Third Five-Year Review Report

For

Coakley Landfill Superfund Site

North Hampton and Greenland
Rockingham County, New Hampshire

September, 2011

PREPARED BY:

With assistance from

New Hampshire Department of Environmental Services

Approved by: _____ Date: 9/22/11
FOR JTO

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ABBREVIATIONS AND ACRONYMS

ARARs	Applicable or Relevant and Appropriate Requirements
CD	Consent Decree
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CLG	Coakley Landfill Group
COC	Contaminants of Concern
ESD	Explanation of Significant Difference
GMP	Groundwater Management Permit
GMZ	Groundwater Management Zone
IC	Institutional Controls
ICL	Interim Cleanup Levels
ICP	Institutional Control Plan
LFG	Landfill Gas
MCL	Maximum Contaminant Level
NCP	National Contingency Plan
NHDES	New Hampshire Department of Environmental Services
NPL	National Priorities List
O&M	Operation and Maintenance
OMP	Operation and Maintenance Plan
OU	Operable Unit
PAH	Polycyclic Aromatic Hydrocarbons
PRPs	Potential Responsible Parties
RA	Remedial Action
RD	Remedial Design
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
TBCs	To Be Considered Requirements
ug/l	micrograms per liter (i.e., parts per billion)
EPA	United States Environmental Protection Agency
VOC	Volatile Organic Compounds

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Executive Summary

The United States Environmental Protection Agency, Region 1 (EPA) has conducted a Five-Year Review of the Remedial Actions (RAs) implemented at the Coakley Landfill Superfund Site in North Hampton and Greenland, New Hampshire in compliance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 42 U.S.C. Section 9601, et seq. EPA conducted this review between December 2010 and September 2011 with technical assistance from the New Hampshire Department of Environmental Services (NHDES).

This is the third Five-Year Review Report for the Site. The triggering action for this review was the date of the second Five-Year Review, signed September 21, 2006. Subsequent reviews are conducted at least every five years. The purpose of the Five-Year Review is to evaluate whether response actions and original performance standards remain protective of human health and the environment.

The response actions for the Site are documented in two Records of Decision (RODs) and five Explanations of Significant Differences (ESDs). The Site is divided into two separate operable units (OUs). The first OU (source control) provided for the remediation of the source of contamination at the Coakley Landfill Site, including the contaminated groundwater beneath and in the vicinity of the landfill. Source control included consolidation onto the landfill of wastes and sediments identified beyond the edge of the landfill and covering the landfill with an impermeable cap. The remedy for the second OU (management of migration) addresses groundwater contamination which has migrated from the landfill. The response action includes using institutional controls (ICs) to prevent use of contaminated groundwater; utilizing natural attenuation to remediate the contaminated groundwater plume; and groundwater monitoring. The Coakley Landfill Site achieved construction completion status with the signing of the Preliminary Close-Out Report on September 29, 1999.

Overall, the remedy at the Coakley Landfill Superfund Site currently protects human health and the environment in the short-term. Long-term protectiveness has been achieved already in OU-1 through the completion and continued maintenance of the landfill cap, long-term monitoring, and use restrictions. Long-term protectiveness will be achieved in OU-2 when interim groundwater cleanup levels for all contaminants of concern are met and restrictions on the use of groundwater within OU-2 can be removed. Monitoring of the Site will continue until cleanup levels for all contaminants of concern are met.

Five-Year Review Summary Form

SITE IDENTIFICATION		
Site name: Coakley Landfill		
EPA ID: NHD064424153		
Region: 1	**State:** NH	**City/County:** North Hampton and Greenland, Rockingham County

SITE STATUS	
NPL status: Final	
Remediation status Complete	
Multiple OUs? Yes	**Construction completion date:** 09/29/1999
Has site been put into reuse? No	

REVIEW STATUS	
Lead agency: Potential Responsible Party (PRP) with U.S. Environmental Protection Agency (EPA) and State oversight	
Author name: Gerardo Millán-Ramos	
Author title: Remedial Project Manager	**Author affiliation:** EPA Region 1
Review period: 12/2010 to 09/2011	
Date(s) of site inspection: 04/27/2011	
Type of review: X Post-SARA Pre-SARA NPL-Removal only Non-NPL Remedial Action Site NPL State/Tribe-lead Regional Discretion	
Review number: Third	
Triggering action: Completion of Second Five-Year Review	
Triggering action date: 09/21/2006	
Due date ***(five years after triggering action date)***: 09/21/2011	

Five-Year Review Summary Form cont'd.

Issues:

1. *Even though no one within the Groundwater Management Zone (GMZ) and its immediate vicinity is exposed to the groundwater, 1,4-Dioxane has been detected at levels exceeding the New Hampshire Ambient Groundwater Quality Standards (NHAGQS) at most monitoring wells within OU-1 and several within OU-2. Additionally, manganese has been detected outside the current GMZ (wells GZ-123 and FPC-2A/B outside the southern edge of the GMZ) above the EPA Health Advisory, and both manganese and arsenic concentrations in the FPC-6 well cluster (inside the eastern edge of the GMZ) suggest that concentrations may exceed the Interim Compliance Levels (ICLs) beyond the GMZ boundary.*

2. *Damage to the fence must be repaired; unlocked monitoring wells and gates must be locked and properly labeled; excessive vegetation in some swales and near the fence must be removed; also construction equipment and materials that are too close to the fence and monitoring wells, must be relocated.*

3. *There is a possible need for groundwater extraction restrictions for properties on the eastern side of the landfill. Groundwater extraction in this area has the potential to alter the flow of groundwater and increase the extent of the plume, thus adding complexities and time to the ongoing remedy.*

4. *Changes to the Institutional Control Plan (ICP) were made at the time the GMZ was being discussed and implemented. However, these changes have not been incorporated into the final ICP that was approved by EPA.*

5. *Groundwater Management Permit will expire on June 18, 2013. Site contaminants within the GMZ continue to exceed state and federal cleanup levels. Exceedences outside GMZ suggest that concentrations may also exceed ICLs beyond the GMZ boundary.*

Recommendations and Follow up actions:

1. *a) Sample monitoring wells at the outermost edge of the GMZ and the two residential wells for 1,4 –Dioxane for the next two rounds.*
   b) Perform additional analysis to determine whether the site contaminants are moving beyond the edge of the GMZ and whether the current GMZ needs to be expanded and Institutional Controls (ICs) need to be established on additional properties and evaluate the need for further response action.
   c) *Prepare an Explanation of Significant Differences (ESD) to add 1,4-Dioxane as a COC with an ICL.*

2. *Perform the necessary repairs to the fence, and lock / properly label all monitoring wells that were lacking these features at the time of the inspection. Also remove excessive vegetation and relocate the construction equipment and materials to a safe distance from the fence. Coordinate and document this activity with the regulatory agencies and the Coakley Landfill Group (CLG).*

3. *Evaluate the need for further ICs in the area east of the landfill to prevent altering of groundwater flow as a means of containing the contaminated groundwater plume.*

4. *Update the Final ICP to incorporate changes that were made during the planning and implementation of the GMZ.*

5. *Renew GMP for GMZ and potentially expand boundary if additional tests show site contaminants migrating beyond the current GMZ boundary.*

Protectiveness Statement(s):

OU-1

The remedy at Operable Unit 1 currently protects human health and the environment, both in the short and long term. All human health threats at the Site have been addressed through stabilization and capping of the landfill and the landfill cap is functioning as intended. Installation of fencing and warning signs and deed restrictions are preventing human exposures at the capped landfill. Toxicity tests that were applied to a "worst case scenario" in the sediment samples, revealed no significant ecological impact, and EPA concluded that it is likely there are no significant ecological impacts in surface water and sediment at the Site. In order to ensure that the currently non-toxic concentrations are not increasing significantly, a reduced surface water and sediment monitoring effort will remain in place. Also, the landfill gas monitoring program will remain in place.

OU-2

The remedy at OU-2 currently protects human health and the environment in the short-term because on-site residents are not exposed to the groundwater, as water utility service has been provided, and there is no evidence of such exposure for off-site residents. Also, a GMZ has been established via a NHDES GMP, and ICs have been established for all properties within the GMZ. Groundwater monitoring to determine compliance with the groundwater monitoring standards for the landfill, will continue to be conducted as a component of OU-2. Long-term protectiveness will be achieved when interim groundwater cleanup levels for all contaminants of concern are met.

Site-Wide

Overall, the remedy at the Coakley Landfill Superfund Site currently protects human health and the environment in the short-term. Long-term protectiveness has been achieved already in OU-1 based on the maintenance of the landfill cap, long-term monitoring, and use restrictions. Long-term protectiveness will be achieved in OU-2 when interim groundwater cleanup levels for all contaminants of concern are met and restrictions on the use of groundwater within OU-2 can be removed. Monitoring of the Site will continue until cleanup levels for the contaminants of concern are met.

1.0 INTRODUCTION

The purpose of a five-year review is to determine whether a remedy at a Superfund Site is protective of human health and the environment. The methods, findings and conclusions of reviews are documented in Five-Year Review Reports. In addition, Five-Year Review Reports identify issues found during the review, if any, and identify recommendations to address them.

The Agency has prepared this Five-Year Review Report pursuant to CERCLA and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 40 C.F.R. Part 300. CERCLA Section 121(c) as amended states:

> *If the President selects a remedial action that results in any hazardous substances, pollutants, or contaminants remaining at the site, the President shall review such remedial action no less often than each five years after the initiation of such remedial action to assure that human health and the environment are being protected by the remedial action being implemented. In addition, if upon such review it is the judgment of the President that action is appropriate at such site in accordance with section [104] or [106], the President shall take or require such action. The President shall report to the Congress a list of facilities for which such review is required, the results of all such review, and any actions taken as a result of such reviews.*

The Agency interpreted this requirement further in the NCP; 40 CFR Section 300.430(f)(4)(ii) states:

> *If a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure, the lead agency shall review such action no less often than every five years after initiation of the remedial action.*

EPA has conducted this five-year review of the selected remedy at the Coakley Landfill Superfund Site (Site) in Greenland and North Hampton, New Hampshire. The review was conducted from December 2010 through September 2011, with assistance from the New Hampshire Department of Environmental Services (NHDES). This report documents the results of the review.

This is the third five-year review for the Site, which is required due to the fact that hazardous substances, pollutants, or contaminants remain at the Site above levels that allow for unlimited use and unrestricted exposure. The triggering action for this statutory review is the date of the second Five-Year Review Report signed on September 21, 2006.

2.0 SITE CHRONOLOGY

Table 1 lists the chronology of events for the Coakley Landfill Superfund Site.

Table 1: Chronology of Site Events

Date	Event
1972	Landfill operations begin
1979	Initial discovery of the problem
1983-1986	Water main extension completed near the site by the towns of North Hampton and Rye Water Districts
July, 1985	Landfill operations cease
June 10, 1986	Final listing on the National Priorities List (NPL)
March 2, 1990	Operable Unit 1(OU-1) Remedial Investigation/Feasibility Study (RI/FS) complete
June 28, 1990	OU-1 Record of Decision (ROD) signature
March 22, 1991	OU-1 Explanation of Significant Differences (ESD) addressing landfill cap design
May 23, 1994	Operable Unit 2 (OU-2) RI/FS complete
September 30, 1994	OU-2 ROD signature
May 17, 1996	OU-1 ESD addressing landfill gas system design
September 24, 1996	OU-1 construction start
September 29, 1999	OU-1 ESD addressing leachate collection and treatment
September 29, 1999	Construction completion
September 25, 2001	First five-year review report

September 21, 2006	Second Five Year Review Report
September 28, 2007	ESD for OU-1 and OU-2 updating ARARs to include revised and additional standards
June 19, 2008	Groundwater Management Zone (GMZ) established and all Institutional Controls (ICs) in place
July 1st, 2009	ESD for OU-2 clarifying the revision of the Arsenic Maximum Contaminant Level (MCL)
July 29, 2009	Addendum to the Second Five Year Review Report
May 10, 2010	Approval of an updated Project Operations Plan for OU-2

3.0 BACKGROUND

3.1 Physical Characteristics

The Coakley Landfill Superfund Site (Site) includes approximately 92 acres located within the towns of Greenland and North Hampton, Rockingham County, New Hampshire. The actual landfill covers approximately 27 acres. The Site is located about 400 to 800 feet west of Lafayette Road (U.S. Route 1), directly south of Breakfast Hill Road, and about 2.5 miles northeast of the center of the town of North Hampton. The landfill borders farmland, undeveloped woodlands and wetlands to the north and west and commercial and residential properties to the east and south.

3.2 Land and Resource Use

Landfill operations began in 1972, with the southern portion of the Site used for waste disposal from the New Hampshire municipalities of Portsmouth, North Hampton, Newington, and New Castle, along with Pease Air Force Base.

Concurrent with landfill operations, rock quarrying was conducted from approximately 1973 through 1977. Much of the refuse disposed of at the Site was placed in open (some liquid-filled) trenches created by rock quarrying and sand and gravel mining.

In 1982, the city of Portsmouth began operating a refuse-to-energy plant on leased property at Pease Air Force Base. From July 1982 through July 1985, Pease Air Force Base and the municipalities of Rye, North Hampton, Portsmouth, New Castle, Newington and Derry, among others, began transporting their refuse to this plant for incineration. The Site generally accepted incinerator residue from the refuse-to-energy plant after July, 1982. In March 1983, the New Hampshire Bureau of Solid Waste Management ordered the landfill closed to all waste disposal except burnt residue from the incinerator. In July, 1985 the landfill was closed to all disposal

activities.

3.3 History of Contamination

In 1979, the New Hampshire Waste Management Division received a complaint concerning leachate breakouts in the area. A subsequent investigation by the Bureau of Solid Waste Management resulted in the discovery of allegedly empty drums with markings indicative of cyanide waste. A second complaint was received in early 1983 by the New Hampshire Water Supply and Pollution Control Commission regarding the water quality from a domestic drinking water well. *Testing revealed the presence of five different volatile organic compounds (VOCs).*

3.3 Initial Response

A subsequent confirmatory sampling beyond these initial wells detected VOC contamination to the south, southeast, and northeast of the Coakley Landfill. As a result, the town of North Hampton extended public water to Lafayette Terrace in 1983 and to Birch and North Roads in 1986. Prior to this time, commercial and residential water supply in these areas was obtained from private wells.

Also in 1983, the Rye Water District completed a water main extension along Washington Road to the corner of Lafayette Road (U.S. Route 1) and along Dow Lane. This extension brought the public water supply into the area due east and southeast of the intersection of Breakfast Hill Road and U.S. Route 1. See Figure 1-1 (Site Location Plan) for a map showing the aforementioned roads and the dwelling units. In December 1983, the Coakley Landfill was proposed for listing on the NPL, and was listed in 1986.

3.4 Basis for Taking Action

EPA signed a cooperative agreement with the state of New Hampshire on August 12, 1985 to conduct a RI/FS. The RI/FS for OU-1 (Source Control) was completed on March 2, 1990. The RI/FS for OU-2 (Management of Migration) was conducted by the EPA and completed on May 23, 1994. Both studies found contaminants in groundwater beneath the landfill as well as outside the landfill boundaries. VOCs detected at the Site included benzene, ethyl benzene, chloroethane, chlorobenzene and xylene. Semi-volatile organic compounds (SVOCs) detected included predominantly polycyclic aromatic hydrocarbons (PAHs) and dichlorinated benzenes. Inorganic compounds were detected in all groundwater and sediment samples and included arsenic, barium, iron, lead, manganese, nickel, beryllium, selenium and vanadium.

The objectives of the OU-1 ROD were to eliminate threats posed by direct contact with or ingestion of contaminated soils and wastes at the Site, and protect the drinking water aquifer by minimizing further migration of contaminants to the groundwater and surface water. The objective of the OU-2 ROD was to manage the migration of contaminated groundwater outside

the landfill boundaries. Groundwater in this area is classified a drinking water aquifer. Investigations at the Site have identified ingestion of groundwater as the primary threat to human health at this Site. Interim cleanup levels (ICL) for groundwater were established for 16 contaminants of concern (COC):

Table 2: Contaminants of Concern

Contaminant	ICL (ug/l)*	Revised ICL (ug/l)
Benzene	5	
Chlorobenzene	100	
Tetrachloroethene	3.5	
1,2-Dichloropropane	5	
2-Butanone	200	
Diethyl phthalate	2,800	
Trans-1,2-dichloroethene	100	
Phenol	280	
Antimony	6	
Arsenic	50	10** (MCL)
Beryllium	4	
Chromium	50	
Lead	15	
Manganese	180 (health advisory)	300 ** (health advisory)
Nickel	100	
Vanadium	260	
Tetrahydrofuran	154 (NH AGQS)***	

* ICLs from 1990 and 1994 RODs.

** Revised MCL (effective January 23, 2006) and health advisory (as of 2004) was addressed in a 2007 ESD.

*** New Hampshire Ambient Groundwater Quality Standards (NH AGQS) (Env-Or 603.03, Table 600-1). Tetrahydrofuran was added as a COC by the 2007 ESD.

4.0 REMEDIAL ACTIONS

4.1 Remedy Selection

On June 28, 1990, EPA issued a ROD for the source control operable unit (OU-1) of the Site. On March 22, 1991, EPA issued an ESD concerning modifications to the source control remedy related to landfill cap construction and emissions from air strippers proposed to be used to treat the groundwater. A second ESD was issued on May 17, 1996, which changed active landfill gas collection and treatment to a passive collection system. A third ESD was issued on September 29, 1999 which documented the decision to eliminate groundwater collection and treatment. On September 20, 2007, a fourth ESD was issued, revising the MCL for Arsenic from 0.5mg/L to 0.10 mg/L, increasing the EPA Health Advisory for Manganese from 180 ug/L to 300 ug/L, and adding tetrahydrofuran to the list of COCs. Lastly, on July 1, 2009 an ESD was issued, clarifying that the MCL for Arsenic was revised to 0.010 mg/L and re-issuing the 2007 ESD, to reflect the correct MCL.

The remedial action objectives, as stated in the OU-1 ROD, are to:

- Prevent ingestion of groundwater containing contamination in excess of federal and state drinking water standards or criteria, or that poses a threat to public health and the environment.
- Prevent the public from direct contact with contaminated soils, sediments, solid waste and surface water which may present a health risk.
- Eliminate or minimize the migration of contaminants from the soil into groundwater.
- Prevent the off-site migration of contaminants above levels protective of public health and the environment.
- Restore ground and surface water, soils and sediments to levels which are protective of public health and the environment.

The major components of the source control remedy, as modified by the five ESDs are:

- Excavation with disposal of wetlands sediment onto the landfill.
- Consolidate solid waste.
- Cap the landfill.
- Fence the landfill.
- Collect and vent landfill gases.
- Long-term environmental monitoring.
- Institutional controls (ICs) - to prevent contact with Site contaminants and to protect components of the remedy.

The ROD for the management of migration operable unit (OU-2) was issued on September 30, 1994. The ROD called for natural attenuation of the contaminated groundwater, which had migrated from beneath the landfill into off-site areas, together with long-term environmental monitoring and institutional controls. The major components of the management of migration remedy, as modified by the 2007 and 2009 ESDs are:

- ICs to prevent use of contaminated groundwater.
- Natural attenuation for the contaminated groundwater plume.
- Groundwater monitoring.

4.2 Remedy Implementation

4.2.1 Source Control and Management of Migration

A Consent Decree (CD) for the remedial design (RD), construction, operation and maintenance (O&M) of the source control remedy became effective on May 5, 1992. The Coakley Landfill Group (CLG), representing parties potentially responsible for the contamination, completed the design of the OU-1 remedy, and EPA approved the design on January 25, 1996. Construction began September 24, 1996 with the relocation of trash from along the perimeter of the landfill to the top of the landfill. Wetland sediments were removed and placed on the landfill during 1997. The landfill cap was completed in the fall of 1998 and a pre-final inspection was conducted by EPA and NHDES on September 15, 1998 which concluded that no significant construction items remained. Similarly, a pre-final inspection was conducted on October 6, 1998 which determined that wetland construction/restoration activities were complete.

Monitoring of groundwater quality and water levels continued throughout the RD, construction and post-construction phases. EPA evaluated that data and determined that the landfill cap was effective in reducing leachate generation such that the collection and treatment of contaminated groundwater at the edge of the landfill was no longer necessary. EPA's decision was documented in the ESD issued on September 29, 1999.

A CD for the implementation of the management of migration remedy became effective on January 11, 1999. The CLG submitted an environmental monitoring plan for the OU-2 remedy which EPA approved on March 10, 1999. The monitoring plan objective was to 1) assess OU-1 Remedial Action (RA) impacts on site sediment, surface water, groundwater, and 2) monitor natural attenuation of cleanup standard constituents in the OU-2 area, sediments, surface water and groundwater. To attain this objective, the monitoring plan originally required sediment, surface water and groundwater sampling and analysis in April, August and November of each year. The monitoring plan also required analysis for VOCs, SVOCs, metals, natural attenuation indicators and water quality indicators. Annual monitoring of groundwater and surface water

continues today and an annual data assessment report is provided to the EPA and NHDES. However, sediment sampling was subsequently modified to be collected every five years, and ambient air and landfill gas monitoring occurs quarterly after which reports are provided to both agencies.

An updated version of the Project Operations Plan (POP) for the management of migration remedy was conditionally approved on May 10, 2010; it contains an Environmental Monitoring Plan, a Quality Assurance Project Plan, a Health and Safety Plan, and a Methane Monitoring Plan. The Environmental Monitoring Plan's purpose is to monitor the extent of migration of the contaminated groundwater and other potentially affected media (surface water and sediments), and to track the natural attenuation of the groundwater contamination. The plan outlines the methods and procedures that will be used to demonstrate conformance and compliance with ICLs.

Under the POP, wells at OU-1 and OU-2 are monitored annually for field parameters (i.e. static water level, turbidity, specific conductance, temperature, pH, and dissolved oxygen), dissolved metals, total metals, and volatile organic compounds (see figure 2, table 2-2 and table 2-3 in **Appendix G** for further details). Surface water and leachate samples are collected and analyzed annually for field parameters, inorganic parameters, total metals and volatile organic compounds. Sediment samples are collected and analyzed every 5 years for total metals (see table 2-5 in **Appendix G** for further details).

4.2.2 Institutional Controls

A plan for implementation of ICs was submitted to EPA by CLG in June 2000 and the final draft of the Groundwater Use Restriction documents for incorporation into the plan was submitted in June 2001. Both documents were approved by EPA in August 2001. The objectives of the Institutional Control Plan (ICP) are to: 1) provide a plan and schedule to implement institutional controls to restrict ingestion of the degraded groundwater plume that is migrating from the Site in accordance with Section X of the OU-2 ROD, and 2) evaluate the effectiveness of the selected and implemented ICs. The CD defines these ICs as deed restrictions or other declarations of covenants, easements or notices created to restrict the use of groundwater at the Site, limit exposure to waste material, ensure non-interference with the remedy and ensure the integrity and effectiveness of the remedy. More specifically, the statement of work attached to the CD states that with respect to groundwater use, ICs for the Site will include an ICP that creates a GMZ for the landfill and the contaminated groundwater plume.

A GMZ was established via a Groundwater Management Permit (GMP) issued by NHDES on June 19, 2008. Groundwater easements to restrict and/or control the use of groundwater were obtained by the CLG from property owners located within the GMZ that do not have alternate water available. In addition, notifications were recorded with the registry of deeds on all parcels contained within the GMZ which have alternate water available. See **Appendix I** for a copy of

the notice of GMP as filed at the Rockingham County Registry of Deeds, a list of the properties located within the GMZ, and a copy of the GMP issued by NHDES.

Restrictions on the landfill property prohibit any activity, including, but not limited to any construction, or use of the property which would damage the landfill cap, or interfere with the performance, operation or maintenance of remedial actions for OU-1 and OU-2.

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

Required system operations in the OU-1 Operation and Maintenance Plan (OMP) include: annual mowing and inspection of the landfill cap and surface water drainage systems, and quarterly ambient air and landfill gas monitoring. Annual sampling and monitoring of groundwater and surface water is required for both OUs. Sediment sampling is performed every five years. Since ICs are in place, annual monitoring of the effectiveness of ICs is also required.

Table 3: Annual Operating and Maintenance Expenses by Operable Unit

Year	Operable Unit 1	Operable Unit 2
2010	$ 46,292.97	$ 40,447.39
2009	$ 47,048.95	$ 45,841.22
2008	$ 45,311.65	$ 71,175.57
2007	$ 33,967.79	$ 63,881.71
2006	$ 51,494.55	$ 47,479.73
TOTAL	$ 224,115.91	$ 268,825.62
Estimated annual cost (3 year average)	$ 46, 217.86	$ 52,488.06

5.0 PROGRESS SINCE THE LAST FIVE-YEAR REVIEW

5.1 Protectiveness Statement from the Previous Five-Year Review

The protectiveness statements from the entire site, taken from the Second Five Year Review read as follows:

A protectiveness determination of the source control remedy at OU-1 cannot be made at this time until further information is obtained. Metals exceedances are present above ecological benchmarks in the surface water, leachate and sediment at the Site. Additional monitoring data has been collected and will be analyzed to determine if adverse ecological impacts are present in these media. It is expected that the data analysis will take approximately 15 months to complete, at which time a protectiveness determination will be made. In addition, sporadic violation of off-site methane gas levels must be brought into compliance with state regulations. All human health threats at the Site have been addressed through stabilization and capping of the landfill and the landfill cap is functioning as intended. Installation of fencing and warning signs and deed restrictions are preventing human exposures at the capped landfill.

A protectiveness determination of the management of migration remedy at OU-2 cannot be made at this time until further information is obtained. High levels of arsenic and manganese are present in wells at the edge of the proposed groundwater management zone. Additional data must be collected so that a determination can be made whether elevated levels are a result of landfill impacts or from a source other than the NPL Site. Dependent on these findings, the scope of the groundwater remedy may need to be modified. A protectiveness determination will be made in 15 months when all data has been evaluated. The extent of the GMZ needs to be determined and institutional controls established for all properties within the GMZ. Monitoring of the Site will continue until cleanup levels for the contaminants of concern are met. It is expected to take approximately 15 years to reach cleanup levels.

A site-wide protectiveness determination for the Coakley Superfund Site cannot be made at this time until further information is obtained. Metals exceedances are present above ecological benchmarks in the surface water, leachate and sediment at the Site and high levels of arsenic and manganese are present in wells at the edge of the proposed groundwater management zone. Additional data has been and/or will be collected and analyzed and a protectiveness determination will be made in 15 months.

Subsequently, on July 29, 2009 and Addendum to the Second Five Year Review was approved and modified these statements to read:

The remedy at Operable Unit 1 is protective of human health and the environment. However, the landfill gas monitoring program will remain in place, as will a reduced surface water and sediment monitoring effort to ensure that the currently non-toxic concentrations are not increasing significantly. Groundwater monitoring to determine compliance with the revised groundwater monitoring standards for the landfill will be conducted as a component of OU-2. A plan for future monitoring will be developed by the agencies and CLG as appropriate for the next five year review.

The remedy at Operable Unit 2 is protective of human health and the environment in the short-term. Long-term protectiveness will be achieved when interim groundwater cleanup levels for all contaminants

of concern are met.

The remedy at the Coakley Landfill Superfund Site is protective of human health and the environment in the short-term. Long-term protectiveness has been achieved already in OU-1 based on the maintenance of the landfill cap, long-term monitoring, and use restrictions. Long-term protectiveness will be achieved in OU-2 when interim groundwater cleanup levels for all contaminants of concern are met and restrictions on the use of groundwater within OU-2 can be removed.

5.2 Progress Since the Last Five-Year Review

The recommendations of the 2006 review, as modified by the 2009 Addendum, are stated as follows:

- Prepare an ESD (to reflect the changes in the Arsenic MCL and Manganese Health Advisory).
- Affirm boundary of GMZ and if it needs to be expanded, establish ICs at additional properties.
- Obtain GMP approval from NHDES.
- Obtain easements for three properties which currently require ICs, and others, if GMZ is expanded.
- Install active measures to control methane gas exceedances in compliance with state regulations
- Follow up sampling and discussion with EPA and NHDES to determine whether the sediment, surface water and leachate pose an ecological risk and, if so, how it should be addressed.
- Continue methane gas monitoring program.
- Perform chemistry testing to ensure that the currently non-toxic concentrations (at sediment, surface water, and leachate samples) do not show an upward trend.

5.3 Status of Recommendations Since the Last Five-Year Review

Table 4: Status of Recommendations since Last Five-Year Review

Issues from Previous Review	Action Taken and Outcome
Arsenic MCL has been lowered to 10 ug/l from current site ICL of 50 ug/l and health advisory for manganese has changed from 180 ug/l to 300 ug/l.	An ESD documenting the changes in the arsenic MCL and the manganese health advisory was written and finalized on September 30, 2007. Subsequently, on July 1, 2009 another ESD corrected an error in the reported numeric value of the revised arsenic MCL.
Boundary of proposed GMZ needs to be affirmed.	The CLG defined a clean edge for the plume and provided all the necessary information to apply for a GMP in 2008.
GMP must be obtained.	On June 19, 2008, NHDES approved the GMP application submitted by the CLG.
All Institutional Controls must be in place.	ICs at the remaining properties were implemented at the time of the GMP approval, establishing a GMZ, on June 19, 2008. Deed notices were placed on all affected properties within the GMZ and the notices were recorded at the Rockingham County Registry of Deeds in June 2008. The CLG is required to annually notify residents at all affected properties. Annual monitoring at the Site will continue until the interim groundwater cleanup levels for all contaminants of concern, as required under the OU-2 ROD are met.
Off-site methane gas levels must be brought into compliance with state regulations.	The Coakley Landfill Group (CLG) installed methane gas alarms in buildings on abutting properties in 2007 and no violations have been reported on those properties since that time. From September 21, 2006 to the present, no methane has been detected above the state standard for methane soil gas (2.5%) at three of the six gas monitoring probes (M-2, M-4, and M-5). For the other three monitoring probes (M-1, M-6, and M-7), sporadic violations have been observed ranging from single detections of 2.6% at M-1 on September 24, 2007, and 4.2% at M-7 on September 30, 2008, to several detections at M-6 (8.1% on September 30, 2008, 4.5% on September 18, 2009, 8.0% on June 30, 2010, and lastly, 3.4% on March 30, 2011). The agencies will continue to require CLG to perform quarterly landfill gas monitoring of landfill gas probes M-4, M-5, M-6 and M-7 and allow scaled back landfill gas monitoring at M-1 and M-2 to twice a year based on historical data and lack of any nearby structures.
Leachate, surface water and sediment metal exceedances must be addressed.	In 2008 and 2009 additional sediment and surface water samples, respectively, were collected and toxicity tests were run, which showed no significant ecological impact. Since the sampled area was selected as the "worst case area" based on chemistry testing, EPA concluded that it is likely there are no significant ecological impacts in surface water and sediment at the Site. This was documented in July 29, 2009 as an Addendum to the Second 5 Year Review.
Methane Gas	CLG has continued the methane gas monitoring program as described above, under the oversight of EPA and NHDES.

Issues from Previous Review	Action Taken and Outcome
Sediment, Surface Water and Leachate Sampling Plan	CLG performed annual chemistry testing of these samples and in 2010 it performed a statistical analysis of all historical data to ensure that the currently non-toxic concentrations do not show an upward trend.

6.0 THE FIVE-YEAR REVIEW PROCESS

6.1 Administrative Components

The Coakley Landfill Superfund Site five-year review was conducted by Gerardo Millán-Ramos, the EPA Remedial Project Manager, with assistance from the following review team members:

Joseph Donovan	NHDES Remedial Project Manager
Lloyd Selbst, Esq.	U.S.EPA Attorney
Cynthia Catri	U.S. EPA Attorney
Rudy Brown	U.S. EPA Community Involvement Coordinator
Richard Sugatt	U.S. EPA Risk Assessor
Stephen Mangion	U.S. EPA Hydro-geologist
Charles Porfert	U.S. EPA QA/QC Chemist

The five-year review was conducted between December 2010 and September 2011.

6.2 Community Notification and Involvement

Community notification was initiated by the release of a fact sheet announcing the start of the five-year review. Rudy Brown, EPA Community Involvement Coordinator issued the fact sheet on Friday January 21, 2011. The notification was published in the "Portsmouth Herald" and the "Hampton Union" newspapers. A copy of each notice as published in the newspapers is shown in Appendix N.

Another fact sheet and notification to the newspapers will be issued announcing the completion of the report and the results of the review. A copy of the final report will be available for review at the North Hampton Public Library, 235 Atlantic Avenue, North Hampton, NH; at the EPA Region I office, 5 Post Office Square, Boston, MA; and at http://www.epa.gov/region1/superfund/sites/coakley.

6.3 Document Review

The project team reviewed several documents and files to understand the history and status of the cleanup in order to assess the protectiveness of the remedy at the Site. Specific documents reviewed included:

1. Records of Decision: June 28, 1990 and September 30, 1994
2. Consent Decrees: May 4, 1992 and October 29, 1998
3. Explanation of Significant Differences: March 22, 1991; May 17, 1996; September 29, 1999; September 28, 2007; July 1, 2009
4. Initial Data Analysis and Monitoring Report: September 1999
5. Final Institutional Control Plan: June 2000
6. Initial Five-Year Review Report: September 25, 2001
7. Second Five-Year Review Report: September 21, 2006
8. Addendum to the Second Five-Year Review Report: July 29, 2009
9. Project Operations Plan: May 10, 2010
10. Annual Monitoring Reports: 2000-2010
11. Methane Soil Gas Survey Work Plan: January 2006
12. Landfill Gas Monitoring Results: 2006-2010

6.4 Data Review

6.4.1 Groundwater Monitoring

Sixteen (16) groundwater contaminants of concern were identified and ICLs were established in the OU-2 ROD. A seventeenth (17) groundwater COC (tetrahydrofuran) was added in September 2007 via an ESD. See Table 2 in Section 3 herein for more details. Thirty-six compliance wells were sampled in the latest groundwater sampling round for which data are available (August, 2010) and Mann-Kendall data evaluations were performed to evaluate trends for arsenic at 19 wells, for manganese at 19 wells, and for benzene at 5 wells, with data from the most recent 16 sampling events. The trend analysis was performed for these three contaminants because they have historically been the most prevalent at the edge of the GMZ.

For arsenic, decreasing trends were observed for 10 wells, increasing trends were observed for 6 wells, and no trend was observed for 3 wells. For manganese, decreasing trends were observed for 13 wells, increasing trends were observed for 4 wells, and no trend was observed for 2 wells. For benzene, decreasing trends were observed for all 5 wells. Overall, contaminant concentrations in groundwater at the Site show a decreasing trend. Data sheets for the Mann-Kendall evaluation are included in **Appendix C**. A summary of results by wells and compounds is also included.

While there appears to be a general downward trending site-wide of contaminant concentrations, many COCs within the GMZ continue to exceed state and federal cleanup standards. In addition, manganese exceedances were found in two wells outside the GMZ. During the past six years, nine chemicals of concern, in decreasing order of prevalence (i.e. number of detections above ICLs) did not meet their specified cleanup levels: manganese, arsenic, benzene, lead, chromium, nickel, beryllium, antimony and vanadium. Also, concentrations for tetrahydrofuran and most

recently (starting with sampling in 2008 at the request of NHDES)1,4- Dioxane exceeded the NH AGQS.

After reviewing the data from the past six annual monitoring reports, twenty-eight wells exceeded the manganese cleanup level (health advisory of 300 ug/l) with concentrations ranging from 310 ug/l to 13,000 ug/l. Twenty-one wells exceeded the arsenic cleanup level (MCL of 10 ug/l) with concentrations ranging from 11 ug/l to 280 ug/l; three wells exceeded the benzene cleanup level (MCL of 5 ug/l) with concentrations ranging from 6 to 8 ug/l; two wells exceeded the nickel cleanup level (MCL of 100 ug/l) with concentrations ranging from 130 to 410 ug/l; one well exceeded the chromium cleanup level (50 ug/l) with concentrations ranging from 140 ug/l to 600 ug/l; one well exceeded the lead cleanup level (15 ug/l) with concentrations ranging from 23 to 100 ug/l; two wells exceeded the beryllium cleanup level (4 ug/L) with concentrations ranging from 23 to 85 ug/L; one well exceeded the antimony cleanup level (6 ug/L) at 8 ug/L; and one well exceeded the vanadium cleanup level (260 ug/L) at 350 ug/L. The NH AGQS for tetrahydrofuran (154 ug/L) was exceeded at one well with concentrations at 160 and 180 ug/L.

The NH AGQS for 1,4-Dioxane (3 ug/L), which is not an ICL, was exceeded at ten wells (all of them located within the established GMZ) with concentrations ranging from 6 to 310 ug/L. All the wells showing exceedances of the ICLs, are located within the established GMZ, except wells GZ-123, and FPC-2A, which are outside the GMZ, south of the landfill. These two wells show exceedances of the manganese ICL (300 ug/L) that range from 2,200 to 3,300 ug/L, and from 500 to 730 ug/L, respectively. See figure 2 (site plan) on Appendix B for the location of these two wells and the GMZ boundary.

While VOCs are still detected above cleanup levels within the GMZ, VOCs have not been detected in either of the off-site residential water supply wells at concentrations that exceeded the laboratory detection limits of 0.5 ug/l, except for one sample collected from well R-3 on January 24, 2008 which detected Methyl tert-butyl ether (MTBE) at 1.6 ug/L (below the New Hampshire GW-1 standard of 13 ug/L). The analytical results for samples collected from off-site residential water supply wells do not indicate any impacts from the landfill Site.

The potential for vapor intrusion was evaluated following the 2002 EPA Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils. A risk evaluation of the worst case scenario (a building directly above the location with the highest benzene concentration) revealed that the potential risk would be within EPA's acceptable risk range of 1E-04 to 1E-06. Also, according to the most current concentration contours and the known direction of groundwater flow, no structures exist within a 100 feet from the presumed extent of the plume, nor is the plume expanding in the direction of any structures or non-wetland areas where future construction is a possibility. Please see figures 3 and 4 in **Appendix B** for maps showing overburden and bedrock groundwater flow, and **Appendix K** for a memo detailing the evaluation performed.

The lateral distributions of arsenic, manganese, and 1,4-Dioxane in overburden and bedrock wells, and graphs illustrating contaminant concentrations over time for arsenic, manganese, and benzene in selected wells, are included in **Appendix C**.

6.4.2 Landfill Gas Monitoring

Based on data generated during extensive pre-design studies and other new information developed after the OU-1 ROD was issued in June 1990, the landfill gas management component of the selected remedy was modified from an active interior gas collection system and on-site thermal destruction to a passive gas collection and venting system. This new data indicated that rates of gas generation and levels of hazardous substances in the landfill gas would be lower than those assumed and used for the preparation of the OU-1 ROD. Therefore, after consultation with NHDES, EPA concluded that a passive landfill gas collection and venting system would prevent off-site, sub-surface migration of landfill gases and be protective of human health and the environment, while saving significant costs. This change was documented by an Explanation of Significant Differences (ESD) issued on May 17, 1996. As a result, "turbine vents" were installed on several landfill gas vent pipes in order to prevent the off-site migration of landfill gas.

At the time of the Second Five Year Review, sporadic violations of off-site methane gas levels needed to be brought into compliance with state regulations (Env-Hw 702.09 and 702.11). In 2007, the Coakley Landfill Group (CLG) installed methane gas alarms in buildings on six abutting properties along the eastern edge of the landfill, and discontinued the quarterly monitoring of landfill gas at these locations. The methane gas alarms are still in place in order to alert the occupants of any unsafe gas conditions on the premises, should those occur. Subsequently, NHDES and EPA required the CLG to continue quarterly monitoring of landfill gas probes M-4, M-5, M-6 and M-7 and allowed scaled back landfill gas monitoring at M-1 and M-2 to twice a year based on historical data and lack of any nearby structures.

From September 21, 2006 to the present, no methane has been detected above the state standard for methane soil gas (2.5%) at three of the six gas monitoring probes (M-2, M-4, and M-5). For the other three monitoring probes (M-1, M-6, and M-7), sporadic violations have been observed ranging from single detections of 2.6% at M-1 on September 24, 2007, and 4.2% at M-7 on September 30, 2008, to several detections at M-6 (8.1% on September 30, 2008, 4.5% on September 18, 2009, 8.0% on June 30, 2010, and lastly, 3.4% on March 30, 2011. No indication of methane in the six nearby occupied buildings being monitored has been found to date.

Given the sporadic nature of these excursions (six excursions out of a total of ninety two readings (6.5%) taken during the last five years), and the lack of methane detections in the occupied buildings, EPA and NHDES have recommended the CLG to continue with the quarterly monitoring of landfill gas for probes M-4, M-5, M-6 and M-7, and bi-annual

monitoring for probes M-1 and M-2. **Appendix C** contains a figure showing the location of the landfill gas monitoring probes, and graphs of the concentrations observed at all probes since the start of the monitoring program in 1999.

6.4.3 Surface Water/Sediment Monitoring

Comparison of the first five years of monitoring results (2001-2005) with ecological benchmarks for freshwater organisms revealed exceedances by some metals in landfill leachate, surface water and sediment. The CLG performed an additional round of sampling in August, 2006 which revealed additional exceedances. As a result, EPA in consultation with NHDES evaluated the data and determined that the concentrations had the potential for significant ecological impact. Thus, EPA requested that additional sediment and surface water samples be collected in 2008 and 2009 and ran for various toxicity tests. EPA concluded that these results showed no significant ecological impact. Since the sampled area was selected as the "worst case area" based on frequency and magnitude of benchmark exceedances, EPA concluded that it is likely there are no significant ecological impacts in surface water and sediment at the Site. This was documented in July 29, 2009 as an Addendum to the Second 5 Year Review Report.

In accordance with the Environmental Monitoring Plan (EMP) dated April 2010, sediment sampling was reduced to once every 5 years, with the next sediment sampling to be performed in 2014. Therefore, sediment sampling was not performed in August 2010. Surface water and leachate sampling continue on a yearly basis, however surface water sample locations SW-4, SW-5, and SW-103 were dry in August 2010, thus surface water samples could not be collected at these locations. The leachate and surface water sample locations are indicated on figure 2 at **Appendix B**.

The EPA risk assessor evaluated the historical data for the sediment samples and developed an approach for evaluating the potential toxicity of sediments at the Site during five year review periods. The approach basically requires that the worst case sediment location (SED-05) be sampled and analyzed for inorganics every five years. It uses a benchmark quotient approach to identify conditions that might result in toxicity. Please see **Appendix J** for a detailed explanation of this approach.

6.4.4 Institutional Controls

Restrictions on the landfill property prohibit any activity, including, but not limited to any construction, or use of the property which would damage the landfill cap, or interfere with the performance, operation or maintenance of remedial actions for OU-1 and OU-2.

EPA endorses the State Comprehensive Ground Water Protection Program embodied in RSA 485C. New Hampshire law requires that all groundwater must meet drinking water quality standards. The exception is for areas contained within a GMZ where a GMP has been issued. A

GMP establishes an area within which New Hampshire acknowledges that groundwater is contaminated above drinking water quality standards and includes monitoring criteria that will ensure the long-term protection of public health and the environment. The goal in establishing a GMZ is to bring groundwater back to drinking water quality standards.

There are two categories of ICs under the NHDES GMP regulations: 1) deed notices and 2) easements. Deed notices are required for properties within the GMZ with access to public water supplies; permission of the landowner is not required to record a deed notice. Easements are required on properties within the GMZ where no alternative water supply exists and are designed to restrict and/or control the use of groundwater. Easements are obtained by the permittee from property owners within the GMZ.

A GMP was issued by NH DES for the Coakley Landfill on June 19, 2008 with an expiration date of June 18, 2013. It established a GMZ consisting of 23 properties with a recorded deed notice and 11 properties with recorded easements. Six of the 34 properties have recorded groundwater restrictions. Permission was obtained for all properties within the GMZ, and the GMZ boundaries were affirmed. (See the GMZ boundary plan on figure 2 at **Appendix B**).

The implementation of the current ICs is monitored at least on an annual basis at the time of the sampling events. The contractor retained by the CLG is required to observe any developments within the GMZ property lots they enter and notify the CLG of any such findings. In addition every year, the CLG sends letters to all the property owners of the GMZ lots, requesting that they notify the CLG technical committee of any new drinking water supply wells within their property. See **Appendix H** for a sample letter.

Item 2.e of the OU-2 Statement of Work (SOW) requires EPA to review and approve an ICP that among other things requires *...a program and schedule for follow-up to evaluate the effectiveness of the ICs and to implement other types of ICs if not effective, and to evaluate if additional properties require ICs because of the contaminated groundwater plume migrating from the Coakley Landfill beyond the areas in which ICs have been implemented and to implement ICs on such additional properties.* An ICP was approved by EPA in August 2001, however, many changes were made at the time the GMZ was being discussed and implemented, and have not been formally documented. Thus an updated version of the Institutional Control Plan is necessary.

6.5 Site Inspection

The third five-year review's site inspection to assess the protectiveness of the remedy was conducted on April 27, 2011. The inspection was conducted by Gerardo Millán-Ramos, EPA Remedial Project Manager, and Stephen Mangion, EPA hydro-geologist. Peter Britz, CLG Landfill Project Coordinator, and Mr. Robert P. Sullivan, CLG Executive Committee Chairman were present at the time of the inspection. During the inspection, the integrity of the landfill cap

and surface drainage system was evaluated. The condition of the landfill gas venting and monitoring system, groundwater monitoring wells and the perimeter fence were also observed. Warning signs were posted, however extensive damage to the fence was observed and some of the monitoring wells were found unlocked. Observations and recommendations were made on-site at the time of the inspection; most notable was the presence of construction equipment and materials extremely close to the southwestern corner of the fence. On May 24, 2011 EPA sent letters to the owners of the properties where these materials and equipment were observed, requiring them to coordinate their relocation with the CLG and EPA. See **Appendix E** for photos documenting Site conditions and **Appendix F** for the inspection checklist.

6.6 Interviews

Gerardo Millán-Ramos interviewed the CLG Landfil Project Coordinator, the NHDES Project Manager, and an adjacent business owner. During the interview with the adjacent business owner, he indicated his interest in using groundwater for irrigation purposes. EPA cautioned him against such use given the potential for that action to change the groundwater flow in the area. Altering the groundwater flow could likely cause complications by expanding the extent of the groundwater contamination and increasing costs. There are currently no recorded groundwater use restrictions on his property. Further evaluation is necessary to determine whether additional groundwater restrictions on properties east of the landfill are necessary.

Both the CLG Landfill Project Coodinator and the NHDES project manager raised concerns about the presence of 1,4-Dioaxane within the GMZ. A report of those interviews can be found in **Appendix D**.

7.0 TECHNICAL ASSESSMENT

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

Yes. A review of all available documents, applicable or relevant and appropriate requirements (ARARs), risk assumptions and the results of the Site inspections indicates that the remedy is functioning as intended. Even though the concentration of some metals and VOCs in leachate, sediment, and surface water samples exceeded the NH standards during the past five years, toxicity tests using the worst case scenario have demonstrated these concentrations pose no significant risk to the ecosystem. Sporadic exceedances to the NH landfill gas standard for methane have been observed at some of the landfill gas monitoring probes, however, no methane has been detected by the methane alarms installed at any of the residential and commercial buildings being monitored. Although a number of wells have shown elevated levels of metals, tetrahydrofuran and most recently, 1,4-Dioxane, the vast majority of these wells are within the established GMZ. The exceptions are two wells: FPC-2A/B, and GZ-123 which showed levels of manganese exceeding the 300 ppb health advisory, but not exceeding the NH AGQS for

manganese of 840 ppb. In addition, public water is provided to all potential drinking water users in the immediate area of the landfill, thus no one is exposed to the groundwater. While natural attenuation processes are occurring at the Site, additional analysis is required to determine whether the current GMZ needs to be expanded and ICs need to be established on additional properties. Because COCs within, and potentially beyond the GMZ, still exceed state and federal cleanup levels, and are expected to remain above these levels for the foreseeable future, the GMP, currently set to expire on June 18, 2013, must be renewed, prior to that date. Finally, changes to the ICP were made at the time the GMZ was being discussed and implemented and these changes need to be incorporated into the Final ICP.

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

Yes. There have been no changes in land use at and surrounding the Site which would change the exposure assumptions contained in the RODs or affect the protectiveness of the remedy. No new sources or exposure pathways were identified during this five-year review. A new COC (tetrahydrofuran) was identified. This was documented in the July 1, 1999 ESD for OU-1.

Several annual monitoring reports have indicated four wells (MW-8, GZ-105, AE-2A, and AE-2B) contaminated with tetrahydrofuran in concentrations which exceed the NH AGQS of 154 (ug/l). Presently, there are no federal drinking water standards for tetrahydrofuran. Nonetheless, these detections do not require a change in the selected remedy, nor do they impact the overall protectiveness of the remedy, as they have all occurred in monitoring wells located within the GMZ, and no one is exposed to the groundwater.

There have been no changes in toxicity factors that would affect the risk calculated for the Site, or significant enough to require a change in the selected remedy. An Addendum to the Second Five Year Review Report was finalized on July 29, 2009, documenting that there is no significant ecological risk associated with surface water and sediment at the Site. Two ESDs were finalized on September 28, 2007, and July 1, 2009, to include revised and additional standards (i.e. a more stringent MCL for arsenic from 50 ug/L to 10 ug/L, and a less stringent health advisory for manganese from 180 ug/l to 300 ug/l). These changes will not affect the risk calculated at the Site; however, the revised manganese cleanup level for groundwater may require a revision to the size of the existing GMZ.

A Project Operations Plan (POP) is currently in place which requires annual groundwater, leachate, and surface water monitoring. Additionally, sediment monitoring is required every five years. A landfill gas (LFG) monitoring plan is also in place which requires quarterly monitoring at several locations. These monitoring events continue to provide the necessary data to ensure that the cleanup levels and remedial action objectives (RAOs) are still valid at the Site. The updated POP was established on May 10, 2010, and contains an Environmental Monitoring Plan (EMP), a Quality Assurance Project Plan (QAPP), a Health and Safety Plan, and a Methane

Monitoring Plan. The EMP describes how the extent of migration of the contaminated groundwater and other potentially affected media (surface water and sediments) will be monitored, and how the natural attenuation of the contamination will be tracked. It outlines the methods and procedures that will be used to demonstrate conformance and compliance with ICLs.

All chemical-specific Applicable or Relevant and Appropriate Requirements (ARARs) and To Be Considered (TBCs) criteria were reviewed for changes that could affect protectiveness and no changes were found. See **Appendix L** for a complete list including legal references, a synopsis of the requirements and the actions to be taken. Data provided and analyzed indicate no change in Site conditions which would warrant a re-evaluation of risk, except for additional data collection and analysis that is required to determine whether the current GMZ adequately includes the entire area of groundwater contamination attributable to the Site.

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

Yes. Although no newly identified human health risks have been identified to date, the implementation of recent (2008) changes in the NHDES sampling requirements for this Site (See **Appendix M** for a copy of the NHDES letter describing the changes) have revealed the presence of 1,4-Dioxane at most wells in the periphery of OU-1, several wells within OU-2, and in sediment samples. The concentrations of 1,4-Dioxane detected above the NHDES AGQS (3 ug/L) in the monitoring wells ranges from 6 to 310 ug/L, and in the sediment samples from 20 to 26 ug/L. The CLG has recommended that the extent of the impact and the temporal trends be evaluated by monitoring 5 additional wells (MW-6, FPC-5A, FPC-7A, AE-1A, and AE-1B) added to the 15 wells currently sampled for 1,4-dioxane (MW-4, MW-5S, MW-5D, MW-8, MW-9, MW-11, BP-4, OP-2, OP-5, FPC-8A, FPC-8B, AE-2A, AE-2B, AE-3A, and AE-3B). EPA and NHDES have agreed in principle with this recommendation and will be further evaluating this recommendation plus the appropriateness of additional measures, to determine whether the area of the existing GMZ needs to be revised. An ICL has not been established for 1,4-Dioxane at this site; however, a decision document will be issued to add 1,4-Dioxane to the site COCs and to establish an ICL.

Two of the property owners adjacent to the east side of the landfill expressed interest in using an existing well in their property for irrigation purposes. EPA, NHDES, and the CLG met with these two property owners to dissuade them from such idea. While preparing for this meeting it became evident that their lot and many others at this area (east of the landfill) do not have recorded groundwater use restrictions in place. Groundwater extraction in this area has the potential to alter the flow of groundwater and increase the extent of the plume, thus adding complexities and time to the ongoing remedy. Thus the possibility of instituting such restrictions via a City ordinance will be explored.

No other information has come to light which could affect the protectiveness of the remedy.

7.4 Technical Assessment Summary

According to the data reviewed, the Site inspections and interviews conducted, the remedy is functioning as intended by the existing RODs and ESDs, except additional information and analysis is required to better determine the extent of the groundwater contamination and whether an adjustment of the GMZ boundaries is necessary. Institutional controls have been implemented to restrict use of the landfill-impacted groundwater surrounding the Site. Continued monitoring is required to ensure that methane emissions are compliant, that the boundaries of the GMZ are adequate and that potential surface water-sediment exposures do not pose unacceptable risks in the future.

8.0 ISSUES

The following issues were identified as a result of the Five-Year Review:

Table 5: Issues

ISSUES	Affects Current Protectiveness (Y/N)	Affects Future Protectiveness (Y/N)
Even though no one within the Groundwater Management Zone (GMZ) and its immediate vicinity is exposed to the groundwater, 1,4-Dioxane has been detected at levels exceeding the New Hampshire Ambient Groundwater Quality Standards (NHAGQS) at most monitoring wells within OU-1 and several within OU-2. Additionally, manganese has been detected outside the current GMZ (wells GZ-123 and FPC-2A/B outside the southern edge of the GMZ) above the EPA Health Advisory, and both manganese and arsenic concentrations in the FPC-6 well cluster (inside the eastern edge of the GMZ) suggest that concentrations may exceed the Interim Compliance Levels (ICLs) beyond the GMZ boundary.	N	Y
Damage to the fence must be repaired; unlocked monitoring wells and gates must be locked and properly labeled; excessive vegetation in some swales and near the fence must be removed; also construction equipment and materials that are too close to the fence and monitoring wells, must be relocated.	N	Y

There is a possible need for groundwater extraction restrictions for properties on the eastern side of the landfill. Groundwater extraction in this area has the potential to alter the flow of groundwater and increase the extent of the plume, thus adding complexities and time to the ongoing remedy.	N	Y
Changes to the Institutional Control Plan were made at the time the GMZ was being discussed and implemented. However, these changes have not been incorporated into the Final Institutional Control Plan that was approved by EPA.	N	Y
Groundwater Management Permit will expire on June 18, 2013. Site contaminants within the GMZ continue to exceed state and federal cleanup levels. Exceedences outside GMZ suggest that concentrations may also exceed ICLs beyond the GMZ boundary.	N	Y

9.0 RECOMMENDATIONS AND FOLLOW-UP ACTIONS

The following recommendations have been made based on the data review for the Site.

Table 6: Recommendations and Follow-up Actions

Issue	Recommendations and Follow-up Actions	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness (Y/N)	
					Current	Future
Even though no one within the Groundwater Management Zone (GMZ) and its immediate vicinity is exposed to the groundwater, 1,4-Dioxane has been detected at levels exceeding the New Hampshire Ambient Groundwater Quality Standards (NHAGQS) at most monitoring wells within OU-1 and several within OU-2. Additionally, manganese has been detected outside the current GMZ (wells GZ-123 and FPC-2A/B outside the southern edge of the GMZ) above the EPA Health Advisory, and both manganese and arsenic concentrations in the FPC-6 well cluster (inside the eastern edge of the GMZ) suggest that concentrations may exceed the Interim Compliance Levels (ICLs) beyond the GMZ boundary.	a) Sample monitoring wells at the outermost edge of the GMZ and the two residential wells for 1,4 –Dioxane for the next two rounds.	CLG	EPA and NHDES	August 2013	N	Y
	b) Perform additional analysis to determine whether the site contaminants are moving beyond the edge of the GMZ and whether the current GMZ needs to be expanded and Institutional Controls (ICs) need to be established on additional properties and evaluate the need for further response action.	CLG	EPA and NHDES	August 2013	N	Y
	c) Prepare an Explanation of Significant Differences (ESD) to add 1,4-Dioxane as a COC with an ICL.	EPA	EPA and NHDES	August 2013	N	Y

Issue	Recommendations and Follow-up Actions	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness (Y/N)	
					Current	Future
Damage to the fence must be repaired; unlocked monitoring wells and gates must be locked and properly labeled; excessive vegetation in some swales and near the fence must be removed; also construction equipment and materials that are too close to the fence and monitoring wells, must be relocated.	Perform the necessary repairs to the fence, and lock / properly label all monitoring wells that were lacking these features at the time of the inspection. Also remove excessive vegetation and relocate the construction equipment and materials to a safe distance from the fence. Coordinate and document this activity with the regulatory agencies and the CLG.	CLG, Town of North Hampton, abutting property owner	EPA and NHDES	November 2011	N	Y
There is a possible need for groundwater extraction restrictions for properties on the eastern side of the landfill. Groundwater extraction in this area has the potential to alter the flow of groundwater and increase the extent of the plume, thus adding complexities and time to the ongoing remedy.	Evaluate the need for further ICs in the area east of the landfill to prevent altering of groundwater flow as a means of containing the contaminated groundwater plume.	CLG	EPA & NHDES	September 2013	N	Y
Changes to the Institutional Control Plan were made at the time the GMZ was being discussed and implemented. However, these changes have not been incorporated into the Final Institutional Control Plan that was approved by EPA.	Update the Final Institutional Control Plan to incorporate changes that were made to the follow-up requirements for ICs.	CLG	EPA & NHDES	March 2012	N	Y

Issue	Recommendations and Follow-up Actions	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness (Y/N)	
					Current	Future
Groundwater Management Permit will expire on June 18, 2013. Site contaminants within the GMZ continue to exceed state and federal cleanup levels. Exceedences outside GMZ suggest that concentrations may also exceed ICLs beyond the GMZ boundary.	Renew GMP for GMZ and potentially expand boundary if additional tests show site contaminants migrating beyond the current GMZ boundary.	CLG	EPA & NHDES	June 2013	N	Y

10.0 PROTECTIVENESS STATEMENTS

OU-1

The remedy at OU-1 currently protects human health and the environment, both in the short and long term. Also, the landfill gas monitoring program will remain in place. All human health threats at the Site have been addressed through stabilization and capping of the landfill and the landfill cap is functioning as intended. Installation of fencing and warning signs and deed restrictions are preventing human exposures at the capped landfill. Toxicity tests that were

applied to a "worst case scenario" in the sediment samples, revealed no significant ecological impact, and EPA concluded that it is likely there are no significant ecological impacts in surface water and sediment at the Site. In order to ensure that the currently non-toxic concentrations are not increasing significantly, a reduced surface water and sediment monitoring effort will remain in place. Also, the landfill gas monitoring program will remain in place.

OU-2

The remedy at OU-2 currently protects human health and the environment in the short-term because on-site residents are not exposed to the groundwater, as water utility service has been provided, and there is no evidence of such exposure for off-site residents. Also, a GMZ has been established via a NHDES GMP, and ICs have been established for all properties within the GMZ. Groundwater monitoring to determine compliance with the groundwater monitoring standards for the landfill will continue to be conducted as a component of OU-2. Long-term protectiveness will be achieved when interim groundwater cleanup levels for all contaminants of

concern are met.

Site-Wide

Overall, the remedy at the Coakley Landfill Superfund Site currently protects human health and the environment in the short-term. Long-term protectiveness has been achieved already in OU-1 based on the maintenance of the landfill cap, long-term monitoring, and use restrictions. Long-term protectiveness will be achieved in OU-2 when interim groundwater cleanup levels for all contaminants of concern are met and restrictions on the use of groundwater within OU-2 can be removed. Monitoring of the Site will continue until cleanup levels for the contaminants of concern are met.

11.0 NEXT REVIEW

The next statutory five-year review for the Coakley Landfill Superfund Site will be issued either on or prior to September 21, 2016, five years from the date of signature of this review.

APPENDIX A - REFERENCES

"Record of Decision Operable Unit 1", U.S. Environmental Protection Agency, June 28, 1990

"Record of Decision Operable Unit 2", U.S. Environmental Protection Agency, September 30, 1994

"Explanation of Significant Differences", U.S. Environmental Protection Agency, March 22, 1991

"Explanation of Significant Differences", U.S. Environmental Protection Agency, May 17, 1996

"Explanation of Significant Differences", U.S. Environmental Protection Agency, September 29, 1999

"Explanation of Significant Differences", U.S. Environmental Protection Agency, September 28, 2007

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"Addendum to the Second Five Year Review Report", U.S. Environmental Protection Agency, July 29, 2009

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"Initial Data Analysis and Monitoring Report," Aries Engineering, Inc., September 1999

"Initial Five-Year Review Report," U.S. Environmental Protection Agency, September, 2001

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"2008 Post Closure Annual Monitoring Report", Provan & Lorber Inc., February 3, 2009

"2009 Post Closure Annual Monitoring Report", Provan & Lorber Inc., December 8, 2009

"2010 Post Closure Annual Monitoring Report", Provan & Lorber Inc., April 25, 2011

"Methane Soil Gas Survey Work plan," Golder Associates Inc., January, 2006

"Landfill Gas Monitoring Results," Aries Engineering, Inc., February, 2006

"March 2006 Landfill Gas Monitoring Results," Aries Engineering, Inc., April 12, 2006

"June 2006 Landfill Gas Monitoring Results," Aries Engineering, Inc., July 25, 2006

"September 2006 Landfill Gas Monitoring Results," Aries Engineering, Inc., October 20, 2006

"December 2006 Landfill Gas Monitoring Results," Aries Engineering, Inc., January 23, 2007

"March 2007 Landfill Gas Monitoring Results," Aries Engineering, Inc., May 7, 2007

"June 2007 Landfill Gas Monitoring Results," Aries Engineering, Inc., August 13, 2007

"September 2007 Landfill Gas Monitoring Results," Aries Engineering, Inc., November 5, 2007

"December 2007 Landfill Gas Monitoring Results," Aries Engineering, Inc., January 17, 2008

"June 2008 Landfill Gas Monitoring Results," Aries Engineering, Inc., September 29, 2008

"September 2008 Landfill Gas Monitoring Results," Aries Engineering, Inc., October 17, 2008

"December 2008 Landfill Gas Monitoring Results," Aries Engineering, Inc., March 25, 2009

"September 2009 Landfill Gas Monitoring Results," Aries Engineering, Inc., December 8, 2009

"December 2009 Landfill Gas Monitoring Results," Aries Engineering, Inc., February 19, 2010

"June 2010 Landfill Gas Monitoring Results," Aries Engineering, Inc., October 12, 2010

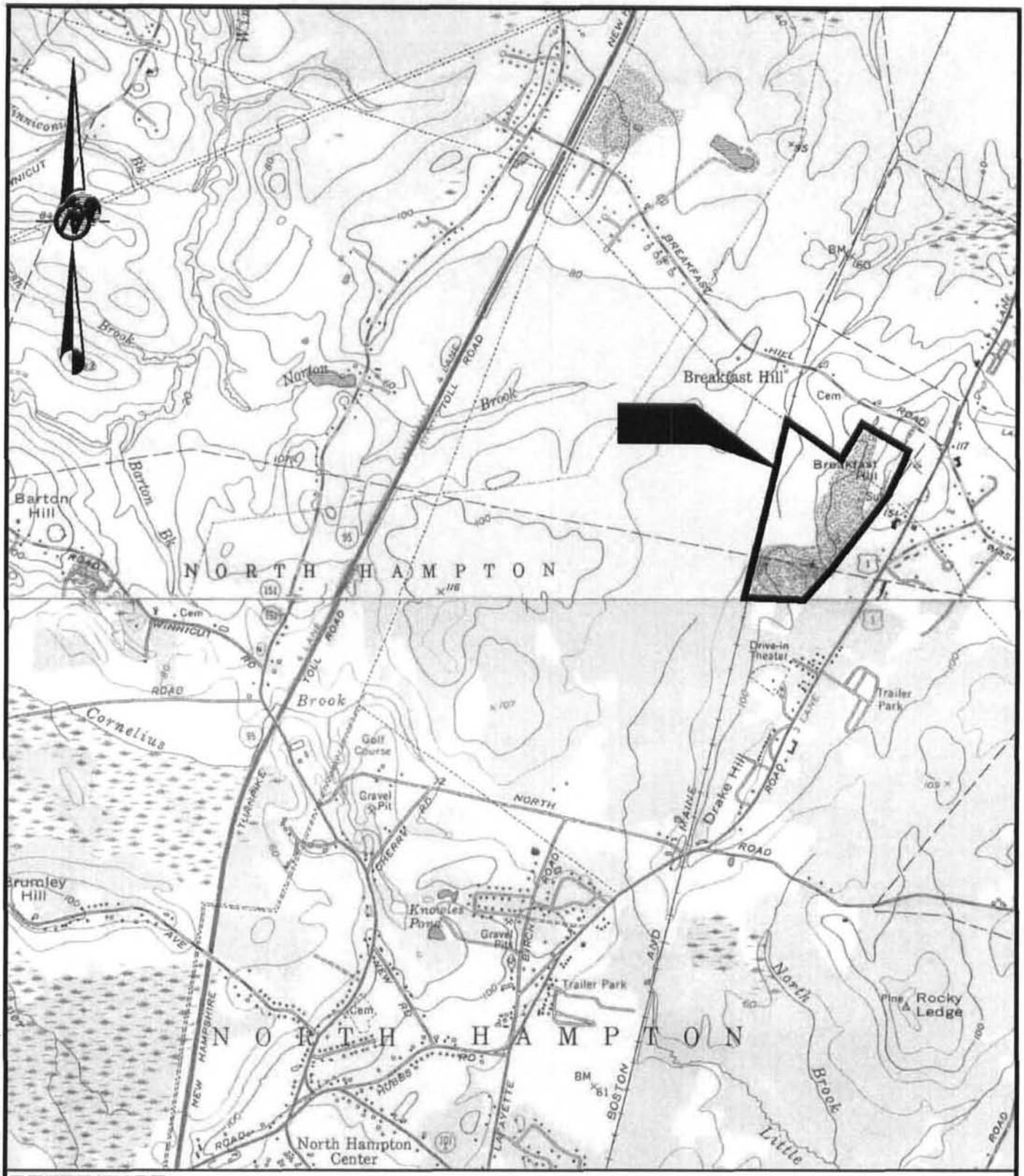
"March 2010 Landfill Gas Monitoring Results," Aries Engineering, Inc., June 21, 2010

"September 2010 Landfill Gas Monitoring Results," Aries Engineering, Inc., October 26, 2010

"February 2011 Landfill Gas Monitoring Results," Aries Engineering, Inc., February 17, 2011

"March 2011 Landfill Gas Monitoring Results," Aries Engineering, Inc., May 19, 2011

APPENDIX B – SITE MAP, SITE PLAN, AND GROUNDWATER ELEVATION CONTOUR MAPS



REFERENCE

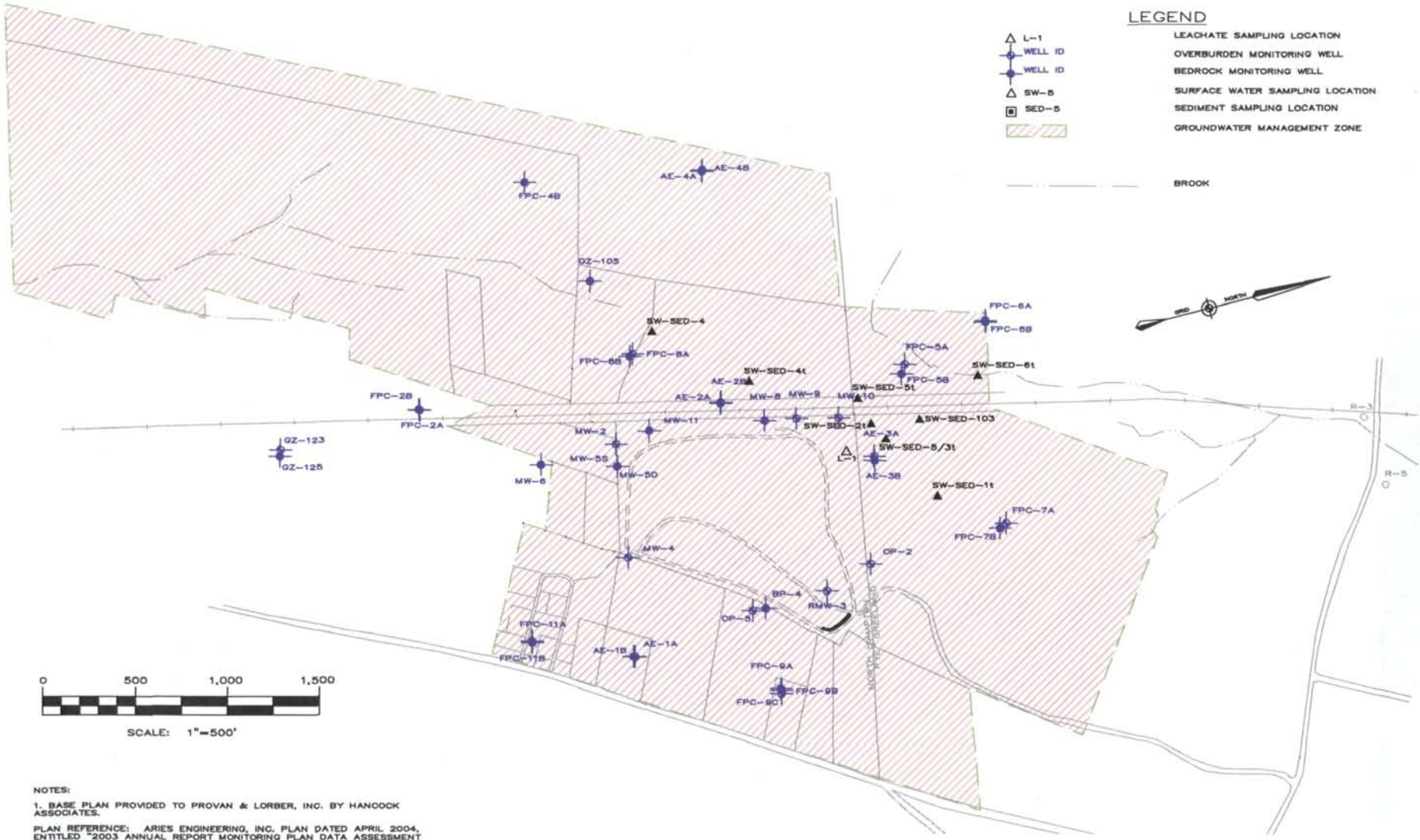
1.) USGS MAP TITLED "HAMPTON, NH", 1:24,000 TOPOGRAPHIC QUADRANGLE DATED 1957 PHOTOREVISED 1973.

2000 0 2000
SCALE APPROXIMATE FEET

Golder Associates
BRUNSWICK, MAINE

SCALE	AS SHOWN	TITLE	SITE LOCATION PLAN
DATE	08/16/07		
DESIGN	ERM		
CADD	MPB		
CHECK	APTM		COAKLEY LANDFILL/HAMPTON, NH
REVIEW	APTM		FIGURE 1-1
FILE No.	0636944A002		
PROJECT No.	063-6944 REV. 0		

Drawing file: 0636944A002.dwg Apr 07, 2010 - 2:38pm



NOTES:

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PLAN REFERENCE: ARIES ENGINEERING, INC. PLAN DATED APRIL 2004, ENTITLED "2003 ANNUAL REPORT MONITORING PLAN DATA ASSESSMENT REPORT, COAKLEY LANDFILL, NORTH HAMPTON, NEW HAMPSHIRE, SITE PLAN.

2. ADDITIONAL MONITORING WELL LOCATIONS BASED ON PLAN BY GOLDER ASSOCIATES TITLED "ENVIRONMENTAL MONITORING NETWORK" DATED 08/16/07.

3. SURFACE WATER AND SEDIMENT SAMPLE LOCATIONS BASED ON A SEPTEMBER 2007 PLAN FROM THE CITY OF PORTSMOUTH TITLED "SEDIMENT TOXICITY SAMPLE LOCATIONS".

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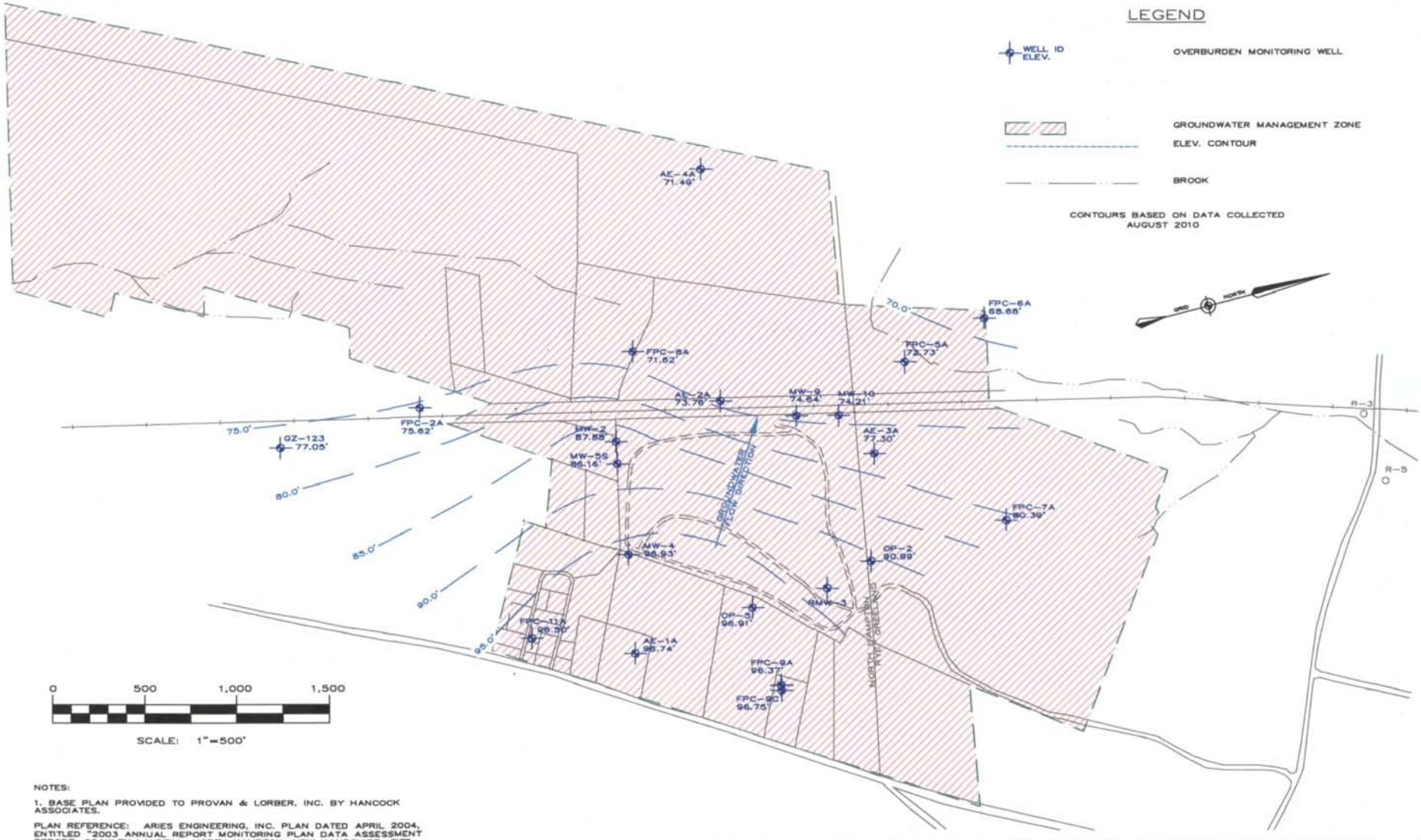
603 444-6501

COAKLEY LANDFILL
NORTH HAMPTON, NH

SITE PLAN

DATE FEBRUARY 2011	
ENG. BY ENG	DRWN. BY DRWN
CHKD.BY KMM	PROJ. NO. P0081

FIGURE 2



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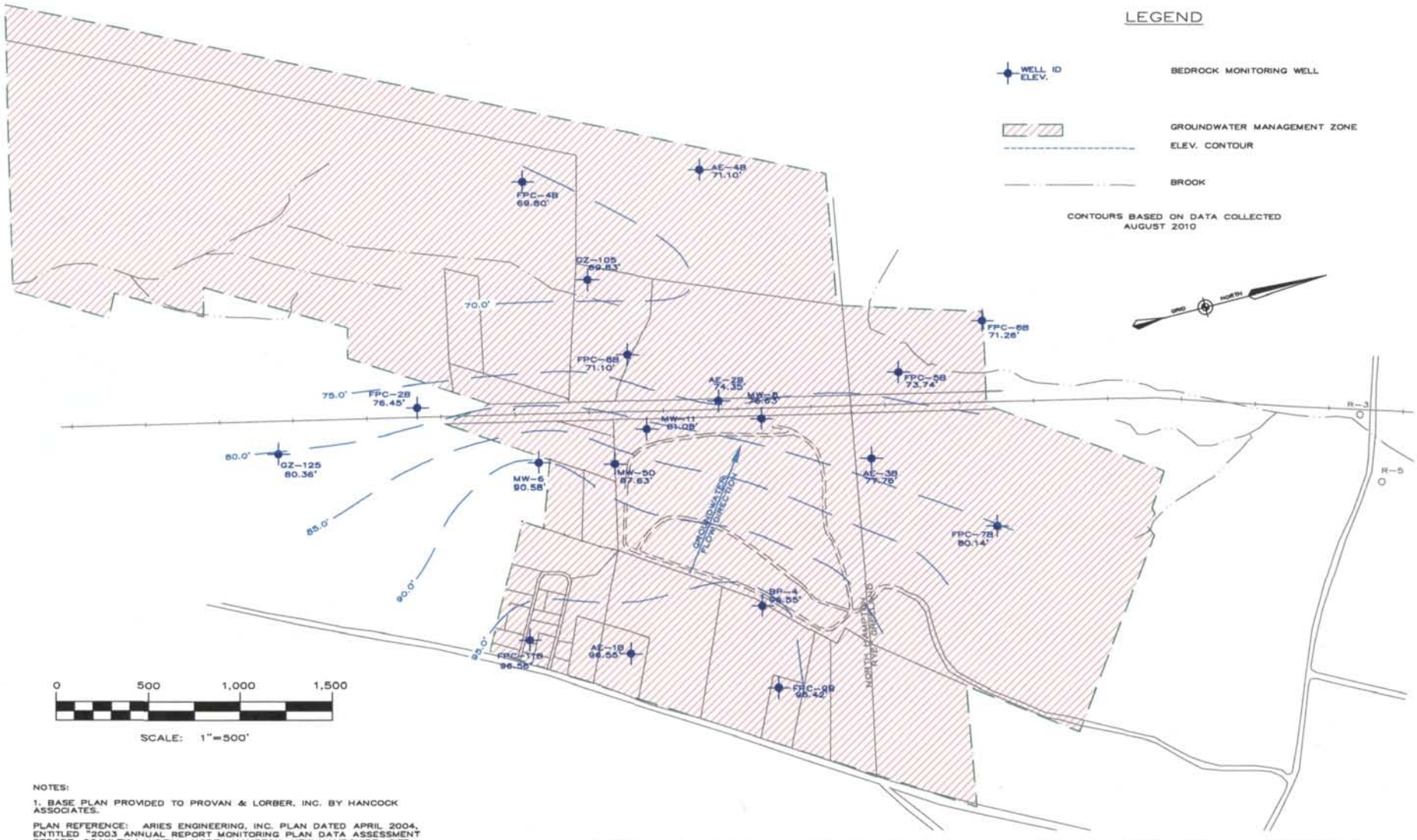
OVERBURDEN GROUNDWATER
ELEVATION CONTOUR MAP
AUGUST 2010

DATE FEBRUARY 2011	
ENG. BY KMM	DRWN. BY DRWN
CHKD.BY KMM	PROJ. NO. P0051

FIGURE 3



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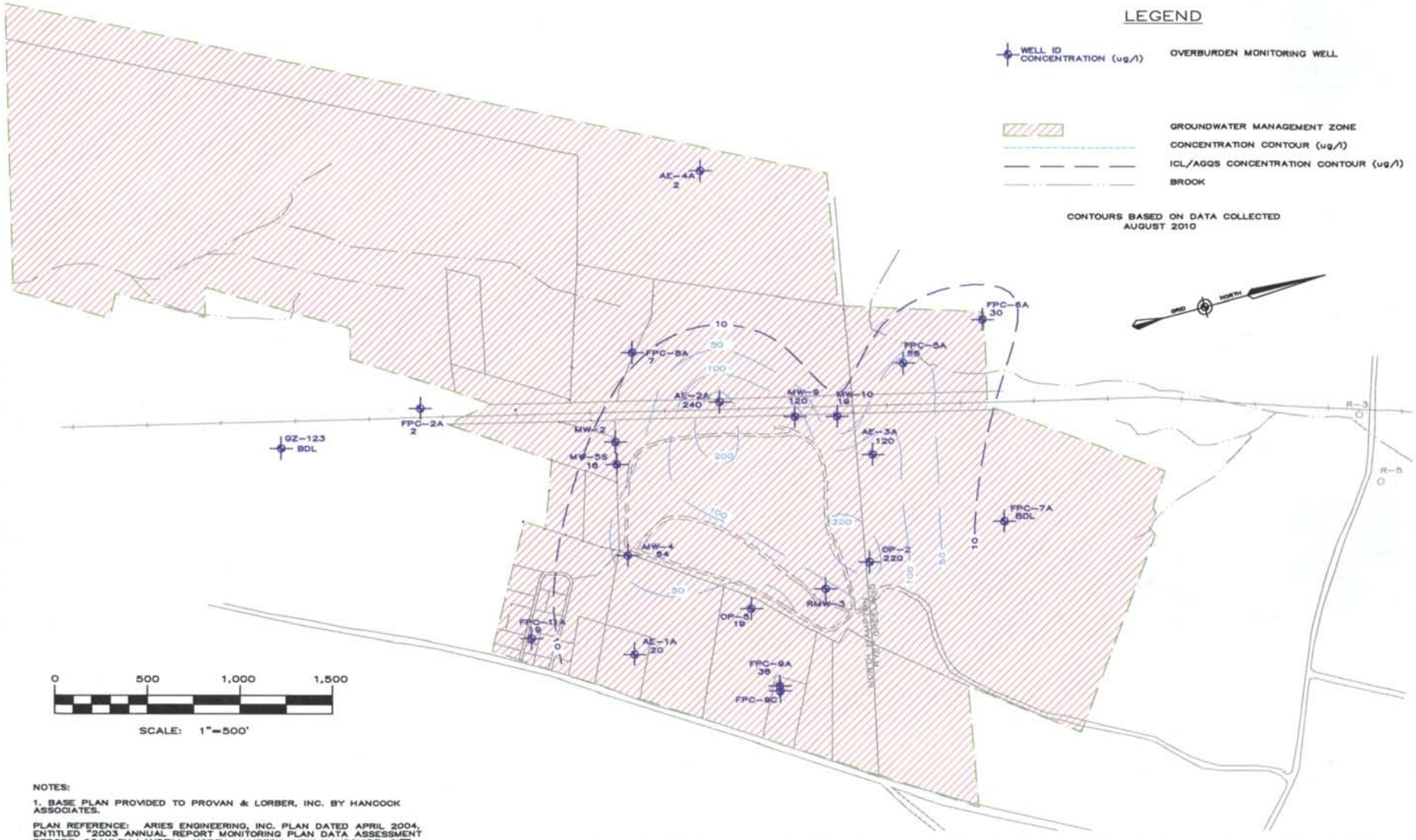
BEDROCK GROUNDWATER ELEVATION CONTOUR MAP
AUGUST 2010

DATE FEBRUARY 2011	
ENG. BY KMM	DRWN. BY DRWN
CHKD.BY KMM	PROJ. NO. P0051

FIGURE 4

APPENDIX C – ANNUAL MONITORING RESULTS



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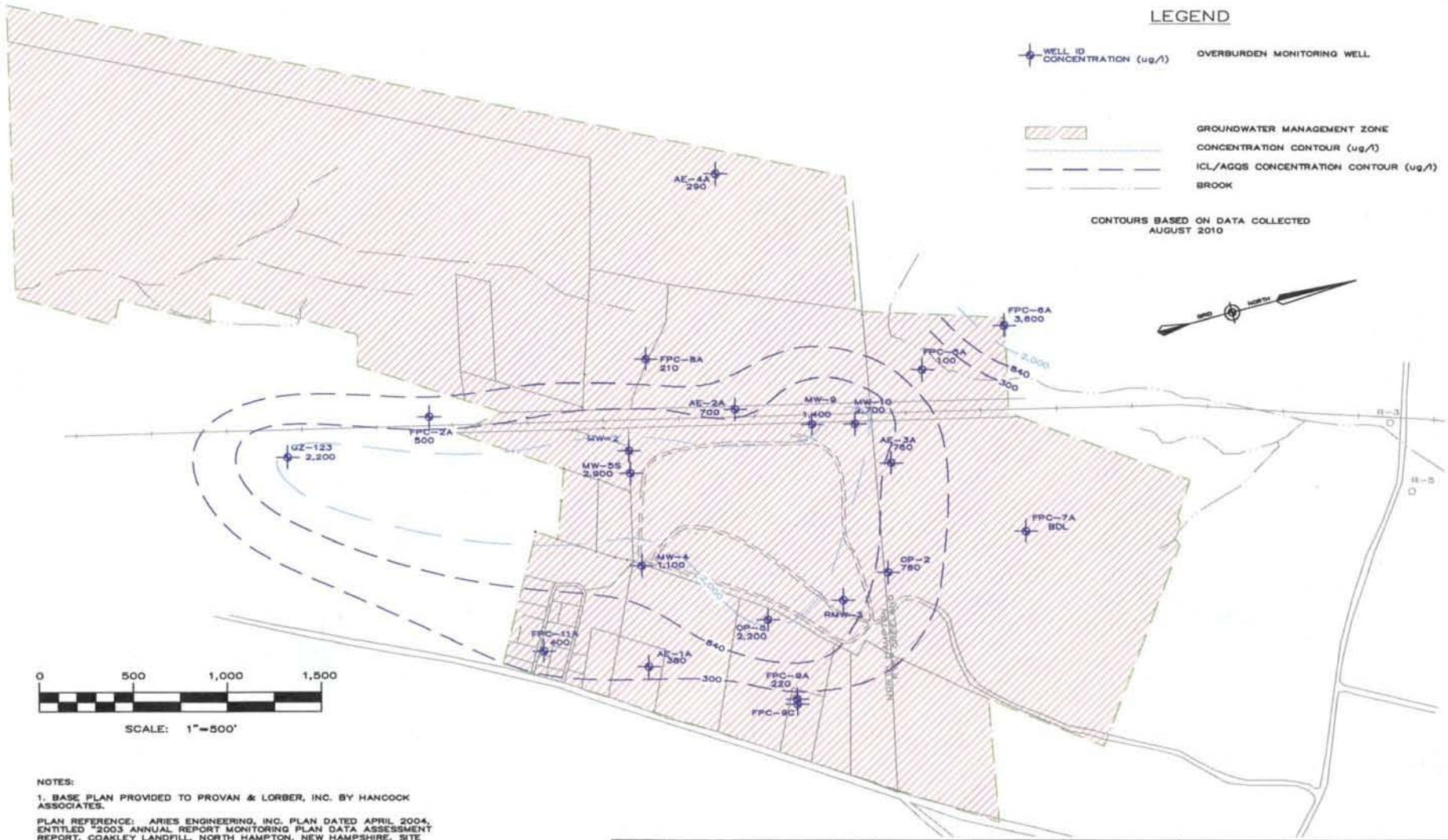
ARSENIC CONCENTRATIONS
OVERBURDEN WELLS
AUGUST 2010

DATE FEBRUARY 2011	
ENG. BY KMM	DRWN. BY DRWN
CHKD.BY KMM	PROJ. NO. P0081

FIGURE 5



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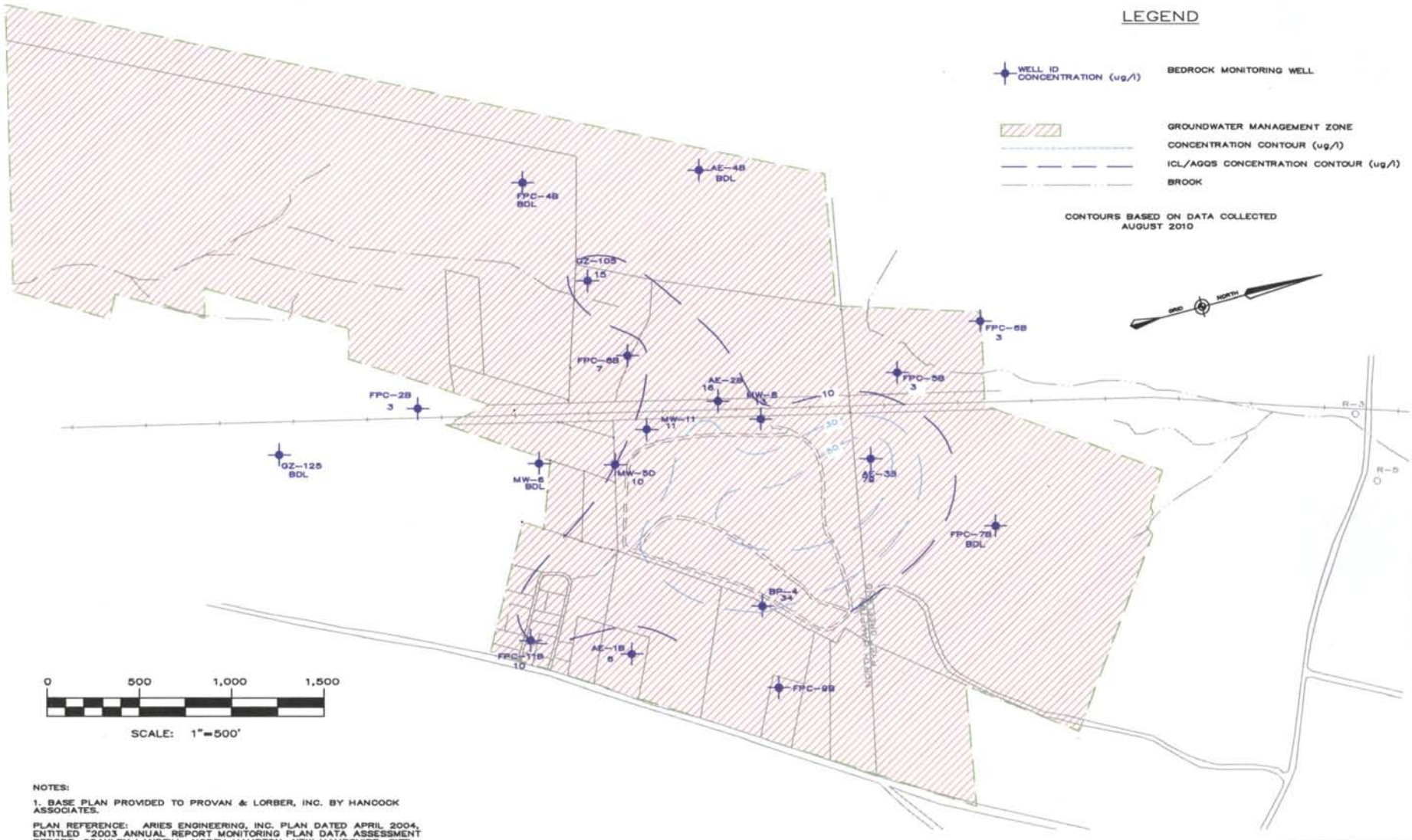
MANGANESE CONCENTRATIONS
OVERBURDEN WELLS
AUGUST 2010

DATE FEBRUARY 2011	
ENG. BY KMM	DRWN. BY DRWN
CHKD.BY KMM	PROJ. NO. P0051

FIGURE 6



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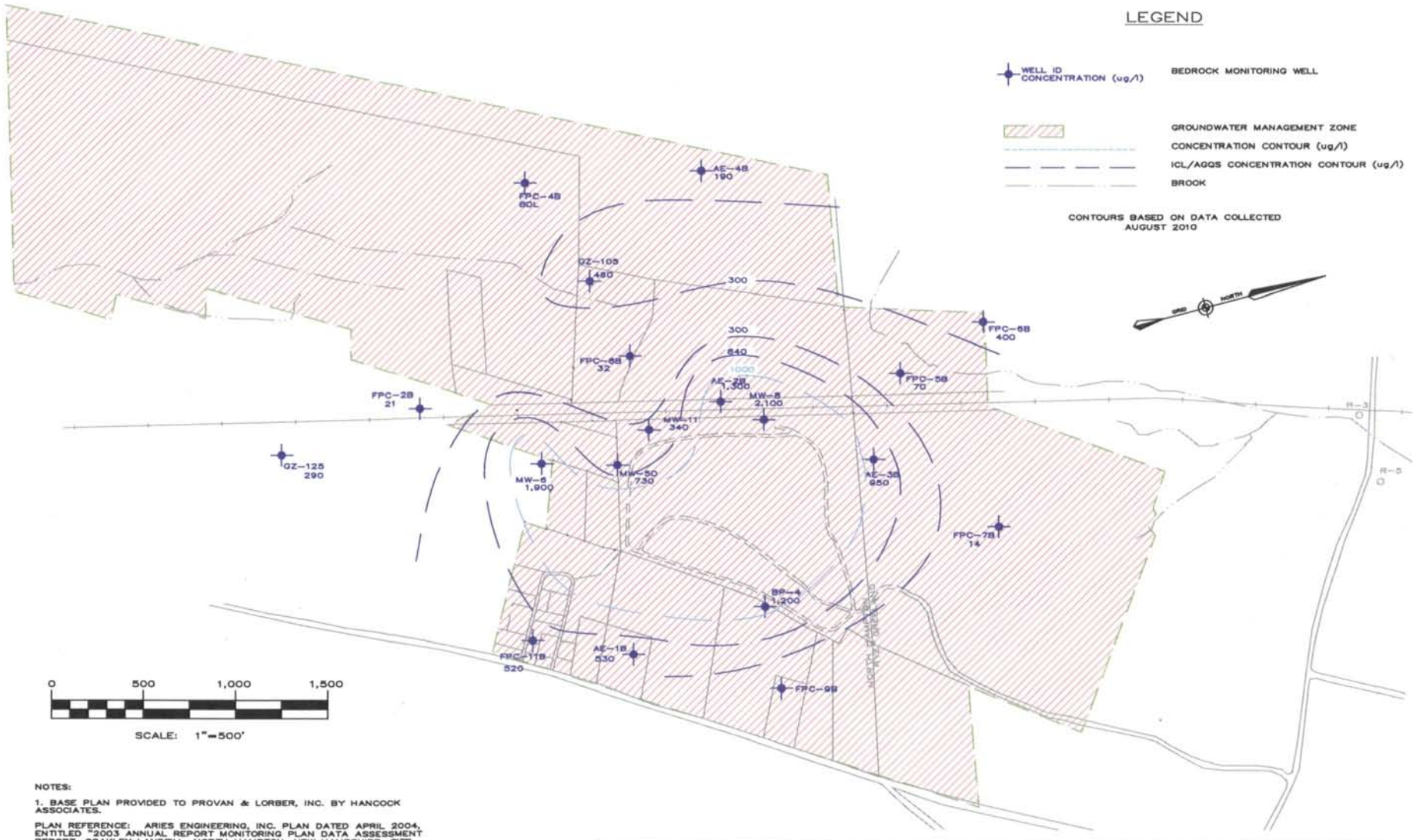
BEDROCK WELLS
AUGUST 2010

DATE FEBRUARY 2011	
ENG. BY KMM	DRWN. BY DRWN
CHKD.BY KMM	PROJ. NO. P0081
FIGURE 7	



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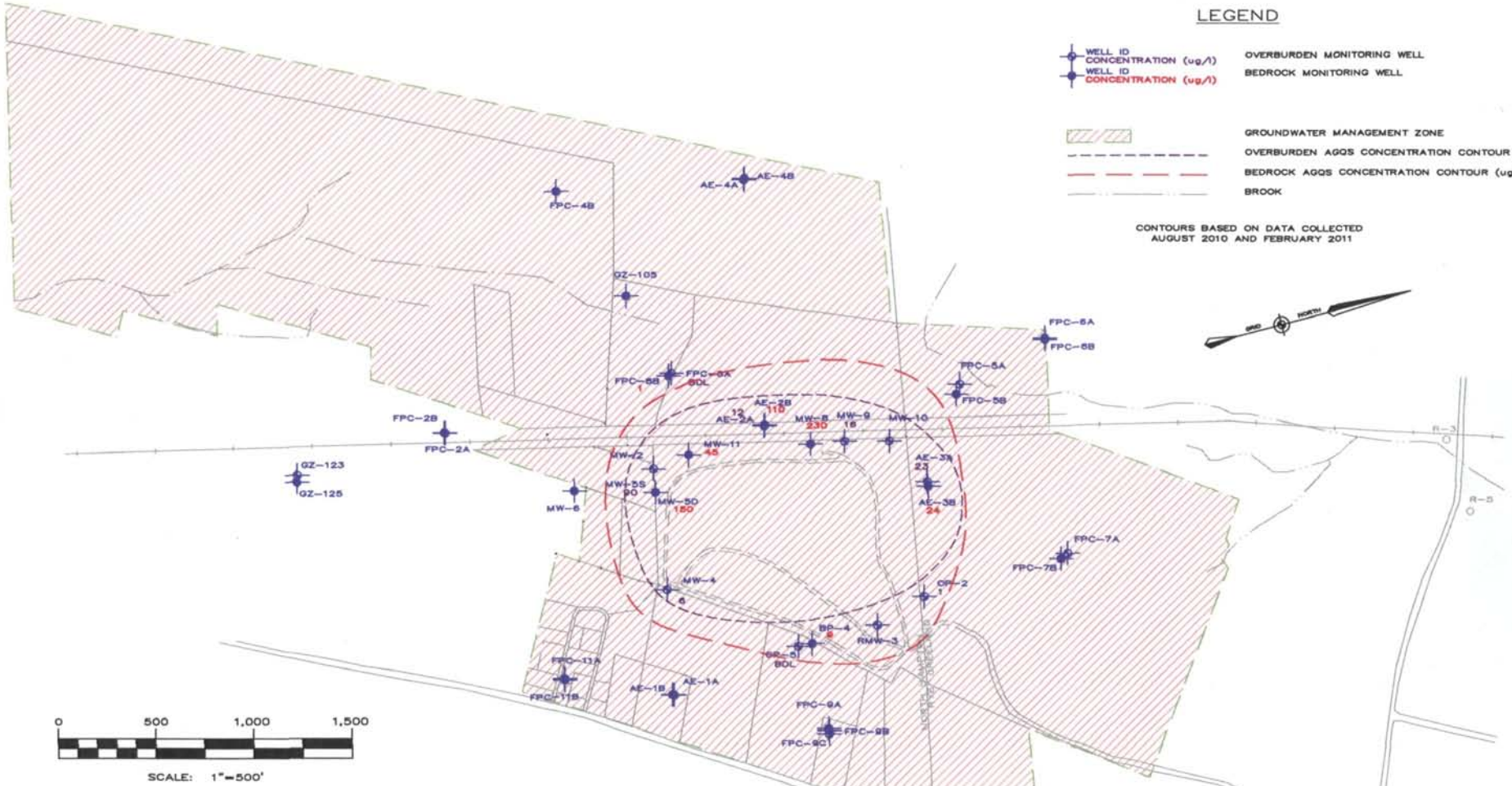
MANGANESE CONCENTRATIONS
BEDROCK WELLS
AUGUST 2010

DATE FEBRUARY 2011	
ENG. BY KMM	DRWN. BY DRWN
CHKD.BY KMM	PROJ. NO. P0081

FIGURE 8



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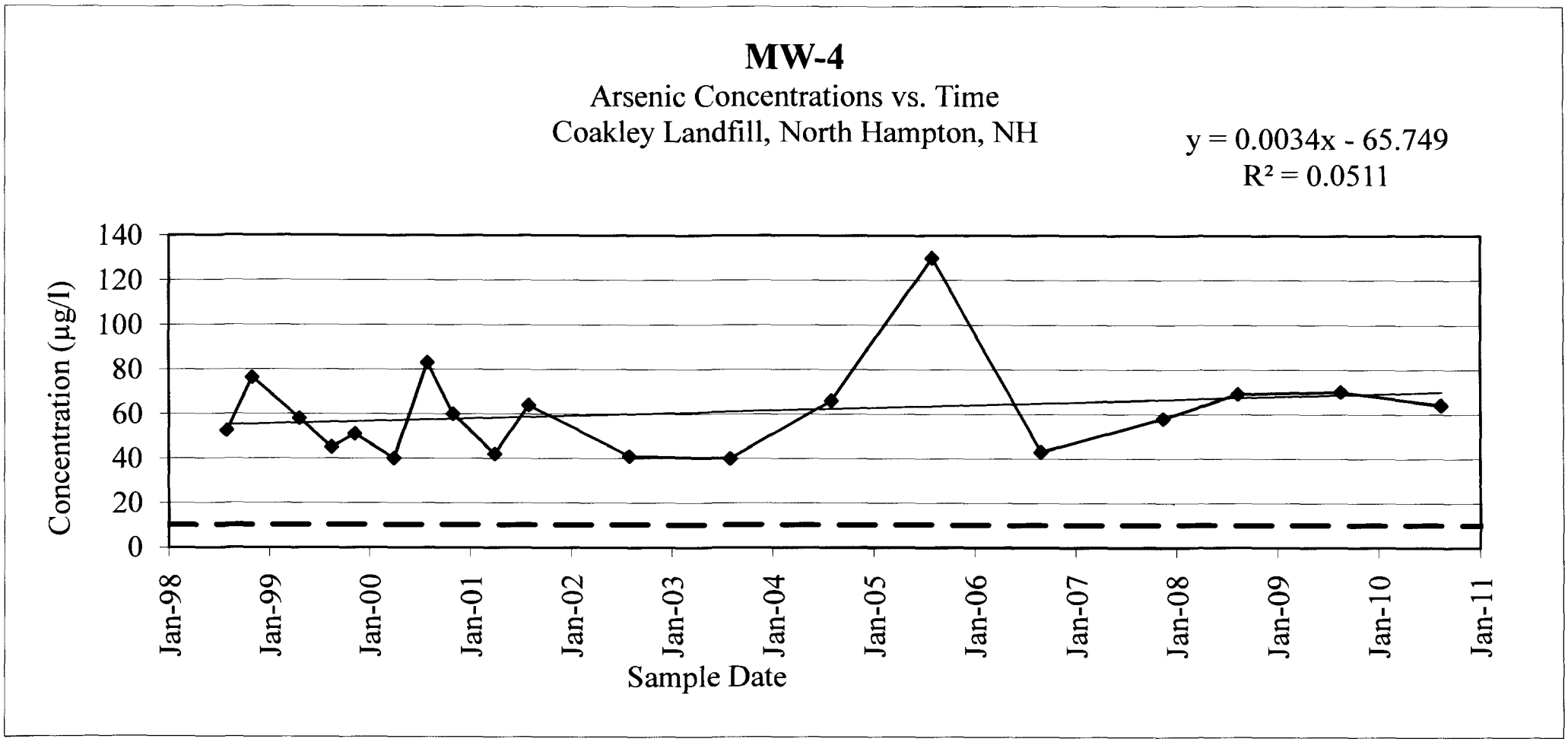
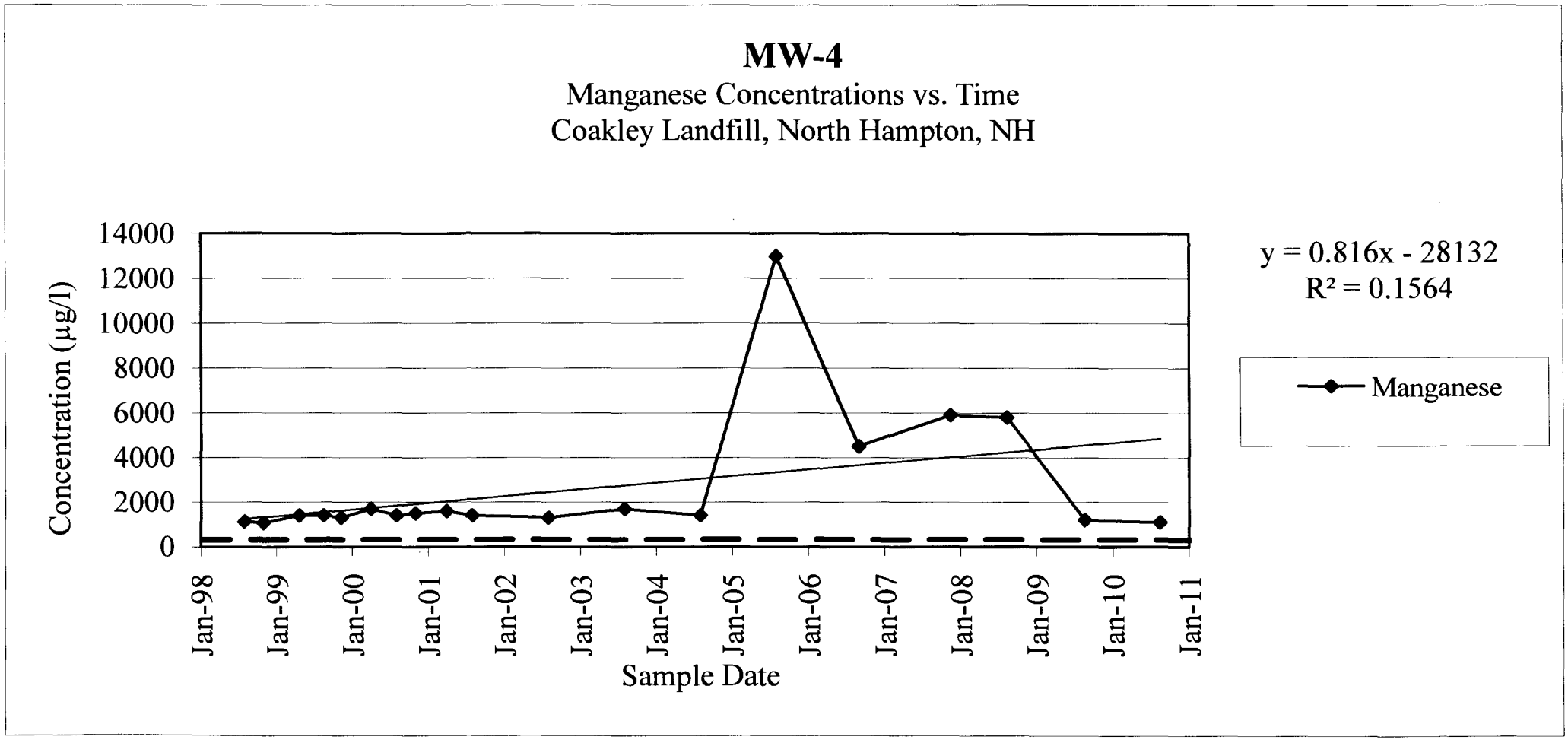
NORTH HAMPTON, NH

1,4-DIOXANE CONCENTRATIONS
OVERBURDEN & BEDROCK WELLS
AUGUST 2010

DATE FEBRUARY 2011	
ENG. BY KMM	DRWN. BY DRWN
CHKD.BY KMM	PROJ. NO. P0061

FIGURE 9


MW-4
Arsenic Concentrations vs. Time
Coakley Landfill, North Hampton, NH
y = 0.0034x - 65.749
R² = 0.0511
Concentration (µg/l)
140
120
100
80
60
40
20
0
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Sample Date


MW-4
Manganese Concentrations vs. Time
Coakley Landfill, North Hampton, NH
Concentration (µg/l)
14000
12000
10000
8000
6000
4000
2000
0
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Sample Date
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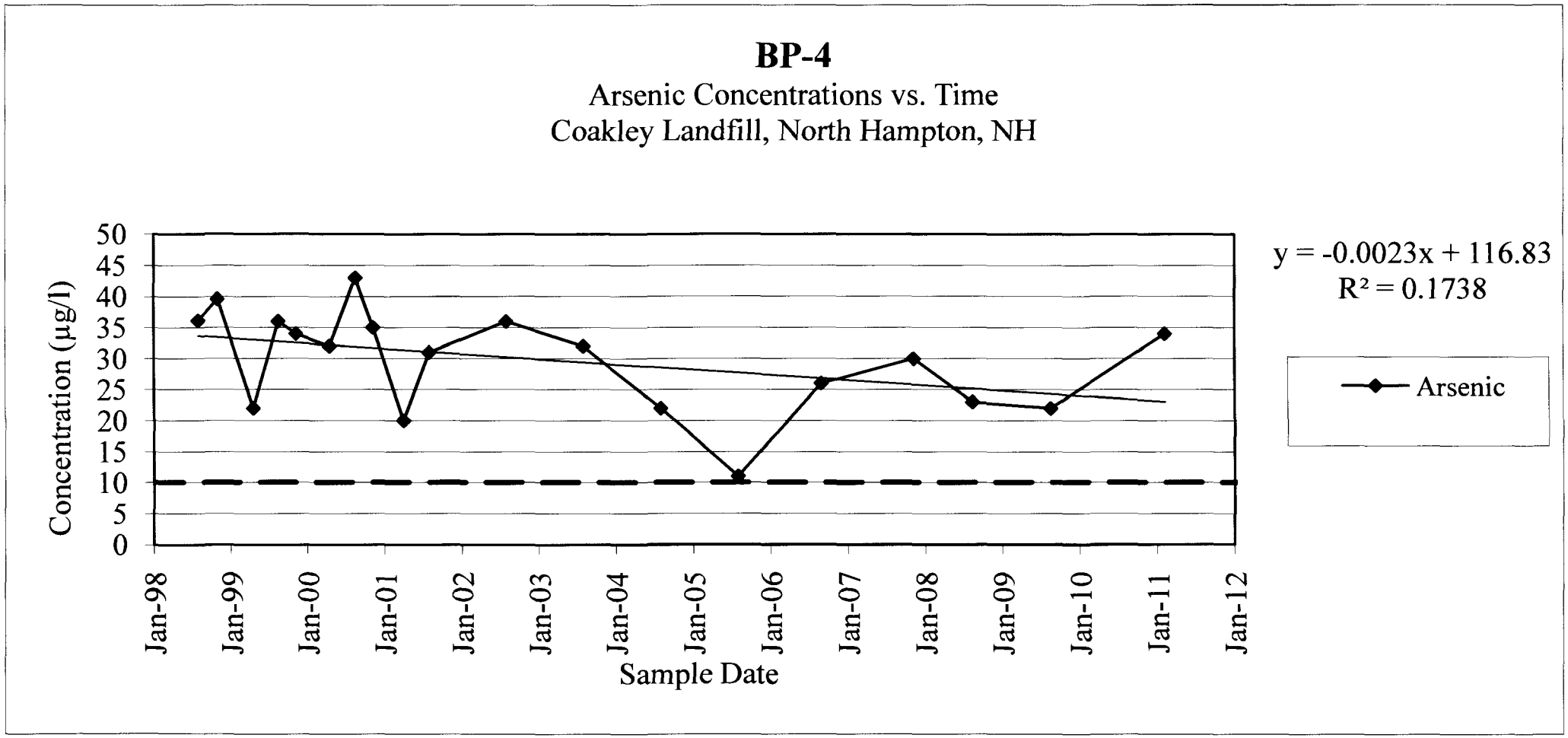
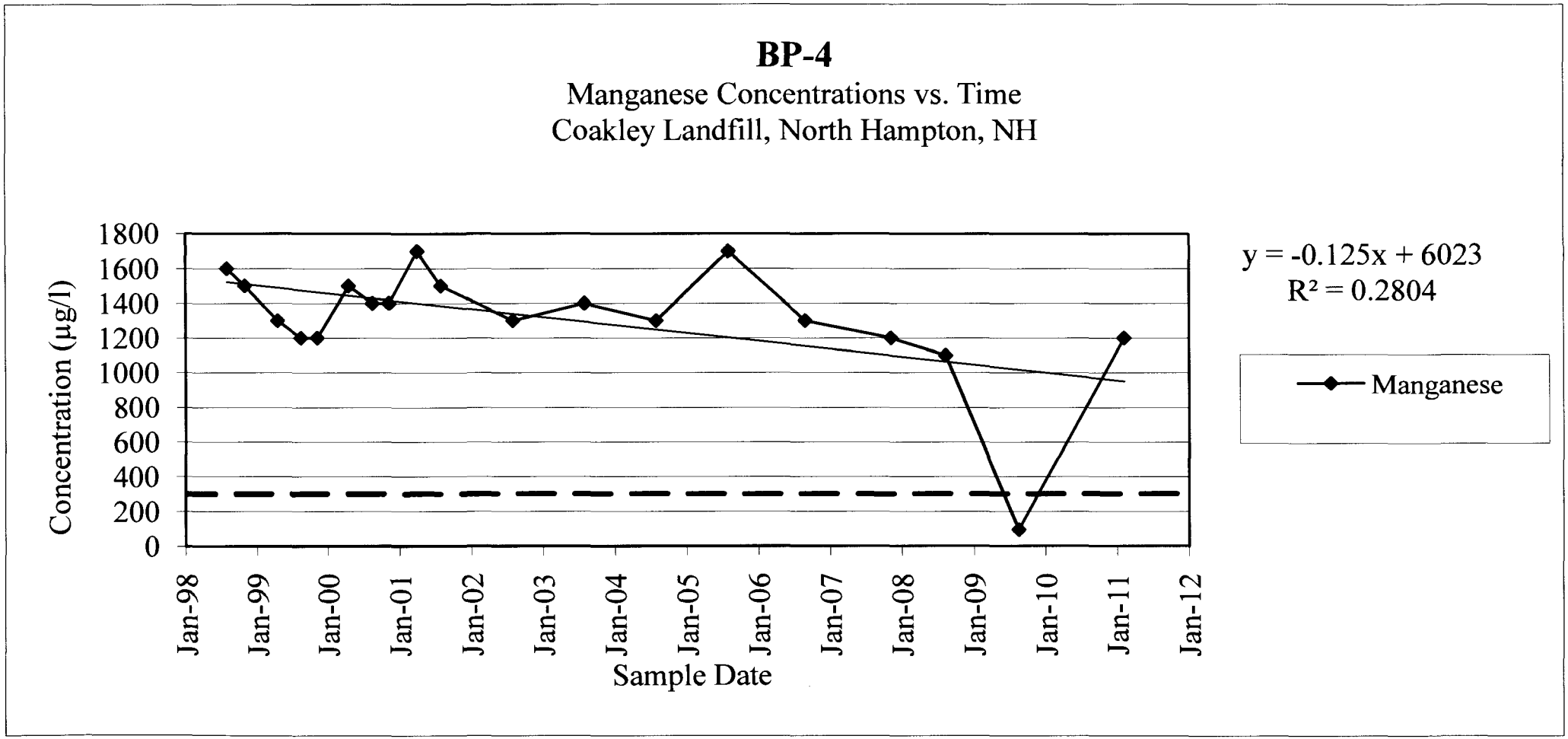
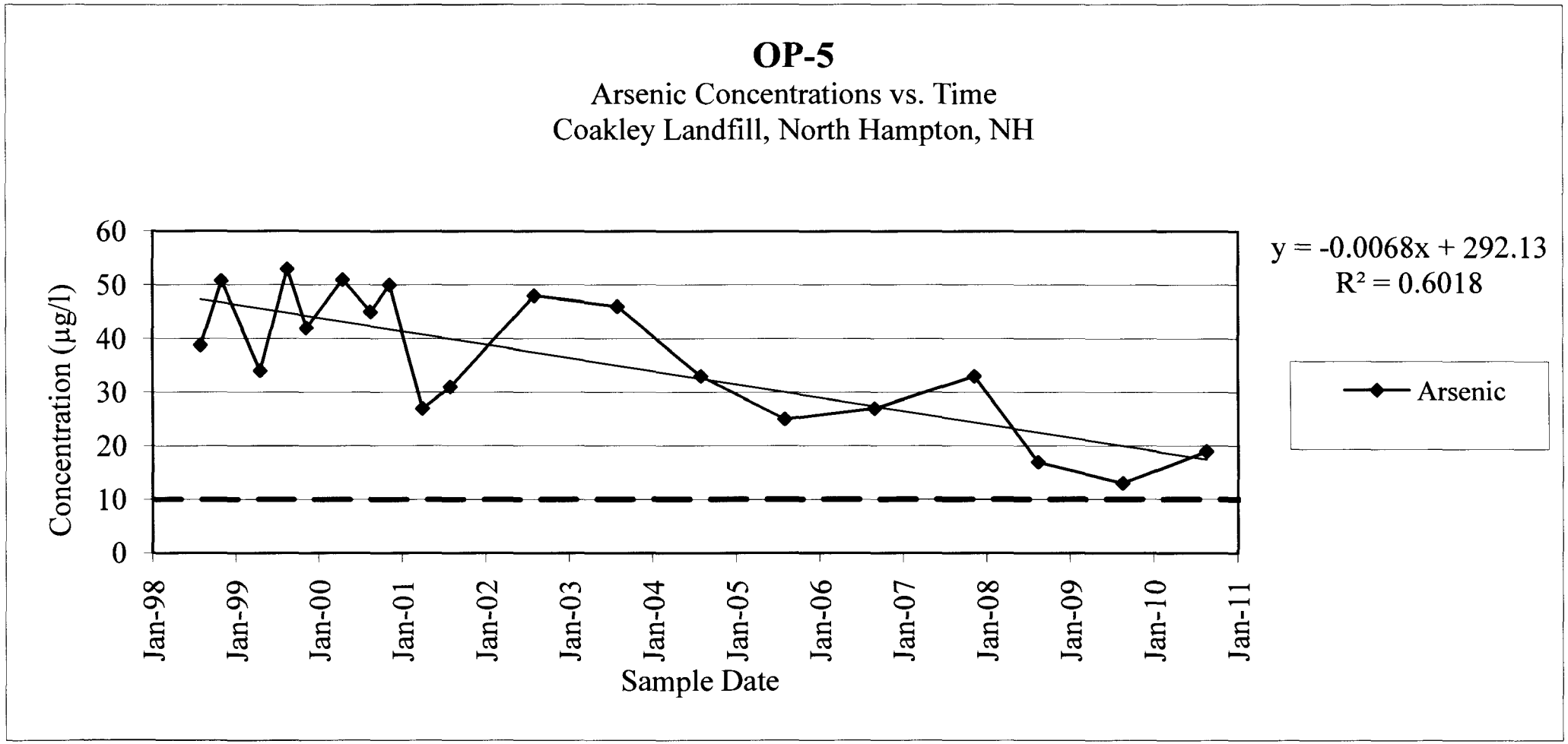
R² = 0.1564
Manganese


BP-4
Arsenic Concentrations vs. Time
Coakley Landfill, North Hampton, NH
Concentration (µg/l)
50
45
40
35
30
25
20
15
10
5
0
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Sample Date
y = -0.0023x + 116.83
R² = 0.1738
Arsenic


BP-4
Manganese Concentrations vs. Time
Coakley Landfill, North Hampton, NH
Concentration (µg/l)
1800
1600
1400
1200
1000
800
600
400
200
0
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Sample Date
y = -0.125x + 6023
R² = 0.2804
Manganese


OP-5
Arsenic Concentrations vs. Time
Coakley Landfill, North Hampton, NH
Concentration (µg/l)
60
50
40
30
20
10
0
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Sample Date
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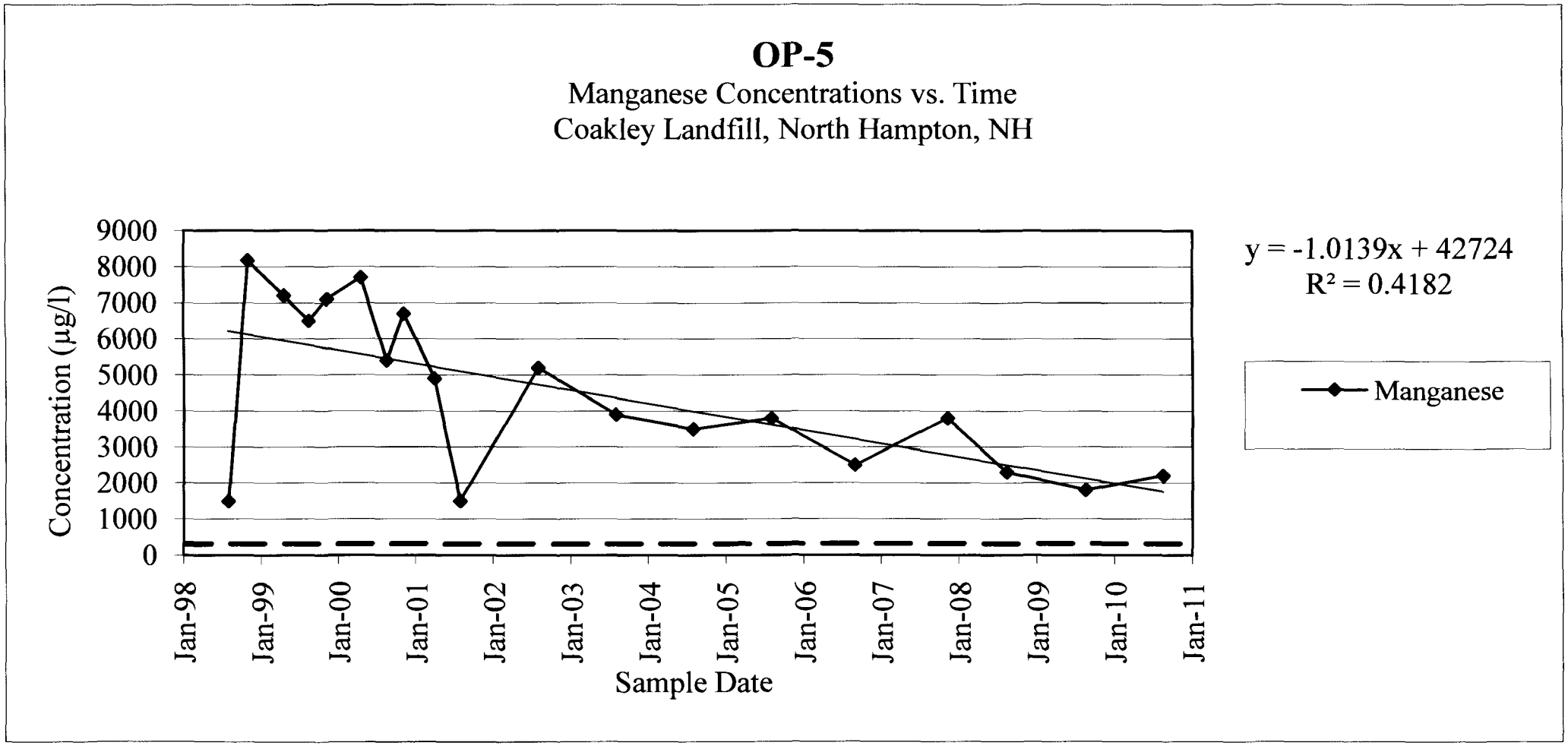
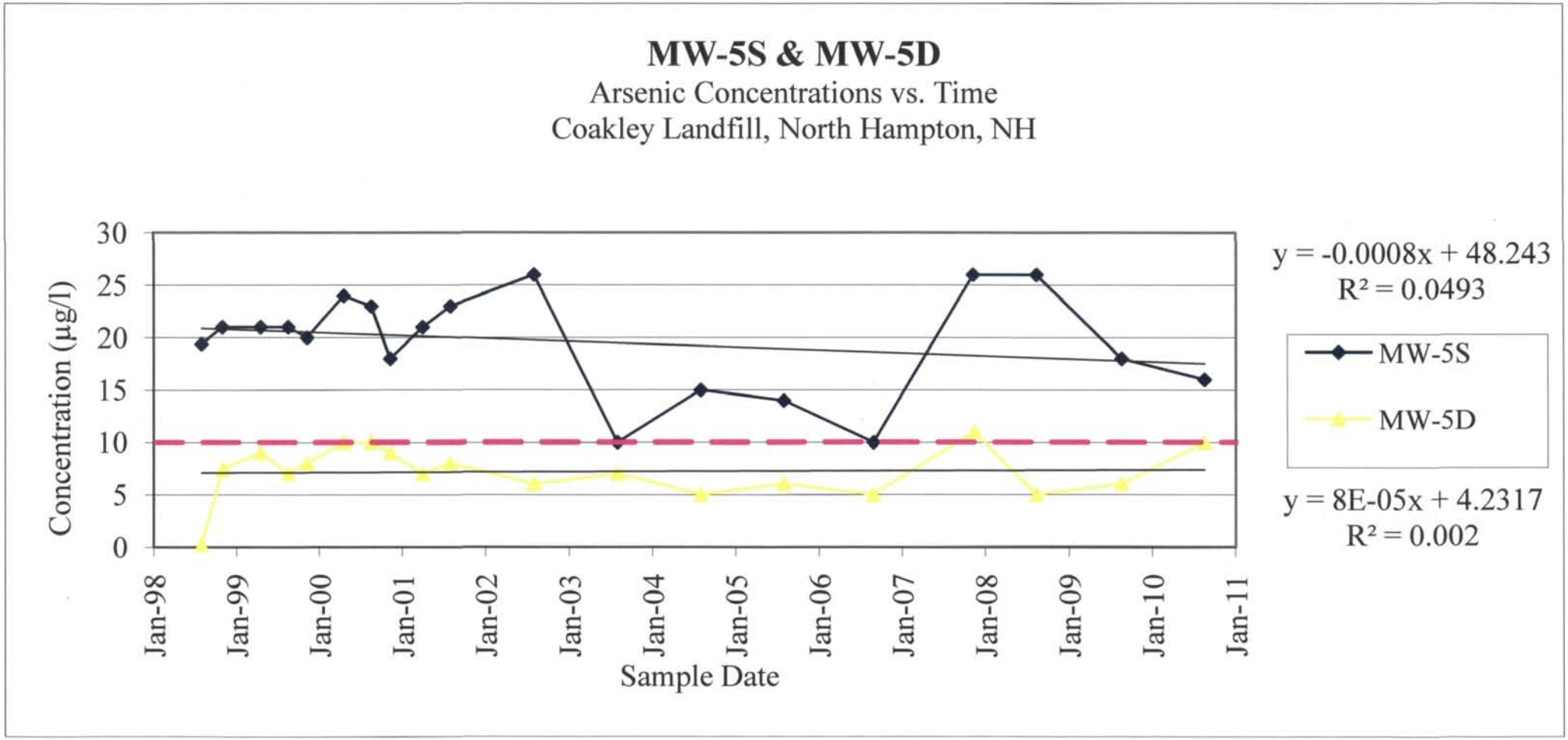
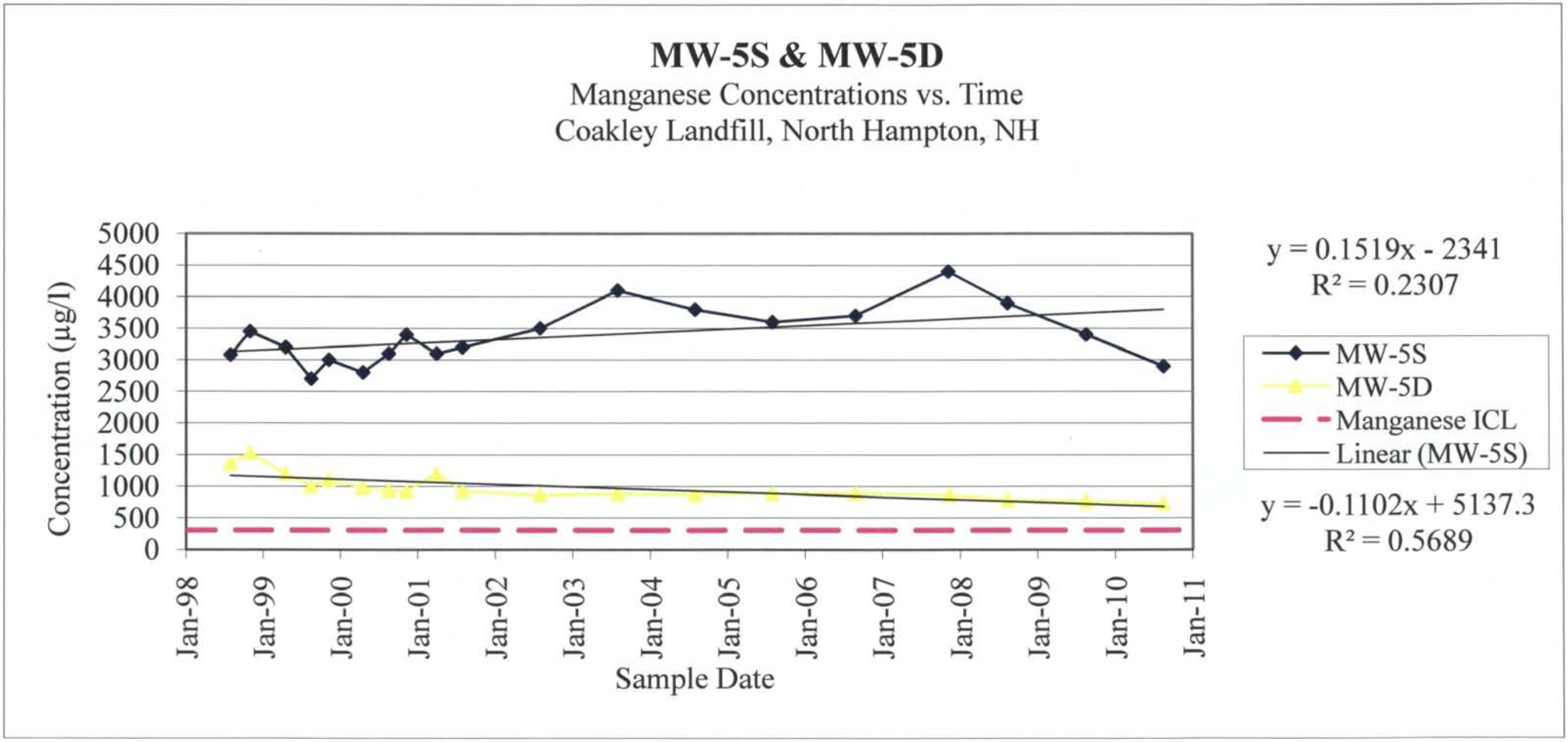
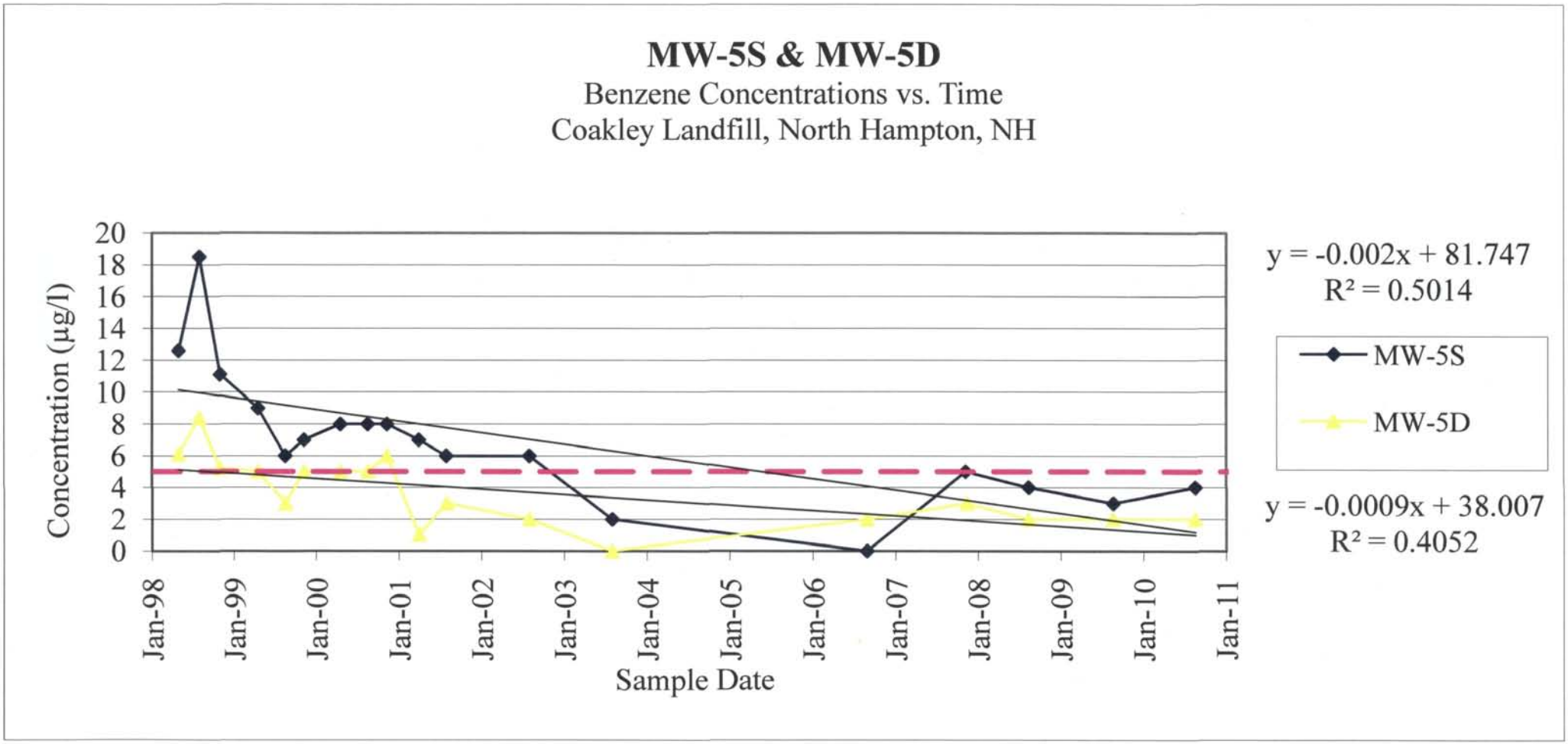
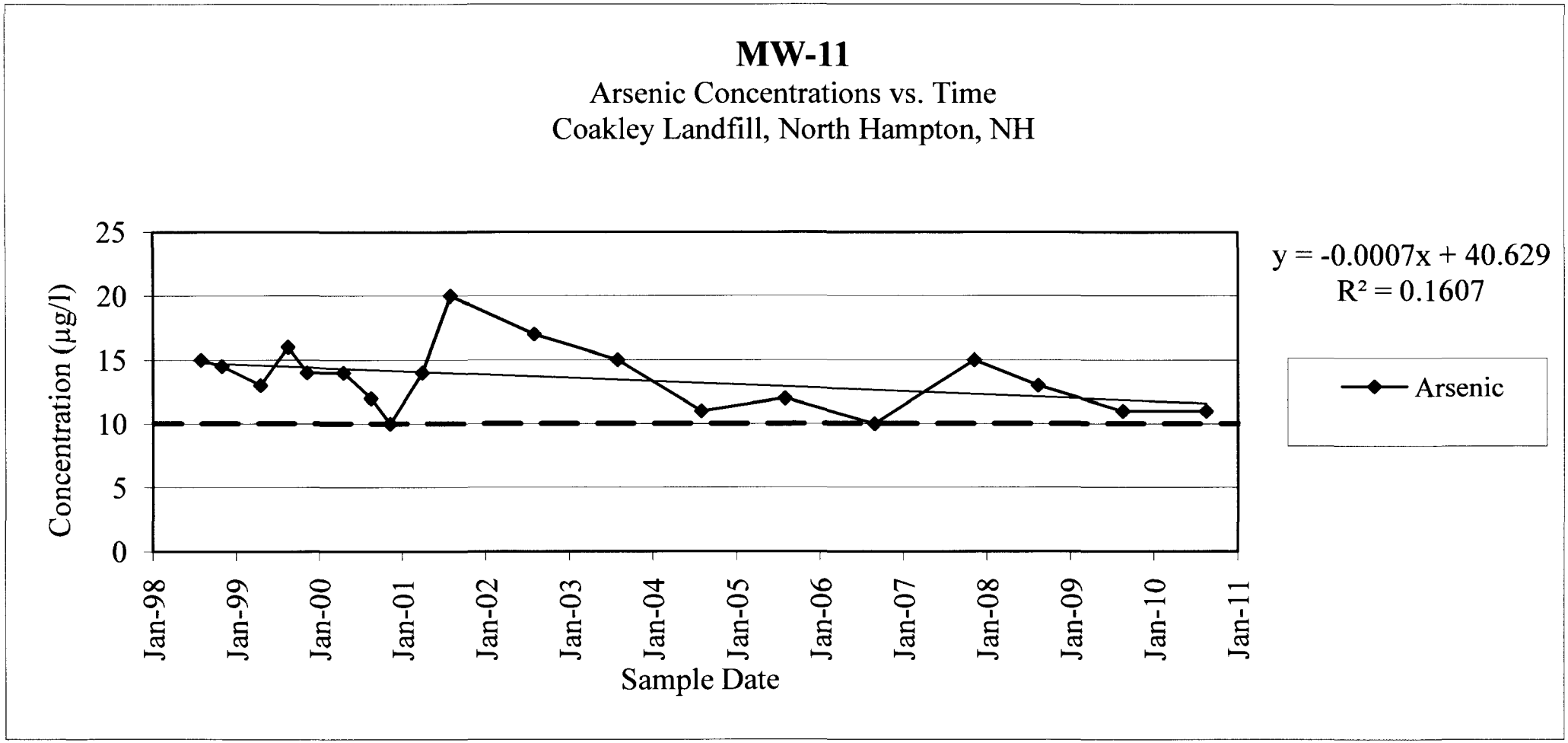
R² = 0.6018
Arsenic

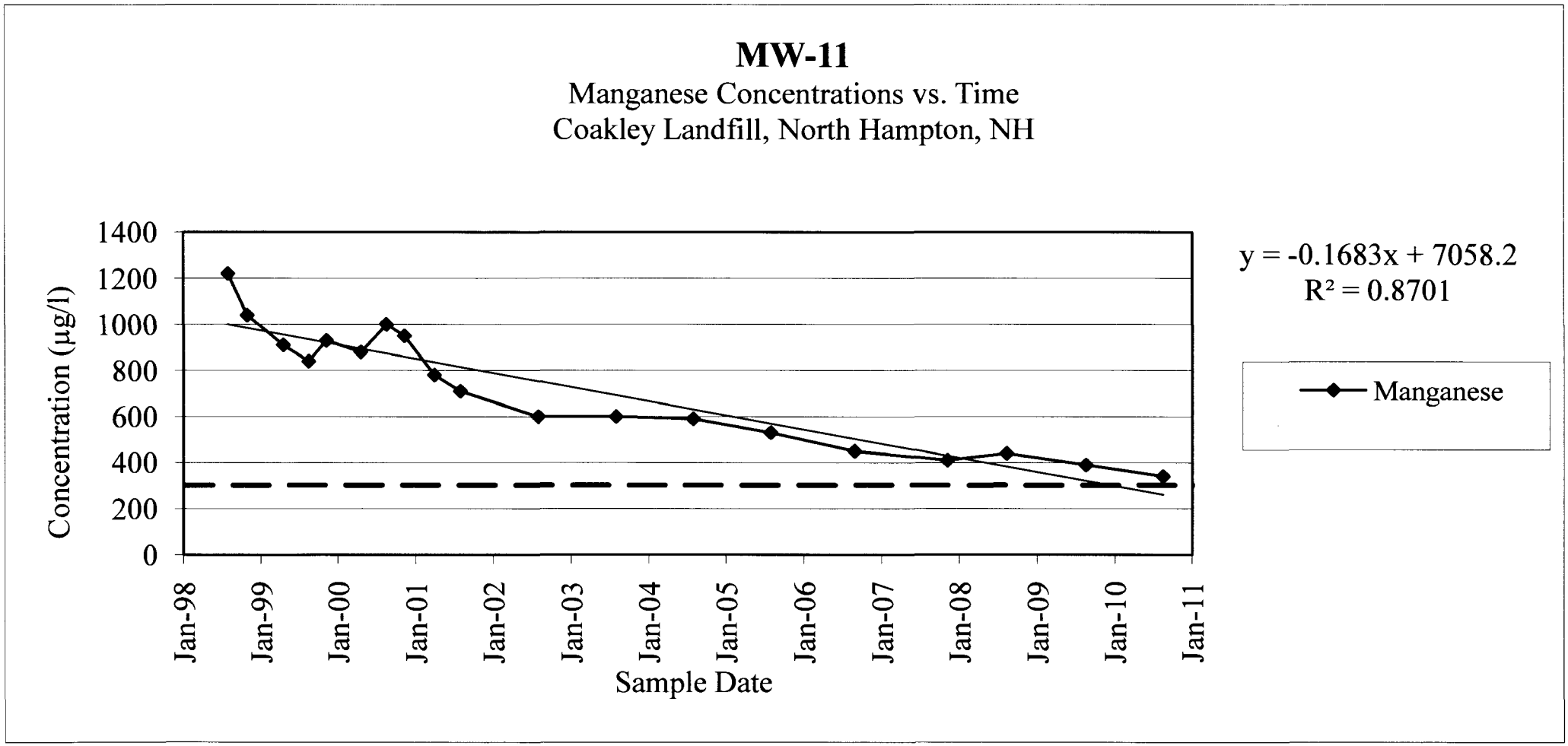

OP-5
Manganese Concentrations vs. Time
Coakley Landfill, North Hampton, NH
Concentration (µg/l)
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Sample Date
y = -1.0139x + 42724
R² = 0.4182
Manganese

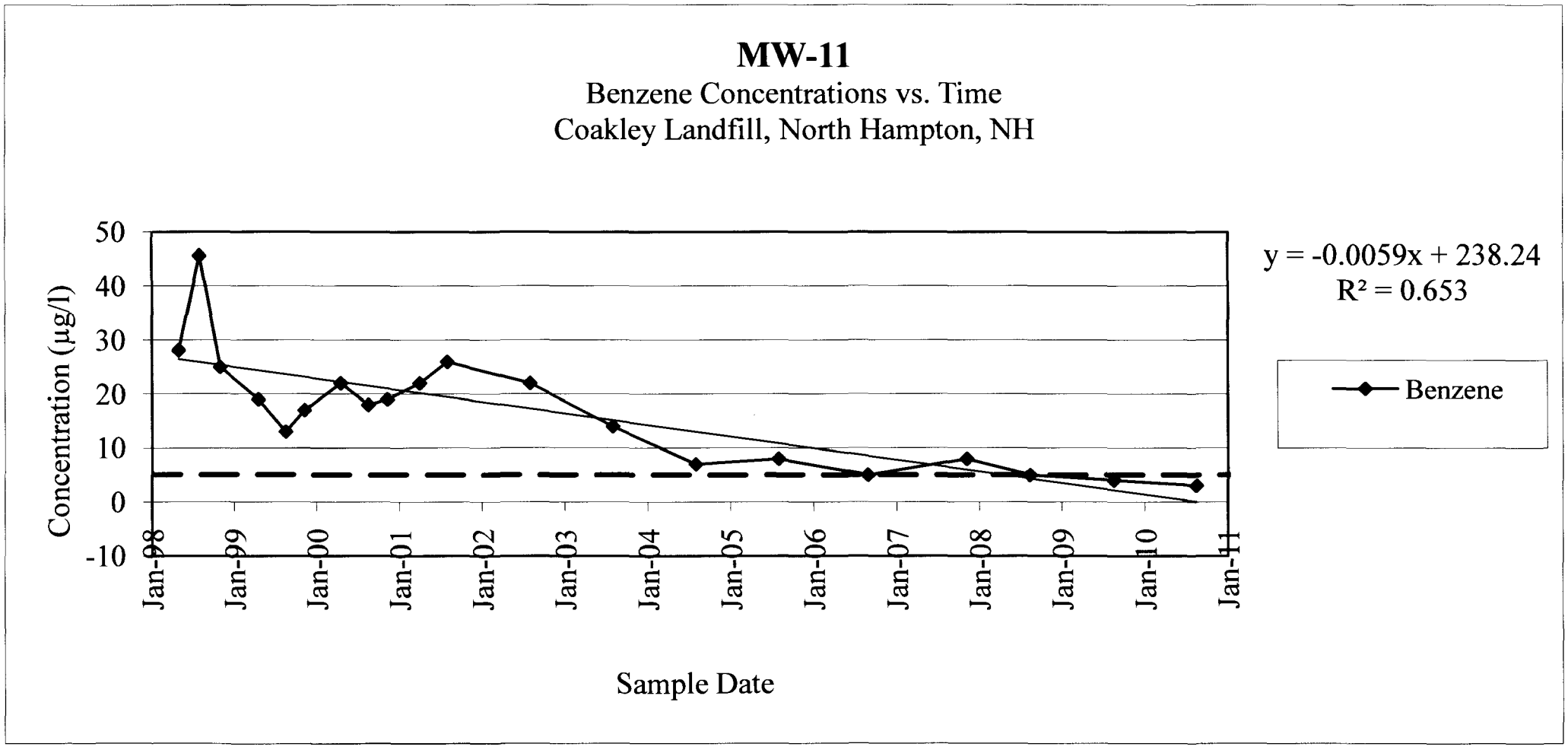

MW-5S & MW-5D
Arsenic Concentrations vs. Time
Coakley Landfill, North Hampton, NH
Concentration (µg/l)
30
25
20
15
10
5
0
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Sample Date
y = -0.0008x + 48.243
R² = 0.0493
MW-5S
MW-5D
y = 8E-05x + 4.2317
R² = 0.002

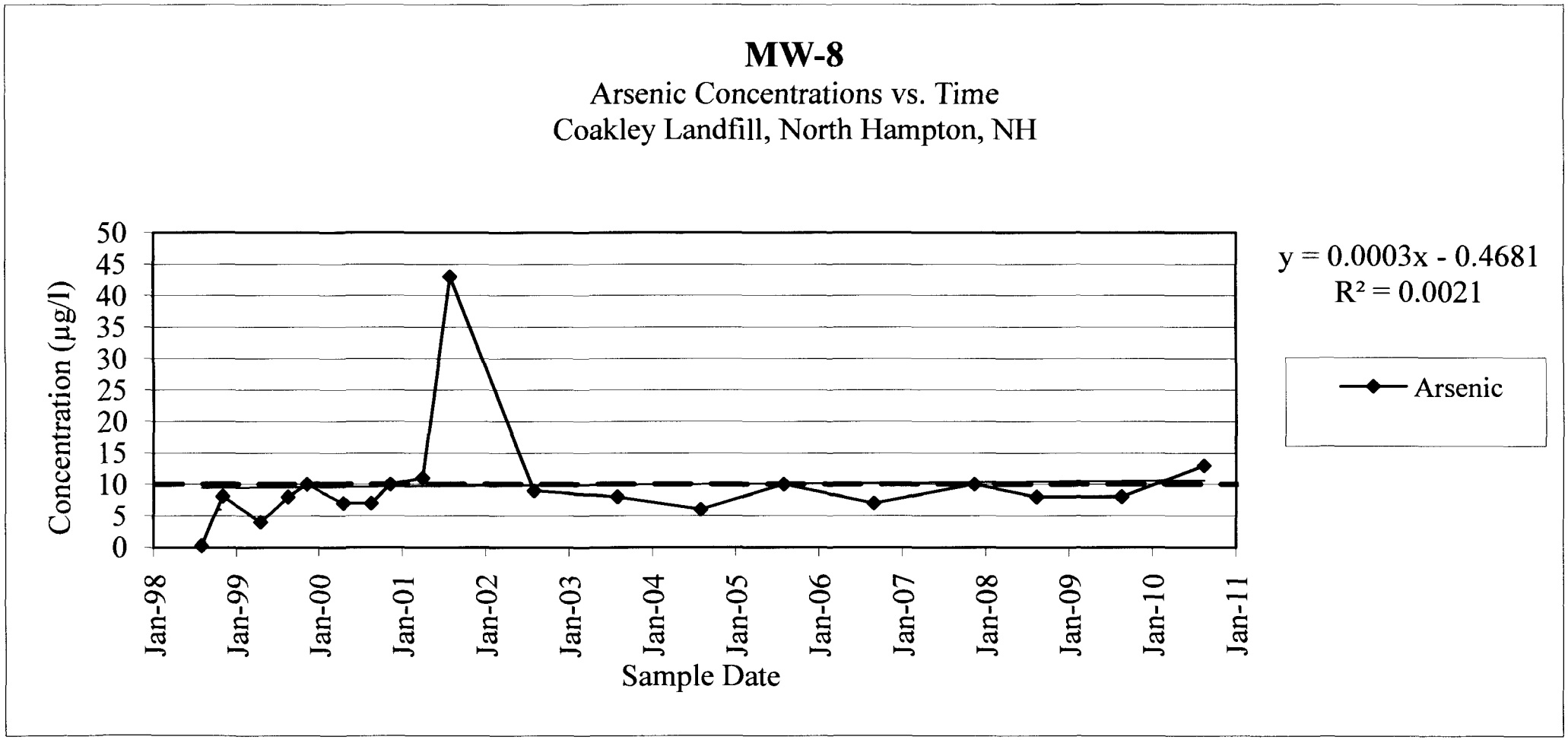

MW-5S & MW-5D
Manganese Concentrations vs. Time
Coakley Landfill, North Hampton, NH
Concentration (µg/l)
5000
4500
4000
3500
3000
2500
2000
1500
1000
500
0
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Sample Date
y = 0.1519x - 2341
R² = 0.2307
MW-5S
MW-5D
Manganese ICL
Linear (MW-5S)
y = -0.1102x + 5137.3
R² = 0.5689

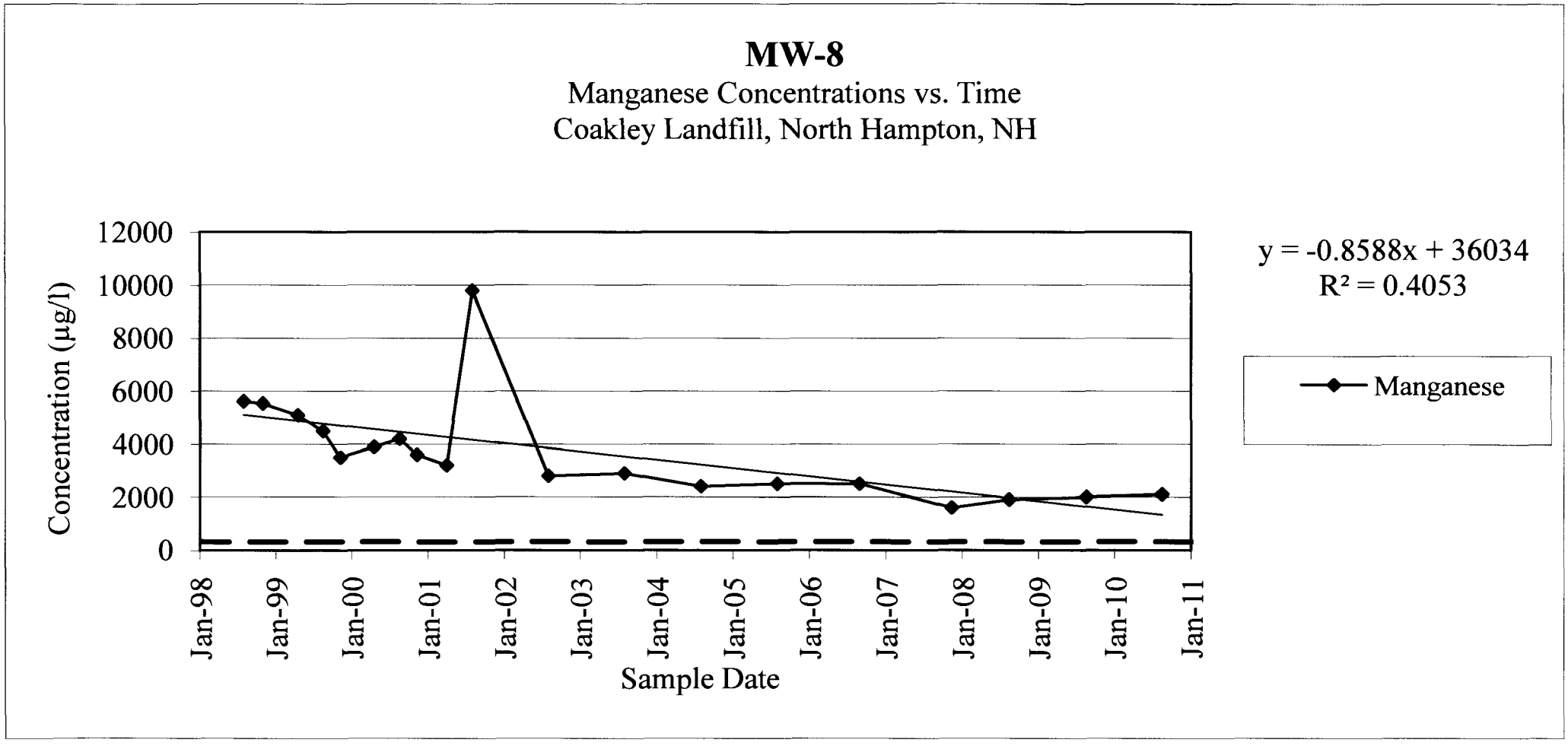

MW-5S & MW-5D
Benzene Concentrations vs. Time
Coakley Landfill, North Hampton, NH
Concentration (µg/l)
20
18
16
14
12
10
8
6
4
2
0
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Sample Date
y = -0.002x + 81.747
R² = 0.5014
MW-5S
MW-5D
y = -0.0009x + 38.007
R² = 0.4052

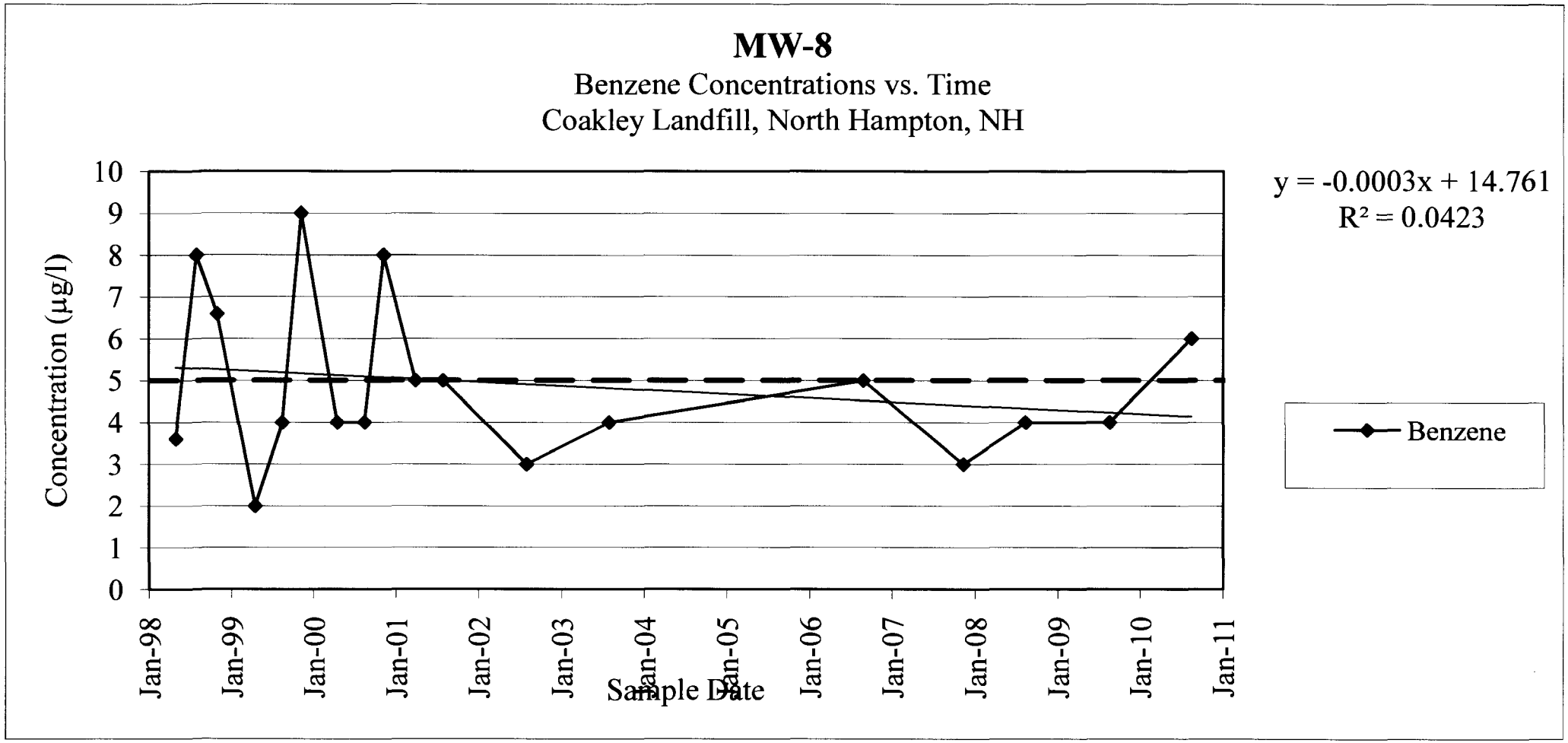

MW-11
Arsenic Concentrations vs. Time
Coakley Landfill, North Hampton, NH
Concentration (µg/l)
25
20
15
10
5
0
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Sample Date
y = -0.0007x + 40.629
R² = 0.1607
Arsenic

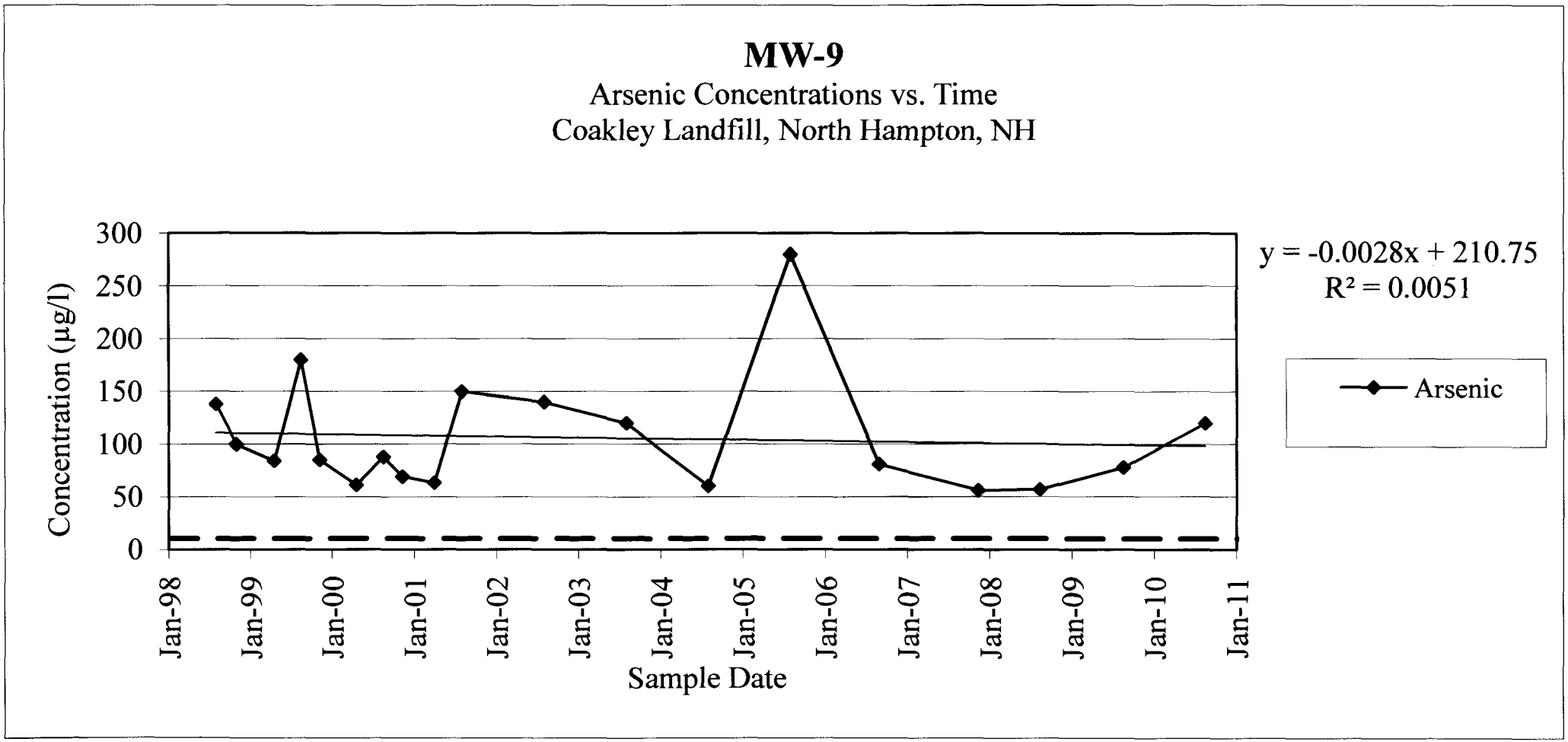

MW-11
Manganese Concentrations vs. Time
Coakley Landfill, North Hampton, NH
Concentration (µg/l)
1400
1200
1000
800
600
400
200
0
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Sample Date
y = -0.1683x + 7058.2
R² = 0.8701
Manganese

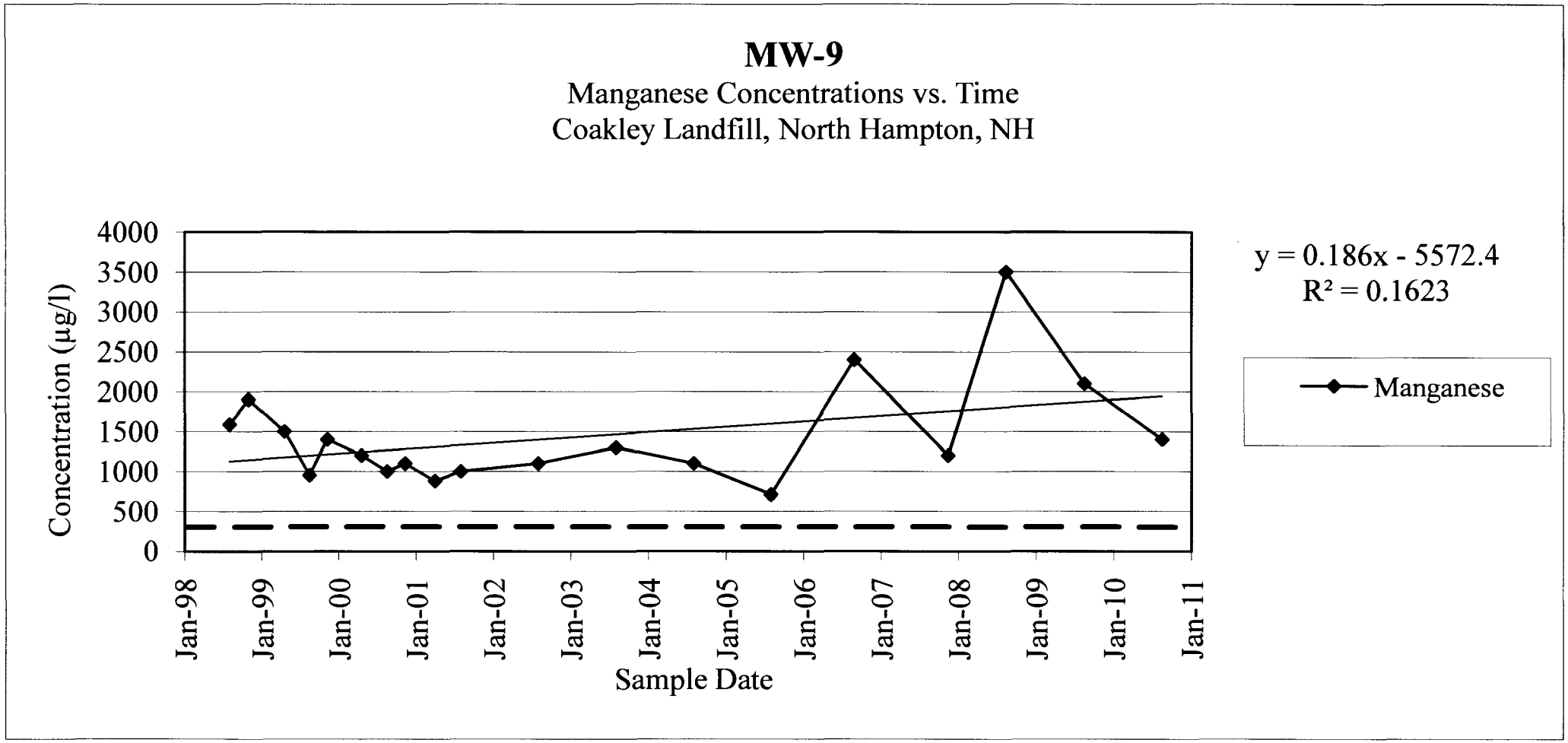

MW-11
Benzene Concentrations vs. Time
Coakley Landfill, North Hampton, NH
Concentration (µg/l)
50
40
30
20
10
0
-10
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Sample Date
y = -0.0059x + 238.24
R² = 0.653
Benzene

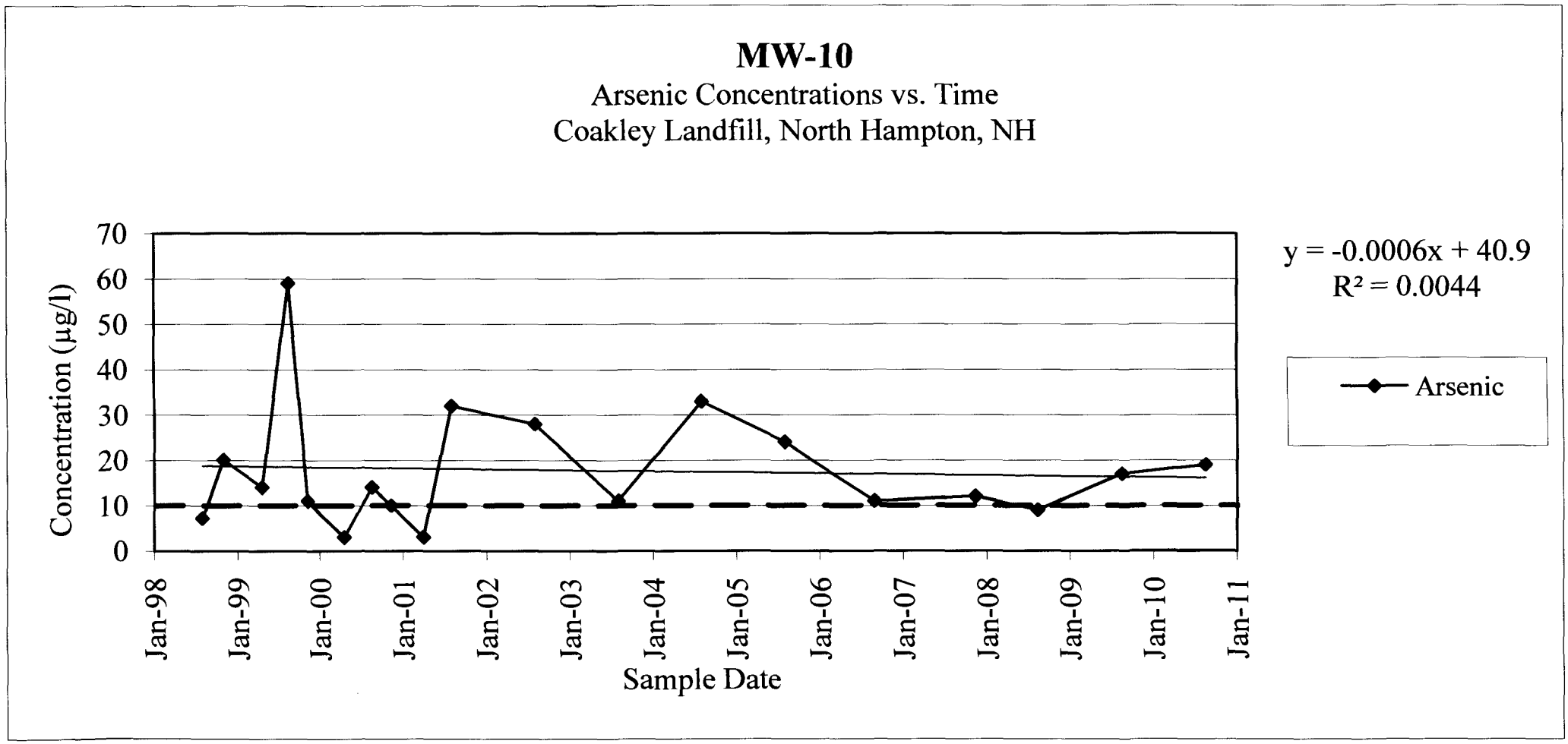

MW-8
Arsenic Concentrations vs. Time
Coakley Landfill, North Hampton, NH
Concentration (µg/l)
50
45
40
35
30
25
20
15
10
5
0
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Sample Date
y = 0.0003x - 0.4681
R² = 0.0021
Arsenic

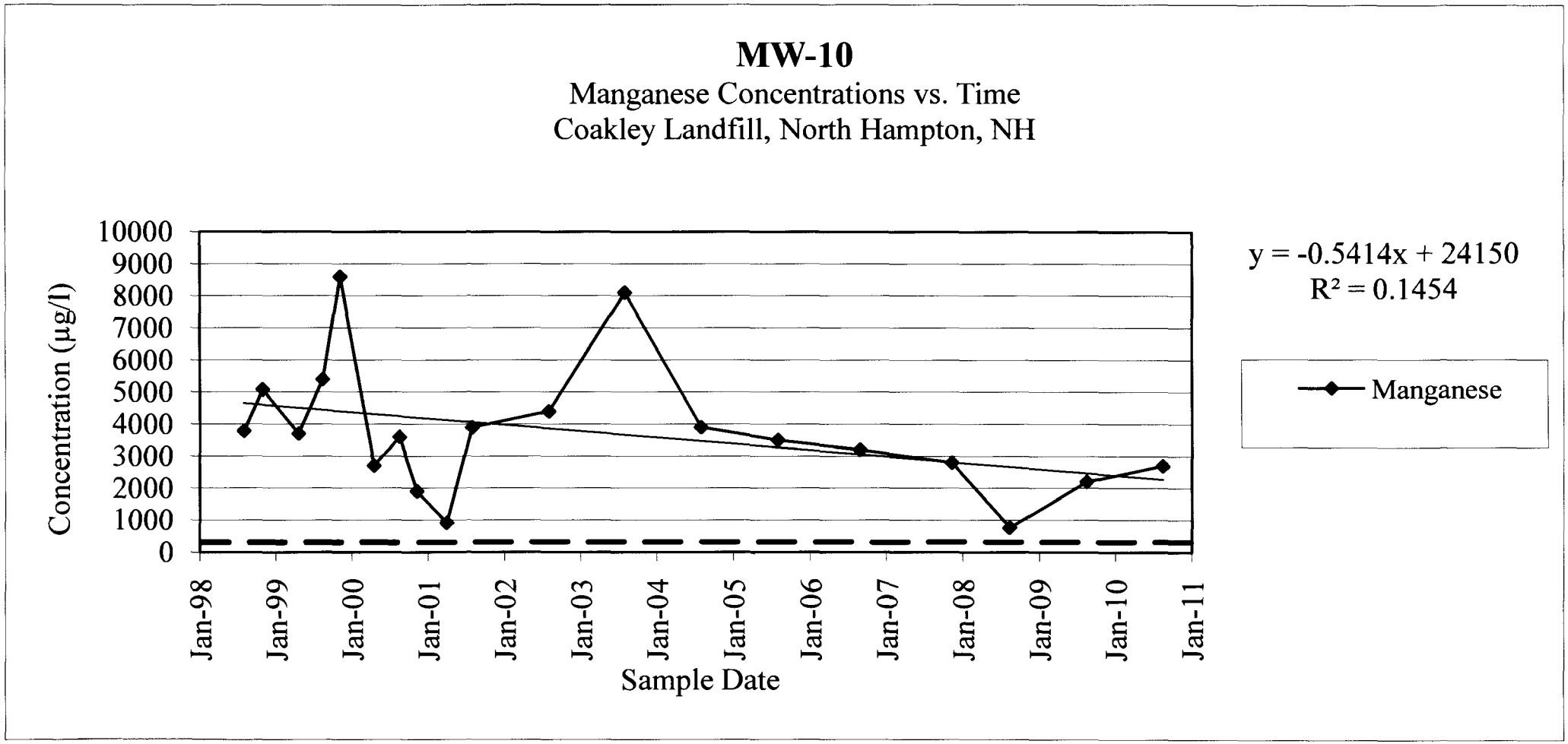

MW-8
Manganese Concentrations vs. Time
Coakley Landfill, North Hampton, NH
Concentration (µg/l)
12000
10000
8000
6000
4000
2000
0
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Sample Date
y = -0.8588x + 36034
R² = 0.4053
Manganese

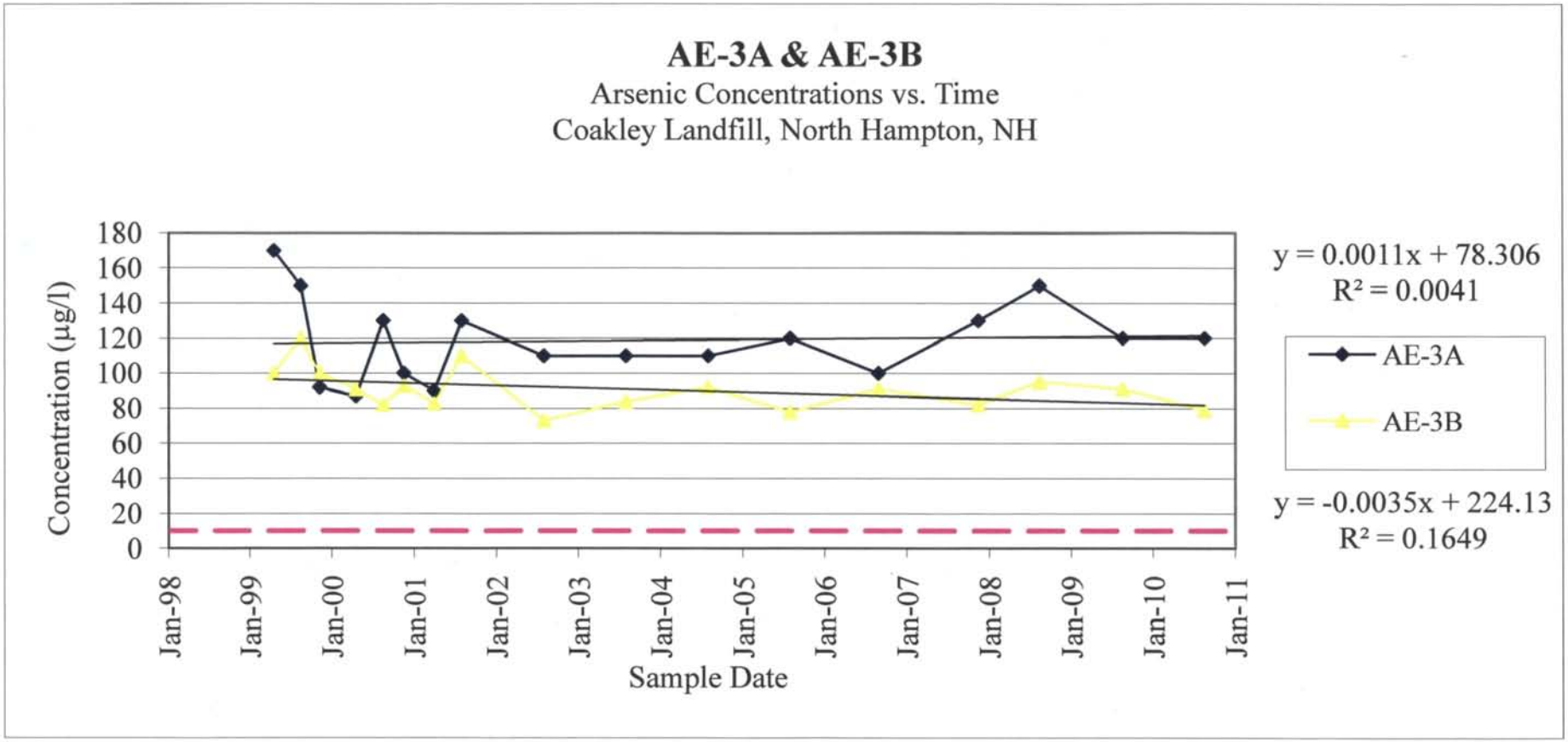

MW-8
Benzene Concentrations vs. Time
Coakley Landfill, North Hampton, NH
y = -0.0003x + 14.761
R² = 0.0423
Concentration (µg/l)
0
1
2
3
4
5
6
7
8
9
10
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Sample Date
Benzene

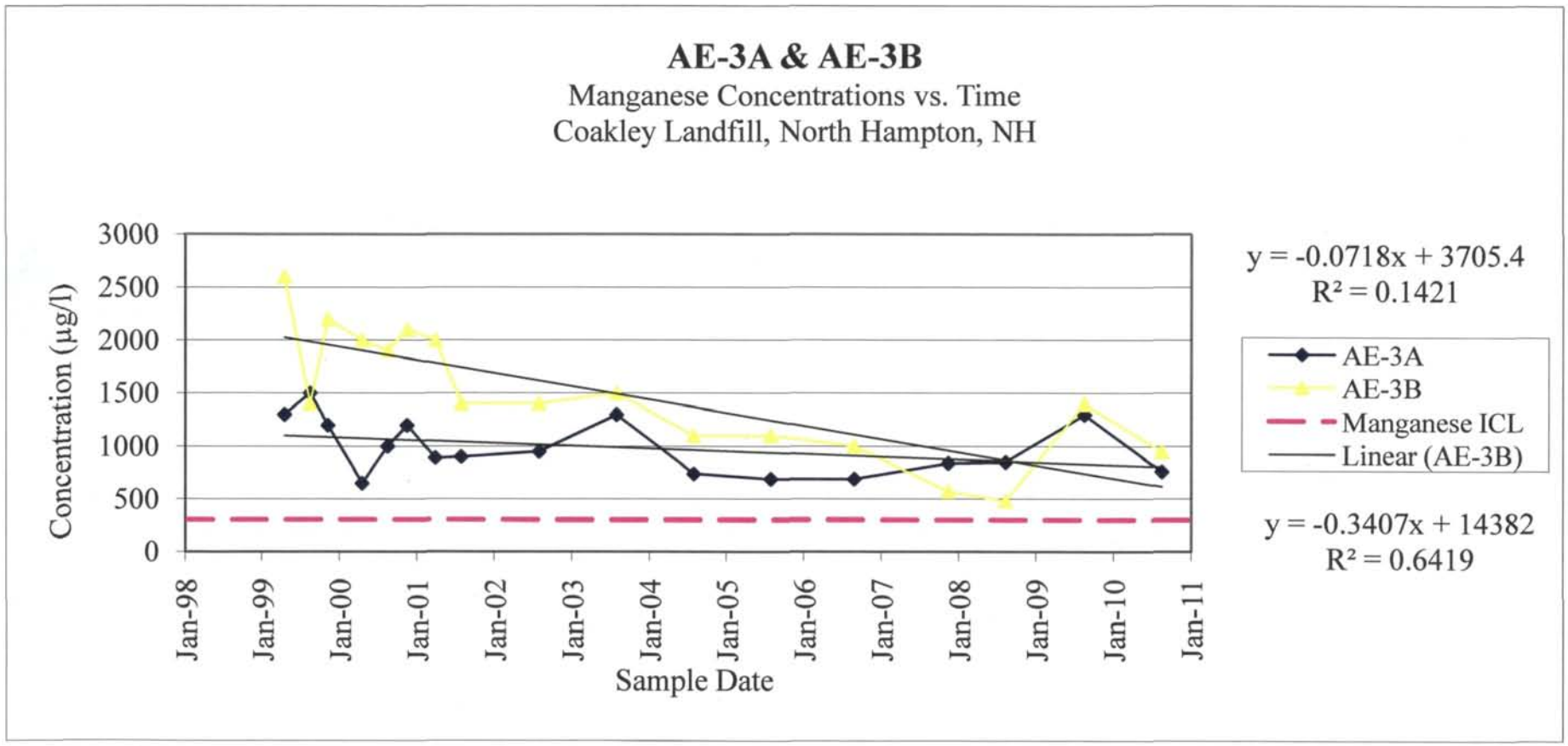

MW-9
Arsenic Concentrations vs. Time
Coakley Landfill, North Hampton, NH
Concentration (µg/l)
300
250
200
150
100
50
0
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Sample Date
y = -0.0028x + 210.75
R² = 0.0051
Arsenic

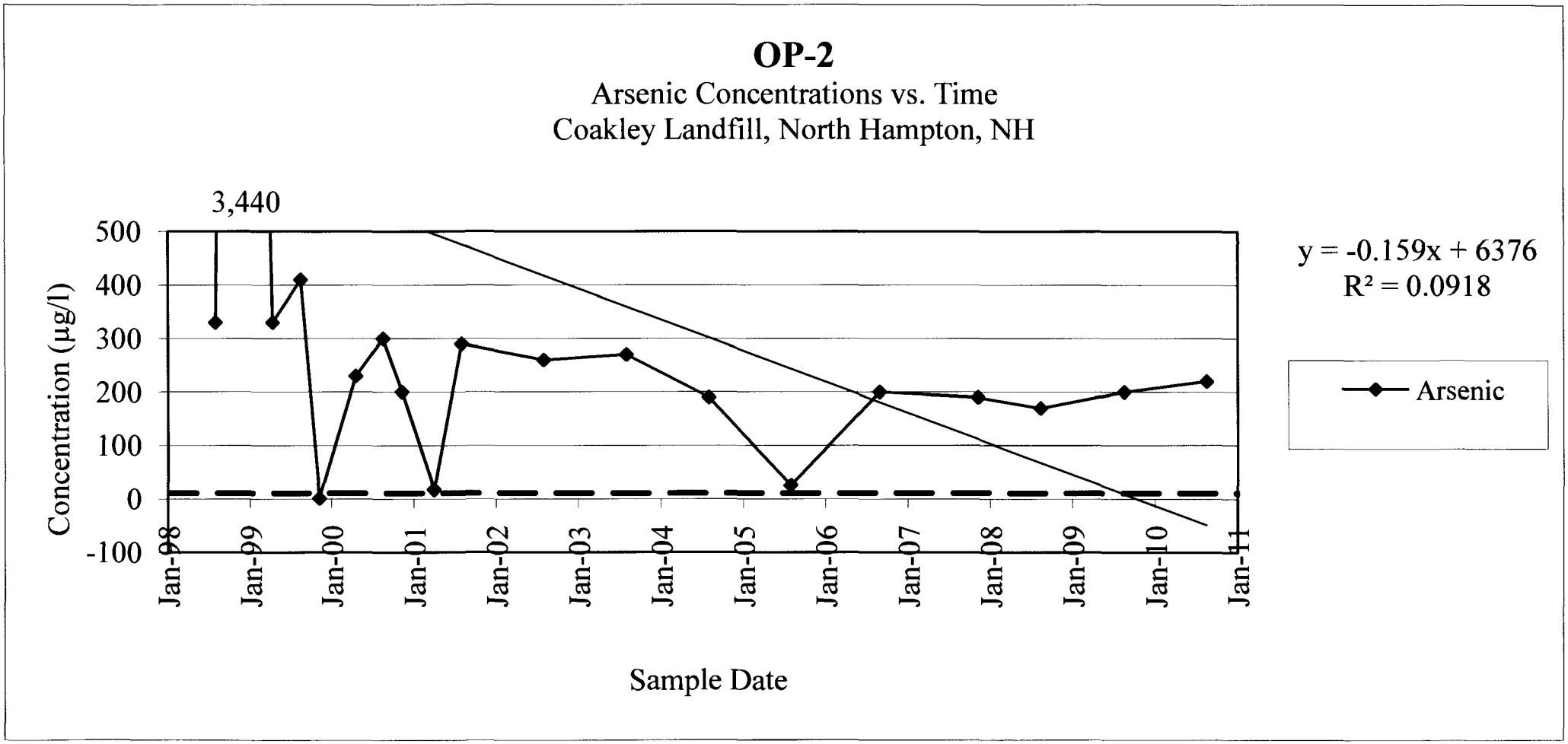

MW-9
Manganese Concentrations vs. Time
Coakley Landfill, North Hampton, NH
Concentration (µg/l)
4000
3500
3000
2500
2000
1500
1000
500
0
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Sample Date
y = 0.186x - 5572.4
R² = 0.1623
Manganese

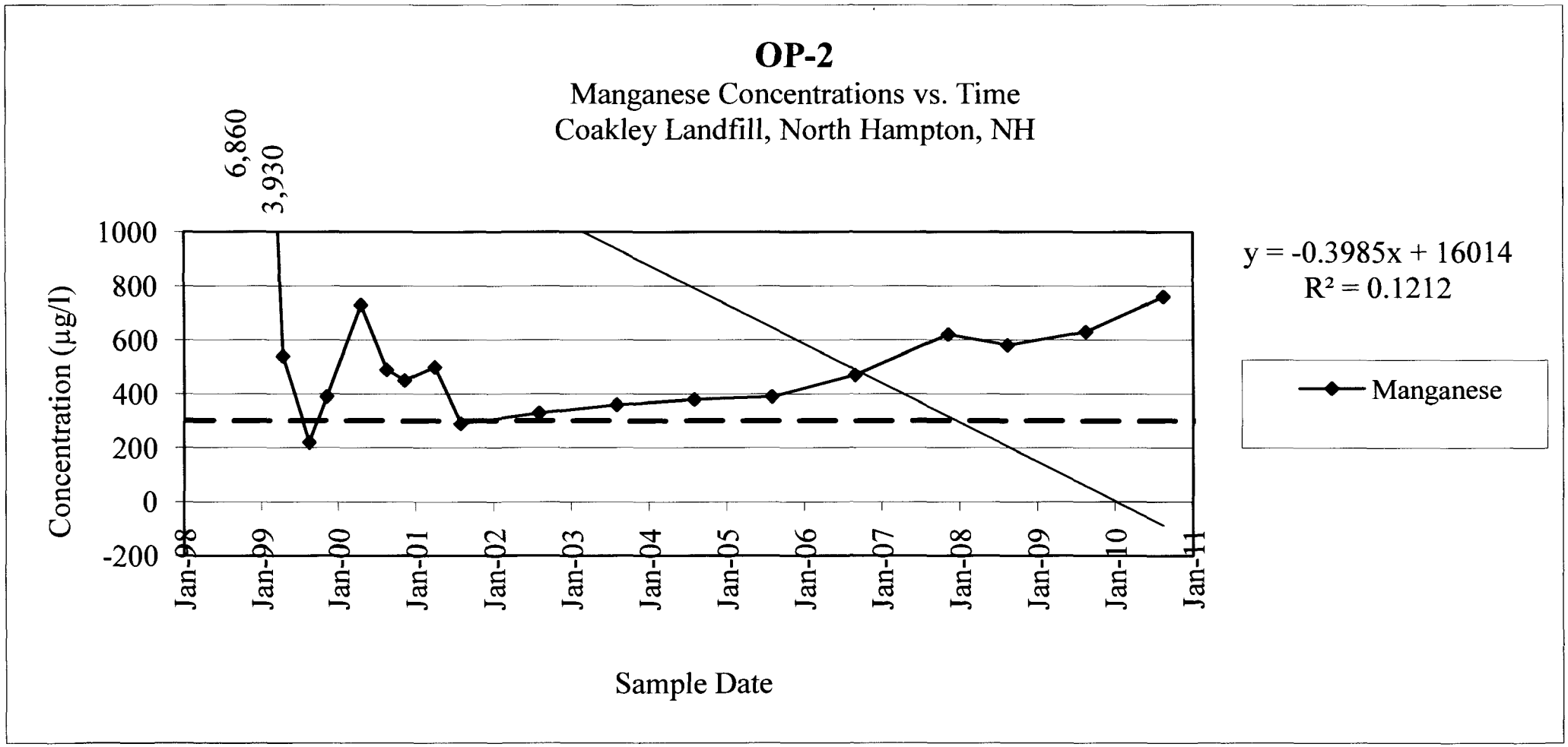

MW-10
Arsenic Concentrations vs. Time
Coakley Landfill, North Hampton, NH
Concentration (µg/l)
70
60
50
40
30
20
10
0
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Sample Date
y = -0.0006x + 40.9
R² = 0.0044
Arsenic

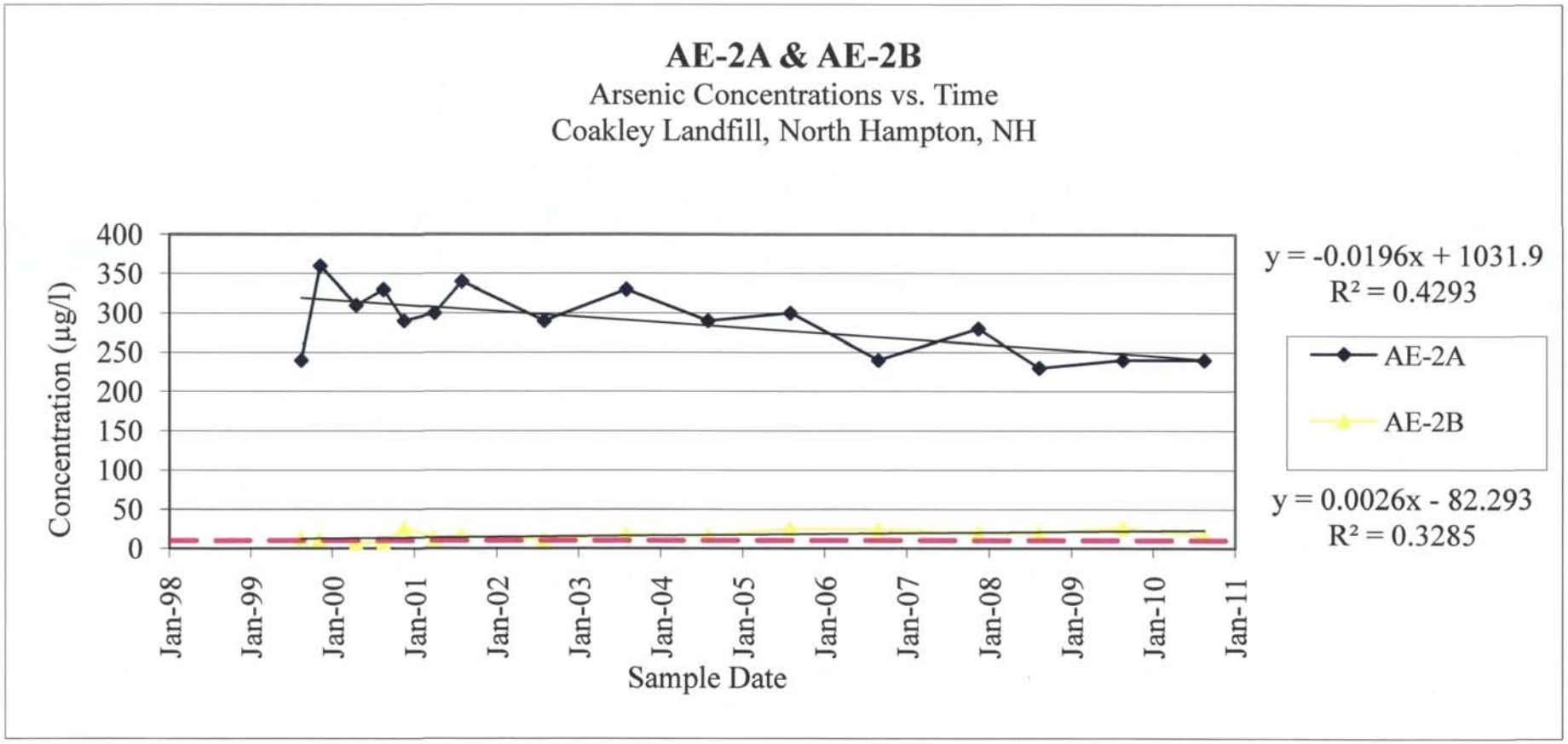

MW-10
Manganese Concentrations vs. Time
Coakley Landfill, North Hampton, NH
Concentration (µg/l)
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Sample Date
y = -0.5414x + 24150
R² = 0.1454
Manganese

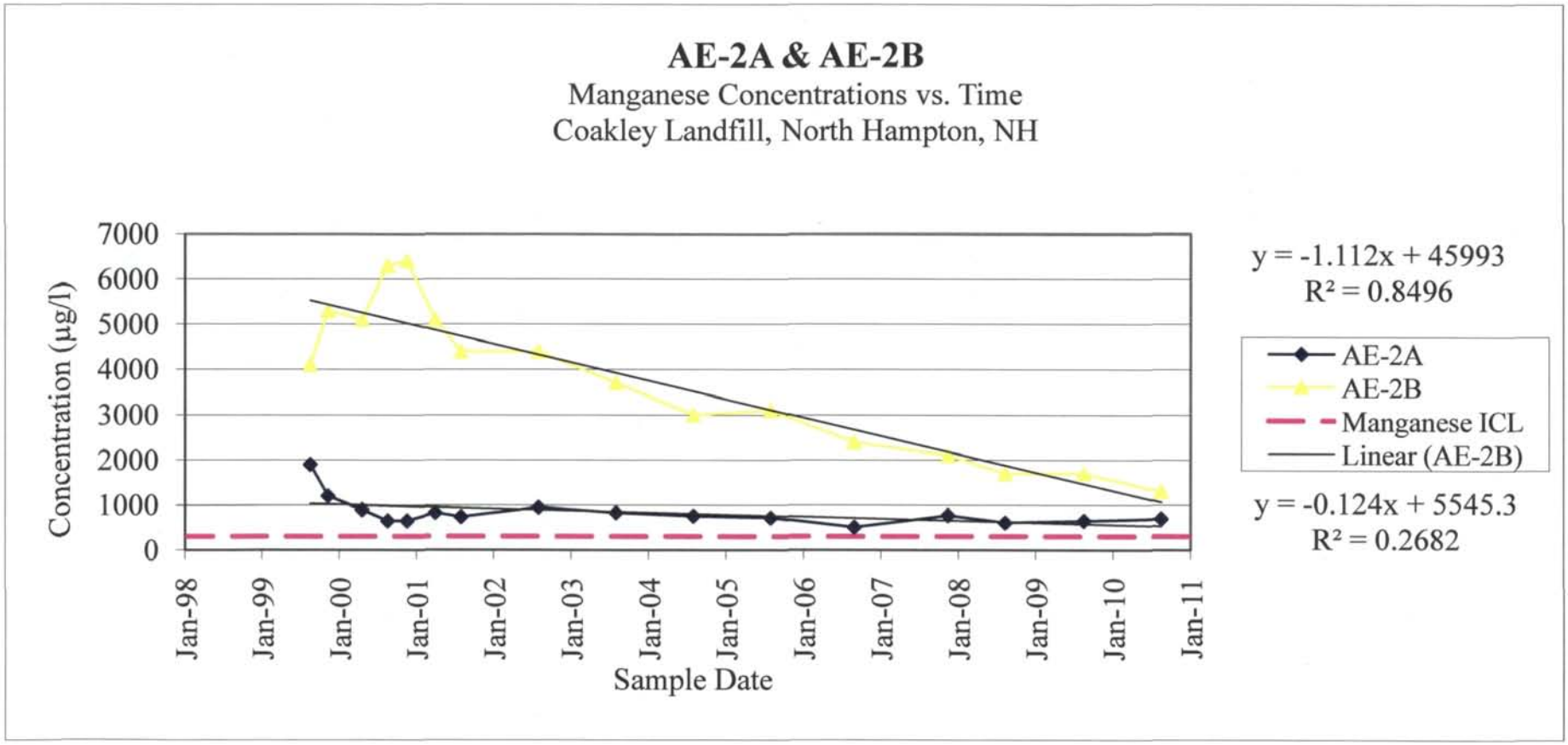

AE-3A & AE-3B
Arsenic Concentrations vs. Time
Coakley Landfill, North Hampton, NH
Concentration (µg/l)
180
160
140
120
100
80
60
40
20
0
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Sample Date
y = 0.0011x + 78.306
R² = 0.0041
AE-3A
AE-3B
y = -0.0035x + 224.13
R² = 0.1649

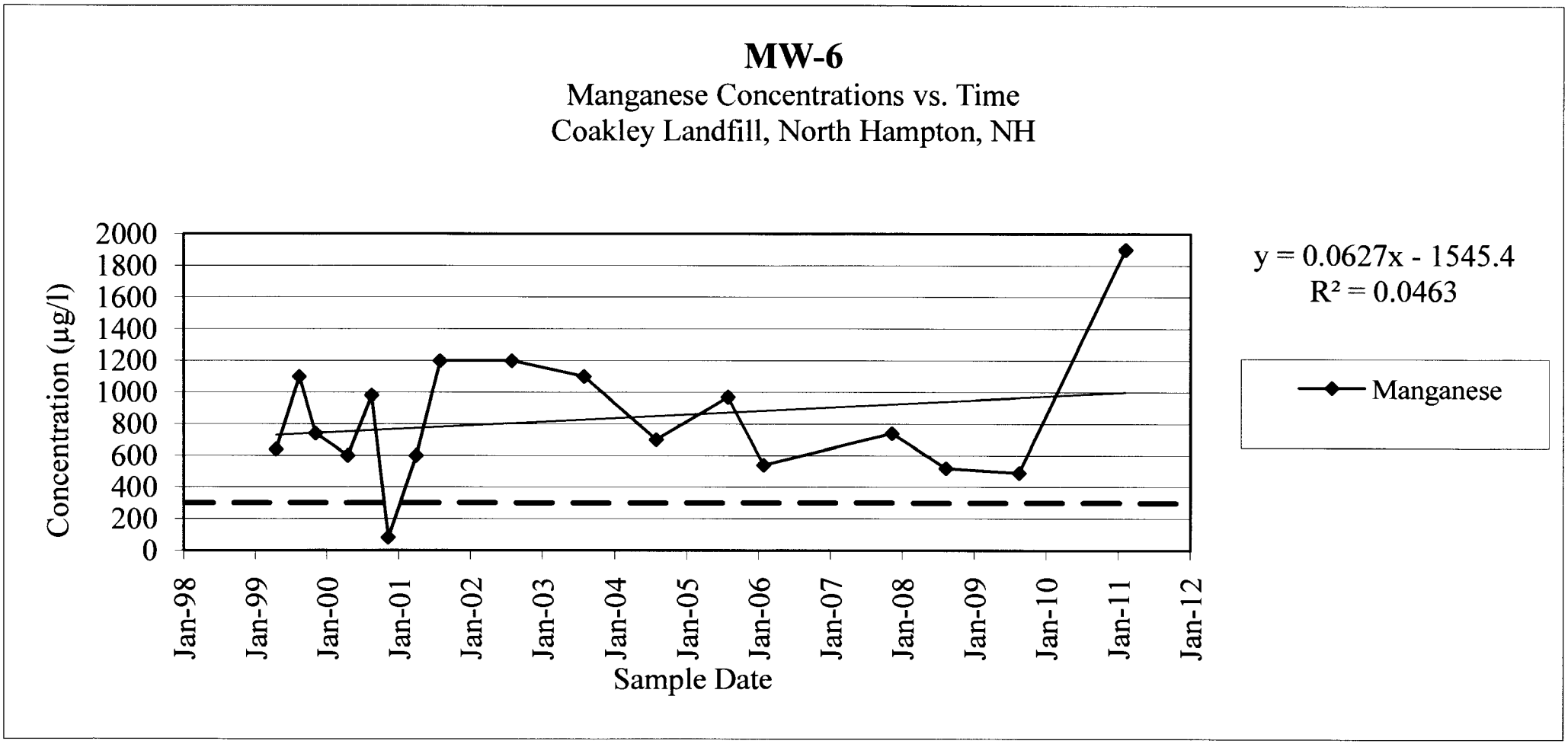

AE-3A & AE-3B
Manganese Concentrations vs. Time
Coakley Landfill, North Hampton, NH
Concentration (µg/l)
3000
2500
2000
1500
1000
500
0
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Sample Date
y = -0.0718x + 3705.4
R² = 0.1421
AE-3A
AE-3B
Manganese ICL
Linear (AE-3B)
y = -0.3407x + 14382
R² = 0.6419

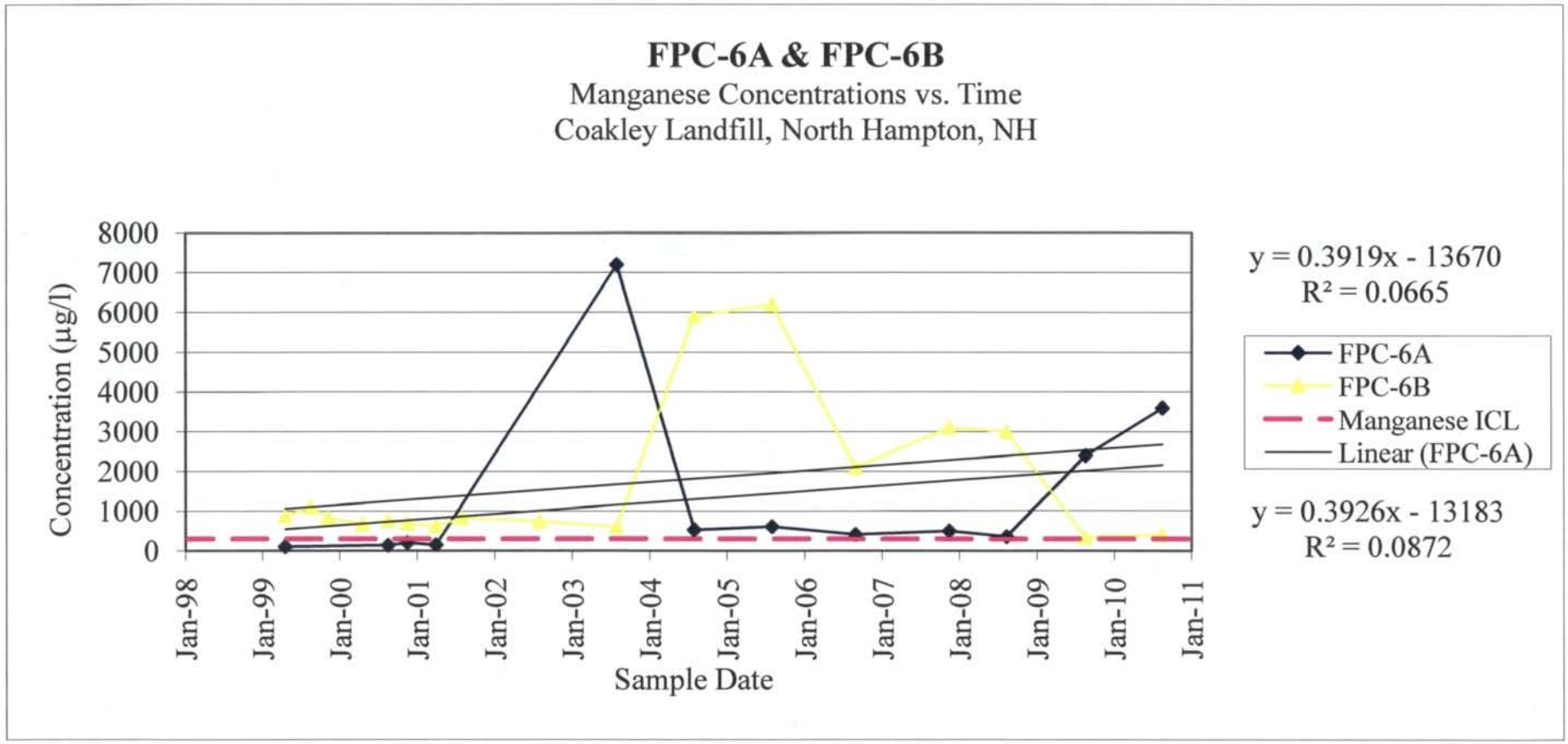

OP-2
Arsenic Concentrations vs. Time
Coakley Landfill, North Hampton, NH
3,440
500
400
300
200
100
0
-100
Concentration (µg/l)
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Sample Date
y = -0.159x + 6376
R² = 0.0918
Arsenic

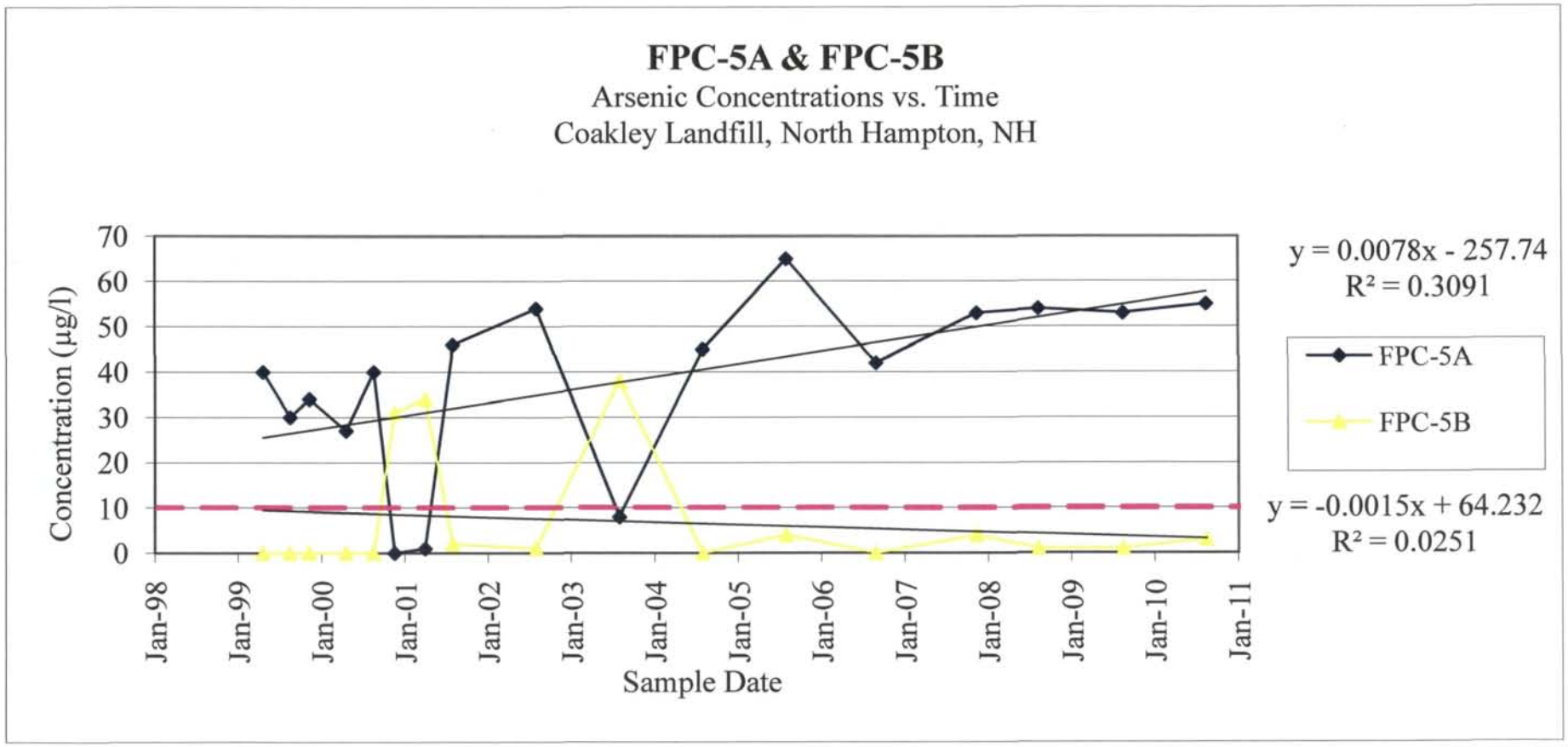

OP-2
Manganese Concentrations vs. Time
Coakley Landfill, North Hampton, NH
6,860
3,930
1000
800
600
400
200
0
-200
Concentration (µg/l)
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Sample Date
y = -0.3985x + 16014
R² = 0.1212
Manganese

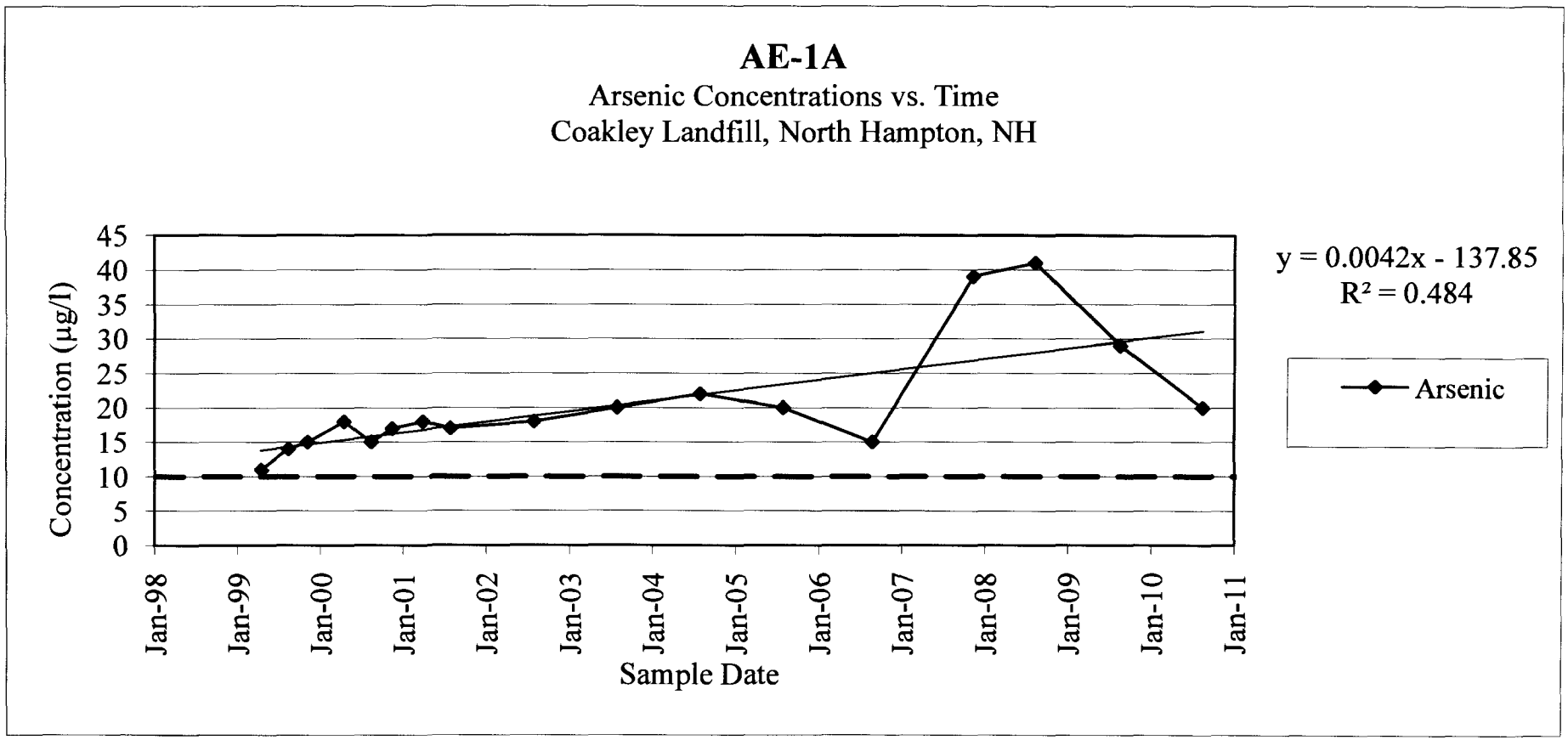

AE-2A & AE-2B
Arsenic Concentrations vs. Time
Coakley Landfill, North Hampton, NH
Concentration (µg/l)
400
350
300
250
200
150
100
50
0
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Sample Date
y = -0.0196x + 1031.9
R² = 0.4293
AE-2A
AE-2B
y = 0.0026x - 82.293
R² = 0.3285

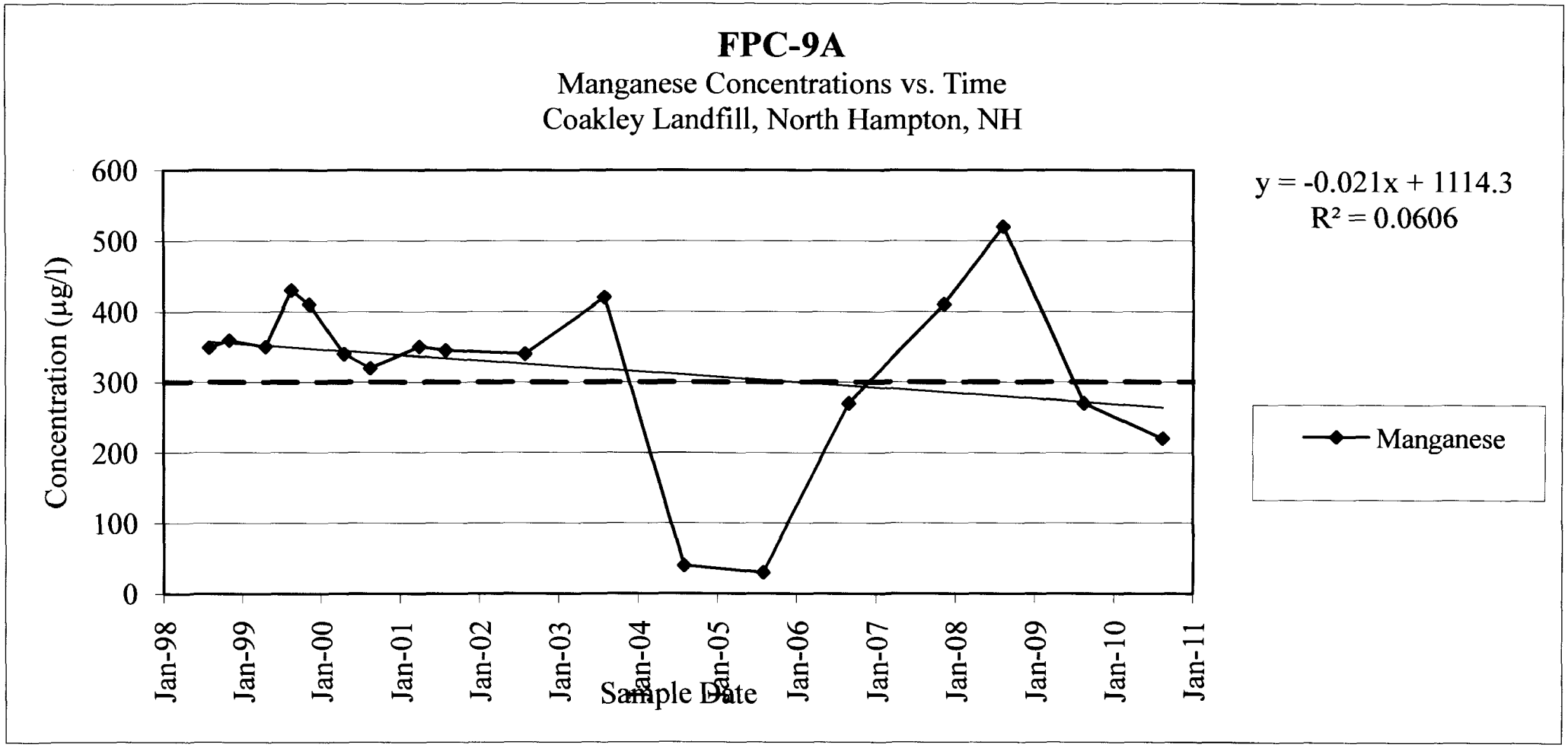

AE-2A & AE-2B
Manganese Concentrations vs. Time
Coakley Landfill, North Hampton, NH
Concentration (µg/l)
7000
6000
5000
4000
3000
2000
1000
0
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Sample Date
y = -1.112x + 45993
R² = 0.8496
AE-2A
AE-2B
Manganese ICL
Linear (AE-2B)
y = -0.124x + 5545.3
R² = 0.2682

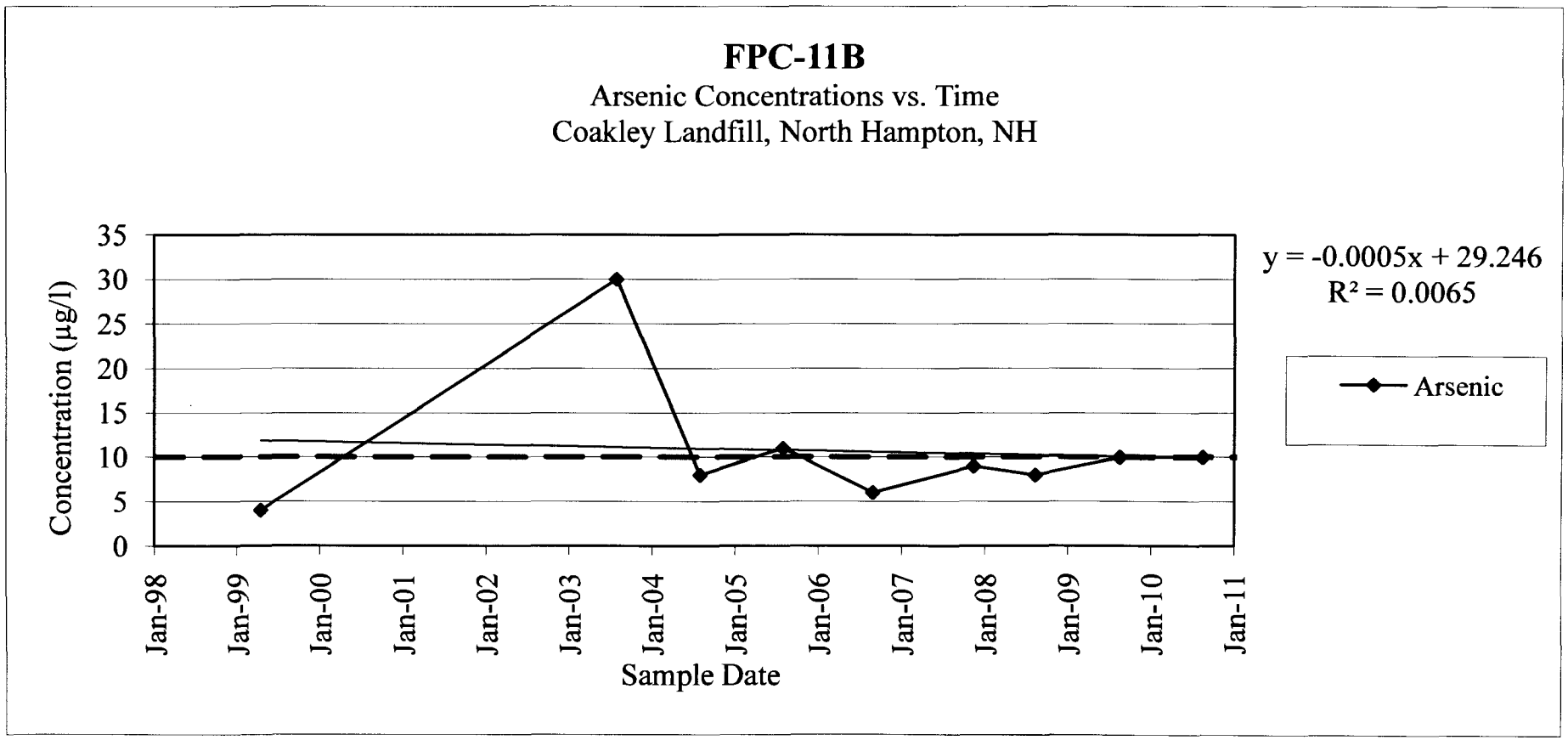

MW-6
Manganese Concentrations vs. Time
Coakley Landfill, North Hampton, NH
Concentration (µg/l)
2000
1800
1600
1400
1200
1000
800
600
400
200
0
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Sample Date
y = 0.0627x - 1545.4
R² = 0.0463
Manganese

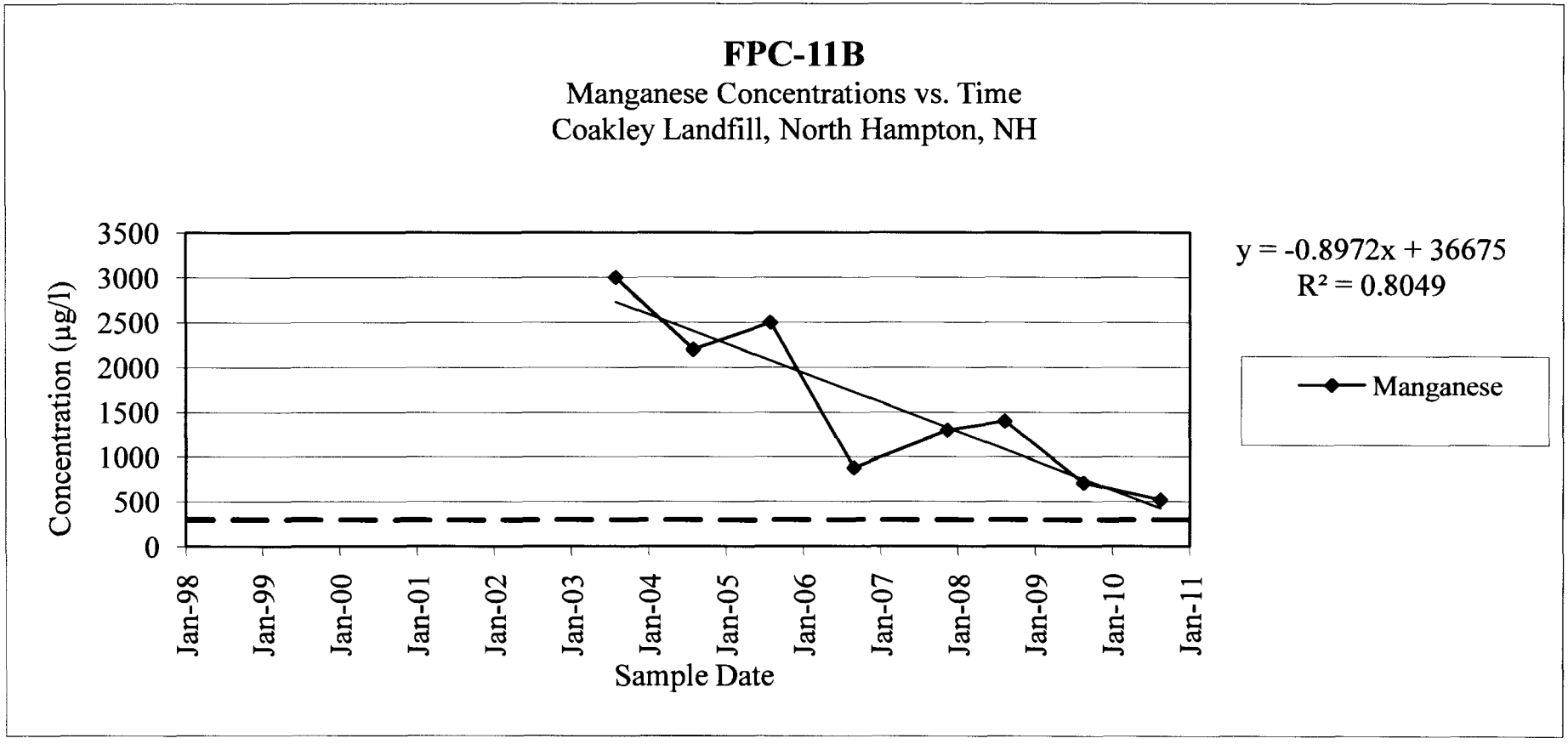

FPC-6A & FPC-6B
Manganese Concentrations vs. Time
Coakley Landfill, North Hampton, NH
Concentration (µg/l)
8000
7000
6000
5000
4000
3000
2000
1000
0
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Sample Date
y = 0.3919x - 13670
R² = 0.0665
FPC-6A
FPC-6B
Manganese ICL
Linear (FPC-6A)
y = 0.3926x - 13183
R² = 0.0872

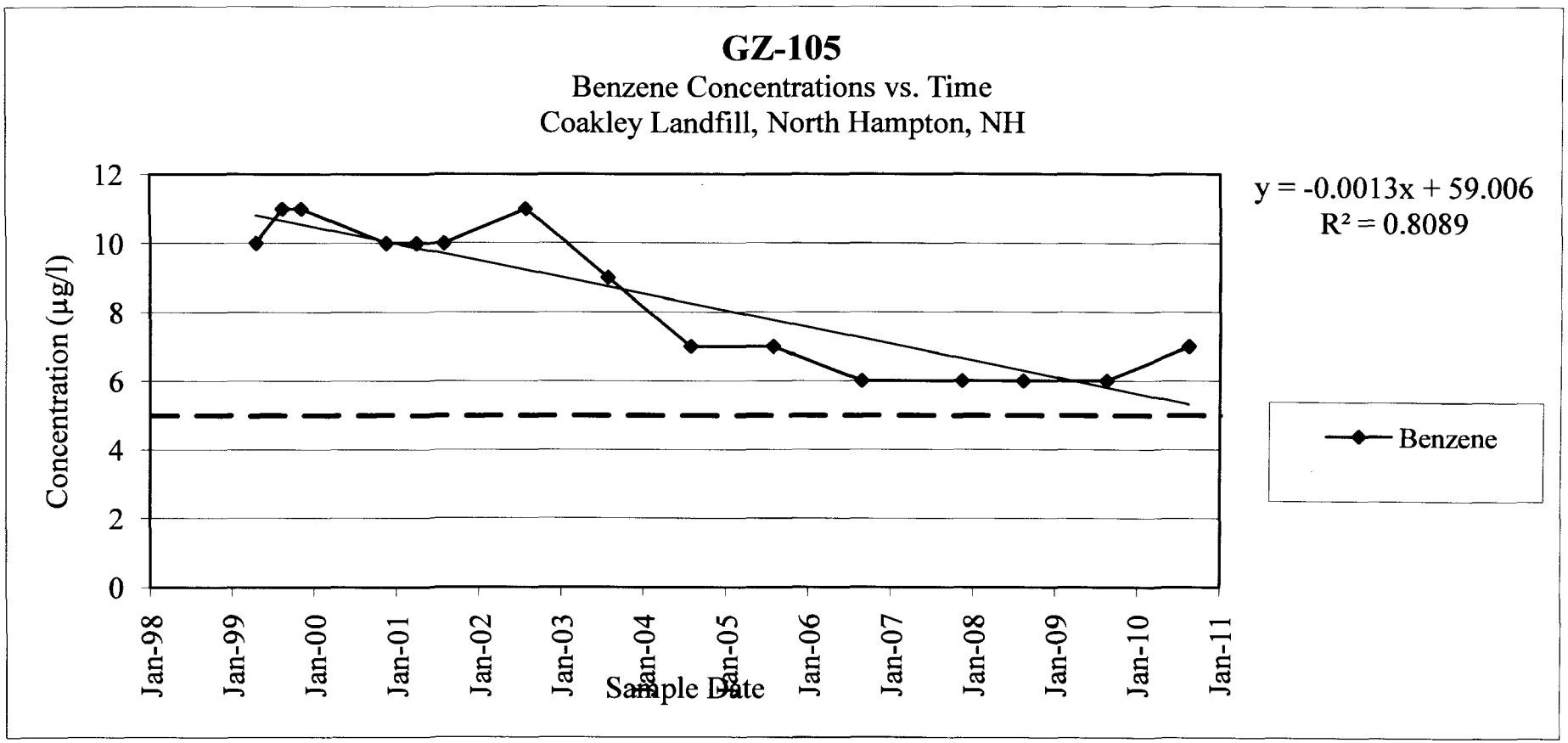

FPC-5A & FPC-5B
Arsenic Concentrations vs. Time
Coakley Landfill, North Hampton, NH
Concentration (µg/l)
70
60
50
40
30
20
10
0
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Sample Date
y = 0.0078x - 257.74
R² = 0.3091
FPC-5A
FPC-5B
y = -0.0015x + 64.232
R² = 0.0251

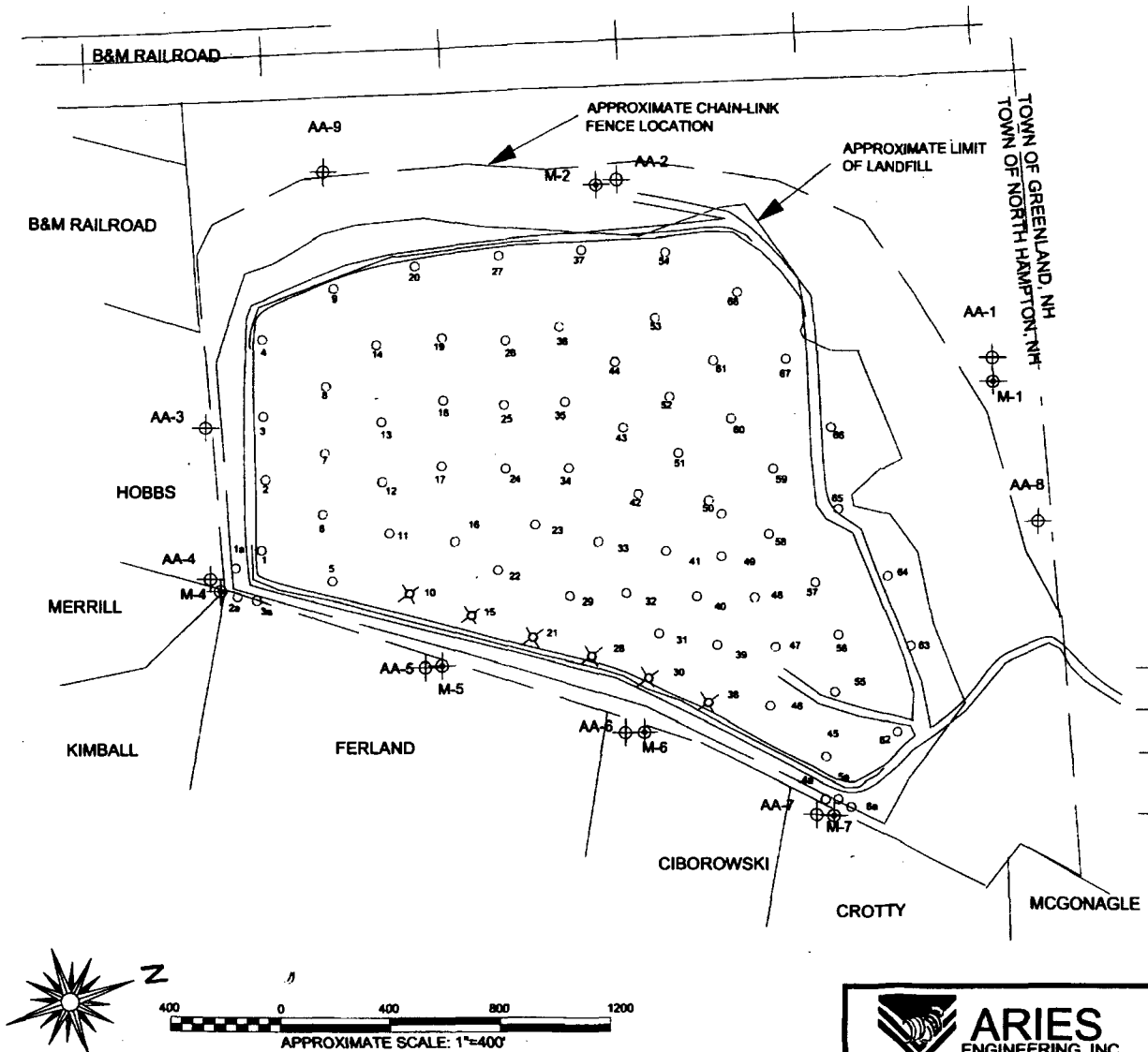

AE-1A
Arsenic Concentrations vs. Time
Coakley Landfill, North Hampton, NH
Concentration (µg/l)
45
40
35
30
25
20
15
10
5
0
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Sample Date
y = 0.0042x - 137.85
R² = 0.484
Arsenic


FPC-9A
Manganese Concentrations vs. Time
Coakley Landfill, North Hampton, NH
y = -0.021x + 1114.3
R² = 0.0606
Concentration (µg/l)
600
500
400
300
200
100
0
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Sample Date
Manganese


FPC-11B
Arsenic Concentrations vs. Time
Coakley Landfill, North Hampton, NH
Concentration (µg/l)
35
30
25
20
15
10
5
0
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Sample Date
y = -0.0005x + 29.246
R² = 0.0065
Arsenic


FPC-11B
Manganese Concentrations vs. Time
Coakley Landfill, North Hampton, NH
Concentration (µg/l)
3500
3000
2500
2000
1500
1000
500
0
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Sample Date
y = -0.8972x + 36675
R² = 0.8049
Manganese


GZ-105
Benzene Concentrations vs. Time
Coakley Landfill, North Hampton, NH
y = -0.0013x + 59.006
R² = 0.8089
Concentration (µg/l)
12
10
8
6
4
2
0
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Sample Date
Benzene



NOTES:

1. Aries developed the Institutional Control Zone Area Plan from a plan titled "Study Area Base Map" contained in the May 1994 Management of Migration Remedial Investigation Feasibility Study prepared by Camp Dresser & McKee Inc. of Boston, MA.
2. Approximate property boundary locations are from Town of Greenfield, NH Tax Map R-1, Town of Rye, NH Tax Map 10, Town of North Hampton Tax Map 17 and a Town of North Hampton map titled "Properties Within or Adjacent to the Coakley GMZ".
3. Methane volume percent measurements were collected with a Geotechnical Instrument, Ltd Model GEM-500 Infrared Gas Analyzer.
4. Site feature locations are approximate.

LEGEND:

- M-1 — Landfill gas monitoring probe.
- AA-1 — Ambient air monitoring station.
- 55 — Landfill Gas Vent Discontinued From Sampling Program
- 63 — Landfill Gas Vent
- Chain-link fence.
- Approximate limit of landfill.
- Approximate property boundary based on Town of Greenfield, Rye and North Hampton Tax Maps.
- Railroad tracks.

JOB # 97070E

ARIES ENGINEERING, INC.
environmental engineers and hydrogeologists

TECHNICAL ASSISTANCE SERVICES
COAKLEY LANDFILL
NORTH HAMPTON, NEW HAMPSHIRE

LANDFILL GAS MONITORING LOCATIONS
OCTOBER 2010 FIGURE 1

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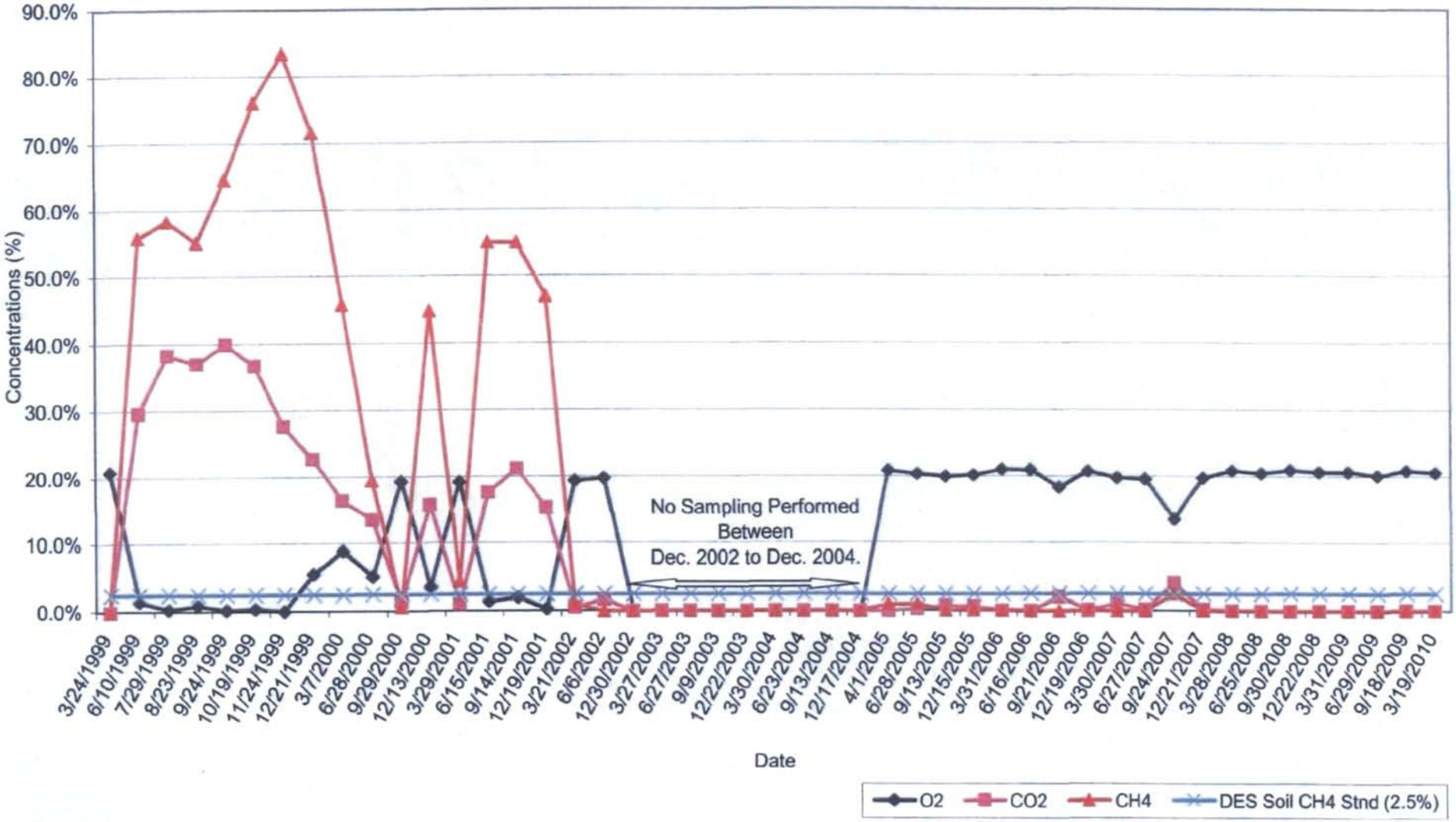
PROBE M-1

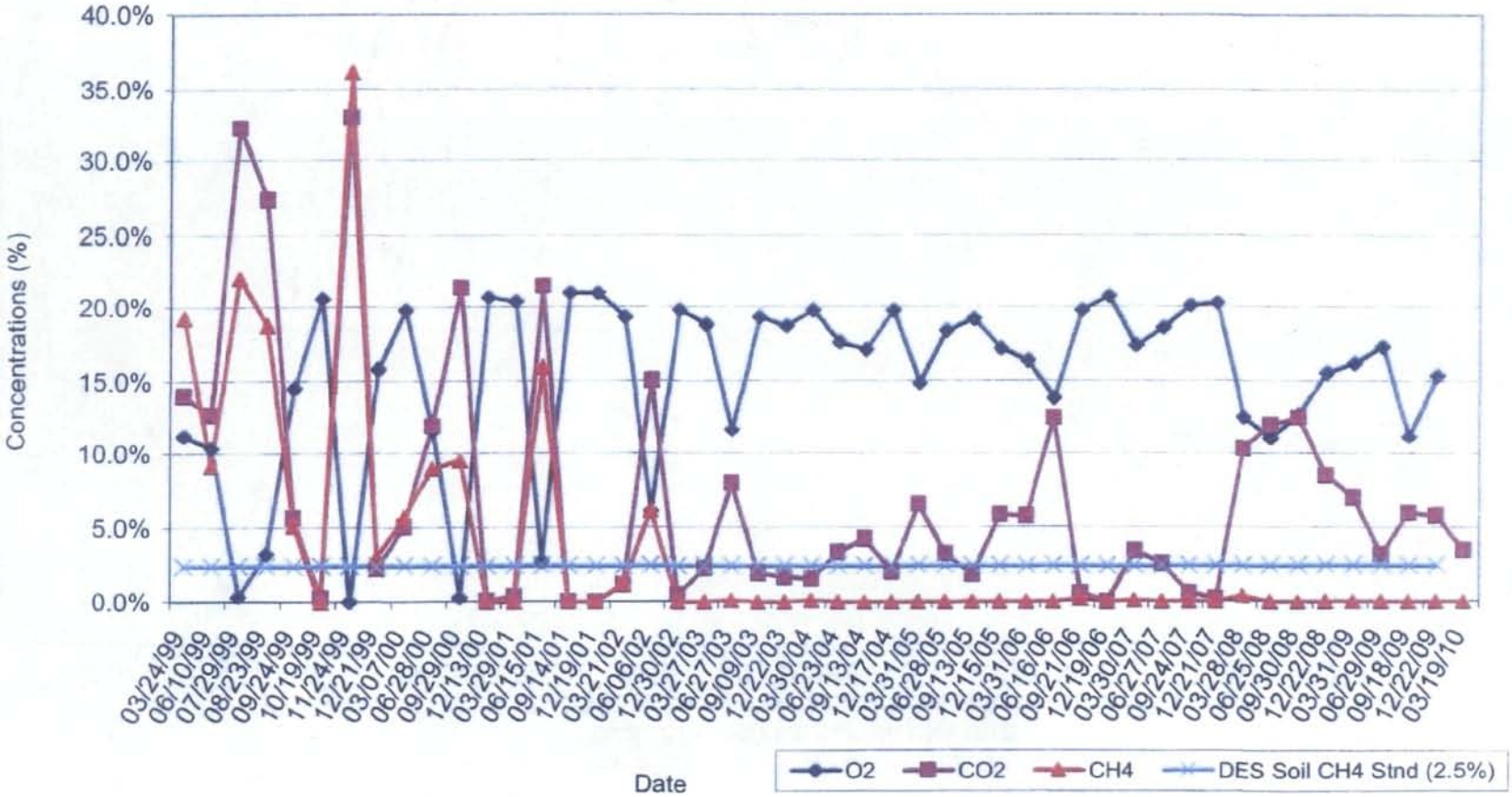
LANDFILL GAS MONITORING TRENDS
COAKLEY LANDFILL SUPERFUND SITE
NORTH HAMPTON, NEW HAMPSHIRE
JUNE 2010



Aries Engineering, Inc.

PROBE M-2

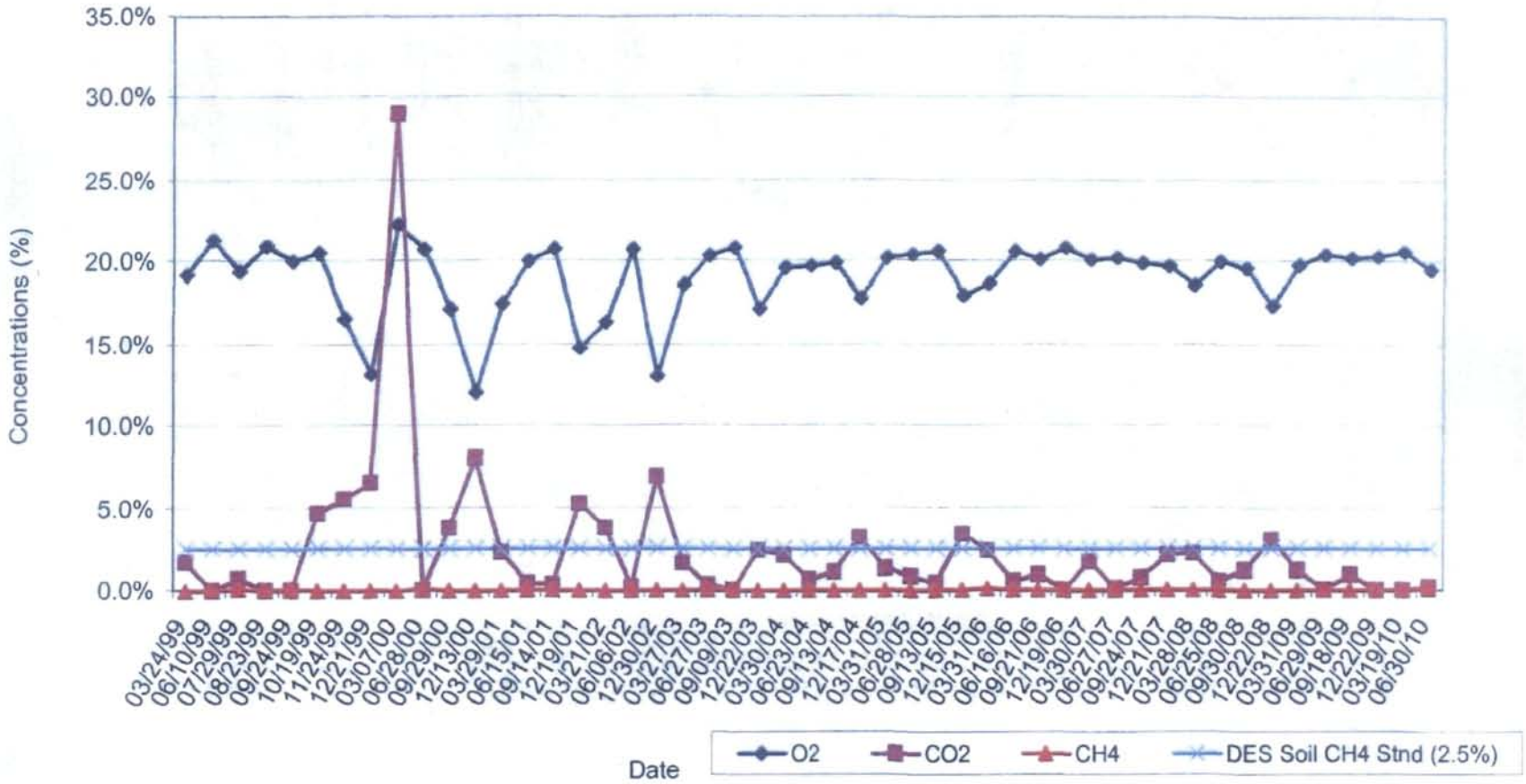
LANDFILL GAS MONITORING TRENDS
COAKLEY LANDFILL SUPERFUND SITE
NORTH HAMPTON, NEW HAMPSHIRE
JUNE 2010



Aries Engineering, Inc.

PROBE M-4

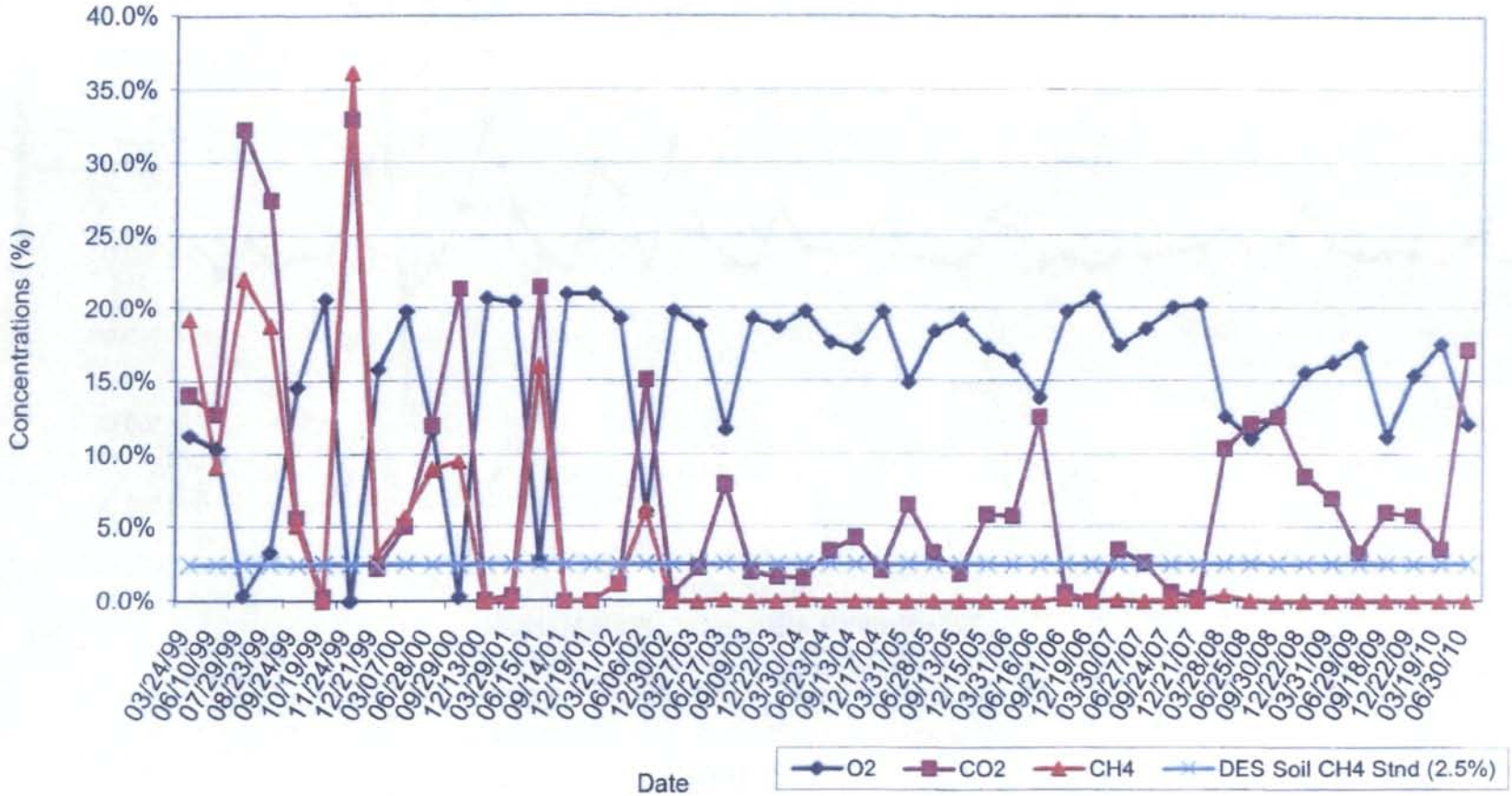
LANDFILL GAS MONITORING TRENDS
COAKLEY LANDFILL SUPERFUND SITE
NORTH HAMPTON, NEW HAMPSHIRE
JUNE 2010



Aries Engineering, Inc.

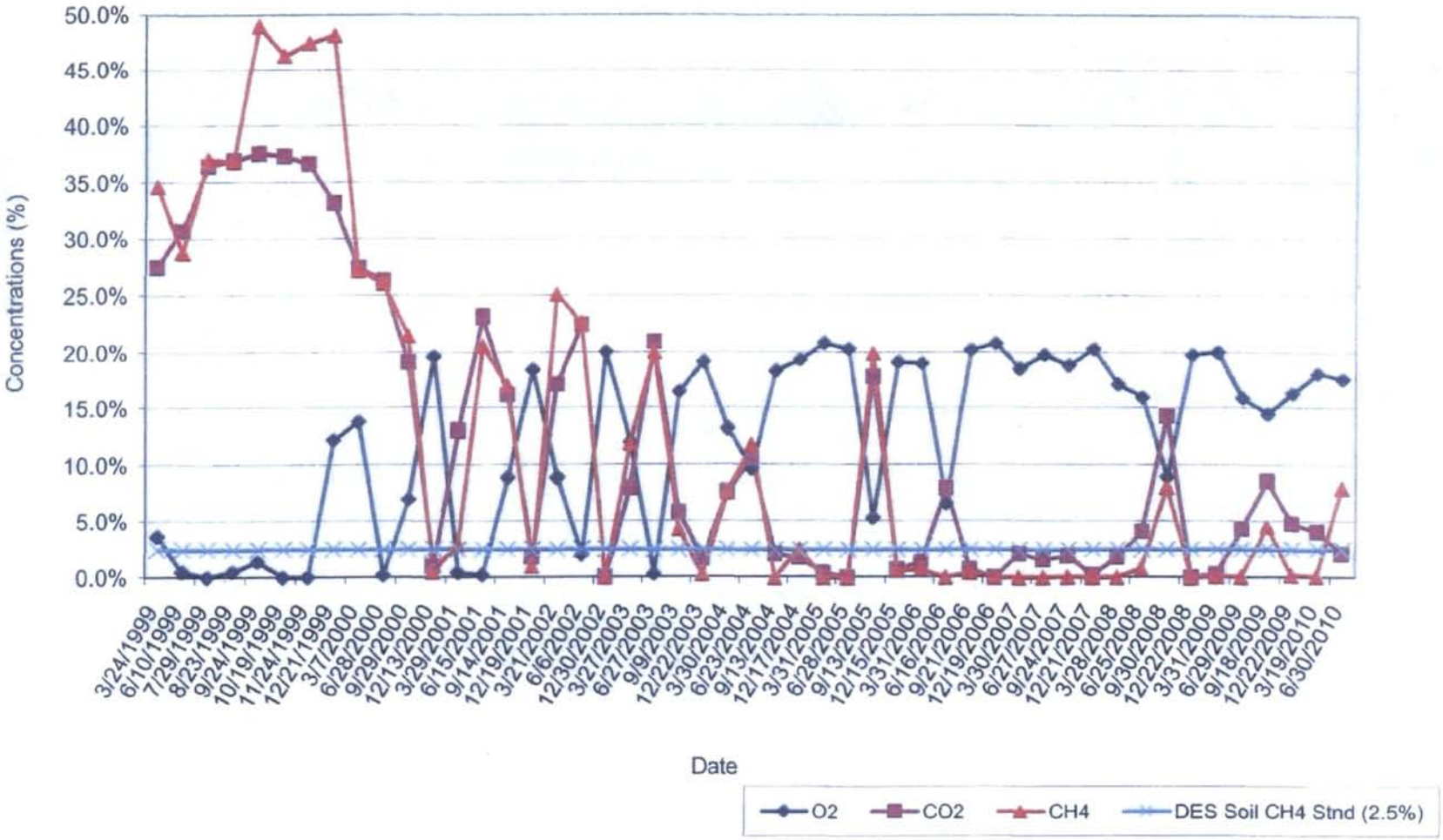
PROBE M-5

LANDFILL GAS MONITORING TRENDS
COAKLEY LANDFILL SUPERFUND SITE
NORTH HAMPTON, NEW HAMPSHIRE
JUNE 2010



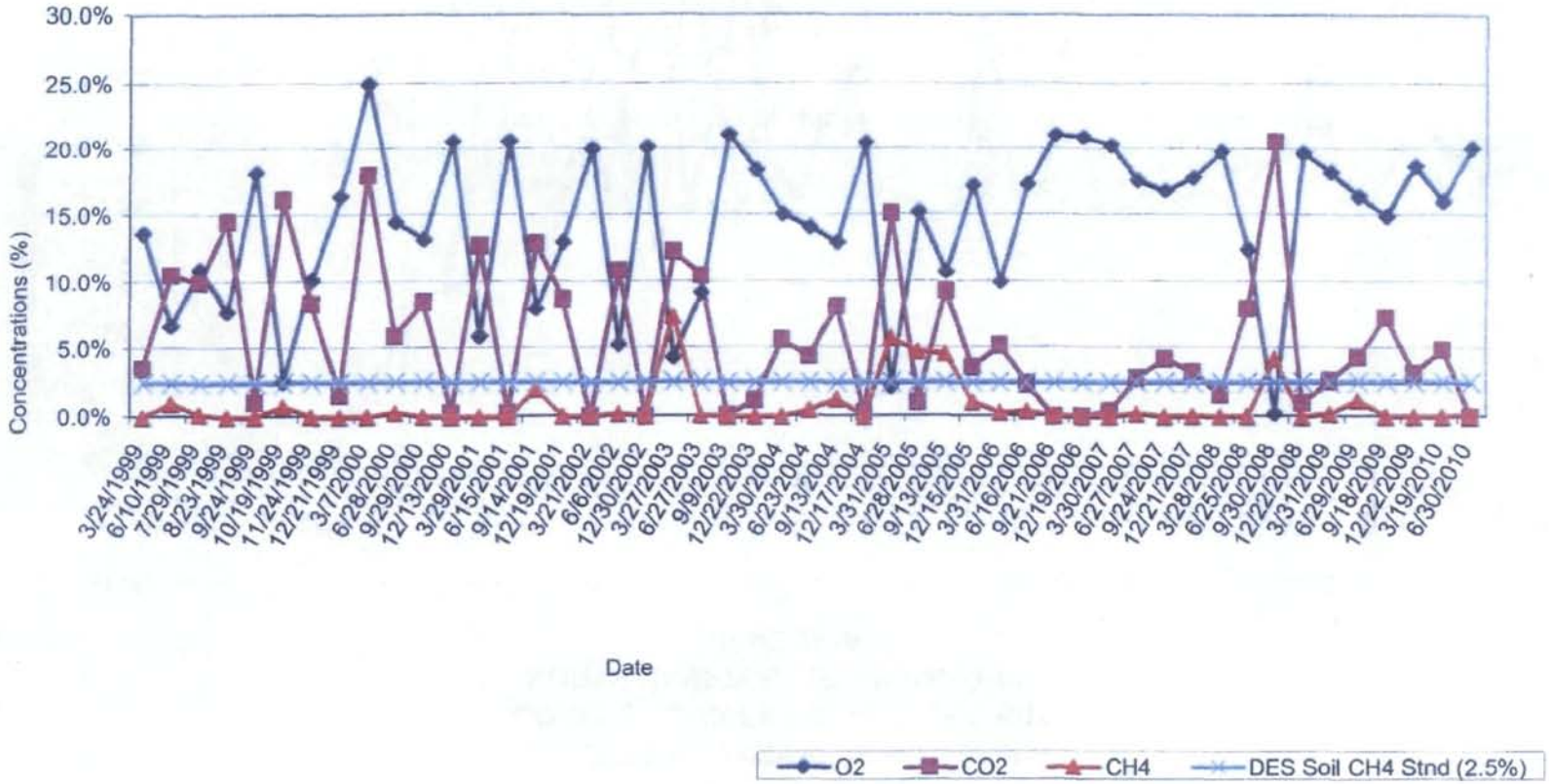
Aries Engineering, Inc.

PROBE M-6
LANDFILL GAS MONITORING TRENDS
COAKLEY LANDFILL SUPERFUND SITE
NORTH HAMPTON, NEW HAMPSHIRE
JUNE 2010



Aries Engineering, Inc.

PROBE M-7
LANDFILL GAS MONITORING TRENDS
COAKLEY LANDFILL SUPERFUND SITE
NORTH HAMPTON, NEW HAMPSHIRE
JUNE 2010



MANN-KENDALL DATA EVALUATION SUMMARY

	Arsenic		Manganese		Benzene	
Well	Trend	Confidence	Trend	Confidence	Trend	Confidence
BP-4	Decreasing	95	Decreasing	90		
MW-4	Increasing	90	No Trend	Not stable		
MW-5S	Decreasing	70	Increasing	99	Decreasing	99.5
MW-5D	Decreasing	90	Decreasing	99.5	Decreasing	95
MW-6			Decreasing	70		
MW-8	No Trend	Stable	Decreasing	99.5	Decreasing	70
MW-9	Decreasing	75	Increasing	95		
MW-10	No Trend	Stable	Decreasing	95		
MW-11	Decreasing	90	Decreasing	99.5	Decreasing	99.5
OP-2	Decreasing	80	Increasing	97.5		
OP-5	Decreasing	99.5	Decreasing	99.5		
AE-1A	Increasing	99.5				
AE-2A	Decreasing	99	Decreasing	99		
AE-2B	Increasing	97.5	Decreasing	99.5		
AE-3A	Increasing	85	Decreasing	85		
AE-3B	Decreasing	90	Decreasing	99.5		
FPC-5A	Increasing	99.5				
FPC-5B	Increasing	85				
FPC-6A			Increasing	95		
FPC-6B			No Trend	Not stable		
FPC-9A	Decreasing	95	Decreasing	90		
FPC-11B	No Trend	Stable	Decreasing	99		
GZ-105					Decreasing	99.5

Shaded cells are for bedrock wells

Summary

Arsenic		Manganese		Benzene	
Decreasing	10	Decreasing	13	Decreasing	5
Increasing	6	Increasing	4	Increasing	0
No Trend	3	No Trend	2	No Trend	0

MANN-KENDALL DATA EVALUATION

Site Name	Coakley Landfill	NHDES Site #	198712001	Compound =	Arsenic
		EPA ID #	NHD064424153		

	Well ID =	MW-4	MW-5S	MW-9	MW-10
Event Number	Sampling Date (most recent last)	Concentration (leave blank if no data)	Concentration (leave blank if no data)	Concentration (leave blank if no data)	Concentration (leave blank if no data)
1	8/18/99	45	21	180	59
2	11/10/99	51	20	85	11
3	4/19/00	40	24	61	3
4	8/18/00	83	23	88	14
5	11/18/00	60	18	69	10
6	4/1/01	42	21	63	3
7	8/1/01	64	23	150	32
8	8/1/02	41	26	140	28
9	8/1/03	40	10	120	11
10	8/1/04	66	15	60	33
11	8/1/05	130	14	280	24
12	8/1/06	43	10	81	11
13	11/15/07	58	26	56	12
14	8/12/08	69	26	57	9
15	8/19/09	70	18	78	17
16	8/18/10	64	16	120	19
	Mann Kendall Statistic (S) =	32.0	-15.0	-19.0	4.0
	Number of Rounds (n) =	16	16	16	16
	Average =	60.38	19.44	105.50	18.50
	Standard Deviation =	22.745	5.316	59.814	14.213
	Coefficient of Variation(CV)=	0.377	0.274	0.567	0.768

Error Check, Blank if No Errors Detected

Trend	INCREASING	DECREASING	DECREASING	No Trend
Confidence Level	90%	70%	75%	No Trend
Stability Test, If No Trend Exists at 70% Confidence Level	NA	NA	NA	**CV <= 1 STABLE**

Entry By =	KMM	Date =	24-Mar-11

Data entered in yellow cells

MANN-KENDALL DATA EVALUATION

Coakley Landfill	NHDES Site #	198712001	Compound =	Arsenic
	EPA ID #	NHD064424153		
Well ID =	MW-4	MW-5S	MW-9	MW-10
Number of tied groups	Count Ties	Count Ties	Count Ties	Count Ties
#tied 2 times	2	4	1	1
#tied 3 times	0	1	0	1
#tied 4 times	0	0	0	0
#tied 5 times	0	0	0	0
#tied 6 times	0	0	0	0
#tied 7 times	0	0	0	0
#tied 8 times	0	0	0	0
#tied 9 times	0	0	0	0
#tied 10 times	0	0	0	0
Count Error?				
n =	16	16	16	16
V(S) =	491.33	485.67	492.33	488.67
S =	32	-15	-19	4
Z =	1.399	-0.635	-0.811	0.136

n = Number of Samples

V(S) = variance of S = $1/18\ [n(n-1)(2n+5) - \sum p=1 \rightarrow g\ \ w_p(w_p-1)(2w_p+5)]$

where g = number of tied groups and w_p represents the number of data points in the pth group

S = Mann-Kendall Statistic, number of increases versus number of decreases in data comparrision

$Z = (S-1)/[V(S)]^{1/2}$ if $S>0$, $Z=0$ if $S=0$, $Z= (S+1)/[V(S)]^{1/2}$ if $S<0$

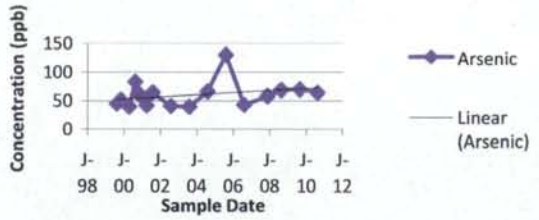
Z is comparred to table of critical values to determine confidence in trend

Trend confidences defined at 99.5%, 99%, 97.5%, 95%, 90%, 85%, 80%, 75%, 70%, and no trend

Mann Kendall Statistic Calculations

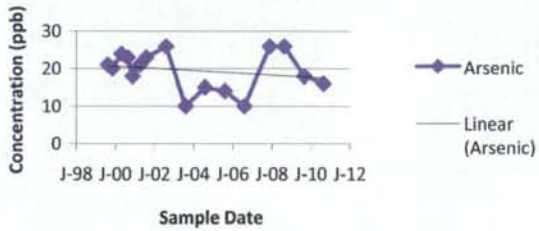
MW-4 Site = Coakley Landfill NHDES#: 198712001 EPA ID #: NHD064424153 Compound = Arsenic

Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Event 7	Event 8	Event 9	Event 10	Event 11	Event 12	Event 13	Event 14	Event 15	Event 16	
45	51	40	83	60	42	64	41	40	66	130	43	58	69	70	64	Sum Rows
	1	-1	1	1	-1	1	-1	-1	1	1	-1	1	1	1	1	5
		-1	1	1	-1	1	-1	-1	1	1	-1	1	1	1	1	4
			1	1	1	1	1	0	1	1	1	1	1	1	1	12
				-1	-1	-1	-1	-1	-1	1	-1	-1	-1	-1	-1	-10
					-1	1	-1	-1	1	1	-1	-1	1	1	1	1
						1	-1	-1	1	1	1	1	1	1	1	6
							-1	-1	1	1	-1	-1	1	1	0	0
								-1	1	1	1	1	1	1	1	6
									1	1	1	1	1	1	1	7
										1	-1	-1	1	1	-1	0
											-1	-1	-1	-1	-1	-5
												1	1	1	1	4
													1	1	1	3
														1	-1	0
															-1	-1
													Mann Kendall Statistic (S) =			32



MW-5S Site = Coakley Landfill NHDES#: 198712001 EPA ID #: NHD064424153 Compound = Arsenic

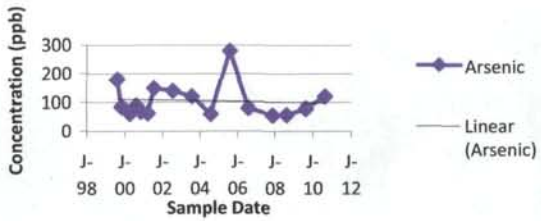
Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Event 7	Event 8	Event 9	Event 10	Event 11	Event 12	Event 13	Event 14	Event 15	Event 16	
21	20	24	23	18	21	23	26	10	15	14	10	26	26	18	16	Sum Rows
	-1	1	1	-1	0	1	1	-1	-1	-1	-1	1	1	-1	-1	-2
		1	1	-1	1	1	1	-1	-1	-1	-1	1	1	-1	-1	0
			-1	-1	-1	-1	1	-1	-1	-1	-1	1	1	-1	-1	-7
				-1	-1	0	1	-1	-1	-1	-1	1	1	-1	-1	-5
					1	1	1	-1	-1	-1	-1	1	1	0	-1	0
						1	1	-1	-1	-1	-1	1	1	-1	-1	-2
							1	-1	-1	-1	-1	1	1	-1	-1	-3
								-1	-1	-1	-1	0	0	-1	-1	-6
									1	1	0	1	1	1	1	6
										-1	-1	1	1	1	1	2
											-1	1	1	1	1	3
												1	1	1	1	4
													0	-1	-1	-2
														-1	-1	-2
															-1	-1
													Mann Kendall Statistic (S) =			-15



Mann Kendall Statistic Calculations

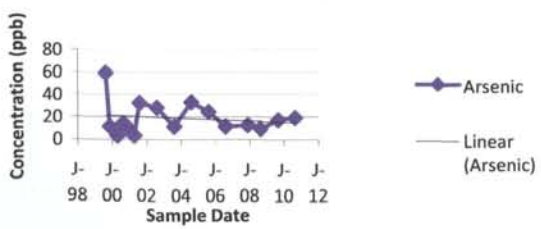
MW-9 Site = Coakley Landfill NHDES#: 198712001 EPA ID #: NHD064424153 Compound = Arsenic

Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Event 7	Event 8	Event 9	Event 10	Event 11	Event 12	Event 13	Event 14	Event 15	Event 16	
180	85	61	88	69	63	150	140	120	60	280	81	56	57	78	120	Sum Rows
	-1	-1	-1	-1	-1	-1	-1	-1	-1	1	-1	-1	-1	-1	-1	-13
		-1	1	-1	-1	1	1	1	-1	1	-1	-1	-1	-1	1	-2
			1	1	1	1	1	1	-1	1	1	-1	-1	1	1	7
				-1	-1	1	1	1	-1	1	-1	-1	-1	-1	1	-2
					-1	1	1	1	-1	1	1	-1	-1	1	1	3
						1	1	1	-1	1	1	-1	-1	1	1	4
							-1	-1	-1	1	-1	-1	-1	-1	-1	-7
								-1	-1	1	-1	-1	-1	-1	-1	-6
									-1	1	-1	-1	-1	-1	0	-4
										1	1	-1	-1	1	1	2
											-1	-1	-1	-1	-1	-5
												-1	-1	-1	1	-2
													1	1	1	3
														1	1	2
															1	1
													Mann Kendall Statistic (S) =			-19



MW-10 Site = Coakley Landfill NHDES#: 198712001 EPA ID #: NHD064424153 Compound = Arsenic

Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Event 7	Event 8	Event 9	Event 10	Event 11	Event 12	Event 13	Event 14	Event 15	Event 16	
59	11	3	14	10	3	32	28	11	33	24	11	12	9	17	19	Sum Rows
	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-15
		-1	1	-1	-1	1	1	0	1	1	0	1	-1	1	1	4
			1	1	0	1	1	1	1	1	1	1	1	1	1	12
				-1	-1	1	1	-1	1	1	-1	-1	-1	1	1	0
					-1	1	1	1	1	1	1	1	-1	1	1	7
						1	1	1	1	1	1	1	1	1	1	10
							-1	-1	1	-1	-1	-1	-1	-1	-1	-7
								-1	1	-1	-1	-1	-1	-1	-1	-6
									1	1	0	1	-1	1	1	4
										-1	-1	-1	-1	-1	-1	-6
											-1	-1	-1	-1	-1	-5
												1	-1	1	1	2
													-1	1	1	1
														1	1	2
															1	1
													Mann Kendall Statistic (S) =			4



MANN-KENDALL DATA EVALUATION

Site Name	Coakley Landfill	NHDES Site #	198712001	Compound =	Arsenic
		EPA ID #	NHD064424153		

	Well ID =	OP-2	OP-5	AE-1A	AE-2A
Event Number	Sampling Date (most recent last)	Concentration (leave blank if no data)	Concentration (leave blank if no data)	Concentration (leave blank if no data)	Concentration (leave blank if no data)
1	8/18/99	410	53	14	240
2	11/10/99	1	42	15	360
3	4/19/00	230	51	18	310
4	8/18/00	300	45	15	330
5	11/18/00	200	50	17	290
6	4/1/01	17	27	18	330
7	8/1/01	290	31	17	340
8	8/1/02	260	48	18	290
9	8/1/03	270	46	20	330
10	8/1/04	190	33	22	290
11	8/1/05	25	25	20	300
12	8/1/06	200	27	15	240
13	11/15/07	190	33	39	280
14	8/12/08	170	17	41	230
15	8/19/09	200	13	29	240
16	8/18/10	220	19	20	240
	Mann Kendall Statistic (S) =	-22.0	-74.0	72.0	-54.0
	Number of Rounds (n) =	16	16	16	16
	Average =	198.31	35.00	21.13	290.00
	Standard Deviation =	108.557	13.064	8.197	41.952
	Coefficient of Variation(CV)=	0.547	0.373	0.388	0.145

Error Check, Blank if No Errors Detected

Trend	DECREASING	DECREASING	INCREASING	DECREASING
Confidence Level	80%	99.5%	99.5%	99%
Stability Test, If No Trend Exists at 70% Confidence Level	NA	NA	NA	NA

Entry By =	KMM	Date =	24-Mar-11

Data entered in yellow cells

MANN-KENDALL DATA EVALUATION

Coakley Landfill	NHDES Site #	198712001	Compound =	Arsenic
	EPA ID #	NHD064424153		
Well ID =	OP-2	OP-5	AE-1A	AE-2A
Number of tied groups	Count Ties	Count Ties	Count Ties	Count Ties
#tied 2 times	1	2	1	0
#tied 3 times	1	0	3	2
#tied 4 times	0	0	0	1
#tied 5 times	0	0	0	0
#tied 6 times	0	0	0	0
#tied 7 times	0	0	0	0
#tied 8 times	0	0	0	0
#tied 9 times	0	0	0	0
#tied 10 times	0	0	0	0
Count Error?				
n =	16	16	16	16
V(S) =	488.67	491.33	481.33	477.33
S =	-22	-74	72	-54
Z =	-0.950	-3.293	3.236	-2.426

n = Number of Samples

$V(S)$ = variance of $S = 1/18\ [n(n-1)(2n+5) - \sum p=1 \rightarrow g\ \ w_p(w_p-1)(2w_p+5)]$

where g = number of tied groups and w_p represents the number of data points in the pth group

S = Mann-Kendall Statistic, number of increases versus number of decreases in data comparrision

$Z = (S-1)/[V(S)]^{1/2}$ if $S>0$, $Z=0$ if $S=0$, $Z= (S+1)/[V(S)]^{1/2}$ if $S<0$

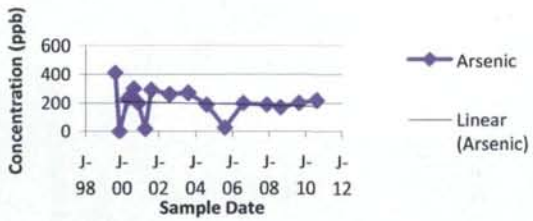
Z is comparred to table of critical values to determine confidence in trend

Trend confidences defined at 99.5%, 99%, 97.5%, 95%, 90%, 85%, 80%, 75%, 70%, and no trend

Mann Kendall Statistic Calculations

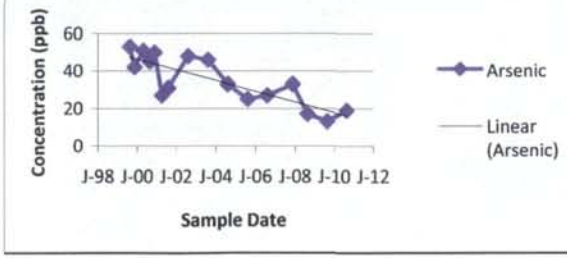
OP-2 Site = Coakley Landfill NHDES#: 198712001 EPA ID #: NHD064424153 Compound = Arsenic

Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Event 7	Event 8	Event 9	Event 10	Event 11	Event 12	Event 13	Event 14	Event 15	Event 16	
410	1	230	300	200	17	290	260	270	190	25	200	190	170	200	220	Sum Rows
	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-15
		1	1	1	1	1	1	1	1	1	1	1	1	1	1	14
			1	-1	-1	1	1	1	-1	-1	-1	-1	-1	-1	-1	-5
				-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-12
					-1	1	1	1	-1	-1	0	-1	-1	0	1	-1
						1	1	1	1	1	1	1	1	1	1	10
							-1	-1	-1	-1	-1	-1	-1	-1	-1	-9
								1	-1	-1	-1	-1	-1	-1	-1	-6
									-1	-1	-1	-1	-1	-1	-1	-7
										-1	1	0	-1	1	1	1
											1	1	1	1	1	5
												-1	-1	0	1	-1
													-1	1	1	1
														1	1	2
															1	1
													Mann Kendall Statistic (S) =			-22



OP-5 Site = Coakley Landfill NHDES#: 198712001 EPA ID #: NHD064424153 Compound = Arsenic

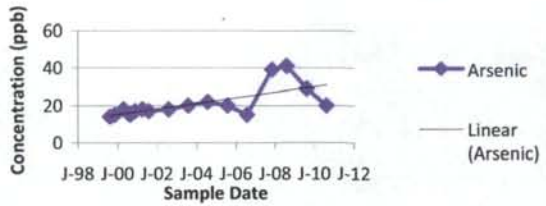
Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Event 7	Event 8	Event 9	Event 10	Event 11	Event 12	Event 13	Event 14	Event 15	Event 16	
53	42	51	45	50	27	31	48	46	33	25	27	33	17	13	19	Sum Rows
	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-15
		1	1	1	-1	-1	1	1	-1	-1	-1	-1	-1	-1	-1	-4
			-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-13
				1	-1	-1	1	1	-1	-1	-1	-1	-1	-1	-1	-6
					-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-11
						1	1	1	1	-1	0	1	-1	-1	-1	1
							1	1	1	-1	-1	1	-1	-1	-1	-1
								-1	-1	-1	-1	-1	-1	-1	-1	-8
									-1	-1	-1	-1	-1	-1	-1	-7
										-1	-1	0	-1	-1	-1	-5
											1	1	-1	-1	-1	-1
												1	-1	-1	-1	-2
													-1	-1	-1	-3
														-1	1	0
															1	1
													Mann Kendall Statistic (S) =			-74



Mann Kendall Statistic Calculations

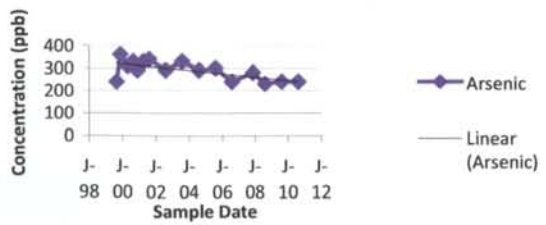
AE-1A | Site = Coakley Landfill | NHDES#: 198712001 | EPA ID #: NHD064424153 | Compound = Arsenic

Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Event 7	Event 8	Event 9	Event 10	Event 11	Event 12	Event 13	Event 14	Event 15	Event 16	
14	15	18	15	17	18	17	18	20	22	20	15	39	41	29	20	Sum Rows
	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	15
		1	0	1	1	1	1	1	1	1	0	1	1	1	1	12
			-1	-1	0	-1	0	1	1	1	-1	1	1	1	1	3
				1	1	1	1	1	1	1	0	1	1	1	1	11
					1	0	1	1	1	1	-1	1	1	1	1	8
						-1	0	1	1	1	-1	1	1	1	1	5
							1	1	1	1	-1	1	1	1	1	7
								1	1	1	-1	1	1	1	1	6
									1	0	-1	1	1	1	0	3
										-1	-1	1	1	1	-1	0
											-1	1	1	1	0	2
												1	1	1	1	4
													1	-1	-1	-1
														-1	-1	-2
															-1	-1
													Mann Kendall Statistic (S) =			72



AE-2A | Site = Coakley Landfill | NHDES#: 198712001 | EPA ID #: NHD064424153 | Compound = Arsenic

Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Event 7	Event 8	Event 9	Event 10	Event 11	Event 12	Event 13	Event 14	Event 15	Event 16	
240	360	310	330	290	330	340	290	330	290	300	240	280	230	240	240	Sum Rows
	1	1	1	1	1	1	1	1	1	1	0	1	-1	0	0	10
		-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-14
			1	-1	1	1	-1	1	-1	-1	-1	-1	-1	-1	-1	-5
				-1	0	1	-1	0	-1	-1	-1	-1	-1	-1	-1	-8
					1	1	0	1	0	1	-1	-1	-1	-1	-1	-1
						1	-1	0	-1	-1	-1	-1	-1	-1	-1	-7
							-1	-1	-1	-1	-1	-1	-1	-1	-1	-9
								1	0	1	-1	-1	-1	-1	-1	-3
									-1	-1	-1	-1	-1	-1	-1	-7
										1	-1	-1	-1	-1	-1	-4
											-1	-1	-1	-1	-1	-5
												1	-1	0	0	0
													-1	-1	-1	-3
														1	1	2
															0	0
													Mann Kendall Statistic (S) =			-54



MANN-KENDALL DATA EVALUATION

Site Name	Coakley Landfill	NHDES Site #	198712001	Compound =	Arsenic
		EPA ID #	NHD064424153		

	Well ID =	AE-3A	FPC-5A	FPC-9A	
Event Number	Sampling Date (most recent last)	Concentration (leave blank if no data)	Concentration (leave blank if no data)	Concentration (leave blank if no data)	Concentration (leave blank if no data)
1	8/18/99	150	30	81	
2	11/10/99	92	34	18	
3	4/19/00	87	27	60	
4	8/18/00	130	40	70	
5	11/18/00	100	0.5		
6	4/1/01	90	1	53	
7	8/1/01	130	46	65	
8	8/1/02	110	54	79	
9	8/1/03	110	8	64	
10	8/1/04	110	45	2	
11	8/1/05	120	65	2	
12	8/1/06	100	42	44	
13	11/15/07	130	53	37	
14	8/12/08	150	54	26	
15	8/19/09	120	53	34	
16	8/18/10	120	55	35	
	Mann Kendall Statistic (S) =	27.0	60.0	-38.0	0.0
	Number of Rounds (n) =	16	16	15	0
	Average =	115.56	37.97	44.67	#DIV/0!
	Standard Deviation =	19.422	19.982	25.634	#DIV/0!
	Coefficient of Variation(CV)=	0.168	0.526	0.574	#DIV/0!

Error Check, Blank if No Errors Detected				n<4
Trend	INCREASING	INCREASING	DECREASING	n<4
Confidence Level	85%	99.5%	95%	n<4
Stability Test, If No Trend Exists at 70% Confidence Level	NA	NA	NA	n<4 n<4

Entry By =	KMM	Date =	24-Mar-11

Data entered in yellow cells

MANN-KENDALL DATA EVALUATION

Coakley Landfill	NHDES Site #	198712001	Compound =	Arsenic
	EPA ID #	NHD064424153		
Well ID =	AE-3A	FPC-5A	FPC-9A	0
Number of tied groups	Count Ties	Count Ties	Count Ties	No Ties
#tied 2 times	2	2	1	0
#tied 3 times	3	0	0	0
#tied 4 times	0	0	0	0
#tied 5 times	0	0	0	0
#tied 6 times	0	0	0	0
#tied 7 times	0	0	0	0
#tied 8 times	0	0	0	0
#tied 9 times	0	0	0	0
#tied 10 times	0	0	0	0
Count Error?				
n =	16	16	15	0
V(S) =	480.33	491.33	407.33	0.00
S =	27	60	-38	0
Z =	1.186	2.662	-1.833	0.000

n = Number of Samples

V(S) = variance of S = $1/18\ [n(n-1)(2n+5) - \sum p=1 \rightarrow g\ \ w_p(w_p-1)(2w_p+5)]$

where g = number of tied groups and w_p represents the number of data points in the pth group

S = Mann-Kendall Statistic, number of increases versus number of decreases in data comparrision

$Z = (S-1)/[V(S)]^{1/2}$ if $S>0$, $Z=0$ if $S=0$, $Z= (S+1)/[V(S)]^{1/2}$ if $S<0$

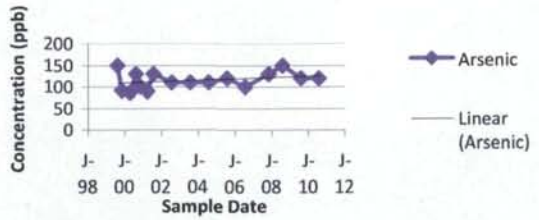
Z is comparred to table of critical values to determine confidence in trend

Trend confidences defined at 99.5%, 99%, 97.5%, 95%, 90%, 85%, 80%, 75%, 70%, and no trend

Mann Kendall Statistic Calculations

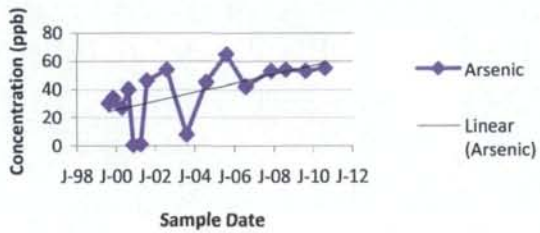
AE-3A | Site = Coakley Landfill | NHDES#: 198712001 | EPA ID #: NHD064424153 | Compound = Arsenic

Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Event 7	Event 8	Event 9	Event 10	Event 11	Event 12	Event 13	Event 14	Event 15	Event 16	
150	92	87	130	100	90	130	110	110	110	120	100	130	150	120	120	Sum Rows
	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	0	-1	-1	-14
		-1	1	1	-1	1	1	1	1	1	1	1	1	1	1	10
			1	1	1	1	1	1	1	1	1	1	1	1	1	13
				-1	-1	0	-1	-1	-1	-1	-1	0	1	-1	-1	-8
					-1	1	1	1	1	1	0	1	1	1	1	8
						1	1	1	1	1	1	1	1	1	1	10
							-1	-1	-1	-1	-1	0	1	-1	-1	-6
								0	0	1	-1	1	1	1	1	4
									0	1	-1	1	1	1	1	4
										1	-1	1	1	1	1	4
											-1	1	1	0	0	1
												1	1	1	1	4
													1	-1	-1	-1
														-1	-1	-2
															0	0
													Mann Kendall Statistic (S) =			27



FPC-5A | Site = Coakley Landfill | NHDES#: 198712001 | EPA ID #: NHD064424153 | Compound = Arsenic

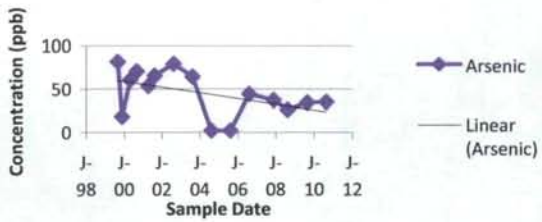
Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Event 7	Event 8	Event 9	Event 10	Event 11	Event 12	Event 13	Event 14	Event 15	Event 16	
30	34	27	40	1	1	46	54	8	45	65	42	53	54	53	55	Sum Rows
	1	-1	1	-1	-1	1	1	-1	1	1	1	1	1	1	1	7
		-1	1	-1	-1	1	1	-1	1	1	1	1	1	1	1	6
			1	-1	-1	1	1	-1	1	1	1	1	1	1	1	7
				-1	-1	1	1	-1	1	1	1	1	1	1	1	6
					1	1	1	1	1	1	1	1	1	1	1	11
						1	1	1	1	1	1	1	1	1	1	10
							1	-1	-1	1	-1	1	1	1	1	3
								-1	-1	1	-1	-1	0	-1	1	-3
									1	1	1	1	1	1	1	7
										1	-1	1	1	1	1	4
											-1	-1	-1	-1	-1	-5
												1	1	1	1	4
													1	0	1	2
														-1	1	0
															1	1
													Mann Kendall Statistic (S) =			60



Mann Kendall Statistic Calculations

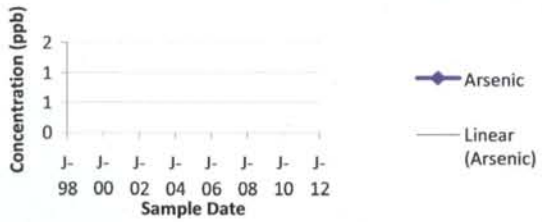
FPC-9A | Site = Coakley Landfill | NHDES#: 198712001 | EPA ID #: NHD064424153 | Compound = Arsenic

Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Event 7	Event 8	Event 9	Event 10	Event 11	Event 12	Event 13	Event 14	Event 15	Event 16	
81	18	60	70		53	65	79	64	2	2	44	37	26	34	35	Sum Rows
	-1	-1	-1		-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-14
		1	1		1	1	1	1	-1	-1	1	1	1	1	1	9
			1		-1	1	1	1	-1	-1	-1	-1	-1	-1	-1	-4
					-1	-1	1	-1	-1	-1	-1	-1	-1	-1	-1	-9
																0
						1	1	1	-1	-1	-1	-1	-1	-1	-1	-4
							1	-1	-1	-1	-1	-1	-1	-1	-1	-7
								-1	-1	-1	-1	-1	-1	-1	-1	-8
									-1	-1	-1	-1	-1	-1	-1	-7
										0	1	1	1	1	1	5
											1	1	1	1	1	5
												-1	-1	-1	-1	-4
													-1	-1	-1	-3
														1	1	2
															1	1
													Mann Kendall Statistic (S) =			-38



0 | Site = Coakley Landfill | NHDES#: 198712001 | EPA ID #: NHD064424153 | Compound = Arsenic

Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Event 7	Event 8	Event 9	Event 10	Event 11	Event 12	Event 13	Event 14	Event 15	Event 16	
																Sum Rows
																0
																0
																0
																0
																0
																0
																0
																0
																0
																0
																0
																0
																0
																0
													Mann Kendall Statistic (S) =			0



MANN-KENDALL DATA EVALUATION

Site Name	Coakley Landfill	NHDES Site #	198712001	Compound =	Arsenic
		EPA ID #	NHD064424153		

	Well ID =	BP-4	MW-5D	MW-8	MW-11
Event Number	Sampling Date (most recent last)	Concentration (leave blank if no data)	Concentration (leave blank if no data)	Concentration (leave blank if no data)	Concentration (leave blank if no data)
1	8/18/99	36	7	8	16
2	11/10/99	34	8	10	14
3	4/19/00	32	10	7	14
4	8/18/00	43	10	7	12
5	11/18/00	35	9	10	10
6	4/1/01	20	7	11	14
7	8/1/01	31	8	43	20
8	8/1/02	36	6	9	17
9	8/1/03	32	7	8	15
10	8/1/04	22	5	6	11
11	8/1/05	11	6	10	12
12	8/1/06	26	5	7	10
13	11/15/07	30	11	10	15
14	8/12/08	23	5	8	13
15	8/19/09	22	6	8	11
16	8/18/10	34	10	13	11
	Mann Kendall Statistic (S) =	-44.0	-31.0	7.0	-33.0
	Number of Rounds (n) =	16	16	16	16
	Average =	29.19	7.50	10.94	13.44
	Standard Deviation =	7.960	2.000	8.737	2.756
	Coefficient of Variation(CV)=	0.273	0.267	0.799	0.205

Error Check, Blank if No Errors Detected

Trend	DECREASING	DECREASING	No Trend	DECREASING
Confidence Level	95%	90%	No Trend	90%
Stability Test, If No Trend Exists at 70% Confidence Level	NA	NA	CV <= 1 STABLE	NA

Entry By =	KMM	Date =	24-Mar-11

Data entered in yellow cells

MANN-KENDALL DATA EVALUATION

Coakley Landfill	NHDES Site #	198712001	Compound =	Arsenic
	EPA ID #	NHD064424153		
Well ID =	BP-4	MW-5D	MW-8	MW-11
Number of tied groups	Count Ties	Count Ties	Count Ties	Count Ties
#tied 2 times	4	1	0	3
#tied 3 times	0	4	1	2
#tied 4 times	0	0	2	0
#tied 5 times	0	0	0	0
#tied 6 times	0	0	0	0
#tied 7 times	0	0	0	0
#tied 8 times	0	0	0	0
#tied 9 times	0	0	0	0
#tied 10 times	0	0	0	0
Count Error?				
n =	16	16	16	16
V(S) =	489.33	477.67	472.33	483.00
S =	-44	-31	7	-33
Z =	-1.944	-1.373	0.276	-1.456

n = Number of Samples

$V(S)$ = variance of $S = 1/18\ [n(n-1)(2n+5) - \sum p=1 \rightarrow g\ \ w_p(w_p-1)(2w_p+5)]$

where g = number of tied groups and w_p represents the number of data points in the pth group

S = Mann-Kendall Statistic, number of increases versus number of decreases in data comparrision

$Z = (S-1)/[V(S)]^{1/2}$ if $S>0$, $Z=0$ if $S=0$, $Z= (S+1)/[V(S)]^{1/2}$ if $S<0$

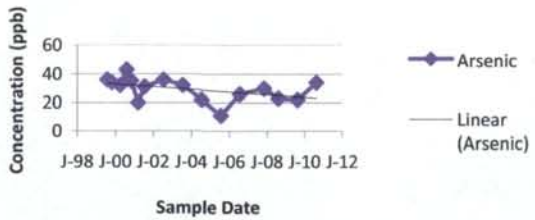
Z is comparred to table of critical values to determine confidence in trend

Trend confidences defined at 99.5%, 99%, 97.5%, 95%, 90%, 85%, 80%, 75%, 70%, and no trend

Mann Kendall Statistic Calculations

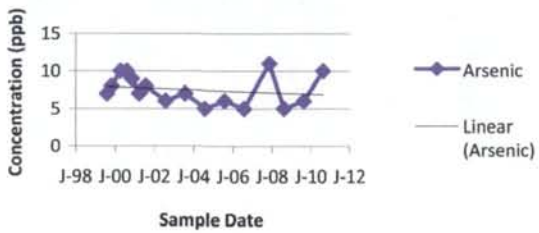
BP-4 Site = Coakley Landfill NHDES#: 198712001 EPA ID #: NHD064424153 Compound = Arsenic

Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Event 7	Event 8	Event 9	Event 10	Event 11	Event 12	Event 13	Event 14	Event 15	Event 16	
36	34	32	43	35	20	31	36	32	22	11	26	30	23	22	34	Sum Rows
	-1	-1	1	-1	-1	-1	0	-1	-1	-1	-1	-1	-1	-1	-1	-12
		-1	1	1	-1	-1	1	-1	-1	-1	-1	-1	-1	-1	0	-7
			1	1	-1	-1	1	0	-1	-1	-1	-1	-1	-1	1	-4
				-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-12
					-1	-1	1	-1	-1	-1	-1	-1	-1	-1	-1	-9
						1	1	1	1	-1	1	1	1	1	1	8
							1	1	-1	-1	-1	-1	-1	-1	1	-3
								-1	-1	-1	-1	-1	-1	-1	-1	-8
									-1	-1	-1	-1	-1	-1	1	-5
										-1	1	1	1	0	1	3
											1	1	1	1	1	5
												1	-1	-1	1	0
													-1	-1	1	-1
														-1	1	0
															1	1
													Mann Kendall Statistic (S) =			-44



MW-5D Site = Coakley Landfill NHDES#: 198712001 EPA ID #: NHD064424153 Compound = Arsenic

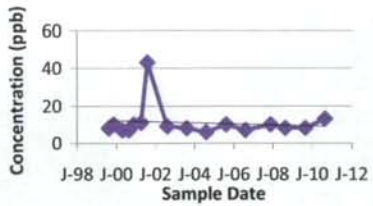
Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Event 7	Event 8	Event 9	Event 10	Event 11	Event 12	Event 13	Event 14	Event 15	Event 16	
7	8	10	10	9	7	8	6	7	5	6	5	11	5	6	10	Sum Rows
	1	1	1	1	0	1	-1	0	-1	-1	-1	1	-1	-1	1	1
		1	1	1	-1	0	-1	-1	-1	-1	-1	1	-1	-1	1	-3
			0	-1	-1	-1	-1	-1	-1	-1	-1	1	-1	-1	0	-9
				-1	-1	-1	-1	-1	-1	-1	-1	1	-1	-1	0	-9
					-1	-1	-1	-1	-1	-1	-1	1	-1	-1	1	-7
						1	-1	0	-1	-1	-1	1	-1	-1	1	-3
							-1	-1	-1	-1	-1	1	-1	-1	1	-5
								1	-1	0	-1	1	-1	0	1	0
									-1	-1	-1	1	-1	-1	1	-3
										1	0	1	0	1	1	4
											-1	1	-1	0	1	0
												1	0	1	1	3
													-1	-1	-1	-3
														1	1	2
															1	1
													Mann Kendall Statistic (S) =			-31



Mann Kendall Statistic Calculations

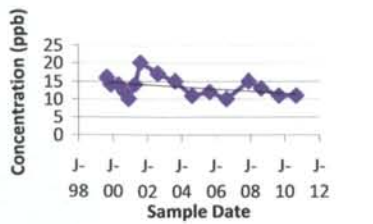
MW-8 Site = Coakley Landfill NHDES#: 198712001 EPA ID #: NHD064424153 Compound = Arsenic

Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Event 7	Event 8	Event 9	Event 10	Event 11	Event 12	Event 13	Event 14	Event 15	Event 16	
8	10	7	7	10	11	43	9	8	6	10	7	10	8	8	13	Sum Rows
	1	-1	-1	1	1	1	1	0	-1	1	-1	1	0	0	1	4
		-1	-1	0	1	1	-1	-1	-1	0	-1	0	-1	-1	1	-5
			0	1	1	1	1	1	-1	1	0	1	1	1	1	9
				1	1	1	1	1	-1	1	0	1	1	1	1	9
					1	1	-1	-1	-1	0	-1	0	-1	-1	1	-3
						1	-1	-1	-1	-1	-1	-1	-1	-1	1	-6
							-1	-1	-1	-1	-1	-1	-1	-1	-1	-9
								-1	-1	1	-1	1	-1	-1	1	-2
									-1	1	-1	1	0	0	1	1
										1	1	1	1	1	1	6
											-1	0	-1	-1	1	-2
												1	1	1	1	4
													-1	-1	1	-1
														0	1	1
															1	1
													Mann Kendall Statistic (S) =			7



MW-11 Site = Coakley Landfill NHDES#: 198712001 EPA ID #: NHD064424153 Compound = Arsenic

Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Event 7	Event 8	Event 9	Event 10	Event 11	Event 12	Event 13	Event 14	Event 15	Event 16	
16	14	14	12	10	14	20	17	15	11	12	10	15	13	11	11	Sum Rows
	-1	-1	-1	-1	-1	1	1	-1	-1	-1	-1	-1	-1	-1	-1	-11
		0	-1	-1	0	1	1	1	-1	-1	-1	1	-1	-1	-1	-4
			-1	-1	0	1	1	1	-1	-1	-1	1	-1	-1	-1	-4
				-1	1	1	1	1	-1	0	-1	1	1	-1	-1	1
					1	1	1	1	1	1	0	1	1	1	1	10
						1	1	1	-1	-1	-1	1	-1	-1	-1	-2
							-1	-1	-1	-1	-1	-1	-1	-1	-1	-9
								-1	-1	-1	-1	-1	-1	-1	-1	-8
									-1	-1	-1	0	-1	-1	-1	-6
										1	-1	1	1	0	0	2
											-1	1	1	-1	-1	-1
												1	1	1	1	4
													-1	-1	-1	-3
														-1	-1	-2
															0	0
													Mann Kendall Statistic (S) =			-33



MANN-KENDALL DATA EVALUATION

Site Name	Coakley Landfill	NHDES Site #	198712001	Compound =	Arsenic
		EPA ID #	NHD064424153		

	Well ID =	AE-2B	AE-3B	FPC-5B	FPC-11B
Event Number	Sampling Date (most recent last)	Concentration (leave blank if no data)	Concentration (leave blank if no data)	Concentration (leave blank if no data)	Concentration (leave blank if no data)
1	8/18/99	13	120	0.5	
2	11/10/99	11	100	0.5	
3	4/19/00	7	91	0.5	
4	8/18/00	8	82	0.5	
5	11/18/00	26	93	31	
6	4/1/01	13	83	34	
7	8/1/01	16	110	2	
8	8/1/02	11	73	1	
9	8/1/03	18	84	38	30
10	8/1/04	16	92	0.5	8
11	8/1/05	25	78	4	11
12	8/1/06	24	91	0.5	6
13	11/15/07	20	82	4	9
14	8/12/08	19	95	1	8
15	8/19/09	26	91	1	10
16	8/18/10	16	79	3	10
	Mann Kendall Statistic (S) =	52.0	-32.0	23.0	-2.0
	Number of Rounds (n) =	16	16	16	8
	Average =	16.81	90.25	7.63	11.50
	Standard Deviation =	6.199	12.130	13.367	7.635
	Coefficient of Variation(CV)=	0.369	0.134	1.753	0.664

Error Check, Blank if No Errors Detected

Trend	INCREASING	DECREASING	INCREASING	No Trend
Confidence Level	97.5%	90%	85%	No Trend
Stability Test, If No Trend Exists at 70% Confidence Level	NA	NA	NA	CV <= 1 STABLE

Entry By =	KMM	Date =	24-Mar-11

Data entered in yellow cells

MANN-KENDALL DATA EVALUATION

Coakley Landfill	NHDES Site #	198712001	Compound =	Arsenic
	EPA ID #	NHD064424153		
Well ID =	AE-2B	AE-3B	FPC-5B	FPC-11B
Number of tied groups	Count Ties	Count Ties	Count Ties	Count Ties
#tied 2 times	3	1	1	2
#tied 3 times	1	1	1	0
#tied 4 times	0	0	0	0
#tied 5 times	0	0	0	0
#tied 6 times	0	0	1	0
#tied 7 times	0	0	1	0
#tied 8 times	0	0	0	0
#tied 9 times	0	0	0	0
#tied 10 times	0	0	0	0
Count Error?				
n =	16	16	16	8
V(S) =	486.67	488.67	449.33	63.33
S =	52	-32	23	-2
Z =	2.312	-1.402	1.038	-0.126

n = Number of Samples

$V(S)$ = variance of $S = 1/18\ [n(n-1)(2n+5) - \sum p=1 \rightarrow g\ \ w_p(w_p-1)(2w_p+5)]$

where g = number of tied groups and w_p represents the number of data points in the pth group

S = Mann-Kendall Statistic, number of increases versus number of decreases in data comparrision

$Z = (S-1)/[V(S)]^{1/2}$ if $S>0$, $Z=0$ if $S=0$, $Z= (S+1)/[V(S)]^{1/2}$ if $S<0$

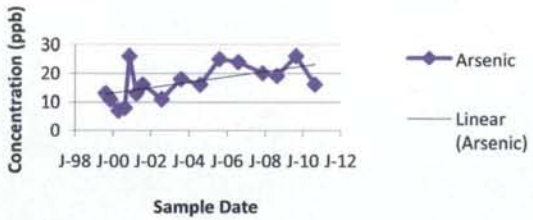
Z is comparred to table of critical values to determine confidence in trend

Trend confidences defined at 99.5%, 99%, 97.5%, 95%, 90%, 85%, 80%, 75%, 70%, and no trend

Mann Kendall Statistic Calculations

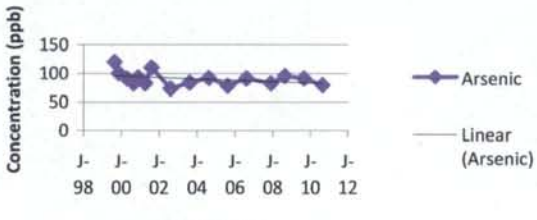
AE-2B Site = Coakley Landfill NHDES#: 198712001 EPA ID #: NHD064424153 Compound = Arsenic

Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Event 7	Event 8	Event 9	Event 10	Event 11	Event 12	Event 13	Event 14	Event 15	Event 16	
13	11	7	8	26	13	16	11	18	16	25	24	20	19	26	16	Sum Rows
	-1	-1	-1	1	0	1	-1	1	1	1	1	1	1	1	1	6
		-1	-1	1	1	1	0	1	1	1	1	1	1	1	1	9
			1	1	1	1	1	1	1	1	1	1	1	1	1	13
				1	1	1	1	1	1	1	1	1	1	1	1	12
					-1	-1	-1	-1	-1	-1	-1	-1	-1	0	-1	-10
						1	-1	1	1	1	1	1	1	1	1	8
							-1	1	0	1	1	1	1	1	0	5
								1	1	1	1	1	1	1	1	8
									-1	1	1	1	1	1	-1	3
										1	1	1	1	1	0	5
											-1	-1	-1	1	-1	-3
												-1	-1	1	-1	-2
													-1	1	-1	-1
														1	-1	0
															-1	-1
													Mann Kendall Statistic (S) =			52



AE-3B Site = Coakley Landfill NHDES#: 198712001 EPA ID #: NHD064424153 Compound = Arsenic

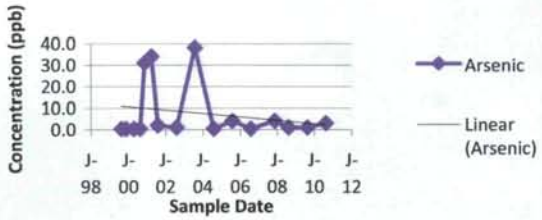
Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Event 7	Event 8	Event 9	Event 10	Event 11	Event 12	Event 13	Event 14	Event 15	Event 16	
120	100	91	82	93	83	110	73	84	92	78	91	82	95	91	79	Sum Rows
	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-15
		-1	-1	-1	-1	1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-12
			-1	1	-1	1	-1	-1	1	-1	0	-1	1	0	-1	-3
				1	1	1	-1	1	1	-1	1	0	1	1	-1	5
					-1	1	-1	-1	-1	-1	-1	-1	1	-1	-1	-7
						1	-1	1	1	-1	1	-1	1	1	-1	2
							-1	-1	-1	-1	-1	-1	-1	-1	-1	-9
								1	1	1	1	1	1	1	1	8
									1	-1	1	-1	1	1	-1	1
										-1	-1	-1	1	-1	-1	-4
											1	1	1	1	1	5
												-1	1	0	-1	-1
													1	1	-1	1
														-1	-1	-2
															-1	-1
													Mann Kendall Statistic (S) =			-32



Mann Kendall Statistic Calculations

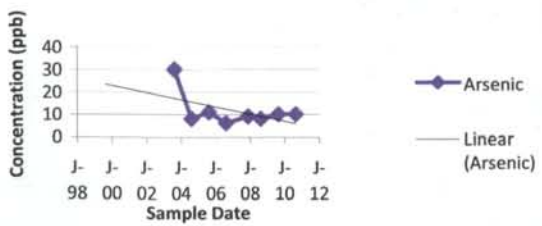
FPC-5B | Site = Coakley Landfill | NHDES#: 198712001 | EPA ID #: NHD064424153 | Compound = Arsenic

Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Event 7	Event 8	Event 9	Event 10	Event 11	Event 12	Event 13	Event 14	Event 15	Event 16	
1	1	1	1	31	34	2	1	38	1	4	1	4	1	1	3	Sum Rows
	0	0	0	1	1	1	1	1	0	1	0	1	1	1	1	10
		0	0	1	1	1	1	1	0	1	0	1	1	1	1	10
			0	1	1	1	1	1	0	1	0	1	1	1	1	10
				1	1	1	1	1	0	1	0	1	1	1	1	10
					1	-1	-1	1	-1	-1	-1	-1	-1	-1	-1	-7
						-1	-1	1	-1	-1	-1	-1	-1	-1	-1	-8
							-1	1	-1	1	-1	1	-1	-1	1	-1
								1	-1	1	-1	1	0	0	1	2
									-1	-1	-1	-1	-1	-1	-1	-7
										1	0	1	1	1	1	5
											-1	0	-1	-1	-1	-4
												1	1	1	1	4
													-1	-1	-1	-3
														0	1	1
															1	1
													Mann Kendall Statistic (S) =			23



FPC-11B | Site = Coakley Landfill | NHDES#: 198712001 | EPA ID #: NHD064424153 | Compound = Arsenic

Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Event 7	Event 8	Event 9	Event 10	Event 11	Event 12	Event 13	Event 14	Event 15	Event 16	
								30	8	11	6	9	8	10	10	Sum Rows
																0
																0
																0
																0
																0
																0
																0
																0
									-1	-1	-1	-1	-1	-1	-1	-7
										1	-1	1	0	1	1	3
											-1	-1	-1	-1	-1	-5
												1	1	1	1	4
													-1	1	1	1
														1	1	2
															0	0
													Mann Kendall Statistic (S) =			-2



MANN-KENDALL DATA EVALUATION

Site Name	Coakley Landfill	NHDES Site #	198712001	Compound =	Manganese
		EPA ID #	NHD064424153		

Event Number	Sampling Date (most recent last)	MW-4 Concentration (leave blank if no data)	MW-5S Concentration (leave blank if no data)	MW-9 Concentration (leave blank if no data)	MW-10 Concentration (leave blank if no data)
1	8/18/99	1,400	2,700	950	5,400
2	11/10/99	1,300	3,000	1,400	8,600
3	4/19/00	1,700	2,800	1,200	2,700
4	8/18/00	1,400	3,100	1,000	3,600
5	11/18/00	1,500	3,400	1,100	1,900
6	4/1/01	1,600	3,100	880	910
7	8/1/01	1,400	3,200	1,000	3,900
8	8/1/02	1,300	3,500	1,100	4,400
9	8/1/03	1,700	4,100	1,300	8,100
10	8/1/04	1,400	3,800	1,100	3,900
11	8/1/05	13,000	3,600	710	3,500
12	8/1/06	4,500	3,700	2,400	3,200
13	11/15/07	5,900	4,400	1,200	2,800
14	8/12/08	5,800	3,900	3,500	760
15	8/19/09	1,200	3,400	2,100	2,200
16	8/18/10	1,100	2,900	1,400	2,700

Well ID =	MW-4	MW-5S	MW-9	MW-10
Mann Kendall Statistic (S) =	12.0	58.0	40.0	-42.0
Number of Rounds (n) =	16	16	16	16
Average =	2887.50	3412.50	1396.25	3660.63
Standard Deviation =	3149.153	484.252	708.462	2188.346
Coefficient of Variation(CV)=	1.091	0.142	0.507	0.598

Error Check, Blank if No Errors Detected

Trend	No Trend	INCREASING	INCREASING	DECREASING
Confidence Level	No Trend	99%	95%	95%
Stability Test, If No Trend Exists at 70% Confidence Level	CV > 1 NON-STABLE	NA	NA	NA

Entry By =	KMM	Date =	24-Mar-11

Data entered in yellow cells

MANN-KENDALL DATA EVALUATION

Coakley Landfill	NHDES Site #	198712001	Compound =	Manganese
	EPA ID #	NHD064424153		
Well ID =	MW-4	MW-5S	MW-9	MW-10
Number of tied groups	Count Ties	Count Ties	Count Ties	Count Ties
#tied 2 times	2	2	3	2
#tied 3 times	0	0	1	0
#tied 4 times	1	0	0	0
#tied 5 times	0	0	0	0
#tied 6 times	0	0	0	0
#tied 7 times	0	0	0	0
#tied 8 times	0	0	0	0
#tied 9 times	0	0	0	0
#tied 10 times	0	0	0	0
Count Error?				
n =	16	16	16	16
V(S) =	482.67	491.33	486.67	491.33
S =	12	58	40	-42
Z =	0.501	2.572	1.768	-1.850

n = Number of Samples

V(S) = variance of S = $1/18\ [n(n-1)(2n+5) - \sum p=1 \rightarrow g\ w_p(w_p-1)(2w_p+5)]$

where g = number of tied groups and w_p represents the number of data points in the pth group

S = Mann-Kendall Statistic, number of increases versus number of decreases in data comparrision

$Z = (S-1)/[V(S)]^{1/2}$ if S>0, Z=0 if S=0, $Z= (S+1)/[V(S)]^{1/2}$ if S<0

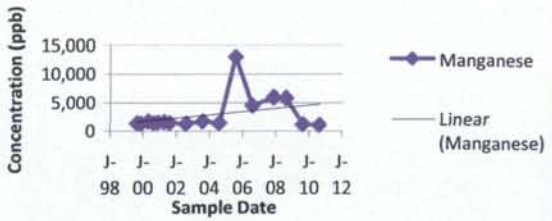
Z is comparred to table of critical values to determine confidence in trend

Trend confidences defined at 99.5%, 99%, 97.5%, 95%, 90%, 85%, 80%, 75%, 70%, and no trend

Mann Kendall Statistic Calculations

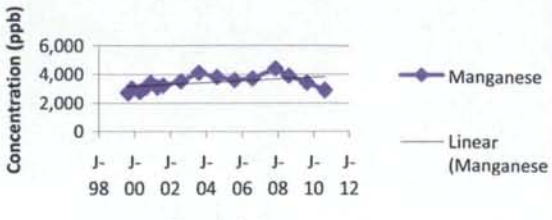
MW-4 Site = Coakley Landfill NHDES#: 198712001 EPA ID #: NHD064424153 Compound = Manganese

Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Event 7	Event 8	Event 9	Event 10	Event 11	Event 12	Event 13	Event 14	Event 15	Event 16	
1,400	1,300	1,700	1,400	1,500	1,600	1,400	1,300	1,700	1,400	13,000	4,500	5,900	5,800	1,200	1,100	Sum Rows
	-1	1	0	1	1	0	-1	1	0	1	1	1	1	-1	-1	4
		1	1	1	1	1	0	1	1	1	1	1	1	-1	-1	9
			-1	-1	-1	-1	-1	0	-1	1	1	1	1	-1	-1	-4
				1	1	0	-1	1	0	1	1	1	1	-1	-1	4
					1	-1	-1	1	-1	1	1	1	1	-1	-1	1
						-1	-1	1	-1	1	1	1	1	-1	-1	0
							-1	1	0	1	1	1	1	-1	-1	2
								1	1	1	1	1	1	-1	-1	4
									-1	1	1	1	1	-1	-1	1
										1	1	1	1	-1	-1	2
											-1	-1	-1	-1	-1	-5
												1	1	-1	-1	0
													-1	-1	-1	-3
														-1	-1	-2
															-1	-1
														Mann Kendall Statistic (S) =		12



MW-5S Site = Coakley Landfill NHDES#: 198712001 EPA ID #: NHD064424153 Compound = Manganese

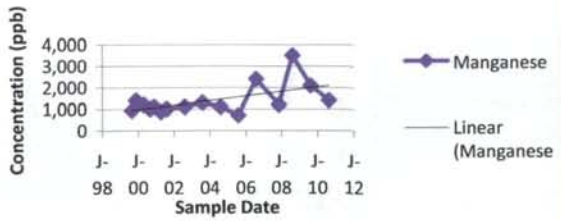
Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Event 7	Event 8	Event 9	Event 10	Event 11	Event 12	Event 13	Event 14	Event 15	Event 16	
2,700	3,000	2,800	3,100	3,400	3,100	3,200	3,500	4,100	3,800	3,600	3,700	4,400	3,900	3,400	2,900	Sum Rows
	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	15
		-1	1	1	1	1	1	1	1	1	1	1	1	1	-1	10
			1	1	1	1	1	1	1	1	1	1	1	1	1	13
				1	0	1	1	1	1	1	1	1	1	1	-1	9
					-1	-1	1	1	1	1	1	1	1	0	-1	4
						1	1	1	1	1	1	1	1	1	-1	8
							1	1	1	1	1	1	1	1	-1	7
								1	1	1	1	1	1	-1	-1	4
									-1	-1	-1	1	-1	-1	-1	-5
										-1	-1	1	1	-1	-1	-2
											1	1	1	-1	-1	1
												1	1	-1	-1	0
													-1	-1	-1	-3
														-1	-1	-2
															-1	-1
														Mann Kendall Statistic (S) =		58



Mann Kendall Statistic Calculations

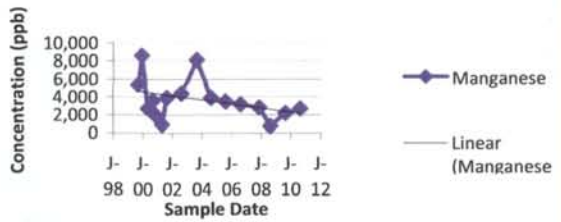
MW-9 Site = Coakley Landfill NHDES#: 198712001 EPA ID #: NHD064424153 Compound = Manganese

Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Event 7	Event 8	Event 9	Event 10	Event 11	Event 12	Event 13	Event 14	Event 15	Event 16	
950	1,400	1,200	1,000	1,100	880	1,000	1,100	1,300	1,100	710	2,400	1,200	3,500	2,100	1,400	Sum Rows
	1	1	1	1	-1	1	1	1	1	-1	1	1	1	1	1	11
		-1	-1	-1	-1	-1	-1	-1	-1	-1	1	-1	1	1	0	-7
			-1	-1	-1	-1	-1	1	-1	-1	1	0	1	1	1	-2
				1	-1	0	1	1	1	-1	1	1	1	1	1	7
					-1	-1	0	1	0	-1	1	1	1	1	1	3
						1	1	1	1	-1	1	1	1	1	1	8
							1	1	1	-1	1	1	1	1	1	7
								1	0	-1	1	1	1	1	1	5
									-1	-1	1	-1	1	1	1	1
										-1	1	1	1	1	1	4
											1	1	1	1	1	5
												-1	1	-1	-1	-2
													1	1	1	3
														-1	-1	-2
															-1	-1
													Mann Kendall Statistic (S) =			40



MW-10 Site = Coakley Landfill NHDES#: 198712001 EPA ID #: NHD064424153 Compound = Manganese

Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Event 7	Event 8	Event 9	Event 10	Event 11	Event 12	Event 13	Event 14	Event 15	Event 16	
5,400	8,600	2,700	3,600	1,900	910	3,900	4,400	8,100	3,900	3,500	3,200	2,800	760	2,200	2,700	Sum Rows
	1	-1	-1	-1	-1	-1	-1	1	-1	-1	-1	-1	-1	-1	-1	-11
		-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-14
			1	-1	-1	1	1	1	1	1	1	1	-1	-1	0	4
				-1	-1	1	1	1	1	-1	-1	-1	-1	-1	-1	-4
					-1	1	1	1	1	1	1	1	-1	1	1	7
						1	1	1	1	1	1	1	-1	1	1	8
							1	1	0	-1	-1	-1	-1	-1	-1	-4
								1	-1	-1	-1	-1	-1	-1	-1	-6
									-1	-1	-1	-1	-1	-1	-1	-7
										-1	-1	-1	-1	-1	-1	-6
											-1	-1	-1	-1	-1	-5
												-1	-1	-1	-1	-4
													-1	-1	-1	-3
														1	1	2
															1	1
													Mann Kendall Statistic (S) =			-42



MANN-KENDALL DATA EVALUATION

Site Name	Coakley Landfill	NHDES Site #	198712001	Compound =	Manganese
		EPA ID #	NHD064424153		

	Well ID =	OP-2	OP-5	AE-2A	AE-3A
Event Number	Sampling Date (most recent last)	Concentration (leave blank if no data)	Concentration (leave blank if no data)	Concentration (leave blank if no data)	Concentration (leave blank if no data)
1	8/18/99	220	6,500	1,900	1,500
2	11/10/99	390	7,100	1,200	1,200
3	4/19/00	730	7,700	900	650
4	8/18/00	490	5,400	650	1,000
5	11/18/00	450	6,700	650	1,200
6	4/1/01	500	4,900	830	890
7	8/1/01	290	1,500	740	900
8	8/1/02	330	5,200	950	950
9	8/1/03	360	3,900	830	1,300
10	8/1/04	380	3,500	760	740
11	8/1/05	390	3,800	720	690
12	8/1/06	470	2,500	510	690
13	11/15/07	620	3,800	770	840
14	8/12/08	580	2,300	610	850
15	8/19/09	630	1,800	650	1,300
16	8/18/10	760	2,200	700	760
	Mann Kendall Statistic (S) =	49.0	-81.0	-54.0	-29.0
	Number of Rounds (n) =	16	16	16	16
	Average =	474.38	4300.00	835.63	966.25
	Standard Deviation =	155.090	1990.310	326.005	258.763
	Coefficient of Variation(CV)=	0.327	0.463	0.390	0.268

Error Check, Blank if No Errors Detected

Trend	INCREASING	DECREASING	DECREASING	DECREASING
Confidence Level	97.5%	99.5%	99%	85%
Stability Test, If No Trend Exists at 70% Confidence Level	NA	NA	NA	NA

Entry By =	KMM	Date =	24-Mar-11

Data entered in yellow cells

MANN-KENDALL DATA EVALUATION

Coakley Landfill	NHDES Site #	198712001	Compound =	Manganese
	EPA ID #	NHD064424153		
Well ID =	OP-2	OP-5	AE-2A	AE-3A
Number of tied groups	Count Ties	Count Ties	Count Ties	Count Ties
#tied 2 times	1	1	1	3
#tied 3 times	0	0	1	0
#tied 4 times	0	0	0	0
#tied 5 times	0	0	0	0
#tied 6 times	0	0	0	0
#tied 7 times	0	0	0	0
#tied 8 times	0	0	0	0
#tied 9 times	0	0	0	0
#tied 10 times	0	0	0	0
Count Error?				
n =	16	16	16	16
V(S) =	492.33	492.33	488.67	490.33
S =	49	-81	-54	-29
Z =	2.163	-3.605	-2.398	-1.264

n = Number of Samples

V(S) = variance of S = $1/18\ [n(n-1)(2n+5) - \sum p=1 \rightarrow g\ w_p(w_p-1)(2w_p+5)]$

where g = number of tied groups and w_p represents the number of data points in the pth group

S = Mann-Kendall Statistic, number of increases versus number of decreases in data comparrision

$Z = (S-1)/[V(S)]^{1/2}$ if S>0, Z=0 if S=0, $Z= (S+1)/[V(S)]^{1/2}$ if S<0

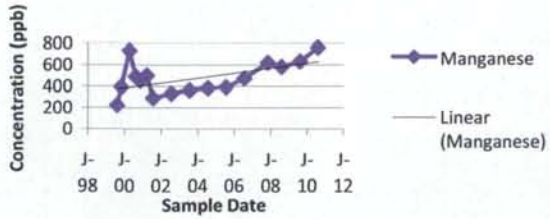
Z is comparred to table of critical values to determine confidence in trend

Trend confidences defined at 99.5%, 99%, 97.5%, 95%, 90%, 85%, 80%, 75%, 70%, and no trend

Mann Kendall Statistic Calculations

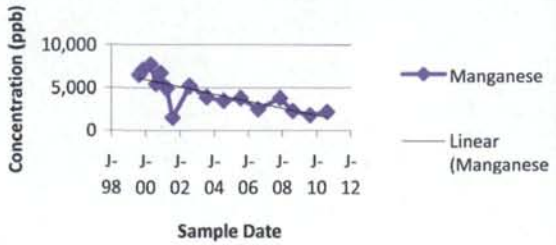
OP-2 Site = Coakley Landfill NHDES#: 198712001 EPA ID #: NHD064424153 Compound = Manganese

Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Event 7	Event 8	Event 9	Event 10	Event 11	Event 12	Event 13	Event 14	Event 15	Event 16	
220	390	730	490	450	500	290	330	360	380	390	470	620	580	630	760	Sum Rows
	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	15
		1	1	1	1	-1	-1	-1	-1	0	1	1	1	1	1	5
			-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	1	-11
				-1	1	-1	-1	-1	-1	-1	-1	1	1	1	1	-2
					1	-1	-1	-1	-1	-1	1	1	1	1	1	1
						-1	-1	-1	-1	-1	-1	1	1	1	1	-2
							1	1	1	1	1	1	1	1	1	9
								1	1	1	1	1	1	1	1	8
									1	1	1	1	1	1	1	7
										1	1	1	1	1	1	6
											1	1	1	1	1	5
												1	1	1	1	4
													-1	1	1	1
														1	1	2
															1	1
													Mann Kendall Statistic (S) =			49



OP-5 Site = Coakley Landfill NHDES#: 198712001 EPA ID #: NHD064424153 Compound = Manganese

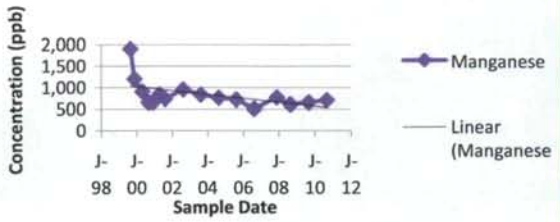
Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Event 7	Event 8	Event 9	Event 10	Event 11	Event 12	Event 13	Event 14	Event 15	Event 16	
6,500	7,100	7,700	5,400	6,700	4,900	1,500	5,200	3,900	3,500	3,800	2,500	3,800	2,300	1,800	2,200	Sum Rows
	1	1	-1	1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-9
		1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-12
			-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-13
				1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-10
					-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-11
						-1	1	-1	-1	-1	-1	-1	-1	-1	-1	-8
							1	1	1	1	1	1	1	1	1	9
								-1	-1	-1	-1	-1	-1	-1	-1	-8
									-1	-1	-1	-1	-1	-1	-1	-7
										1	-1	1	-1	-1	-1	-2
											-1	0	-1	-1	-1	-4
												1	-1	-1	-1	-2
													-1	-1	-1	-3
														-1	-1	-2
															1	1
													Mann Kendall Statistic (S) =			-81



Mann Kendall Statistic Calculations

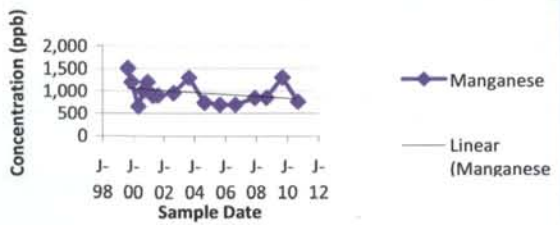
AE-2A | Site = Coakley Landfill | NHDES#: 198712001 | EPA ID #: NHD064424153 | Compound = Manganese

Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Event 7	Event 8	Event 9	Event 10	Event 11	Event 12	Event 13	Event 14	Event 15	Event 16	
1,900	1,200	900	650	650	830	740	950	830	760	720	510	770	610	650	700	Sum Rows
	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-15
		-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-14
			-1	-1	-1	-1	1	-1	-1	-1	-1	-1	-1	-1	-1	-11
				0	1	1	1	1	1	1	-1	1	-1	0	1	6
					1	1	1	1	1	1	-1	1	-1	0	1	6
						-1	1	0	-1	-1	-1	-1	-1	-1	-1	-7
							1	1	1	-1	-1	1	-1	-1	-1	-1
								-1	-1	-1	-1	-1	-1	-1	-1	-8
									-1	-1	-1	-1	-1	-1	-1	-7
										-1	-1	1	-1	-1	-1	-4
											-1	1	-1	-1	-1	-3
												1	1	1	1	4
													-1	-1	-1	-3
														1	1	2
															1	1
													Mann Kendall Statistic (S) =			-54



AE-3A | Site = Coakley Landfill | NHDES#: 198712001 | EPA ID #: NHD064424153 | Compound = Manganese

Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Event 7	Event 8	Event 9	Event 10	Event 11	Event 12	Event 13	Event 14	Event 15	Event 16	
1,500	1,200	650	1,000	1,200	890	900	950	1,300	740	690	690	840	850	1,300	760	Sum Rows
	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-15
		-1	-1	0	-1	-1	-1	1	-1	-1	-1	-1	-1	1	-1	-9
			1	1	1	1	1	1	1	1	1	1	1	1	1	13
				1	-1	-1	-1	1	-1	-1	-1	-1	-1	1	-1	-6
					-1	-1	-1	1	-1	-1	-1	-1	-1	1	-1	-7
						1	1	1	-1	-1	-1	-1	-1	1	-1	-2
							1	1	-1	-1	-1	-1	-1	1	-1	-3
								1	-1	-1	-1	-1	-1	1	-1	-4
									-1	-1	-1	-1	-1	0	-1	-6
										-1	-1	1	1	1	1	2
											0	1	1	1	1	4
												1	1	1	1	4
													1	1	-1	1
														1	-1	0
															-1	-1
													Mann Kendall Statistic (S) =			-29



MANN-KENDALL DATA EVALUATION

Site Name	Coakley Landfill	NHDES Site #	198712001	Compound =	Manganese
		EPA ID #	NHD064424153		

	Well ID =	FPC-6A	FPC-9A		
Event Number	Sampling Date (most recent last)	Concentration (leave blank if no data)	Concentration (leave blank if no data)	Concentration (leave blank if no data)	Concentration (leave blank if no data)
1	8/18/99		430		
2	11/10/99		410		
3	4/19/00		340		
4	8/18/00	140	320		
5	11/18/00	200			
6	4/1/01	150	350		
7	8/1/01		345		
8	8/1/02		340		
9	8/1/03	7,200	420		
10	8/1/04	530	40		
11	8/1/05	610	30		
12	8/1/06	410	270		
13	11/15/07	500	410		
14	8/12/08	360	520		
15	8/19/09	2,400	270		
16	8/18/10	3,600	220		
	Mann Kendall Statistic (S) =	23.0	-28.0	0.0	0.0
	Number of Rounds (n) =	11	15	0	0
	Average =	1463.64	314.33	#DIV/0!	#DIV/0!
	Standard Deviation =	2197.231	135.658	#DIV/0!	#DIV/0!
	Coefficient of Variation(CV)=	1.501	0.432	#DIV/0!	#DIV/0!
Error Check, Blank if No Errors Detected				n<4	n<4
Trend		INCREASING	DECREASING	n<4	n<4
Confidence Level		95%	90%	n<4	n<4
Stability Test, If No Trend Exists at 70% Confidence Level		NA	NA	n<4 n<4	n<4 n<4

Entry By =	KMM	Date =	24-Mar-11

Data entered in yellow cells

MANN-KENDALL DATA EVALUATION

Coakley Landfill	NHDES Site #	198712001	Compound =	Manganese
	EPA ID #	NHD064424153		
Well ID =	FPC-6A	FPC-9A	0	0
Number of tied groups	No Ties	Count Ties	No Ties	No Ties
#tied 2 times	0	3	0	0
#tied 3 times	0	0	0	0
#tied 4 times	0	0	0	0
#tied 5 times	0	0	0	0
#tied 6 times	0	0	0	0
#tied 7 times	0	0	0	0
#tied 8 times	0	0	0	0
#tied 9 times	0	0	0	0
#tied 10 times	0	0	0	0
Count Error?				
n =	11	15	0	0
V(S) =	165.00	405.33	0.00	0.00
S =	23	-28	0	0
Z =	1.713	-1.341	0.000	0.000

n = Number of Samples

V(S) = variance of S = $1/18\ [n(n-1)(2n+5) - \sum p=1 \rightarrow g\ \ w_p(w_p-1)(2w_p+5)]$

where g = number of tied groups and w_p represents the number of data points in the pth group

S = Mann-Kendall Statistic, number of increases versus number of decreases in data comparrision

$Z = (S-1)/[V(S)]^{1/2}$ if S>0, Z=0 if S=0, $Z= (S+1)/[V(S)]^{1/2}$ if S<0

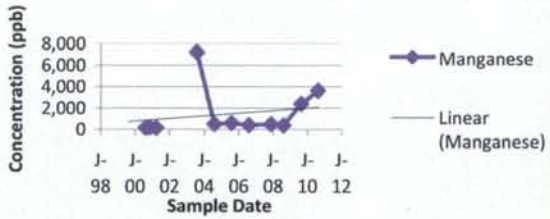
Z is comparred to table of critical values to determine confidence in trend

Trend confidences defined at 99.5%, 99%, 97.5%, 95%, 90%, 85%, 80%, 75%, 70%, and no trend

Mann Kendall Statistic Calculations

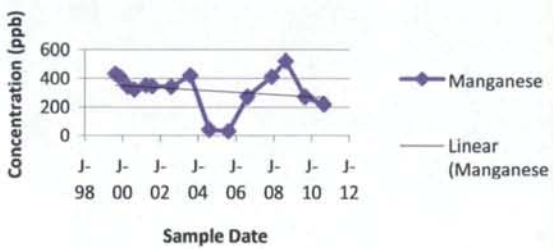
FPC-6A Site = Coakley Landfill NHDES#: 198712001 EPA ID #: NHD064424153 Compound = Manganese

Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Event 7	Event 8	Event 9	Event 10	Event 11	Event 12	Event 13	Event 14	Event 15	Event 16	
			140	200	150			7,200	530	610	410	500	360	2,400	3,600	Sum Rows
																0
																0
																0
				1	1			1	1	1	1	1	1	1	1	10
					-1			1	1	1	1	1	1	1	1	7
								1	1	1	1	1	1	1	1	8
																0
																0
									-1	-1	-1	-1	-1	-1	-1	-7
										1	-1	-1	-1	1	1	0
											-1	-1	-1	1	1	-1
												1	-1	1	1	2
													-1	1	1	1
														1	1	2
															1	1
													Mann Kendall Statistic (S) =			23



FPC-9A Site = Coakley Landfill NHDES#: 198712001 EPA ID #: NHD064424153 Compound = Manganese

Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Event 7	Event 8	Event 9	Event 10	Event 11	Event 12	Event 13	Event 14	Event 15	Event 16	
430	410	340	320		350	345	340	420	40	30	270	410	520	270	220	Sum Rows
	-1	-1	-1		-1	-1	-1	-1	-1	-1	-1	-1	1	-1	-1	-12
		-1	-1		-1	-1	-1	1	-1	-1	-1	0	1	-1	-1	-8
			-1		1	1	0	1	-1	-1	-1	1	1	-1	-1	-1
					1	1	1	1	-1	-1	-1	1	1	-1	-1	1
																0
						-1	-1	1	-1	-1	-1	1	1	-1	-1	-4
							-1	1	-1	-1	-1	1	1	-1	-1	-3
								1	-1	-1	-1	1	1	-1	-1	-2
									-1	-1	-1	-1	1	-1	-1	-5
										-1	1	1	1	1	1	4
											1	1	1	1	1	5
												1	1	0	-1	1
													1	-1	-1	-1
														-1	-1	-2
															-1	-1
													Mann Kendall Statistic (S) =			-28



MANN-KENDALL DATA EVALUATION

Site Name	Coakley Landfill	NHDES Site #	198712001	Compound =	Manganese
		EPA ID #	NHD064424153		

	Well ID =	BP-4	MW-5D	MW-6	MW-8
Event Number	Sampling Date (most recent last)	Concentration (leave blank if no data)	Concentration (leave blank if no data)	Concentration (leave blank if no data)	Concentration (leave blank if no data)
1	8/18/99	1,200	1,000	1,100	4,500
2	11/10/99	1,200	1,100	740	3,500
3	4/19/00	1,500	980	600	3,900
4	8/18/00	1,400	930	980	4,200
5	11/18/00	1,400	920	80	3,600
6	4/1/01	1,700	1,200	600	3,200
7	8/1/01	1,500	920	1,200	9,800
8	8/1/02	1,300	860	1,200	2,800
9	8/1/03	1,400	880	1,100	2,900
10	8/1/04	1,300	870	700	2,400
11	8/1/05	1,700	890	970	2,500
12	8/1/06	1,300	890	540	2,500
13	11/15/07	1,200	860	740	1,600
14	8/12/08	1,100	780	520	1,900
15	8/19/09	94	770	490	2,000
16	8/18/10	1,200	730	1,900	2,100
	Mann Kendall Statistic (S) =	-36.0	-89.0	-14.0	-81.0
	Number of Rounds (n) =	16	16	16	16
	Average =	1280.88	911.25	841.25	3337.50
	Standard Deviation =	361.348	118.596	416.475	1922.802
	Coefficient of Variation(CV)=	0.282	0.130	0.495	0.576

Error Check, Blank if No Errors Detected				
Trend	DECREASING	DECREASING	DECREASING	DECREASING
Confidence Level	90%	99.5%	70%	99.5%
Stability Test, If No Trend Exists at 70% Confidence Level	NA	NA	NA	NA

Entry By =	KMM	Date =	24-Mar-11

Data entered in yellow cells

MANN-KENDALL DATA EVALUATION

Coakley Landfill	NHDES Site #	198712001	Compound =	Manganese
	EPA ID #	NHD064424153		
Well ID =	BP-4	MW-5D	MW-6	MW-8
Number of tied groups	Count Ties	Count Ties	Count Ties	Count Ties
#tied 2 times	2	3	4	1
#tied 3 times	2	0	0	0
#tied 4 times	1	0	0	0
#tied 5 times	0	0	0	0
#tied 6 times	0	0	0	0
#tied 7 times	0	0	0	0
#tied 8 times	0	0	0	0
#tied 9 times	0	0	0	0
#tied 10 times	0	0	0	0
Count Error?				
n =	16	16	16	16
V(S) =	475.33	490.33	489.33	492.33
S =	-36	-89	-14	-81
Z =	-1.605	-3.974	-0.588	-3.605

n = Number of Samples

V(S) = variance of S = $1/18\ [n(n-1)(2n+5) - \sum p=1 \rightarrow g\ \ w_p(w_p-1)(2w_p+5)]$

where g = number of tied groups and w_p represents the number of data points in the pth group

S = Mann-Kendall Statistic, number of increases versus number of decreases in data comparrision

$Z = (S-1)/[V(S)]^{1/2}$ if S>0, Z=0 if S=0, $Z= (S+1)/[V(S)]^{1/2}$ if S<0

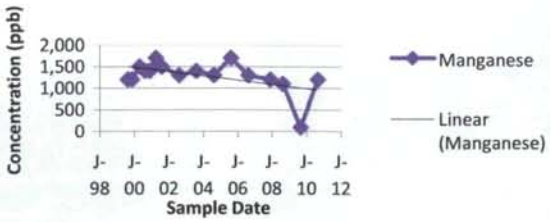
Z is comparred to table of critical values to determine confidence in trend

Trend confidences defined at 99.5%, 99%, 97.5%, 95%, 90%, 85%, 80%, 75%, 70%, and no trend

Mann Kendall Statistic Calculations

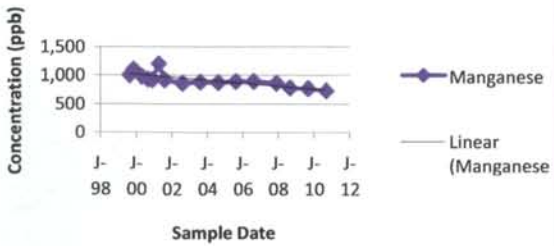
BP-4 Site = Coakley Landfill NHDES#: 198712001 EPA ID #: NHD064424153 Compound = Manganese

Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Event 7	Event 8	Event 9	Event 10	Event 11	Event 12	Event 13	Event 14	Event 15	Event 16	
1,200	1,200	1,500	1,400	1,400	1,700	1,500	1,300	1,400	1,300	1,700	1,300	1,200	1,100	94	1,200	Sum Rows
	0	1	1	1	1	1	1	1	1	1	1	0	-1	-1	0	8
		1	1	1	1	1	1	1	1	1	1	0	-1	-1	0	8
			-1	-1	1	0	-1	-1	-1	1	-1	-1	-1	-1	-1	-8
				0	1	1	-1	0	-1	1	-1	-1	-1	-1	-1	-4
					1	1	-1	0	-1	1	-1	-1	-1	-1	-1	-4
						-1	-1	-1	-1	0	-1	-1	-1	-1	-1	-9
							-1	-1	-1	1	-1	-1	-1	-1	-1	-7
								1	0	1	0	-1	-1	-1	-1	-2
									-1	1	-1	-1	-1	-1	-1	-5
										1	0	-1	-1	-1	-1	-3
											-1	-1	-1	-1	-1	-5
												-1	-1	-1	-1	-4
													-1	-1	0	-2
														-1	1	0
															1	1
													Mann Kendall Statistic (S) =			-36



MW-5D Site = Coakley Landfill NHDES#: 198712001 EPA ID #: NHD064424153 Compound = Manganese

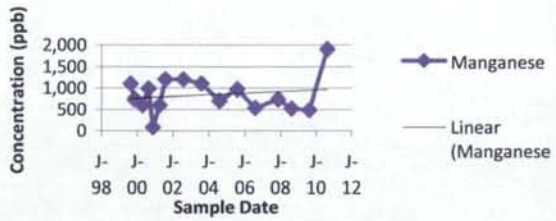
Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Event 7	Event 8	Event 9	Event 10	Event 11	Event 12	Event 13	Event 14	Event 15	Event 16	
1,000	1,100	980	930	920	1,200	920	860	880	870	890	890	860	780	770	730	Sum Rows
	1	-1	-1	-1	1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-11
		-1	-1	-1	1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-12
			-1	-1	1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-11
				-1	1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-10
					1	0	-1	-1	-1	-1	-1	-1	-1	-1	-1	-8
						-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-10
							-1	-1	-1	-1	-1	-1	-1	-1	-1	-9
								1	1	1	1	0	-1	-1	-1	1
									-1	1	1	-1	-1	-1	-1	-3
										1	1	-1	-1	-1	-1	-2
											0	-1	-1	-1	-1	-4
												-1	-1	-1	-1	-4
													-1	-1	-1	-3
														-1	-1	-2
															-1	-1
													Mann Kendall Statistic (S) =			-89



Mann Kendall Statistic Calculations

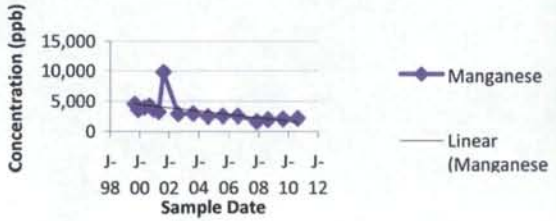
MW-6 Site = Coakley Landfill NHDES#: 198712001 EPA ID #: NHD064424153 Compound = Manganese

Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Event 7	Event 8	Event 9	Event 10	Event 11	Event 12	Event 13	Event 14	Event 15	Event 16	
1,100	740	600	980	80	600	1,200	1,200	1,100	700	970	540	740	520	490	1,900	Sum Rows
	-1	-1	-1	-1	-1	1	1	0	-1	-1	-1	-1	-1	-1	1	-8
		-1	1	-1	-1	1	1	1	-1	1	-1	0	-1	-1	1	-1
			1	-1	0	1	1	1	1	1	-1	1	-1	-1	1	4
				-1	-1	1	1	1	-1	-1	-1	-1	-1	-1	1	-4
					1	1	1	1	1	1	1	1	1	1	1	11
						1	1	1	1	1	-1	1	-1	-1	1	4
							0	-1	-1	-1	-1	-1	-1	-1	1	-6
								-1	-1	-1	-1	-1	-1	-1	1	-6
									-1	-1	-1	-1	-1	-1	1	-5
										1	-1	1	-1	-1	1	0
											-1	-1	-1	-1	1	-3
												1	-1	-1	1	0
													-1	-1	1	-1
														-1	1	0
															1	1
														Mann Kendall Statistic (S) =		-14



MW-8 Site = Coakley Landfill NHDES#: 198712001 EPA ID #: NHD064424153 Compound = Manganese

Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Event 7	Event 8	Event 9	Event 10	Event 11	Event 12	Event 13	Event 14	Event 15	Event 16	
4,500	3,500	3,900	4,200	3,600	3,200	9,800	2,800	2,900	2,400	2,500	2,500	1,600	1,900	2,000	2,100	Sum Rows
	-1	-1	-1	-1	-1	1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-13
		1	1	1	-1	1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-6
			1	-1	-1	1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-9
				-1	-1	1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-10
					-1	1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-9
						1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-8
							-1	-1	-1	-1	-1	-1	-1	-1	-1	-9
								1	-1	-1	-1	-1	-1	-1	-1	-6
									-1	-1	-1	-1	-1	-1	-1	-7
										1	1	-1	-1	-1	-1	-2
											0	-1	-1	-1	-1	-4
												-1	-1	-1	-1	-4
													1	1	1	3
														1	1	2
															1	1
													Mann Kendall Statistic (S) =			-81



MANN-KENDALL DATA EVALUATION

Site Name	Coakley Landfill	NHDES Site #	198712001	Compound =	Manganese
		EPA ID #	NHD064424153		

	Well ID =	MW-11	AE-2B	AE-3B	FPC-6B
Event Number	Sampling Date (most recent last)	Concentration (leave blank if no data)	Concentration (leave blank if no data)	Concentration (leave blank if no data)	Concentration (leave blank if no data)
1	8/18/99	840	4,100	1,400	1,100
2	11/10/99	930	5,300	2,200	830
3	4/19/00	880	5,100	2,000	670
4	8/18/00	1,000	6,300	1,900	760
5	11/18/00	950	6,400	2,100	690
6	4/1/01	780	5,100	2,000	620
7	8/1/01	710	4,400	1,400	830
8	8/1/02	600	4,400	1,400	750
9	8/1/03	600	3,700	1,500	600
10	8/1/04	590	3,000	1,100	5,900
11	8/1/05	530	3,100	1,100	6,200
12	8/1/06	450	2,400	1,000	2,100
13	11/15/07	410	2,100	570	3,100
14	8/12/08	440	1,700	480	3,000
15	8/19/09	390	1,700	1,400	340
16	8/18/10	340	1,300	950	400
	Mann Kendall Statistic (S) =	-101.0	-91.0	-76.0	-3.0
	Number of Rounds (n) =	16	16	16	16
	Average =	652.50	3756.25	1406.25	1743.13
	Standard Deviation =	220.409	1642.749	528.342	1885.509
	Coefficient of Variation(CV)=	0.338	0.437	0.376	1.082

Error Check, Blank if No Errors Detected

Trend	DECREASING	DECREASING	DECREASING	No Trend
Confidence Level	99.5%	99.5%	99.5%	No Trend
Stability Test, If No Trend Exists at 70% Confidence Level	NA	NA	NA	CV > 1 NON-STABLE

Entry By =	KMM	Date =	24-Mar-11

Data entered in yellow cells

MANN-KENDALL DATA EVALUATION

Coakley Landfill	NHDES Site #	198712001	Compound =	Manganese
	EPA ID #	NHD064424153		
Well ID =	MW-11	AE-2B	AE-3B	FPC-6B
Number of tied groups	Count Ties	Count Ties	Count Ties	Count Ties
#tied 2 times	1	3	2	1
#tied 3 times	0	0	0	0
#tied 4 times	0	0	1	0
#tied 5 times	0	0	0	0
#tied 6 times	0	0	0	0
#tied 7 times	0	0	0	0
#tied 8 times	0	0	0	0
#tied 9 times	0	0	0	0
#tied 10 times	0	0	0	0
Count Error?				
n =	16	16	16	16
V(S) =	492.33	490.33	482.67	492.33
S =	-101	-91	-76	-3
Z =	-4.507	-4.064	-3.414	-0.090

n = Number of Samples

V(S) = variance of S = $1/18\ [n(n-1)(2n+5) - \sum p=1 \rightarrow g\ \ w_p(w_p-1)(2w_p+5)]$

where g = number of tied groups and w_p represents the number of data points in the pth group

S = Mann-Kendall Statistic, number of increases versus number of decreases in data comparrision

$Z = (S-1)/[V(S)]^{1/2}$ if S>0, Z=0 if S=0, $Z= (S+1)/[V(S)]^{1/2}$ if S<0

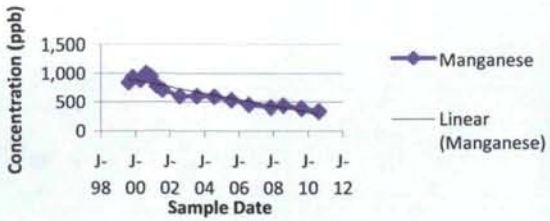
Z is comparred to table of critical values to determine confidence in trend

Trend confidences defined at 99.5%, 99%, 97.5%, 95%, 90%, 85%, 80%, 75%, 70%, and no trend

Mann Kendall Statistic Calculations

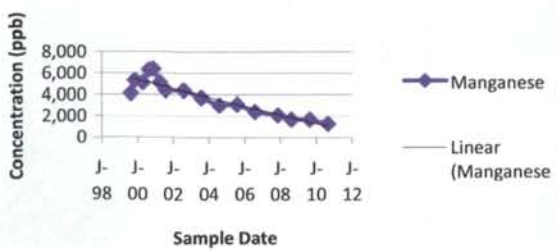
MW-11 Site = Coakley Landfill NHDES#: 198712001 EPA ID #: NHD064424153 Compound = Manganese

Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Event 7	Event 8	Event 9	Event 10	Event 11	Event 12	Event 13	Event 14	Event 15	Event 16	
840	930	880	1,000	950	780	710	600	600	590	530	450	410	440	390	340	Sum Rows
	1	1	1	1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-7
		-1	1	1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-10
			1	1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-9
				-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-12
					-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-11
						-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-10
							-1	-1	-1	-1	-1	-1	-1	-1	-1	-9
								0	-1	-1	-1	-1	-1	-1	-1	-7
									-1	-1	-1	-1	-1	-1	-1	-7
										-1	-1	-1	-1	-1	-1	-6
											-1	-1	-1	-1	-1	-5
												-1	-1	-1	-1	-4
													1	-1	-1	-1
														-1	-1	-2
															-1	-1
													Mann Kendall Statistic (S) =			-101



AE-2B Site = Coakley Landfill NHDES#: 198712001 EPA ID #: NHD064424153 Compound = Manganese

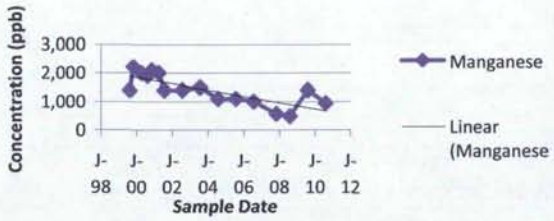
Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Event 7	Event 8	Event 9	Event 10	Event 11	Event 12	Event 13	Event 14	Event 15	Event 16	
4,100	5,300	5,100	6,300	6,400	5,100	4,400	4,400	3,700	3,000	3,100	2,400	2,100	1,700	1,700	1,300	Sum Rows
	1	1	1	1	1	1	1	-1	-1	-1	-1	-1	-1	-1	-1	-1
		-1	1	1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-10
			1	1	0	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-8
				1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-10
					-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-11
						-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-10
							0	-1	-1	-1	-1	-1	-1	-1	-1	-8
								-1	-1	-1	-1	-1	-1	-1	-1	-8
									-1	-1	-1	-1	-1	-1	-1	-7
										1	-1	-1	-1	-1	-1	-4
											-1	-1	-1	-1	-1	-5
												-1	-1	-1	-1	-4
													-1	-1	-1	-3
														0	-1	-1
															-1	-1
													Mann Kendall Statistic (S) =			-91



Mann Kendall Statistic Calculations

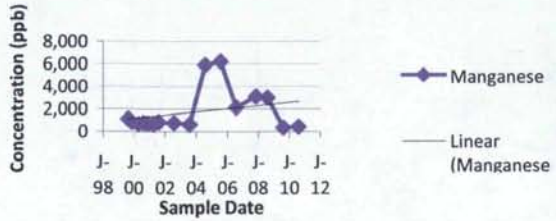
AE-3B | Site = Coakley Landfill | NHDES#: 198712001 | EPA ID #: NHD064424153 | Compound = Manganese

Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Event 7	Event 8	Event 9	Event 10	Event 11	Event 12	Event 13	Event 14	Event 15	Event 16	
1,400	2,200	2,000	1,900	2,100	2,000	1,400	1,400	1,500	1,100	1,100	1,000	570	480	1,400	950	Sum Rows
	1	1	1	1	1	0	0	1	-1	-1	-1	-1	-1	0	-1	0
		-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-14
			-1	1	0	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-10
				1	1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-8
					-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-11
						-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-10
							0	1	-1	-1	-1	-1	-1	0	-1	-5
								1	-1	-1	-1	-1	-1	0	-1	-5
									-1	-1	-1	-1	-1	-1	-1	-7
										0	-1	-1	-1	1	-1	-3
											-1	-1	-1	1	-1	-3
												-1	-1	1	-1	-2
													-1	1	1	1
														1	1	2
															-1	-1
													Mann Kendall Statistic (S) =			-76



FPC-6B | Site = Coakley Landfill | NHDES#: 198712001 | EPA ID #: NHD064424153 | Compound = Manganese

Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Event 7	Event 8	Event 9	Event 10	Event 11	Event 12	Event 13	Event 14	Event 15	Event 16	
1,100	830	670	760	690	620	830	750	600	5,900	6,200	2,100	3,100	3,000	340	400	Sum Rows
	-1	-1	-1	-1	-1	-1	-1	-1	1	1	1	1	1	-1	-1	-5
		-1	-1	-1	-1	0	-1	-1	1	1	1	1	1	-1	-1	-3
			1	1	-1	1	1	-1	1	1	1	1	1	-1	-1	5
				-1	-1	1	-1	-1	1	1	1	1	1	-1	-1	0
					-1	1	1	-1	1	1	1	1	1	-1	-1	3
						1	1	-1	1	1	1	1	1	-1	-1	4
							-1	-1	1	1	1	1	1	-1	-1	1
								-1	1	1	1	1	1	-1	-1	2
									1	1	1	1	1	-1	-1	3
										1	-1	-1	-1	-1	-1	-4
											-1	-1	-1	-1	-1	-5
												1	1	-1	-1	0
													-1	-1	-1	-3
														-1	-1	-2
															1	1
													Mann Kendall Statistic (S) =			-3



MANN-KENDALL DATA EVALUATION

Site Name	Coakley Landfill	NHDES Site #	198712001	Compound =	Manganese
		EPA ID #	NHD064424153		

	Well ID =	FPC-11B			
Event Number	Sampling Date (most recent last)	Concentration (leave blank if no data)	Concentration (leave blank if no data)	Concentration (leave blank if no data)	Concentration (leave blank if no data)
1	8/18/99				
2	11/10/99				
3	4/19/00				
4	8/18/00				
5	11/18/00				
6	4/1/01				
7	8/1/01				
8	8/1/02				
9	8/1/03	3,000			
10	8/1/04	2,200			
11	8/1/05	2,500			
12	8/1/06	880			
13	11/15/07	1,300			
14	8/12/08	1,400			
15	8/19/09	710			
16	8/18/10	520			
	Mann Kendall Statistic (S) =	-20.0	0.0	0.0	0.0
	Number of Rounds (n) =	8	0	0	0
	Average =	1563.75	#DIV/0!	#DIV/0!	#DIV/0!
	Standard Deviation =	904.464	#DIV/0!	#DIV/0!	#DIV/0!
	Coefficient of Variation(CV)=	0.578	#DIV/0!	#DIV/0!	#DIV/0!
Error Check, Blank if No Errors Detected			n<4	n<4	n<4
Trend		DECREASING	n<4	n<4	n<4
Confidence Level		99%	n<4	n<4	n<4
Stability Test, If No Trend Exists at 70% Confidence Level		NA	n<4 n<4	n<4 n<4	n<4 n<4

Entry By =	KMM	Date =	24-Mar-11

Data entered in yellow cells

MANN-KENDALL DATA EVALUATION

Coakley Landfill	NHDES Site #	198712001	Compound =	Manganese
	EPA ID #	NHD064424153		
Well ID =	FPC-11B	0	0	0
Number of tied groups	No Ties	No Ties	No Ties	No Ties
#tied 2 times	0	0	0	0
#tied 3 times	0	0	0	0
#tied 4 times	0	0	0	0
#tied 5 times	0	0	0	0
#tied 6 times	0	0	0	0
#tied 7 times	0	0	0	0
#tied 8 times	0	0	0	0
#tied 9 times	0	0	0	0
#tied 10 times	0	0	0	0
Count Error?				
n =	8	0	0	0
V(S) =	65.33	0.00	0.00	0.00
S =	-20	0	0	0
Z =	-2.351	0.000	0.000	0.000

n = Number of Samples

V(S) = variance of S = $1/18\ [n(n-1)(2n+5) - \sum p=1 \rightarrow g\ w_p(w_p-1)(2w_p+5)]$

where g = number of tied groups and w_p represents the number of data points in the pth group

S = Mann-Kendall Statistic, number of increases versus number of decreases in data comparrision

$Z = (S-1)/[V(S)]^{1/2}$ if S>0, Z=0 if S=0, $Z= (S+1)/[V(S)]^{1/2}$ if S<0

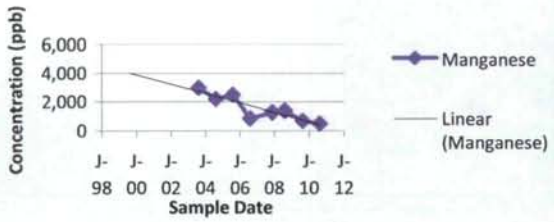
Z is comparred to table of critical values to determine confidence in trend

Trend confidences defined at 99.5%, 99%, 97.5%, 95%, 90%, 85%, 80%, 75%, 70%, and no trend

Mann Kendall Statistic Calculations

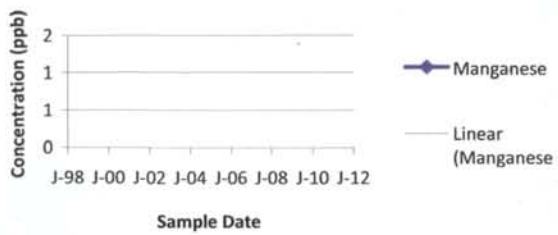
FPC-11B | Site = Coakley Landfill | NHDES#: 198712001 | EPA ID #: NHD064424153 | Compound = Manganese

Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Event 7	Event 8	Event 9	Event 10	Event 11	Event 12	Event 13	Event 14	Event 15	Event 16	
								3,000	2,200	2,500	880	1,300	1,400	710	520	Sum Rows
																0
																0
																0
																0
																0
																0
																0
																0
									-1	-1	-1	-1	-1	-1	-1	-7
										1	-1	-1	-1	-1	-1	-4
											-1	-1	-1	-1	-1	-5
												1	1	-1	-1	0
													1	-1	-1	-1
														-1	-1	-2
															-1	-1
													Mann Kendall Statistic (S) =			-20



0 | Site = Coakley Landfill | NHDES#: 198712001 | EPA ID #: NHD064424153 | Compound = Manganese

Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Event 7	Event 8	Event 9	Event 10	Event 11	Event 12	Event 13	Event 14	Event 15	Event 16	
																Sum Rows
																0
																0
																0
																0
																0
																0
																0
																0
																0
																0
																0
																0
																0
																0
													Mann Kendall Statistic (S) =			0



MANN-KENDALL DATA EVALUATION

Site Name	Coakley Landfill	NHDES Site #	198712001	Compound =	Benzene
		EPA ID #	NHD064424153		

	Well ID =	MW-5S			
Event Number	Sampling Date (most recent last)	Concentration (leave blank if no data)	Concentration (leave blank if no data)	Concentration (leave blank if no data)	Concentration (leave blank if no data)
1	8/18/99	6			
2	11/10/99	7			
3	4/19/00	8			
4	8/18/00	8			
5	11/18/00	8			
6	4/1/01	7			
7	8/1/01	6			
8	8/1/02	6			
9	8/1/03	2			
10	8/1/04				
11	8/1/05				
12	8/1/06	0.5			
13	11/15/07	5			
14	8/12/08	4			
15	8/19/09	3			
16	8/18/10	4			
	Mann Kendall Statistic (S) =	-49.0	0.0	0.0	0.0
	Number of Rounds (n) =	14	0	0	0
	Average =	5.32	#DIV/0!	#DIV/0!	#DIV/0!
	Standard Deviation =	2.350	#DIV/0!	#DIV/0!	#DIV/0!
	Coefficient of Variation(CV)=	0.442	#DIV/0!	#DIV/0!	#DIV/0!
Error Check, Blank if No Errors Detected			n<4	n<4	n<4
Trend		DECREASING	n<4	n<4	n<4
Confidence Level		99.5%	n<4	n<4	n<4
Stability Test, If No Trend Exists at 70% Confidence Level			n<4	n<4	n<4
		NA	n<4	n<4	n<4

Entry By =	KMM	Date =	24-Mar-11

Data entered in yellow cells

MANN-KENDALL DATA EVALUATION

Coakley Landfill	NHDES Site #	198712001	Compound =	Benzene
	EPA ID #	NHD064424153		
Well ID =	MW-5S	0	0	0
Number of tied groups	Count Ties	No Ties	No Ties	No Ties
#tied 2 times	2	0	0	0
#tied 3 times	2	0	0	0
#tied 4 times	0	0	0	0
#tied 5 times	0	0	0	0
#tied 6 times	0	0	0	0
#tied 7 times	0	0	0	0
#tied 8 times	0	0	0	0
#tied 9 times	0	0	0	0
#tied 10 times	0	0	0	0
Count Error?				
n =	14	0	0	0
V(S) =	324.33	0.00	0.00	0.00
S =	-49	0	0	0
Z =	-2.665	0.000	0.000	0.000

n = Number of Samples

V(S) = variance of S = $1/18\ [n(n-1)(2n+5) - \sum p=1 \rightarrow g\ \ w_p(w_p-1)(2w_p+5)]$

where g = number of tied groups and w_p represents the number of data points in the pth group

S = Mann-Kendall Statistic, number of increases versus number of decreases in data comparrision

$Z = (S-1)/[V(S)]^{1/2}$ if S>0, Z=0 if S=0, $Z= (S+1)/[V(S)]^{1/2}$ if S<0

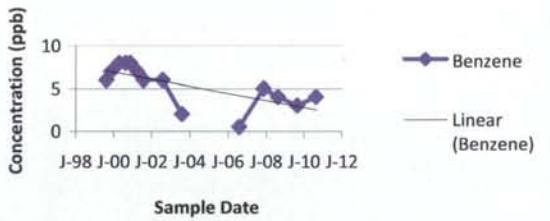
Z is comparred to table of critical values to determine confidence in trend

Trend confidences defined at 99.5%, 99%, 97.5%, 95%, 90%, 85%, 80%, 75%, 70%, and no trend

Mann Kendall Statistic Calculations

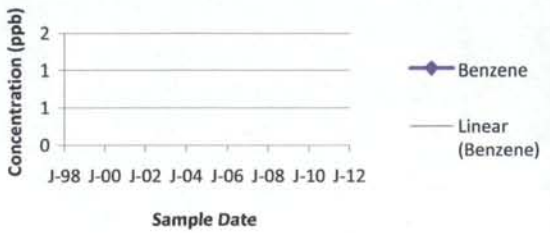
MW-5S | Site = Coakley Landfill | NHDES#: 198712001 | EPA ID #: NHD064424153 | Compound = Benzene

Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Event 7	Event 8	Event 9	Event 10	Event 11	Event 12	Event 13	Event 14	Event 15	Event 16	
6	7	8	8	8	7	6	6	2			1	5	4	3	4	Sum Rows
	1	1	1	1	1	0	0	-1			-1	-1	-1	-1	-1	-1
		1	1	1	0	-1	-1	-1			-1	-1	-1	-1	-1	-5
			0	0	-1	-1	-1	-1			-1	-1	-1	-1	-1	-9
				0	-1	-1	-1	-1			-1	-1	-1	-1	-1	-9
					-1	-1	-1	-1			-1	-1	-1	-1	-1	-9
						-1	-1	-1			-1	-1	-1	-1	-1	-8
							0	-1			-1	-1	-1	-1	-1	-6
								-1			-1	-1	-1	-1	-1	-6
											-1	1	1	1	1	3
																0
																0
												1	1	1	1	4
													-1	-1	-1	-3
														-1	0	-1
															1	1
													Mann Kendall Statistic (S) =			-49



0 | Site = Coakley Landfill | NHDES#: 198712001 | EPA ID #: NHD064424153 | Compound = Benzene

Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Event 7	Event 8	Event 9	Event 10	Event 11	Event 12	Event 13	Event 14	Event 15	Event 16	
																Sum Rows
																0
																0
																0
																0
																0
																0
																0
																0
																0
																0
																0
																0
																0
																0
													Mann Kendall Statistic (S) =			0



MANN-KENDALL DATA EVALUATION

Site Name	Coakley Landfill	NHDES Site #	198712001	Compound =	Benzene
		EPA ID #	NHD064424153		

	Well ID =	MW-5D	MW-8	MW-11	GZ-105
Event Number	Sampling Date (most recent last)	Concentration (leave blank if no data)	Concentration (leave blank if no data)	Concentration (leave blank if no data)	Concentration (leave blank if no data)
1	8/18/99	3	4	13	11
2	11/10/99	5	9	17	11
3	4/19/00	5	4	22	
4	8/18/00	5	4	18	
5	11/18/00	6	8	19	10
6	4/1/01	1	5	22	10
7	8/1/01	3	5	26	10
8	8/1/02	2	3	22	11
9	8/1/03	0.5	4	14	9
10	8/1/04			7	7
11	8/1/05			8	7
12	8/1/06	2	5	5	6
13	11/15/07	3	3	8	6
14	8/12/08	2	4	5	6
15	8/19/09	2	4	4	6
16	8/18/10	2	6	3	7
	Mann Kendall Statistic (S) =	-33.0	-10.0	-63.0	-62.0
	Number of Rounds (n) =	14	14	16	14
	Average =	2.96	4.86	13.31	8.36
	Standard Deviation =	1.669	1.748	7.674	2.098
	Coefficient of Variation(CV)=	0.563	0.360	0.576	0.251

Error Check, Blank if No Errors Detected

Trend	DECREASING	DECREASING	DECREASING	DECREASING
Confidence Level	95%	70%	99.5%	99.5%
Stability Test, If No Trend Exists at 70% Confidence Level	NA	NA	NA	NA

Entry By =	KMM	Date =	24-Mar-11

Data entered in yellow cells

MANN-KENDALL DATA EVALUATION

Coakley Landfill	NHDES Site #	198712001	Compound =	Benzene
	EPA ID #	NHD064424153		
Well ID =	MW-5D	MW-8	MW-11	GZ-105
Number of tied groups	Count Ties	Count Ties	Count Ties	Count Ties
#tied 2 times	0	1	2	0
#tied 3 times	2	1	1	3
#tied 4 times	0	0	0	1
#tied 5 times	1	0	0	0
#tied 6 times	0	1	0	0
#tied 7 times	0	1	0	0
#tied 8 times	0	0	0	0
#tied 9 times	0	0	0	0
#tied 10 times	0	0	0	0
Count Error?				
n =	14	14	16	14
V(S) =	309.67	289.67	487.67	314.00
S =	-33	-10	-63	-62
Z =	-1.818	-0.529	-2.808	-3.442

n = Number of Samples

V(S) = variance of S = $1/18\ [n(n-1)(2n+5) - \sum p=1 \rightarrow g\ \ w_p(w_p-1)(2w_p+5)]$

where g = number of tied groups and w_p represents the number of data points in the pth group

S = Mann-Kendall Statistic, number of increases versus number of decreases in data comparrision

$Z = (S-1)/[V(S)]^{1/2}$ if S>0, Z=0 if S=0, $Z= (S+1)/[V(S)]^{1/2}$ if S<0

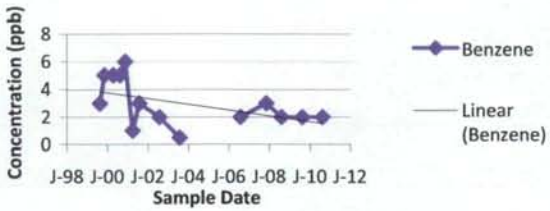
Z is comparred to table of critical values to determine confidence in trend

Trend confidences defined at 99.5%, 99%, 97.5%, 95%, 90%, 85%, 80%, 75%, 70%, and no trend

Mann Kendall Statistic Calculations

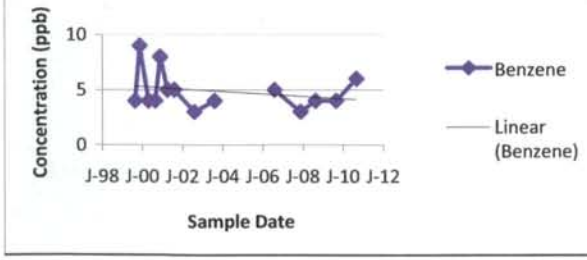
MW-5D | Site = Coakley Landfill | NHDES#: 198712001 | EPA ID #: NHD064424153 | Compound = Benzene

Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Event 7	Event 8	Event 9	Event 10	Event 11	Event 12	Event 13	Event 14	Event 15	Event 16	
3	5	5	5	6	1	3	2	1			2	3	2	2	2	Sum Rows
	1	1	1	1	-1	0	-1	-1			-1	0	-1	-1	-1	-3
		0	0	1	-1	-1	-1	-1			-1	-1	-1	-1	-1	-8
			0	1	-1	-1	-1	-1			-1	-1	-1	-1	-1	-8
				1	-1	-1	-1	-1			-1	-1	-1	-1	-1	-8
					-1	-1	-1	-1			-1	-1	-1	-1	-1	-9
						1	1	-1			1	1	1	1	1	6
							-1	-1			-1	0	-1	-1	-1	-6
								-1			0	1	0	0	0	0
											1	1	1	1	1	5
																0
																0
												1	0	0	0	1
													-1	-1	-1	-3
														0	0	0
															0	0
														Mann Kendall Statistic (S) =		-33



MW-8 | Site = Coakley Landfill | NHDES#: 198712001 | EPA ID #: NHD064424153 | Compound = Benzene

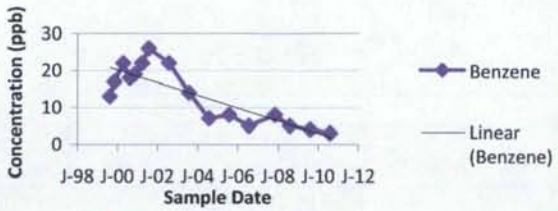
Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Event 7	Event 8	Event 9	Event 10	Event 11	Event 12	Event 13	Event 14	Event 15	Event 16	
4	9	4	4	8	5	5	3	4			5	3	4	4	6	Sum Rows
	1	0	0	1	1	1	-1	0			1	-1	0	0	1	4
		-1	-1	-1	-1	-1	-1	-1			-1	-1	-1	-1	-1	-12
			0	1	1	1	-1	0			1	-1	0	0	1	3
				1	1	1	-1	0			1	-1	0	0	1	3
					-1	-1	-1	-1			-1	-1	-1	-1	-1	-9
						0	-1	-1			0	-1	-1	-1	1	-4
							-1	-1			0	-1	-1	-1	1	-4
								1			1	0	1	1	1	5
											1	-1	0	0	1	1
																0
																0
												-1	-1	-1	1	-2
													1	1	1	3
														0	1	1
															1	1
														Mann Kendall Statistic (S) =		-10



Mann Kendall Statistic Calculations

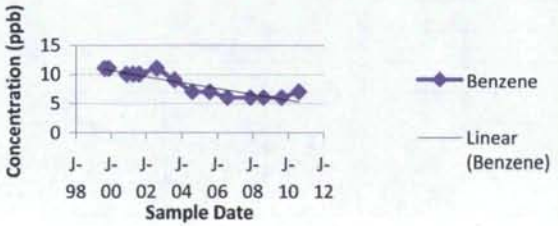
MW-11 Site = Coakley Landfill NHDES#: 198712001 EPA ID #: NHD064424153 Compound = Benzene

Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Event 7	Event 8	Event 9	Event 10	Event 11	Event 12	Event 13	Event 14	Event 15	Event 16	
13	17	22	18	19	22	26	22	14	7	8	5	8	5	4	3	Sum Rows
	1	1	1	1	1	1	1	1	-1	-1	-1	-1	-1	-1	-1	1
		1	1	1	1	1	1	-1	-1	-1	-1	-1	-1	-1	-1	-2
			-1	-1	0	1	0	-1	-1	-1	-1	-1	-1	-1	-1	-9
				1	1	1	1	-1	-1	-1	-1	-1	-1	-1	-1	-4
					1	1	1	-1	-1	-1	-1	-1	-1	-1	-1	-5
						1	0	-1	-1	-1	-1	-1	-1	-1	-1	-7
							-1	-1	-1	-1	-1	-1	-1	-1	-1	-9
								-1	-1	-1	-1	-1	-1	-1	-1	-8
									-1	-1	-1	-1	-1	-1	-1	-7
										1	-1	1	-1	-1	-1	-2
											-1	0	-1	-1	-1	-4
												1	0	-1	-1	-1
													-1	-1	-1	-3
														-1	-1	-2
															-1	-1
														Mann Kendall Statistic (S) =		-63



GZ-105 Site = Coakley Landfill NHDES#: 198712001 EPA ID #: NHD064424153 Compound = Benzene

Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Event 7	Event 8	Event 9	Event 10	Event 11	Event 12	Event 13	Event 14	Event 15	Event 16	
11	11			10	10	10	11	9	7	7	6	6	6	6	7	Sum Rows
	0			-1	-1	-1	0	-1	-1	-1	-1	-1	-1	-1	-1	-11
				-1	-1	-1	0	-1	-1	-1	-1	-1	-1	-1	-1	-11
																0
																0
					0	0	1	-1	-1	-1	-1	-1	-1	-1	-1	-7
						0	1	-1	-1	-1	-1	-1	-1	-1	-1	-7
							1	-1	-1	-1	-1	-1	-1	-1	-1	-7
								-1	-1	-1	-1	-1	-1	-1	-1	-8
									-1	-1	-1	-1	-1	-1	-1	-7
										0	-1	-1	-1	-1	0	-4
											-1	-1	-1	-1	0	-4
												0	0	0	1	1
													0	0	1	1
														0	1	1
															1	1
														Mann Kendall Statistic (S) =		-62



APPENDIX D – INTERVIEW REPORT

INTERVIEW DOCUMENTATION FORM

The following is a list of individuals interviewed for this five-year review. See the attached contact record(s) for a detailed summary of the interviews.

Peter Britz	Landfill Project Coordinator	Coakley Landfill Group	
Joseph Donovan, P.G.	Project Manager	NHDES	June 14, 2011
Don Mitchell	Adjacent Neighbor	North Hill Nursery, Greenland, NH	March 24, 2011

INTERVIEW RECORD

Site Name: Coakley Landfill, North Hampton & Greenland NH	**EPA ID No.:** NHD064424153	
Subject: 3rd Five Year Review	**Time:** AM	**Date:** 03/24/2011
Type: ■ Telephone □ Visit □ Other **Location of Visit:**	□ Incoming ■ Outgoing	

Contact Made By:

Name: Gerardo Millán-Ramos	**Title:** Remedial Project Manager	**Organization:** U.S. EPA Region 1

Individual Contacted:

Name: Mr. Don Mitchell	**Title:** Adjacent neighbor	**Organization:** North Hill Nursery
Telephone No: 603-964-7104 **Fax No:** **E-Mail Address:**	**Street Address:** 206 Lafayette Road **City, State, Zip:** North Hampton, NH, 03862	

Summary Of Conversation

Mr. Mitchell is the owner of a plant nursery adjacent to the site, located at 206 Lafayette Road, North Hampton NH. His property lies east of the landfill and up gradient from the GW flow. Representatives from EPA, NHDES and the CLG met with him and his wife on March 11, 2011 to discuss the technical and legal concerns posed by the potential use of an inactive irrigation well in their property. I called Mr. Mitchell to give him an update on the status of the information he requested (i.e. well completion report on the inactive irrigation well in his property, and list of possible options to alleviate high cost of irrigation water). I also explained Mr. Mitchell, the reason for these questions and assured him that they are totally unrelated to the irrigation well issue. I told Mr. Mitchell that his responses would be part of the Five Year Review Report, which will be available to the public, after its completion in September 2011. I proceeded to ask the questions listed on page C-3 of the June 2001 Comprehensive Five Year Review Guidance. The following is a list of the questions and a summary of Mr. Mitchell's response.

1. What is your overall impression of the project (general sentiment)?

   I think the project is moving along. I also understand that it needs time for you to see the results you want.

2. What effects have site operations had on the surrounding community?

   I haven't heard of anything. I imagine some people may want to use the groundwater just as I would, but I am not aware of any such person.

3. Are you aware of any community concerns regarding the site or its operation and administration? If so please give details.

   No. Some customers ask us about the lump and pipes they see at a distance. We tell them is a Superfund site and that it is being cleaned.

4. Are you aware of any events, incidents, or activities at the site such as vandalism, trespassing, or emergency responses from local authorities? If so please give details.

   No. From time to time we see some people mowing the grass and providing maintenance to it, but that's it.

5. Do you feel well informed about the site's activities and progress?

   I feel more informed now. After the meeting we had, I understand you have a timeframe for the cleanup and what is going on.

6. Do you have any comments, suggestions, or recommendations regarding the site's management or operation?

   No, I don't.

INTERVIEW RECORD

Site Name: Coakley Landfill, North Hampton & Greenland NH		**EPA ID No.:** NHD064424153
Subject: 3rd Five Year Review		**Time:** 1:30 PM **Date:** 08/02/11
Type: ■ Telephone □ Visit □ Other **Location of Visit:**		□ Incoming ■ Outgoing
Contact Made By:		
Name: Gerardo Millán-Ramos	**Title:** Remedial Project Manager	**Organization:** U.S. EPA Region 1
Individual Contacted:		
Name: Mr. Peter Britz	**Title:** Landfill Project Coordinator	**Organization:** Coakley Landfill Group
Telephone No: 603-610-7215 **Fax No:** **E-Mail Address:** plbritz@cityofportsmouth.com	**Street Address:** 1 Junkins Ave. **City, State, Zip:** Portsmouth NH 03801	
Summary Of Conversation		

I interviewed Mr. Britz with the questions listed on page C-6 of the June 2001 Comprehensive Five Year Review Guidance. The following is a list of the questions and a summary of Mr. Britz's response.

1. What is your overall impression of the project (general sentiment)?

   I think that things are generally progressing. It is not a difficult site to manage but there are some uncertainties about future actions regarding some contaminants, such as 1,4 dioxane, arsenic and manganese. It is difficult to identify trends for these contaminants.

   Is the remedy functioning as expected? How well is the remedy performing?

   Yes, all contaminants are decreasing at different rates, except arsenic, manganese, and 1-4 dioxane all of which are difficult to identify trends.: The remedy is performing well, except for the uncertainties mentioned above.

2. What does the monitoring data show? Are there any trends that show contaminant levels are decreasing?

   Yes, the monitoring data shows that all contaminants have concentrations that are decreasing over time, except the three contaminants aforementioned.

3. Is there a continuous on-site O&M presence? If so, please describe staff and activities. If there is not a continuous on-site presence, describe staff and frequency of site inspections and activities.

   There is not a continuous site presence, but there are frequent maintenance activities that take place, such as: a) annual sampling and grass mowing.

   b) quarterly maintenance of fencing and gates (usually it is done more frequently than quarterly).

4. Have there been any significant changes in the O&M requirements, maintenance schedules, or sampling routines since start-up or in the last five years? If so, do they affect the protectiveness or the effectiveness of the remedy? Please describe changes and impacts.

   There have been changes in the sampling routines during the last five years. As a result of changes in the NHDES requirements for the monitoring of hazardous waste sites, we are now sampling for 1,4 dioxane in a selected number of wells. Per EPA and NHDES instructions, for six inch wells with screen lengths greater than 10 feet we are using discrete interval sampling for all analytes. Also, a number of gas monitoring stations have been discontinued due to lack of observed exceedances and at two of the gas monitoring stations the sampling frequency has decreased from four times a year to two times a year.

   None, of these changes affect the protectiveness of the remedy. The changes implemented have increased the remedy's efficiency and effectiveness in meeting both NHDES and EPA QA/QC requirements.

5. Have there been unexpected O&M difficulties or costs at the site since start-up or in the last five years? If so, please give details.

   The only unexpected costs were those caused by the refinements to the sampling routines described above. They amount to a one time cost of approximately $7800 plus an annual increase in laboratory and sampling costs.

6. Have there been opportunities to optimize O&M, or sampling efforts? Please describe changes and resultant or desired cost savings or improved efficiency.

   The decrease in the number of the gas monitoring stations and their frequency of sampling were opportunities to optimize sampling efforts. They did augment the efficiency of field operations and resulted in cost savings. Also the use of discrete interval sampling at a number of wells has optimized the probability of detecting contaminants at the correct horizontal strata of groundwater flow.

7. Do you have any comments, suggestions, or recommendations regarding the project?

   No, not at this time.

INTERVIEW RECORD

Site Name: Coakley Landfill, North Hampton & Greenland NH	**EPA ID No.:** NHD064424153	
Subject: 3rd Five Year Review	**Time:** 9:20 AM	**Date:** 06/14/2011
Type: ■ Telephone ☐ Visit ☐ Other **Location of Visit:** n/a	☐ Incoming ■ Outgoing	

Contact Made By:

Name: Gerardo Millán-Ramos	**Title:** Remedial Project Manager	**Organization:** U.S. EPA Region 1

Individual Contacted:

Name: Mr. Joseph Donovan	**Title:** Project Manager	**Organization:** NH DES
Telephone No: 603 271-6811 **Fax No:** 603 271-2181 **E-Mail Address:** jdonovan@des.state.nh.us	**Street Address:** 6 Hazen Drive **City, State, Zip:** Concord NH 03302-0095	

Summary Of Conversation

I called Mr. Donovan to perform this interview and ask him question about his comments on this Review. I proceeded to ask the questions listed on page C-4 of the June 2001 Comprehensive Five Year Review Guidance. The following is a list of the questions and a summary of Mr. Donovan's response.

1. What is your overall impression of the project (general sentiment)?

   It seems to be running well. I am little bit more nervous about it than Somersworth Sanitary Landfill because of the presence of 1,4-Dioxane. I want to make sure we get a good handle on the situation to ensure it is safe for everyone.

2. Have there been routine communications or activities (site visits, inspections, reporting activities, etc.) conducted by your office regarding the site?

   Yes, I have joined EPA at a couple of site visits/inspections, also, I have attended a number of conference calls to discuss ongoing work at the site, and I have reviewed documents prepared by the CLG contractor.

3. Have there been any complaints, violations, or other incidents related to the site requiring a response by your office? If so please give details.

   No.

4. Do you feel well informed about the site's activities and progress?

   Yes.

5. Do you have any comments, suggestions, or recommendations regarding the site's management or operation?

   No, I don't.

APPENDIX E – PHOTOS DOCUMENTING SITE CONDITIONS

APPENDIX E – PHOTOS DOCUMENTING SITE CONDITIONS

DRAFT

Figure 1. First Gate. Looking South East from the church parking lot

Figure 2. Sign at first gate

Figure 3. Second gate and fence. Entrance to the landfill (looking south).

Figure 4. Sign at the second gate.

Figure 5. Rip-Rap on top of drainage swale. Looking west.

Figure 6. Drainage culvert showing partial obstruction from rip rap.

Figure 7. View of the North Hill Nursery from the top of the landfill (Looking South-South East)

Figure 8. Rubber casing protecting one of the most recent settlement gauges.

Figure 9. South-eastern section of fence showing snowstorm/ice damage

Figure 10. Snowstorm/ice damage to eastern section of the fence.

Figure 11. Damaged fence with well MW-4 in the background (Looking south)

Figure 12. Damaged fence on the southern section (Looking south)

Figure 13. Unidentified well without lock.

Figure 14. View of pedestrian gate at the Southeastern corner of the fence, gas vent, and partial erosion of the drainage slope's toe.

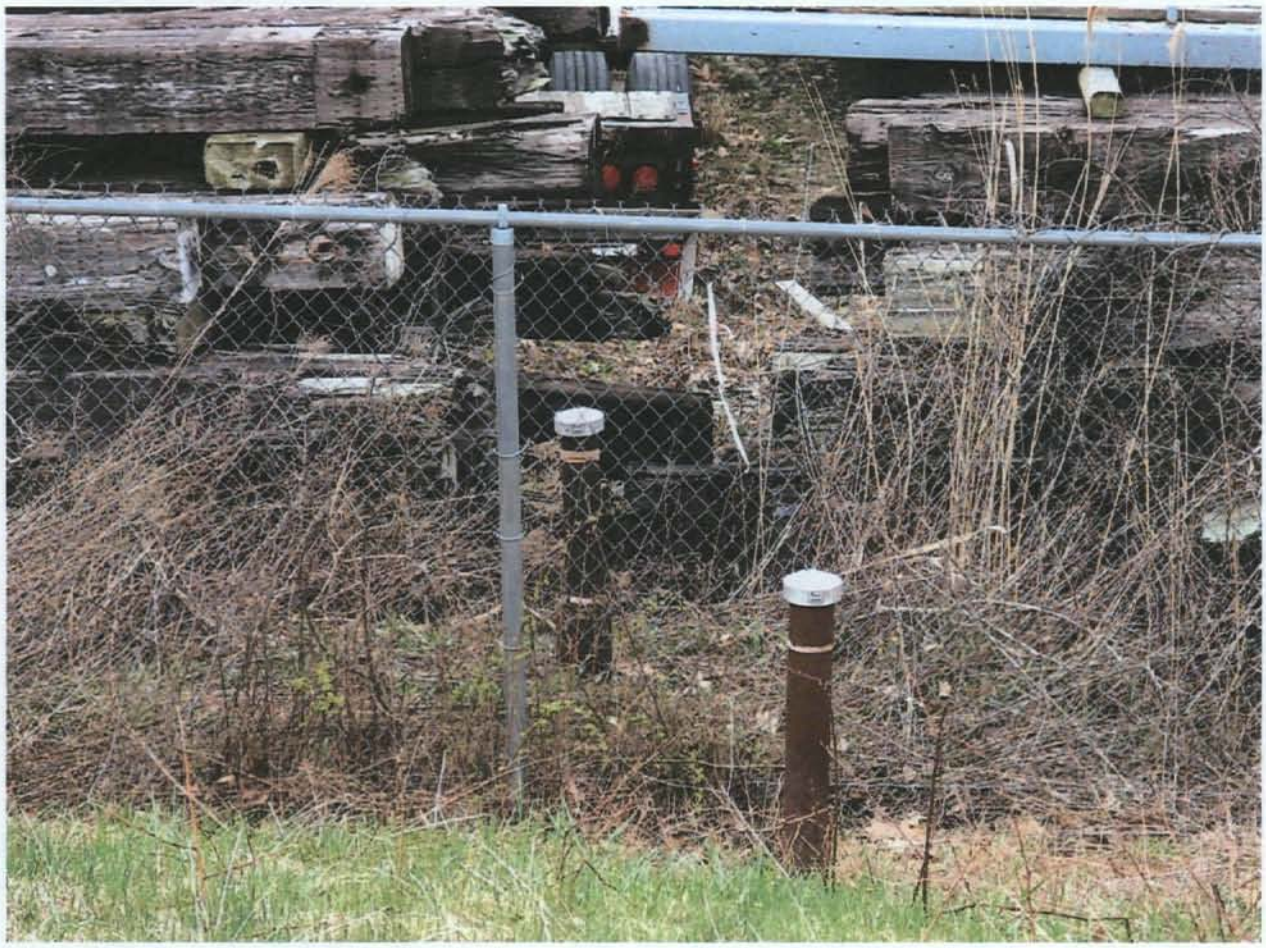


Figure 15. Wells MW-5S and MW-5D with posts directly behind.

Figure 16. View of construction equipment depot along the southwestern section of the fence (looking south from the top of the landfill)

Figure 17. View of wooden post protruding into the fence

Figure 18. View of geotextile exposed

Figure 19. View of pedestrian gate at the southwestern corner of the fence unlocked, open and without a sign.

Figure 20. Section of the drainage slope (toe) showing rupture of the geotextile and exposure of the gravel underneath. Southwestern corner of the landfill.

Figure 21. Fallen tree on top of a section of the western side of the fence. Looking north.

Figure 22. Unlocked pedestrian gate on the western side of the fence.

Figure 23. Unlocked pedestrian gate at western side of the fence.

Figure 24. Overgrowth of vegetation on top of drainage swale.

Figure 25. View of the sampling location for Leachates (L-1)

APPENDIX F – INSPECTION CHECKLIST

Site Inspection Checklist

I. SITE INFORMATION	
Site name: Coakley Landfill	**Date of inspection:** April 27, 2011
Location and Region: 480 Breakfast Hill Road, Greenland/North Hampton, New Hampshire 03840	**EPA ID:** NHD064424153
Agency, office, or company leading the five-year review: U.S. EPA Region 1 – New England, Office of Site Remediation and Restoration	**Weather/temperature:** Sunny / 52° F

Remedy Includes: (Check all that apply)

- ■ Landfill cover/containment
- ■ Access controls
- ■ Institutional controls
- ☐ Groundwater pump and treatment
- ☐ Surface water collection and treatment
- ☐ Other Permeable Reactive Barrier
- ■ Monitored natural attenuation
- ☐ Groundwater containment
- ☐ Vertical barrier walls

Attachments: ☐ Inspection team roster attached ☐ Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** _____ _____ _____
   Name Title Date
   Interviewed ☐ at site ☐ at office ☐ by phone Phone no.
   Problems, suggestions; ☐ Report attached _____

2. **O&M staff** _____ _____ _____
   Name Title Date
   Interviewed ☐ at site ☐ at office ☐ by phone Phone no. _____
   Problems, suggestions; ☐ Report attached _____

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

Agency
Contact
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached _____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached _____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached _____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached _____

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. **O&M Documents**
   - ☐ O&M manual ☐ Readily available ☐ Up to date ■ N/A
   - ☐ As-built drawings ☐ Readily available ☐ Up to date ■ N/A
   - ☐ Maintenance logs ☐ Readily available ☐ Up to date ■ N/A

   Remarks

2. **Site-Specific Health and Safety Plan** ☐ Readily available ☐ Up to date ■ N/A
   - ☐ Contingency plan/emergency response plan ☐ Readily available ☐ Up to date ■ N/A

   Remarks

3. **O&M and OSHA Training Records** ☐ Readily available ☐ Up to date ■ N/A

   Remarks

4. **Permits and Service Agreements**
   - ☐ Air discharge permit ☐ Readily available ☐ Up to date ■ N/A
   - ☐ Effluent discharge ☐ Readily available ☐ Up to date ■ N/A
   - ☐ Waste disposal, POTW ☐ Readily available ☐ Up to date ■ N/A
   - ■ Other permits GW Management Permit ☐ Readily available ■ Up to date ☐ N/A

   Remarks NH DES issued a Groundwater Management Permit on 06/19/2008

5. **Gas Generation Records** ☐ Readily available ☐ Up to date ■ N/A

   Remarks

6. **Settlement Monument Records** ☐ Readily available ☐ Up to date ■ N/A

   Remarks

7. **Groundwater Monitoring Records** ☐ Readily available ■ Up to date ☐ N/A

   Remarks

8. **Leachate Extraction Records** ☐ Readily available ☐ Up to date ■ N/A

   Remarks

9. **Discharge Compliance Records**
   - ☐ Air ☐ Readily available ☐ Up to date ■ N/A
   - ☐ Water (effluent) ☐ Readily available ☐ Up to date ■ N/A

   Remarks

10. **Daily Access/Security Logs** ☐ Readily available ☐ Up to date ■ N/A

    Remarks

IV. O&M COSTS

1. **O&M Organization**

☐ State in-house ☐ Contractor for State
☐ PRP in-house ■ Contractor for PRP
☐ Federal Facility in-house ☐ Contractor for Federal Facility
☐ Other _____

2. **O&M Cost Records**

☐ Readily available ■ Up to date
☐ Funding mechanism/agreement in place
Original O&M cost estimate _____ ☐ Breakdown attached

Total annual cost by year for review period if available (**Breakdown shown on Table 3 of the 5 YR Review Report**)

From _____ To _____ _____ ☐ Breakdown attached
Date Date Total cost
From _____ To _____ _____ ☐ Breakdown attached
Date Date Total cost
From _____ To _____ _____ ☐ Breakdown attached
Date Date Total cost
From _____ To _____ _____ ☐ Breakdown attached
Date Date Total cost
From _____ To _____ _____ ☐ Breakdown attached
Date Date Total cost

3. **Unanticipated or Unusually High O&M Costs During Review Period**

Describe costs and reasons: Not available at the time of inspection. See table 3 in report for information obtained from the CLG. No unanticipated or unusually high O&M cost was noticed.

V. ACCESS AND INSTITUTIONAL CONTROLS ■ Applicable ☐ N/A

A. Fencing

1. **Fencing damaged** ☐ Location shown on site map ■ Gates secured ☐ N/A

Remarks Extensive damage due to severe snow storms was observed and two pedestrian gates were unsecured. See photos on Appendix E.

B. Other Access Restrictions

1. **Signs and other security measures** ☐ Location shown on site map ☐ N/A

Remarks Most gates had attached signs and there are some signs mounted in posts, however there were two pedestrian gates without signs. See photos on Appendix E.

C. Institutional Controls (ICs)

1. **Implementation and enforcement**

Site conditions imply ICs not properly implemented ☐ Yes ■ No ☐ N/A
Site conditions imply ICs not being fully enforced ☐ Yes ■ No ☐ N/A

Type of monitoring (*e.g.*, self-reporting, drive by)

On a yearly basis, in accordance with NH Department of Environmental Services rule Env-Or 607.06(d), the Coakley Landfill Group (CLG) sends a letter to all property owners within the GMZ established by the GMP. This letter requests the self-reporting of any new drinking water wells installed within these properties. Appendix H shows a sample of the letters sent on February 2011 and a copy of the certified mail receipts. Also, during the sampling events (Spring and Fall every year) the contractor performing the work is required to note any observations about new wells and report it to the CLG.

Responsible party/agency Coakley Landfill Group
Contact Mr. Peter Britz (Name) Executive Director/Project Manager (Title) _____ (Date) 603-610-7215 (Phone no.)

Reporting is up-to-date ■ Yes ☐ No ☐ N/A
Reports are verified by the lead agency ■ Yes ☐ No ☐ N/A

Specific requirements in deed or decision documents have been met ■ Yes ☐ No ☐ N/A
Violations have been reported ☐ Yes ☐ No ■ N/A
Other problems or suggestions: ■ Report attached (Appendix H)

2. **Adequacy** ☐ ICs are adequate ■ ICs are inadequate ☐ N/A

Remarks
There is a need for groundwater extraction restrictions for properties on the eastern side of the landfill. Research of the ICs in this area revealed that there is no legal instrument to prohibit the extraction of groundwater in this area. Groundwater extraction in this area has the potential to alter the flow of groundwater and increase the extent of the plume, thus adding complexities and time to the ongoing remedy.

D. General

1. **Vandalism/trespassing** ☐ Location shown on site map ■ No vandalism evident

Remarks No vandalism or trespassing was evident on-site, however several of the signs mounted on posts outside the fence had bullet holes in them.

2. **Land use changes on site** ☐ N/A

Remarks Three parcels of land abutting the fence on the southern side of the landfill (see site map/figure and photos in Appendix E), are being used for the storage of construction equipment and materials. Wood posts are extremely close to the fence and wells and are a potential hazard.

3. **Land use changes off site** ■ N/A

Remarks

VI. GENERAL SITE CONDITIONS

A. Roads ■ Applicable ☐ N/A

1. **Roads damaged** ■ Location shown on site map ■ Roads adequate ☐ N/A

Remarks

B. Other Site Conditions

Remarks None

VII. LANDFILL COVERS ■ Applicable ☐ N/A

A. Landfill Surface

1. **Settlement** (Low spots) ☐ Location shown on site map ■ Settlement not evident
Areal extent_____ Depth_____
Remarks_____

2. **Cracks** ☐ Location shown on site map ■ Cracking not evident
Lengths_____ Widths_____ Depths_____
Remarks____

3. **Erosion** ■ Location shown on site map ☐ Erosion not evident
Areal extent_____ Depth_____
Remarks The toe at the drainage slope in some areas of the landfill has been eroded to the point of exposing the membrane and crushed stone underneath. See photos in Appendix E. However an examination of the design specifications and a cross-section of the cap components revealed that this geotextile is not a post-construction component of the cap. The geotextile was a temporary device to hold in place the gravel of a drainage layer on top of the liner, while the cap was constructed. It was left in place with the understanding that it would eventually be exposed and disintegrate.

4. **Holes** ☐ Location shown on site map ■ Holes not evident
Areal extent_____ Depth_____
Remarks_____

5. **Vegetative Cover** ■ Grass ■ Cover properly established ■ No signs of stress
☐ Trees/Shrubs (indicate size and locations on a diagram)
Remarks_____

6. **Alternative Cover (armored rock, concrete, etc.)** ■ N/A
Remarks_____

7. **Bulges** ☐ Location shown on site map ■ Bulges not evident
Areal extent_____ Height_____
Remarks_____

8. **Wet Areas/Water Damage** ■ Wet areas/water damage not evident
☐ Wet areas ☐ Location shown on site map Areal extent_____
☐ Ponding ☐ Location shown on site map Areal extent_____
☐ Seeps ☐ Location shown on site map Areal extent_____
☐ Soft subgrade ☐ Location shown on site map Areal extent_____
Remarks_____

9. **Slope Instability** ☐ Slides ☐ Location shown on site map ■ No evidence of slope instability
Areal extent_____
Remarks_____

B. Benches ■ Applicable ☐ N/A
(Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)

1. **Flows Bypass Bench** ☐ Location shown on site map ■ N/A or okay
Remarks_____

2. **Bench Breached** ☐ Location shown on site map ■ N/A or okay
Remarks_____

3. **Bench Overtopped** ☐ Location shown on site map ■ N/A or okay
Remarks_____

C. Letdown Channels ■ Applicable ☐ N/A
(Channel lined with erosion control mats, riprap, grout bags, or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)

1. **Settlement** ☐ Location shown on site map ■ No evidence of settlement
Areal extent_____ Depth_____
Remarks_____

2. **Material Degradation** ☐ Location shown on site map ■ No evidence of degradation
Material type_____ Areal extent_____
Remarks_____

3. **Erosion** ☐ Location shown on site map ■ No evidence of erosion
Areal extent_____ Depth_____
Remarks_____

4. **Undercutting** ☐ Location shown on site map ■ No evidence of undercutting
Areal extent_____ Depth_____
Remarks_____

5. **Obstructions** Type_____ ■ No obstructions
☐ Location shown on site map Areal extent_____
Size_____
Remarks A few rocks from the Rip Rap were observed on the culverts directly across the main entrance of the fence. These rocks were not forming an obstruction at the time, but if more of these accumulate, the culverts could become obstructed. All drainage channels like these should be kept clear of such debris at the time of regular maintenance activities.

6. **Excessive Vegetative Growth** Type__tall grass and a shrub_____
☐ No evidence of excessive growth
■ Vegetation in channels does not obstruct flow
☐ Location shown on site map Areal extent_____
Remarks Some of the drainage swales with rip rap show excessive growth of vegetation. See photos on Appendix E. Such vegetation should be removed at the time of the scheduled maintenance activities.

D. Cover Penetrations ■ Applicable ☐ N/A

1. **Gas Vents** ☐ Active ■ Passive
■ Properly secured/locked ■ Functioning ■ Routinely sampled ■ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance
☐ N/A
Remarks_____

2. **Gas Monitoring Probes**
■ Properly secured/locked ■ Functioning ■ Routinely sampled ■ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A
Remarks None

3. **Monitoring Wells** (within surface area of landfill)
☐ Properly secured/locked ■ Functioning ■ Routinely sampled ■ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A
Remarks Three wells had no lock and the label underneath the cover was barely legible. See photos in Appendix E.

4. **Leachate Extraction Wells**
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ■ N/A
Remarks_____

5. **Settlement Monuments** ☐ Located ☐ Routinely surveyed ■ N/A
Remarks_____

E. Gas Collection and Treatment ■ Applicable ☐ N/A

1. **Gas Treatment Facilities**
   ☐ Flaring ☐ Thermal destruction ☐ Collection for reuse
   ☐ Good condition ☐ Needs Maintenance
   Remarks N/A

2. **Gas Collection Wells, Manifolds and Piping**
   ■ Good condition ☐ Needs Maintenance
   Remarks _____

3. **Gas Monitoring Facilities** (*e.g.*, gas monitoring of adjacent homes or buildings)
   ■ Good condition ☐ Needs Maintenance ☐ N/A
   Remarks _____

F. Cover Drainage Layer ☐ Applicable ■ N/A

1. **Outlet Pipes Inspected** ☐ Functioning ☐ N/A
   Remarks _____

2. **Outlet Rock Inspected** ☐ Functioning ☐ N/A
   Remarks _____

G. Detention/Sedimentation Ponds ☐ Applicable ■ N/A

1. **Siltation** Areal extent _____ Depth _____ ☐ N/A
   ☐ Siltation not evident
   Remarks _____

2. **Erosion** Areal extent _____ Depth _____
   ☐ Erosion not evident
   Remarks _____

3. **Outlet Works** ☐ Functioning ☐ N/A
   Remarks _____

4. **Dam** ☐ Functioning ☐ N/A
   Remarks _____

H. Retaining Walls ☐ Applicable ■ N/A

1. **Deformations** ☐ Location shown on site map ☐ Deformation not evident
Horizontal displacement_____ Vertical displacement_____
Rotational displacement_____
Remarks_____

2. **Degradation** ☐ Location shown on site map ☐ Degradation not evident
Remarks_____

I. Perimeter Ditches/Off-Site Discharge ☐ Applicable ■ N/A

1. **Siltation** ☐ Location shown on site map ☐ Siltation not evident
Areal extent_____ Depth_____
Remarks_____

2. **Vegetative Growth** ☐ Location shown on site map ☐ N/A
☐ Vegetation does not impede flow
Areal extent_____ Type_____
Remarks_____

3. **Erosion** ☐ Location shown on site map ☐ Erosion not evident
Areal extent_____ Depth_____
Remarks_____

4. **Discharge Structure** ☐ Functioning ☐ N/A
Remarks_____

VIII. VERTICAL BARRIER WALLS ☐ Applicable ■ N/A

1. **Settlement** ☐ Location shown on site map ☐ Settlement not evident
Areal extent_____ Depth_____
Remarks_____

2. **Performance Monitoring** Type of monitoring_____
☐ Performance not monitored
Frequency_____ ☐ Evidence of breaching
Head differential_____
Remarks_____

C. Treatment System ☐ Applicable ■ N/A

1. **Treatment Train** (Check components that apply)
   ☐ Metals removal ☐ Oil/water separation ☐ Bioremediation
   ☐ Air stripping ☐ Carbon adsorbers
   ☐ Filters_____
   ☐ Additive (*e.g.*, chelation agent, flocculent)_____
   ☐ Others_____
   ☐ Good condition ☐ Needs Maintenance
   ☐ Sampling ports properly marked and functional
   ☐ Sampling/maintenance log displayed and up to date
   ☐ Equipment properly identified
   ☐ Quantity of groundwater treated annually_____
   ☐ Quantity of surface water treated annually_____
   Remarks_____

2. **Electrical Enclosures and Panels** (properly rated and functional)
   ☐ N/A ☐ Good condition ☐ Needs Maintenance
   Remarks_____

3. **Tanks, Vaults, Storage Vessels**
   ☐ N/A ☐ Good condition ☐ Proper secondary containment ☐ Needs Maintenance
   Remarks_____

4. **Discharge Structure and Appurtenances**
   ☐ N/A ☐ Good condition ☐ Needs Maintenance
   Remarks_____

5. **Treatment Building(s)**
   ☐ N/A ☐ Good condition (esp. roof and doorways) ☐ Needs repair
   ☐ Chemicals and equipment properly stored
   Remarks_____

6. **Monitoring Wells** (pump and treatment remedy)
   ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
   ☐ All required wells located ☐ Needs Maintenance ☐ N/A
   Remarks_____

D. Monitoring Data

1. Monitoring Data
   ■ Is routinely submitted on time ■ Is of acceptable quality

2. Monitoring data suggests:
   ☐ Groundwater plume is effectively contained ■ Contaminant concentrations are declining

D. Monitored Natural Attenuation

1. **Monitoring Wells** (natural attenuation remedy)
☐ Properly secured/locked ■ Functioning ■ Routinely sampled ■ Good condition
■ All required wells located ☐ Needs Maintenance ☐ N/A
Remarks Well MW-4 was found unlocked as well as three wells within OU-1 (the fenced landfill).

X. OTHER REMEDIES

If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction. N/A

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

The objective of the OU-1 ROD is to protect the drinking water aquifer by minimizing further migration of contaminants to the groundwater and surface water and eliminate threats posed by direct contact with or ingestion of contaminated soils and wastes at the site. The OU-1 (source control) response action includes caping and fencing the landfill, collecting and venting landfill gases, the long term monitoring of groundwater, surface water and lecheates from the landfill, and the implementation of institutional controls to prevent contact with site contaminants and to protect the components of the remedy. The objective of the OU-2 ROD is to manage the migration of contaminated groundwater outside the landfill boundaries. The OU-2 (management of migration) response action includes using institutional controls to prevent use of contaminated groundwater; using natural attenuation for the contaminated groundwater plume; and groundwater monitoring.

The integrity of the landfill cap, gas vents, monitoring wells, gas monitoring probes, and drainage swales is intact. Rain and surface water runoff is being diverted from the landfill wastes, therefore further migration of contaminants to the groundwater and surface water is being effectively minimized. The intact integrity of these components also creates an effective barrier between the landfill wastes, its contaminated soils, and people or animals that may have direct contact and/or ingest these. However, the extensive damage on the fence and the lack of locks on some gates and monitoring wells, the proximity of construction materials to the fence (i.e. wooden posts), and the excessive growth of vegetation on some drainage wells and at a section of the fence, pose potential threats that could compromise the integrity of the remedy components and its long-term protectiveness.

The integrity of the monitoring wells in OU-2, the continued performance of annual groundwater, surface water and leacheate sampling events, and the existence of Institutional Controls (ICs) in the form of a Groundwater Management Permit issued by NHDES, is effectively managing the migration of contaminated groundwater and preventing its ingestion by humans. However, the fact that some wells were unlocked and poorly identified poses a potential threat to the long term effectiveness of the remedy.

In conclusion, the inspection observations indicate that the remedy is functioning as designed, but the deficiencies noted need to be corrected in order to ensure long-term protectiveness and continued monitoring is required.

B.	Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

- Fence damage
  Extensive damage created by winter storms was observed. It does not bear on current protectiveness but future protectiveness could be compromised if repairs are not made.

- Gates w/o locks and/or signs
  Some pedestrian gates were observed to be missing locks and/or signs. No indication of trespassing was observed but gates must be locked in order to insure protectiveness.

- Monitoring wells w/o locks and proper label
  Three wells had no lock and the label underneath the cover was barely legible. This needs to be addressed in order to avoid cross-contamination and ensure future protectiveness.

- Electrical posts too close to well MW-5 and one of them almost penetrating the fence
  These posts and construction equipment pose a potential threat of damage to wells MW-5 and MW-2, and to the fence. Current protectiveness is not affected but future protectiveness is compromised if equipment and materials are not relocated at least five feet from these structures.

- Tree too close to fence with limbs on top of it
  A tree was observed to be too close to the western section of the fence and some branches were over the fence and lying directly on top of the fence. Current protectiveness is not affected but future protectiveness could be compromised if tree is not removed and/or trimmed.

- Excesive vegetation on some drainage swales and a few rocks inside culverts.
  All drainage channels must be free of excessive vegetation and debris in order to ensure the free flow of runoff water. Left unchecked, they have the potential to compromise future protectiveness.

C.	Early Indicators of Potential Remedy Problems

Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future.

NONE

D.	Opportunities for Optimization

Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.

NONE

APPENDIX G – MONITORING NETWORK, ANALYTICAL PARAMETERS & SAMPLING FREQUENCY

TABLE 2-2
COAKLEY LANDFILL SUPERFUND SITE
OU-1 GROUNDWATER MONITORING NETWORK,
ANALYTICAL PARAMETERS, AND SAMPLING FREQUENCY

	Groundwater												Residential Wells	
Sampling Point	MW-4	MW-5S	MW-5D	MW-6	MW-8	MW-9	MW-10	MW-11	RMW-3	BP-4	OP-2	OP-5	R-3	R-5
Field Parameters														
Static Water Level	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Turbidity	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Specific Conductance	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Temperature	A	A	A	A	A	A	A	A	A	A	A	A	A	A
pH	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Dissolved Oxygen	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Dissolved Metals														
Dissolved Iron	A	A	N/A	A	N/A	A	N/A	N/A	N/A	N/A	A	A	N/A	N/A
Dissolved Manganese	A	A	N/A	A	N/A	A	N/A	N/A	N/A	N/A	A	A	N/A	N/A
TAL Metals (Total)														
Aluminum	A	A	A	A	A	A	A	A	A	A	A	A	N/A	N/A
Arsenic	A	A	A	A	A	A	A	A	A	A	A	A	N/A	N/A
Barium	A	A	A	A	A	A	A	A	A	A	A	A	N/A	N/A
Cadmium	A	A	A	A	A	A	A	A	A	A	A	A	N/A	N/A
Calcium	A	A	A	A	A	A	A	A	A	A	A	A	N/A	N/A
Chromium	A	A	A	A	A	A	A	A	A	A	A	A	N/A	N/A
Copper	A	A	A	A	A	A	A	A	A	A	A	A	N/A	N/A
Iron	A	A	A	A	A	A	A	A	A	A	A	A	N/A	N/A
Lead	A	A	A	A	A	A	A	A	A	A	A	A	N/A	N/A
Magnesium	A	A	A	A	A	A	A	A	A	A	A	A	N/A	N/A
Mercury	A	A	A	A	A	A	A	A	A	A	A	A	N/A	N/A
Nickel	A	A	A	A	A	A	A	A	A	A	A	A	N/A	N/A
Potassium	A	A	A	A	A	A	A	A	A	A	A	A	N/A	N/A
Selenium	A	A	A	A	A	A	A	A	A	A	A	A	N/A	N/A
Silver	A	A	A	A	A	A	A	A	A	A	A	A	N/A	N/A
Sodium	A	A	A	A	A	A	A	A	A	A	A	A	N/A	N/A
Thallium	A	A	A	A	A	A	A	A	A	A	A	A	N/A	N/A
Zinc	A	A	A	A	A	A	A	A	A	A	A	A	N/A	N/A
Cobalt	A	A	A	A	A	A	A	A	A	A	A	A	N/A	N/A
Beryllium	A	A	A	A	A	A	A	A	A	A	A	A	N/A	N/A
Manganese	A	A	A	A	A	A	A	A	A	A	A	A	N/A	N/A
Antimony	A	A	A	A	A	A	A	A	A	A	A	A	N/A	N/A
Vanadium	A	A	A	A	A	A	A	A	A	A	A	A	N/A	N/A
Volatile Organic Compounds														
NHDES Full List	N/A	A	A	A	A	N/A	N/A	A	N/A	N/A	N/A	N/A	A	A
1,4 Dioxane, EDP and DBCP	Note 3	Note 3	Note 3	N/A	Note 3	Note 3	N/A	Note 3	N/A	Note 3	Note 3	Note 3	N/A	N/A

Notes:
1. A = Annual
2. N/A = Not Analyzed
3. Samples collected from these wells during the 2010 annual monitoring event shall be analyzed for 1,4 Dioxane, ethylene dibromide (EDB) and dibromochloropropane (DBCP). The Group, USEPA and NHDES shall determine whether analysis of 1,4 Dioxane, EDP and DBCP is required after 2010.

TABLE 2-3
COAKLEY LANDFILL SUPERFUND SITE
OU-2 GROUNDWATER MONITORING NETWORK,
ANALYTICAL PARAMETERS, AND SAMPLING FREQUENCY

Sampling Point	FPC-2A	FPC-2B	FPC-4B	FPC-5A	FPC-5B	FPC-6A	FPC-6B	FPC-7A	FPC-7B	FPC-8A	FPC-8B	FPC-9A	FPC-11A	FPC-11B	GZ-105	GZ-123	GZ-125	AE-1A	AE-1B	AE-2A	AE-2B	AE-3A	AE-3B	AE-4A	AE-4B
Field Parameters																									
Static Water Level	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Turbidity	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Specific Conductance	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Temperature	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
pH	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Dissolved Oxygen	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Dissolved Metals																									
Dissolved Iron	A	A	A	N/A	N/A	A	A	A	A	N/A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Dissolved Manganese	A	A	A	N/A	N/A	A	A	A	A	N/A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
TAL Metals (Total)																									
Aluminum	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Arsenic	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Barium	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Beryllium	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Calcium	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Cadmium	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Chromium	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Copper	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Iron	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Lead	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Magnesium	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Mercury	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Nickel	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Potassium	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Selenium	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Silver	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Sodium	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Thallium	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Zinc	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Cobalt	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Manganese	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Antimony	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Vanadium	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Volatile Organic Compounds																									
NHDES Full List	A	A	A	N/A	N/A	A	A	N/A	N/A	A	A	N/A	N/A	N/A	A	A	A	N/A	N/A	A	A	A	A	A	A
1,4 Dioxane, EDP and DBCP	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Note 3	Note 3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Note 3	Note 3	Note 3	Note 3	N/A	N/A

Notes:
1. A = Annual
2. N/A = Not Analyzed
3. Samples collected from these wells during the 2010 annual monitoring event shall be analyzed for 1,4 Dioxane, ethylene dibromide (EDB) and dibromochloropropane (DBCP). The Group, USEPA and NHDES shall determine whether analysis of 1,4 Dioxane, EDP and DBCP is required after 2010.

TABLE 2-5
COAKLEY LANDFILL SUPERFUND SITE
SURFACE WATER, SEDIMENT, AND LEACHATE MONITORING NETWORK, ANALYTICAL PARAMETERS, AND SAMPLING FREQUENCY

	Surface Water			Sediment		Leachate
Sampling Point	SW-4	SW-5	SW-103	SED-4	SED-5	L-1
Field Parameters						
Turbidity	A	A	A	N/A	N/A	A
Specific Conductance	A	A	A	N/A	N/A	A
Temperature	A	A	A	N/A	N/A	A
pH	A	A	A	N/A	N/A	A
Dissolved Oxygen	A	A	A	N/A	N/A	A
Inorganic Paramters						
Chemical Oxygen Demand	N/A	N/A	N/A	N/A	N/A	A
Ammonia	A	A	A	N/A	N/A	A
TAL Metals (Total)						
Aluminum	A	A	A	5-YR	5-YR	A
Arsenic	A	A	A	5-YR	5-YR	A
Barium	A	A	A	5-YR	5-YR	A
Cadmium	A	A	A	5-YR	5-YR	A
Calcium	A	A	A	5-YR	5-YR	A
Chromium	A	A	A	5-YR	5-YR	A
Copper	A	A	A	5-YR	5-YR	A
Iron	A	A	A	5-YR	5-YR	A
Lead	A	A	A	5-YR	5-YR	A
Magnesium	A	A	A	5-YR	5-YR	A
Mercury	A	A	A	5-YR	5-YR	A
Nickel	A	A	A	5-YR	5-YR	A
Potassium	A	A	A	5-YR	5-YR	A
Selenium	A	A	A	5-YR	5-YR	A
Silver	A	A	A	5-YR	5-YR	A
Sodium	A	A	A	5-YR	5-YR	A
Thallium	A	A	A	5-YR	5-YR	A
Zinc	A	A	A	5-YR	5-YR	A
Cobalt	A	A	A	5-YR	5-YR	A
Beryllium	A	A	A	5-YR	5-YR	A
Manganese	A	A	A	5-YR	5-YR	A
Antimony	A	A	A	5-YR	5-YR	A
Vanadium	A	A	A	5-YR	5-YR	A
Volatile Organic Compounds (4)	A	A	A	N/A	N/A	A

Notes:
1. A = Annual
2. N/A = Not Analyzed
3. 5-YR - Sample once every 5 years beginning in 2014.
4. The Volatile Organic Compounds alalyte list for surface water and leachate shall be the NHDES Waste Management Division Full List of Analytes for Volatile Organics (NHDES Full List). Leachate sample (L-1) shall be analyzed for 1,4 Dioxane, ethylene dibromide (EDB) and dibromochloropropane (DBCP) during the 2010 sampling event. Surface water samples shall not be analyzed for 1,4 Dioxane, EDB or DBCP. The Group, USEPA and NHDES shall determine whether analysis of 1,4 Dioxane, EDB or DBCP is required after 2010.

APPENDIX H – INQUIRY ON NEW DRINKING WATER WELLS

February 17, 2011

Elmer Sewall
340 Breakfast Hill Road
Greenland, NH 03840

Dear Mr. Sewall,

Approximately one year ago you were notified because your property is one of the properties within the proposed groundwater management zone for the Coakley Landfill.

As required by NH Department of Environmental Services rule Env-Or 607.06(d), this letter is being sent to inquire as to whether there are any new drinking water supply wells on your property. If so please notify me at the address below.

If you have questions or would like additional information please contact me at 603-610-7215, by email at plbritz@cityofportsmouth.com or by mail at the City of Portsmouth, 1 Junkins Avenue, Portsmouth, NH 03801.

Sincerely,

Peter L. Britz
Coakley Technical Committee

Name and Address of Sender
Planning Department
City of Portsmouth
1 Junkins Avenue
Portsmouth, NH 03801

Check type of mail or service:
- [x] Certified
- [ ] COD
- [ ] Delivery Confirmation
- [ ] Express Mail
- [ ] Insured
- [ ] Recorded Delivery (International)
- [ ] Registered
- [ ] Return Receipt for Merchandise
- [ ] Signature Confirmation

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Postmark and Date of Receipt

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Article Number	Addressee (Name, Street, City, State, & ZIP Code)	Postage	Fee	Handling Charge	Actual Value if Registered	Insured Value	Due Sender if COD	DC Fee	SC Fee	SH Fee	RD Fee	RR Fee
7005-0390-0000-9117-6701	Town of Greenland PO Box 100 Greenland, NH 03840											
7005 ——— 1607	Alexis Perron 9 Lafayette Terrace North Hampton, NH 03862											
7005 ——— 6282	John Wylie Darleena Wylie 8 Lafayette Terrace North Hampton, NH 03862											
7005 ——— 1645	[illegible] Sewall Rev.Tr.96 [illegible] reakfa[illegible] Hill Road [illegible]nland, NH 03840											
7005 ——— 6718	Joseph Hanley 20 Lafayette Terrace North Hampton, NH 03862											
7005 ——— 6299	Joan Nordstrom 67 North Road North Hampton, NH 03862											
7005 ——— 6244	Joseph McKittrick Helen McKittrick 188 Lafayette Road North Hampton, NH 03862											
7005 ——— 6312	Boston & Maine Corp,c/o Gilford Trans.Inc [illegible]n Horse Park North Billerica, MA 01802											
ZCCMMXIIV0000IIII/5/ NH Ltd Ptshp PO Box 65 Portsmouth, NH 03802 7005 ——— 1652												
7005 ——— 1638	Town of N. Hampton [illegible]nserva[illegible]r Commisssion [illegible] O B[illegible]x [illegible] [illegible]rth H[illegible]pton, NH 03862											
7005 ——— 6251	William Adinolfo Christine Adinolfo 16 Lafayette Terrace North Hampton, NH 03862											
7005 ——— 6329	Elmer Sewall 340 Breakfast Hill Road Greenland, NH 03840											
7005 ——— 1621	William Warman 380 Lafayette Rd,11-102 Seabrook, NH 03874											
7005 ——— 6275	Ambrose Laffey Susan Laffey 12 Lafayette Terrace North Hampton, NH 03862											
7005 ——— 6336	Coakley Landfill LLC PO Box 190 Greenland, NH 03840											

Total Number of Pieces Listed by Sender: 15
Total Number of Pieces Received at Post Office: 15
Postmaster, Per (Name of receiving employee): 14

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PORTSMOUTH NH 03801 FEB 22 2011 USPS

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Pg. 2 of 3

Name and Address of Sender
Planning Department
City of Portsmouth
1 Junkins Avenue
Portsmouth, NH 03801

Check type of mail or service:
- ☑ Certified
- ☐ COD
- ☐ Delivery Confirmation
- ☐ Express Mail
- ☐ Insured
- ☐ Recorded Delivery (International)
- ☐ Registered
- ☐ Return Receipt for Merchandise
- ☐ Signature Confirmation

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D-15

Article Number	Addressee (Name, Street, City, State, & ZIP Code)	Postage	Fee	Handling Charge	Actual Value if Registered	Insured Value	Due Sender if COD	DC Fee	SC Fee	SH Fee	RD Fee	RR Fee
	Richard R. Grenier I.V. Trust Richard Grenier & Charter Trust, CoTrustees 10 Canterbury Lane Bedford, NH 03110-4435 7005 ——— 6343											
	Leo Crotty, Jr. 216 Lafayette Road North Hampton, NH 03862 7005 ——— 6350											
	MA NEGM, LLC 302 Main Street Somersworth, MA 03878 7005 ——— 6367											
	[illegible] Enterprises [illegible] Lafayette Road North Hampton, NH 03862 7005 ——— 6374											
	Louis Fucci Christopher & Ricardo Fucci 180 Lafayette Road North Hampton, NH 03862 7005 ——— 1683											
	Lori Lessard, Trustee 186 Lafayette Road North Hampton, NH 03862 7005 ——— 1713											
	Kenneth Margeson Tracy Margeson 15 Lafayette Terrace North Hampton, NH 03862 7005 ——— 1591											
	Edward Gabree Anita Gabree 15 Lafayette Terrace North Hampton, NH 03862 7005 ——— 1577											
	Joseph Conner Bridget Conner 44 Lafayette Terrace North Hampton, NH 03862 7005 ——— 1584											
	Joseph Fitzgerald Yolanda Fitzgerald PO Box 626 North Hampton, NH 03862 7005 ——— 1560											
	Gozinta LLC c/o Rodney Booker 198 Lafayette Road North Hampton, NH 03862 7005 ——— 1553											
	Derek Burt 8774 Mustic Circle Northport, FL 34287 7005 ——— 1546											
	206 Lafayette Road LLC 206 Lafayette Road North Hampton, NH 03862 7005 ——— 1539											
	Stella Cibrowski PO Box 443 Concord, NH 03301 7005 ——— 1522											
	Kent Norman, Trustee S&L Realty Trust PO Box 4276 Portsmouth, NH 03802-4276 7005 ——— 1515											

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PS Form 3877, February 2002 (Page 1 of 2)

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Pg. 3 of 3

Name and Address of Sender
Planning Department
City of Portsmouth
1 Junkins Avenue
Portsmouth, NH 03801

Check type of mail or service:
- [x] Certified
- [ ] COD
- [ ] Delivery Confirmation
- [ ] Express Mail
- [ ] Insured
- [ ] Recorded Delivery (International)
- [ ] Registered
- [ ] Return Receipt for Merchandise
- [ ] Signature Confirmation

Affix Stamp Here *(If issued as a certificate of mailing, or for additional copies of this bill)*
Postmark and Date of Receipt

D-5

Article Number	Addressee (Name, Street, City, State, & ZIP Code)	Postage	Fee	Handling Charge	Actual Value if Registered	Insured Value	Due Sender if COD	DC Fee	SC Fee	SH Fee	RD Fee	RR Fee
7005 ——— 1508	First and Ten Property Management PO Box 1058 Hampton, NH 03843											
7005 ——— 1492	Kathleen Simmel 3 Lafayette Terrace North Hampton, NH 03862											
7005 ——— 6237	Judith Tracey Bernard Tracey 257 Washington Road Rye, NH 03870											
7005 ——— 1614	Richard Bartlett Kimberly Bartlett 5 Lafayette Terrace North Hampton, NH 03862											
7005 ——— 6268	James Jones 207 Atlantic Avenue North Hampton, NH 03862											

PORTSMOUTH NH 03801 FEB 22 2011 USPS

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PS Form **3877**, February 2002 *(Page 1 of 2)*

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APPENDIX I – GMP & GMP NOTICE

The State of New Hampshire
DEPARTMENT OF ENVIRONMENTAL SERVICES

Thomas S. Burack, Commissioner

June 19, 2008

Peter Britz
Environmental Planner
City of Portsmouth
1 Junkins Avenue
Portsmouth, NH 03801

SUBJECT: **North Hampton** – Coakley Landfill Superfund Site, 480 Breakfast Hill Road Groundwater Management Permit, DES Site # 198712001, Project RSN # 431

Groundwater Management Permit Application, prepared by Hancock & Associates, dated May 14, 2008

Dear Mr. Britz:

Please find enclosed Groundwater Management Permit Number GWP-198712001-N-001, approved by the Department of Environmental Services (Department). This permit is issued for a period of 5 years to monitor the effects of past discharges of contaminants of concern, as defined in Table 12 of the 1994 Site Record of Decision.

All monitoring summaries and all required sampling results must be submitted to the Groundwater Management Permits Coordinator at the address below. All correspondence shall contain a cover letter that clearly shows the Department identification number for the site (DES Site # 198712001). **Please note that upon issuance of this permit, it is only necessary to submit monitoring results to the "Groundwater Management Permits Coordinator" and not to my attention.**

Please note that Condition # 9 requires the permit holder to provide notice of the permit by certified mail, within 30 days of permit issuance, to all owners of lots of record within the Groundwater Management Zone. Documentation of the notification, in the form of a copy of the notice with return receipt(s), shall be submitted to the Department within 60 days of permit issuance.

Also, please note that Condition # 10 requires the permit holder to record "Notice" of the permit (not the permit), within 60 days of issuance, at the registry of deeds in the chain of title for each lot within the Groundwater Management Zone. An example Notice is enclosed for your use. A copy of each recorded Notice shall be submitted to the Department within 30 days of recordation.

SDMS DOCID 288688

DES Web Site: www.des.nh.gov
P.O. Box 95, 29 Hazen Drive, Concord, New Hampshire 03302-0095
Telephone: (603) 271-2908 Fax: (603) 271-2181 TDD Access: Relay NH 1-800-735-2964

Should you have any questions, please contact me at the Waste Management Division.

Sincerely,

Dept. of Environmental Services

Digitally signed by Dept. of Environmental Services
DN: CN = Dept. of Environmental Services, C = US, O = Hazardous Waste Remediation Bureau, OU = Waste Management Division
Reason: I attest to the accuracy and integrity of this document
Date: 2008.06.19 07:50:04 -04'00'

Andrew Hoffman, P.E.
State Project Coordinator
Hazardous Waste Remediation Bureau
Tel: (603) 271-6778
Fax: (603) 271-2181
Email: Andrew.Hoffman@des.nh.gov

Enclosure(s): Groundwater Management Permit No. GWP-198712004-N-001
Sample Recordation Notice

cc: Daniel MacRitchie, Hancock Associates
Kim McNamara, City Health Officer
Richard Pease, Federal Sites, Supervisor
Karlee Kenison, HWRB-GR&P, Supervisor
Peter Roth, NH DoJ

The

NEW HAMPSHIRE DEPARTMENT OF ENVIRONMENTAL SERVICES

hereby issues

GROUNDWATER MANAGEMENT PERMIT NO. GWP-198712001-N-001

to the permittee

COAKLEY LANDFILL GROUP

to monitor the past discharge of

Contaminants of Concern, as identified in Table 12 of the 1994 Record of Decision

at

COAKLEY LANDFILL
(480 Breakfast Hill Road)

in NORTH HAMPTON, N.H.

via the groundwater monitoring system comprised of

12 OU-1 monitoring wells, 25 OU-2 monitoring wells, 3 surface water, and 2 sediment and 1 leachate sampling station(s)

as depicted on the Site Plan entitled

"Environmental Monitoring Network"

dated August 16, 2007, prepared by Golder & Associates, Inc. of Manchester, New Hampshire

TO: COAKLEY LANDFILL GROUP
1 JUNKINS AVENUE
PORTSMOUTH, NEW HAMPSHIRE 03801

Date of Issuance: June 19, 2008
Date of Expiration: June 18, 2013

Pursuant to authority in N.H. RSA 485-C:6-a, the New Hampshire Department of Environmental Services (Department), hereby grants this permit to monitor past discharges to the groundwater at the above described location for five years subject to the following conditions:

(continued)

STANDARD MANAGEMENT PERMIT CONDITIONS

1. The permittee shall not violate Ambient Groundwater Quality Standards adopted by the Department (N.H. Admin. Rules Env-Or 600) in groundwater outside the boundaries of the Groundwater Management Zone, as shown on the referenced site plan.

2. The permittee shall not cause groundwater degradation that results in a violation of surface water quality standards (N.H. Admin. Rules Env-Ws 1700) in any surface water body.

3. The permittee shall allow any authorized staff of the Department, or its agent, to enter the property covered by this permit for the purpose of collecting information, examining records, collecting samples, or undertaking other action associated with this permit.

4. The permittee shall apply for the renewal of this permit at least 90 days prior to its expiration date.

5. This permit is transferable only upon written request to, and approval of, the Department. Compliance with the existing Permit shall be established prior to permit transfer. Transfer requests shall include the name and address of the person to whom the permit transfer is requested, signature of the current and future permittee, and a summary of all monitoring results to date.

6. The Department reserves the right, under N.H. Admin. Rules Env-Or 600, to require additional hydrogeologic studies and/or remedial measures if the Department receives information indicating the need for such work.

7. The permittee shall maintain a water quality monitoring program and submit monitoring results inclusive with the annual report to the Department's Groundwater Management Permits Coordinator no later than 120 days after sampling. Samples shall be taken from on-site monitoring wells and surface water sampling points as shown and labeled on the referenced site plan and other sampling points listed on the following table in accordance with the schedule outlined herein:

Monitoring Locations	**Sampling Frequency**	**Parameters**
MW-5S, MW-6, FPC-2A, FPC-2B, FPC-4B, FPC-6A, FPC-6B, FPC-8B, GZ-105, GZ-123, GZ-125, AE-2A, AE-2B, AE-3A, AE-3B, AE-4A, AE-4B	August each year	Field parameters, dissolved iron & manganese, target analyte list (TAL) metals (total), NHDES Waste Management Division Full List of Analytes for Volatile Organics (Full List VOCs).
MW-4, MW-9, OP-2, OP-5, FPC-7A, FPC-7B, FPC-9A, FPC-11A, FPC-11B, AE-1A, AE-1B	August each year	Field parameters, dissolved iron & manganese, TAL metals (total).
MW-5D, MW-8, MW-11,FPC-8A	August each year	Field parameters, TAL metals (total), Full List VOCs.
MW-10, RMW-3, BP-4, FPC-5A, FPC-5B	August each year	Field parameters, TAL metals (total).

(continued)

Monitoring Locations	Sampling Frequency	Parameters
R-3, R-5	August each year	Field parameters, Full List VOCs.
SW-4, SW-5, SW-103	August each year	Field parameters, ammonia, TAL metals (total), Full List VOCs.
SED-4, SED-5	August each year	TAL metals (total).
L-1	August each year	Field parameters, COD, ammonia, TAL metals (total), Full List VOCs.

Sampling shall be performed in accordance with the documents listed in Env-Or 610.02 (e). Samples shall be analyzed by a laboratory certified by the U.S. Environmental Protection Agency or the New Hampshire Department of Environmental Services. All overburden groundwater samples collected for metal analyses (iron, manganese, and Drinking Water Metals) shall be analyzed for dissolved metals; and thus must be field filtered (with a 0.45-micron filter) and acidified after filtration in the field. Surface water samples and samples collected from bedrock or water supply wells shall be analyzed for total metals, and shall not be filtered. Surface water samples shall be collected and analyzed in accordance with 40 CFR 136. As referred to herein, the term "Target Analyte Metals (TAL)" refers to aluminum, arsenic, barium, cadmium, calcium, chromium, copper, iron, lead, magnesium, mercury, nickel, potassium, selenium, silver, sodium, thallium, zinc, cobalt, beryllium, manganese, antimony and vanadium.

Summaries of water quality shall be submitted annually in December to the Department's Waste Management Division, attention Groundwater Management Permits Coordinator, using a format acceptable to the Department. The Summary Report shall include the information listed in Env-Or 607.04 (a), as applicable.

The Annual Summary Report shall be prepared and stamped by a professional engineer or professional geologist licensed in the State of New Hampshire.

8. Issuance of this permit is based on the Groundwater Management Permit Application dated May 14, 2008, and the historical documents found in the Department file DES Site # 198712001. The Department may require additional hydrogeologic studies and/or remedial measures if invalid or inaccurate data are submitted.

9. Within 30 days of the date of Department approval of this Groundwater Management Permit, the permittee shall provide notice of the permit by certified mail, return receipt requested, to all owners of lots of record within the Groundwater Management Zone. The permittee shall submit documentation of this notification to the Department within 60 days of permit issuance.

10. Within 60 days of the date of Department approval of this Groundwater Management Permit, the permit holder shall record notice of the permit in the registry of deeds in the chain of title for each **lot** within the Groundwater Management Zone. **This recordation requires that the registry be provided with the name of current property owner and associated book and page numbers for the deed of each lot encumbered by this permit. Portions of State/Town/City roadways and associated right-of-way properties within the Groundwater Management Zone do not require recordation.** A copy of each recorded notice shall be submitted to the Department within 30 days of recordation.

(continued)

11. Within 30 days of discovery of a violation of an ambient groundwater quality standard at or beyond the Groundwater Management Zone boundary, the permittee shall notify the Department in writing. Within 60 days of discovery, the permittee shall submit recommendations to correct the violation. The Department shall approve the recommendations if the Department determines that they will correct the violation.

SPECIAL CONDITIONS FOR THIS PERMIT

12. Recorded property within the Groundwater Management Zone shall include the lots as listed and described in the following table:

Tax Map/ Lot #	Property Address	Owner Name and Address	Deed Reference (Book/Page)
Map 10 Lot 11	355 Lafayette Road Rye	First & Ten Property Management PO Box 1058 Rye 03843	Book 3294 Page 2953
Map 17 Lot 72	67 North Road North Hampton	Joan Nordstrom 67 North Road North Hampton 03862	Book 2416 Page 583
Map 17 Lot 73	65 North Road North Hampton	Yolanda Fitzgerald PO Box 626 North Hampton 03862	Book 3007 Page 2807
Map 17 Lot 82	160 Lafayette Rd North Hampton	Luck Enterprises 115 Lafayette Road North Hampton 03862	Book 2473 Page 1659
Map 17 Lot 86	180 Lafayette Rd North Hampton	Christopher & Ricardo Fucci 180 Lafayette Road North Hampton 03862	Book 3319 Page 952
Map 17 Lot 87	186 Lafayette Rd North Hampton	Lori Lessard, Trustee 186 Lafayette Road North Hampton 03862	Book 2760 Page 2101
Map 21 Lot 8	188 Lafayette Rd North Hampton	Helen McKittrick 188 Lafayette Road North Hampton 03862	Book 2641 Page 2656
Map 21 Lot 10	8A Lafayette Terrace North Hampton	Darleena Wylie 8 Lafayette Terrace North Hampton 03862	Book 3219 Page 2588
Map 21 Lot 11	12A Lafayette Terrace North Hampton	Susan Laffey 12 Lafayette Terrace North Hampton 03862	Book 2964 Page 2565
Map 21 Lot 12	16A Lafayette Terrace North Hampton	Christine Adinolfo 16 Lafayette Terrace North Hampton 03862	Book 2963 Page 1721
Map 21 Lot 14	20 Lafayette Terrace North Hampton	Joseph Hanley 20 Lafayette Terrace North Hampton 03862	Book 4682 Page 1265

(continued)

Tax Map/ Lot #	Property Address	Owner Name and Address	Deed Reference (Book/Page)
Map 21 Lot 14-1	40-42 Lafayette Terrace North Hampton	James Jones 207 Atlantic Avenue North Hampton 03862	Book 4451 Page 1104
Map 21 Lot 15	44 Lafayette Terrace North Hampton	Bridget Conner 44 Lafayette Terrace North Hampton 03862	Book 4183 Page 1638
Map 21 Lot 16	46 Lafayette Terrace North Hampton	Rodney Booker 46 Lafayette Terrace North Hampton 03862	Book 4275 Page 902
Map 21 Lot 17	1 Lafayette Terrace North Hampton	Bernard Tracey 257 Washington Road Rye 03870	Book 2450 Page 687
Map 21 Lot 18	3 Lafayette Terrace North Hampton	Kathleen Tracey 3 Lafayette Terrace North Hampton 03862	Book 1243 Page 317
Map 21 Lot 19	5 Lafayette Terrace North Hampton	Kimberly Bartlett 5 Lafayette Terrace North Hampton NH 03862	Book 3824 Page2799
Map 21 Lot 20	9 Lafayette Terrace North Hampton	Alexis Perron 9 Lafayette Terrace North Hampton NH 03862	Book 3088 Page 1774
Map 21 Lot 21	15 Lafayette Terrace North Hampton	Tracy Margeson 15 Lafayette Terrace North Hampton NH 03862	Book 3121 Page 1606
Map 21 Lot 22	15 Lafayette Terrace North Hampton	Anita Gabree 15 Lafayette Terrace North Hampton 03862	Book 3013 Page 2221
Map 21 Lot 23	15 Lafayette Terrace North Hampton	Tracy Margeson 15 Lafayette Terrace North Hampton NH 03862	Book 3121 Page 1606
Map 21 Lot 24	43 Lafayette Terrace North Hampton	William Warman 380 Lafayette Rd,11-102 Seabrook NH 03874	Book 4374 Page1365
Map 21 Lot 25	45 Lafayette Terrace North Hampton	ZCCMMXIIV0000IIII/5 NH Ltd Partnership PO Box 65 Portsmouth NH 03802	Book 2530 Page 1863
Map 21 Lot 26	198 Lafayette Road North Hampton	Gozinta LLC 198 Lafayette Road North Hampton NH 03862	Book 4275 Page 902
Map 21 Lot 27	206 Lafayette Road North Hampton	206 Lafayette Road LLC 206 Lafayette Road North Hampton NH 03862	Book 4785 Page 379
Map 21 Lot 27-1	200 Lafayette Road North Hampton	Derek Burt 8774 Mustic Circle Northport FL 34287	Book 2491 Page 339

(continued)

Tax Map/ Lot #	Property Address	Owner Name and Address	Deed Reference (Book/Page)
Map 21 Lot 28	216 Lafayette Road North Hampton	Stella Ciboroski PO Box 443 Concord, NH 03301	Book 2366 Page 1127
Map 21 Lot 28-1	216 Lafayette Road North Hampton	Leo Crotty, Jr. 216 Lafayette Road North Hampton NH 03862	Book 2475 Page 1278
Map 21 Lot 29	212 Lafayette Road North Hampton	S&L Realty Trust PO Box 4276 Portsmouth NH 03802	Book 3666 Page 1199
Map 21 Lot 31	224 Lafayette Road North Hampton	MA NEGM, LLC 302 Main Street Somersworth MA 03878	Book 4649 Page 2366
Map 21 Lot 41	North Road Rear North Hampton	Elmer Sewell 340 Breakfast Hill Road Greenland NH 03840	Book 1340 Page 524
Map 21 Lot 46	8A Lafayette Terrace, North Hampton	Darleena Wylie 8 Lafayette Terrace North Hampton NH 03862	Book 3219 Page 2588
*Map R1 Lot 13	340 Breakfast Hill Rd Greenland	Elmer Sewell, Rev. Tr. 96 340 Breakfast Hill Road, Greenland NH 03840	Book 3159 Page 928
Map R1 Lot 9B	560 Breakfast Hill Rd Greenland	Town of Greenland PO Box 100 Greenland NH 03840	Book 3454 Page 1131

*A portion of the Sewall parcel (Tax Map R1, Lot #13) is included as within the GMZ and is described as follows:

Commencing at a point at the intersection of the westerly sideline of the Boston and Maine Railroad right of way and the town line of Greenland and North Hampton, thence; N80°19'25"W four hundred sixty-six and fourteen hundredths feet (466.14') by the town line of North Hampton to a point, thence; N79°55'00"W eighteen and ninety-nine hundredths feet (18.99') by the town line of North Hampton to a point, thence; N17°29'30"E one thousand ninety-seven and eighty hundredths feet (1097.80') by other land of the Barbara E. Sewall Revocable Trust to a point, thence; S76°51'30"E four hundred thirty-four and zero hundredths feet (434.00') by other land of the Barbara E. Sewall Revocable Trust to a point, thence; S13°08'30"W one hundred sixty-three and twenty-one hundredths feet (163.21') by land of the Boston and Maine Railroad right of way to a point, thence; S35°09'35"W eighty-eight and two hundredths feet (88.02') by land of the Boston and Maine Railroad right of way to a point, thence; S13°08'30"W eight hundred twenty and sixty-four hundredths feet (820.64') by land of the Boston and Maine Railroad right of way to the point of beginning.

13. All monitoring wells at the site shall be properly maintained and secured from unauthorized access or surface water infiltration.

14. UNDEVELOPED LOTS WITHIN THE GROUNDWATER MANAGEMENT ZONE:

A) Consistent with Env-Or 607.06(d), for each undeveloped lot which is included (in whole or part) in the groundwater management zone and which lacks access to a public water system, the permittee shall inquire of the property owner at least once each year as to whether there are any new drinking water supply well(s) on the property. The permittee shall include a report on this inquiry in the Annual Summary Report required in Standard Permit Condition # 7.

B) Upon discovery of a new drinking water supply well(s), whether as a result of the annual inquiry, upon notice from the lot owner or by any other means, the permittee shall provide written notification to the Department and, to ensure compliance with Env-Or 607.06(a), prepare a contingency plan to provide potable drinking water in the event a well is or becomes contaminated above the drinking water standards. The potable water supply shall meet applicable federal and state water quality criteria. This plan shall be submitted to the Department for approval within 15 days of the date of discovery.

C) Consistent with Env-Or 607.06(e), the permittee shall cause all new drinking water supply well(s) to be sampled within 30 days of discovery. The well(s) shall be sampled for all the parameters included in Standard Condition # 7, unless otherwise specified in writing by the Department. The permittee shall forward all analytical results to the Department and the owner of the drinking water supply well within 7 days of receipt of the results.

Based on the results:

i. If the new well is not contaminated as defined in Env-Or 603.01, the permittee shall continue to sample the new wells annually as part of the permit.

ii. If analytical results indicate the water is contaminated above applicable federal and state water quality criteria, the permittee shall:

a. Notify the owner immediately;

b. Obtain a confirmation set of analytical samples within 14 days of receipt of the original results indicating a groundwater quality standard exceedence; and

c. Following confirmation of groundwater quality standard exceedence, immediately implement the contingency plan submitted for approval pursuant to Special Permit Condition # 14B, above.

Carl W. Baxter, P.E., Administrator
Hazardous Waste Remediation Bureau
Waste Management Division

Under RSA 21-0:14 and 21-0:9-V, any person aggrieved by any terms or conditions of this permit may appeal to the Waste Management Council in accordance with RSA 541-A and N.H. Admin. Rules, Env-WMC 200. Such appeal must be made to the Council within 30 days and must be addressed to the Chairman of the Waste Management Council, c/o Appeals Clerk, Department of Environmental Services Legal Unit, 29 Hazen Drive, P.O. Box 95, Concord, NH 03302-0095.

GWP-198712001-N-001

Example

NOTICE OF GROUNDWATER MANAGEMENT PERMIT
GWP-_____-A-001
TO BE RECORDED AGAINST:

[IDENTIFY OWNER OF PARCEL AND
BOOK AND PAGE OF DEED IN TO THAT PARTY]

NOTICE IS HEREBY GIVEN THAT: The New Hampshire Department of Environmental Services (Department) has issued Groundwater Management Permit #GWP-_____-A-001 ("Permit") to [Permittee]. Pursuant to Env-Or 607.09(a) this notice is recorded for each property located within the groundwater management zone identified in the Permit at the Registry of Deeds for the county in which the property is located.

The Permit establishes a Groundwater Management Zone ("GMZ"), an area within which groundwater use must be controlled and monitored due to the presence of groundwater contaminants that exceed the State's Ambient Groundwater Quality Standards ("AGQS"). The Permit may include conditions to and restrictions upon the use of the properties within the GMZ, including restrictions on the use of groundwater.

The Permit was issued on [Date] and expires on [Date], unless renewed for subsequent five-year period(s). This Notice will remain in effect until such time as the AGQS are restored within the GMZ and the Department issues a Release of Recordation to the Permittee. The Permit is available for review at the New Hampshire Department of Environmental Services, 29 Hazen Drive, Concord, NH 03301 or can be viewed by searching under our OneStop Data Retrieval Site at http://www2.des.nh.gov/OneStop/ORCB_Query.aspx?Project+CCST .

The following properties are located within the GMZ:

Property Owner/Address	**Tax Map/Lot**	**Deed Reference Book/Page**

/s/ [Permittee Name], Permittee
[Company Name]

_____
Date

CITY OF PORTSMOUTH

Community Development Department
(603) 610-7232

Planning Department
(603) 610-7216

RECEIVED
JUL 21 2008
DES/DWGWB
By

DES Site # 198712001
Groundwater Management Permits Coordinator
P.O. Box 95, 29 Hazen Drive
Concord, NH 03302-0095

July 18, 2008

Dear Permit Coordinator:

Enclosed please find certified mail receipts for each of the owners of the lots of record within the Groundwater Management Zone. As required by Permit # 198712001-2-001 condition 9. Of the notices sent one had no receipt returned and four were returned from sender.

Also included please find a sample copy of the letter which was sent out and the notice which was included in the letter.

I believe this satisfies all of the requirements for the initial filing of this permit. I will be reporting in approximately one year's time to provide the annual requirements found in the permit.

If you have any questions or need additional information please do not hesitate to contact me at (603)610-7215 or plbritz@ch.cityofportsmouth.com

Sincerely,

Peter L. Britz
Coakley Technical Advisory Committee

ecc: Coakley Executive Committee
Andrew Hoffman, NHDES
Mike Jasinski, USEPA
Brenda Haslett, USEPA

This document is confidential and may contain privileged information. If you (the reader) are not the intended recipient or the employee or agent responsible to deliver it to the intended recipient, you are hereby notified that you may not use, copy or disclose to anyone any information contained.

1 Junkins Avenue
Portsmouth, New Hampshire 03801
Fax (603) 427-1593

CITY OF PORTSMOUTH

LEGAL DEPARTMENT

Robert P. Sullivan, City Attorney – 603-610-7204 (Direct Dial)
Kathleen M. Dwyer, Assistant City Attorney – 603-427-1338 (Phone/Fax)
Suzanne M. Woodland, Assistant City Attorney – 603-610-7240 (Direct Dial)

Municipal Complex
1 Junkins Avenue
Portsmouth, NH 03801
(603) 431-2000
(603) 427-1577 (FAX)

June 26, 2008

Kathleen Tracey
3 Lafayette Terrace
North Hampton, NH 03862

RE: Property at 3 Lafayette Terrace
Assessor Plan 21, Lot 18

Dear Sir/Madam:

Below please find the notice of Groundwater Management Permit as filed at the Rockingham Registry of Deeds. This letter and the notice, found below, was filed on June 25th 2008 in accordance with the permit conditions of the Groundwater Management Permit issued by the New Hampshire Department of Environmental Services on June 19th 2008. If you have questions please contact Peter Britz at (603)610-7215 or by email at plbritz@ch.cityofportsmouth.com.

Sincerely,

Robert P. Sullivan, City Attorney
Chairman Coakley Executive Committee

h\rps\coakley\ltr re-recorded gmp

Recorded on 6/25/08 at 8:57 a.m. Book 4929, Book 0795

NOTICE OF GROUNDWATER MANAGEMENT PERMIT
GWP-198712001-N-001
TO BE RECORDED AGAINST:

Coakley Landfill Inc. Bk1340 P254 and Bk1347 P172

NOTICE IS HEREBY GIVEN THAT: The New Hampshire Department of Environmental Services (Department) has issued Groundwater Management Permit #GWP-198712001-N-001 ("Permit") to the Coakley Landfill Group. Pursuant to Env-Or 607.09(a) this notice is recorded for each property located within the groundwater management zone identified in the Permit at the Registry of Deeds in Rockingham County.

The Permit establishes a Groundwater Management Zone ("GMZ"), an area within which groundwater use must be controlled and monitored due to the presence of groundwater contaminants that exceed the State's Ambient Groundwater Quality Standards ("AGQS"). The Permit may include conditions to and restrictions upon the use of the properties within the GMZ, including restrictions on the use of groundwater.

The Permit was issued on June 19, 2008 and expires on June 18, 2013, unless renewed for subsequent five-year period(s). This Notice will remain in effect until such time as the AGQS are restored within the GMZ and the Department issues a Release of Recordation to the Permittee. The Permit is available for review at the New Hampshire Department of Environmental Services, 29 Hazen Drive, Concord, NH 03301 or can be viewed by searching under our OneStop Data Retrieval Site at http://www2.des.nh.gov/OneStop/ORCB_Query.aspx?Project+CCST .

The following properties are located within the GMZ:

Property Owner/Address	MAP	LOT	Deed Reference Book/Page	
First and Ten Property Management 355 Lafayette Road, Rye	10	1	3294	2953
Joan Nordstrom 67 North Road, North Hampton	17	72	2416	583
Yolanda Fitzgerald 65 North Road, North Hampton	17	73	3007	2807

Luck Enterprises 160 Lafayette Road, North Hampton	17	82	2473	1659
Christopher & Ricardo Fucci 180 Lafayette Road, North Hampton	17	86	3319	952
Lori Lessard, Trustee 186 Lafayette Road, North Hampton	17	87	2760	2101
Helen McKittrick 188 Lafayette Road, North Hampton	21	8	2641	2656
Darleena Wylie 8A Lafayette Terrace, North Hampton	21	10	3219	2588
Susan Laffey 12A Lafayette Terrace, North Hampton	21	11	2964	2565
Christine Adinolfo 16A Lafayette Terrace, North Hampton	21	12	2963	1721
Joseph Hanley 20 Lafayette Terrace, North Hampton	21	14	4682	1265
James Jones 40-42 Lafayette Terrace, North Hampton	21	14-1	4451	1104
Bridget Conner 44 Lafayette Terrace, North Hampton	21	15	4183	1638
Rodney Booker 46 Lafayette Terrace, North Hampton	21	16	4275	902
Bernard Tracey 1Lafayette Terrace, North Hampton	21	17	2450	687
Kathleen Tracey 3 Lafayette Terrace, North Hampton	21	18	1243	317
Kimberly Bartlett 5 Lafayette Terrace, North Hampton	21	19	3824	2799
Alexis Perron 9 Lafayette Terrace, North Hampton	21	20	3088	1774
Tracy Margeson 15 Lafayette Terrace, North Hampton	21	21	3121	1606
Anita Gabree 15 Lafayette Terrace, North Hampton	21	22	3013	2221
Tracy Margeson 15 Lafayette Terrace, North Hampton	21	23	3121	1606
William Warman 43 Lafayette Terrace, North Hampton	21	24	4374	1365
ZCCMMXIIV0000IIII/5/ NH Ltd Ptshp 45 Lafayette Terrace, North Hampton	21	25	2530	1863
Gozinta LLC 198 Lafayette Road, North Hampton	21	26	4275	904
206 Lafayette Road LLC206 Lafayette RoadNorth Hampton	21	27	4785	379

Hampton				
Stella Ciboroski 216 Lafayette, RoadNorth Hampton	21	28	2366	1127
Leo Crotty, Jr. 216 Lafayette Road, North Hampton	21	28-1	2475	1278
S&L Realty Trust 212 Lafayette Road, North Hampton	21	29	3666	1199
MA NEGM, LLC 224 Lafayette Road, North Hampton	21	31	4649	2366
Coakley Landfill LLC Lafayette Road Rear,North Hampton	21	32	3117	2934
Coakley Landfill, LLC Lafayette Road Rear, North Hampton	21	33	3117	2934
James Jones Lafayette Terrace Rear, North Hampton	21	34	4451	1102
James Jones Lafayette Terrace Rear, North Hampton	21	35	4451	1102
James Jones Lafayette Terrace Rear, North Hampton	21	36	4451	1102
Town of N. Hampton Conservation Commissionn Lafayette Road Rear, North Hampton	21	37	3451	1661
Boston & Maine Corp,c/o Gilford Trans.Inc North Road Rear, North Hampton	21	38		
Richard Grenier & Charter Trust, CoTrustees North Road Rear, North Hampton	21	39	3550	1660
Boston & Maine Corp, c/o Gilford Trans.Inc North Road Rear, North Hampton	21	40		
Elmer Sewell North Road Rear, North Hampton	21	41	1340	524
Darleena Wylie8ALafayette TerraceNorth Hampton	21	46	3219	2588
Elmer M. Sewell Rev. Tr. 96340 Breakfast Hill Road, Greenland	R1	13	3159	928
Town of Greenland 560 Breakfast Hill Road, Greenland	R1	9B	3454	1131

/s/Robert Sullivan, Permittee
Coakley Landfill Group

June 24, 2008

Approved pursuant to authorization of Coakley
Executive Committee via electronic communication dated June 24, 2008.

SENDER: COMPLETE THIS SECTION

- Complete items 1, 2, and 3. Also complete item 4 if Restricted Delivery is desired.
- Print your name and address on the reverse so that we can return the card to you.
- Attach this card to the back of the mailpiece, or on the front if space permits.

1. Article Addressed to:

Christine Adinolfo
16 Lafayette Terrace
North Hampton, NH 03862

COMPLETE THIS SECTION ON DELIVERY

A. Signature
X [signature] ☐ Agent ☒ Addressee

B. Received by (Printed Name): Christine Adinolfo
C. Date of Delivery: 6-28-08

D. Is delivery address different from item 1? ☐ Yes
If YES, enter delivery address below: ☐ No

3. Service Type
☒ Certified Mail ☐ Express Mail
☐ Registered ☐ Return Receipt for Merchandise
☐ Insured Mail ☐ C.O.D.

4. Restricted Delivery? (Extra Fee) ☐ Yes

2. Article Number (Transfer from service label): 7007 1490 0003 0669 9838

PS Form 3811, February 2004 Domestic Return Receipt 102595-02-M-1540

SENDER: COMPLETE THIS SECTION

- Complete items 1, 2, and 3. Also complete item 4 if Restricted Delivery is desired.
- Print your name and address on the reverse so that we can return the card to you.
- Attach this card to the back of the mailpiece, or on the front if space permits.

1. Article Addressed to:

Kimberly Bartlett
5 Lafayette Terrace
North Hampton, NH 03862

COMPLETE THIS SECTION ON DELIVERY

A. Signature
X [signature] ☐ Agent ☐ Addressee

B. Received by (Printed Name)
C. Date of Delivery

D. Is delivery address different from item 1? ☐ Yes
If YES, enter delivery address below: ☐ No

3. Service Type
☒ Certified Mail ☐ Express Mail
☐ Registered ☐ Return Receipt for Merchandise
☐ Insured Mail ☐ C.O.D.

4. Restricted Delivery? (Extra Fee) ☐ Yes

2. Article Number (Transfer from service label): 7007 1490 0003 0669 9777

PS Form 3811, February 2004 Domestic Return Receipt 102595-02-M-1540

SENDER: COMPLETE THIS SECTION

- Complete items 1, 2, and 3. Also complete item 4 if Restricted Delivery is desired.
- Print your name and address on the reverse so that we can return the card to you.
- Attach this card to the back of the mailpiece, or on the front if space permits.

1. Article Addressed to:

Rodney Booker
46 Lafayette Terrace
North Hampton, NH 03862

COMPLETE THIS SECTION ON DELIVERY

A. Signature
X [signature] ☐ Agent ☒ Addressee

B. Received by (Printed Name): R. Booker
C. Date of Delivery: 6-30-08

D. Is delivery address different from item 1? ☐ Yes
If YES, enter delivery address below: ☐ No

3. Service Type
☒ Certified Mail ☐ Express Mail
☐ Registered ☐ Return Receipt for Merchandise
☐ Insured Mail ☐ C.O.D.

4. Restricted Delivery? (Extra Fee) ☐ Yes

2. Article Number (Transfer from service label): 7001 2510 0008 7668 0041

PS Form 3811, February 2004 Domestic Return Receipt 102595-02-M-1540

SENDER: COMPLETE THIS SECTION

- Complete items 1, 2, and 3. Also complete item 4 if Restricted Delivery is desired.
- Print your name and address on the reverse so that we can return the card to you.
- Attach this card to the back of the mailpiece, or on the front if space permits.

1. Article Addressed to:

Boston & Maine Corp,c/o Gilford Trans.Inc
Iron Horse Park
North Billerica, MA 01802

COMPLETE THIS SECTION ON DELIVERY

A. Signature
X Chad Moores ☑ Agent ☐ Addressee

B. Received by (Printed Name) Chad Moores
C. Date of Delivery 6/2/08

D. Is delivery address different from item 1? ☐ Yes
If YES, enter delivery address below: ☐ No

3. Service Type
☑ Certified Mail ☐ Express Mail
☐ Registered ☐ Return Receipt for Merchandise
☐ Insured Mail ☐ C.O.D.

4. Restricted Delivery? (Extra Fee) ☐ Yes

2. Article Number (Transfer from service label) 7007 1490 0003 0669 9890

PS Form 3811, February 2004 Domestic Return Receipt 102595-02-M-1540

SENDER: COMPLETE THIS SECTION

- Complete items 1, 2, and 3. Also complete item 4 if Restricted Delivery is desired.
- Print your name and address on the reverse so that we can return the card to you.
- Attach this card to the back of the mailpiece, or on the front if space permits.

1. Article Addressed to:

Derek Burt
8774 Mustic Circle
Northport, FL 34287

COMPLETE THIS SECTION ON DELIVERY

A. Signature
X ☐ Agent ☐ Addressee

B. Received by (Printed Name)
C. Date of Delivery

D. Is delivery address different from item 1? ☐ Yes
If YES, enter delivery address below: ☐ No

3. Service Type
☑ Certified Mail ☐ Express Mail
☐ Registered ☐ Return Receipt for Merchandise
☐ Insured Mail ☐ C.O.D.

4. Restricted Delivery? (Extra Fee) ☐ Yes

2. Article Number (Transfer from service label) 7001 2510 0008 7668 0072

PS Form 3811, February 2004 Domestic Return Receipt 102595-02-M-1540

SENDER: COMPLETE THIS SECTION

- Complete items 1, 2, and 3. Also complete item 4 if Restricted Delivery is desired.
- Print your name and address on the reverse so that we can return the card to you.
- Attach this card to the back of the mailpiece, or on the front if space permits.

1. Article Addressed to:

Stella A. Cibrowski
PO Box 443
Concord, NH 03301

COMPLETE THIS SECTION ON DELIVERY

A. Signature
X Mark Ulrowski ☐ Agent ☐ Addressee

B. Received by (Printed Name) Merle Cibrowski
C. Date of Delivery

D. Is delivery address different from item 1? ☐ Yes
If YES, enter delivery address below: ☐ No

CONCORD JUN 30 2008 NH 03301

3. Service Type
☑ Certified Mail ☐ Express Mail
☐ Registered ☐ Return Receipt for Merchandise
☐ Insured Mail ☐ C.O.D.

4. Restricted Delivery? (Extra Fee) ☐ Yes

2. Article Number (Transfer from service label) 7001 2510 0008 7668 0096

PS Form 3811, February 2004 Domestic Return Receipt 102595-02-M-1540

SENDER: COMPLETE THIS SECTION

- Complete items 1, 2, and 3. Also complete item 4 if Restricted Delivery is desired.
- Print your name and address on the reverse so that we can return the card to you.
- Attach this card to the back of the mailpiece, or on the front if space permits.

1. Article Addressed to:

Coakley Landfill LLC
PO Box 190
Greenland, NH 03840

COMPLETE THIS SECTION ON DELIVERY

A. Signature
X [signature] ☐ Agent ☐ Addressee

B. Received by (Printed Name) | C. Date of Delivery 7/1/08

D. Is delivery address different from item 1? ☐ Yes
If YES, enter delivery address below: ☐ No

JUL 01 2008

3. Service Type
☑ Certified Mail ☐ Express Mail
☐ Registered ☐ Return Receipt for Merchandise
☐ Insured Mail ☐ C.O.D.

4. Restricted Delivery? (Extra Fee) ☐ Yes

2. Article Number (Transfer from service label) 7007 1490 0003 0669 9920

PS Form 3811, February 2004 Domestic Return Receipt 102595-02-M-1540

SENDER: COMPLETE THIS SECTION

- Complete items 1, 2, and 3. Also complete item 4 if Restricted Delivery is desired.
- Print your name and address on the reverse so that we can return the card to you.
- Attach this card to the back of the mailpiece, or on the front if space permits.

1. Article Addressed to:

Bridget Conner
44 Lafayette Terrace
North Hampton, NH 03862

COMPLETE THIS SECTION ON DELIVERY

A. Signature
X [signature] ☐ Agent ☐ Addressee

B. Received by (Printed Name) Joseph B Conner | C. Date of Delivery 7/1/08

D. Is delivery address different from item 1? ☐ Yes
If YES, enter delivery address below: ☐ No

3. Service Type
☑ Certified Mail ☐ Express Mail
☐ Registered ☐ Return Receipt for Merchandise
☐ Insured Mail ☐ C.O.D.

4. Restricted Delivery? (Extra Fee) ☐ Yes

2. Article Number (Transfer from service label) 7001 2510 0008 7668 0010

PS Form 3811, February 2004 Domestic Return Receipt 102595-02-M-1540

SENDER: COMPLETE THIS SECTION

- Complete items 1, 2, and 3. Also complete item 4 if Restricted Delivery is desired.
- Print your name and address on the reverse so that we can return the card to you.
- Attach this card to the back of the mailpiece, or on the front if space permits.

1. Article Addressed to:

Leo Crotty, Jr.
216 Lafayette Road
North Hampton, NH 03862

COMPLETE THIS SECTION ON DELIVERY

A. Signature
X [signature] ☐ Agent ☑ Addressee

B. Received by (Printed Name) J Wood | C. Date of Delivery 7-2-08

D. Is delivery address different from item 1? ☐ Yes
If YES, enter delivery address below: ☐ No

3. Service Type
☑ Certified Mail ☐ Express Mail
☐ Registered ☐ Return Receipt for Merchandise
☐ Insured Mail ☐ C.O.D.

4. Restricted Delivery? (Extra Fee) ☐ Yes

2. Article Number (Transfer from service label) 7007 1490 0003 0669 9944

PS Form 3811, February 2004 Domestic Return Receipt 102595-02-M-1540

SENDER: COMPLETE THIS SECTION

- Complete items 1, 2, and 3. Also complete item 4 if Restricted Delivery is desired.
- Print your name and address on the reverse so that we can return the card to you.
- Attach this card to the back of the mailpiece, or on the front if space permits.

1. Article Addressed to:

First and Ten Property Management
PO Box 1058
Hampton, NH 03843

COMPLETE THIS SECTION ON DELIVERY

A. Signature
X ☐ Agent ☐ Addressee

B. Received by (Printed Name) | C. Date of Delivery

D. Is delivery address different from item 1? ☐ Yes
If YES, enter delivery address below: ☐ No

3. Service Type
☑ Certified Mail ☐ Express Mail
☐ Registered ☐ Return Receipt for Merchandise
☐ Insured Mail ☐ C.O.D.

4. Restricted Delivery? (Extra Fee) ☐ Yes

2. Article Number (Transfer from service label) 7001 2510 0008 7668 0119

PS Form 3811, February 2004 Domestic Return Receipt 102595-02-M-1540

SENDER: COMPLETE THIS SECTION

- Complete items 1, 2, and 3. Also complete item 4 if Restricted Delivery is desired.
- Print your name and address on the reverse so that we can return the card to you.
- Attach this card to the back of the mailpiece, or on the front if space permits.

1. Article Addressed to:

Christopher & Ricardo Fucci
180 Lafayette Road
North Hampton, NH 03862

COMPLETE THIS SECTION ON DELIVERY

A. Signature
X ☐ Agent ☑ Addressee

B. Received by (Printed Name) RICK FUCCI | C. Date of Delivery 6-30-05

D. Is delivery address different from item 1? ☐ Yes
If YES, enter delivery address below: ☐ No

3. Service Type
☑ Certified Mail ☐ Express Mail
☐ Registered ☐ Return Receipt for Merchandise
☐ Insured Mail ☐ C.O.D.

4. Restricted Delivery? (Extra Fee) ☐ Yes

2. Article Number (Transfer from service label) 7007 1490 0003 0669 9975

PS Form 3811, February 2004 Domestic Return Receipt 102595-02-M-1540

SENDER: COMPLETE THIS SECTION

- Complete items 1, 2, and 3. Also complete item 4 if Restricted Delivery is desired.
- Print your name and address on the reverse so that we can return the card to you.
- Attach this card to the back of the mailpiece, or on the front if space permits.

1. Article Addressed to:

Anita Gabree
15 Lafayette Terrace
North Hampton, NH 03862

COMPLETE THIS SECTION ON DELIVERY

A. Signature
X ☐ Agent ☐ Addressee

B. Received by (Printed Name) Anita GABREE | C. Date of Delivery

D. Is delivery address different from item 1? ☐ Yes
If YES, enter delivery address below: ☐ No

[redacted]

3. Service Type
☑ Certified Mail [redacted] Mail
☐ Registered ☐ Return Receipt for Merchandise
☐ Insured Mail [redacted]

4. Restricted Delivery? (Extra Fee) ☐ Yes

NORTH HAMPTON JUN 30 2008 NH 03862

2. Article Number (Transfer from service label) 7001 2510 0008 7668 0003

PS Form 3811, February 2004 Domestic Return Receipt 102595-02-M-1540

SENDER: COMPLETE THIS SECTION

- Complete items 1, 2, and 3. Also complete item 4 if Restricted Delivery is desired.
- Print your name and address on the reverse so that we can return the card to you.
- Attach this card to the back of the mailpiece, or on the front if space permits.

1. Article Addressed to:

Gozinta LLC
198 Lafayette Road
North Hampton, NH 03862

COMPLETE THIS SECTION ON DELIVERY

A. Signature
X [signature] ☐ Agent ☐ Addressee

B. Received by (Printed Name): R Booker
C. Date of Delivery: 6-25-07

D. Is delivery address different from item 1? ☐ Yes
If YES, enter delivery address below: ☐ No

3. Service Type
☑ Certified Mail ☐ Express Mail
☐ Registered ☐ Return Receipt for Merchandise
☐ Insured Mail ☐ C.O.D.

4. Restricted Delivery? (Extra Fee) ☐ Yes

2. Article Number (Transfer from service label) 7001 2510 0008 7668 0065

PS Form 3811, February 2004 Domestic Return Receipt 102595-02-M-1540

SENDER: COMPLETE THIS SECTION

- Complete items 1, 2, and 3. Also complete item 4 if Restricted Delivery is desired.
- Print your name and address on the reverse so that we can return the card to you.
- Attach this card to the back of the mailpiece, or on the front if space permits.

Article Addressed to:

Richard R. Grenier I.V. Trust
Richard Grenier & Charter Trust,
CoTrustees
10 Canterbury Lane
Bedford, NH 03110-4435

COMPLETE THIS SECTION ON DELIVERY

A. Signature
X [signature] ☐ Agent ☐ Addressee

B. Received by (Printed Name): A. Sargent
C. Date of Delivery: 6/25/07

D. Is delivery address different from item 1? ☐ Yes
If YES, enter delivery address below: ☐ No

3. Service Type
☑ Certified Mail ☐ Express Mail
☐ Registered ☐ Return Receipt for Merchandise
☐ Insured Mail ☐ C.O.D.

4. Restricted Delivery? (Extra Fee) ☐ Yes

2. Article Number (Transfer from service label) 7007 1490 0003 0669 9937

PS Form 3811, February 2004 Domestic Return Receipt 102595-02-M-1540

SENDER: COMPLETE THIS SECTION

- Complete items 1, 2, and 3. Also complete item 4 if Restricted Delivery is desired.
- Print your name and address on the reverse so that we can return the card to you.
- Attach this card to the back of the mailpiece, or on the front if space permits.

1. Article Addressed to:

James Jones
207 Atlantic Avenue
North Hampton, NH 03862

COMPLETE THIS SECTION ON DELIVERY

A. Signature
X [signature] ☐ Agent ☐ Addressee

B. Received by (Printed Name): Jim Jones
C. Date of Delivery: 6-20-07

D. Is delivery address different from item 1? ☐ Yes
If YES, enter delivery address below: ☐ No

3. Service Type
☑ Certified Mail ☐ Express Mail
☐ Registered ☐ Return Receipt for Merchandise
☐ Insured Mail ☐ C.O.D.

4. Restricted Delivery? (Extra Fee) ☐ Yes

2. Article Number (Transfer from service label) 7007 1490 0003 0669 9883

PS Form 3811, February 2004 Domestic Return Receipt 102595-02-M-1540

SENDER: COMPLETE THIS SECTION

- Complete items 1, 2, and 3. Also complete item 4 if Restricted Delivery is desired.
- Print your name and address on the reverse so that we can return the card to you.
- Attach this card to the back of the mailpiece, or on the front if space permits.

1. Article Addressed to:

James Jones
207 Atlantic
North Hampton, NH 03862

COMPLETE THIS SECTION ON DELIVERY

A. Signature
X ☐ Agent ☐ Addressee

B. Received by (Printed Name) Jim Jones
C. Date of Delivery 6/30/08

D. Is delivery address different from item 1? ☐ Yes
If YES, enter delivery address below: ☐ No

3. Service Type
☑ Certified Mail ☐ Express Mail
☐ Registered ☐ Return Receipt for Merchandise
☐ Insured Mail ☐ C.O.D.

4. Restricted Delivery? (Extra Fee) ☐ Yes

2. Article Number (Transfer from service label) 7001 2510 0008 7668 0058

PS Form 3811, February 2004 Domestic Return Receipt 102595-02-M-1540

SENDER: COMPLETE THIS SECTION

- Complete items 1, 2, and 3. Also complete item 4 if Restricted Delivery is desired.
- Print your name and address on the reverse so that we can return the card to you.
- Attach this card to the back of the mailpiece, or on the front if space permits.

1. Article Addressed to:

206 Lafayette Road LLC
206 Lafayette Road
North Hampton, NH 03862

COMPLETE THIS SECTION ON DELIVERY

A. Signature
X ☐ Agent ☐ Addressee

B. Received by (Printed Name)
C. Date of Delivery 6-28-08

D. Is delivery address different from item 1? ☐ Yes
If YES, enter delivery address below: ☐ No

3. Service Type
☑ Certified Mail ☐ Express Mail
☐ Registered ☐ Return Receipt for Merchandise
☐ Insured Mail ☐ C.O.D.

4. Restricted Delivery? (Extra Fee) ☐ Yes

2. Article Number (Transfer from service label) 7001 2510 0008 7668 0089

PS Form 3811, February 2004 Domestic Return Receipt 102595-02-M-1540

SENDER: COMPLETE THIS SECTION

- Complete items 1, 2, and 3. Also complete item 4 if Restricted Delivery is desired.
- Print your name and address on the reverse so that we can return the card to you.
- Attach this card to the back of the mailpiece, or on the front if space permits.

1. Article Addressed to:

Susan Laffey
12 Lafayette Terrace
North Hampton, NH 03862

COMPLETE THIS SECTION ON DELIVERY

A. Signature
X ☐ Agent ☐ Addressee

B. Received by (Printed Name) John Holmes
C. Date of Delivery 7-7-08

D. Is delivery address different from item 1? ☐ Yes
If YES, enter delivery address below: ☐ No

3. Service Type
☑ Certified Mail ☐ Express Mail
☐ Registered ☐ Return Receipt for Merchandise
☐ Insured Mail ☐ C.O.D.

4. Restricted Delivery? (Extra Fee) ☐ Yes

2. Article Number (Transfer from service label) 7007 1490 0003 0669 9845

PS Form 3811, February 2004 Domestic Return Receipt 102595-02-M-1540

SENDER: COMPLETE THIS SECTION

- Complete items 1, 2, and 3. Also complete item 4 if Restricted Delivery is desired.
- Print your name and address on the reverse so that we can return the card to you.
- Attach this card to the back of the mailpiece, or on the front if space permits.

1. Article Addressed to:

Lori Lessard, Trustee
186 Lafayette Road
North Hampton, NH 03862

COMPLETE THIS SECTION ON DELIVERY

A. Signature
X [signature] ☐ Agent ☑ Addressee

B. Received by (Printed Name) | C. Date of Delivery 6-30-08

D. Is delivery address different from item 1? ☐ Yes
If YES, enter delivery address below: ☐ No

3. Service Type
☑ Certified Mail ☐ Express Mail
☐ Registered ☐ Return Receipt for Merchandise
☐ Insured Mail ☐ C.O.D.

4. Restricted Delivery? (Extra Fee) ☐ Yes

2. Article Number (Transfer from service label) 7007 1490 0003 0669 9982

PS Form 3811, February 2004 Domestic Return Receipt 102595-02-M-1540

SENDER: COMPLETE THIS SECTION

- Complete items 1, 2, and 3. Also complete item 4 if Restricted Delivery is desired.
- Print your name and address on the reverse so that we can return the card to you.
- Attach this card to the back of the mailpiece, or on the front if space permits.

1. Article Addressed to:

Luck Enterprises
115 Lafayette Road
North Hampton, NH 03862

NORTH HAMPTON JUN 28 2008 NH 03862

COMPLETE THIS SECTION ON DELIVERY

A. Signature
X Edward A Luck ☐ Agent ☐ Addressee

B. Received by (Printed Name) Edward A Luck | C. Date of Delivery

D. Is delivery address different from item 1? ☐ Yes
If YES, enter delivery address below: ☐ No

3. Service Type
[redacted] ☐ Express Mail
[redacted] ☐ Return Receipt for Merchandise
☐ Registered
[redacted] ☐ C.O.D.

4. Restricted Delivery? (Extra Fee) ☐ Yes

2. Article Number (Transfer from service label) 7007 1490 0003 0669 9968

PS Form 3811, February 2004 Domestic Return Receipt 102595-02-M-1540

SENDER: COMPLETE THIS SECTION

- Complete items 1, 2, and 3. Also complete item 4 if Restricted Delivery is desired.
- Print your name and address on the reverse so that we can return the card to you.
- Attach this card to the back of the mailpiece, or on the front if space permits.

1. Article Addressed to:

MA NEGM, LLC
302 Main Street
Somersworth, MA 03878

COMPLETE THIS SECTION ON DELIVERY

A. Signature
X Pamela Casey ☐ Agent ☐ Addressee

B. Received by (Printed Name) | C. Date of Delivery 7/1/08

D. Is delivery address different from item 1? ☐ Yes
If YES, enter delivery address below: ☐ No

Pamela Casey

3. Service Type
☑ Certified Mail ☐ Express Mail
☐ Registered ☐ Return Receipt for Merchandise
☐ Insured Mail ☐ C.O.D.

4. Restricted Delivery? (Extra Fee) ☐ Yes

2. Article Number (Transfer from service label) 7007 1490 0003 0669 9951

PS Form 3811, February 2004 Domestic Return Receipt 102595-02-M-1540

SENDER: COMPLETE THIS SECTION

- Complete items 1, 2, and 3. Also complete item 4 if Restricted Delivery is desired.
- Print your name and address on the reverse so that we can return the card to you.
- Attach this card to the back of the mailpiece, or on the front if space permits.

1. Article Addressed to:

Tracy Margeson
15 Lafayette Terrace
North Hampton, NH 03862

COMPLETE THIS SECTION ON DELIVERY

A. Signature
X [signature] ☐ Agent ☐ Addressee

B. Received by (Printed Name) | C. Date of Delivery 9-2-08

D. Is delivery address different from item 1? ☑ Yes
If YES, enter delivery address below: ☐ No

11 LAFAYETTE TERRACE
NORTH HAMPTON, NH 03862

3. Service Type
☑ Certified Mail ☐ Express Mail
☐ Registered ☐ Return Receipt for Merchandise
☐ Insured Mail ☐ C.O.D.

4. Restricted Delivery? (Extra Fee) ☐ Yes

2. Article Number (Transfer from service label) 7001 2510 0008 7667 9991

PS Form 3811, February 2004 Domestic Return Receipt 102595-02-M-1540

SENDER: COMPLETE THIS SECTION

- Complete items 1, 2, and 3. Also complete item 4 if Restricted Delivery is desired.
- Print your name and address on the reverse so that we can return the card to you.
- Attach this card to the back of the mailpiece, or on the front if space permits.

1. Article Addressed to:

Helen McKittrick
188 Lafayette Road
North Hampton, NH 03862

COMPLETE THIS SECTION ON DELIVERY

A. Signature
X [signature] ☐ Agent ☐ Addressee

B. Received by (Printed Name) | C. Date of Delivery 6-30-08

D. Is delivery address different from item 1? ☐ Yes
If YES, enter delivery address below: ☐ No

3. Service Type
☑ Certified Mail ☐ Express Mail
☐ Registered ☐ Return Receipt for Merchandise
☐ Insured Mail ☐ C.O.D.

4. Restricted Delivery? (Extra Fee) ☐ Yes

2. Article Number (Transfer from service label) 7007 1490 0003 0669 9869

PS Form 3811, February 2004 Domestic Return Receipt 102595-02-M-1540

SENDER: COMPLETE THIS SECTION

- Complete items 1, 2, and 3. Also complete item 4 if Restricted Delivery is desired.
- Print your name and address on the reverse so that we can return the card to you.
- Attach this card to the back of the mailpiece, or on the front if space permits.

1. Article Addressed to:

Joan Nordstrom
67 North Road
North Hampton, NH 03862

COMPLETE THIS SECTION ON DELIVERY

A. Signature
X [signature] ☐ Agent ☐ Addressee

B. Received by (Printed Name) W Nordstrom | C. Date of Delivery

D. Is delivery address different from item 1? ☐ Yes
If YES, enter delivery address below: ☐ No

[redacted]

3. Service Type
☑ Certified Mail [redacted] ☐ Return Receipt for Merchandise
☐ Registered
☐ Insured [redacted]

4. [redacted] Delivery? (Extra Fee) ☐ Yes

NORTH HAMPTON
JUN 23 2008
NH 03862

2. Article Number (Transfer from service label) 7007 1490 0003 0669 9876

PS Form 3811, February 2004 Domestic Return Receipt 102595-02-M-1540

SENDER: COMPLETE THIS SECTION

- Complete items 1, 2, and 3. Also complete item 4 if Restricted Delivery is desired.
- Print your name and address on the reverse so that we can return the card to you.
- Attach this card to the back of the mailpiece, or on the front if space permits.

1. Article Addressed to:

Alexis Perron
9 Lafayette Terrace
North Hampton, NH 03862

COMPLETE THIS SECTION ON DELIVERY

A. Signature
X [signature] ☐ Agent ☐ Addressee

B. Received by (Printed Name) | C. Date of Delivery 6-30-08

D. Is delivery address different from item 1? ☐ Yes
If YES, enter delivery address below: ☐ No

3. Service Type
☑ Certified Mail ☐ Express Mail
☐ Registered ☐ Return Receipt for Merchandise
☐ Insured Mail ☐ C.O.D.

4. Restricted Delivery? (Extra Fee) ☐ Yes

2. Article Number (Transfer from service label) 7001 2510 0008 7667 9977

PS Form 3811, February 2004 Domestic Return Receipt 102595-02-M-1540

SENDER: COMPLETE THIS SECTION

- Complete items 1, 2, and 3. Also complete item 4 if Restricted Delivery is desired.
- Print your name and address on the reverse so that we can return the card to you.
- Attach this card to the back of the mailpiece, or on the front if space permits.

1. Article Addressed to:

S&L Realty Trust
PO Box 4276
Portsmouth, NH 03802-4276

COMPLETE THIS SECTION ON DELIVERY

A. Signature
X [signature] ☐ Agent ☐ Addressee

B. Received by (Printed Name) Daniel Neff | C. Date of Delivery 7/10/08

D. Is delivery address different from item 1? ☐ Yes
If YES, enter delivery address below: ☐ No

3. Service Type
☑ Certified Mail ☐ Express Mail
☐ Registered ☐ Return Receipt for Merchandise
☐ Insured Mail ☐ C.O.D.

4. Restricted Delivery? (Extra Fee) ☐ Yes

2. Article Number (Transfer from service label) 7001 2510 0008 7668 0102

PS Form 3811, February 2004 Domestic Return Receipt 102595-02-M-1540

SENDER: COMPLETE THIS SECTION

- Complete items 1, 2, and 3. Also complete item 4 if Restricted Delivery is desired.
- Print your name and address on the reverse so that we can return the card to you.
- Attach this card to the back of the mailpiece, or on the front if space permits.

1. Article Addressed to:

Elmer Sewell
340 Breakfast Hill Road
Greenland, NH 03840

COMPLETE THIS SECTION ON DELIVERY

A. Signature
X [signature] ☐ Agent ☐ Addressee

B. Received by (Printed Name) Elmer M Sewell | C. Date of Delivery

D. Is delivery address different from item 1? ☐ Yes
If YES, enter delivery address below: ☐ No

GREENLAND NH 03840 USPS

3. Service Type
☐ Certified Mail ☐ Express Mail
☐ Registered ☐ Return Receipt for Merchandise
☐ Insured Mail ☐ C.O.D.

4. Restricted Delivery? (Extra Fee) ☐ Yes

2. Article Number (Transfer from service label) 7007 1490 0003 0669 9913

PS Form 3811, February 2004 Domestic Return Receipt 102595-02-M-1540

SENDER: COMPLETE THIS SECTION

- Complete items 1, 2, and 3. Also complete item 4 if Restricted Delivery is desired.
- Print your name and address on the reverse so that we can return the card to you.
- Attach this card to the back of the mailpiece, or on the front if space permits.

1. Article Addressed to:

Elmer M. Sewall Rev.Tr.96
340 Breakfast Hill Road
Greenland, NH 03840

COMPLETE THIS SECTION ON DELIVERY

A. Signature
X [signature] ☐ Agent ☐ Addressee

B. Received by (Printed Name) C. Date of Delivery
Elmer M Sewall

D. Is delivery address different from item 1? ☐ Yes
If YES, enter delivery address below: ☐ No

JUL 01 2008

3. Service Type
☑ Certified Mail ☐ Express Mail
☐ Registered ☐ Return Receipt for Merchandise
☐ Insured Mail ☐ C.O.D.

USPS

4. Restricted Delivery? (Extra Fee) ☐ Yes

2. Article Number (Transfer from service label) 7007 1490 0003 0669 9999

PS Form 3811, February 2004 Domestic Return Receipt 102595-02-M-1540

SENDER: COMPLETE THIS SECTION

- Complete items 1, 2, and 3. Also complete item 4 if Restricted Delivery is desired.
- Print your name and address on the reverse so that we can return the card to you.
- Attach this card to the back of the mailpiece, or on the front if space permits.

1. Article Addressed to:

Town of Greenland
PO Box 100
Greenland, NH 03840

COMPLETE THIS SECTION ON DELIVERY

A. Signature
X [signature] ☐ Agent ☐ Addressee

B. Received by (Printed Name) C. Date of Delivery
Liz Cummings 28 Jun 08

D. Is delivery address different from item 1? ☐ Yes
If YES, enter delivery address below: ☐ No

GREENLAND NH 03840

JUN 2 8 2008

USPS

3. Service Type
☑ Certified Mail ☐ Express Mail
☐ Registered ☐ Return Receipt for Merchandise
☐ Insured Mail ☐ C.O.D.

4. Restricted Delivery? (Extra Fee) ☐ Yes

2. Article Number (Transfer from service label) 7001 2510 0008 7668 0126

PS Form 3811, February 2004 Domestic Return Receipt 102595-02-M-1540

SENDER: COMPLETE THIS SECTION

- Complete items 1, 2, and 3. Also complete item 4 if Restricted Delivery is desired.
- Print your name and address on the reverse so that we can return the card to you.
- Attach this card to the back of the mailpiece, or on the front if space permits.

1. Article Addressed to:

Town of N. Hampton Conservation Commsn
PO Box 710
North Hampton, NH 03862

COMPLETE THIS SECTION ON DELIVERY

A. Signature
X Wendy V. Chase ☐ Agent ☐ Addressee

B. Received by (Printed Name) C. Date of Delivery
Wendy Chase 6/30/08

D. Is delivery address different from item 1? ☐ Yes
If YES, enter delivery address below: ☐ No

3. Service Type
☑ Certified Mail ☐ Express Mail
☐ Registered ☐ Return Receipt for Merchandise
☐ Insured Mail ☐ C.O.D.

4. Restricted Delivery? (Extra Fee) ☐ Yes

2. Article Number (Transfer from service label) 7007 1490 0003 0669 9906

PS Form 3811, February 2004 Domestic Return Receipt 102595-02-M-1540

SENDER: COMPLETE THIS SECTION

- Complete items 1, 2, and 3. Also complete item 4 if Restricted Delivery is desired.
- Print your name and address on the reverse so that we can return the card to you.
- Attach this card to the back of the mailpiece, or on the front if space permits.

1. Article Addressed to:

Bernard Tracey
257 Washington Road
Rye, NH 03870

COMPLETE THIS SECTION ON DELIVERY

A. Signature
X [signature] ☐ Agent ☐ Addressee

B. Received by (Printed Name) BERNARD TRACEY
C. Date of Delivery 6-30-08

D. Is delivery address different from item 1? ☐ Yes
If YES, enter delivery address below: ☐ No

3. Service Type
☑ Certified Mail ☐ Express Mail
☐ Registered ☐ Return Receipt for Merchandise
☐ Insured Mail ☐ C.O.D.

4. Restricted Delivery? (Extra Fee) ☐ Yes

2. Article Number (Transfer from service label) 7007 1490 0003 0669 9814

PS Form 3811, February 2004 Domestic Return Receipt 102595-02-M-1540

SENDER: COMPLETE THIS SECTION

- Complete items 1, 2, and 3. Also complete item 4 if Restricted Delivery is desired.
- Print your name and address on the reverse so that we can return the card to you.
- Attach this card to the back of the mailpiece, or on the front if space permits.

1. Article Addressed to:

William Warman
380 Lafayette Rd,11-102
Seabrook, NH 03874

COMPLETE THIS SECTION ON DELIVERY

A. Signature
X [signature] ☐ Agent ☐ Addressee

B. Received by (Printed Name)
C. Date of Delivery

D. Is delivery address different from item 1? ☐ Yes
If YES, enter delivery address below: ☐ No

UNITED STATES POSTAL SERVICE JUN 30 2008 SEABROOK NH 03874-9998

3. Service Type
☑ Certified Mail ☐ Express Mail
☐ Registered ☐ Return Receipt for Merchandise
☐ Insured Mail ☐ C.O.D.

4. Restricted Delivery? (Extra Fee) ☐ Yes

2. Article Number (Transfer from service label) 7007 1490 0003 0669 9784

PS Form 3811, February 2004 Domestic Return Receipt 102595-02-M-1540

SENDER: COMPLETE THIS SECTION

- Complete items 1, 2, and 3. Also complete item 4 if Restricted Delivery is desired.
- Print your name and address on the reverse so that we can return the card to you.
- Attach this card to the back of the mailpiece, or on the front if space permits.

1. Article Addressed to:

Darleena Wylie
8 Lafayette Terrace
North Hampton, NH 03862

COMPLETE THIS SECTION ON DELIVERY

A. Signature
X [signature] ☐ Agent ☐ Addressee

B. Received by (Printed Name)
C. Date of Delivery

D. Is delivery address different from item 1? ☐ Yes
If YES, enter delivery address below: ☐ No

3. Service Type
☑ Certified Mail ☐ Express Mail
☐ Registered ☐ Return Receipt for Merchandise
☐ Insured Mail ☐ C.O.D.

4. Restricted Delivery? (Extra Fee) ☐ Yes

2. Article Number (Transfer from service label) 7007 1490 0003 0669 9852

PS Form 3811, February 2004 Domestic Return Receipt 102595-02-M-1540

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City of Portsmouth
1 Junkins Avenue
Portsmouth, New Hampshire 03801

7001 2510 0008 7668 0027

UNITED STATES POSTAGE
PITNEY BOWES
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0004243738 JUN 27 2008
MAILED FROM ZIP CODE 03801

UNC

YolandaFitzgerald
PO Box 626
North Hampton, NH 03862

1st NOTICE 6-28
2nd NOTICE 7-2
3rd NOTICE 7-8

NIXIE 031 5E 1 23 07/10/08
RETURN TO SENDER
UNCLAIMED
UNABLE TO FORWARD

BC: 03801455599 *1784-00175-10-27

03862+0626-26 5001 03801@4555

City of Portsmouth
1 Junkins Avenue
Portsmouth, New Hampshire 03801

CERTIFIED MAIL

7001 2510 0008 7668 0034

UNC

UNITED STATES POSTAGE
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02 1M $ 05.49⁰
0004243738 JUN 27 2008
MAILED FROM ZIP CODE 03801

6 28

JosephHanley
20 Lafayette Terrace
North Hampton NH 03862

1st NOTICE 7-2
2nd NOTICE
RETURNED 7-7

NIXIE 031 5E 1 23 07/10/08
RETURN TO SENDER
UNCLAIMED
UNABLE TO FORWARD

BC: 03801455599 *1863-05056-27-40

03862+2430-20 0003
03801@4555

CERTIFIED MAIL™

City of Portsmouth
1 Junkins Avenue
Portsmouth, New Hampshire 03801

7007 1490 0003 0669 9791

LGA
UTF

6.28

UNITED STATES POSTAGE
PITNEY BOWES
02 1M $ 05.49⁰
0004243738 JUN 27 2008
MAILED FROM ZIP CODE 03801

KathleenSimmel
3 Lafayette Terrace
North Hampton NH 03862

NIXIE 031 5E 1 23 07/05/08
RETURN TO SENDER
NOT DELIVERABLE AS ADDRESSED
UNABLE TO FORWARD

BC: 03801455599 *1894-04950-05-20

03862+2431-03 RDC: 03801@4555

City of Portsmouth
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Portsmouth, New Hampshire 03801

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MAILED FROM ZIP CODE 03801

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KathleenTracey
3 Lafayette Terrace
North Hampton, NH 03862

NIXIE 031 SE 1 23 07/05/08
RETURN TO SENDER
NOT DELIVERABLE AS ADDRESSED
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for Instructions

APPENDIX J – EVALUATION OF POTENTIAL TOXICITY OF SEDIMENTS

TECHNICAL MEMORANDUM

To: Gerardo Millan-Ramos

From: Richard Sugatt

Date: June 29, 2011

Subject: Approach for evaluating sediment at Coakley Landfill during five year review periods

Summary

The approach for evaluating potential toxicity of sediments at Coakley Landfill Superfund Site in the future is summarized here and detailed below. Every five years the worst-case sediment location at Coakley Landfill Superfund Site (SED-05) will be sampled and analyzed for inorganics. The Benchmark quotient (BQ) will be calculated by dividing the measured concentration of each metal by its site-specific benchmark, derived herein. The average BQ for all of the detected inorganics will be calculated and compared to the empirically demonstrated average BQ of 1 for the samples shown to be non-toxic by toxicity testing in 2007. Based on the average ratio of 4 between Threshold Effect Concentrations (TECs) and Probable Effect Concentrations (PECs) for metals from MacDonald et al (2000), additional toxicity testing will be required only if the average BQ exceeds 4 in future sediment samples. Otherwise, only analysis of inorganics in one sample from SED-05 would be conducted once during the next five year review period and evaluated by the describe BQ process.

Detailed Description of Approach

Sediment samples from several locations at Coakley Landfill have been analyzed on an annual basis since at least 2001. As part of the latest Five Year Review, it was determined that several inorganics in sediment exceeded generally accepted no-effect ecological benchmarks. The ecological benchmarks were the freshwater sediment benchmarks from EPA Region 3, which, for metals, are the same as the Threshold Effect Concentrations (TECs) from MacDonald et al (2000). Since exceedance of these benchmarks suggested that the site sediments might be toxic to aquatic organisms, it was decided to investigate prior to the subsequent five year review period whether there was any toxicity to aquatic organisms by sediment sampled at the site.

Since sediments with benchmark exceedances are often not toxic when tested in laboratory toxicity tests, it was not justified to conduct expensive toxicity testing at all historic sediment locations that had benchmark exceedances. Instead, it was decided to analyze another round of samples from these locations for inorganics concentrations and to conduct one toxicity test on the location that had the highest frequency and magnitude of benchmark exceedances. SED-05 was selected for toxicity testing because it had the highest benchmark quotients for the most chemicals. In 2007, a sediment sample was collected from this location and tested for toxicity on the freshwater amphipod *Hyallela azteca* in a standard 10-day test. There were no ecologically significant effects on the test organisms. As a result, it was concluded that the concentrations of inorganics measured in the sediment sample comprised site-specific no-effect concentrations that could be used as site-specific benchmarks for this site.

As shown in Table 1, the site-specific no-effect concentration was higher than the EPA Region 3 ecological benchmark for most of the chemicals that have benchmarks. Since the EPA Region 3 benchmarks represent non-toxic concentrations on a generic, non-site-specific basis, and the site-specific no-effect concentrations represent non-toxic concentrations in the particular type of sediments at the site, it is reasonable to assume that the site-specific no-effect benchmark should be the higher of the site-specific no-effect concentration or the EPA Region 3 benchmark.

The approach for evaluating potential toxicity of sediment collected in the future uses a benchmark quotient approach to evaluate the frequency and magnitude of benchmark exceedances using future data compared to site-specific no-effect benchmarks. This approach is exemplified in Table 1 in which the concentration of each inorganic in sample SED-05 taken in August 2009 is divided by its site-specific benchmark to derive a benchmark quotient. The benchmark quotient (BQ) approach is similar to the Hazard Quotient (HQ) approach in which the concentration at a site is divided by the no-effect concentration.

As shown in Table 1, the August 2009 concentration of chromium, nickel, and cobalt exceeded the site-specific benchmark concentration, with benchmark quotients of 1.1, 1.1, and 1.1, respectively. The toxicity of the August, 2009 sample was not measured, so the next step in developing an approach for future sampling is to estimate how much higher the concentrations would have to be compared to the non-toxic samples in November 2007 in order to be toxic. Of course, this can be done with total certainty only by conducting toxicity tests; however, the following approach can be used to estimate how high the BQ must go before toxicity is likely.

MacDonald et al (2000) derived TECs which are the concentrations, below which no toxicity is expected, but they also derived Probable Effect Concentrations (PECs) which are the concentrations, above which toxicity is likely, but not necessarily certain, to occur. For metals, the PEC was, on average, a factor of four higher than the TEC (Table 2). Therefore, it is reasonable to conclude that benchmark quotients would have to be about four times higher than no-effect benchmarks for toxicity to be likely.

Since the site-specific no-effect benchmarks for the inorganics in the 2007 non-toxic SED-05 sample are the same as the maximum measured concentrations of the same inorganics in the non-toxic sample, the average BQ in that non-toxic sample must be equal to 1, by definition. Therefore, the average benchmark quotient in a future sample would have to be 1 or less to be assured that the future sample is non-toxic. Conversely, the average BQ in a future sample would have to be no more than 4 to ensure that the future sample is unlikely to be toxic. Therefore, a future sample is likely to be non-toxic if the average BQ is less than or equal to 1, and likely to be toxic if the average BQ is equal to or greater than 4. It will be uncertain whether or not the sample is likely to be toxic if the average BQ is between 1 and 4. Therefore, the following criteria will be used to evaluate the potential for toxicity in future sediment samples:

- If average BQ is ≤ 1, conclude sample is likely to be non-toxic.
- If average BQ is > 1 but <4, conclude that it is uncertain whether sample is likely to be toxic.
- If average BQ is ≥ 4, conclude sample is likely to be toxic.

As an example of this type of approach, Table 1 shows that the average BQ for the sediment sample taken from SED-05 in August 2009 is 0.7. Based on the above criteria, it is concluded that this sample is likely to be non-toxic. If the average BQ had been between 1 and 4, then no conclusion could be made whether or not the sample was likely to be toxic. If the average BQ had been 4 or greater, then it would be concluded that the sample is likely to be toxic; however, only a toxicity test would be able to confirm that the sample was actually toxic. Therefore, it is proposed that a toxicity test be conducted only if future sampling shows that the average BQ is 4 or greater.

The concentrations of inorganics in the worst-case area of SED-05 are likely to increase only very slowly, if at all, based on the balance of leachate input via groundwater, overland erosive transport from the landfill surface and output via surface water export. Table 3 shows that there is no discernible trend in inorganics concentrations in SED-05 from 2001 to 2009. Therefore, it is reasonable to conclude that measuring inorganics and conducting the described BQ evaluation at an interval of five years will be sufficient to identify the development of conditions that might result in toxicity.

Therefore, the recommended criteria are summarized below along with the action(s) to be taken for each criterion:

- If average BQ is ≤ 1, conclude sample is likely to be non-toxic. Once during the next five year review period, collect and analyze one sample from SED-05 for inorganics and repeat BQ evaluation.
- If average BQ is > 1 but <4, conclude that it is uncertain whether sample is likely to be toxic. Once during the next five year review period, collect and analyze one sample from SED-05 and repeat the BQ evaluation.
- If average BQ is ≥ 4, conclude sample is likely to be toxic. Conduct 10-day amphipod toxicity test on a stored refrigerated aliquot of this sample or a freshly collected sample from SED-05 that is also analyzed for inorganics.
- If the tested sample is non-toxic, conclude that the area is not toxic and once during the next five year review period collect and analyze one sample from SED-05 for inorganics and repeat the BQ evaluation.
- If the tested sample is toxic, design appropriate remedial actions during the next five year review period.

Reference

MacDonald, D., C. Ingersoll, and T. Berger. 2000. Development and evaluation of consensus-based sediment quality guidelines for freshwater ecosystems. Archives of Environmental Contamination and Toxicology. 39: 20-31.

Table 1. Derivation of Site-Specific Benchmarks and Benchmark Quotients-Coakley Landfill Superfund Site

Chemical	Sediment Benchmark[1] Concentration	Non-Toxic[2] Site Sediment Concentration	Site-specific Sediment[3] Benchmark	SED-05 26-Apr-01	SED-05 27-Aug-03	SED-05 26-Aug-04	SED-05 29-Aug-05	SED-05 30-Aug-06	SED-5/SED-3T[4] SED-5/SED-3T 1107 15-Nov-07	SED-5/SED-3T[4] SED-5/SED-3T-DUP 15-Nov-07	SED-05 19-Aug-09	
(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	BQ[5]
Aluminum	NA		NA	27000	18000	17000	6600	34000			17,000	
Arsenic	9.8	15	15	25	19	36	310	17	15	14	15	1.0
Barium	NA			150	88	130	270	150			110	
Cadmium	0.99	2	3	BDL	BDL	BDL	BDL	BDL	2.7	0.6	BDL	
Calcium	NA			4300	4700	11000	8900	3600			1,700	
Chromium	43.4	43	43	70	46	56	13	69	39	43	49	1.1
Copper	31.6	55	55	40	37	20	6	45	55	40	28	0.5
Iron	20000	54000	54000	36000	31000	37000	210000	40000	54000	53000	29,000	0.5
Lead	35.8	4000	4000	24	25	40	20	23	4000	860	18	0.0
Magnesium	NA			8400	6500	6000	3200	10000			7,700	
Mercury	0.18	1	1	BDL	BDL	BDL	0.5	BDL	0.9	0.5	BDL	
Nickel	22.7	34	34	53	38	38	9	53	32	34	38	1.1
Potassium	NA			25000	4400	2000	1300	8200			5,400	
Selenium	2			BDL	BDL	BDL	BDL	BDL	<0.5	<0.5	BDL	
Silver	1	1	1	BDL	BDL	BDL	BDL	BDL	1.4	0.5	BDL	
Sodium	NA			350	480	270	240	800			300	
Thallium	NA			BDL	BDL	BDL	BDL	BDL			BDL	
Zinc	121	700	700	110	170	120	38	130	700	250	80	0.1
Cobalt	50	10	10	14	12	13	6	14	9.7	10	11	1.1
Beryllium	NA			BDL	BDL	BDL	BDL	BDL			1.0	
Manganese	460	600	600	680	840	1400	2500	500	600	570	300	0.5
Antimony	2	2	2	BDL	BDL	BDL	BDL	BDL	1	0.8	BDL	
Vanadium	NA			53	35	38	17	55			41	

Average BQ: 0.7

Highlighted numbers exceed the site-specific benchmark.

BDL = Below Detection Limit

[1]EPA Region III benchmarks for freshwater sediment
http://www.epa.gov/reg3hwmd/risk/eco/btag/sbv/fwsed/screenbench.htm

[2] highest measured concentration in sediment sample that was not toxic to amphipods in 10-day sediment toxicity test, rounded to nearest significant figure

[3] The higher of the EPA Region III benchmark for freshwater sediment or the concentration in non-toxic site sediment sample

[4] Sediment sample was tested for toxicity to amphipods

[5] BQ = Benchmark Quotient, calculated as the concentration at the site divided by the site-specific benchmark.

Table 2. Ratio of Sediment PEC to TEC for Metals

Chemical (mg/kg)	Threshold Effect Concentration[1] (mg/kg)	Probable Effect Concentration[1] (mg/kg)	PEC/TEC
Aluminum			
Arsenic	9.8	33	3.4
Barium			
Cadmium	0.99	4.98	5.0
Calcium			
Chromium	43.4	111	2.6
Copper	31.9	149	4.7
Iron			
Lead	35.8	128	3.6
Magnesium			
Mercury	0.18	1.06	5.9
Nickel	22.7	48.6	2.1
Potassium			
Selenium			
Silver			
Sodium			
Thallium			
Zinc	121	459	3.8
Cobalt			
Beryllium			
Manganese			
Antimony			
Vanadium			
Average:			3.9

[1] MacDonald, D. , C. Ingersoll, T. Berger. 2000. Development and Evaluation of Consensus-Based Sediment Quality Guidelines for Freshwater Ecosystems. Archives of Environmental Contamination and Toxicology 39: 20-31.

Table 3. Concentrations of Inorganics in Sediment Location SED-05 from 2001 to 2009, Coakley Landfill Superfund Site

Chemical	Concentration (mg/kg)						
	2001	2003	2004	2005	2006	2007	2009
Aluminum	27000	18000	17000	6600	34000		17,000
Arsenic	25	19	36	310	17	15	15
Barium	150	88	130	270	150		110
Cadmium						2.7	
Calcium	4300	4700	11000	8900	3600		1,700
Chromium	70	46	56	13	69	43	49
Copper	40	37	20	6	45	55	28
Iron	36000	31000	37000	210000	40000	54000	29,000
Lead	24	25	40	20	23	4000	18
Magnesium	8400	6500	6000	3200	10000		7,700
Mercury				0.5		0.9	
Nickel	53	38	38	9	53	34	38
Potassium	25000	4400	2000	1300	8200		5,400
Selenium							
Silver						1.4	
Sodium	350	480	270	240	800		300
Thallium							
Zinc	110	170	120	38	130	700	80
Cobalt	14	12	13	6	14	10	11
Beryllium							1.0
Manganese	680	840	1400	2500	500	600	300
Antimony						1	
Vanadium	53	35	38	17	55		41

APPENDIX K - EVALUATION OF POTENTIAL VAPOR INTRUSION

MEMORANDUM

To: Gerardo Millan-Ramos

From: Richard Sugatt

Date: July 19, 2011

Subject: Evaluation of potential vapor intrusion at Coakley Landfill Superfund Site

The maximum concentrations of volatile organic chemicals (VOCs) in groundwater at Coakley Landfill Superfund Site were compiled and compared with the vapor intrusion target groundwater concentration in Table 2c of the November 2002 "OSWER Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils (Subsurface Vapor Intrusion Guidance" (EPA, 2002). These target concentrations represent the concentration in groundwater associated with a cancer risk of 1×10^{-6} or a hazard quotient of 1 in indoor air with an attenuation factor of 0.001 from groundwater to indoor air. However, the target concentration for those VOCs with a Maximum Contaminant Level (MCL) was set to the MCL as a matter of policy, rather than risk. Benzene is the only chemical that has a MCL and occurred in groundwater at the Site.

In order to provide a cancer risk-based target concentration in groundwater for this chemical, EPA Region I calculated a risk-based target concentration in groundwater using the equations in the 2002 EPA draft guidance, as follows:

1) Target Indoor Air (ug/m^3) = Target Cancer Risk x ATc / (EF x ED x IUR)

   where: Target Cancer Risk = 1E-06

   ATc = averaging time, carcinogens (25,550 days)

   EF = exposure frequency for a resident (350 days/year)

   ED = exposure duration for a resident (30 years)

   IUR = inhalation unit risk $(ug/m^3)^{-1}$

2) Target Soil Gas (ug/m^3) = Target Indoor Air/α

   where: α = soil gas to indoor air attenuation factor (0.1 for target soil gas)

3) Target Groundwater (ug/L) = Target Indoor Air x 10^{-3} m^3/L / (H x α)

   where: α = soil gas to indoor air attenuation factor (0.001 and partitioning across water table obeys Henry's Law

   H = Henry's Law Constant (dimensionless)

Using these equations, the target groundwater concentration for benzene is 1.36 ug/L (for a cancer risk of 1E-06). The target concentrations in groundwater from EPA (2002) and EPA Region I are compared with the maximum concentration in groundwater in Table 1 below.

As shown in the table, the only chemical which exceeded the risk-based target concentration was benzene, which occurred at a maximum concentration of 8 ug/l. This concentration is about 5.9 times

higher than the target level, equating to a potential cancer risk of about 6E-06 (i.e. 8E-06/1.36E-06 = 5.9E-06). The cancer risk of 6E-06 is within EPA's acceptable risk range of 1E-04 to 1E-06 so the hypothetical vapor intrusion risk would be acceptable, if buildings occurred or potentially occurred above the location where the maximum benzene concentration was measured. Although the target concentration of 1.36 ug/L was exceeded, the groundwater plume is more than 100 feet horizontally from any structure. According to the 2002 EPA draft guidance, vapor intrusion is not of concern if a structure is 100 feet or more distant, either horizontally or vertically, from contaminated groundwater. In addition, the existing plume is not expanding in the direction of any structures or non-wetland areas where structures could be built in the future. Therefore, it is concluded that there is no current or potential future vapor intrusion risk associated with the Site.

Table 1. Comparison of Maximum Concentrations in Groundwater with Regulatory Criteria and Vapor Intrusion Target Levels
Coakley Landfill Superfund Site-Prepared by EPA, July, 2011

Chemical	Interim Cleanup Level	Revised ICL	Federal MCL	NH MCL	NH AGQS	VI Target Level		Maximum Concentration (ug/L)
						EPA (2002) (ug/L)	EPA Region I (ug/L)	
Acetone	6,000	NA	NA	NA	NA	220000		BDL
Benzene	5	5	5	5	5	**5**	**1.36**	**8**
Chlorobenzene	100	100	100	100	100	390		79
Chloroethane	NA	NA	NA	NA	NA	28000		38
Chloromethane (methyl chloride)	30	NA	NA	NA	NA	6.7		BDL
1,4 Dichlorobenzene	75	NA	75	NA	NA	8200		19
1,1 Dichloroethane	81	NA	NA	NA	NA	2200		3
trans-1, 2-Dichloroethene	100	100	100	100	100	180		NR
1,2-Dichloropropane	5	5	5	5	5	35		NR
Diethyl Phthalate	2,800	2,800	NA	NA	NA	NA		NR
Ethylbenzene	700	NA	700	NA	NA	700	3.04	BDL
Isopropylbenzene	800	NA	NA	NA	NA	NA		4
p – Isopropyltoluene	260	NA	NA	NA	NA	NA		BDL
Naphthalene	20	NA	NA	NA	NA	150		BDL
Phenol	280	280	NA	NA	4,000	NA		NR
Diethyl Ether	1,400	NA	NA	NA	NA	NA		130
Tetrachloroethene	3.5	3.5	5	5	5	5	0.55	NR
Tetrahydrofuran	NA	154	NA	NA	154	NA		180
Toluene	1,000	NA	1,000	NA	NA	1500		BDL
1,2,4 Trimethylbenzene	330	NA	NA	NA	NA	24		2
1,3,5 Trimethylbenzene	330	NA	NA	NA	NA	25		BDL
o-Xylene	NA	NA	NA	NA	NA	NA		1
m&p – Xylene	NA	NA	NA	NA	NA	NA		12
1,4-Dioxane	NA	NA	NA	NA	3	NV		310
Methylethylketone (2-butanone)	200	200	NA	NA	4,000	440000		BDL
Methylisobutylketone (MIBK)	2,000	NA	NA	NA	NA	14000		BDL
Methyl-t-butyl Ether (MTBE)	NA	13	NA	13	13	120000		5
Tertiary-butyl Alcohol (TBA)	NA	NA	NA	NA	NA	NA		70

ICL = Interim Cleanup Level

BDL = Below Detection Limit

NA = Not Available

NR = Not Reported

APPENDIX L - ARARs & TBCs

APPENDIX L - ARARs & TBCs

DRAFT

Attachment 2 - Coakley Landfill Superfund Site, Operable Unit 1 Chemical-specific ARARs

Requirement	Status	Requirement Synopsis	Action to be Taken to Attain ARAR
EPA Risk Reference Dose (RfDs)	To Be Considered	RfDs are considered to be the levels unlikely to cause significant adverse health effects associated with a threshold mechanism of action in human exposure for a lifetime.	Hazards due to noncarcinogens with EPA RfDs are used to evaluate exposures to contaminated media. The source control remedy prevents exposure and migration of contaminants. Use restrictions on the landfill and other remedial components, as well as groundwater use restrictions will be maintained until risks identified under these standards are eliminated.
EPA Carcinogenicity Slope Factor	To Be Considered	Slope factors are developed by EPA from Health Effects Assessments and present the most up-to-date information on cancer risk potency. Slope factors are developed by EPA from Health Effects Assessments by the Carcinogenic Assessment Group.	Risks due to carcinogens as assessed with slope factors are used to evaluate exposures to contaminated media. The source control remedy prevents exposure and migration of contaminants. Use restrictions on the landfill and other remedial components, as well as groundwater use restrictions will be maintained until risks identified under these standards are eliminated.
Guidelines for Carcinogen Risk Assessment EPA/630/P-03/001F (March 2005)	To Be Considered	Guidance for assessing cancer risk.	Risks due to carcinogens are assessed using these guidelines. The source control remedy prevents exposure and migration of contaminants. Use restrictions on the landfill and other remedial components, as well as groundwater use restrictions will be maintained until risks identified under these standards are eliminated.
Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens EPA/630/R-03/003F (March 2005)	To Be Considered	Guidance of assessing cancer risks to children.	Risks to children due to carcinogens are assessed using these guidelines. The source control remedy prevents exposure and migration of contaminants. Use restrictions on the landfill and other remedial components, as well as groundwater use restrictions will be maintained until risks identified under these standards are eliminated.

Attachment 2 - Coakley Landfill Superfund Site, Operable Unit 1 Chemical-specific ARARs

Requirement	Status	Requirement Synopsis	Action to be Taken to Attain ARAR
Health Advisories (EPA Office of Drinking Water)	To Be Considered	Health Advisories are estimates of risk due to consumption of contaminated drinking water; they consider non-carcinogenic effects only. To be considered for contaminants in groundwater that may be used for drinking water where the standard is more conservative than either federal or state statutory or regulatory standards. The Health Advisory standard for manganese is 0.3 mg/l.	Health advisories will be used to evaluate the non-carcinogenic risk resulting from exposure to certain compounds (e.g., manganese). The source control remedy prevents exposure and migration of contaminants. Use restrictions on the landfill and other remedial components, as well as groundwater use restrictions will be maintained until risks identified under these standards are eliminated.
Soil Remediation Criteria, Env-Or 606.19	Applicable	Numeric soil remediation standards for organic and inorganic contaminants are established, with a provision for development of risk-based site-specific soil remediation standards.	Risks posed by contaminated soils and debris under the landfill cover will be controlled through operation and maintenance of the cap and institutional controls
New Hampshire Department of Environmental Services Risk Characterization and Management Policy (Section 7.4(5))	To be Considered	Establishes GW-1 and GW-2 guidelines for contaminants in groundwater. GW-1 values are equal to the NH AGQS values for ambient groundwater. GW-2 values are based on a subsurface vapor intrusion into buildings to calculate indoor air conservative risk assessments, and therefore apply to volatile contaminants only.	Risks due to groundwater contaminants are assessed using these guidelines. The source control remedy prevents exposure and migration of contaminants. Use restrictions on the landfill and other remedial components, as well as groundwater use restrictions will be maintained until risks identified under these standards are eliminated.

Attachment 2 - Coakley Landfill Superfund Site, Operable Unit 1
Location-specific ARARs

Authority	Requirements	Status	Requirement Synopsis	Action to be Taken to Attain ARAR
Federal Requirements	Fish and Wildlife Coordination Act (16 U.S.C.. §661 *et seq.*); Fish and Wildlife Protection (40 C.F.R. §6.302(g))	Applicable	Any modification of a body of water or wetland requires consultation with the U.S. Fish and Wildlife Service and the appropriate state wildlife agency to develop measures to prevent, mitigate, or compensate for losses of fish and wildlife.	Wetlands are in close proximity to OU 1 where the landfill cap has been constructed. Operation and maintenance of the remedy may have some limited impacts to fish and wildlife resource areas. Planning and decision making will incorporate fish and wildlife protection considerations in consultation with the resource agencies.
	Protection of Wetlands (40 C.F.R. § 6.302(a); Appendix A)	Applicable	This regulation codifies standards established under Executive Order 11990. Under this requirement, no activity that adversely affects a federal jurisdictional wetland shall be permitted if a practicable alternative with lesser effects is available. Action to avoid, whenever possible, the long- and short-term impacts on wetlands and to preserve and enhance wetlands.	Wetlands are in close proximity to OU 1 where the landfill cap has been constructed. Operation and maintenance of the remedy, along with monitoring activities may have some limited impacts to Federal jurisdictional wetlands. Wetlands disturbed by well installation, landfill cap operation and maintenance, monitoring, or other remedial activities will be mitigated in accordance with requirements.
	Clean Water Act, Section 404 (33 U.S.C.. § 1344); Section 404(b)(1) Guidelines for Specification of Disposal Sites for Dredged or Fill Material (40 C.F.R. Part 230, 231 and 33 C.F.R. Parts 320-323)	Applicable	Under this requirement, no activity that adversely affects a federal jurisdictional wetland shall be permitted if a practicable alternative with lesser effects is available. Controls discharges of dredged or fill material to protect aquatic ecosystems.	Operation and maintenance, along with monitoring activities that require activity in wetlands will be implemented to meet these requirements. EPA has determined that this alternative is the least damaging practicable alternative to protect wetland resources both on-site and off-site. At the time of the issuance of the ROD there was no public oposition to this finding.

Attachment 2 - Coakley Landfill Superfund Site, Operable Unit 1
Location-specific ARARs

Authority	Requirements	Status	Requirement Synopsis	Action to be Taken to Attain ARAR
State Requirements	Criteria and Conditions for Fill and Dredge In Wetlands: RSA Ch. 482-A and NH Admin. Code Env-Wt Parts 300 400, 600, and 700	Applicable	These standards regulate filling and other activities in or adjacent to wetlands, and establish criteria for the protection of wetlands from adverse impacts on fish, wildlife, commerce, and public recreation.	Wetlands are in close proximity to OU 1 where the landfill cap has been constructed. Operation and maintenance of the remedy, along with monitoring activities may have some limited impacts to State jurisdictional wetlands. Wetlands disturbed by well installation, landfill cap operation and maintenance, monitoring, or other remedial activities will be mitigated in accordance with requirements.
	Terrain alteration adjacent to surface waters; Env-Ws 415 and RSA 485-A:17	Relevant and Appropriate	The purpose of these rules is to protect surface water quality from degradation resulting from any activity which significantly alters terrain or occurs in or on the border of the surface waters of the state. The permanent methods for protecting water quality decribed include: vegetated filter strips, grassed swales, detention ponds, wet ponds, constructed wetlands, infiltration trenches, infiltration basins and water quality inlets.	Activities performed in association with the implementation of the remedy, including operation and maintenance of the landfill cap, along with monitoring, will be compliant with these standards and will result in the least adverse impact to surface waters/wetlands. Engineering controls (e.g. siltation controls, erosion controls) will be implemented during remedial activities to minimize harm to surface waters/wetlands. Excavated material, including well drillings, will be stockpiled and dewatered outside of wetland areas prior to off Site disposal. Wetlands would be restored (using suitable soil and vegetation) where altered temporarily by the remedy.

Attachment 2 - Coakley Landfill Superfund Site, Operable Unit 1 Action-specific ARARs

Authority	Requirement	Status	Requirement Synopsis	Action to be Taken to Attain ARAR
Federal Requirements	Resource Conservation and Recovery Act (RCRA), 42 U.S.C.. §§ 6901 *et seq.,* Standards for identification and listing of hazardous waste, 40 C.F.R. Part 261	Applicable	New Hampshire has been delegated the authority to administer these RCRA standards through its state hazardous waste management regulations (Env-Wm 400). These provisions have been adopted by the State.	Any wastes generated by remedial activity will be analyzed by appropriate test methods. If found to be hazardous wastes, then they will be managed in accordance with the substantive requirements of the State hazardous waste regulations. Wastes that may be generated include: investigation derived waste from monitoring activities and contaminated media produced during the operation and maintenance of the landfill cap and other components of the remedy.
	RCRA, Standards applicable to generators of hazardous wastes, 40 C.F.R. Part 262	Applicable	New Hampshire has been delegated the authority to administer these RCRA standards through its state hazardous waste management regulations (Env-Wm 500). These provisions have been adopted by the State.	If remedial activity generates hazardous wastes, then they will be managed in accordance with the substantive requirements of the State hazardous waste regulations.
	RCRA, Standards for owners and operators of hazardous waste treatment, storage, and disposal facilities, 40 C.F.R. Part 264	Applicable	New Hampshire has been delegated the authority to administer these RCRA standards through its state hazardous waste management regulations (Env-Wm 700).	The Site's landfill meets regulatory standards to be a hazardous waste facility. Therefore, it will be operated and maintained in compliance with the substantive requirements of the State hazardous waste regulations.
	Clean Water Act (CWA), Section 402, 33 U.S.C. § 1342; 40 C.F.R.. 122-124, 131, 136 - Discharge of Pollutants	Applicable	These standards address water discharges which may be directed to surface water.	If a discharge from the remedial action is directed to surface water the discharge will be treated, if necessary, so that these standards will be achieved. Monitoring will be performed to determine whether operation and maintenance of the remedy could potentially affect nearby surface water bodies, in accordance with Env-Or-607 (see below).

Attachment 2 - Coakley Landfill Superfund Site, Operable Unit 1 Action-specific ARARs

Authority	Requirement	Status	Requirement Synopsis	Action to be Taken to Attain ARAR
	CWA, Ambient Water Quality Criteria (AWQC), 40 C.F.R. 122.44	Relevant and Appropriate	These regulations establish water quality standards for protection of human health and aquatic life.	Used to establish monitoring standards for surface waters and sediments. Surface water and sediment will be monitored annually to determine whether this alternative is effective in protecting areas outside of OU 1 from the migration of contaminants from the landfill.
	Safe Drinking Water Act (42 U.S.C. §300f *et seq.*); National primary drinking water regulations (40 C.F.R. 141, Subpart B and G)	Relevant and Appropriate	Establishes maximum contaminant levels (MCLs) for common organic and inorganic contaminants applicable to public drinking water supplies. Used as relevant and appropriate monitoring standards for aquifers and surface water bodies that are potential drinking water sources.	Used to establish monitoring standards for groundwater. The source control (landfill cap) remedy will be operated and maintained to prevent migration of contaminants outside of the compliance boundary established as OU 1. Long-term monitoring of contaminants, based on these standards, will be performed to evaluate whether the source control remedy is effective in preventing the migration of contaminants.
	Safe Drinking Water Act (42 U.S.C. §300f *et seq.*); National primary drinking water regulations (40 C.F.R.. 141, Subpart F)	Relevant and Appropriate for non-zero MCLGs only; MCLGs set as zero are To Be Considered.	Establishes maximum contaminant level goals (MCLGs) for public water supplies. MCLGs are health goals for drinking water sources. These unenforceable health goals are available for a number of organic and inorganic compounds.	Used to establish monitoring standards for groundwater. The source control (landfill cap) remedy will be operated and maintained to prevent migration of contaminants outside of the compliance boundary established as OU 1. Long-term monitoring, utilizing these standards, will be performed to evaluate whether the source control remedy is effective in preventing the migration of contaminants. Non-zero MCLGs are relevant and appropriate. MCLGs set at zero are to be considered.

Attachment 2 - Coakley Landfill Superfund Site, Operable Unit 1 Action-specific ARARs

Authority	Requirement	Status	Requirement Synopsis	Action to be Taken to Attain ARAR
State Requirements	Contaminated Site Management, NH Admin. Code Env-Or 600: Part 607, Groundwater Management Permits; Part 608, Activity and Use Restrictions; Part 610, Monitoring; Part 611, Contaminated Soils	Applicable	Env-Or Part 607 provides for establishment of Groundwater Management Zones (GMZ) to control use of groundwater that exceeds AGQS, requires monitoring of the groundwater quality within the GMZ, requires implementation of measures to restore the groundwater quality, and requires an evaluation of the effectiveness of the measures. Part 608 establishes standards for setting institutional controls to protect human health and components of the remedy. Part 610 establishes standards for monitoring groundwater, including requirements and criteria for constructing, developing, and decommissioning monitoring wells. Part 611 establishes standards for managing contaminated soils.	A GMZ will be established for OU 1 to protect against use of contaminated groundwater. Note that even if compliance with these standards is acheived, groundwater use restrictions may still be required for the remedy if there are more stringent federal compliance standards that still have not been achieved. Activity and use restrictions will be established to prevent human exposure to contaminated groundwater and protect components of the remedy. Groundwater monitoring will be required until State ground water standards are acheived throughout the GMZ (monitoring will be continued if additional Federal groundwater standards still need to be achieved). Groundwater monitoring wells will be installed, operated, and decommissioned under these standards. Contaminated soils generated from installation of wells, operation and maintenance of the landfill cap, and any other remedial activity will be managed in compliance with these standards.
	Identification and Listing of Hazardous Wastes, N.H.. Admin. Code Env-Wm 400, Toxicity Characteristic	Applicable	These standards list particular hazardous wastes and identify the maximum concentration of contaminants for which the waste would be a RCRA characteristic waste. The analytical test set out in Appendix II of 40 C.F.R.. Part 261 is referred to as the Toxicity Characteristic Leaching Procedure (TCLP). The federal requirements 40 C.F.R. Part 261 are incorporated by reference.	Any wastes generated by remedial activity will be analyzed to determine whether they are listed or characteristic hazardous waste under these standards. Materials that are listed waste or exceed TCLP hazardous waste thresholds will be disposed off-site in a RCRA Subtitle C facility. Non-hazardous materials will be disposed appropriately.

Attachment 2 - Coakley Landfill Superfund Site, Operable Unit 1 Action-specific ARARs

Authority	Requirement	Status	Requirement Synopsis	Action to be Taken to Attain ARAR
	Requirements for Hazardous Waste Generators, N.H. Admin. Code Env-Wm 500 [formerly He-P Ch. 1905.06]: including Part 507 Storage Requirements; Part 513 Emergency/Remedial Actions	Applicable	Requires determination as to whether waste materials are hazardous and, if so, requirements for managing such materials on site prior to shipment off site. The federal requirements 40 C.F.R. Part 262 are incorporated by reference.	If remedial activity generates hazardous wastes, then they will be managed in accordance with the substantive requirements of these regulations.
	Requirements for Owners and Operators of Hazardous Waste Facilities/Hazardous Waste Transfer Facilities, N.H.. Admin. Code Env-Wm 700 [formerly He-P Ch. 1905.08]: including § 702.10 Groundwater Monitoring; § 702.11, Other Monitoring; Part 706, Emergency/Remedial Actions; Part 708, Facility Standards	Applicable	This regulation establishes requirements for owners or operators of hazardous waste sites. Part 708 incorporates by reference the federal requirements under 40 C.F.R. Part 264, including but not limited to Subpart G (closure/post closure), Subpart I (containers), Subpart J (tanks)	The landfill meets regulatory standards to be a hazardous waste facility. Therefore, it will be operated and maintained in compliance with these standards.

Attachment 2 - Coakley Landfill Superfund Site, Operable Unit 1 Action-specific ARARs

Authority	Requirement	Status	Requirement Synopsis	Action to be Taken to Attain ARAR
	Rules Governing the Control of Air Pollution, RSA Ch. 125-C, Air Pollution Control; NH Admin. Code Env-A 100-4300	Applicable	These provisions establish standards for the release of air emissions, including VOCs and hazardous air pollutants. Applicable standards include the most stringent of the following requirements: (1) New Source Performance Standards, (40 C.F.R. Part 60); (2) National Emissions Standards for Hazardous Air Pollutants (40 C.F.R. Part 61); and (3) New Hampshire State Implementation Plan limits. See RSA 125-C:6.	If operation and maintenance actions, along with monitoring, causes a release of contaminants from groundwater to the unsaturated zone, emissions controls will be included in the remedial design to control emissions.
	Drinking Water Quality Standards: NH Admin. Code Env-Ws 314 MCLs and MCLGs for Inorganics; NH Admin. Code Env-Ws 315 MCLs and MCLGs for Regulated Organics	Relevant and Appropriate for MCLs and non-zero MCLGs only; MCLGs set as zero are To Be Considered.	State MCLs and MCLGs establish maximum contaminant levels permitted in public water supplies and are the basis of State Ambient Groundwater Quality Standards (AGQS) that are applicable to site ground water. The regulations are generally equivalent to the Federal Safe Drinking Water Act (SDWA).	Used to establish monitoring standards for groundwater. The source control (landfill cap) remedy will be operated and maintained to prevent migration of contaminants outside of the compliance boundary established as OU 1. Long-term monitoring of contaminants, based on these standards, will be performed to evaluate whether the source control remedy is effective in preventing the migration of contaminants.
	New Hampshire Ambient Groundwater Quality Standards (NH AGQS) (Env-Or 603.03, Table 600-1).	Relevant and Appropriate	Establishes maximum concentration levels for regulated contaminants in groundwater which result from human operations or activities. NH AGQS are equivalent to MCLs for contaminants that have MCLs. NH AGQS have been established for site groundwater contaminants for which no MCLs are established, and are derived to be protective for drinking water uses. The NH AGQS will be used for site contaminants where MCLs are not currently established.	Used to establish monitoring standards for groundwater. The source control (landfill cap) remedy will be operated and maintained to prevent migration of contaminants outside of the compliance boundary established as OU 1. Long-term monitoring of contaminants, based on these standards, will be performed to evaluate whether the source control remedy is effective in preventing the migration of contaminants.

Attachment 2 - Coakley Landfill Superfund Site, Operable Unit 1 Action-specific ARARs

Authority	Requirement	Status	Requirement Synopsis	Action to be Taken to Attain ARAR
	Groundwater Protection Standards: NH Admin. Code Env-Or 603.01(a) and (b)	Applicable	Wm-Or 603.01(a) and (b) provide that groundwater shall be suitable for use as drinking water without treatment and shall not contain any regulated contaminant in concentrations greater than ambient groundwater quality standards established in Env-Or 603.03.	Used to establish monitoring standards for groundwater. The source control (landfill cap) remedy will be operated and maintained to prevent migration of contaminants outside of the compliance boundary established as OU 1. Long-term monitoring of contaminants, based on these standards, will be performed to evaluate whether the source control remedy is effective in preventing the migration of contaminants.
	Nondegradation of Groundwater to Protect Surface Water: NH Admin. Code Env-Or 603.01 (c)	Applicable	Wm-Or 603.01(c) provides that, unless naturally occurring, groundwater shall not contain any contaminants at concentrations such that groundwater to surface water results in a violation of surface water standards in any surface water body within or adjacent to the site. Env-Or 603.01 (c) therefore incorporates surface water standards set forth at Env-Ws 1700.	Used to establish monitoring standards for groundwater. The source control (landfill cap) remedy will be operated and maintained to prevent migration of contaminants outside of the compliance boundary established as OU 1. Long-term monitoring of contaminants, based on these standards, will be performed to evaluate whether the source control remedy is effective in preventing the migration of contaminants.
	Ambient Air Quality Standards, NH Admin. Code Env-A 300	Applicable	These regulations set primary and secondary ambient air quality standards (equivalent to federal standards). The standards do not allow *significant deterioration of existing air quality in* any portion of the state for: particulate matter, sulfur dioxide, carbon monoxide, nitrogen dioxide, ozone hydrocarbons and lead.	If there are remedial processes that result in releases of contaminants into the air, air quality standards will be complied with during *remedial activities.*
	Fugitive Dust, N.H.. Admin. Code Env-A Part 1002	Applicable	Requires precautions to prevent, abate and control fugitive dust during specified activities, including excavation, maintenance, and construction.	Precautions to control fugitive dust emissions will be required during site remediation activities that could generate dust, such as maintenance of the landfill cap and monitoring well installation.

Attachment 2 - Coakley Landfill Superfund Site, Operable Unit 1 Action-specific ARARs

Authority	Requirement	Status	Requirement Synopsis	Action to be Taken to Attain ARAR
	Regulated Toxic Air Pollutants, NH Admin. Code Env-A Part 1400	Applicable	This regulation identifies toxic air pollutants to be regulated. These pollutants are also listed by EPA in 40 CFR 261. High, moderate and low Toxicity Classifications are established. Air toxics in these classifications are regulated when they occur in concentrations that cause adverse health effects including increased cancer risk.	If there are remedial processes that result in releases of contaminants into the air, air quality standards will be complied with during remedial activities.
	Surface Water Quality Regulations, NH Admin. Code Env-Ws 1700	Applicable	These rules establish water quality standards for the state's surface waters. Water quality criteria for toxic substances are established. [See Part Env-Ws 1703 Water Quality Standards and Env-Ws 1704 Alternative Site Specific Criteria]. These rules are applicable to point or non-point discharge(s) of pollutants to surface waters.	Standards will be used for monitoring to measure the performance and effectiveness of the remedial action in preventing contaminated groundwater from degrading nearby surface waters.
	Interim Criteria for Groundwater Discharges: NH Admin. Code Env-Ws 1500	Applicable	These regulations establish substantive requirements for discharges to groundwater, including prohibited discharges (Env-Ws 1503,04), compliance criteria (Env-Ws 1504.03), and water quality sampling (Env-Ws 1507.01).	If the operation and maintenance of the landfill cover or the monitoring system requires discharge to groundwater, these standards will be complied with.
	Management of Contaminated Soil, NH Admin. Code Env-Or 611	Applicable	Establishes requirements for managing contaminated soils, including requirements for sampling and analysis of soil destined for off-site treatment or disposal, storage requirements for stockpiled soil, and disposal requirements.	Any remedial activities on the site that generates and stockpiles contaminated soil requiring on-site management or off-site disposal will comply with these requirements. Minimal soil generation is anticipated from the installation of monitoring wells and the operation and maintenance of the landfill cap.

Attachment 2 - Coakley Landfill Superfund Site, Operable Unit 1 Action-specific ARARs

Authority	Requirement	Status	Requirement Synopsis	Action to be Taken to Attain ARAR
	Standards for Construction, Maintenance and Abandonment of Wells, NH Admin. Code Env-We 600	Applicable	This provision requires that wells be constructed, maintained, relocated, and/or abandoned according to these regulations.	Wells used for the remedy will be created, operated, and closed in compliance with these standards.

Attachment 2 - Coakley Landfill Superfund Site,
Operable Unit 2
Chemical-specific ARARs

Authority	Requirement	Status	Requirement Synopsis	Action to be Taken to Attain ARAR
Federal Requirements	Safe Drinking Water Act (42 U.S.C. §300f *et seq.*); National primary drinking water regulations (40 C.F.R. 141, Subpart B and G)	Relevant and Appropriate	Establishes maximum contaminant levels (MCLs) for common organic and inorganic contaminants applicable to public drinking water supplies. Used as relevant and appropriate cleanup standards for aquifers and surface water bodies that are potential drinking water sources.	Used to establish cleanup standards for groundwater. Long-term monitoring of contaminants, based on these standards, will be performed to evaluate whether the natural attenuation remedy is effective in preventing the migration of contaminants and achieving drinking water standards.
	Safe Drinking Water Act (42 U.S.C. §300f *et seq.*); National primary drinking water regulations (40 C.F.R. 141, Subpart F)	Relevant and Appropriate for non-zero MCLGs only; MCLGs set as zero are To Be Considered	Establishes maximum contaminant level goals (MCLGs) for public water supplies. MCLGs are health goals for drinking water sources. These unenforceable health goals are available for a number of organic and inorganic compounds.	Used to establish cleanup standards for groundwater. Long-term monitoring of contaminants, based on these standards, will be performed to evaluate whether the natural attenuation remedy is effective in preventing the migration of contaminants and achieving drinking water standards. Non-zero MCLGs are relevant and appropriate. MCLGs set at zero are to be considered.
Federal Criteria, Advisories, and Guidance	EPA Risk Reference Dose (RfDs)	To Be Considered	RfDs are considered to be the levels unlikely to cause significant adverse health effects associated with a threshold mechanism of action in human exposure for a lifetime.	Hazards due to noncarcinogens with EPA RfDs are used to evaluate exposures to contaminated media. The remedy prevents exposure to contaminants though institutional controls and monitoring of the natural attenuation process. Groundwater use restrictions will be maintained until risks identified under these standards are eliminated.

Attachment 2 - Coakley Landfill Superfund Site,
Operable Unit 2
Chemical-specific ARARs

Authority	Requirement	Status	Requirement Synopsis	Action to be Taken to Attain ARAR
	EPA Carcinogenicity Slope Factor	To Be Considered	Slope factors are developed by EPA from Health Effects Assessments and present the most up-to-date information on cancer risk potency. Slope factors are developed by EPA from Health Effects Assessments by the Carcinogenic Assessment Group.	Risks due to carcinogens as assessed with slope factors are used to evaluate exposures to contaminated media. The remedy prevents exposure to contaminants though institutional controls and monitoring of the natural attenuation process. Use restrictions will be maintained until risks identified under these standards are eliminated.
	Guidelines for Carcinogen Risk Assessment EPA/630/P-03/001F (March 2005)	To Be Considered	Guidance for assessing cancer risk.	Risks due to carcinogens are assessed using these guidelines. The remedy prevents exposure to contaminants though institutional controls and monitoring of the natural attenuation process. Use restrictions will be maintained until risks identified under these standards are eliminated.
	Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens EPA/630/R-03/003F (March 2005)	To Be Considered	Guidance of assessing cancer risks to children.	Risks to children due to carcinogens are assessed using these guidelines. The remedy prevents exposure to contaminants though institutional controls and monitoring of the natural attenuation process. Use restrictions will be maintained until risks identified under these standards are eliminated.

Attachment 2 - Coakley Landfill Superfund Site,
Operable Unit 2
Chemical-specific ARARs

Authority	Requirement	Status	Requirement Synopsis	Action to be Taken to Attain ARAR
	Health Advisories (EPA Office of Drinking Water)	To Be Considered	Health Advisories are estimates of risk due to consumption of contaminated drinking water; they consider non-carcinogenic effects only. To be considered for contaminants in groundwater that may be used for drinking water where the standard is more conservative than either federal or state statutory or regulatory standards. The Health Advisory standard for manganese is 0.3 mg/l.	Health advisories will be used to evaluate the non-carcinogenic risk resulting from exposure to certain compounds (e.g., manganese). The remedy prevents exposure to contaminants though institutional controls and monitoring of the natural attenuation process. Use restrictions will be maintained until risks identified under these standards are eliminated.
State Requirements	Drinking Water Quality Standards: NH Admin. Code Env-Ws 314 MCLs and MCLGs for Inorganics; NH Admin. Code Env-Ws 315 MCLs and MCLGs for Regulated Organics	Relevant and Appropriate for MCLs and non-zero MCLGs only; MCLGs set as zero are To Be Considered	State MCLs and MCLGs establish maximum contaminant levels permitted in public water supplies and are the basis of State Ambient Groundwater Quality Standards (AGQS) that are applicable to site groundwater. The regulations are generally equivalent to the Federal Safe Drinking Water Act (SDWA).	Used to establish cleanup standards for groundwater. Long-term monitoring of contaminants, based on these standards, will be performed to evaluate whether the natural attenuation remedy is effective in preventing the migration of contaminants and achieving drinking water standards.

Attachment 2 - Coakley Landfill Superfund Site,
Operable Unit 2
Chemical-specific ARARs

Authority	Requirement	Status	Requirement Synopsis	Action to be Taken to Attain ARAR
	New Hampshire Ambient Groundwater Quality Standards (NH AGQS) (Env-Or 603.03, Table 600-1)	Relevant and Appropriate	Establishes maximum concentration levels for regulated contaminants in groundwater which result from human operations or activities. NH AGQS are equivalent to MCLs for contaminants that have MCLs. NH AGQS have been established for site groundwater contaminants for which no MCLs are established, and are derived to be protective for drinking water uses. The NH AGQS will be used for site contaminants where MCLs are not currently established.	Used to establish cleanup standards for groundwater. Long-term monitoring of contaminants, based on these standards, will be performed to evaluate whether the natural attenuation remedy is effective in preventing the migration of contaminants and achieving drinking water standards.
	Groundwater Protection Standards: NH Admin. Code Env-Or 603.01(a) and (b)	Applicable	Wm-Or 603.01(a) and (b) provide that groundwater shall be suitable for use as drinking water without treatment and shall not contain any regulated contaminant in concentrations greater than ambient groundwater quality standards established in Env-Or 603.03.	Used to establish cleanup standards for groundwater. Long-term monitoring of contaminants, based on these standards, will be performed to evaluate whether the natural attenuation remedy is effective in preventing the migration of contaminants and achieving drinking water standards.

Attachment 2 - Coakley Landfill Superfund Site,
Operable Unit 2
Chemical-specific ARARs

Authority	Requirement	Status	Requirement Synopsis	Action to be Taken to Attain ARAR
	Nondegradation of Groundwater to Protect Surface Water: NH Admin. Code Env-Or 603.01(c)	Applicable	Wm-Or 603.01(c) provides that, unless naturally occurring, groundwater shall not contain any contaminants at concentrations such that groundwater to surface water results in a violation of surface water standards in any surface water body within or adjacent to the site. Env-Or 603.01 (c) therefore incorporates surface water standards set forth at Env-Ws 1700.	Used to establish cleanup standards for groundwater. Long-term monitoring of contaminants, based on these standards, will be performed to evaluate whether the natural attenuation remedy is effective in preventing the migration of contaminants and achieving drinking water standards.
State Criteria, Advisories, and Guidance	New Hampshire Department of Environmental Services Risk Characterization and Management Policy (Section 7.4(5))	To be Considered	Establishes GW-1 and GW-2 guidelines for contaminants in groundwater. GW-1 values are equal to the NH AGQS values for ambient groundwater. GW-2 values are based on a subsurface vapor intrusion into buildings to calculate indoor air conservative risk assessments, and therefore apply to volatile contaminants only.	Risks due to groundwater contaminants are assessed using these guidelines. The remedy prevents exposure to contaminants though institutional controls and monitoring of the natural attenuation process. Use restrictions will be maintained until risks identified under these standards are eliminated.

Attachment 2 - Coakley Landfill Superfund Site,
Operable Unit 2
Location-specific ARARs

Authority	Requirements	Status	Requirement Synopsis	Action to be Taken to Attain ARAR
Federal Requirements	Fish and Wildlife Coordination Act (16 U.S.C.. §661 *et seq.*); Fish and Wildlife Protection (40 C.F.R. §6.302(g))	Applicable	Any modification of a body of water or wetland requires consultation with the U.S. Fish and Wildlife Service and the appropriate state wildlife agency to develop measures to prevent, mitigate, or compensate for losses of fish and wildlife.	Wetlands are present in OU 2 adjacent to monitoring wells. Operation and maintenance of the remedy may have some limited impacts to fish and wildlife resource areas. Planning and decision-making will incorporate fish and wildlife protection considerations in consultation with the resource agencies.
	Floodplain Management (40 C.F.R. 6.302(b); Appendix A)	Applicable	This regulation codifies standards established under Executive Order 11988. Action to avoid, whenever possible, the long- and short-term impacts associated with the occupancy and modifications of floodplains development, wherever there is a practical alternative. Promotes the preservation and restoration of floodplains so that their natural and beneficial value can be realized.	Portions of the area of OU 2 are within the 100 year floodplain. Remedial actions that involve construction in the floodplain areas, other than the potential installation of additional monitoring wells, are not anticipated. If such actions are later found to be necessary, the remedial design will include all practicable means to minimize harm to and preserve beneficial values of the floodplains. Floodplains disturbed by remedial actions will be restored to their original conditions and utility.

Attachment 2 - Coakley Landfill Superfund Site,
Operable Unit 2
Location-specific ARARs

Authority	Requirements	Status	Requirement Synopsis	Action to be Taken to Attain ARAR
	Protection of Wetlands (40 C.F.R. § 6.302(a); Appendix A)	Applicable	This regulation codifies standards established under Executive Order 11990. Under this requirement, no activity that adversely affects a federal jurisdictional wetland shall be permitted if a practicable alternative with lesser effects is available. Action to avoid, whenever possible, the long- and short-term impacts on wetlands and to preserve and enhance wetlands.	Wetlands are present within OU 2. Operation and maintenance of the remedy may have some limited impacts to Federal jurisdictional wetlands. Wetlands disturbed by well installation, monitoring, or other remedial activities will be mitigated in accordance with requirements.
	Clean Water Act, Section 404 (33 U.S.C.. § 1344); Section 404(b)(1) Guidelines for Specification of Disposal Sites for Dredged or Fill Material (40 C.F.R. Part 230, 231 and 33 C.F.R. Parts 320-323)	Applicable	Under this requirement, no activity that adversely affects a federal jurisdictional wetland shall be permitted if a practicable alternative with lesser effects is available. Controls discharges of dredged or fill material to protect aquatic ecosystems.	Wetlands are present within OU 2. Operation and maintenance of the remedy may have some limited impacts to Federal jurisdictional wetlands. Wetlands disturbed by well installation, monitoring, or other remedial activities will be mitigated in accordance with requirements. EPA has determined that this alternative is the least damaging practicable alternative to protect wetland resources both on-site and off-site. At the time of the issuance of the ROD there was no public opposition to this finding.

Attachment 2 - Coakley Landfill Superfund Site,
Operable Unit 2
Location-specific ARARs

Authority	Requirements	Status	Requirement Synopsis	Action to be Taken to Attain ARAR
State Requirements	Criteria and Conditions for Fill and Dredge In Wetlands: RSA Ch. 482-A and NH Admin. Code Env-Wt Parts 300 400, 600, and 700	Applicable	These standards regulate filling and other activities in or adjacent to wetlands, and establish criteria for the protection of wetlands from adverse impacts on fish, wildlife, commerce, and public recreation.	Wetlands are present within OU 2. Operation and maintenance of the remedy may have some limited impacts to State jurisdictional wetlands. Wetlands disturbed by well installation, monitoring, or other remedial activities will be mitigated in accordance with requirements.
	Native Plant Protection Act; RSA 217A and Res 1100-1108	Applicable	Prohibits damaging plant species listed as endangered within the State.	Listed plant species will be identified and remedial activities will comply with these standards.
	Terrain alteration adjacent to surface waters; Env-Ws 415 and RSA 485-A:17	Relevant and Appropriate	The purpose of these rules is to protect surface water quality from degradation resulting from any activity which significantly alters terrain or occurs in or on the border of the surface waters of the state. The permanent methods for protecting water quality described include: vegetated filter strips, grassed swales, detention ponds, wet ponds, constructed wetlands, infiltration trenches, infiltration basins and water quality inlets.	Activities performed in association with the implementation of the remedy, including groundwater monitoring, will be compliant with these standards and will result in the least adverse impact to surface waters/wetlands. Engineering controls (e.g. siltation controls, erosion controls) will be implemented during remedial activities to minimize harm to surface waters/wetlands. Excavated material, including well drillings, will be stockpiled and dewatered outside of wetland areas prior to off site disposal. Wetlands would be restored (using suitable soil and vegetation) where altered temporarily by the remedy.

Attachment 2 - Coakley Landfill Superfund Site,
Operable Unit 2
Action-specific ARARs

Authority	Requirement	Status	Requirement Synopsis	Action to be Taken to Attain ARAR
Federal Requirements	Resource Conservation and Recovery Act (RCRA), 42 U.S.C. §§ 6901 *et seq.,* Standards for identification and listing of hazardous waste, 40 C.F.R. Part 261	Applicable	New Hampshire has been delegated the authority to administer these RCRA standards through its state hazardous waste management regulations (Env-Wm 400). These provisions have been adopted by the State.	Any wastes generated by remedial activity will be analyzed by appropriate test methods. If found to be hazardous wastes, then they will be managed in accordance with the substantive requirements of the State hazardous waste regulations. Wastes that may be generated include investigation derived waste from monitoring activities and contaminated media produced during the operation and maintenance of other components of the remedy.
	RCRA, Standards applicable to generators of hazardous wastes, 40 C.F.R. Part 262	Applicable	New Hampshire has been delegated the authority to administer these RCRA standards through its state hazardous waste management regulations (Env-Wm 500). These provisions have been adopted by the State.	If remedial activity generates hazardous wastes, then they will be managed in accordance with the substantive requirements of the State hazardous waste regulations.
	RCRA, Standards for owners and operators of hazardous waste treatment, storage, and disposal facilities, 40 C.F.R. Part 264	Applicable	New Hampshire has been delegated the authority to administer these RCRA standards through its state hazardous waste management regulations (Env-Wm 700).	If any hazardous waste is generated from remedial activities it will be treated, stored, and disposed of under these standards.

Attachment 2 - Coakley Landfill Superfund Site,
Operable Unit 2
Action-specific ARARs

Authority	Requirement	Status	Requirement Synopsis	Action to be Taken to Attain ARAR
	Clean Water Act (CWA), Section 402, 33 U.S.C. § 1342; 40 C.F.R.. 122-124, 131, 136 - Discharge of Pollutants	Applicable	These standards address water discharges which may be directed to surface water.	If a discharge from the remedial action is directed to surface water the discharge will be treated, if necessary, so that these standards will be achieved. Monitoring will be performed to determine whether operation and maintenance of the remedy could potentially affect nearby surface water bodies, in accordance with Env-Or-607 (see below).
	CWA, Ambient Water Quality Criteria (AWQC), 40 C.F.R. 122.44	Relevant and Appropriate	These regulations establish water quality standards for protection of human health and aquatic life.	Used to establish monitoring standards for surface waters and sediments. Surface water and sediment will be monitored annually to determine whether this alternative is effective in protecting areas from the migration of contaminants from the landfill.

Attachment 2 - Coakley Landfill Superfund Site,
Operable Unit 2
Action-specific ARARs

Authority	Requirement	Status	Requirement Synopsis	Action to be Taken to Attain ARAR
State Requirements	Contaminated Site Management, NH Admin. Code Env-Or 600: Part 607, Groundwater Management Permits; Part 608, Activity and Use Restrictions; Part 610, Monitoring; Part 611, Contaminated Soils	Applicable	Env-Or Part 607 provides for establishment of Groundwater Management Zones (GMZ) to control use of groundwater that exceeds AGQS, requires monitoring of the groundwater quality within the GMZ, requires implementation of measures to restore the groundwater quality, and requires an evaluation of the effectiveness of the measures. Part 608 establishes standards for setting institutional controls to protect human health and components of the remedy. Part 610 establishes standards for monitoring groundwater, including requirements and criteria for constructing, developing, and decommissioning monitoring wells. Part 611 establishes standards for managing contaminated soils.	A GMZ will be established for OU 2 to protect against use of contaminated groundwater. Note that even if compliance with these standards is achieved, groundwater use restrictions may still be required for the remedy if there are more stringent federal compliance standards that still have not been achieved. Activity and use restrictions will be established to prevent human exposure to contaminated groundwater and protect components of the remedy. Groundwater monitoring will be required until State groundwater standards are acheived throughout the GMZ (monitoring will be continued if additional Federal groundwater standards still need to be achieved). Groundwater monitoring wells will be installed, operated, and decommissioned under these standards. Contaminated soils generated from installation of wells and any other remedial activity will be managed in compliance with these standards.
	Identification and Listing of Hazardous Wastes, N.H. Admin. Code Env-Wm 400, Toxicity Characteristic	Applicable	These standards list particular hazardous wastes and identify the maximum concentration of contaminants for which the waste would be a RCRA characteristic waste. The analytical test set out in Appendix II of 40 C.F.R.. Part 261 is referred to as the Toxicity Characteristic Leaching Procedure (TCLP). The federal requirements 40 C.F.R. Part 261 are incorporated by reference.	Any wastes generated by remedial activity will be analyzed to determine whether they are listed or characteristic hazardous waste under these standards. Materials that are listed waste or exceed TCLP hazardous waste thresholds will be disposed off-site in a RCRA Subtitle C facility. Non-hazardous materials will be disposed appropriately.

Attachment 2 - Coakley Landfill Superfund Site,
Operable Unit 2
Action-specific ARARs

Authority	Requirement	Status	Requirement Synopsis	Action to be Taken to Attain ARAR
	Requirements for Hazardous Waste Generators, N.H.. Admin. Code Env-Wm 500 [formerly He-P Ch. 1905.06]: including Part 507 Storage Requirements; Part 513 Emergency/Remedial Actions	Applicable	Requires determination as to whether waste materials are hazardous and, if so, requirements for managing such materials on site prior to shipment off site. The federal requirements 40 C.F.R. Part 262 are incorporated by reference.	If remedial activity generates hazardous wastes, then they will be managed in accordance with the substantive requirements of these regulations.
	Requirements for Owners and Operators of Hazardous Waste Facilities/Hazardous Waste Transfer Facilities, N.H. Admin. Code Env-Wm 700 [formerly He-P Ch. 1905.08]: including § 702.10 Groundwater Monitoring; § 702.11, Other Monitoring; Part 706, Emergency/Remedial Actions; Part 708, Facility Standards	Applicable	This regulation establishes requirements for owners or operators of hazardous waste sites. Part 708 incorporates by reference the federal requirements under 40 C.F.R. Part 264, including but not limited to Subpart G (closure/post closure), Subpart I (containers), Subpart J (tanks)	If any hazardous waste is generated from remedial activities it will be treated, stored, and disposed of under these standards.

Attachment 2 - Coakley Landfill Superfund Site,
Operable Unit 2
Action-specific ARARs

Authority	Requirement	Status	Requirement Synopsis	Action to be Taken to Attain ARAR
	Fugitive Dust, N.H. Admin. Code Env-A Part 1002	Applicable	Requires precautions to prevent, abate and control fugitive dust during specified activities, including excavation, maintenance, and construction.	Precautions to control fugitive dust emissions will be required during site remediation activities that could generate dust, such as maintenance of the landfill cap and monitoring well installation.
	Regulated Toxic Air Pollutants, NH Admin. Code Env-A Part 1400	Applicable	This regulation identifies toxic air pollutants to be regulated. These pollutants are also listed by EPA in 40 CFR 261. High, moderate and low Toxicity Classifications are established. Air toxics in these classifications are regulated when they occur in concentrations that cause adverse health effects including increased cancer risk.	If there are remedial processes that result in releases of contaminants into the air, air quality standards will be complied with during remedial activities.
	Surface Water Quality Regulations, NH Admin. Code Env-Ws 1700	Applicable	These rules establish water quality standards for the state's surface waters. Water quality criteria for toxic substances are established. [See Part Env-Ws 1703 Water Quality Standards and Env-Ws 1704 Alternative Site Specific Criteria]. These rules are applicable to point or non-point discharge(s) of pollutants to surface waters.	Standards will be used for monitoring to measure the performance and effectiveness of the remedial action in preventing contaminated groundwater from degrading nearby surface waters.
	Interim Criteria for Groundwater Discharges: NH Admin. Code Env-Ws 1500	Applicable	These regulations establish substantive requirements for discharges to groundwater, including prohibited discharges (Env-Ws 1503,04), compliance criteria (Env-Ws 1504.03), and water quality sampling (Env-Ws 1507.01).	If the operation and maintenance of the remedy requires discharge to groundwater, these standards will be complied with.

Attachment 2 - Coakley Landfill Superfund Site,
Operable Unit 2
Action-specific ARARs

Authority	Requirement	Status	Requirement Synopsis	Action to be Taken to Attain ARAR
	Management of Contaminated Soil, NH Admin. Code Env-Or 611	Applicable	Establishes requirements for managing contaminated soils, including requirements for sampling and analysis of soil destined for off-site treatment or disposal, storage requirements for stockpiled soil, and disposal requirements.	Any remedial activities on the site that generates and stockpiles contaminated soil requiring on-site management or off-site disposal will comply with these requirements. Minimal soil generation is anticipated from the installation of monitoring wells.
	Standards for Construction, Maintenance and Abandonment of Wells, NH Admin. Code Env-We 600	Applicable	This provision requires that wells be constructed, maintained, relocated, and/or abandoned according to these regulations.	Wells used for the remedy will be created, operated, and closed in compliance with these standards.

APPENDIX M - NHDES SAMPLING REQUIREMENTS

The State of New Hampshire

DEPARTMENT OF ENVIRONMENTAL SERVICES

Thomas S. Burack, Commissioner

June 30, 2009

Peter Britz
City of Portsmouth
City Hall
1 Junkins Avenue
Portsmouth, NH 03801

Superfund Records Center
SITE: Coakley
BREAK: 8.4
OTHER:

SUBJECT: NORTH HAMPTON – Coakley Landfill, Breakfast Hill Road,
DES # **198712001**, Project # 431

SDMS DocID **452893**

Changes in Volatile Organic Sampling Requirements

I am writing to summarize recent changes in sampling requirements at the Coakley Landfill and other Superfund sites in New Hampshire.

1. Analyses for the Waste Management Division's Full List of Analytes for Volatile Organic Compounds "WMD Full List" (attached) are required for all soil, groundwater and drinking water samples collected for hazardous waste sites, landfills and petroleum sites. The Department's January 30, 2008 correspondence to analytical laboratories and environmental professionals can be accessed at the following link.

http://des.nh.gov/organization/divisions/waste/hwrb/documents/voc_changes.pdf

2. At all Superfund Sites, wells regularly sampled for Volatile Organic Compounds (VOCs) need two consecutive rounds of the WMD Full List, and a subset of representative wells must be analyzed for 1,4-dioxane. Due to the high solubility and mobility of 1,4-dioxane in groundwater several wells should be selected in source areas with high VOC concentrations and a few wells should be selected at downgradient locations.

3. The Waste Management Division will consider reducing the requirement to test for some chemicals, including 1,4-dioxane, if two consecutive rounds of analyses fail to detect the chemicals above reporting limits. At a minimum the WMD Full List must be analyzed for once every five years on a schedule that allows the data to be included in the Five Year Review.

4. Not all labs who run 8260B routinely analyze for all the analytes in the WMD Full List. Therefore, it may be necessary to request that the lab(s) analyze for all the compounds, and to confirm that detection limits for the laboratory are low enough to determine if regulatory benchmarks have been exceeded.

5. Five compounds designated with an asterisk (*) in the WMD Full List, i.e., Bromodichloromethane, Hexachlorobutadiene, Ethylene dibromide (EDB), Dibromochloropropane, and 1,3-Dichloropropene (mixed isomers), have typical reporting limits using 8260B that are above the Department's Ambient Groundwater Quality Standards. If any of these five compounds are a concern at a site it may be necessary for the lab(s) to use a different analytical method.

6. The NHDES Lab uses Method 524 for Bromodichloromethane or Hexachlorobutadiene and Method 504 for Ethylene dibromide (EDB) or Dibromochloropropane. The 504 method could be used in place of both the 8260B and 524 methods to reach the lower reporting limits.

We appreciate your willingness to address environmental concerns at this site. Should you have any questions, please contact me at the Department's Waste Management Division at the letterhead address, by e-mail or by phone.

Sincerely,

Joseph Donovan

Waste Management Division

Digitally signed by Waste Management Division
DN: cn=Waste Management Division, o=NHDES, ou=WMD, email=kimberly.durgin@des.nh.gov, c=US
Date: 2009.06.30 15:50:53 -04'00'

Joseph Donovan, P.G.
Hazardous Waste Remediation Bureau
Tel: (603) 271-6811
Fax: (603) 271-2181
E-mail: Joseph.Donovan@des.nh.gov

cc: Kenneth N. Kettenring, Ph.D, P.G., NHDES
Richard Pease, P.E., NHDES
Mike Jasinski, USEPA
Brenda M. Haslett, USEPA
Alistair Macdonald, Golder Associates
North Hampton Health Officer

APPENDIX N - EPA PUBLIC NOTICES ABOUT START OF FIVE YEAR REVIEW

Hampton Union
Friday, January 21, 2011

Ad Number: 076484
Insertion Number: N/A
Size: 2 Col x 2.5 in
Color Type: N/A
Advertiser: US Environmental Protection Agenc...
Agency: N/A
Section-Page-Zone(s): B-6-All
Description: FIVE-YEAR REVIE

Support Fund Recap
SITE: 481855
BREAK: 3
OTHER: 481855

SDMS DocID 481855

FAMILY NOTICE

Judith Franzoso

DOVER — Judith (Demarais) Franzoso, 67, died Monday, Jan. 17, 2011.

Judy was born March 4, 1943 in Haverhill, Mass., the daughter of Melvin and Eleanor (Hosford) Demarais. She graduated from Portsmouth High School, Class of 1961, and Colby Sawyer College, Class of 1963.

Judy was a familiar face along with her brother, Ric, for 14 years at E. Richard Ltd., dressing hundreds of clients in the finest men's and women's wear north of Boston. Judy also worked at the Portsmouth Visiting Nurses Association from 1993 through 2008.

She is survived by son Anthony Franzoso and his wife, Nicole, of Shrewsbury, Mass. and their children, Anthony, Matthew, Joseph and Gabrielle; son Christopher and his wife, Ann, of Hampton, and children Alexa, Benjamin, Zachary and Sydney; and son Michael Stephen and his daughters, Rio and Mira. She also is survived by her brother, Stephen Demarais of Hampton; and sister Melanie Demarais of Worcester, Mass. She was predeceased by her brother, Ric Demarais.

Judy's love of family grew during summers at local beaches, working at her family's restaurant, Flagstones, and remained strong through her hosting of Nana's Camp for her many grandchildren during the summers. She loved her family unconditionally and cherished the times they spent before and during her strong fight.

She enjoyed her life and many wonderful caring friends, including Gene and Colleen Franzoso, Barbara Smucker and Sandy Bussiere, and especially her closest friend, Suzette Beevers, whose love and support helped Judy and her family through this very challenging time.

Calling hours are from 2 to 5 p.m. Sunday, Jan. 23, 2011, at Farrell Funeral Home, 684 State St., Portsmouth, NH 03801; (603) 436-5418. Mass will be conducted at 11 a.m. Monday, Jan. 24, 2011, at Immaculate Conception Church, 98 Summer St., Portsmouth, NH 03801. In lieu of flowers, donations can be made to Seacoast Cancer Center at Wentworth-Douglass Hospital, 789 Central Ave., Dover, NH 03820.

HAMPTON POLICE LOG

Monday, Jan. 10

■ 1:22 a.m. — Melissa L. Coffey, 29, of Holland, Mass., was charged with driving or operating under the influence of drugs or liquor, possession of drug paraphernalia and unregistered vehicle.

■ 9:09 a.m. — A 15 year-old juvenile was charged with possession of drug paraphernalia and violation of the controlled drug act.

■ 12:48 p.m. — Stephen Fraser, 39, of Hampton, was charged with driving after revocation or suspension.

Tuesday, Jan. 11

■ 9:38 a.m. — Lawrence F. McGovern Jr., 43 of Hampton, was charged on arrest warrant, governor's warrant and being a fugitive from justice.

■ 7:55 p.m. — Steven Patten, 53, of Hampton, was charged with alcoholism and possession of a controlled/ narcotic drugs.

Wednesday, Jan. 12

■ 2:21 a.m. — Joseph F. Paquette Jr., 29, was charged with simple assault.

Friday, Jan. 14

■ 5:54 p.m. — Donald J. Murphy, 39, of Seabrook, was charged with harassment and on an arrest warrant.

Saturday, Jan. 15

■ 1:12 a.m. — Charles R. Locke, 53, of Hampton, was charged with driving or operating under the influence of drugs or liquor.

Obituary Guidelines

For guidelines on how to submit an obituary, visit www.seacoastonline.com/SubmitObit

Legal Notice
AGENDA
TOWN OF NORTH HAMPTON
PLANNING BOARD
THURSDAY, FEBRUARY 3, 2011 AT 6:30PM
TOWN HALL, 231 ATLANTIC AVENUE

I. OLD BUSINESS

1. #11:01 – GZA GeoEnvironmental, Inc., 202 Kent Place, Newmarket, NH 03857. The Applicant requests a Conditional Use Permit under Article IV, Section 408.12 to allow the expansion of an existing structure located within the wetlands conservation district freshwater and tidal buffer zones. Property owner: Richard Clark; property location: 1 Appledore Avenue; M/L 001-022-000; zoning district: R-2. This case is continued from the January 13, 2011 Meeting.

II. NEW BUSINESS

1. #11:04 – Nancy Briggs and Joseph Guilmette, 67 Exeter Road, North Hampton, NH. The Applicants propose a change of use by relocating their existing business "C'est Cheese", a wine, cheese and gift shop; also serving food, to 61 Lafayette Road, previously used as a "Gift Shop" business only. Property location: 61 Lafayette Road; property owners: Nancy Briggs and Joseph Guilmette; M/L 007-063-000; zoning district: I-B/R.

III. OTHER BUSINESS

1. * Items laid on the table
   a. Master Plan update
   b. Junk Yard update
2. Any other business to come before the Board.

Respectively submitted,
Phil Wilson
Chair

Applications are available at the North Hampton Town Office, 233 Atlantic Avenue, Monday-Friday 8:00am to 4:00pm for public review.

* Items laid on the table shall remain on the table until a member of Board makes a motion to remove such item from the table.

#1956 1EN 1/21

Roger J. Dignard Sr.

SEABROOK — Roger J. Dignard Sr., "Roger the Roofer," died Saturday, Jan. 15, 2011 in Exeter Hospital.

He was born July 27, 1933, in Amesbury, Mass., the son of the late Edmund and Flora (McLaughlin) Dignard. He raised his children in Salisbury, Mass., before moving to Seabrook.

Mr. Dignard was the longtime owner and operator of Roger's Roofing Co., which was based in Salisbury, working in many of the surrounding areas.

He was a member of the Elks Lodge, the St. Jean Club and the Lafayette Club.

He is survived by two sons, Roger Dignard Jr. and his wife Cheryl, and Edmond Dignard, all of Lake Worth, Fla.; one daughter, Deborah Benning of Wayne, Maine; eight grandchildren; several great-grandchildren; two brothers and their wives, Joe and Maxine Dignard of New Hampshire and Normand and Pat Dignard of Florida; one sister, Laura McPadden of Connecticut; and many nieces and nephews.

SERVICES: At Mr. Dignard's request, there will be no calling hours or funeral services.

Memorial donations may be made to the Roger J. Dignard Sr. Memorial Fund, c/o, Deborah Benning, 21 Tall Timbers Road, Wayne, ME 04284.

Arrangements were by the Brewitt Funeral Home, Exeter. To sign an online guest book, visit www.brewittfuneralhome.com.

James R. West

EXETER — James Russell West, 83, died Saturday, Jan. 15, 2011.

Mr. West retired from Exeter and Hampton / Unitil Electric Co. after 35 years of service. He was a U.S. Navy veteran of World War II serving aboard the USS Macon.

He was a loving father, father-in-law, grandfather, and great-grandfather and enjoyed spending time with his family.

He is survived by his wife of 42 years, Rita (Hope) West; two sons and their wives, Michael and Evelyn West of Benton and Jeffrey and Ann West of Milton; one stepson and his wife, Robert and Eilen Corning of Londonderry; one stepdaughter and her husband, Marilyn and Shawn Sweeney of Hooksett; his son Jeffrey's children, William, Joshua and Mi Yon of Sarasota, Fla.; and step-grandchildren Richard and Matthew Corning of Londonderry; and three great-grandchildren, Amelia, Sienna and Aaron, all of Sarasota.

He was predeceased by his parents.

WE REMEMBER: He loved the outdoors, his favorite days were spent skiing in New Hampshire's mountains, fishing in its lakes, and hunting with his buddies in the fall.

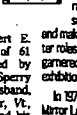
SERVICES: For those that wish to share in honoring the life of Jim West, visiting hours will be held Saturday, Jan. 22, from 11 a.m. to 12:30 p.m., at the Brewitt Funeral Home, 14 Pine St., Exeter.

A funeral service with military honors will be held following calling hours on Saturday at 12:30 p.m., in the funeral home. Spring burial will be in Exeter Cemetery.

In lieu of flowers, memorial donations may be made to the Rockingham Visiting Nurse Association, 137 Epping Road, Exeter, NH 03833.

To sign an online guest book, visit www.brewittfuneralhome.com.

Ethyle W. Sperry



MIRROR LAKE — Ethyle Wiggin Sperry, 89, died Saturday, Jan. 8, 2011, after a brief illness.

She was born Nov. 7, 1921, in Lynn, Mass., the daughter of the late Leon and Agnes (O'Brien) Wiggin.

The widow of Robert E. Sperry, her husband of 61 years, she is survived by her children, Victoria Sperry Wheeler and her husband, Randolph, of Colchester, Vt., and Robert B. Sperry and his wife, Linda Harmon, of Hampton; and two grandchildren, Kathleen Wheeler of Wrightwood, Calif., and Christopher Wheeler of Colchester.

She was a 1939 graduate of Lynn English High School and opted for the General Electric Drafting School in lieu of attending Vesper George School of Art (to which she had been awarded a scholarship).

Following graduation from the drafting program, she began work in the GE Steam Turbine Engineering Department.

In 1945 she was moved to serve her country and joined the Women Accepted for Volunteer Service (WAVES) and trained at Great Lakes Naval Training Station to be a gunnery instructor (20 mm). At the conclusion of World War II she returned to General Electric where she met her husband who was the manager of Steam Turbine Design.

WE REMEMBER: Early in their married life they were active in the Thomson Golf and Country Club of Nahant and North Reading, Mass., particularly in playing duplicate bridge at sanctioned events, garnering many master points. Also as a member of the Thomson Club, Mrs. Sperry hit a "hole-in-one" and was Club Champion in 1963.

After the birth of their two children, they moved to Lynnfield, Mass., where she soon became active in a variety of organizations: P.T.A., LHS Band Boosters, Lynnfield Art Guild and The Spodgfiters of Lynnfield, community theatre group. As a member of three of these groups, she initiated scholarships to help enable graduating high school seniors to pursue careers in art, music, or theatre. Her personal participation in the Spodgfiters ranged from behind the scenes work in stage design and make-up to a variety of character roles on stage, and her art work garnered many awards at local art exhibitions.

In 1979, the Sperrys moved to Mirror Lake, and again she committed herself to becoming an integral part of her new community. She was an original member of the Lakes Region Newcomers Club and she organized two duplicated bridge groups that are still in existence today.

[illegible] a 12-year member of the New Hampshire Women's Golf League.

New Hampshire was the perfect place to retire for Mrs. Sperry. She began skiing in 1940 at Cranmore Mountain and had many fond memories of the famous ski-mobile and the early ski trains from Boston. She ultimately became a member of the "70+" ski club in New Hampshire and traveled with her late husband to ski in Switzerland as well as to tour Ireland, England, Greece and Spain.

SERVICES: A memorial celebration of her life will be held in the spring. Memorial donations may be made to the Visiting Nursing Association Hospice Program, P.O. Box 1520, S. Main Street, Wolfeboro, NH 03894 (www.vnahospice.net); The Caregivers of Wolfeboro, Main Street, Wolfeboro, NH 03894; or the New England Ski Museum, Franconia, NH 03580. Funeral arrangements are by the Baker-Gagne Funeral Home and Cremation Service of Wolfeboro, NH. To sign an online guest book, visit www.baker-gagnefuneralhomes.com.

COLD TURKEYS: YOU COULD HELP WINTER CENSUS

Residents ask to report when they see wild turkeys

BY CHARLES MCMAHON
cmcmahon@seacoastonline.com

PORTSMOUTH — State Fish and Game officials are asking Seacoast residents who spy wild turkeys this winter to report the feathered flocks.

The New Hampshire Fish and Game Department has asked "citizen conservationists" all over the Granite State to report wild turkey flock sightings from now through March 31.

The initiative, known as the Winter Flock Survey, is entering its third consecutive year and is conducted in order to bolster Fish and Game's understanding of the abundance and distribution of turkeys during New Hampshire's challenging winter months.

According to Ted Walski, turkey project leader at Fish and Game, the survey is designed to fill gaps in the department's existing winter flock data collection efforts.

"For parts of the state, especially eastern and northern New Hampshire, we could benefit by additional sighting reports," Walski said. "This reporting system will allow the public to contribute important information to our understanding of winter turkey status in an inexpensive, efficient and, hopefully, enjoyable way."

The survey asks participants to report the number of turkeys in the flock; the location where they were seen; the type of habitat in which the birds were observed, and what the turkeys were feeding on, such as acorns, beechnuts, seed at birdfeeders or corn silage, Walski said.

Last winter, the surveys were used to report approximately 1,279 flocks, totaling 19,050 turkeys and encompassing all areas of the state.

According to results, the southeast corner of New Hampshire had the most reports, with 239 flocks.

Perhaps one of the most popular places for turkey sightings is the Pease International Tradeport in Portsmouth.

Turkey sightings are so prevalent that officials from the Pease Development Authority enter into a contract each year with the U.S. Department of Agriculture Wildlife Service to monitor flocks.

Recently, PDA officials spent $12,400 for the purpose of providing integrated turkey, other large bird, and animal control and monitoring service at the airfield.

The mitigation efforts are done to ensure the safety of the flying public, Bill Hopper, manager of airport operations.

The last time an event occurred related to turkeys was in 2003, when a KC-135E was significantly damaged when it ingested a turkey on the runway while landing.

Fish and Game officials say turkeys are easy to see this time of year because they gather in large, highly visible flocks.

Currently, there are an estimated 45,000 wild turkeys in New Hampshire.

The wild turkey population all but vanished from the New Hampshire landscape by the mid-1800s because of overuse and habitat loss from extensive land clearing.

Fish and Game officials say they were able to successfully reintroduce turkeys beginning in 1975 when 25 turkeys were relocated to New Hampshire.

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Legal Notice
Town of Epping

Supervisors of the checklist will be in session on January 29, 2011. At the town hall between 11:00am and 11:30am. Additions and corrections will be made at this time.

Supervisors
Grace Lavoie
Pam Holmes
Kim Gauthier

#1955 1E 1/21

Legal Notice
AGENDA
TOWN OF NORTH HAMPTON
Planning Board
Thursday, February 3, 2011 at 6:30pm
TOWN HALL, 231 ATLANTIC AVENUE

I. New Business

1. #11:04 – Nancy Briggs and Joseph Guilmette, 67 Exeter Road, North Hampton, NH. The Applicants propose a Change of Use and Site Plan amendment by relocating their existing business "C'est Cheese", a wine, cheese and gift shop; also serving food, to 61 Lafayette Road, previously used as a "Gift Shop" business only and adding a 10' x 24' addition to the rear of the building. Property location: 61 Lafayette Road; property owners: Nancy Briggs and Joseph Guilmette; M/L 007-063-000; zoning district: I-B/R.

Respectfully submitted,

Phil Wilson
Chairman, North Hampton Planning Board

#1955 1EN 1/21

www.seacoastonline.com

Legal Notice
EPA Starts Five-Year Review for Cocheco Landfill Superfund Site

The U.S. Environmental Protection Agency (EPA) has begun its third Five-Year Review for the Cocheco Landfill Superfund Site, Dover and North Hampton, NH. Five-Year Reviews are required by law. The Reviews determine if the cleanup is protective of human health and the environment. This Five-Year Review will be completed by September 2012 and the results will be publicly available.

The Superfund Site cleanup selected remedy included contaminated soil, groundwater and disposal; into the landfill approximately 1,500 cubic yards of contaminated sediments and 30,000 cubic yards of on-site solid waste; fencing and capping the landfill; enhancing and properly maintaining landfill gases; monitoring the natural attenuation of the contaminated groundwater; and establishing long-term environmental monitoring and institutional controls. An alternate drinking water supply has reduced potential for exposure to groundwater contamination, and since the completion of the landfill cap contamination has not been observed to decline.

Contaminants at the site included volatile organic compounds (VOCs) and metals, the sum of all site surface water and ground water are contaminated. On-site groundwater is contaminated with arsenic, phenol, and vinyl chloride; off-site groundwater is contaminated with many metals including arsenic, chromium and lead, and VOCs including benzene and vinyl chloride. On-site soil and sediments are contaminated with arsenic and lead. Stream sediments contain arsenic and VOCs.

The next review will be conducted and issued in 2016. More information about the cleanup can be found at www.epa.gov/superfund/sites/fiveyear/index.htm

The Superfund Five-Year Review Report will be available for public review at the North Hampton Public Library, 237-A Atlantic Avenue, North Hampton, NH 03862.

EPA
Environmental Protection Agency
Protecting human health and the environment

For more information, contact:
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PORTSMOUTH HERALD
Friday, January 21, 2011

Julius J. Sarosiek

STRATHAM — Julius J. Sarosiek, 59, of Stratham, died unexpectedly Tuesday, Jan. 18, 2011, at Exeter Hospital.

Julius was born Sept. 9, 1951, in Framingham, Mass., the son of the late Julius J. and Dorothy (Gardella) Sarosiek Sr.

In addition to his wife of 22 years, Susan (Graban) Sarosiek, *family members* include his children, Karen Sarosiek of Stratham, Julius J. Sarosiek III and his wife, Cherie, of Fall River, Mass., and Jennifer Martinez and her husband, Pino, of Havelock, N.C.; his grandchildren, Alfonso Martinez and Ashley Sarosiek; his sister, Priscilla Moniz and her husband, Alan, of Palm Harbor, Fla.; his father-in-law, James Garrity *of Clifton, Maine; his sister*-in-law, Linda Bamford and her husband, Mike, of Clifton; his niece and nephews, with whom he shared very special relationships, Kelly Ginn, Gary Moniz and Will McKenney; his brothers-in-law, Tom, Jimmy, David and Brian; and several nieces and nephews.

WE REMEMBER: He was raised in Framingham and graduated from Caroline Military Academy in Maxton, N.C. He entered the boilermaker trade after school and lived and worked in Freetown, Mass., for many years. Julius was a 19-year firefighter and emergency medical technician with the Freetown Fire Department as well volunteering as the town's civil defense director. He and his wife Susan moved to Stratham in 2002 to raise their daughter. Julius was an eight-year veteran of the Stratham Fire Department.

He was a member of the International Brotherhood of Boilermakers, Local 29, of Quincy, Mass., was a member of the First United Methodist Church of Portsmouth Building Study Committee and the Board of Trustees, and also was on the Board of Directors of the New England Country Music Organization.

Julius was a loving husband and a doting father, and spending time with family was the most important part of his life. A true tinkerer, he could fix and build almost anything. Julius will be sadly missed by all who knew and loved him.

SERVICES: A celebration of life will be held at 1 p.m. Monday, Jan. 24, 2011, at the First United Methodist Church, 129 Miller Ave., Portsmouth. Relatives and friends are respectfully invited. Burial will be private. In lieu of flowers, the family suggests donations to Karen E. Sarosiek College Fund, Northeast Credit Union, P.O. Box 1240, Portsmouth, NH 03802, or to the Building Fund at First United Methodist Church, 129 Miller Ave., Portsmouth, NH 03801. Assistance with arrangements was by the Remick & Gendron Funeral Home, Hampton. An online guest book is available at www.RemickGendron.com.

Robert J. Crompton

PALM COAST, Fla. — Robert J. "Bob" Crompton, died Tuesday, Jan. 18, 2011, at home, surrounded by loving family.

Bob was born March 11, 1928, in Portsmouth, N.H., to Frederick and Margaret (Flanagan) Crompton.

He is survived by his wife Priscilla, and their four children and their spouses; nine grandchildren; and three great-grandchildren. They include son Gef and wife Kathy Crompton of Newfields, N.H., and their children Bridget and Nathaniel; Gregory and wife Cindy Crompton of Dunbarton, N.H., and children Lea, Emily and wife Darcie; and Amy and husband Ray LaBelle, and their children Anne, Audrey and Ray. He also leaves son Matt and wife Maureen Crompton of Ponte Vedra Beach, Fla., and children Shauna and Kyle; and daughter Jennifer and her husband, Bob Marchewka, of Portsmouth, N.H., and their children Haley and Brady Marchewka; sister-in-law Suzanne Stetson and husband Jim of Milford, N.H.; sister Ann Carberry of Ocala, Fla.; and several nieces, nephews and cousins.

WE REMEMBER: He graduated from Portsmouth High School in 1945, and the University of New Hampshire, completing a masters program and post-graduate studies. He was a member and captain of the basketball and track teams at both Portsmouth High and UNH. He also served in both the United States Navy and Air Force.

Bob was a lifelong New Hampshire educator and administrator. He began his career at Keene Junior High teaching English before becoming principal. He was the assistant superintendent of schools in Salem, and was superintendent of the Timberlane and Hampstead districts until his retirement in 1987. Bob was active in many school and community organizations. He served on the board of the New Hampshire School Administrators' Association, and was president in 1986. He was on the board of the N.H. Interscholastic Athletic Association, was a basketball referee and member of the IAABO, and served as director of the Greater Haverhill, Mass., Chamber of Commerce.

After retirement, he and his wife of 60 years, Priscilla "Tilla Tacy," traveled on their boat down the Intracoastal Waterway to Palm Coast, Fla., where they built their beloved retirement home. Bob enjoyed sailing, especially around the Isles of Shoals. He loved golf, basketball, following UNH sports and all Boston sports teams, *singing, writing humorous poetry*, and spending time with his many friends and loving family.

In the evening of the day he died, an owl perched opposite his home and watched it for a long time.

SERVICES: A celebration of Bob's life will be held in the spring in New Hampshire. For online condolences, visit www.craig-flaglerpalms.com. Arrangements are in the care and trust of Craig Flagler Palms Funeral Home.

CUTS: Residents express concern over school plan

Continued from page A1

budget is moving too far away from the educational core at the cost of taxpayers.

"Protect the core," said Lisa Sweet, a former board member and current teacher at Portsmouth Middle School. Sweet presented data Thursday stating the city spends 9 percent less than the state average of *its tax income on local education*. "You do need to look and say, 'Is there waste? Is there bloat?' I don't think so if we're spending 9 percent less than the New Hampshire average."

Sweet and others asked the board to define the term "educational core."

"What I want to let you know is that protecting the academic core is more than just the teacher (who) stands in the front of the room. You need to protect the curriculum, student support, professional development; you have to support the social, societal and medical concerns that kids are coming in with every day," she said.

Bill St. Laurent spoke as a *representative of the Association* of Portsmouth Taxpayers, saying taxes are too high and schools play a large role in that.

"Most of the people (who) speak are geared toward their children, and I think you've done a great job with the children," St. Laurent said. "I don't think throwing more money at it is going to make it any better because it is what it is now. I don't know how much more you can take from the people of Portsmouth. You've got to keep these budgets either level or reduce them."

Fear of damaging students' technological growth and education, particularly *with the constantly increasing* and changing world of technology, was a primary concern for many who spoke Thursday. The technology director would be eliminated under the budget proposal, with duties of the position reassigned to the assistant superintendent.

"The fact that the technology director is being cut when we live in a global society that technology is all around us, the idea that we are going to rely upon not a centralized person to look at technology and guide us forward — particularly when we are about to build out all this new technology in the middle school — I'm concerned about that," said parent *Patrick Ellis*.

In urging the board to be "careful" in striving for a zero percent budget increase, parent John Bouchard argued that Portsmouth is already behind when it comes to technology, especially in the city's elementary schools.

PIMP: Arrest warrant issued by police

Continued from page A1

agencies "to bring all the responsible parties to justice." Because the case is ongoing, he said, no further information will be released before the wanted man is arrested.

Police previously said the *minor was sold as a prostitute* in a city hotel room after being advertised through the Web site www.backpage.com. Owned by Village Voice Media, Backpage has been targeted by prosecutors around the country for allegedly facilitating the human trafficking of minors.

MacDonald said police detectives monitoring online sites discovered the girl was being *pimped* in Portsmouth last fall.

Backpage is being sued by a Minnesota girl identified in court records as "M.A." who alleges a pimp posted pornographic images of her on the site to force her into prostitution, according to The Associated Press. Through an attorney, the minor claims Backpage knew or should have known that images posted of her at age 14 were illegal and *promoted child exploitation*, the AP reported.

In Tennessee, the state Bureau of Investigation announced a 15-year-old girl was allegedly sold for sex and two adults were indicted on charges of aggravated sexual exploitation of a minor and promoting prostitution.

A month later, the attorneys general of 21 states, including Maine and New Hampshire, *called on Backpage to remove* its adult services listings, claiming the site can't filter illegal posts. One of them, Connecticut Attorney General Richard Blumenthal, announced in a written statement that Backpage made $17.5 million *from prostitution ads*.

"Adult services sections are little more than online brothels, enabling human trafficking and sexual exploitation of women and children," Blumen*thal said. "Because Backpage* cannot properly police adult services, the section should be shut down immediately."

The attorneys general request was made a month after Craigslist removed its adult services section, also under pressure by prosecutors.

Village Voice Media announced in an October blog post that it would not remove adult ads from Backpage and *the ads remain active*.

The teenager arrested by Portsmouth police is being prosecuted through the city's confidential juvenile court.

PEASE: $1M grant coming to airport

Continued from page A1

and Port City Air Inc. Pease will be responsible for no *more than a $75,000 share* of the agreement.

Following Thursday's announcement, PDA executive director David Mullen said the airport was fortunate to meet the enplanement threshold.

Mullen said the fact Pease has met the minimum requirement means the airport will qualify for the $1 million subject to the *consideration of federal* aviation officials.

The PDA has received the annual entitlement funds since 1992.

N.H. bill to limit college student voting criticized

CONCORD (AP) — Opponents of a bill that would prevent many college students from voting in New Hampshire say imposing such restrictions clearly violates the U.S. Constitution.

The bill, sponsored by Republican Rep. Gregory Sorg of Easton, would bar students from voting in college towns unless they had lived there before enrolling. House Speaker William O'Brien, who supports the bill, has complained about young people with no life experience voting liberal.

Paul Twomey, a lawyer who has represented voters in election law cases, says the bill violates the 26th amendment, which gave 18-year-olds the right to vote. And he says a 1972 federal lawsuit in New Hampshire further settled the issue by saying voters don't have to intend to stay in one location in order to vote there.

N.H. radiologists' computer hacked by online gamers

ROCHESTER (AP) — A New Hampshire radiology practice said its computer server was broken into by hackers looking for more bandwidth so they could play the online game "Call of Duty: Black Ops."

Seacoast Radiology in Rochester said in a Jan. 11 letter to its patients that information such as name, address, Social *Security number, date of birth*, some medical information and limited billing information was contained on the server that was broken into. But no radiology reports, images or financial information were on the server.

The attack was discovered Nov. 12 and the computer taken offline immediately.

Lisa MacKenzie, spokeswoman for a company brought in to secure the server, told Foster's Daily Democrat there's no indication any information was compromised.

FDA: Seafood processor signs consent decree

PORTLAND, Maine (AP) — The Food and Drug Administration said a Maine company has agreed to stop shipping ready-to-eat lobster, shrimp and crab products after tests uncovered listeria.

The FDA said Portland Shellfish Co. officials signed a consent decree, approved Thursday by a federal judge, that arose from a 2010 inspection that found listeria contamination both at the plant and in a ready-to-eat product. The bacteria can cause serious and sometimes fatal infections.

The FDA said the company ships its products to retailers in Massachusetts, California, Georgia, Illinois, Nevada, Washington, New Jersey and *Louisiana. It's been the sub*ject of four recalls in the past two years.

The consent decree calls for the FDA to approve various plans to ensure product safety. A message left with the company's general manager wasn't immediately returned Thursday evening.

Maine's Pingree chooses two House committees

AUGUSTA, Maine (AP) — U.S. Rep. Chellie Pingree says she'll be serving on the House Armed Services and Agriculture committees during the new congressional session. The Maine Democrat says she requested both assignments.

It'll be Pingree's second term on Armed Services, which will deal with issues such as defense spending and the war in Afghanistan. Her subcommittee assignments to Personnel and Seapower will deal with Navy shipbuilding jobs and other matters.

This will be Pingree's first term serving on the Agriculture Committee. The appointment drew support from Russell Libby, president of the Maine Organic Farmers and *Gardeners Association*.

Cable TV not protected utility in N.H. House bill

CONCORD (AP) — New Hampshire landlords should be allowed to cut off the cable television services they provide to tenants without being sued, a lawmaker told the House Judiciary Committee on Thursday.

State Rep. Carol McGuire, R-Epsom, said her bill would exempt cable television from enjoying protections from shut-off the law now provides for necessities such as heat, water and lights.

The bill would let the landlord cut off television service if the landlord was paying *for it*.

The Judiciary Committee began working on an amendment to clarify that only cable television provided by the landlord would be exempt.

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Obituary Guidelines

For guidelines on how to submit an obituary, visit www.seacoastonline.com/SubmitObit

www.seacoastlegals.com

The place to find all legal notices published in Seacoast Media Group's five newspapers:

Portsmouth Herald, Exeter News-Letter, Hampton Union, York Weekly, York County Coast Star

Legal Notice
TOWN OF GREENLAND
PUBLIC HEARING NOTICE

The Greenland Municipal Budget Committee will hold a public hearing to take comments on the annual proposed town and school budgets and proposed warrant articles on Wed., February 9th (snow date 2/10/10) at the Greenland *Central School, Post Road, Greenland beginning at 7:00 PM.*

#9506 1t(1/21)

Legal Notices
EPA Starts Five-Year Review for Auchter Landfill Superfund Site

The U.S. Environmental Protection Agency (EPA) has begun its third Five-Year Review for the Auchter Landfill Superfund Site, Greenland and North Hampton, NH. Five-Year Reviews are required by law. The Remedial Action at the site is protective of human health and the environment. This Five-Year Review will be completed by September 2011 and the results will be publicly available.

The Superfund Site cleanup selected remedy included soil venting, groundfloating and expanding into the benefit approximately 1,000 cubic yard of contaminated sediments and 30,000 cubic yards of on-site solid waste, burning and capping the landfill, installing and permanently venting landfill gases, combining the range of alternatives of the contaminated groundwater, and establishing long-term environmental monitoring and institutional controls. An alternative of taking vector supply has reduced potential for exposure to groundwater contamination, and since the contaminant of concern benefit was contaminated levels are continuing to decline.

Contaminants at the site included volatile organic compounds (VOCs) and metals. On- and off-site surface water and ground water are contaminated. On-site groundwater is contaminated with arsenic, phenol, and vinyl chloride; off-site groundwater is contaminated with many volatile including benzene, chloroform and lead, and VOCs including benzene and vinyl chloride. On-site soil and sediments are contaminated with arsenic and lead. Deeper sediments contain arsenic and VOCs.

The next review will be conducted and issued in 2012. More information about the cleanup can be found at www.epa.gov/region01/superfund/sites/auchter/ and at the North Hampton Public Library, 237-A Atlantic Avenue, North Hampton, NH 03862.

For more information, contact:
Kenneth Little-Siemer, Site Manager
1-888-372-1389, ext. 61377
siemer.kenneth@epa.gov
Joseph Boyle, Community Involvement Coordinator
boyle.joseph@epa.gov

EPA

#8288 1t(1/21)

Legal Notice
PUBLIC NOTICE

The New Hampshire Coastal Program (NHCP) is reviewing the following activities for consistency with its enforceable policies:

- The U.S. Coast Guard is proposing the nationwide use of high *frequency and ultra high frequency active sound navigation ranging* (SONAR) technologies from mobile platforms to broaden its capability to locate, image, and classify submerged/underwater targets of interest.

- The National Marine Fisheries Service (NMFS) is proposing Amendment 11 to the Atlantic Mackerel, Squid, and Butterfish (MSB) Fishery Management Plan (FMP). The primary purposes of the Amendment are to: 1) Establish a cap on capacity in the mackerel fishery via a limited access program that does not impede optimal U.S. utilization of the fishery; 2) update the essential fish habitat (EFH) designations for species in the MSB FMP, per NMFS regulatory guidance; 3) evaluate fishing-related impacts on Loligo squid egg EFH and, if necessary, minimize any adverse effects on Loligo egg EFH caused by fishing; and 4) establish an allocation for the recreational mackerel fishery to facilitate implementation of upcoming Annual Catch Limits and Accountability Measures.

The deadline for written comments on the above proposals is February 4, 2011. For additional information please visit the NHCP web site at http://des.nh.gov/organization/divisions/water/wmb/coastal/public_notices.htm, or contact Christian Williams at (603) 559-0028 or Christian.Williams@des.nh.gov.

#22706 1t(1/21)