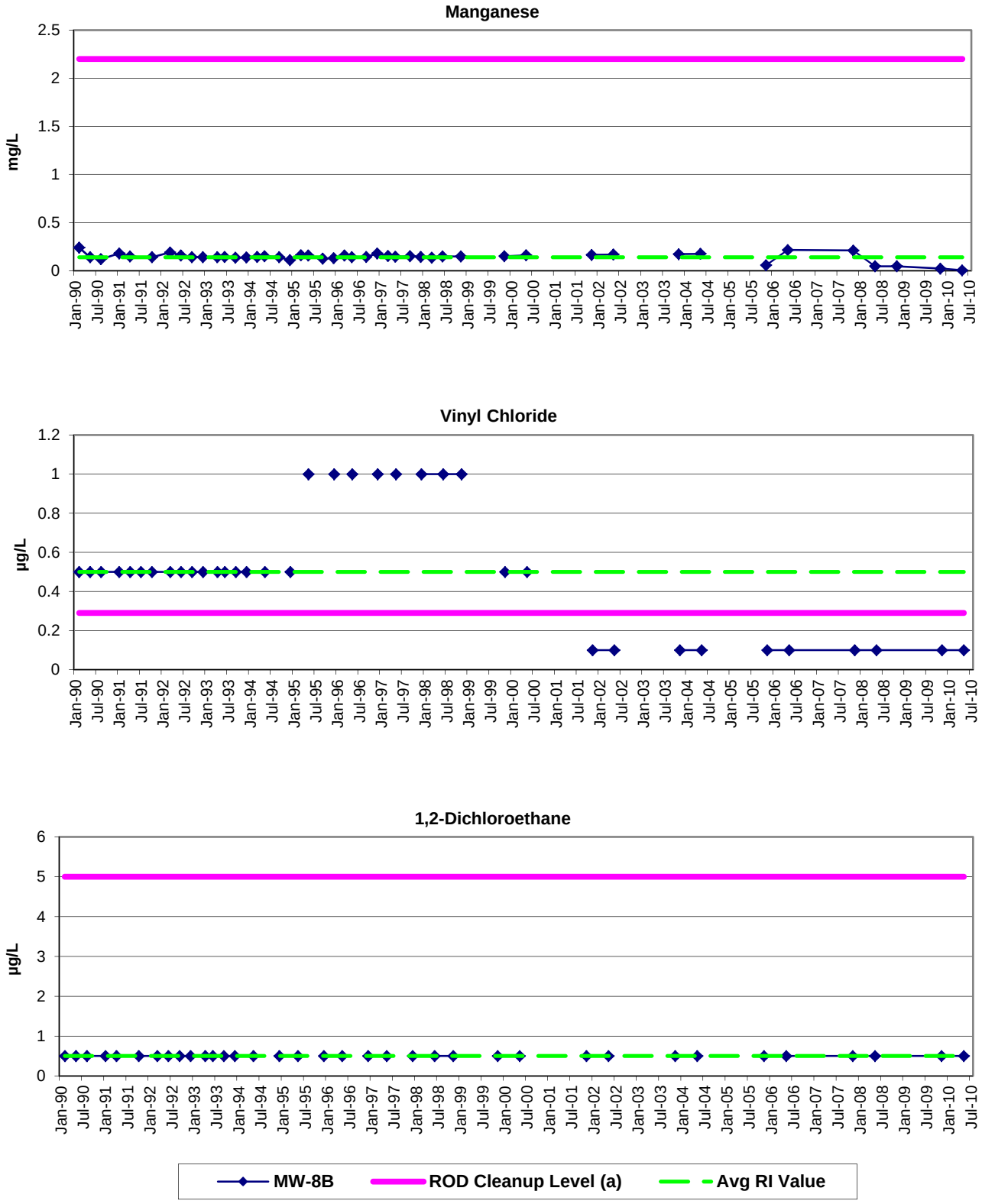
Upgradient Upper Gravel Aquifer Well
MW-21A



(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

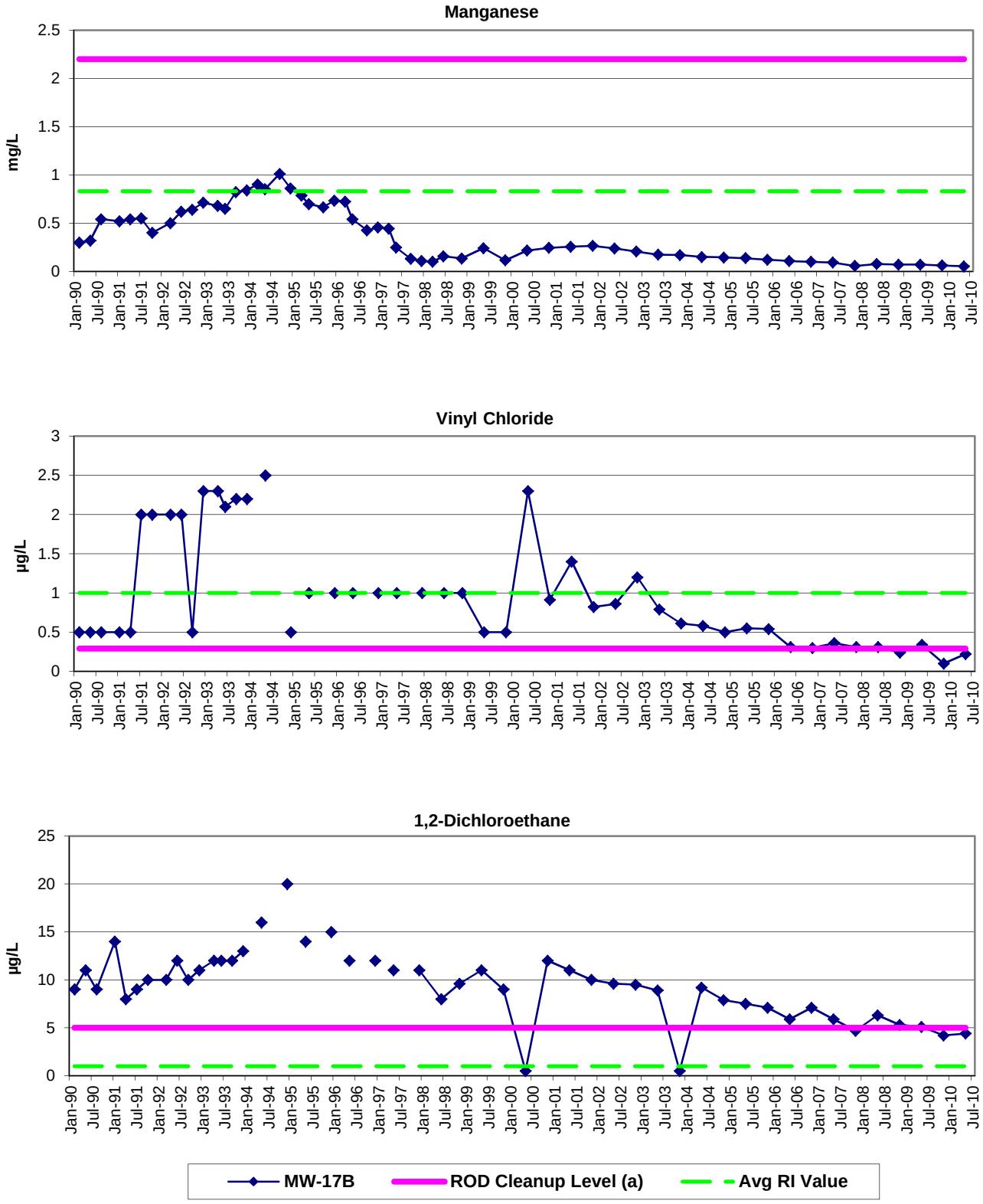
Upgradient Sand Aquifer Well
MW-8B



(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

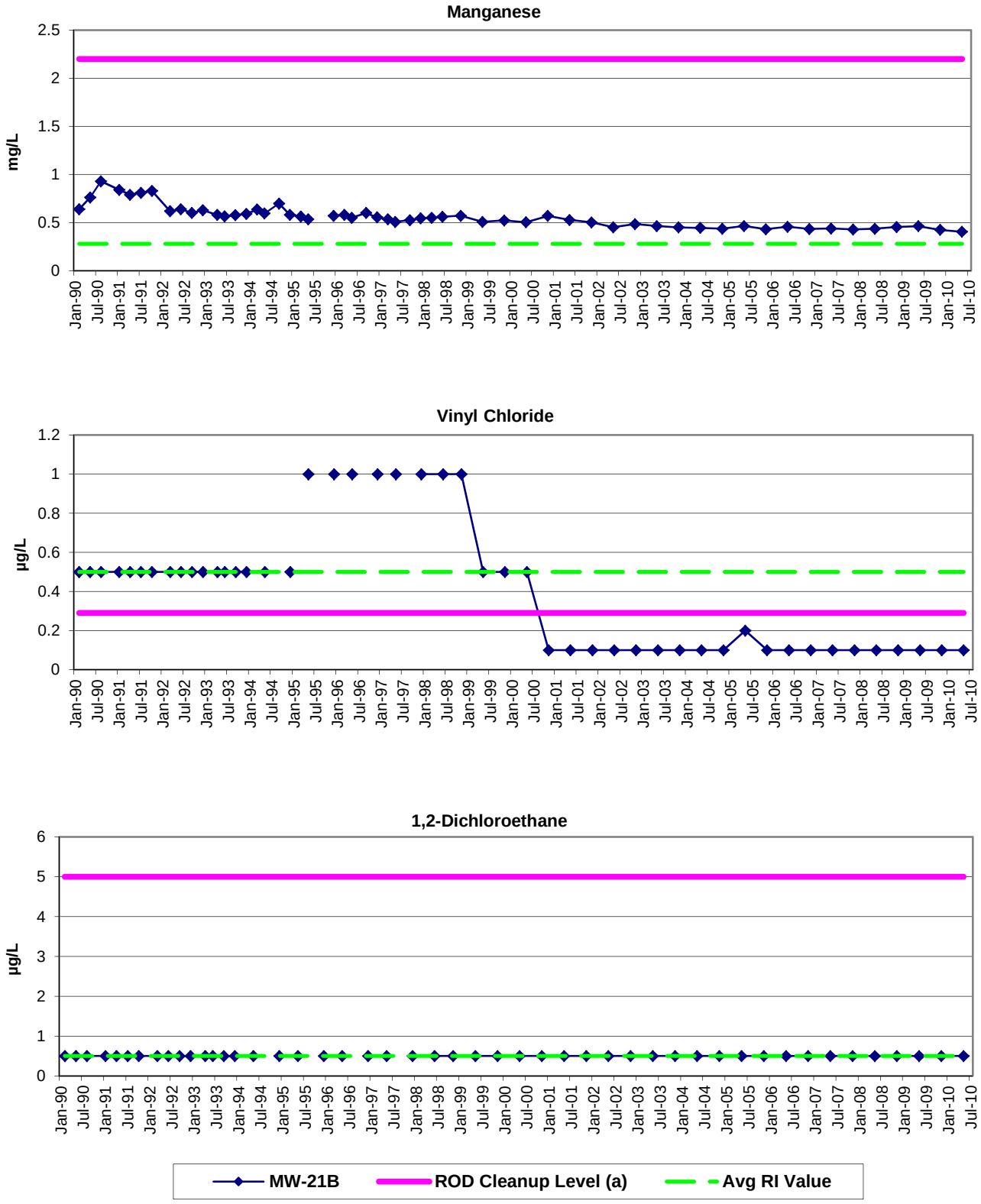
Upgradient Sand Aquifer Well
MW-17B



(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

Upgradient Sand Aquifer Well
MW-21B

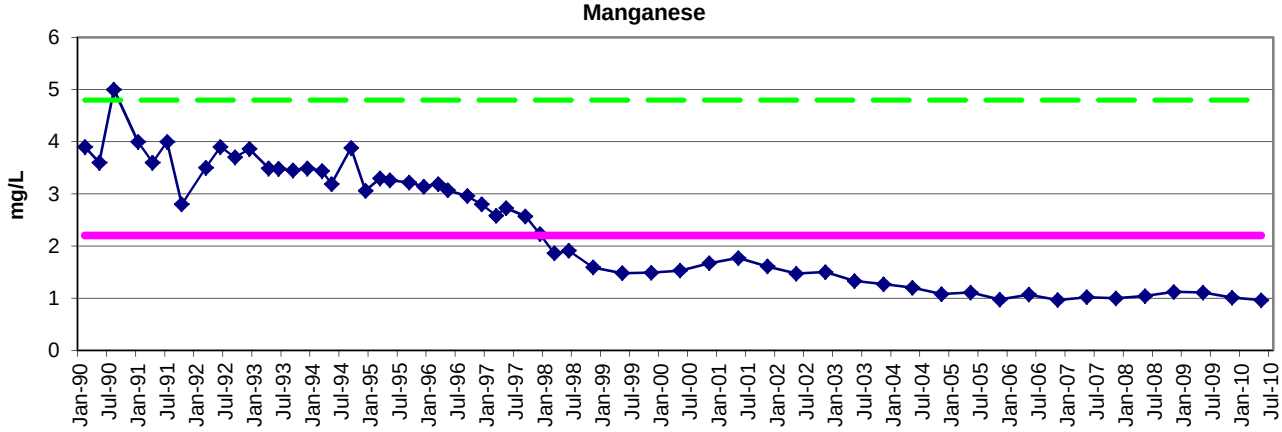


(a) Cleanup level established in the final EPA Record of Decision for the Midway Landfill, September 6, 2000.
Non-detected values are shown as 1/2 the detection limit.
RI = Remedial Investigation

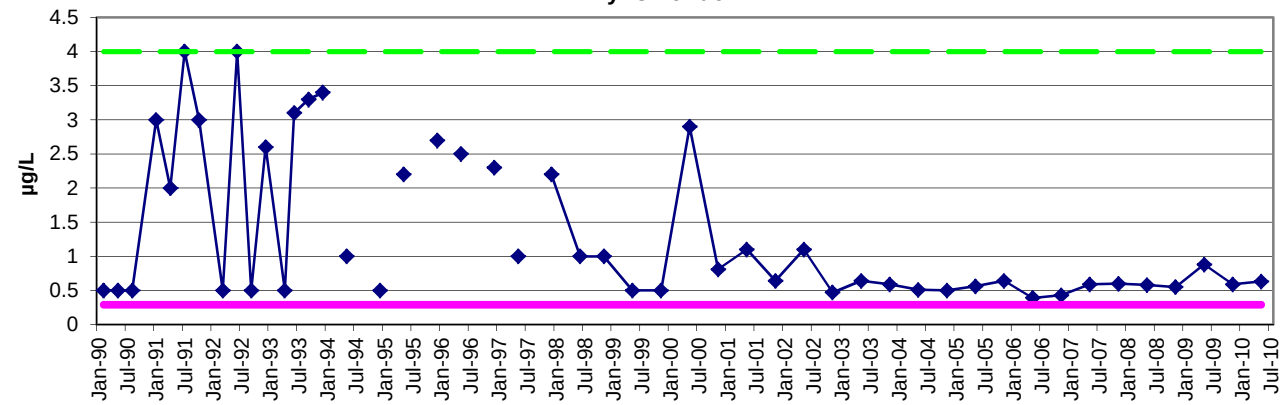
Midway Landfill
ROD Contaminants of Concern

Downgradient Southern Gravel Aquifer Well
MW-14B

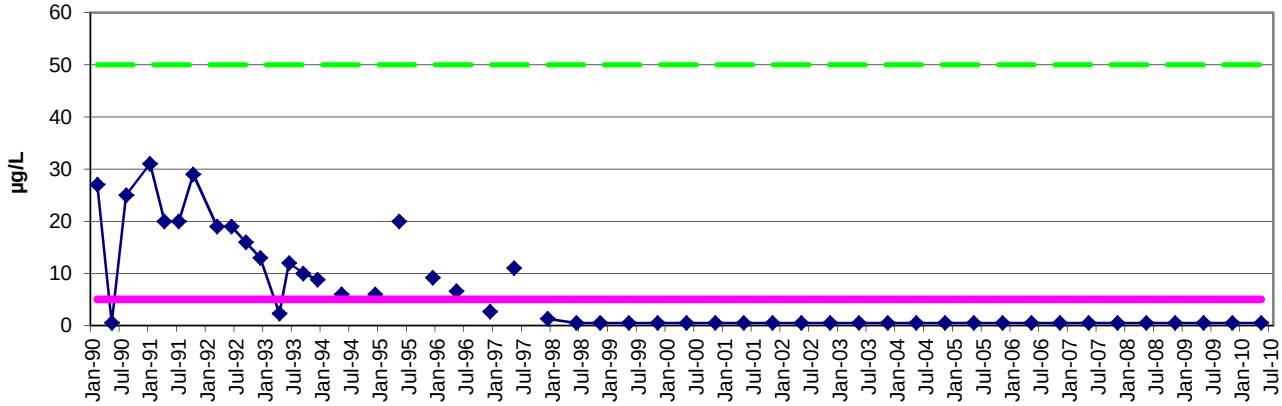
Manganese



Vinyl Chloride



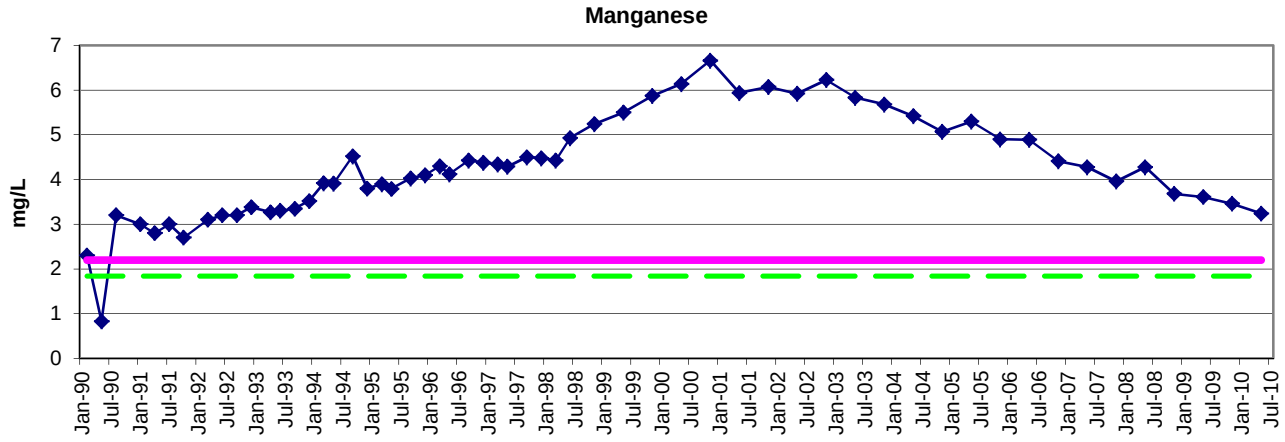
1,2-Dichloroethane

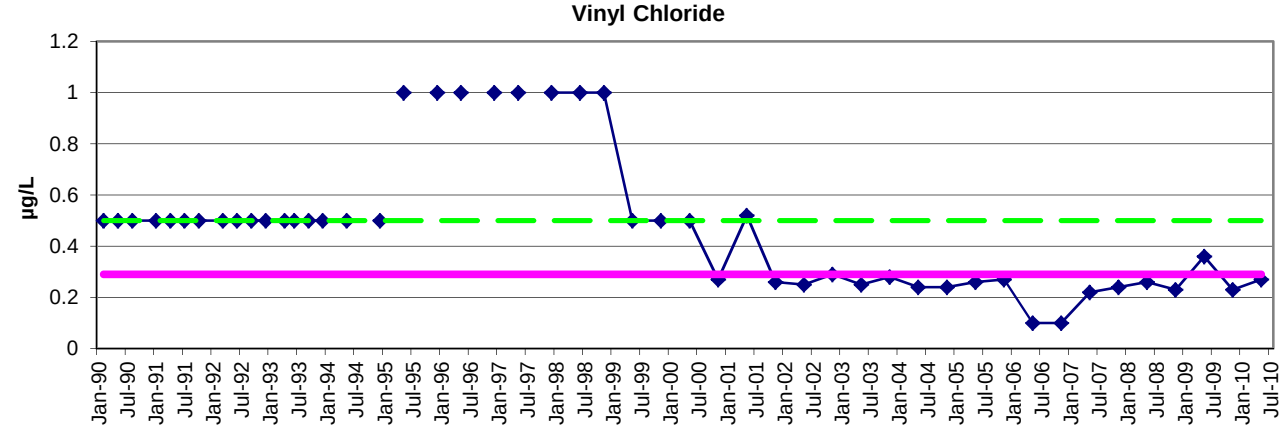


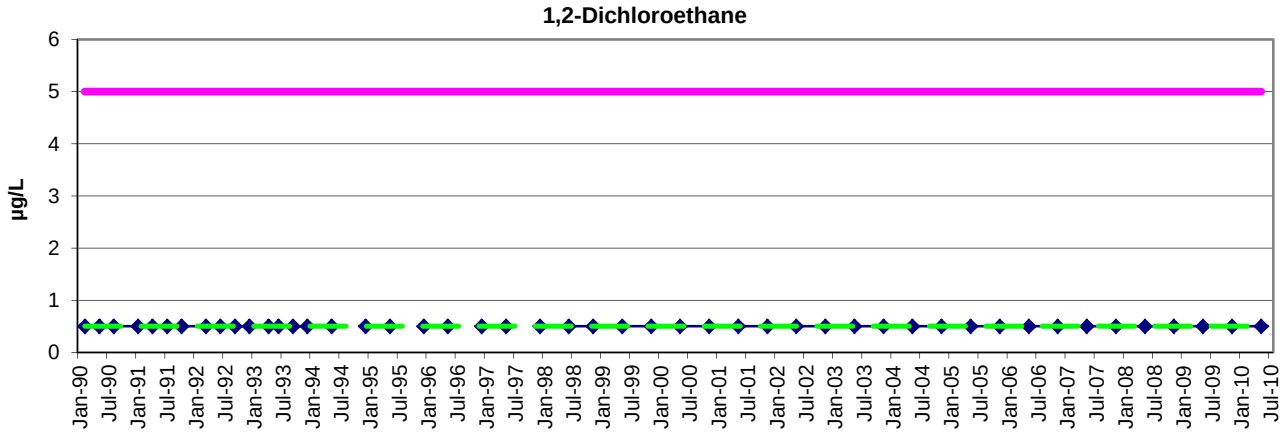
(a) Cleanup level established in the final EPA Record of Decision for the Midway Landfill, September 6, 2000.
Non-detected values are shown as 1/2 the detection limit.
RI = Remedial Investigation

Midway Landfill
ROD Contaminants of Concern

Downgradient Southern Gravel Aquifer Well
MW-20B



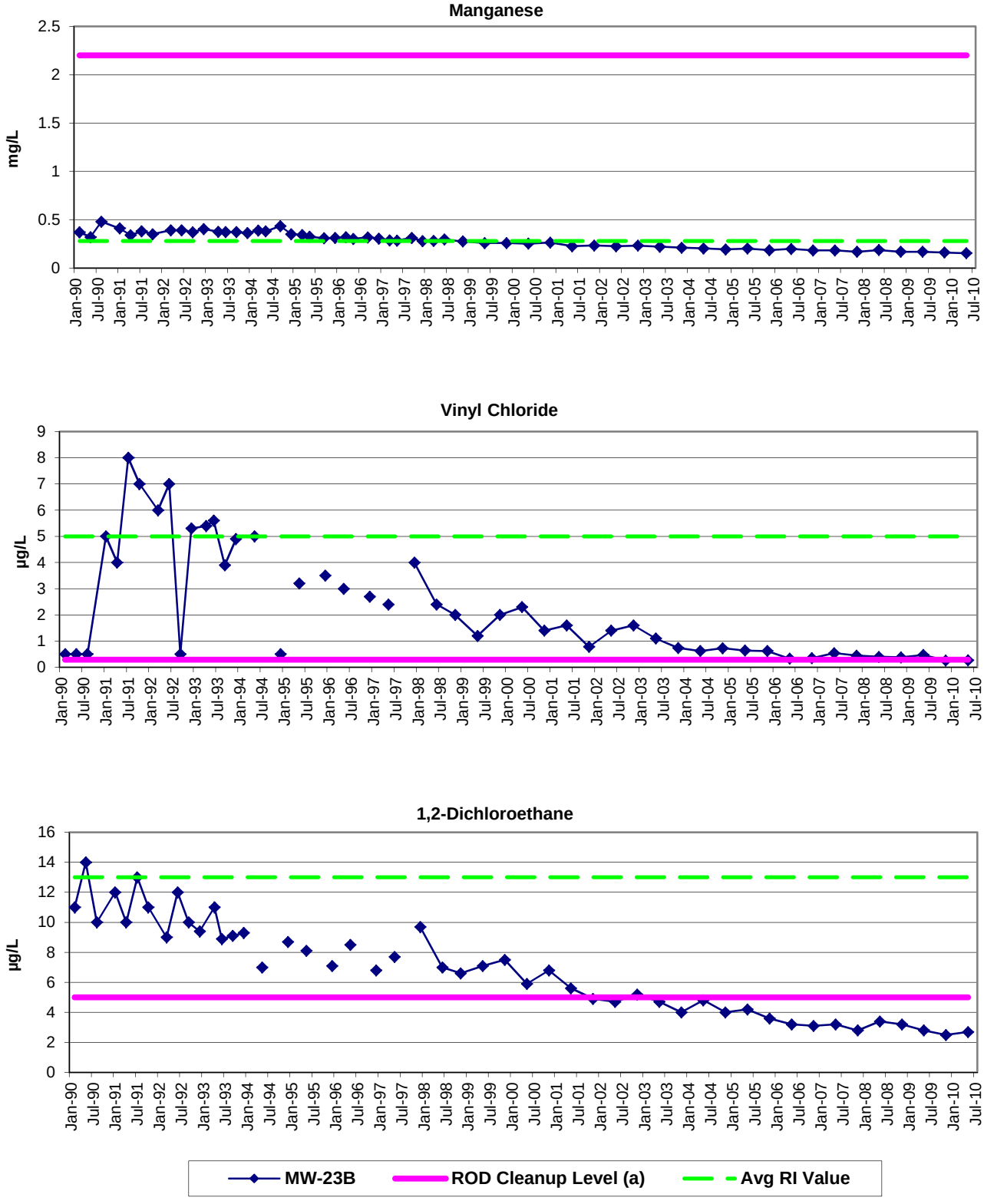




(a) Cleanup level established in the final EPA Record of Decision for the Midway Landfill, September 6, 2000.
Non-detected values are shown as 1/2 the detection limit.
RI = Remedial Investigation

Midway Landfill
ROD Contaminants of Concern

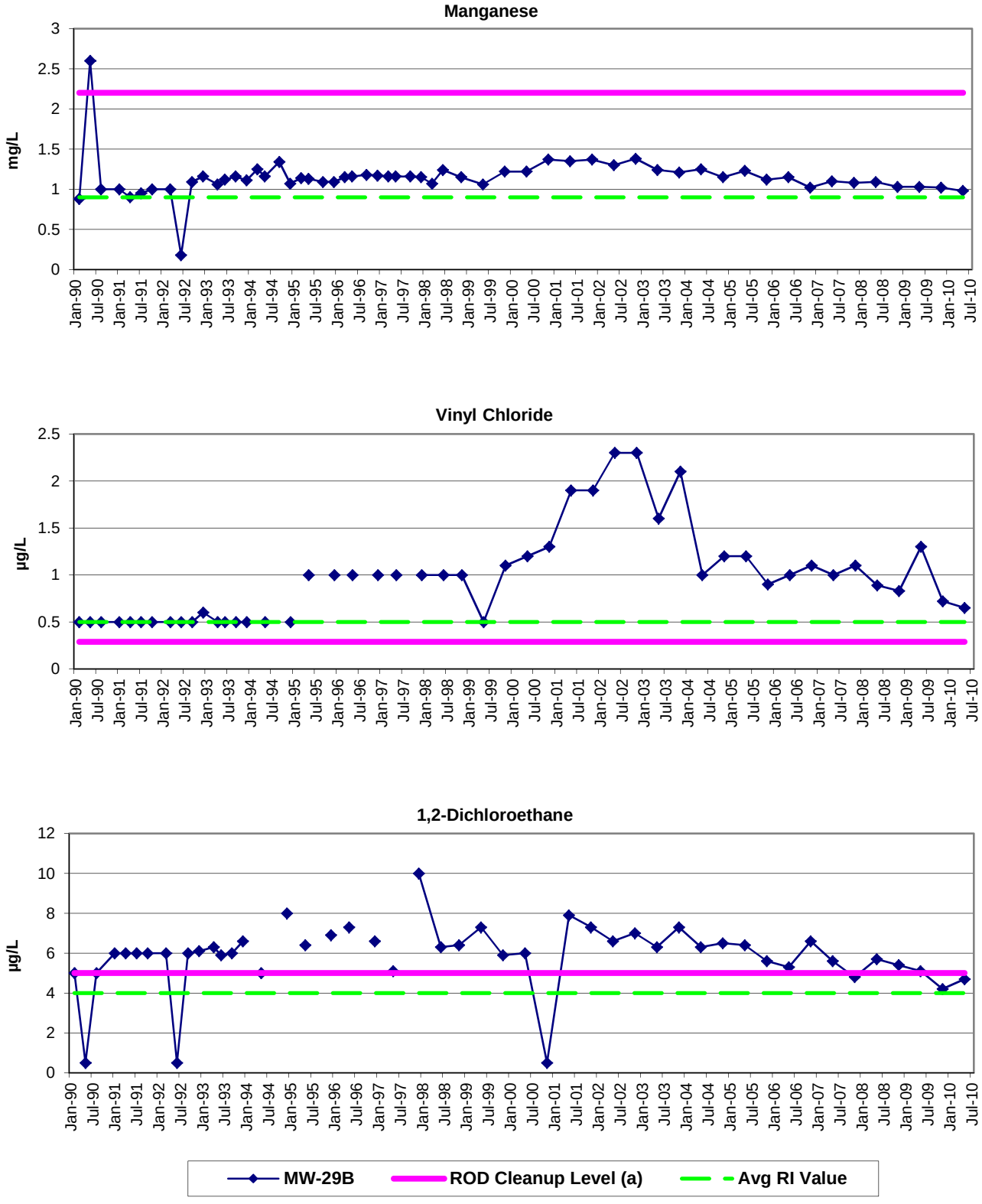
Downgradient Southern Gravel Aquifer Well
MW-23B



(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

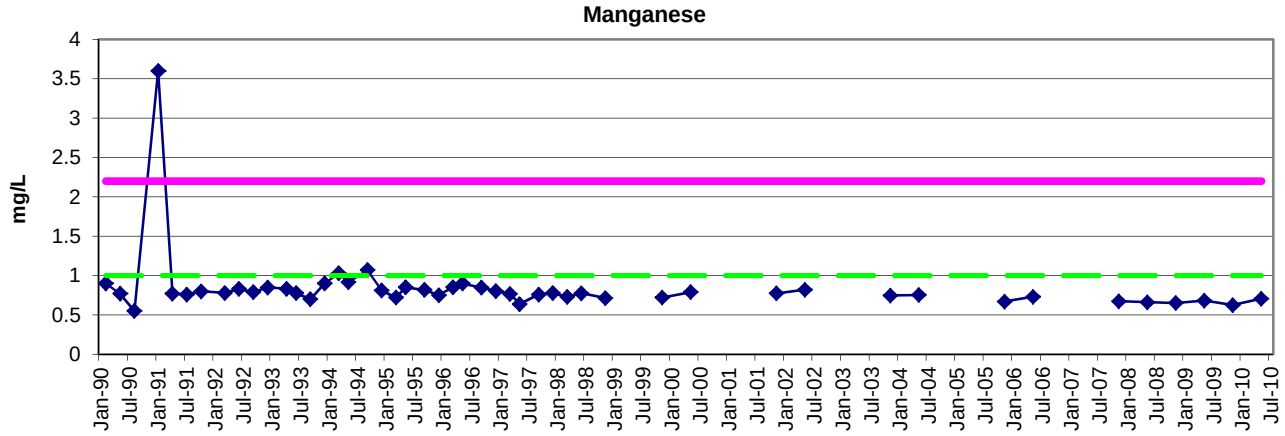
Downgradient Southern Gravel Aquifer Well
MW-29B

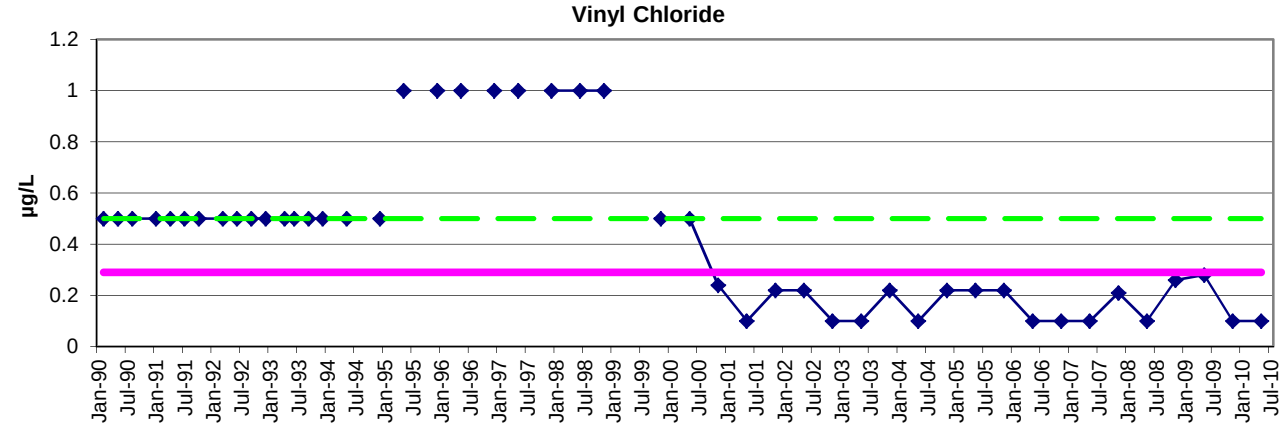


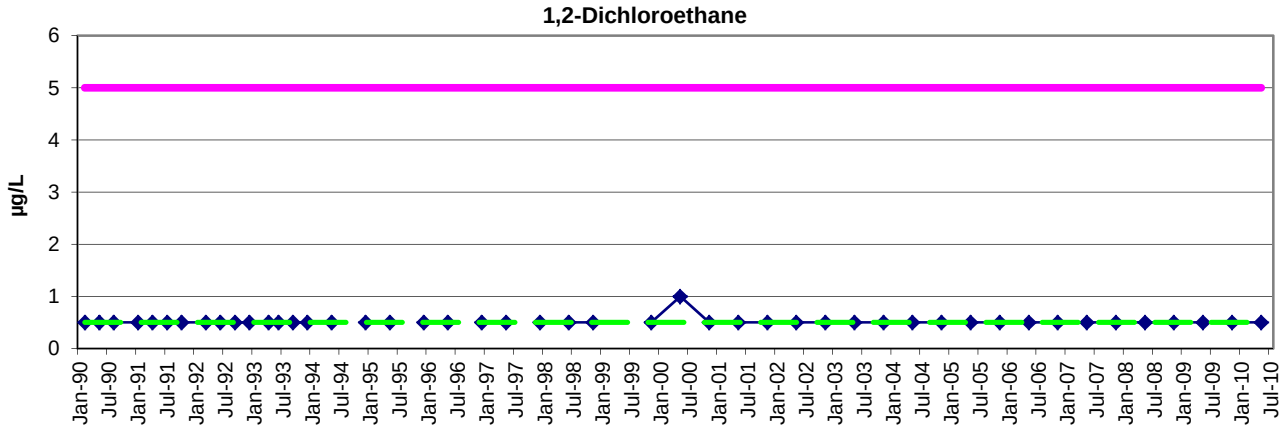
(a) Cleanup level established in the final EPA Record of Decision for the Midway Landfill, September 6, 2000.
Non-detected values are shown as 1/2 the detection limit.
RI = Remedial Investigation

Midway Landfill
ROD Contaminants of Concern

Downgradient Southern Gravel Aquifer Well
MW-30C







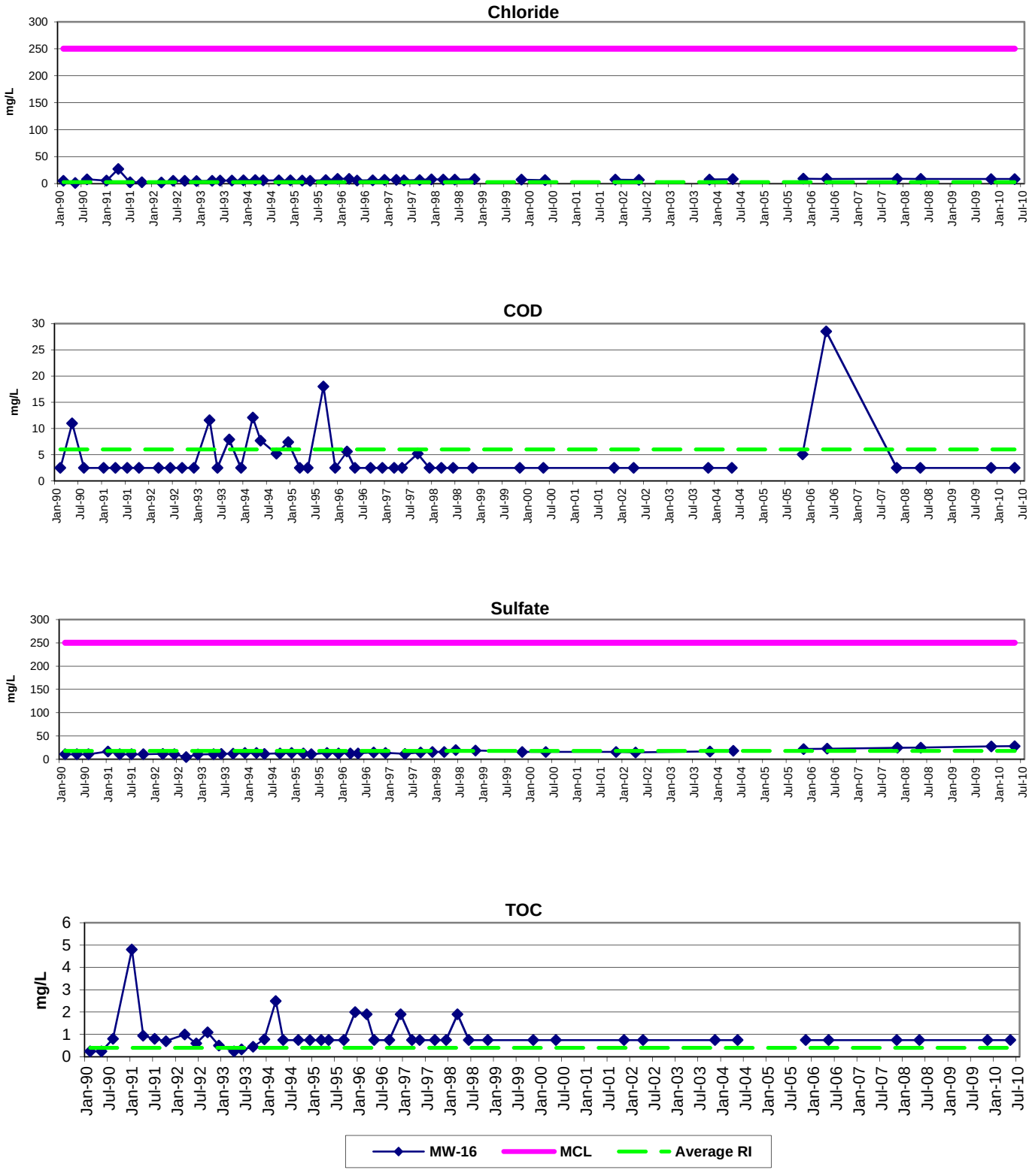
(a) Cleanup level established in the final EPA Record of Decision for the Midway Landfill, September 6, 2000.
Non-detected values are shown as 1/2 the detection limit.
RI = Remedial Investigation

APPENDIX E

Time-Series Plots for Groundwater Quality Parameters Not Included in the ROD

Midway Landfill
Groundwater Quality Parameters Not Included in the ROD

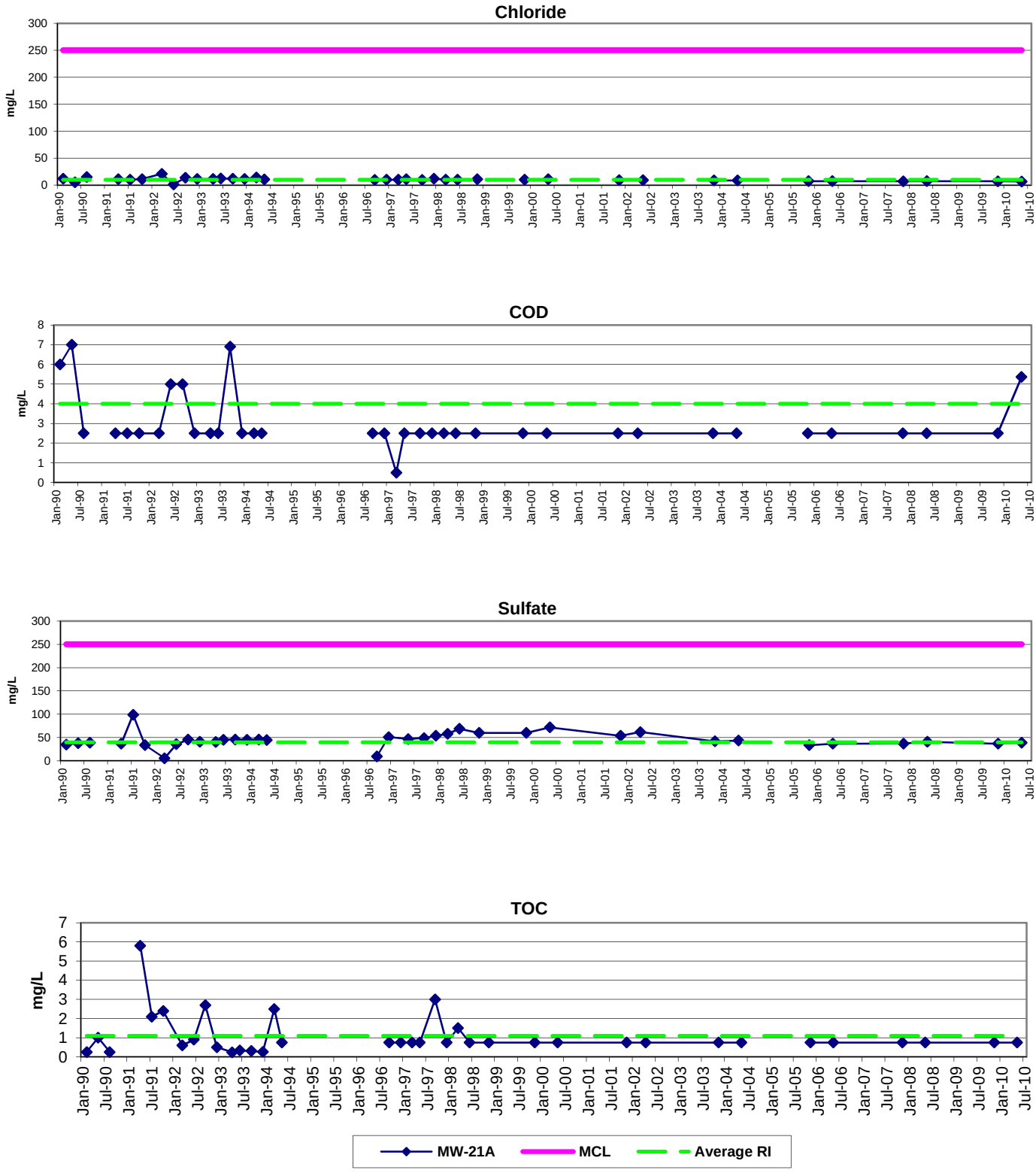
Upgradient Upper Gravel Aquifer Well
MW-16



Non-detected values are shown as 1/2 the detection limit.
MCL = Primary of secondary maximum contaminat level standard.
RI = Remedial Investigation

Midway Landfill
Groundwater Quality Parameters Not Included in the ROD

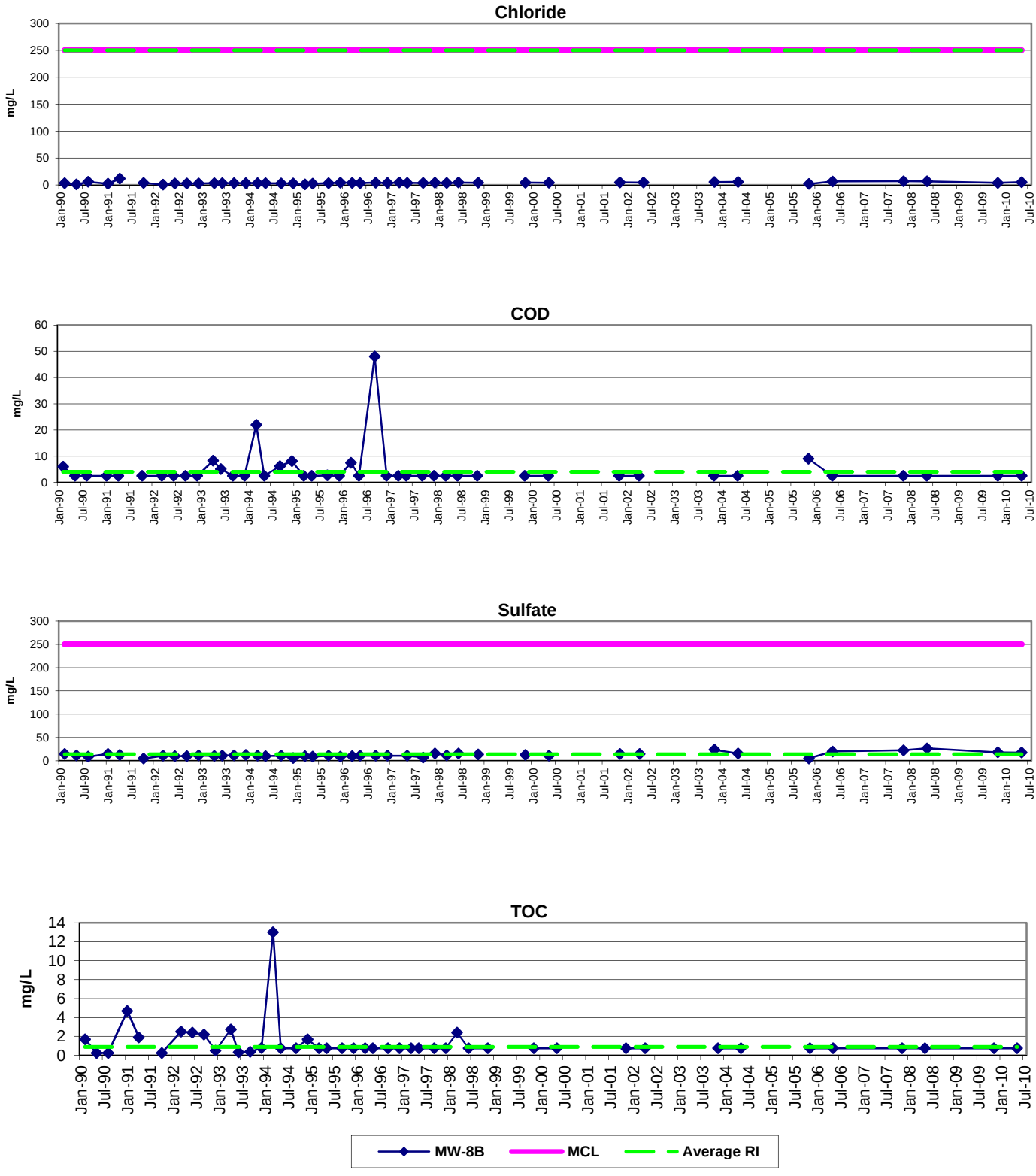
Upgradient Upper Gravel Aquifer Well
MW-21A



Non-detected values are shown as 1/2 the detection limit.
MCL = Primary of secondary maximum contaminat level standard.
RI = Remedial Investigation

Midway Landfill
Groundwater Quality Parameters Not Included in the ROD

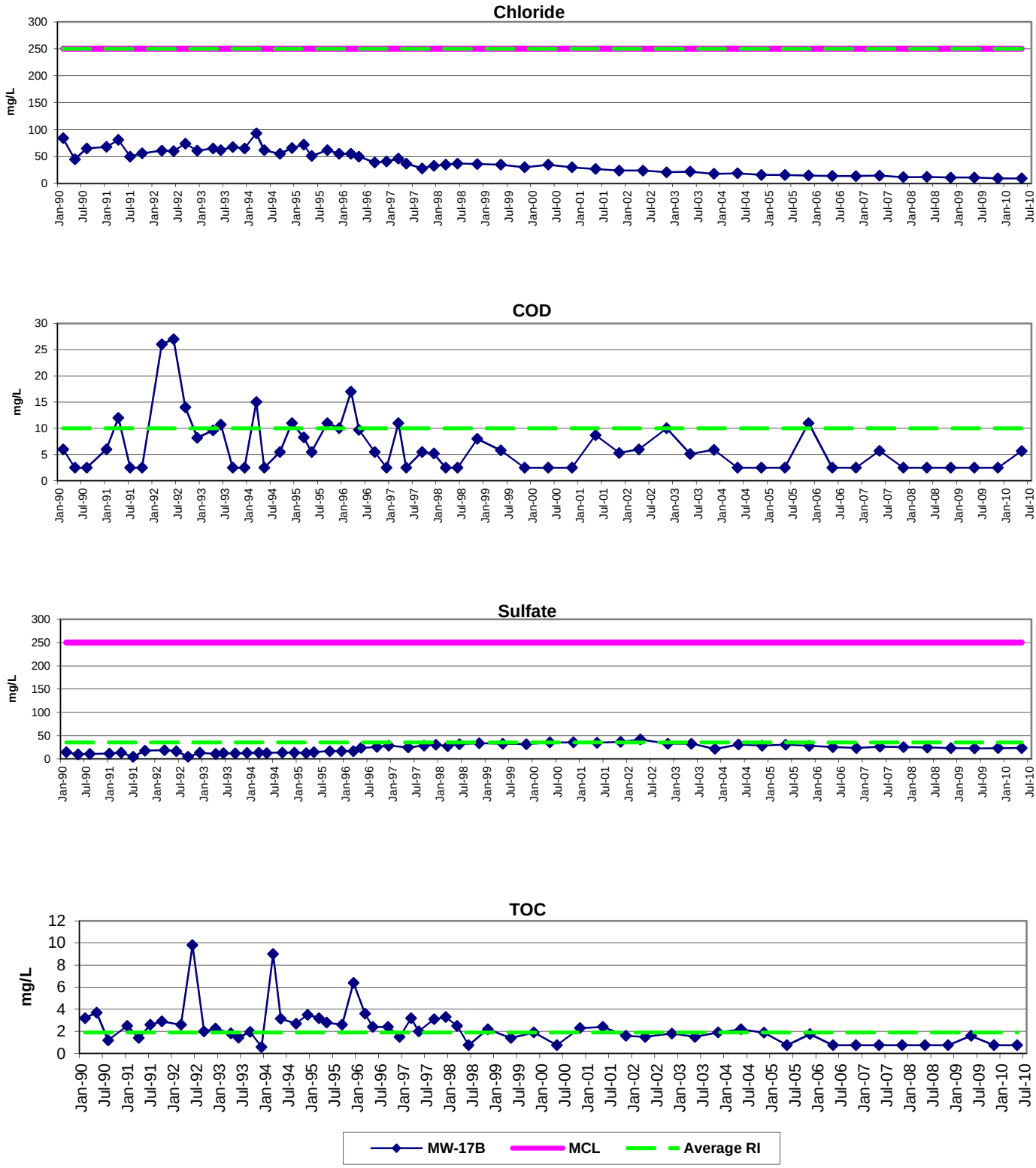
Upgradient Sand Aquifer Well
MW-8B



Non-detected values are shown as 1/2 the detection limit.
MCL = Primary of secondary maximum contaminat level standard.
RI = Remedial Investigation

Midway Landfill
Groundwater Quality Parameters Not Included in the ROD

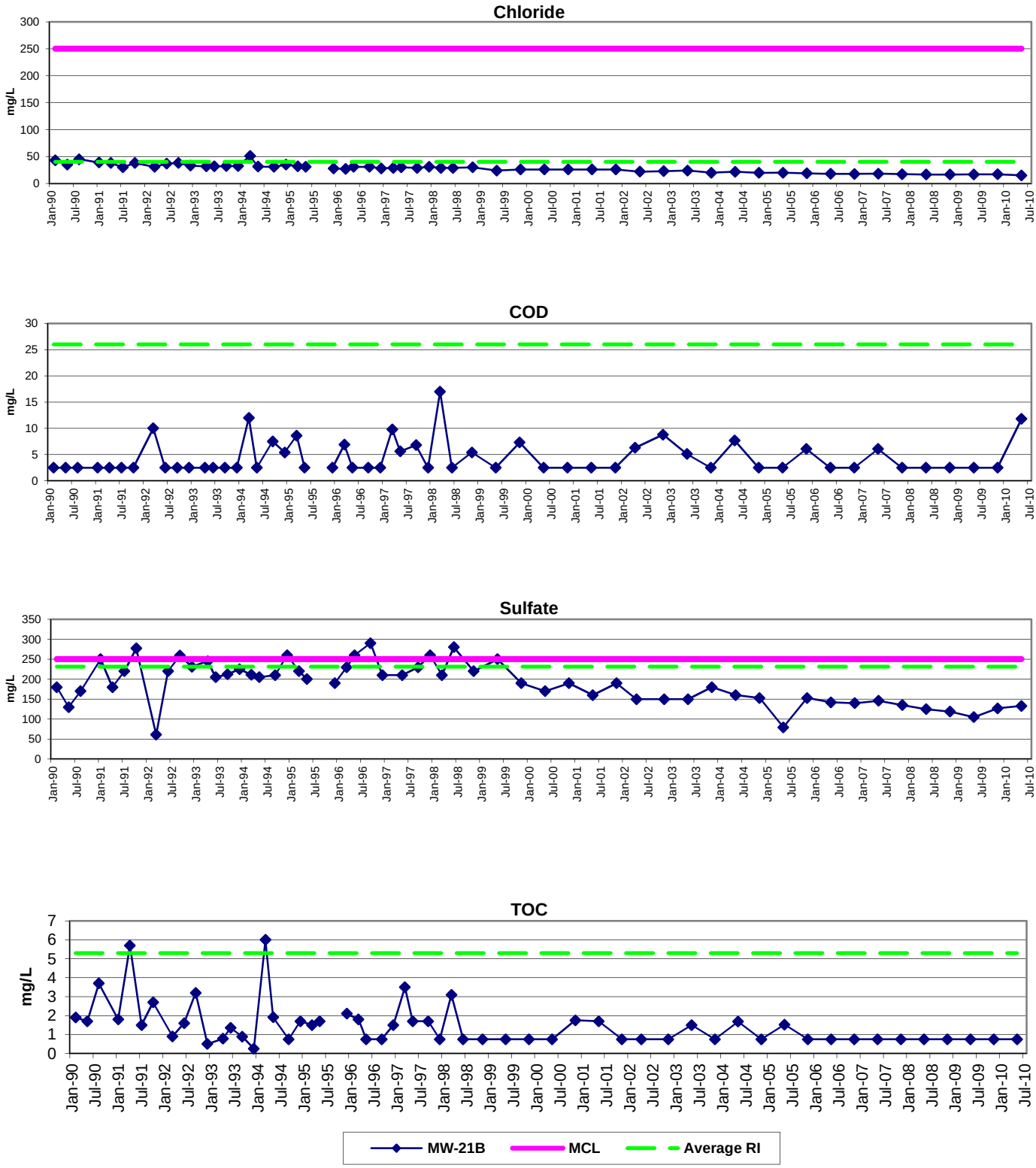
Upgradient Sand Aquifer Well
MW-17B



Non-detected values are shown as 1/2 the detection limit.
MCL = Primary of secondary maximum contaminat level standard.
RI = Remedial Investigation

Midway Landfill
Groundwater Quality Parameters Not Included in the ROD

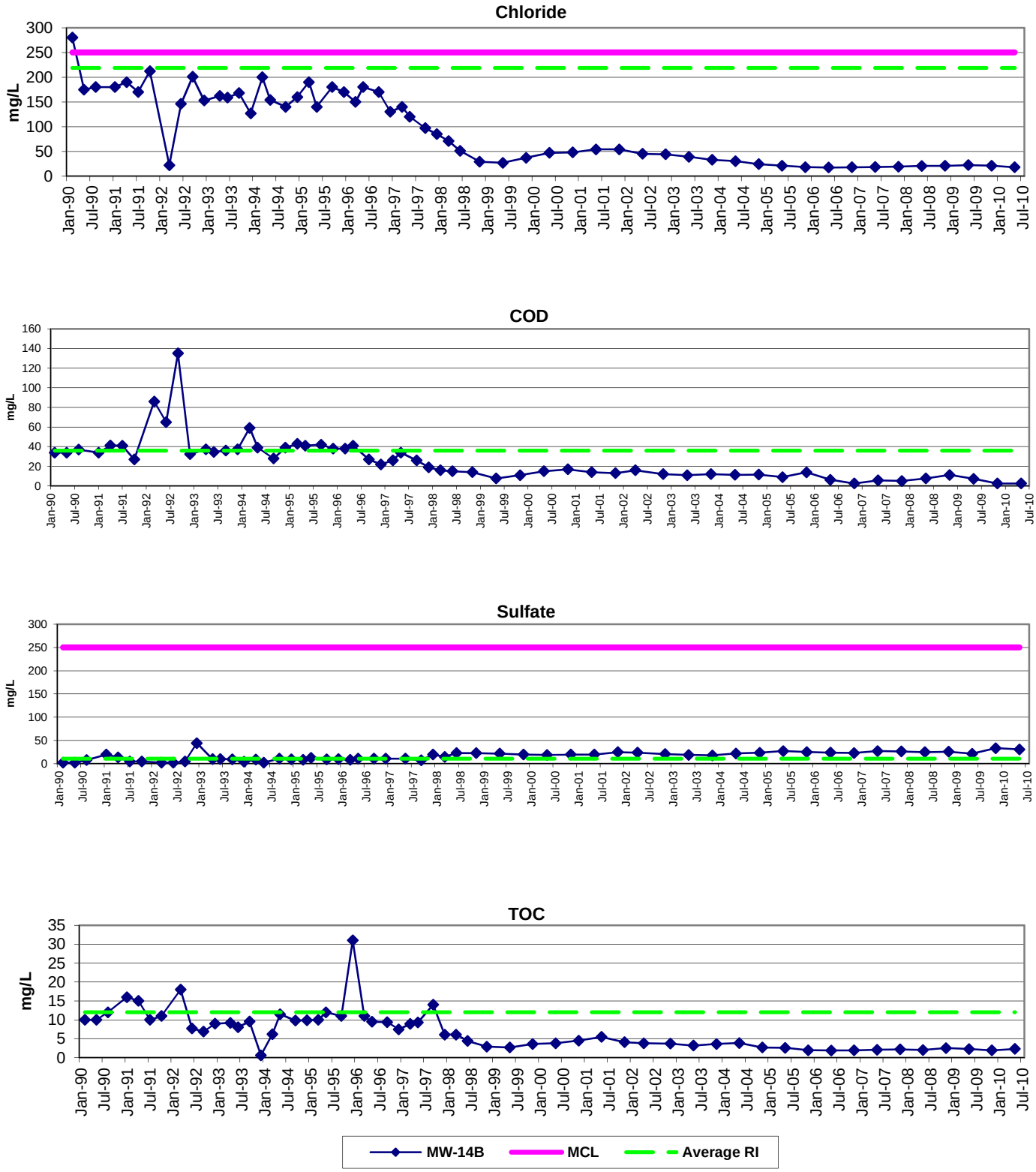
Upgradient Sand Aquifer Well
MW-21B



Non-detected values are shown as 1/2 the detection limit.
MCL = Primary of secondary maximum contaminat level standard.
RI = Remedial Investigation

Midway Landfill
Groundwater Quality Parameters Not Included in the ROD

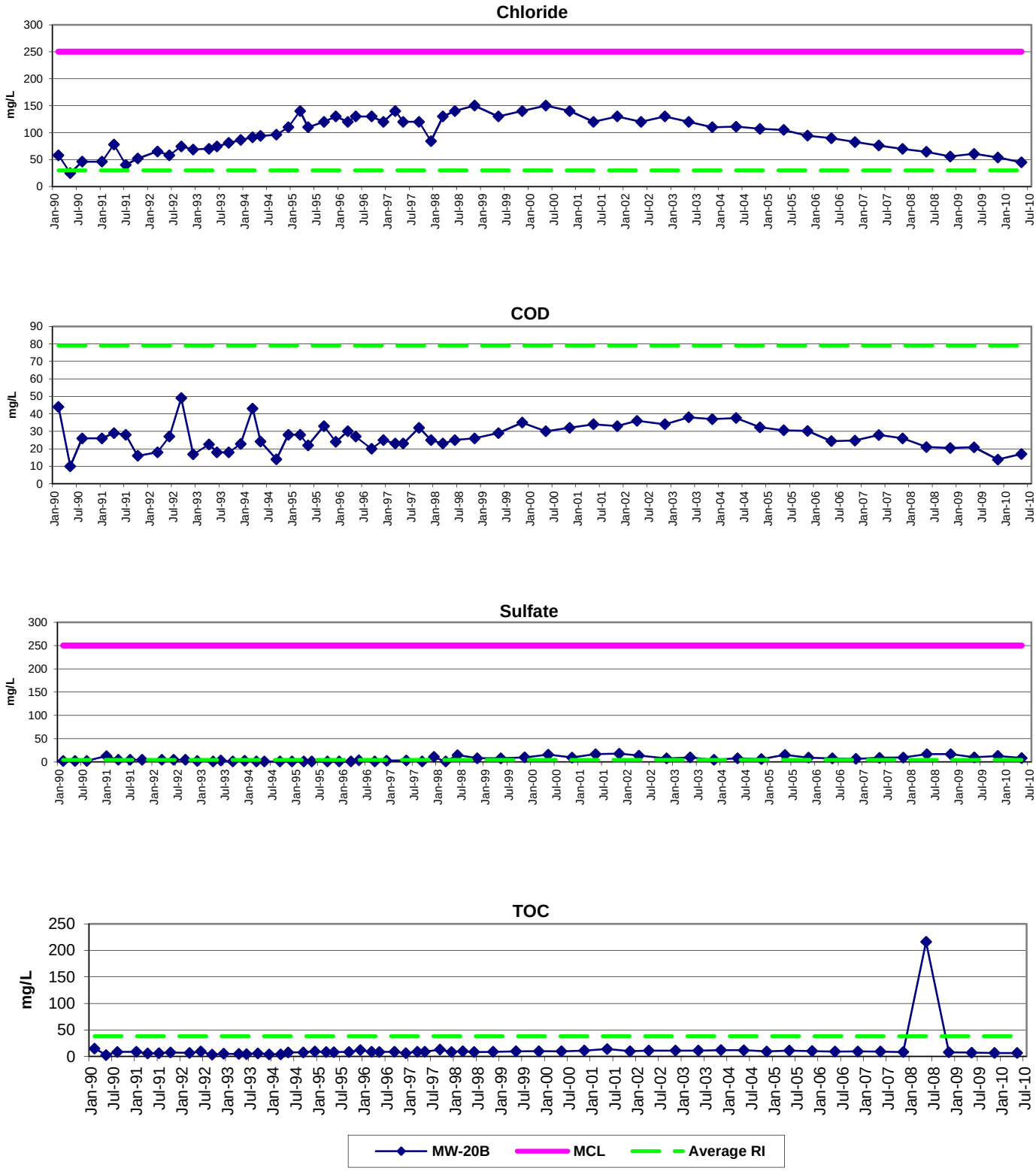
Downgradient Southern Gravel Aquifer Well
MW-14B



Non-detected values are shown as 1/2 the detection limit.
MCL = Primary of secondary maximum contaminat level standard.
RI = Remedial Investigation

Midway Landfill
Groundwater Quality Parameters Not Included in the ROD

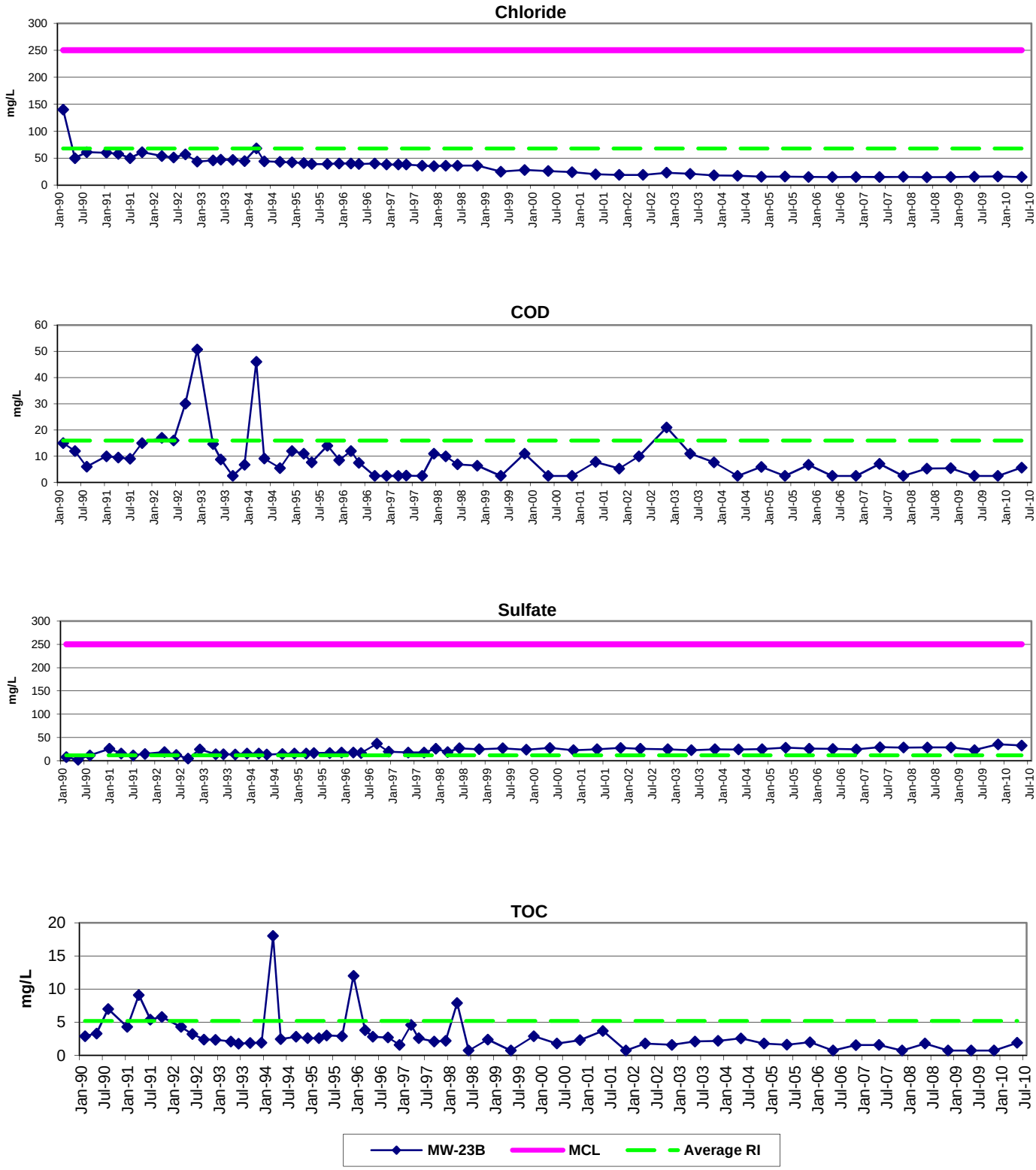
Downgradient Southern Gravel Aquifer Well
MW-20B



Non-detected values are shown as 1/2 the detection limit.
MCL = Primary of secondary maximum contaminat level standard.
RI = Remedial Investigation

Midway Landfill
Groundwater Quality Parameters Not Included in the ROD

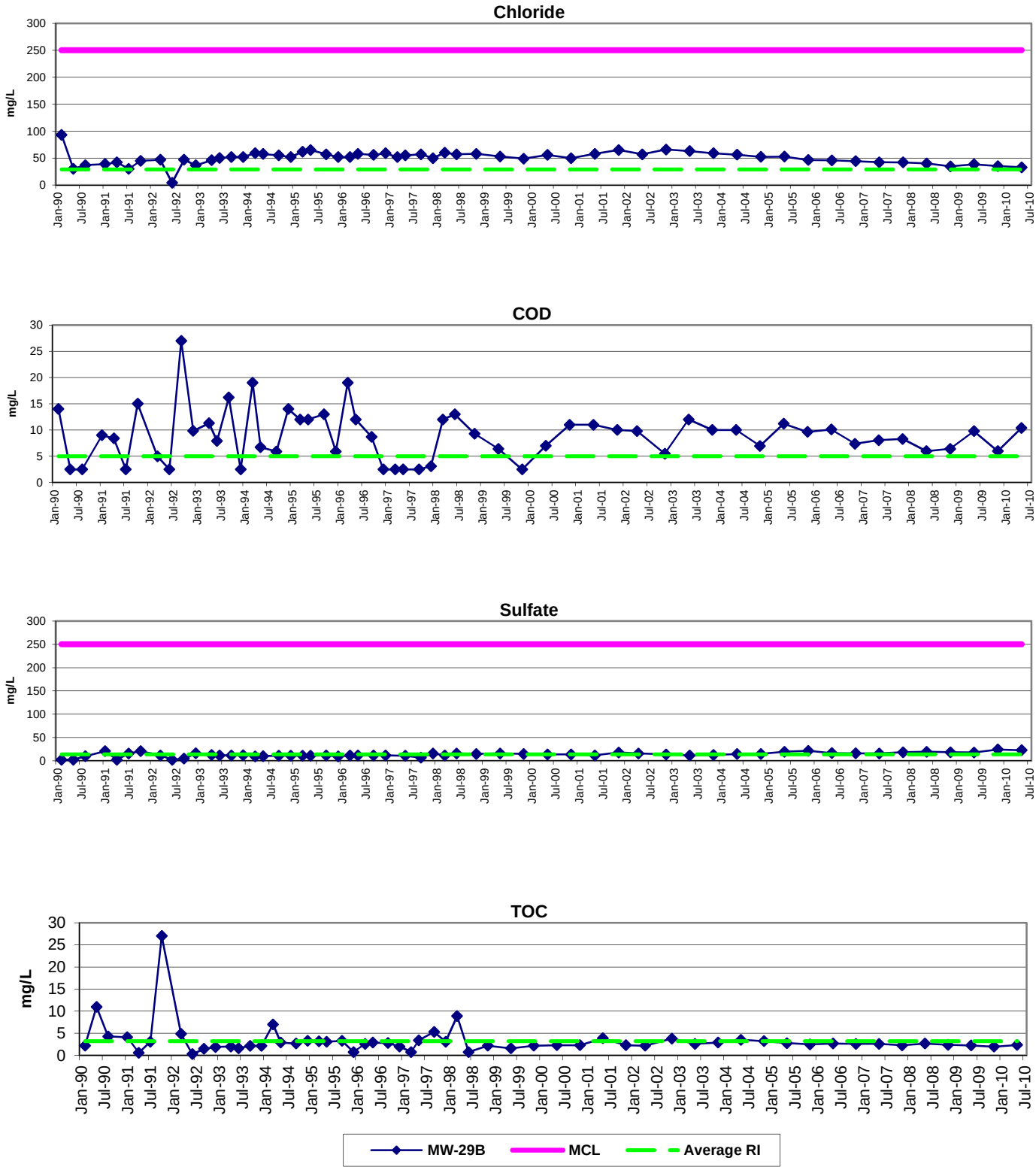
Downgradient Southern Gravel Aquifer Well
MW-23B



Non-detected values are shown as 1/2 the detection limit.
MCL = Primary of secondary maximum contaminat level standard.
RI = Remedial Investigation

Midway Landfill
Groundwater Quality Parameters Not Included in the ROD

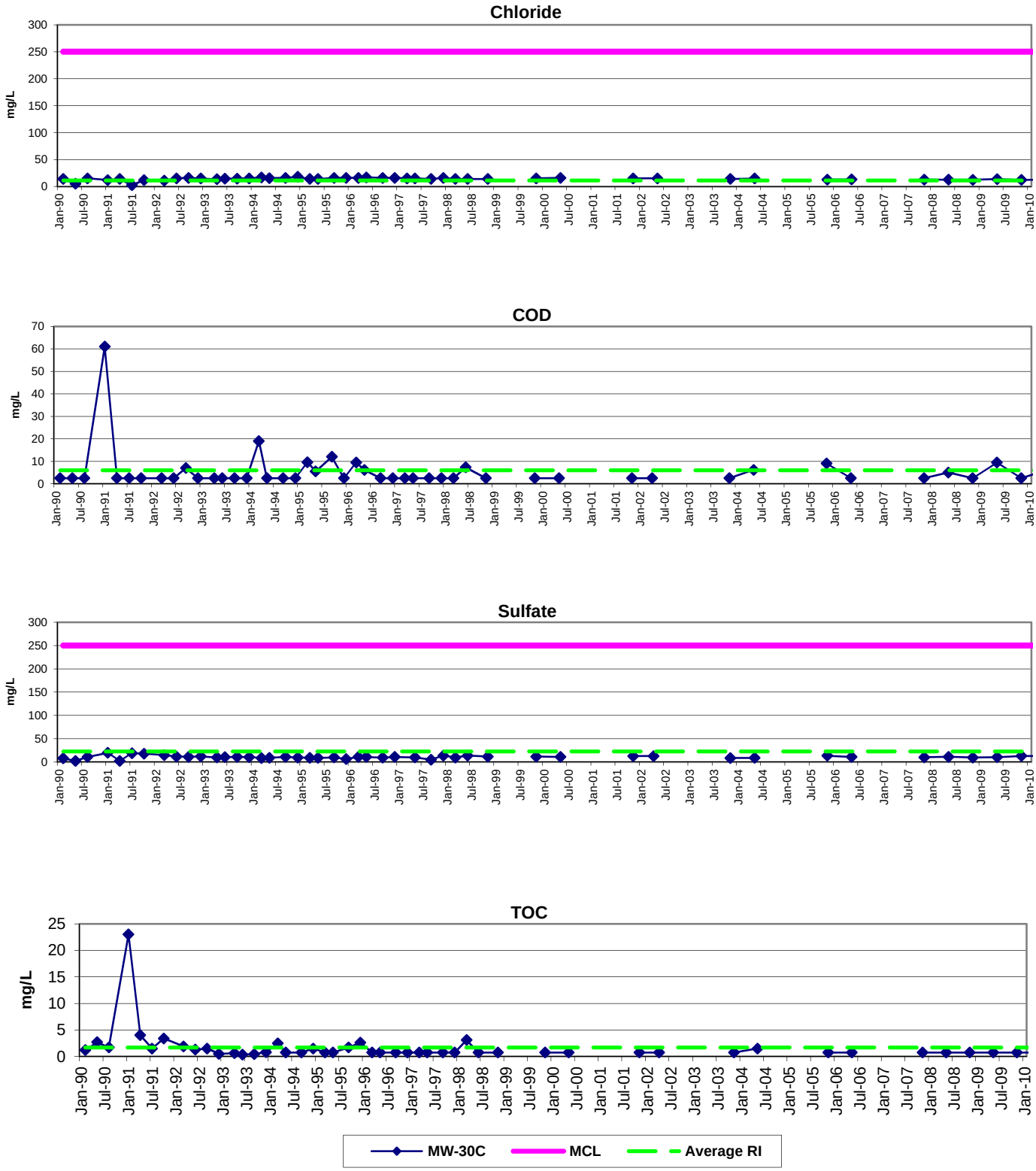
Downgradient Southern Gravel Aquifer Well
MW-29B



Non-detected values are shown as 1/2 the detection limit.
MCL = Primary of secondary maximum contaminat level standard.
RI = Remedial Investigation

Midway Landfill
Groundwater Quality Parameters Not Included in the ROD

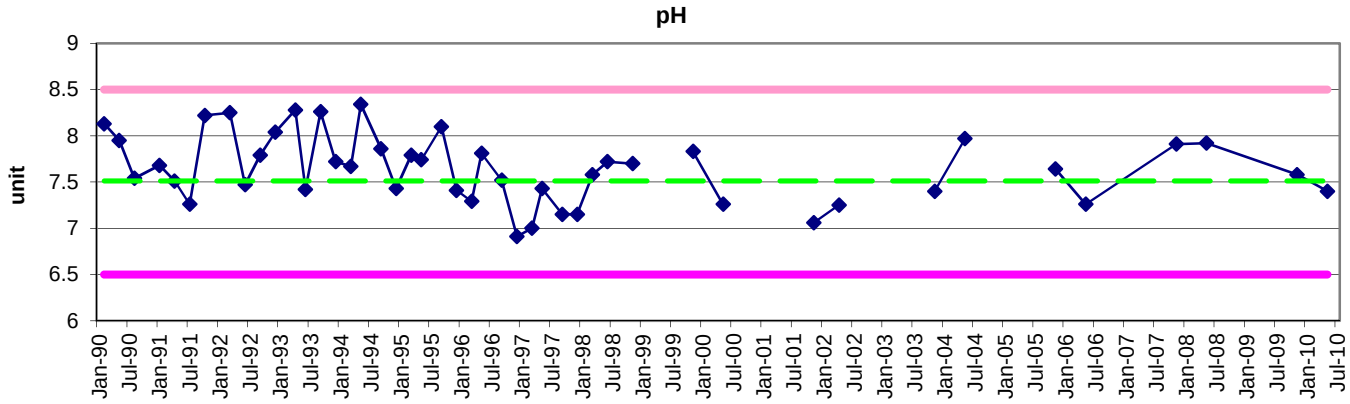
Downgradient Southern Gravel Aquifer Well
MW-30C

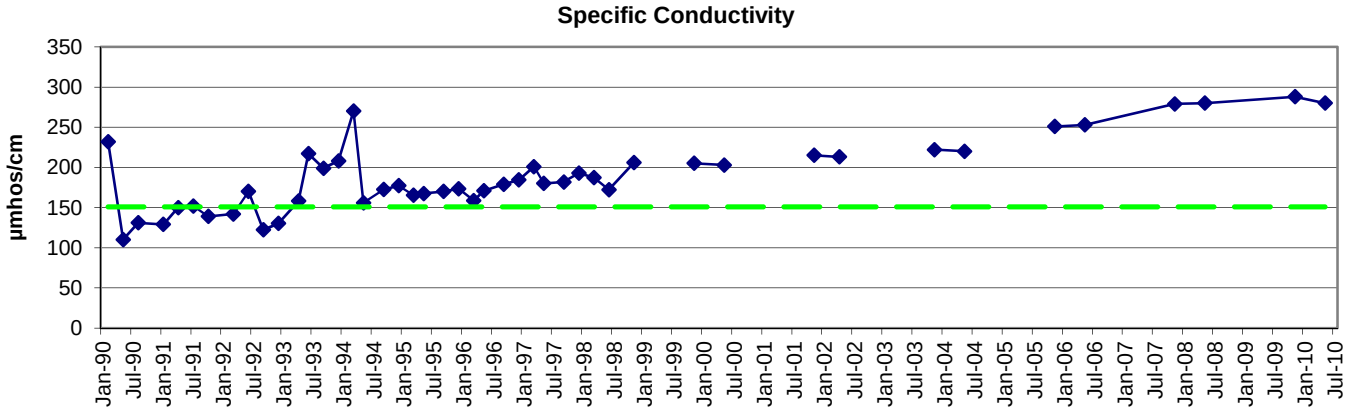


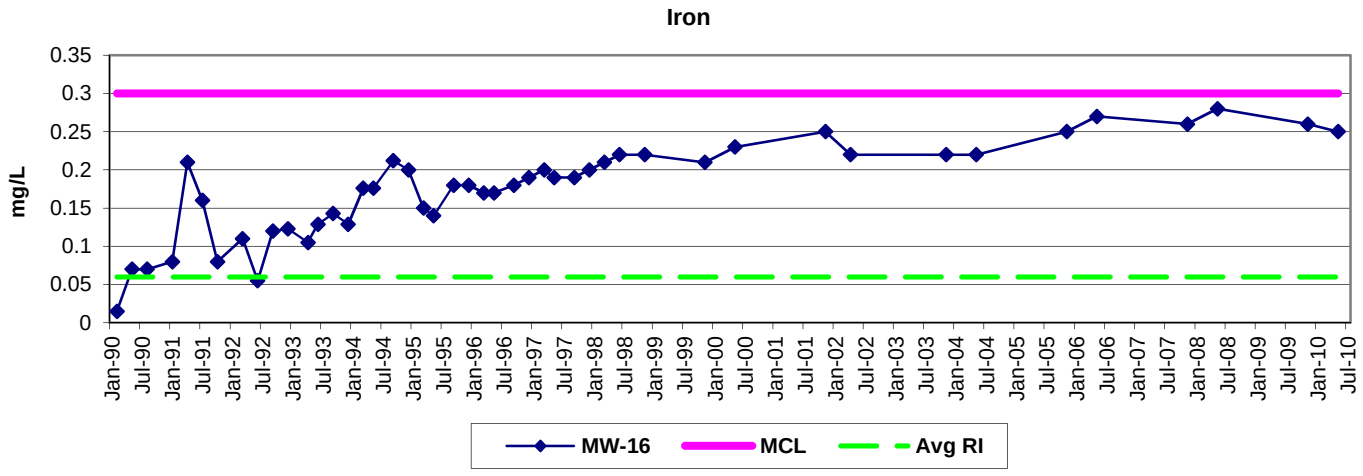
Non-detected values are shown as 1/2 the detection limit.
MCL = Primary of secondary maximum contaminat level standard.
RI = Remedial Investigation

Midway Landfill
Groundwater Quality Parameters Not Included in the ROD

Upgradient Upper Gravel Aquifer Well
MW-16



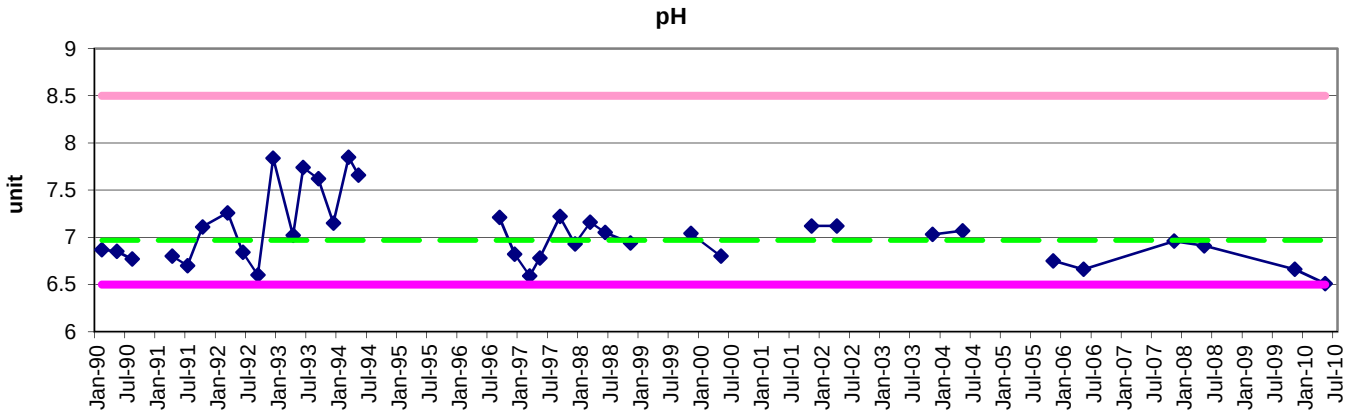


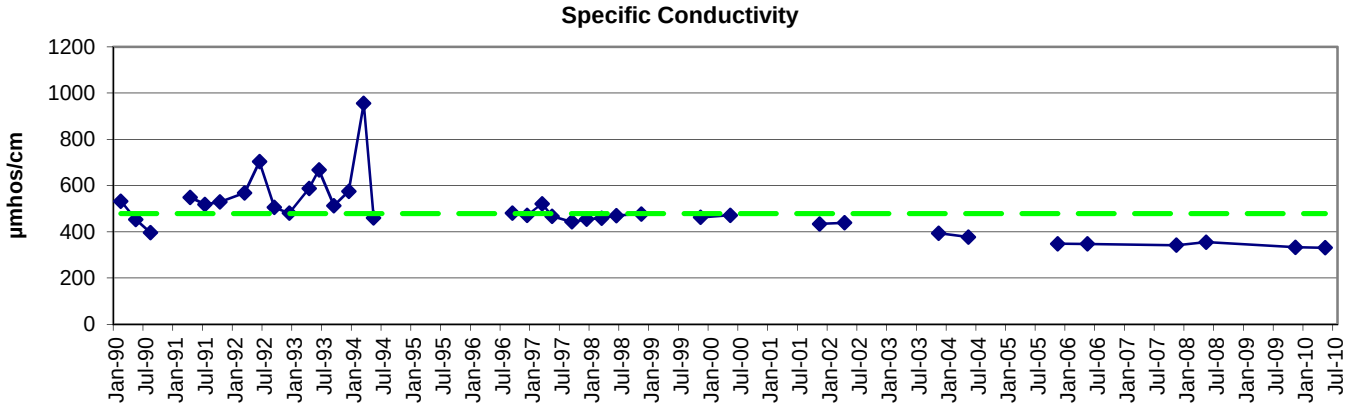


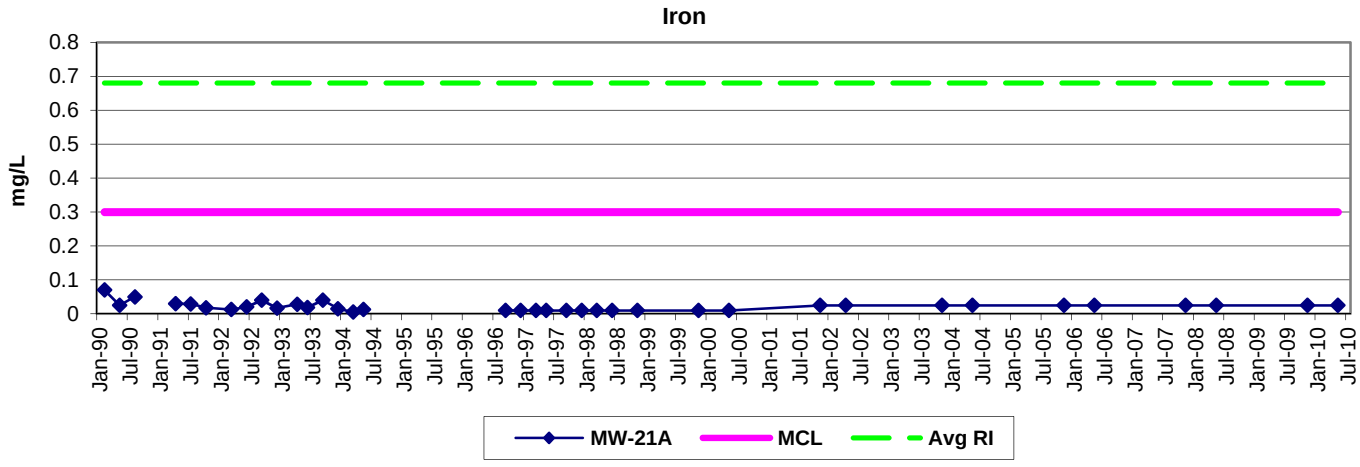
Non-detected values are shown as 1/2 the detection limit.
MCL = Primary of secondary maximum contaminat level standard.
RI = Remedial Investigation

Midway Landfill
Groundwater Quality Parameters Not Included in the ROD

Upgradient Upper Gravel Aquifer Well
MW-21A



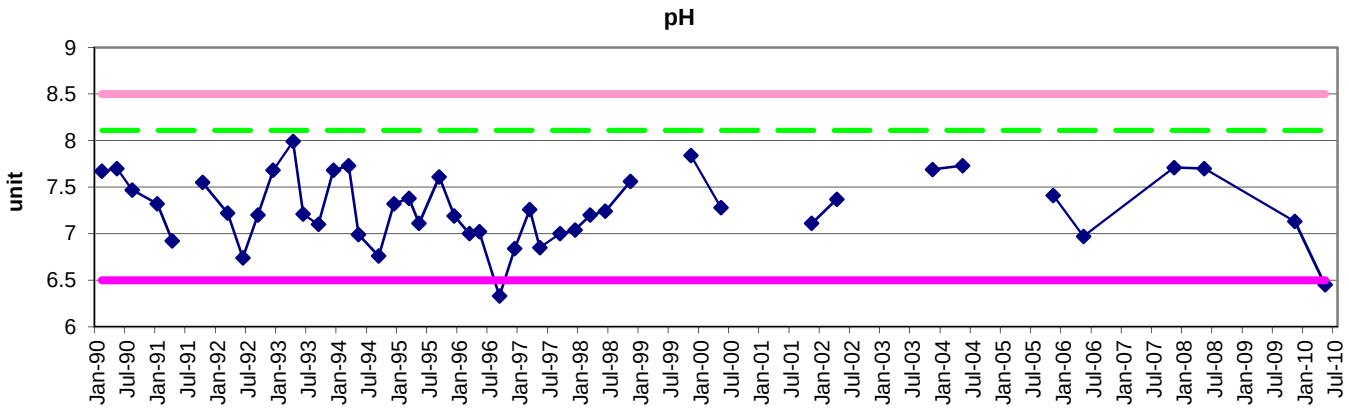


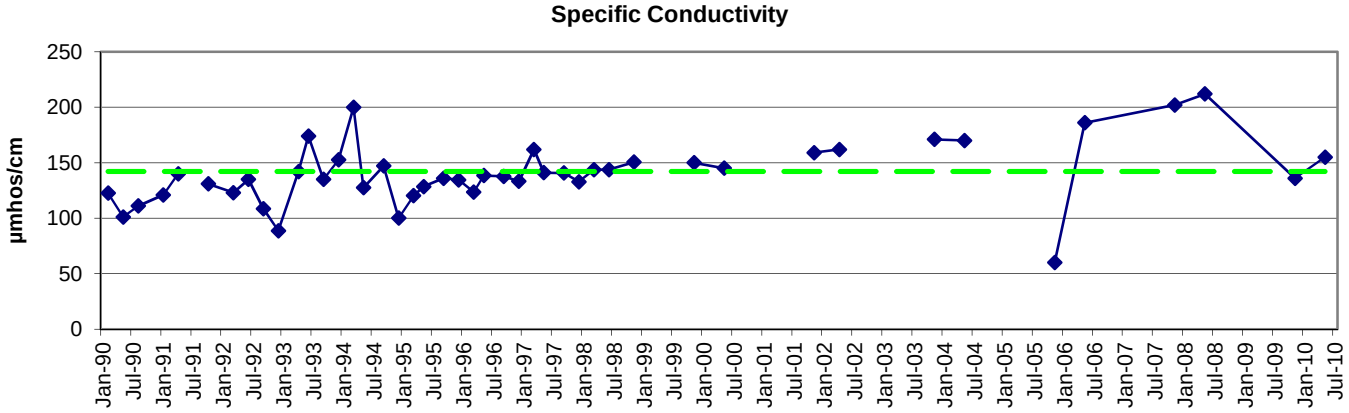


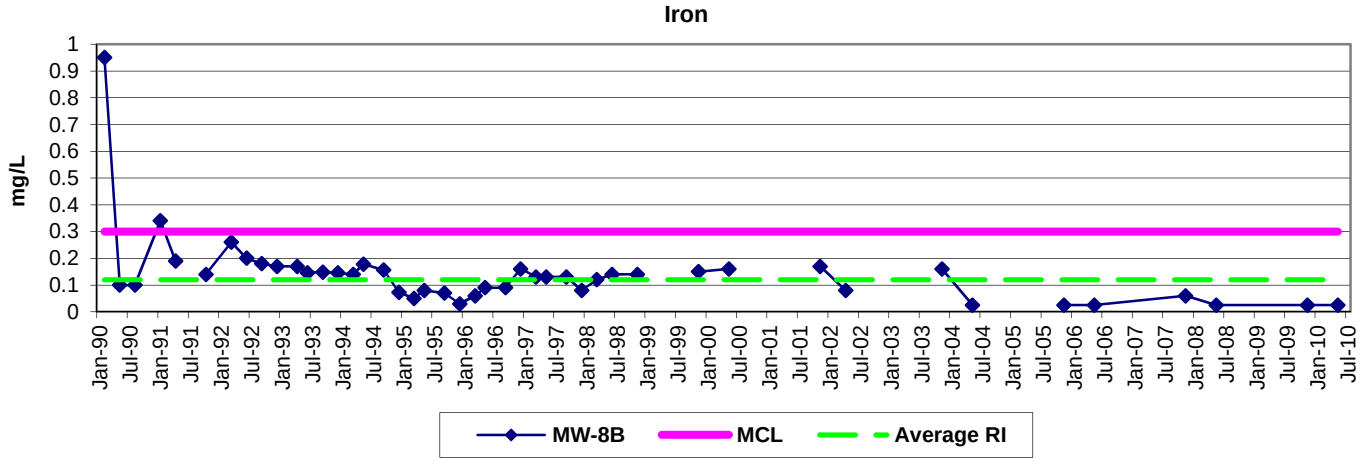
Non-detected values are shown as 1/2 the detection limit.
MCL = Primary of secondary maximum contaminat level standard.
RI = Remedial Investigation

Midway Landfill
Groundwater Quality Parameters Not Included in the ROD

Upgradient Sand Aquifer Well
MW-8B



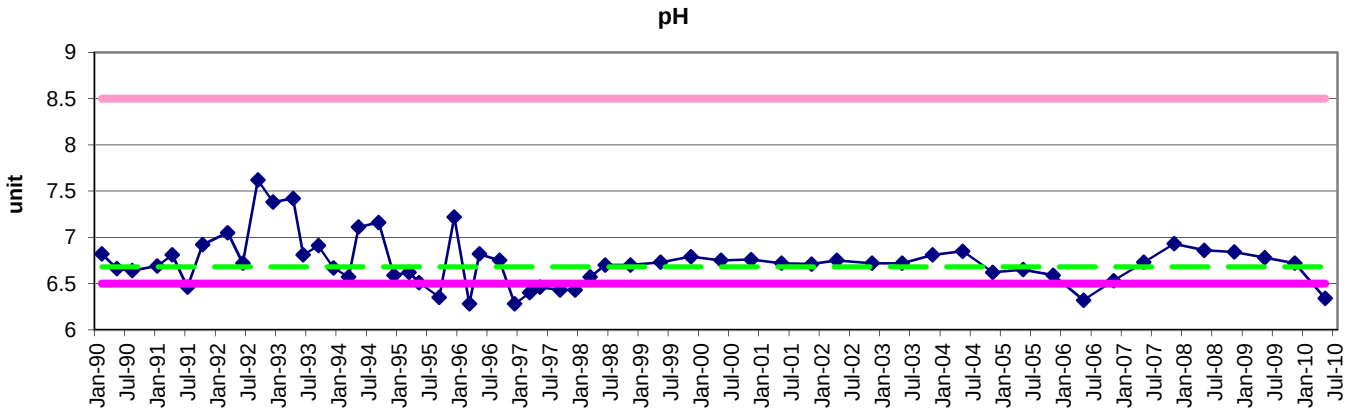


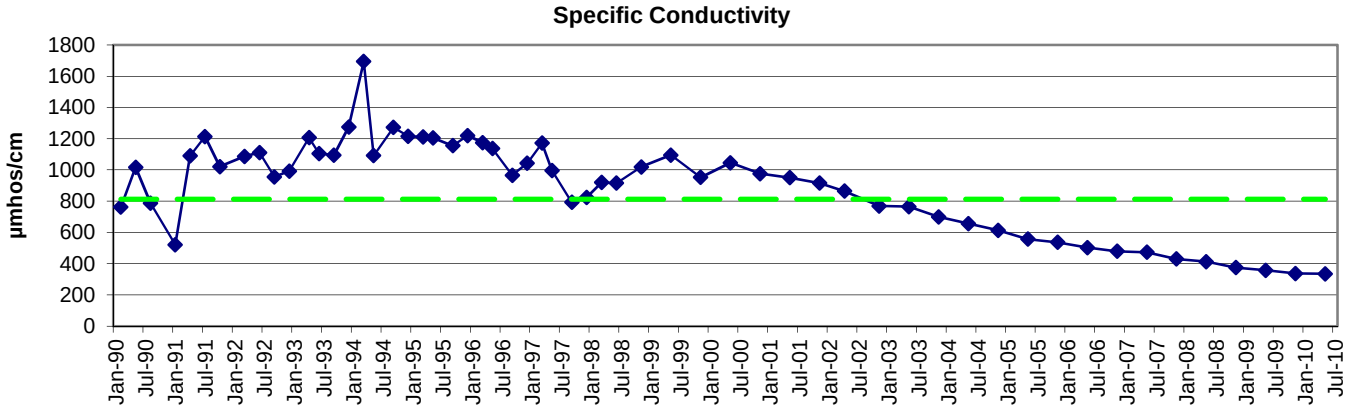


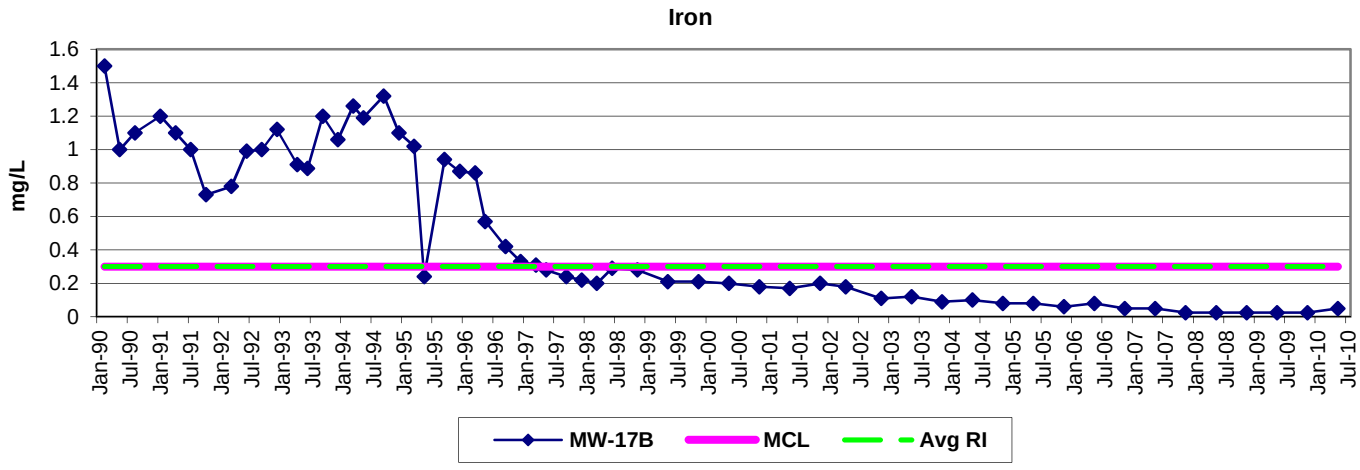
Non-detected values are shown as 1/2 the detection limit.
MCL = Primary of secondary maximum contaminat level standard.
RI = Remedial Investigation

Midway Landfill
Groundwater Quality Parameters Not Included in the ROD

Upgradient Sand Aquifer Well
MW-17B



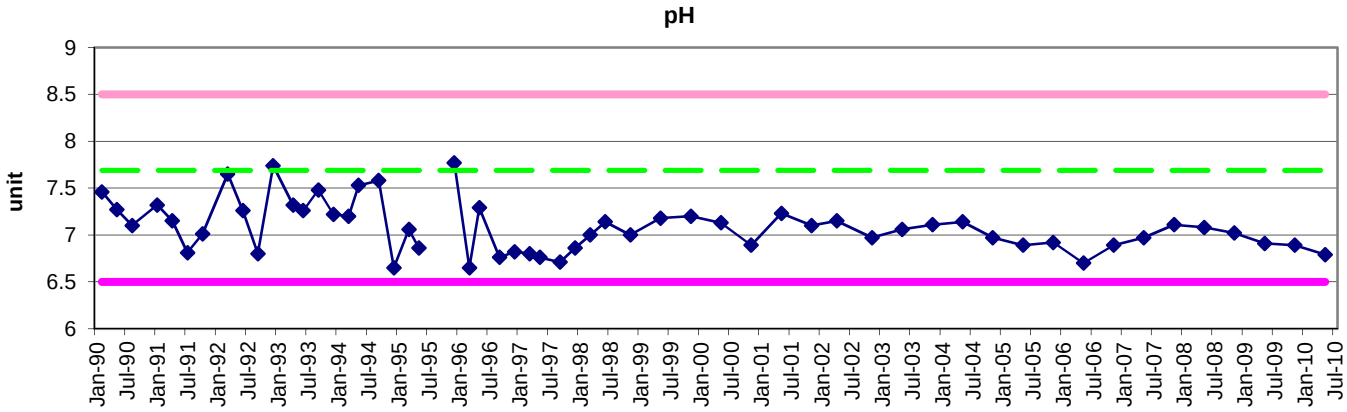


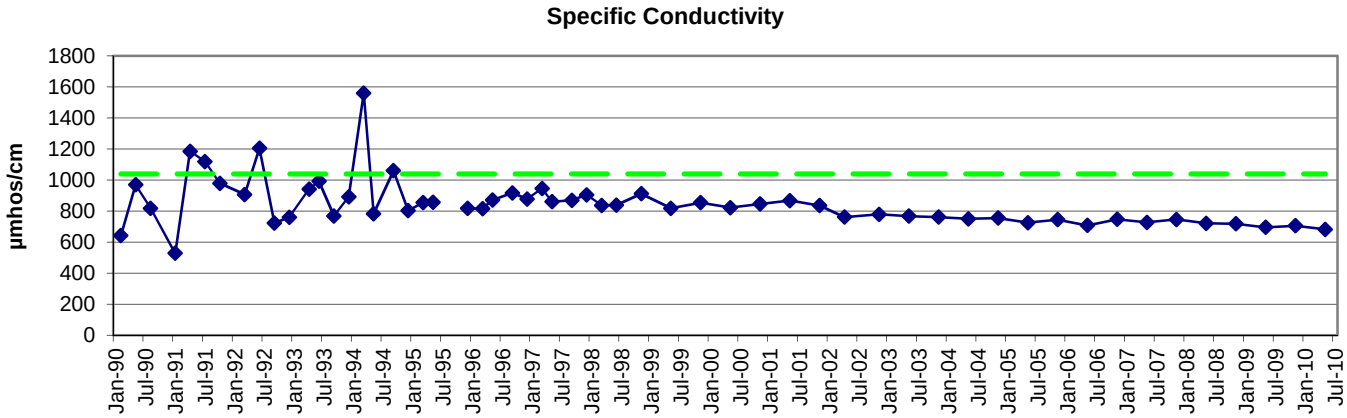


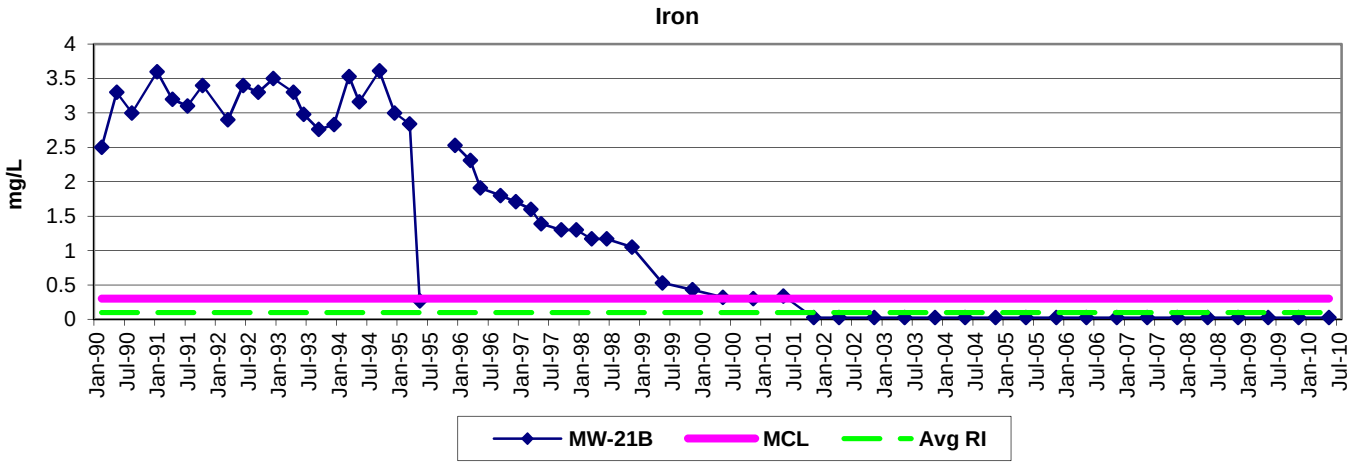
Non-detected values are shown as 1/2 the detection limit.
MCL = Primary of secondary maximum contaminat level standard.
RI = Remedial Investigation

Midway Landfill
Groundwater Quality Parameters Not Included in the ROD

Upgradient Sand Aquifer Well
MW-21B



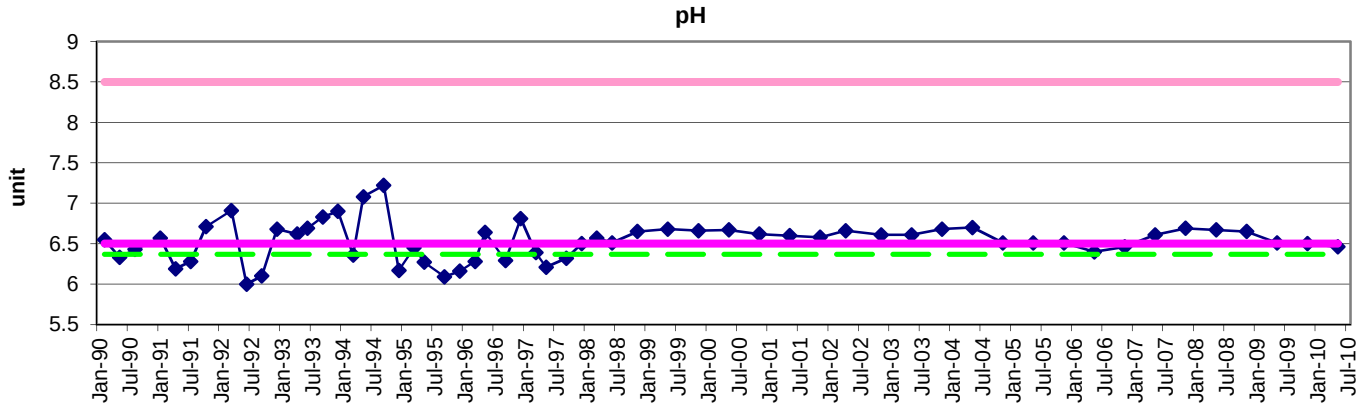


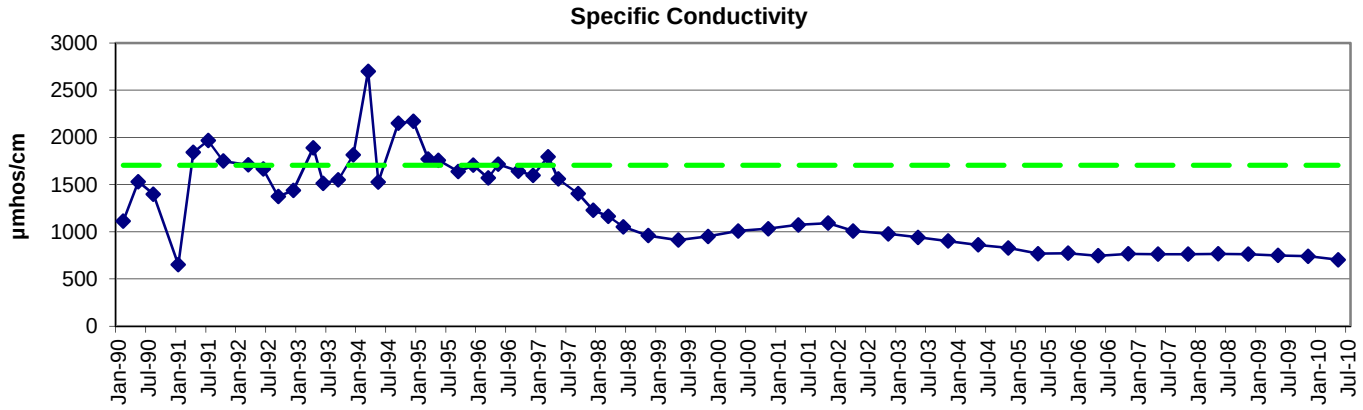


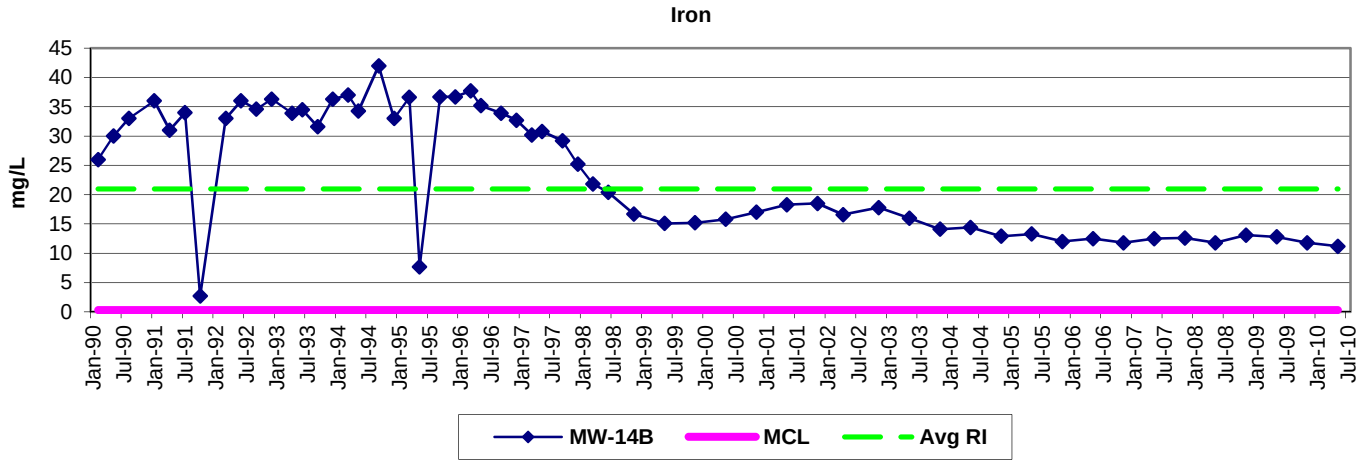
Non-detected values are shown as 1/2 the detection limit.
MCL = Primary of secondary maximum contaminat level standard.
RI = Remedial Investigation

Midway Landfill
Groundwater Quality Parameters Not Included in the ROD

Downgradient Southern Gravel Aquifer Well
MW-14B



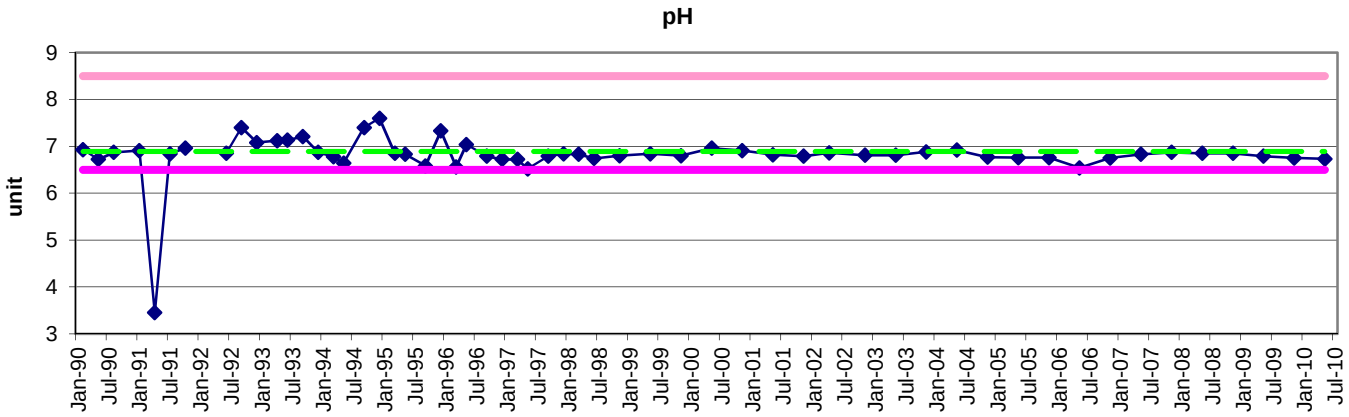


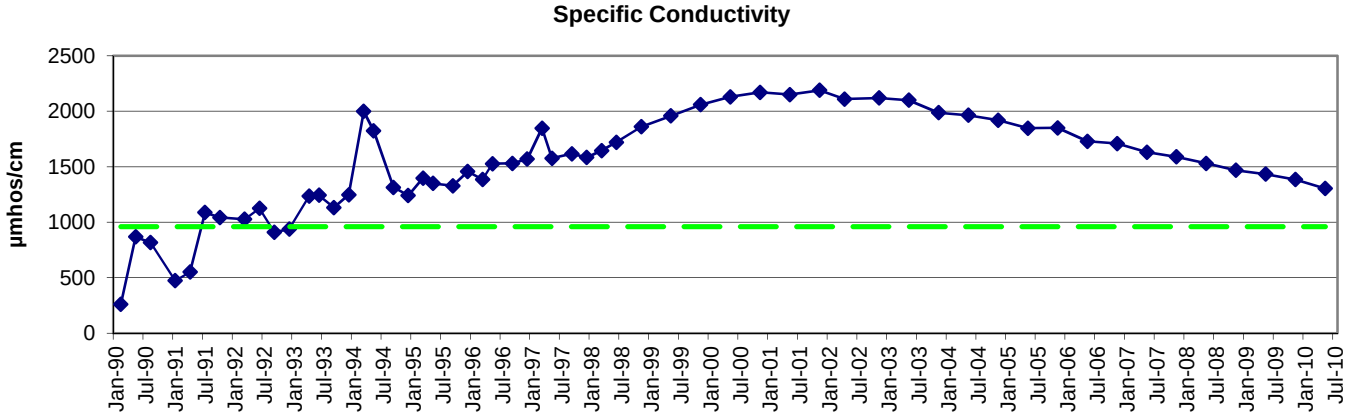


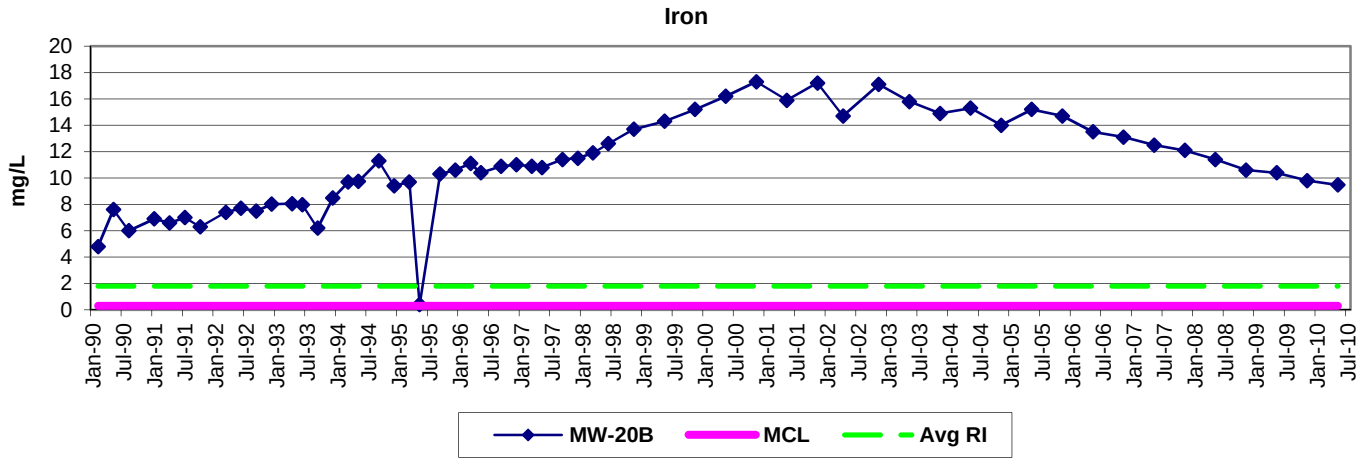
Non-detected values are shown as 1/2 the detection limit.
MCL = Primary of secondary maximum contaminat level standard.
RI = Remedial Investigation

Midway Landfill
Groundwater Quality Parameters Not Included in the ROD

Downgradient Southern Gravel Aquifer Well
MW-20B



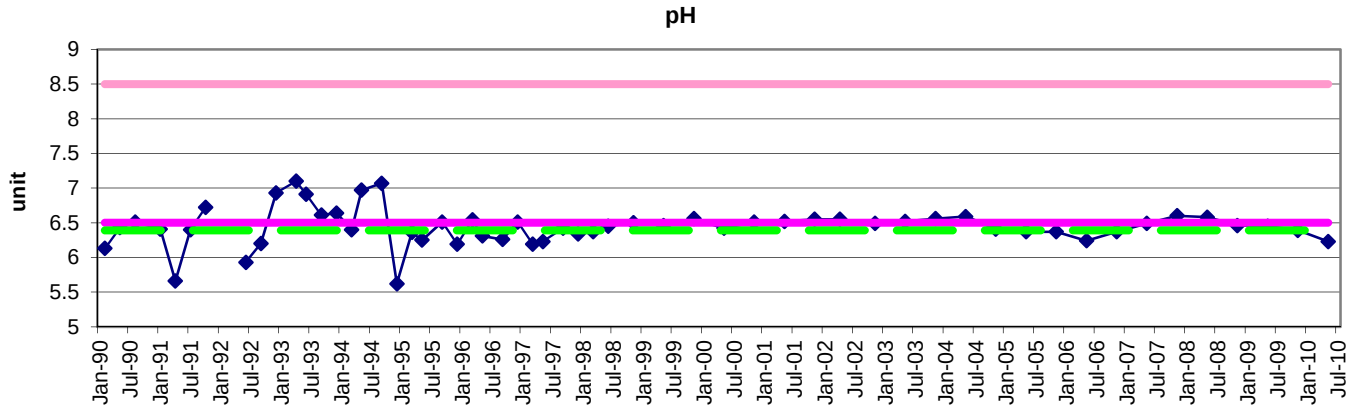


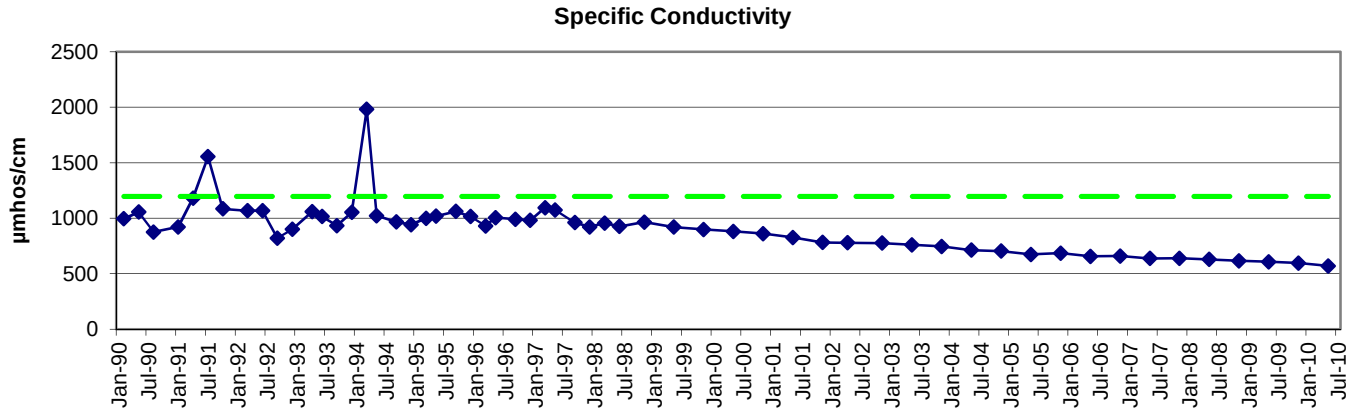


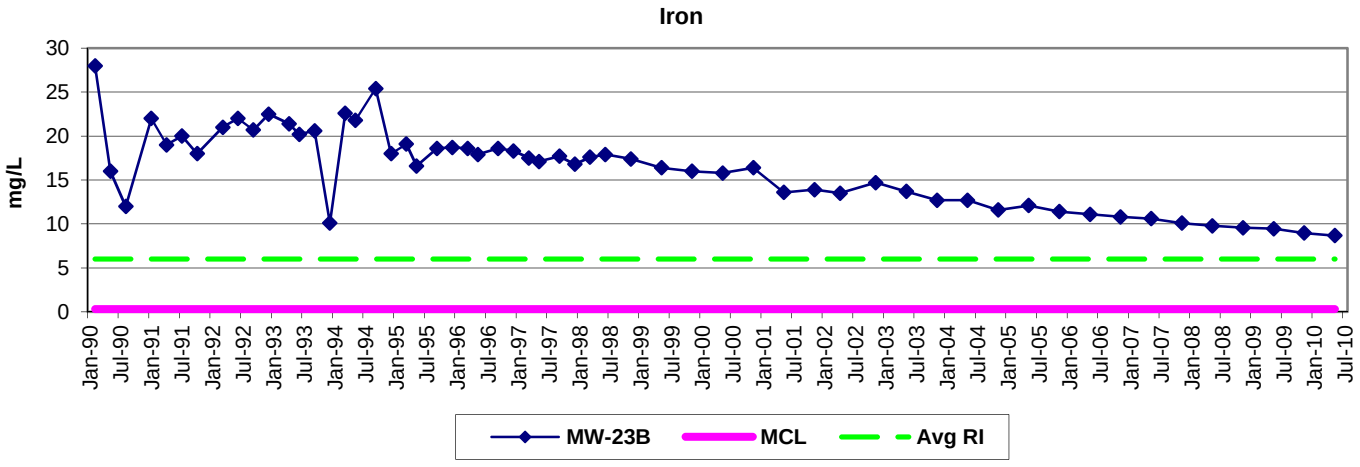
Non-detected values are shown as 1/2 the detection limit.
MCL = Primary of secondary maximum contaminat level standard.
RI = Remedial Investigation

Midway Landfill
Groundwater Quality Parameters Not Included in the ROD

Downgradient Southern Gravel Aquifer Well
MW-23B



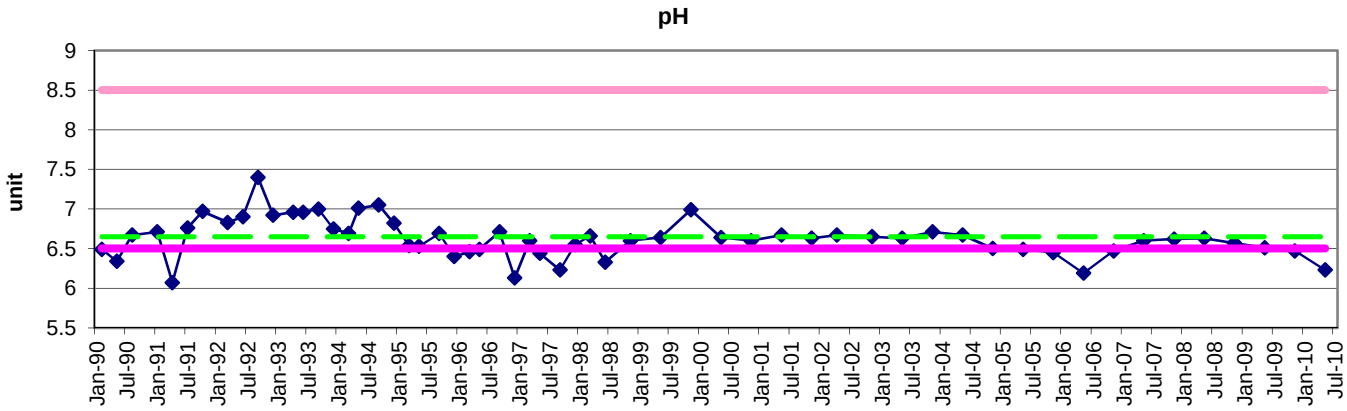


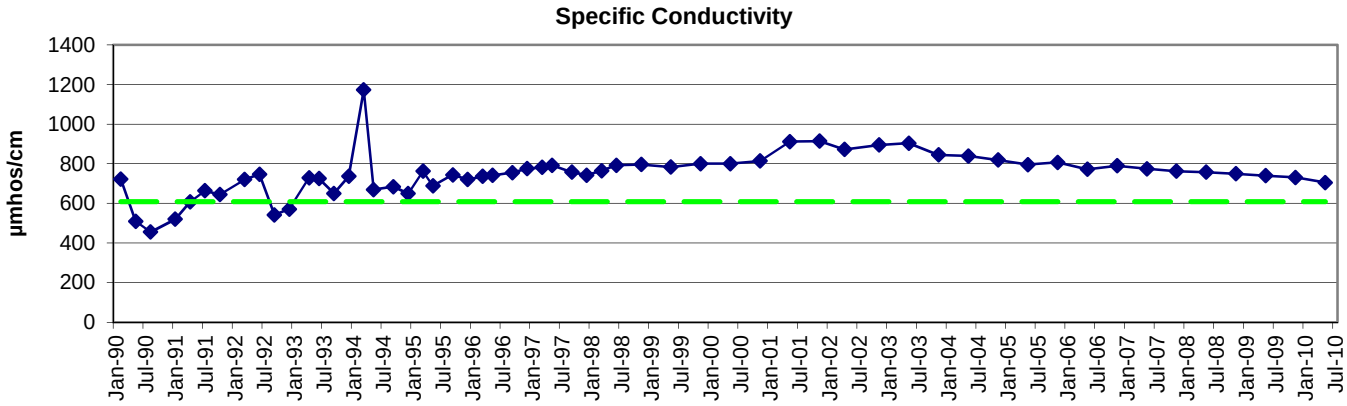


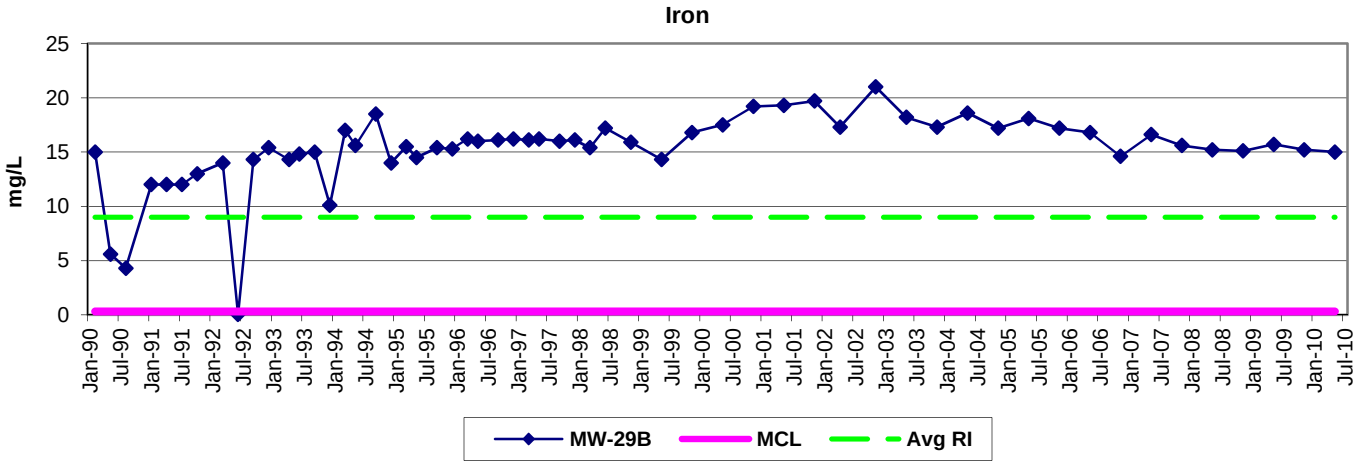
Non-detected values are shown as 1/2 the detection limit.
MCL = Primary of secondary maximum contaminat level standard.
RI = Remedial Investigation

Midway Landfill
Groundwater Quality Parameters Not Included in the ROD

Downgradient Southern Gravel Aquifer Well
MW-29B



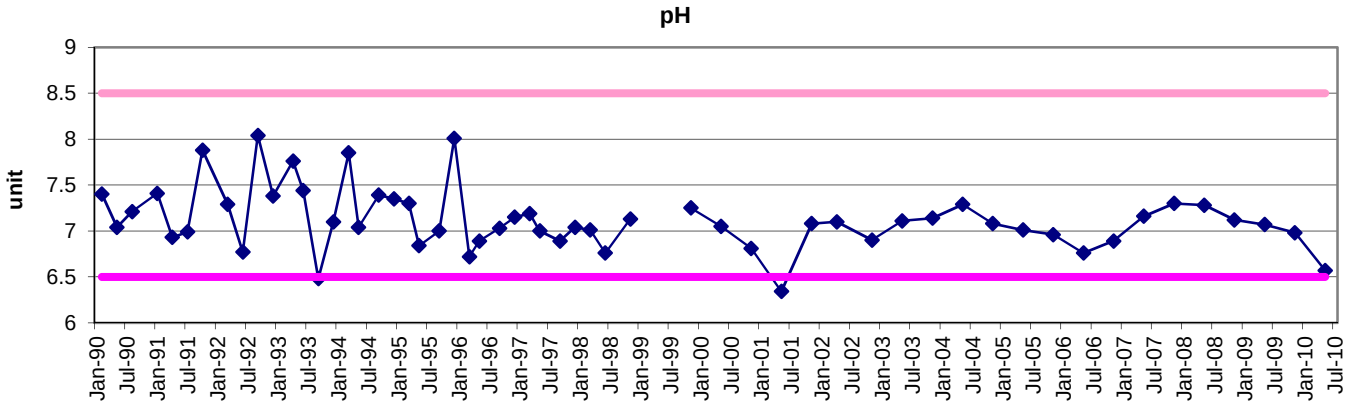


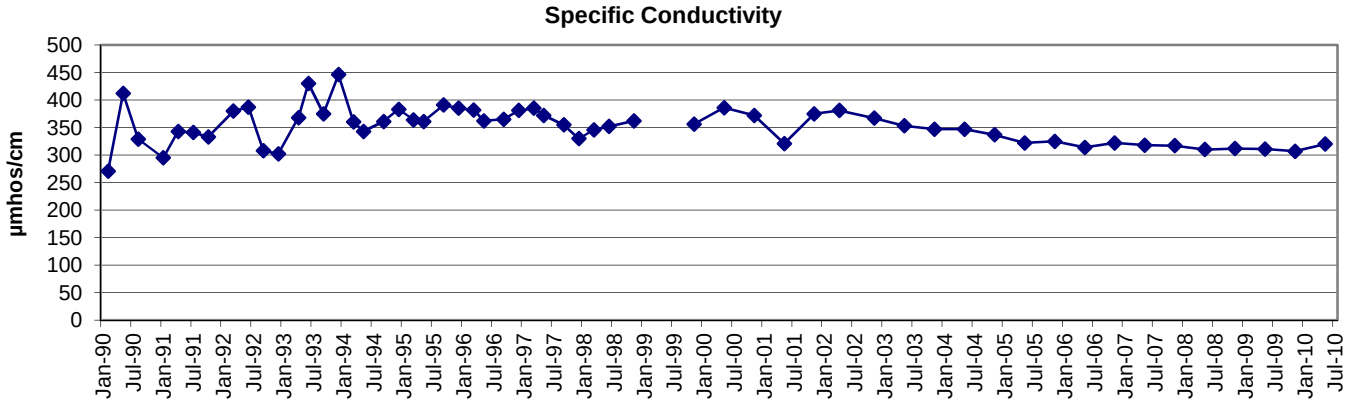


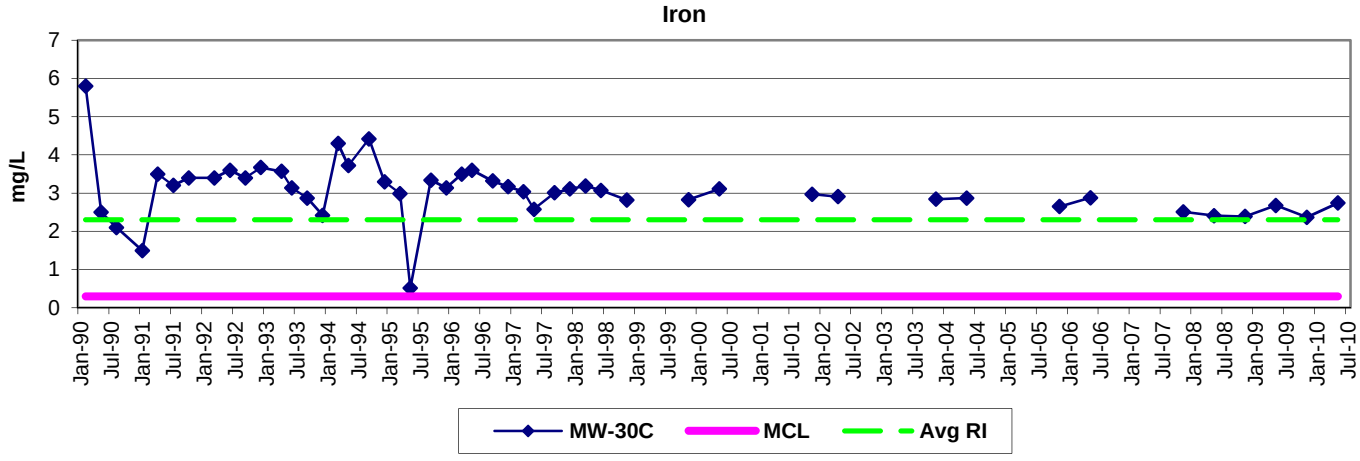
Non-detected values are shown as 1/2 the detection limit.
MCL = Primary of secondary maximum contaminat level standard.
RI = Remedial Investigation

Midway Landfill
Groundwater Quality Parameters Not Included in the ROD

Downgradient Southern Gravel Aquifer Well
MW-30C



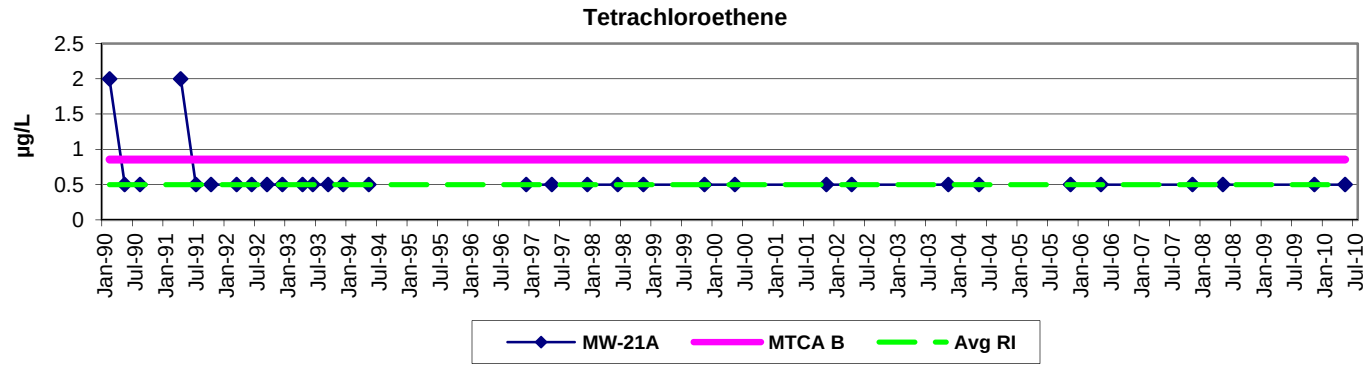


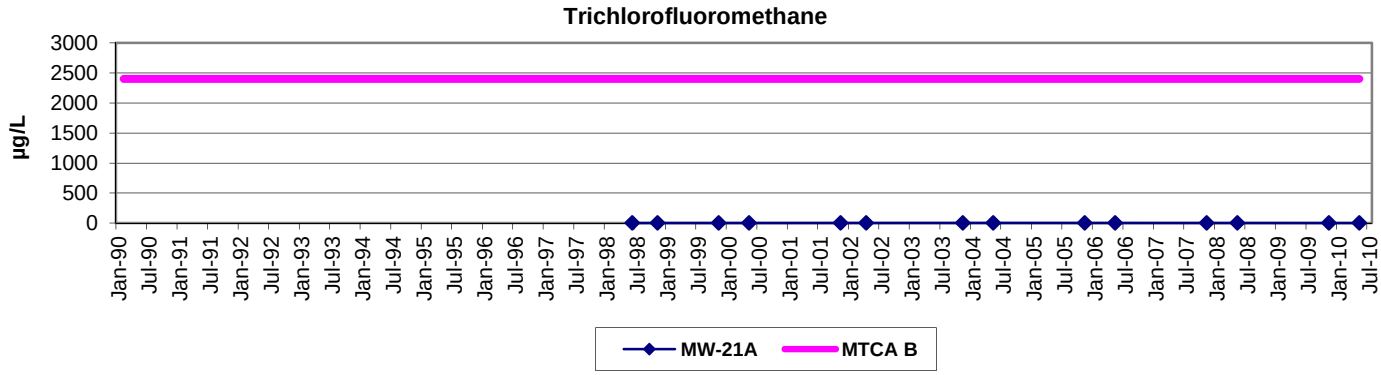


Non-detected values are shown as 1/2 the detection limit.
MCL = Primary of secondary maximum contaminat level standard.
RI = Remedial Investigation

Midway Landfill
Groundwater Quality Parameters Not Included in the ROD

Upgradient Upper Gravel Aquifer Well
MW-21A

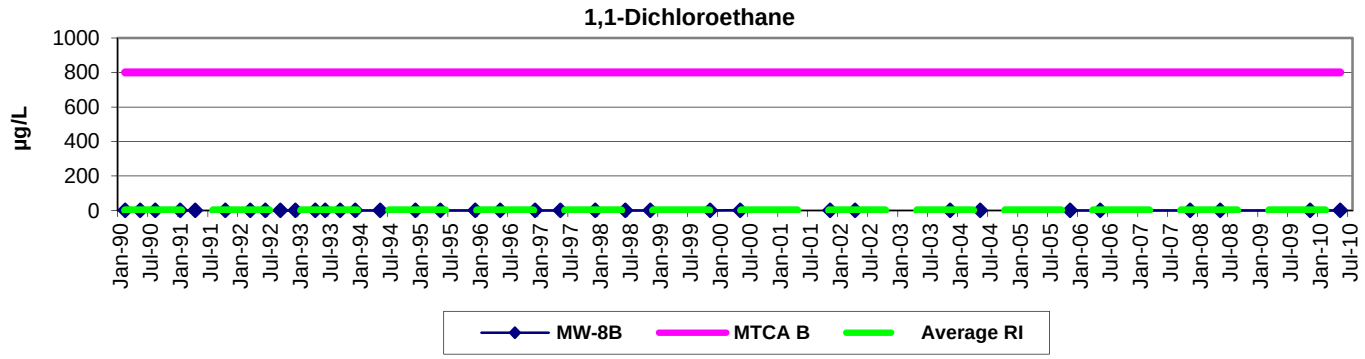




Non-detected values are shown as 1/2 the detection limit.
MTCA B = MTCA B/Model Toxics Control Act (WAC 173-340) Method B cleanup level.
RI = Remedial Investigation

Midway Landfill
Groundwater Quality Parameters Not Included in the ROD

Upgradient Sand Aquifer Well
MW-8B

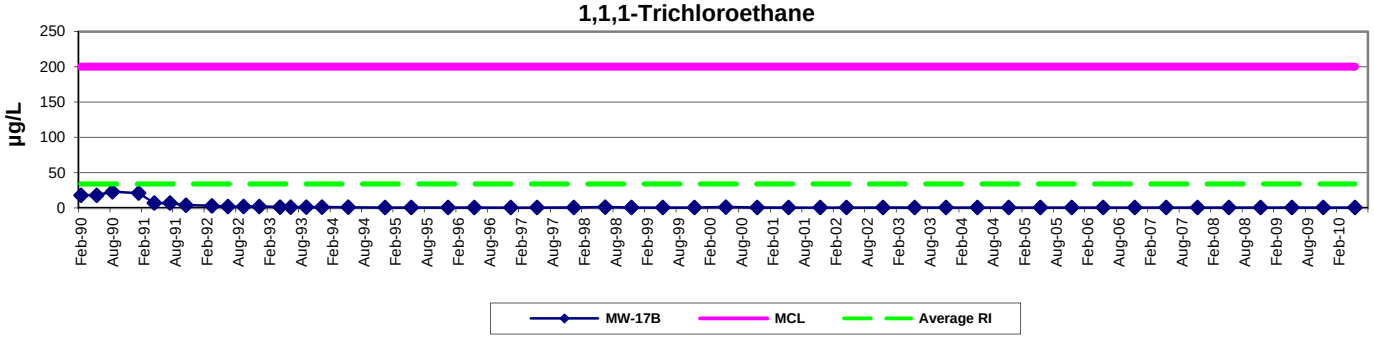


Non-detected values are shown as 1/2 the detection limit.
MTCA B = MTCA B/Model Toxics Control Act (WAC 173-340) Method B cleanup level.
RI = Remedial Investigation

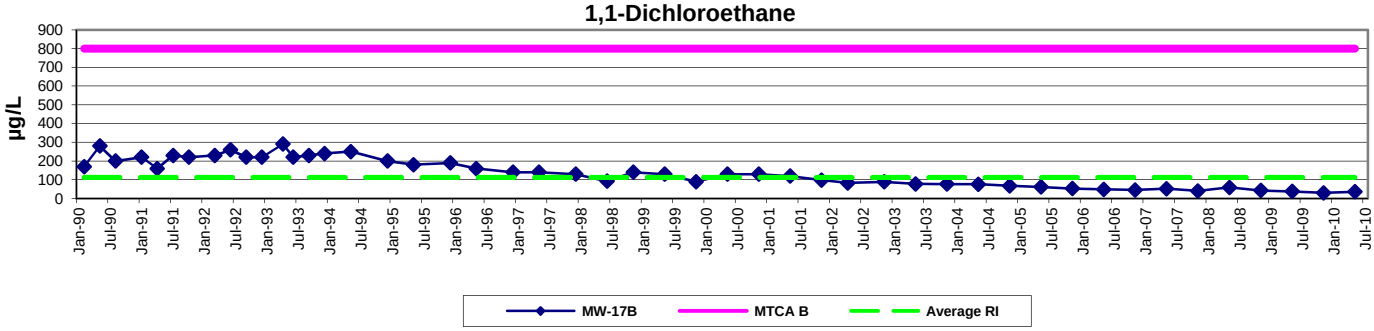
Midway Landfill
Groundwater Quality Parameters Not Included in the ROD

Upgradient Sand Aquifer Well
MW-17B

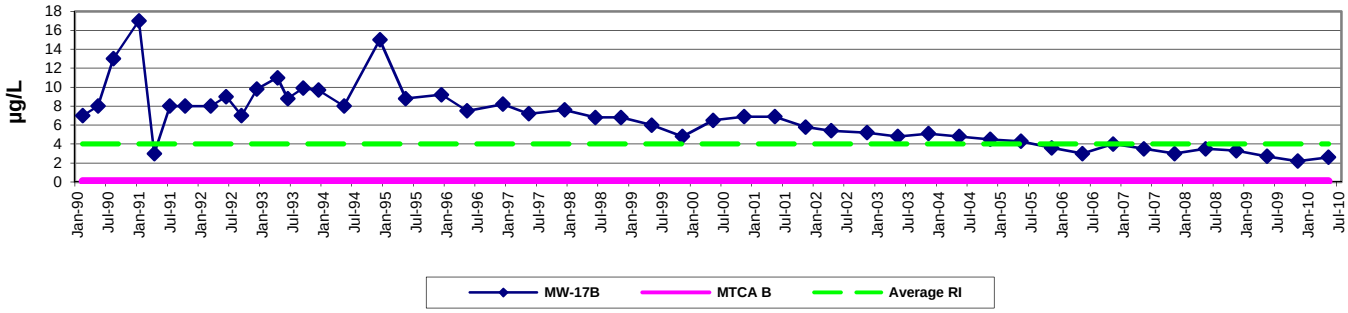
1,1,1-Trichloroethane



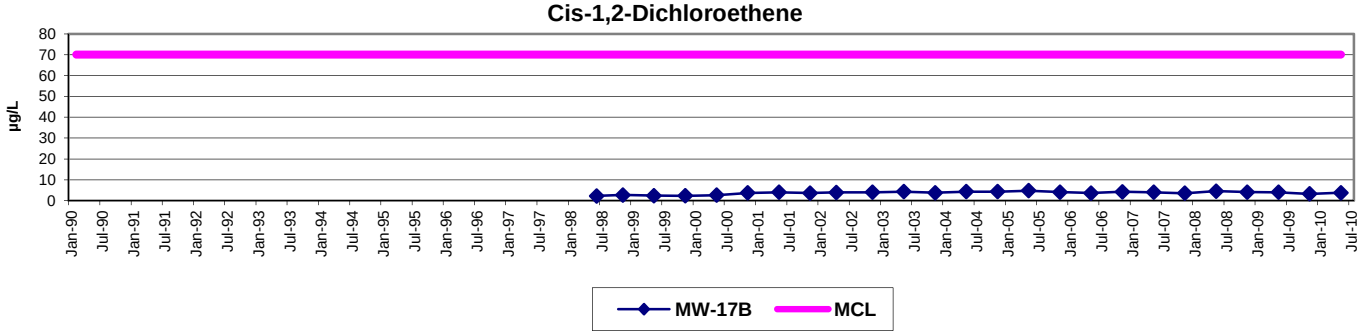
1,1-Dichloroethane



1,1-Dichloroethene



Cis-1,2-Dichloroethene



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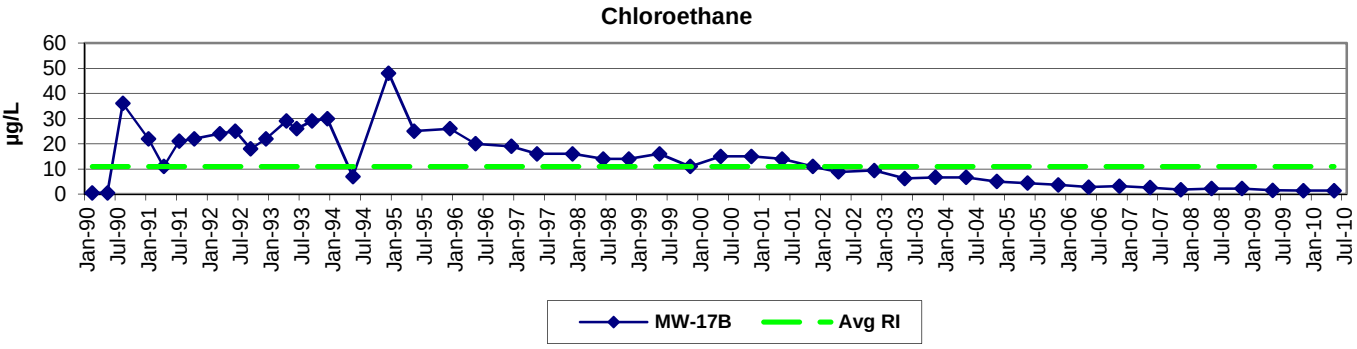
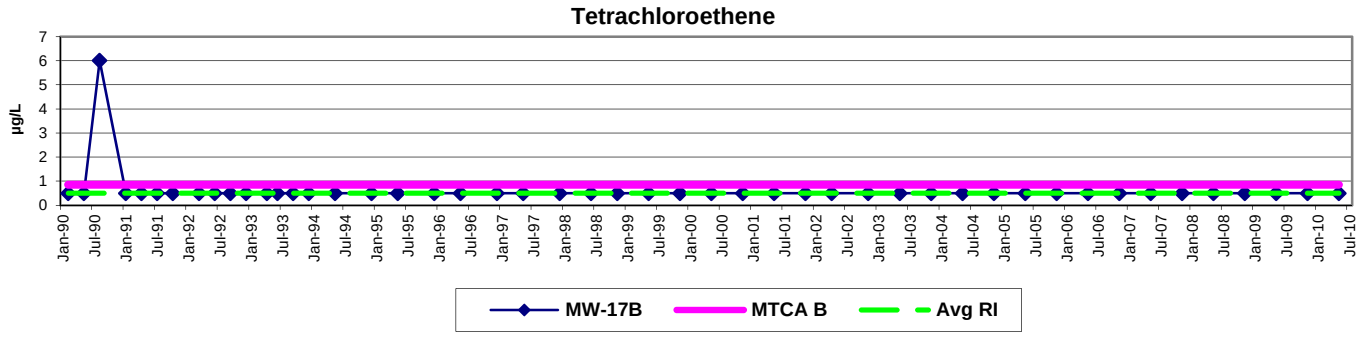
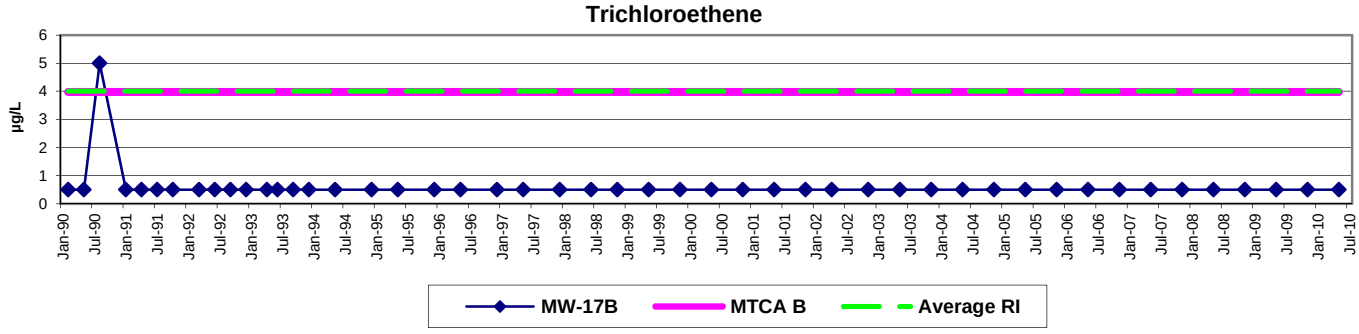
Midway Landfill
Groundwater Quality Parameters Not Included in the ROD

Upgradient Sand Aquifer Well
MW-17B







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MTCA B = MTCA B/Model Toxics Control Act (WAC 173-340) Method B cleanup level.
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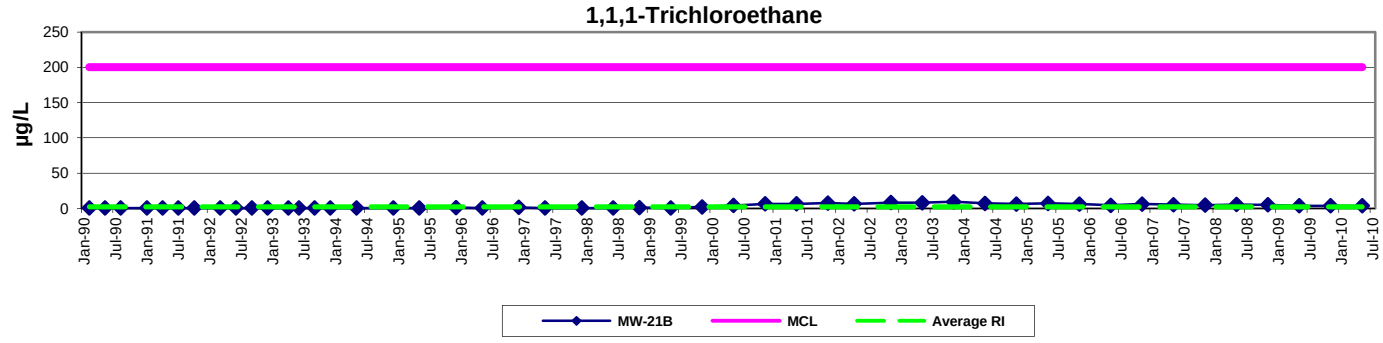
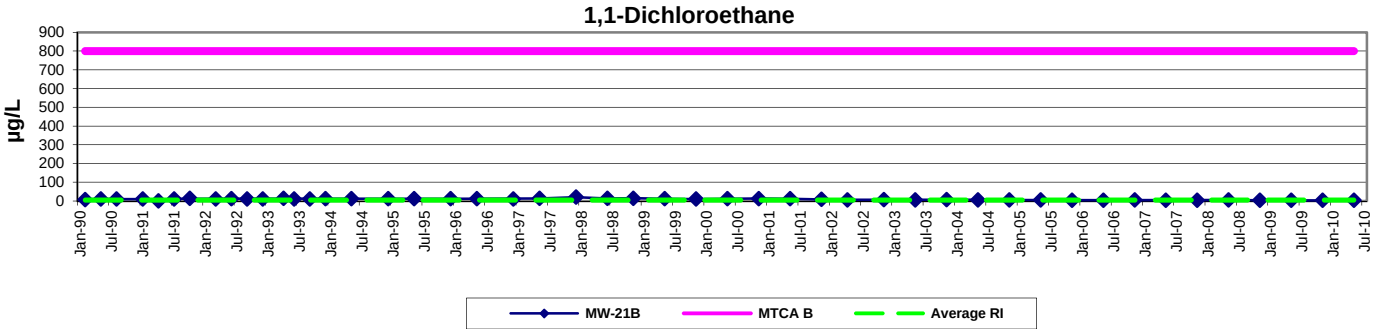
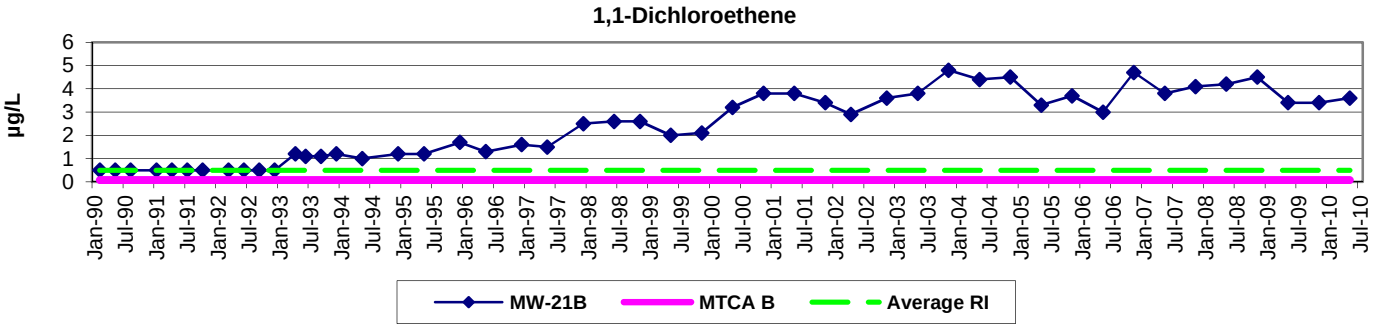
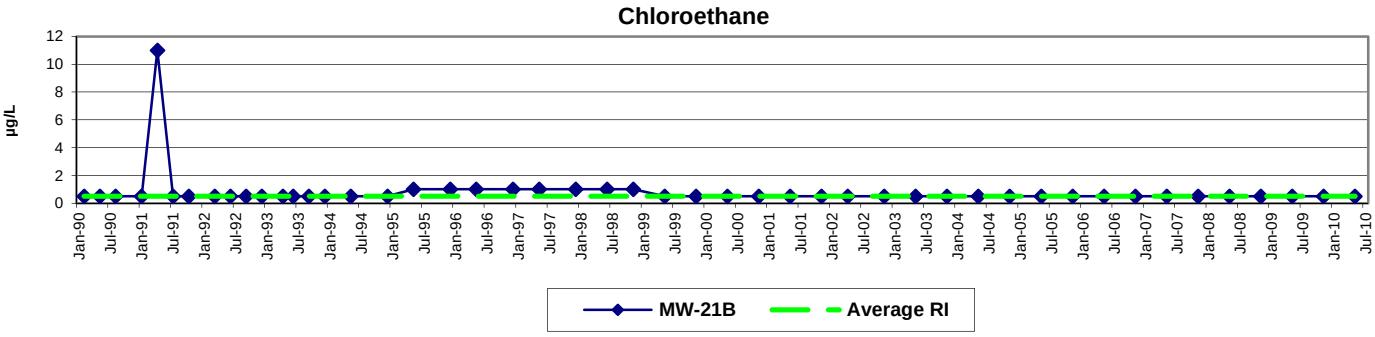
Midway Landfill
Groundwater Quality Parameters Not Included in the ROD

Upgradient Sand Aquifer Well
MW-21B









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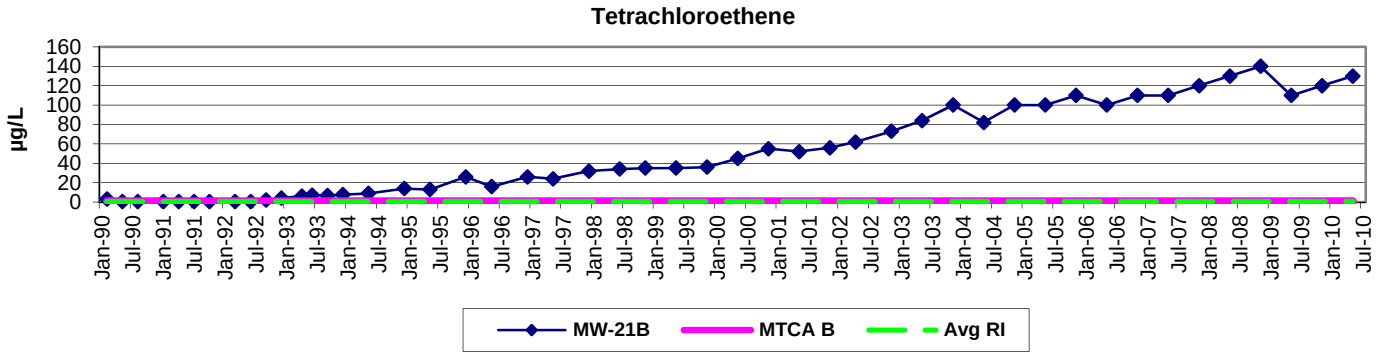
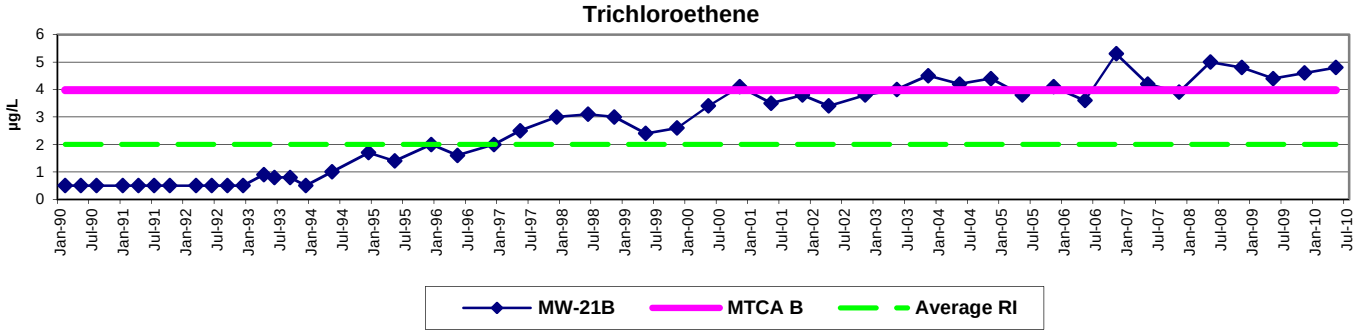
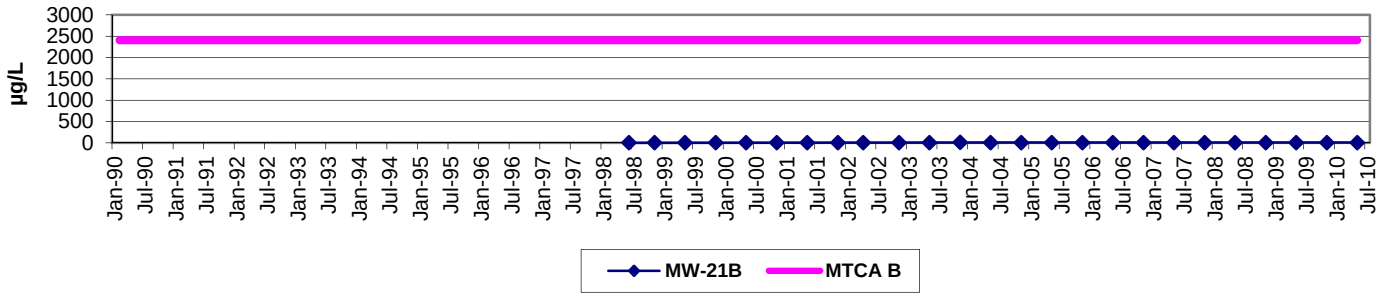
Midway Landfill
Groundwater Quality Parameters Not Included in the ROD

Upgradient Sand Aquifer Well
MW-21B







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MTCA B = MTCA B/Model Toxics Control Act (WAC 173-340) Method B cleanup level.
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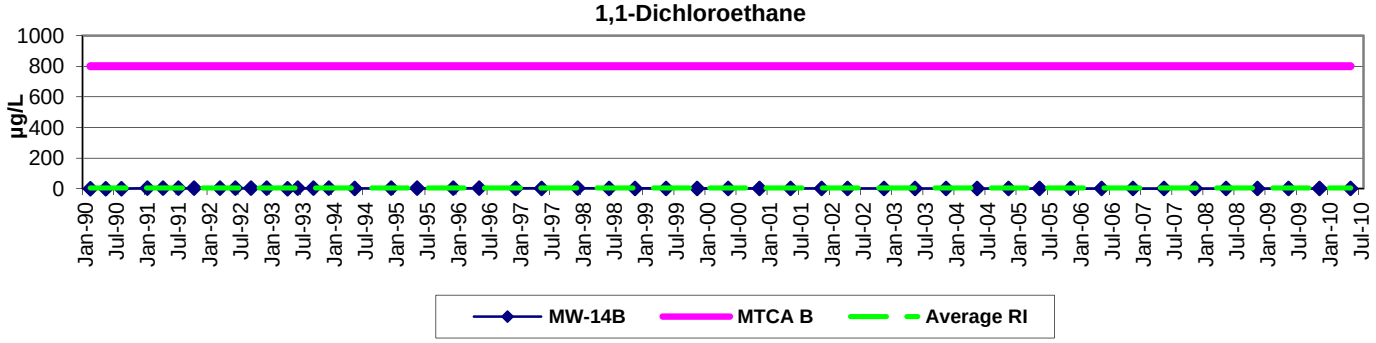
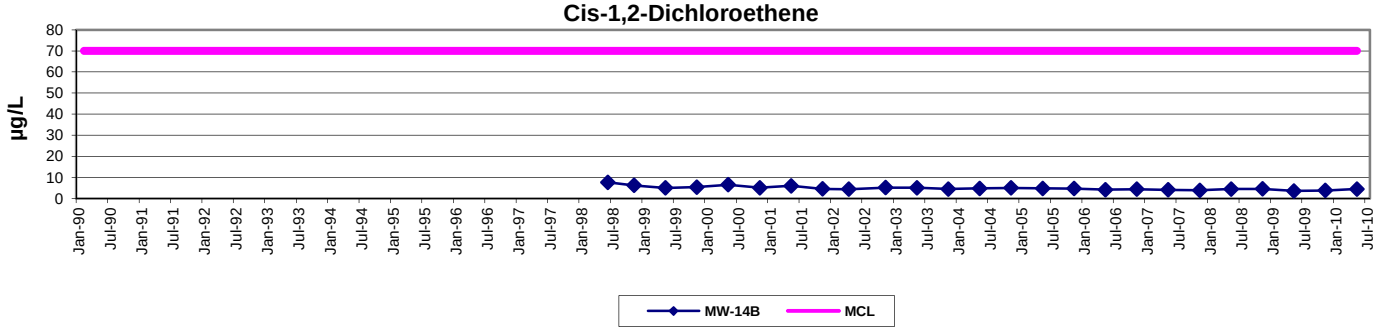
Midway Landfill
Groundwater Quality Parameters Not Included in the ROD

Downgradient Southern Gravel Aquifer Well
MW-14B

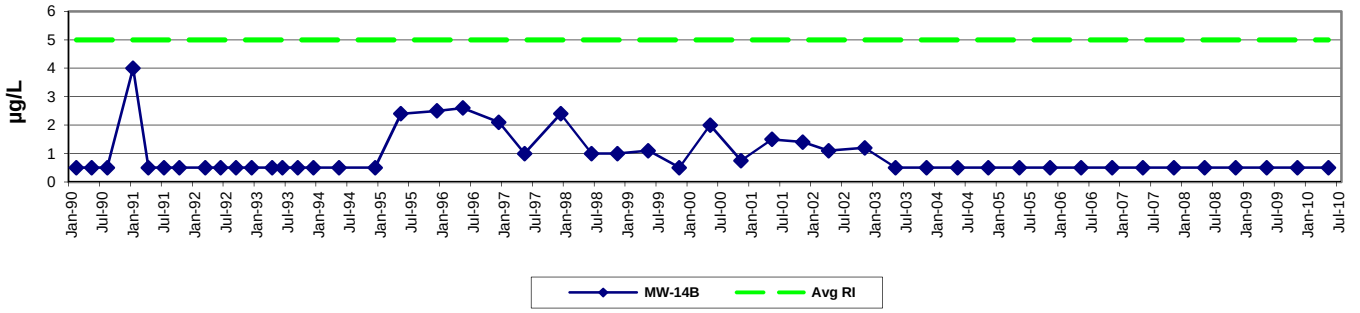
1,1-Dichloroethane



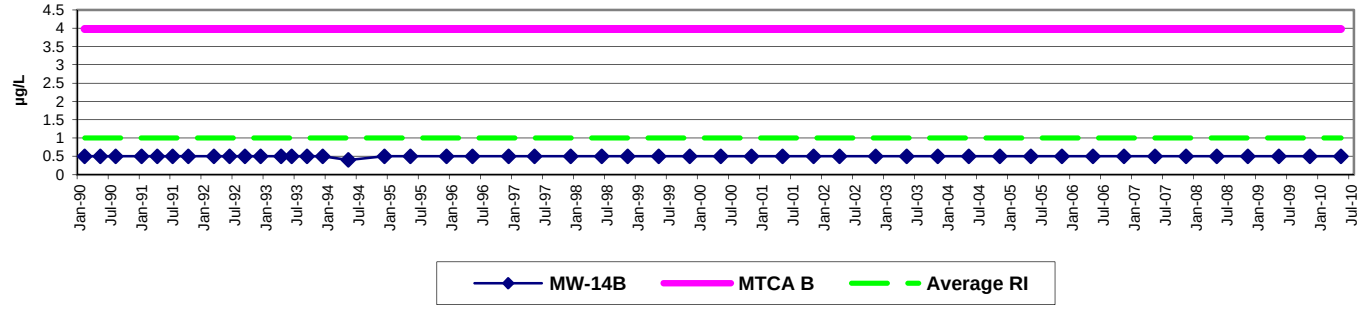
Cis-1,2-Dichloroethene



Chloroethane



Trichloroethene



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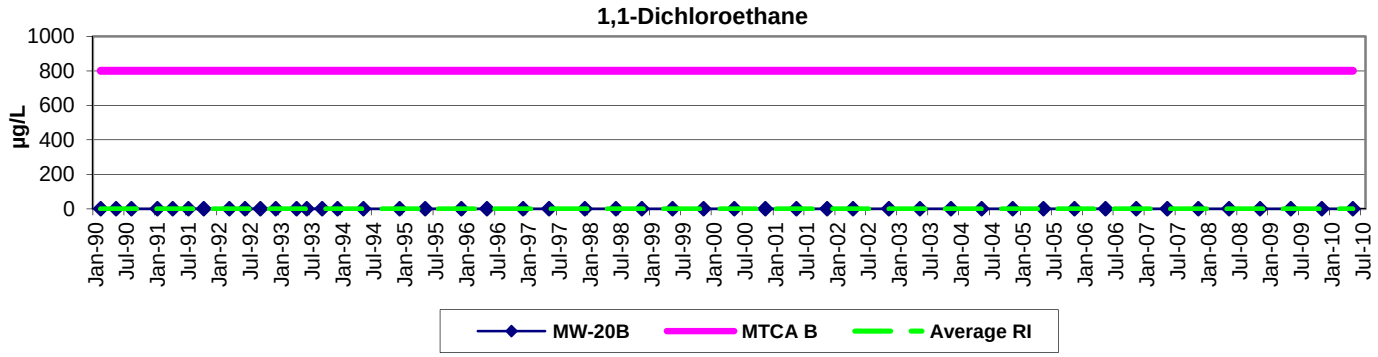
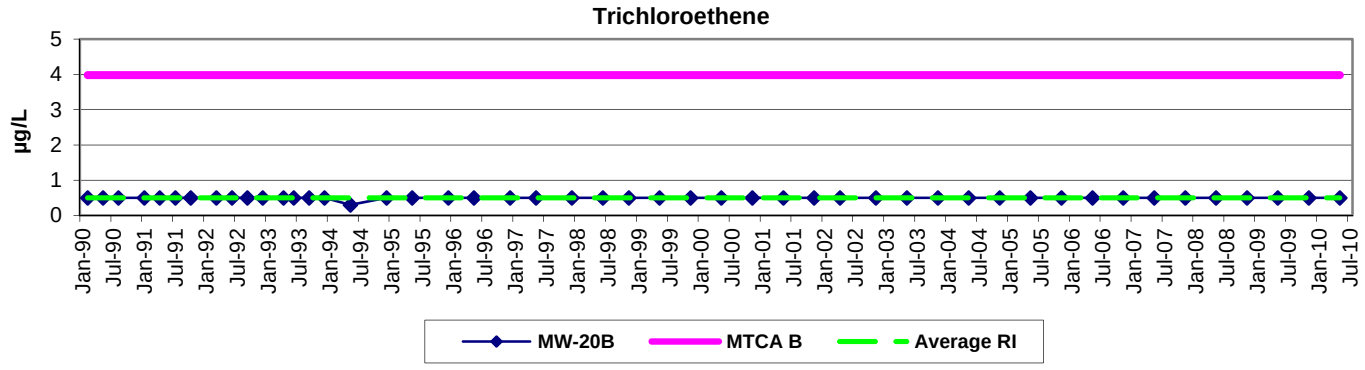
MTCA B = MTCA B/Model Toxics Control Act (WAC 173-340) Method B cleanup level.
RI = Remedial Investigation

Midway Landfill
Groundwater Quality Parameters Not Included in the ROD

Downgradient Southern Gravel Aquifer Well
MW-20B





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MTCA B = MTCA B/Model Toxics Control Act (WAC 173-340) Method B cleanup level.
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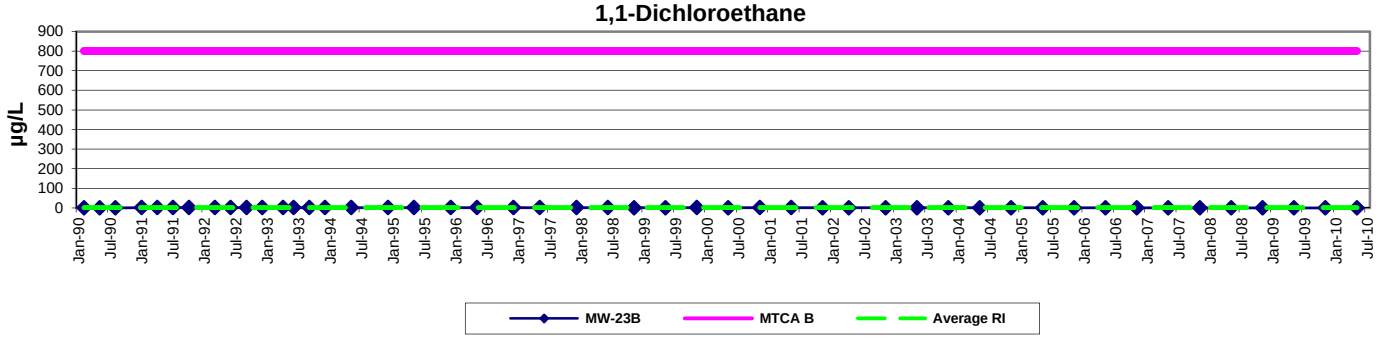
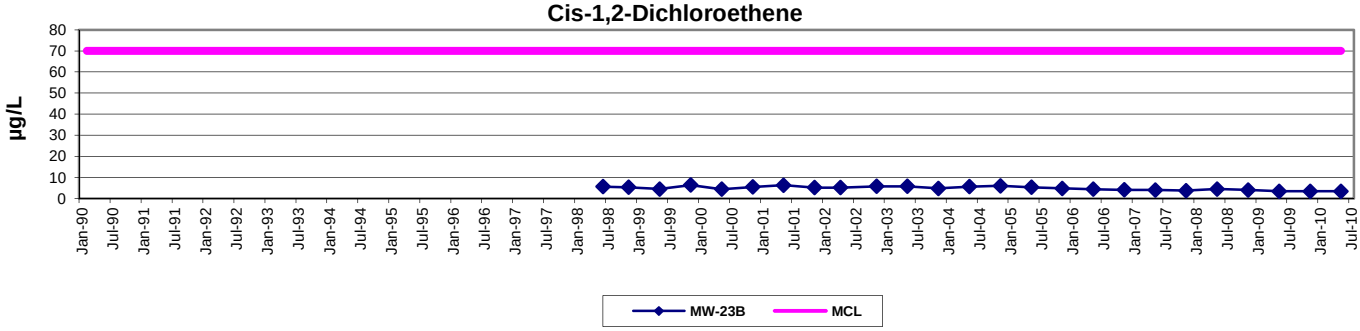
Midway Landfill
Groundwater Quality Parameters Not Included in the ROD

Downgradient Southern Gravel Aquifer Well
MW-23B

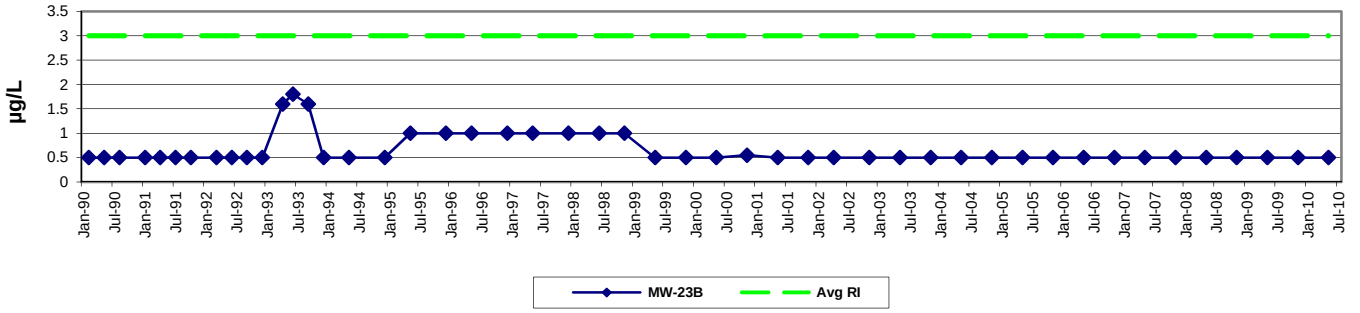
1,1-Dichloroethane



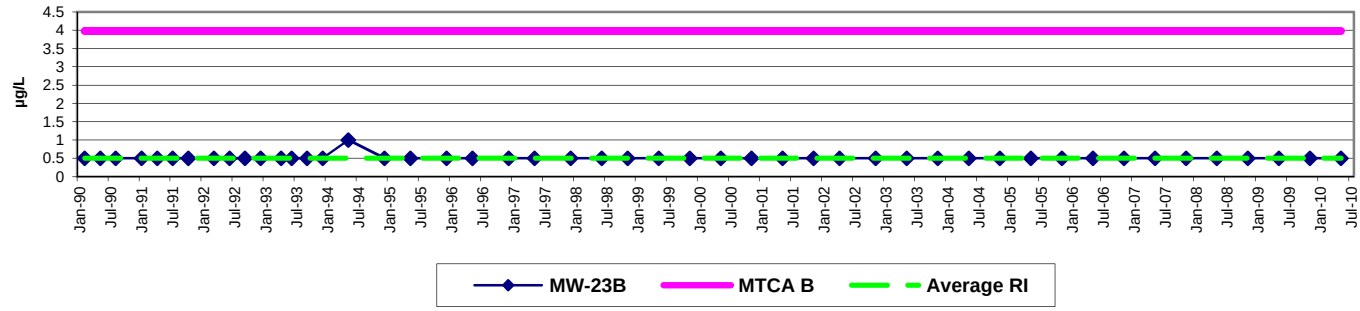
Cis-1,2-Dichloroethene



Chloroethane



Trichloroethene



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MTCA B = MTCA B/Model Toxics Control Act (WAC 173-340) Method B cleanup level.
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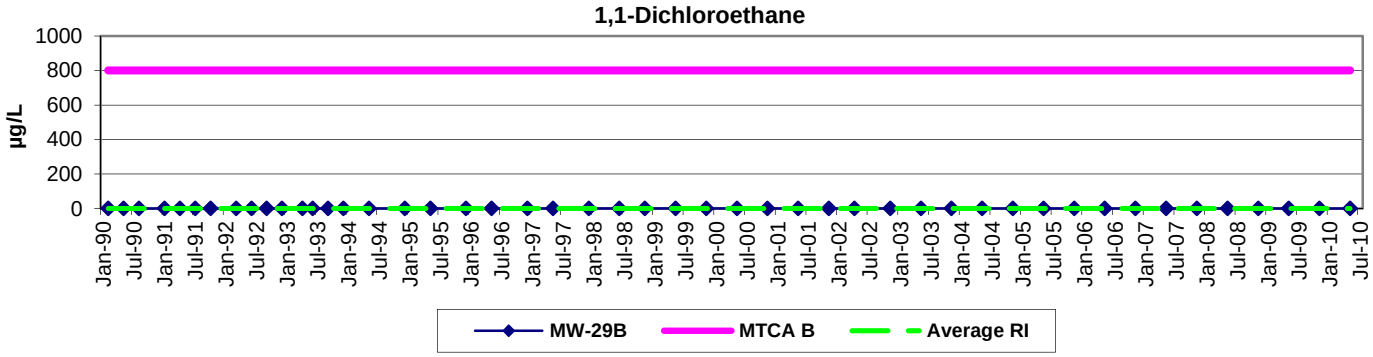
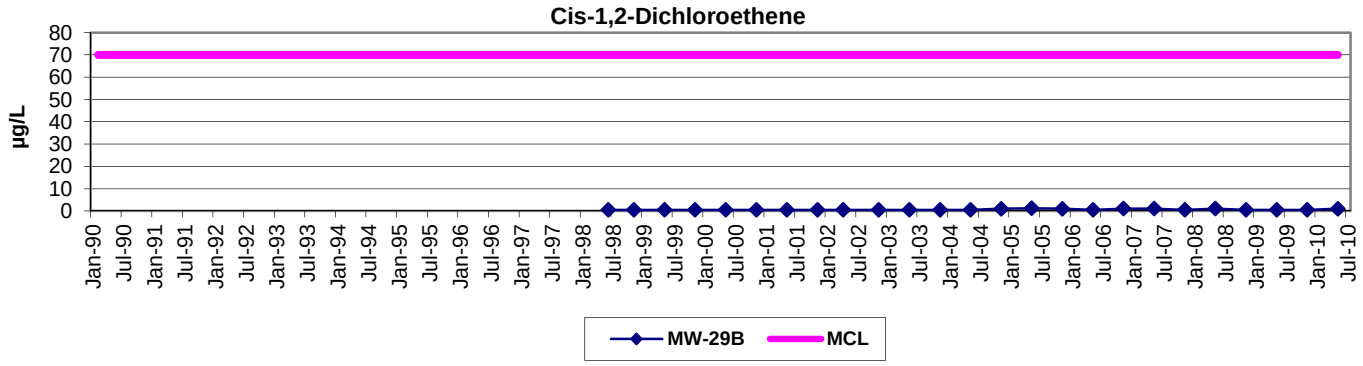
Midway Landfill
Groundwater Quality Parameters Not Included in the ROD

Downgradient Southern Gravel Aquifer Well
MW-29B





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

APPENDIX F

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

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 F-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 F-1 and their locations are shown in Figure F-2. A summary of the contaminants of concern and their reported concentrations in groundwater are presented in Table F-2. A summary of results for additional parameters is presented in Table F-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 F-1 and shown on Figure F-2.

This is an annual notification.

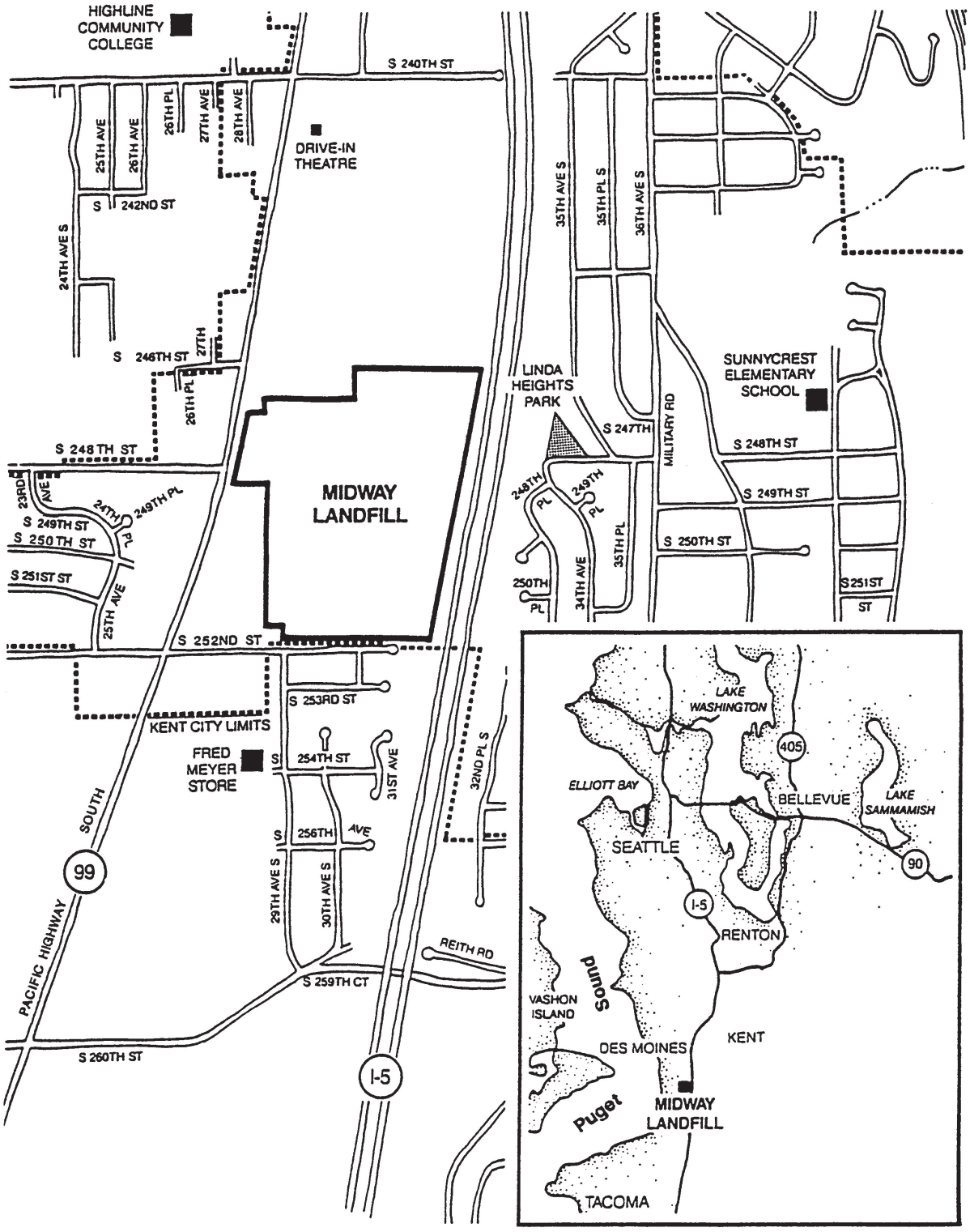
Table F-1. Affected Groundwater Monitoring Wells Downgradient of the Midway Landfill

Monitoring Well	Land Surface Elevation	Elevation of Screened Interval	Aquifer
MW-14B	381.0	79 - 73.5	SGA
MW-20B	373.7	78.7 - 73.7	SGA
MW-23B	425.0	104.7 - 94.7	SGA
MW-29B	428.8	58.9 - 51.9	SGA
MW-30C	407.5	61.8 - 56.8	SGA

Notes:

SGA = Southern Gravel Aquifer

[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.



Parametrix Midway Landfill/555-1550-054/01(01A2) 5/11

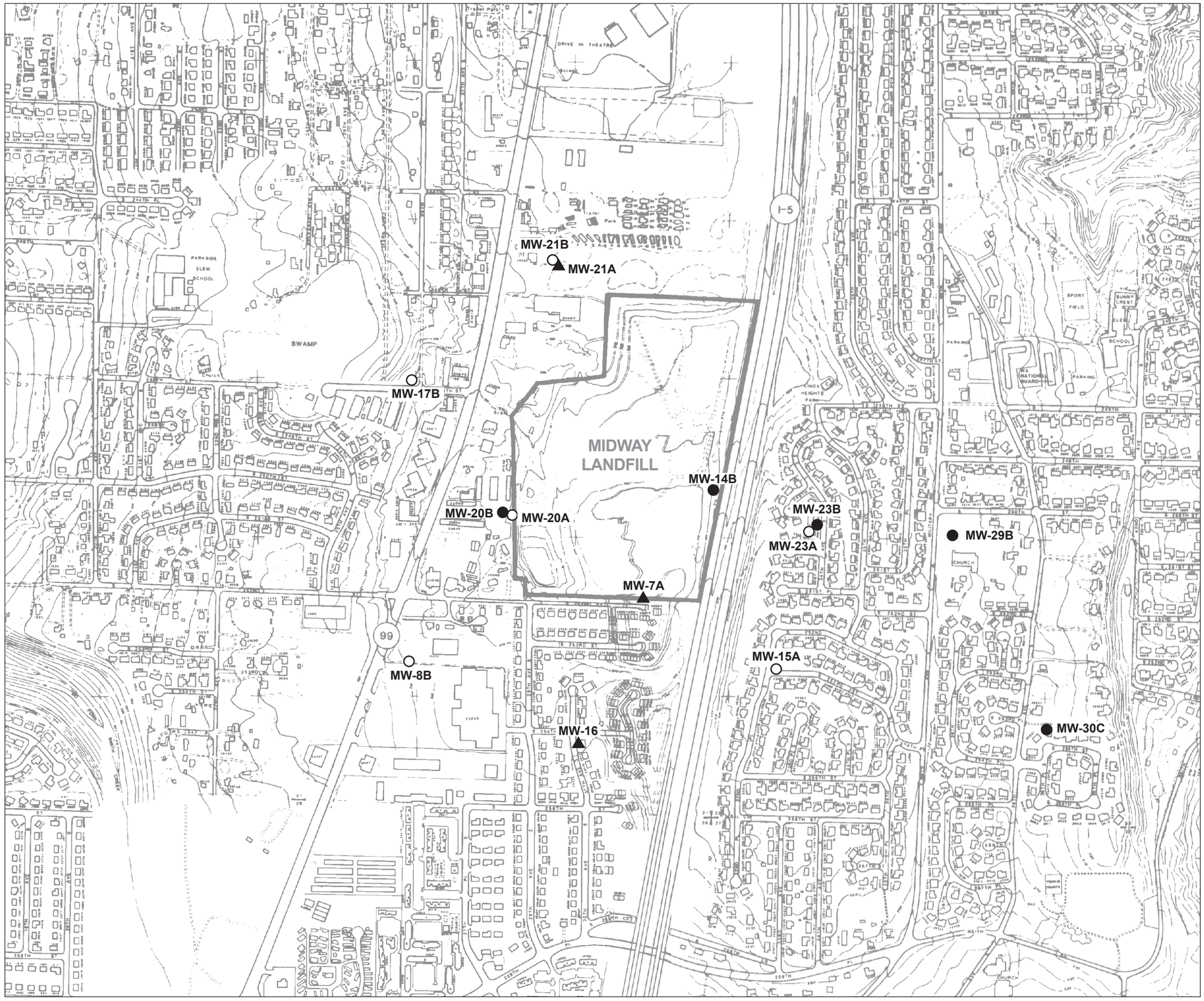
N

0 100

SCALE IN FEET

Figure F-1
Site Location Map
Midway Landfill
Kent, Washington

Figure F-2
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

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

N

0 600

SCALE IN FEET

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

				Upper Gravel Aquifer			Sand Aquifer				Southern Gravel Aquifer				
Analyte	Units	Cleanup Level[a]	Round ID	MW-16 UP	MW-16 DUP UP	MW-21A UP	MW-8B UP	MW-17B UP	MW-21B UP	MW-21B DUP UP	MW-14B DOWN	MW-20B DOWN	MW-23B DOWN	MW-29B DOWN	MW-30C DOWN
Manganese	mg/L	2.2	R-57	0.094	0.094	0.016	0.004	0.053	0.405	0.408	0.961	3.24	0.153	0.98	0.706
1,2-Dichloroethane	µg/L	5	R-57	1 U	1 U	1 U	1 U	4.4	1 U	1 U	1 U	1 U	2.7	4.7	1 U
Vinyl Chloride	µg/L	0.29*	R-57	0.2 U	0.2 U	0.2 U	0.2 U	0.22	0.2 U	0.2 U	0.63	0.27	0.27	0.65	0.2 U

ROD =Record of Decision
R-57 =Round 57, May 2010
a =Cleanup levels established in the Final EPA ROD for the Midway Landfill Site, September 6, 2000.
[ ] =Exceeds cleanup level established in the Final ROD for the Midway Landfill Site, September 6, 2000.
U =Indicates the compound was undetected at the reported concentration.
DUP =Duplicate.
* =The revised cleanup level for vinyl chloride is 0.29 µg/L using the MTCA adjusted cancer risk of 1e-5.
Notes =Up or Down in column title denotes whether the well is located upgradient or downgradient of the landfill's influence.

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

					Upper Gravel Aquifer			Sand Aquifer				Southern Gravel Aquifer				
Compound	**Units**	**MCL[a]**	**MTCA B[b]**	**Round ID**	**MW-16 UP**	**MW-16 DUP UP**	**MW-21A UP**	**MW-8B UP**	**MW-17B UP**	**MW-21B UP**	**MW-21B DUP UP**	**MW-14B DOWN**	**MW-20B DOWN**	**MW-23B DOWN**	**MW-29B DOWN**	**MW-30C DOWN**
Field Parameters																
pH	s.u.	6.5-8.5		R-57	7.4	- -	6.51	6.45	6.34	6.79	- -	6.46	6.73	6.23	6.23	6.57
Specific Conductivity	µmhos/cm			R-57	280	- -	331	155	335	681	- -	703	1303	569	705	320
Temperature	C			R-57	11.4	- -	11.8	11.0	11.5	11.1	- -	13.1	12.1	11.1	10.0	9.6
Conventional Parameters																
Chloride	mg/L	250**		R-57	8.4	8.3	6.6	5.3	9.6	15	15.2	18	44.7	14.8	32.9	12.9
COD	mg/L			R-57	5 U	5 U	5.36 J	5 U	5.68 J	11.8 J	5 U	5 U	17	5.68 J	10.4	6 J
Sulfate	mg/L	250**		R-57	28.4	27.9	39.1	17.9	23.7	133	133	30.9	8.9	33	23	12.9
TOC	mg/L			R-57	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U	2.3	6.47	1.9	2.37	1.5 U
Dissolved Metals																
Iron	mg/L	0.3**		R-57	0.25	0.25	0.05 U	0.05 U	0.05	0.05 U	0.05 U	11.2	9.48	8.67	15	2.74
Volatile Organics																
1,1,1-Trichloroethane	µg/L	200*	7200	R-57	1 U	1 U	1 U	1 U	1 U	3.8	3.9	1 U	1 U	1 U	1 U	1 U
1,1-Dichloroethane	µg/L		800	R-57	1 U	1 U	1 U	1 U	36	3.6	3.6	1.5	1 U	1 U	1 U	1 U
1,1-Dichloroethene	µg/L	7*	0.0729	R-57	1 U	1 U	1 U	1 U	2.6	3.6	3.6	1 U	1 U	1 U	1 U	1 U
cis-1,2-Dichloroethene	µg/L	70*	80	R-57	1 U	1 U	1 U	1 U	3.8	1 U	1 U	4.5	1 U	3.4	1	1 U
Chloroethane	µg/L			R-57	1 U	1 U	1 U	1 U	1.4	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Tetrachloroethene	µg/L	5*	0.858	R-57	1 U	1 U	1 U	1 U	1 U	130	130	1 U	1 U	1 U	1 U	1 U
Trichloroethene	µg/L	5*	3.98	R-57	1 U	1 U	1 U	1 U	1 U	4.8	5.1	1 U	1 U	1 U	1 U	1 U
Trichlorofluoromethane	µg/L		2400	R-57	1 U	1 U	2.5	1 U	1 U	4.4	4.3	1 U	1 U	1 U	1 U	1 U
Semi-Volatile Organics																
1,4-Dioxane***	µg/L		7.95	R-57	- -	- -	- -	- -	2.4	5.3	5.8	17	- -	- -	- -	- -

R-57 =Round 57, May 2010

=Exceeds Federal MCL 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).

*** =Testing for 1,4-Dioxane in selected groundwater samples was recommended by Ecology and EPA.

[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

U: Indicated the compound was undetected at the reported concentration

J: Indicated the compound was detected at an estimated concentration

- - =Not ananlyzed