October 7, 2002

REMEDIAL INVESTIGATION REPORT

Glens Falls Municipal Landfill At Luzerne Road Site

NYSDEC Site No. 5-57-003
Town of Queensbury
Warren County, New York
Volume 1 – Text, Tables and Figures

Prepared for:

Honorable Robert Regan, Mayor
City of Glens Falls
42 Ridge Street
Glens Falls, New York 12801

Prepared by:

C.T. MALE ASSOCIATES, P.C.
50 Century Hill Drive
P.O. Box 727
Latham, New York 12110
(518) 786-7400
FAX (518) 786-7299

C.T. Male Project No: 00.6801

Unauthorized alteration or addition to this document is a violation of Section 7209 Subdivision 2 of the New York State Education Law.

REMEDIAL INVESTIGATION REPORT
GLENS FALLS MUNICIPAL LANDFILL AT LUZERNE ROAD
TOWN OF QUEENSBURY, NEW YORK

TABLE OF CONTENTS
(Continued)

Page

GLOSSARY OF ACRONYMS AND ABBREVIATIONS i

1.0 INTRODUCTION 1
- 1.1 General....1
- 1.2 Report Organization....1
- 1.3 Remedial Investigation Objectives and Scope of Work....2
- 1.4 Site Description....5
- 1.5 Site History....6
- 1.6 Previous Investigations....8
- 1.7 Adjoining Environmental Concern....12

2.0 STUDY AREA INVESTIGATION....14
- 2.1 Modifications to Work Plan....14
- 2.2 Surface Soil and Sediment Sampling....17
  - 2.2.1 Surface Soil Sampling and Analyses....17
  - 2.2.2 Sediment Sampling and Analyses....18
- 2.3 Test Pit Investigation....19
  - 2.3.1 Waste Delineation....19
  - 2.3.2 Subsurface Soil Sampling and Analyses....23
  - 2.3.3 Ash Material Sampling and Analyses....24
  - 2.3.4 Ambient Air Monitoring....25
  - 2.3.5 Inventory of Abandoned Drums, Contents, Sampling and Analyses....27
- 2.4 Groundwater Investigation....29
  - 2.4.1 Soil Borings....29
    - 2.4.1.1 Boring Advancement....30
    - 2.4.1.2 Soil Sampling and Analyses....31
  - 2.4.2 Monitoring Well Installations and Development....32
    - 2.4.2.1 Monitoring Well Installations....33
    - 2.4.2.2 Monitoring Well Development....35
  - 2.4.3 Groundwater Sampling and Analyses....37
    - 2.4.3.1 Water Level Measurements....38
    - 2.4.3.2 Monitoring Well Purging....38

REMEDIAL INVESTIGATION REPORT
GLENS FALLS MUNICIPAL LANDFILL AT LUZERNE ROAD
TOWN OF QUEENSBURY, NEW YORK

TABLE OF CONTENTS
(Continued)

Page

2.4.3.3 Sample Collection Procedures....42
2.4.3.4 Laboratory Analyses....42
2.5 Surface Water Investigation....43
2.6 Explosive Gas Investigation....43
2.7 Surface Leachate Investigation....45
2.8 Vector Investigation....45
2.9 Decontamination of Drilling and Sampling Equipment....46
2.10 Field Survey....47
2.11 Disposition of Investigation Derived Wastes....49
2.11.1 Soil Cuttings and Personal Protective Equipment....49
2.11.2 Monitoring Well Development and Purge Water....50
2.11.3 Waste Transportation and Disposal Off-Site....50
2.12 Analytical Program Quality Control and Data Validation....51
2.12.1 Analytical Methods....51
2.12.2 Field Quality Control Samples and Collection Procedures....53
2.12.3 Laboratory Quality Control....57
2.12.4 Evaluation of Quality Control Results....58
2.12.5 Data Validation....59

3.0 PHYSICAL CHARACTERISTICS OF THE STUDY AREA....63
3.1 Topography and Drainage....63
3.2 Surface Water....63
3.3 Wetlands....63
3.4 Demographics and Land Use....64
3.5 Regional Geology and Hydrogeology....65
3.6 Site Geology and Hydrogeology....66
3.6.1 Site Geology....66
3.6.2 Site Hydrogeology....67

4.0 NATURE AND EXTENT OF CONTAMINATION....70
4.1 General....70
4.2 Evaluation of Surface Soil and Sediment Data....74

REMEDIAL INVESTIGATION REPORT
GLENS FALLS MUNICIPAL LANDFILL AT LUZERNE ROAD
TOWN OF QUEENSBURY, NEW YORK

TABLE OF CONTENTS
(Continued)

Page

4.2.1 Surface Soil....74
4.2.2 Sediment....78
4.3 Evaluation of Subsurface Soil and Ash Material....82
4.3.1 Test Pits....82
4.3.2 Soil Borings....83
4.3.3 Ash Material....84
4.4 Evaluation of Abandoned Drums Sampling Data....88
4.5 Evaluation of Groundwater Data....89
4.5.1 Shallow Groundwater....90
4.5.1.1 Field Parameters....90
4.5.1.2 November 2001 Sampling Event....92
4.5.1.3 March 2002 Sampling Event....96
4.5.1.4 August 2002 Sampling Event....99
4.5.2 Intermediate Groundwater....99
4.5.2.1 Field Parameters....99
4.5.2.2 November 2001 Sampling Event....100
4.5.2.3 March 2002 Sampling Event....102
4.5.3 Upgradient and Downgradient Water Quality Comparison....102
4.5.4 Historical Water Quality Comparison....107
4.6 Evaluation of Explosive Gases....112
4.6.1 Top of Landfill....113
4.6.2 Landfill Perimeter and Property Boundary....113
4.6.3 Structures and Monitoring Wells....114
4.7 Summary of Nature and Extent of Contamination....115
5.0 CONTAMINANT FATE AND TRANSPORT....121
5.1 General Overview....121
5.2 Contaminant Properties and Transport....123
5.2.1 Storm Water Runoff and Surface Water Migration....126
5.2.2 Groundwater Migration....127
5.2.3 Atmospheric Migration....129
5.3 Contaminant Fate....130
6.0 QUALITATIVE EXPOSURE ASSESSMENT....133

REMEDIAL INVESTIGATION REPORT
GLENS FALLS MUNICIPAL LANDFILL AT LUZERNE ROAD
TOWN OF QUEENSBURY, NEW YORK

TABLE OF CONTENTS
(Continued)

Page

6.1 Human Health 133
6.2 Ecological 137

7.0 SUMMARY AND CONCLUSIONS 139
7.1 Extent, Fate and Transport of Contamination 139
7.2 Qualitative Exposure Assessment 144

8.0 REFERENCES 147

TABLES

Table 1.6-1 Summary of Historical Groundwater Sampling Analytical Results
Table 2.3.1-1: Summary of Test Pit Program 21
Table 2.3.5-1: Inventory of Abandoned Drums 27
Table 2.4.1-1: Summary of Soil Boring Program 30
Table 2.4.2.1-1: Summary of Monitoring Well Installations 34
Table 2.4.2.2-1: Summary of Monitoring Well Development Data 36
Table 2.4.3.2-1 Summary of Monitoring Well Purging Data 39
Table 2.12.1-1: Analytical Parameters and Analysis Methods 51
Table 2.12.2-1: Summary of QA/QC Samples Collected and Analyses 55
Table 2.12.4-1: QA/QC Soil Sampling Results – Semi-Volatile Organic Compounds
Table 2.12.4-2: QA/QC Soil Sampling Results – Polychlorinated Biphenyl Compounds
Table 2.12.4-3: QA/QC Soil Sampling Results – Metals
Table 2.12.4-4 QA/QC Soil Sampling Results – Pesticide and Herbicide Compounds
Table 2.12.4-5: QA/QC Groundwater Sampling Results – Volatile Organic Compounds
Table 2.12.4-6: QA/QC Groundwater Sampling Results – Polychlorinated Biphenyl Compounds
Table 2.12.4-7: QA/QC Groundwater Sampling Results – Metals

REMEDIAL INVESTIGATION REPORT
GLENS FALLS MUNICIPAL LANDFILL AT LUZERNE ROAD
TOWN OF QUEENSBURY, NEW YORK

TABLE OF CONTENTS
(Continued)

Page

TABLES (Continued)

Table 2.12.4-8: QA/QC Groundwater Sampling Results – Part 360 Leachate Indicator Parameters
Table 3.6.2-1: Summary of Groundwater Elevation Data 69
Table 4.1-1: Summary of Soil, Sediment and Ash Material Samples Collected and Analyses 70
Table 4.1-2: Summary of Drum Waste Samples Collected and Analyses 72
Table 4.1-3: Summary of Groundwater Samples Collected and Analyses 72
Table 4.2.1-1: Surface Soil Sampling Results - Semi-Volatile Compounds
Table 4.2.1-2: Surface Soil Sampling Results - Polychlorinated Biphenyl Compounds
Table 4.2.1-3: Surface Soil Sampling Results – Metals
Table 4.2.1-4: Surface Soil Sampling Results - Pesticide and Herbicide Compounds
Table 4.2.2-1: Sediment Sampling Results - Semi-Volatile Compounds
Table 4.2.2-2: Sediment Sampling Results - Polychlorinated Biphenyl Compounds
Table 4.2.2-3: Sediment Sampling Results - Metals
Table 4.2.2-4: Sediment Sampling Results - Pesticide and Herbicide Compounds
Table 4.3.1-1: Test Pits Sampling Results - Polychlorinated Biphenyl Compounds
Table 4.3.2-1: Soil Borings Sampling Results - Polychlorinated Biphenyl Compounds
Table 4.3.3-1: Ash Material Sampling Results - Semi-Volatile Compounds
Table 4.3.3-2: Ash Material Sampling Results - Polychlorinated Biphenyl Compounds
Table 4.3.3-3: Ash Material Sampling Results – Metals
Table 4.3.3-4: Ash Material Sampling Results - Hazardous Waste Characteristics
Table 4.4-1: Drum Waste Sampling Results - Hazardous Waste Characteristics
Table 4.5-1: Groundwater Sampling Results - Volatile Organic Compounds, November 26-28, 2001 Sampling Event

REMEDIAL INVESTIGATION REPORT
GLENS FALLS MUNICIPAL LANDFILL AT LUZERNE ROAD
TOWN OF QUEENSBURY, NEW YORK

TABLE OF CONTENTS
(Continued)

Page

TABLES (Continued)

Table 4.5-2: Groundwater Sampling Results - Polychlorinated Biphenyl Compounds, November 26-28, 2001 Sampling Event
Table 4.5-3: Groundwater Sampling Results – Metals, November 26-28, 2001 Sampling Event
Table 4.5-4: Groundwater Sampling Results - Part 360 Leachate Indicator Parameters, November 26-28, 2001 Sampling Event
Table 4.5-5: Groundwater Sampling Results - Volatile Organic Compounds, March 4-6, 2002 Sampling Event
Table 4.5-6: Groundwater Sampling Results - Polychlorinated Biphenyl Compounds, March 4-6, 2002 Sampling Event
Table 4.5-7: Groundwater Sampling Results – Metals, March 4-6, 2002 Sampling Event
Table 4.5-8: Groundwater Sampling Results - Part 360 Leachate Indicator Parameters, March 4-6, 2002 Sampling Event
Table 4.5-9: Groundwater Sampling Results – Volatile Organic Compounds, August 20, 2002 Sampling Event
Table 4.5-10: Summary of Historical and Current Groundwater Sampling Analytical Results
Table 4.5.1-1: Summary of Shallow Groundwater Sampling Field Parameters ... 91
Table 4.5.2-1: Summary of Intermediate Groundwater Sampling Field Parameters........100
Table 4.6.1-1: Explosive Gas Sampling Results – Top of Landfill
Table 4.6.2-1: Explosive Gas Sampling Results – Landfill Perimeter and Property Boundary
Table 4.6.3-1: Explosive Gas Sampling Results – Structures and Monitoring Wells
Table 5.1-1: Summary of Contaminants Detected Above Regulatory Levels and Associated Media........121
Table 5.2-1: Physical and Chemical Properties of Potential Site Related Contaminants........123

REMEDIAL INVESTIGATION REPORT
GLENS FALLS MUNICIPAL LANDFILL AT LUZERNE ROAD
TOWN OF QUEENSBURY, NEW YORK

TABLE OF CONTENTS
(Continued)

FIGURES/DRAWINGS

Figure 1: Site Location Map
Figure 2: Site Plan and Sampling Locations Map
Figure 3: Landfill Waste Delineation Map
Figure 4: Water Level Contour Map (11/19/01)
Figure 5: Water Level Contour Map (2/27/02)
Drawing No. 01-601: Boundary Survey of Glens Falls Municipal Landfill At Luzerne Road

APPENDICES

Appendix A: Correspondence with Bordering Property Owners
Appendix B: Organic Vapor Headspace Analysis Logs
Appendix C: Test Pit Logs
Appendix D: Miscellaneous Documents
    D.1 1966 Aerial Photograph
    D.2: Portion of NYSDOT Map of Ash Material Area
    D.3: 1977-1978 Photographs of Landfill
    D.4: Analytical Data and Trend Graph for PCB Detections at Monitoring Wells MW-101-1 and MW-101-5
Appendix E: Subsurface Exploration Logs
Appendix F: Monitoring Well Construction Logs
Appendix G: Land Survey State Plane Coordinates Data
Appendix H: Investigation Derived Waste Transportation and Disposal Documents
Appendix I: Narrative Portion of Data Validation Report By Data Validation Services
    I.1: Soil, Sediment and Ash Material Samples
    I.2: Groundwater Samples
Appendix J: Soil, Sediment and Ash Material Laboratory Analyses Reports and Chain of Custody Records
Appendix K: Drum Waste Laboratory Analyses Report and Chain of Custody Record

REMEDIAL INVESTIGATION REPORT
GLENS FALLS MUNICIPAL LANDFILL AT LUZERNE ROAD
TOWN OF QUEENSBURY, NEW YORK

TABLE OF CONTENTS
(Continued)

APPENDICES (Continued)

Appendix L: Groundwater Laboratory Analyses Reports and Chain of Custody Records
  L.1: November 2001 Sampling Event
  L.2: March 2002 Sampling Event
  L.3: August 2002 Sampling Event
Appendix M: Fish and Wildlife Impact Assessment (Step I), Glens Falls Municipal Landfill At Luzerne Road

GLOSSARY OF ACRONYMS AND ABBREVIATIONS

ARAR	Applicable or Relevant and Appropriate Requirements
ASP	Analytical Services Protocol
ASTM	American Society for Testing and Materials
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CHA	Clough, Harbour & Associates
Chemtech	Chemtech Consulting Group, Inc.
C.T. Male	C.T. Male Associates, P.C.
CLP	Contract Laboratory Protocol
CP	Citizen Participation
CPP	Citizen Participation Plan
CRDL	Contract Required Detection Limit
DQO	Data Quality Objectives
DUSR	Data Usability Summary Report
EPA	Environmental Protection Agency
EQBA	Environmental Quality Bond Act
ERA	Ecological Risk Assessment
FS	Feasibility Study
FSP	Field Sampling Plan
FWIA	Fish and Wildlife Impact Analysis
HASP	Health and Safety Plan
HRS	Hazard Ranking System
IDL	Instrument Detection Limit
MW	Monitoring Well
MSW	Municipal Solid Waste
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NYCRR	New York Codes, Rules and Regulations
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
NYSDOT	New York State Department of Transportation
PCB	Polychlorinated Biphenyl
PID	Photoionization Detector
PIM	Precision Industrial Maintenance, Inc.
ppb	Parts Per Billion
PPE	Personal Protective Equipment
ppm	Parts Per Million
PQL	Practical Quantitation Limit
QAPP	Quality Assurance Project Plan
QA/QC	Quality Assurance Quality Control
RCRA	Resource Conservation and Recovery Act
Recra	Recra Environmental, Inc.

GLOSSARY OF ACRONYMS AND ABBREVIATIONS
(Continued)

RI	Remedial Investigation
RTK	Right to Know
SCG	Standards, Criteria and Guidelines
SDG	Sample Delivery Group
STEL	Short Term Exposure Limit
SVOC	Semi-Volatile Organic Compounds
SU	Standard Units
TAGM	Technical Administration Guidance Memorandum
TAL	Target Analyte List
TCL	Target Compound List
TICs	Tentatively Identified Compounds
TOGS	Technical and Operational Guidance Series
USGS	United State Geological Society
VOC	Volatile Organic Compound

1.0 INTRODUCTION

1.1 General

This document is the Remedial Investigation (RI) Report for the Glens Falls Municipal Landfill At Luzerne Road Site (the "site"), a New York State Department of Environmental Conservation (NYSDEC) classified Class 2 Inactive Hazardous Waste Disposal Site. The subject site is located in the Town of Queensbury, Warren County, New York. The Glens Falls Municipal Landfill is identified in the Registry of Inactive Hazardous Waste Disposal Sites in New York as Site Number 5-57-003.

The RI was implemented as directed by the Order on Consent Index No. A7-0383-9903 dated March 31, 2000. This report presents the results of the RI field investigations conducted by C.T. Male Associates, P.C. (C.T. Male) from October 18, 2001 through August 20, 2002. The work performed as part of the RI was completed in accordance with the NYSDEC approved "Remedial Investigation/Feasibility Study (RI/FS) Work Plan" (Work Plan) dated August 2001 and associated documents unless otherwise noted. A complete listing of those documents is provided in the reference section of this report.

This document has been prepared by C.T. Male on behalf of the City of Glens Falls.

1.2 Report Organization

This report consists of a glossary of acronyms and abbreviations and eight main sections. Section 1 describes the report's organization, presents the objectives and scope of the RI, a description of the site and the history of the site including past investigations. Section 2 presents modifications to the approved Work Plan and a summary of the RI field activities as implemented. The majority of this section is devoted to the major components of the study area investigations. Section 3 identifies the physical characteristics of the study area including topography and drainage, surface water, wetlands, land use and demographics, geology and hydrogeology. Section 4 discusses the nature and extent of contamination as determined based on the findings of the RI activities. This section is segmented into the various media and material evaluated (i.e., surface soil, sediment, subsurface soil, ash material, abandoned drums contents, groundwater, and explosive gases) and the results of the field activities and chemical analysis are presented. Section 5 addresses contaminant fate and transport of site related contaminants. Section 6 presents the human health qualitative exposure assessment and a summary of the ecological impact assessment. Section 7 provides a summary of the findings and conclusions relative to the extent, fate and transport of contamination and the qualitative exposure assessment. Section 8 is a listing of references.

Tables prepared for the presentation of and evaluation of data are included within the text and tables section of the report, and figures and maps are presented within the figures section of the report. Appendices include correspondence, organic vapor headspace analysis logs, test pit logs, miscellaneous documents, subsurface exploration logs, monitoring well construction logs, land survey State plane coordinates data, waste transportation and disposal documents, data validation reports, laboratory analyses reports and chain of custody records, and Fish and Wildlife Impact Assessment.

1.3 Remedial Investigation Objectives and Scope of Work

Previous investigations by others identified PCB contaminated groundwater at select locations on-site and to a lesser extent groundwater contamination in existing monitoring wells from solid waste landfill leachate. The overall objectives of the RI were to identify and define the extent of groundwater contamination downgradient of and affiliated with the landfill, to identify migration pathways and potential receptors, and to identify possible exposures to human health and the environment. The specific work tasks objectives included:

- Determine the property boundaries with respect to the landfill mass encroaching on adjoining properties.
- Delineate the extent of the landfill mass by test pit excavations and determine if any potential sources of PCBs are present within the excavated unsaturated soils in the test pits (below waste and above the water table).
- Evaluate the quality of surficial soils and sediment with respect to contamination.
- Further evaluate the quality of groundwater, specifically, on the down-gradient and cross-gradient sides of the landfill mass (between the Glens Falls Municipal Landfill and adjoining Luzerne Road Site).
- Confirm the direction of groundwater flow, primarily focusing on the effects of the wetland area northeast of the Glens Falls Municipal Landfill site.
- Evaluate the quality of surface water, if present, in low lying areas adjacent to the west and northeast sides of the landfill with respect to the identified contaminants of concern.
- Evaluate the level of explosive gases, if any, resulting from the decomposition of the landfill contents.
- Identify cover and habitat types, and fish and wildlife resources at the site and assess the effect the site may have on fish and wildlife species.
- Determine the current condition of the cover over the landfill.

The data acquired during the RI was used in evaluating the necessity for remediation and in developing and evaluating remedial alternatives during the FS.

The RI scope of work included historical background research, completion of the field investigation work tasks, and performance of a qualitative exposure assessment and Step I Fish and Wildlife Impact Assessment. The background research included review of aerial photographs and site mapping, and interviews with City personnel. The field investigation work tasks completed included:

- Planimetric and boundary surveys, and field survey of RI exploratory and sampling locations;
- Surface soil and sediment sampling and laboratory analysis for TCL SVOCs, TCL PCBs, TCL pesticides, RCRA herbicides, TAL metals and cyanide;
- Test pit excavations and delineation of landfill waste mass, subsurface soil sampling and laboratory analysis for TCL PCBs;
- Advancement of eight soil borings, and subsurface soil sampling and laboratory analysis for TCL PCBs;
- Installation of eight monitoring wells, two rounds of groundwater sampling of the five existing and eight new monitoring wells and laboratory analysis for TCL VOCs, TCL PCBs, TAL metals, cyanide and landfill leachate indicator parameters;
- Water level measurements and mapping of groundwater elevation and flow direction;
- Explosive gas investigation of the landfill waste mass, perimeter, property boundary and structures;
- Surface water investigation including installation of stream gauges in wetlands area northeast of landfill;
- Surface leachate and vector investigations; and
- Data validation by a third party data validator and preparation of data validation reports.

Prior to implementing the field investigation work tasks, a letter was submitted to the property owners bordering the Glens Falls Municipal Landfill to advise them of the upcoming work and the need to gain limited access to the portion of their property bordering the landfill. Copies of the letters are enclosed in Appendix A.

1.4 Site Description

The Glens Falls Municipal Landfill, a Class 2 Inactive Hazardous Waste Disposal Site, is located on an approximately 15 acre parcel north of Luzerne Road and east of Interstate 87 (Adirondack Northway) in the Town of Queensbury, Warren County, New York. A Site Location Map is presented as Figure 1. The site's longitude and latitude are reported to be 73° 40′ 36″ and 43° 18′ 12″. A Class 2 designation indicates that the site has been determined by NYSDEC to categorically pose a significant threat to public health and/or the environment requiring action. This classification has been made on the basis of historical placement of hazardous materials (i.e., ink sludge) within the contents of the landfill.

An active transfer station operated by the Town of Queensbury for residents of Warren and Washington Counties is located between the landfill mass and Luzerne Road. The transfer station opened on January 2, 1977 and accepts municipal waste and recyclables. It consists of a small attendant's building, a covered compactor and associated building and 50 cubic yard container, a small Quonset hut building that is used for storage, and containers for the recyclable materials. Although the landfill can be accessed from many points, the transfer station is considered to be the primary access to the site. Additionally, the access to the site from points other than the transfer station (which is gated) is uncontrolled. Currently, the landfill is covered with trees and overgrown grass/weed vegetation. Several dirt trails traverse the landfill in various directions and appear to be regularly utilized by off-road vehicles. There are sporadic locations where the landfill mass has limited soil cover causing its contents (i.e., refuse, tires, corroded drums, etc.) to become exposed. A Site Plan and Sampling Locations Map of the site is presented as Figure 2. A Boundary Survey of Glens Falls Municipal Landfill At Luzerne Road is presented as Drawing No. 01-601, sheet 1 of 1.

1.5 Site History

The City of Glens Falls operated the Glens Falls Municipal Landfill as a municipal solid waste (MWS) landfill for approximately 16 years from 1961 to 1977. In reference to a telephone conversation with Mr. Bob Schiavoni, Superintendent of the City of Glens Falls Department of Public Works who has worked at the City for over 40 years, he indicated that to his knowledge there was never a sand pit in the area of the current landfill. Mr. Schiavoni indicated that there is an old sand pit located approximately 50 to 150 feet east of the landfill, which is where the sand used to cover the garbage was obtained from during landfilling operations. This area was not excavated below the water table. In reference to a telephone conversation with Mr. Joe Sullivan of the City of Glens Falls Department of Public Works, he indicated that sand or gravel pits are typically not excavated below the water table since that would require significant dewatering. It would not seem practical to excavate into the water table and have to manage water as refuse was being placed. The referenced phone conferences suggest that the landfill area was not excavated into the water table prior to landfilling operations.

According to NYSDEC, the "landfill used primarily municipal refuse and some quantity of PCB capacitors may have been deposited here by private haulers and individuals."[1] Right to Know (RTK) information solicited from NYSDEC reported that five (5) tons of ink sludge waste (D001) from Valcour Imprinting, Inc. were disposed at the landfill. There is no known documentation of the quantity or characteristics of either solid or hazardous waste at the landfill nor data pertaining to receipt of any waste other than general refuse (MSW). It is reported by NYSDEC that the Glens Falls Municipal

---

[1] NYSDEC Hazardous Waste Disposal Report, 1980.

Landfill underwent "...modest closure efforts through grading and seeding; however, the soil cover is considered insufficient and has been observed to be eroding at various points."[2] Paper mill waste (i.e., wood chips, bark, and mulch) are reported to cover much of the landfill's surface area.

In 1977, NYSDEC reported that "the failure of the City of Glens Falls to properly close the Luzerne Road Landfill has resulted in the City being in non-compliance with NYSDEC Part 360, Solid Waste Management Facilities."[3] In 1979, the City submitted a closure plan to NYSDEC in an effort to comply with 6NYCRR Part 360 regulations, and an alternative closure scheme was subsequently implemented at the initiation of the Rotary Club of Glens Falls with NYSDEC support and assistance.

A NYSDEC memorandum reports that the landfill was listed as a Class 2 Inactive Hazardous Waste Disposal Site in 1988 due to two factors: downgradient PCB contamination detected in groundwater at monitoring well MW-101-5, and RTK information which indicated that five (5) tons of ink waste from Valcour Imprinting, Inc. was deposited in the landfill.[4] The landfill currently retains its classification as a Class 2 Inactive Hazardous Waste Site.

Subsequent to the Class 2 designation in 1988, additional investigations were conducted at the site in 1990 and in 1997 as discussed below in Section 1.6. Over the last few years, the City has worked with and met with the NYSDEC to understand the requirements associated with the Inactive Hazardous Waste Site registration, to establish a course of action and to negotiate an Order on Consent.

On March 23, 2000, the City's legislative body (the Common Council) enacted Resolution No. 111, which authorized the Mayor of the City of Glens Falls to enter into the Order on Consent with the NYSDEC, and which included provisions for applying

---

[2] NYSDEC Phase I Report, 1983; p. 1.

[3] NYSDEC Letter to City of Glens Falls, Nov. 15, 1977.

for assistance under the 1986 Environmental Quality Bond Act (EQBA) – Title 3 State Assistance Program. The Order on Consent (Index #A7-0383-9903) was subsequently signed by the Mayor on March 29, 2000 and by the NYSDEC on March 31, 2000. The City signed the Order on Consent with the understanding that based on information available to date the Glens Falls Municipal Landfill At Luzerne Road site qualifies for the EPA Presumptive Remedy for CERCLA Municipal Landfill Sites, and that State assistance (75% grant for eligible costs) was available through the 1986 EQBA - Title 3 State Assistance Program. The goals of the Order on Consent are for the City to develop and implement a remedial program for the site, which includes a RI/FS, design and implementation of the selected remedy, and operation, maintenance and monitoring of the remedial system. Subsequent to signing the Order on Consent, the City applied for State financial assistance through Title 3 of the EQBA, and negotiated a Municipal Assistance Contract with NYSDEC. The Municipal Assistance Contract (No. C301539) was signed by the Mayor on January 22, 2001 and by the NYSDEC on February 9, 2001, and approved by the New York State Comptroller on March 2, 2001. C.T. Male then prepared an RI/FS Work Plan and associated documents for NYSDEC approval. The Work Plan was approved by NYSDEC in a letter dated October 10, 2001. C.T. Male began implementing the RI field activities on October 18, 2001.

1.6 Previous Investigations

Four investigations have been performed at the Glens Falls Municipal Landfill at Luzerne Road Site from 1983 through 1997. The following paragraphs briefly summarize the purpose and findings of these investigations.

1983 Phase I Summary Report by Recra Research, Inc.

The Phase I investigation assessed existing site information and proposed a Phase II scope of work to fill the data gaps identified in the preliminary assessment in order to

---

[4] NYSDEC Memorandum, June 24, 1991.

complete a site characterization/ranking (HRS) and remedial alternative assessment. No field investigations were performed as part of this Phase I study.

Phase II Investigation Report Dated February 1987 by Recra Environmental, Inc.

The purpose of the Phase II investigation conducted in 1985 was to address data inadequacies in the Phase I investigation. The Phase II investigation focused on expanding the information required for completing the NYSDEC Hazard Ranking System (HRS) score for the site. The Phase II investigations performed included:

- Ambient air monitoring of the landfill before and during the field activities using a photoionization detector.
- Terrain conductivity (using EM-31) and seismic refraction (single channel) surveys to aid in the determination of waste limits and supplement other subsurface data.
- Advancement of five subsurface borings around the perimeter of the landfill. Soil samples were collected for analytical testing and geotechnical evaluation.
- Installation, development, and analytical testing of five monitoring wells (MW-101-1, MW-101-2, MW-101-3, MW-101-4, and MW-101-5).
- Groundwater samples were collected from monitoring wells MW-101-1 through MW-101-5 and two domestic sources, and were analyzed for select 6NYCRR Part 360 parameters, PCBs, and priority pollutants.
- Soil (two samples) and sediment (two samples) samples were collected and analyzed for select 6NYCRR Part 360 parameters, PCBs, and priority pollutants.

Recra Environmental, Inc. (Recra) indicated that analytical results from the groundwater, soil, and sediment samples detected the presence of several heavy metals. Analytical results further reported the presence of PCBs in shallow groundwater obtained from downgradient wells MW-101-1 and MW-101-5. Recra concluded in the Phase II Report that it was difficult to discern the origin of the PCBs.

Recra utilized the results of this study to update the HRS worksheets, documentation records, and site inspection forms. Recra also prepared and presented a preliminary engineering assessment of remedial alternatives within this report. It was concluded that installation of additional monitoring wells and collection of soil samples would be required in order to delineate between the presence and/or release of hazardous substances as a result of the Glens Falls Municipal Landfill, the secure PCB disposal cell, and/or the PCB contaminated soil region. In 1988, the results of the Phase II investigations were used by NYSDEC as a substantial basis for classifying the Glens Falls Municipal Landfill as a Class 2 Inactive Hazardous Waste Disposal Site.

Monitoring Well Testing and Analysis Report Dated May 24, 1990 by Clough, Harbour & Associates

In 1990 the City of Glens Falls conducted additional groundwater sampling and testing of the five existing monitoring wells. Laboratory analyses of the recovered groundwater samples were for 6NYCRR Part 360 baseline parameters (inorganic and organic compounds, and metals) and PCBs. Samples were collected with a Waterra Inertial Hydrolift Hand Pump, and the samples subjected to metal analysis were not filtered.

Clough , Harbour & Associates (CHA) concluded the following:

- PCBs were detected at monitoring well MW-101-5 and PCB breakdown products were detected at monitoring well MW-101-1.
- Downgradient monitoring wells MW-101-4, and to a slightly lesser extent, MW-101-5 appeared to have been impacted by landfill leachate due to the elevated leachate indicators and metal parameters detected in the groundwater samples from the wells.
- Downgradient monitoring well MW-101-1 also showed evidence of contamination due to relatively higher concentrations of leachate indicators, and metal and organic

parameters. CHA suggested that sampling results of monitoring well MW-101-1 may have been influenced by the transfer station activities.

- Further investigation was recommended to delineate the PCBs and associated constituents detected.

Supplemental Sampling Project Report Dated March 12, 1997 by NYSDEC

The stated objectives of the 1996 Supplemental Sampling Project were to determine if the landfill was a source of PCB (i.e., Aroclor) groundwater contamination, to determine if ink sludge waste reportedly disposed of in the landfill is impacting groundwater, and to evaluate the proper classification of the site. During this supplemental investigation twenty-two Geoprobe points (eighteen along Haul Road, east of the Glens Falls Municipal Landfill, and four on the adjacent Luzerne Road Site), and four piezometers (two on or in close proximity to the landfill and two east of the landfill) were installed. Groundwater samples were collected from the Geoprobes/piezometers, five existing monitoring wells around the landfill, and five piezometers at the adjacent Luzerne Road Site, and analyzed for PCBs and volatile organic compounds. A total of six subsurface soil samples were collected from various depths at two Geoprobe locations (Luzerne Road Site) and analyzed for PCBs and volatile organic compounds.

From the supplemental investigation, NYSDEC concluded the following about the Glens Falls Municipal Landfill site. Conclusions about the Luzerne Road Site property were not presented.

- The groundwater flow is to the east-southeast and estimated to have a velocity of 1.1 feet per day.

- The sampling along the Old Landfill Haul Road has shown the landfill to be a source of PCB contamination to groundwater.

- PCBs are migrating in groundwater at levels contravening groundwater standards. The source of this contamination is to some extent contributed by two source areas; the Glens Falls Municipal Landfill and the Luzerne Road Site.
- The volatile organics detected do not appear to be a significant problem by themselves; the magnitude and the inconsistent pattern of detection prove them to be a much less concern than the PCBs.

Considering the results of the supplemental work, NYSDEC recommended that the Glens Falls Municipal Landfill remain classified as a Class 2 Inactive Hazardous Waste Disposal Site. The groundwater sampling results for the previous investigations discussed above have been compiled and are presented in Table 1.6-1.

1.7 Adjoining Environmental Concern

The Glens Falls Municipal Landfill is located contiguous to the Luzerne Road Site, a Class 2 Inactive Hazardous Waste Disposal Site which is east of the landfill. The Luzerne Road Site is reported to have been heavily contaminated with PCBs due to capacitor salvaging operations conducted by area residents. In 1979, some surface soils were removed and deposited in a constructed PCB cell (approximately 2.7 acres) for temporary storage. Reportedly, leachate removal activities were performed until 1985 and then the PCB cell cap was improved in 1986 to include a geomembrane. From 1989 through 1995 leachate levels decreased which suggested a leak in the liner system. In 1995, approximately 40,000 gallons of leachate was removed from the PCB cell. PCBs are known to still be present in site soils and have also migrated into groundwater.

Currently, NYSDEC is conducting a remedial investigation/feasibility study (RI/FS) of this adjacent site to determine the extent of soil and groundwater contamination. In September 1999, additional monitoring wells were installed at the Luzerne Road Site as part of the RI for that site. Water levels from these wells suggests groundwater flow direction to be toward the southeast, consistent with previous data. In September 1999 and September 2000, NYSDEC completed groundwater sampling and analysis of all functional existing and new wells. These groundwater sampling results for the Glens Falls Municipal Landfill monitoring wells are also included in Table 1.6-1.

2.0 STUDY AREA INVESTIGATION

This section presents a summary of the RI scope of work as implemented. All work performed during the RI was substantially conducted in accordance with the NYSDEC approved RI/FS Work Plan (Work Plan), Field Sampling Plan (FSP), Quality Assurance Project Plan (QAPP), and Health and Safety Plan. Refer to these documents as necessary for a more detailed description of methodologies employed.

2.1 Modifications to Work Plan

Modifications were made to the approved Work Plan during the implementation of the RI to address unexpected conditions and to expedite the work completed. NYSDEC was notified when Work Plan modifications were considered, and NYSDEC approval was received prior to implementing the modifications. A summary of the Work Plan modifications as approved by NYSDEC are presented as follows:

- Test Pit Investigations

  FSP Page 13: The Work Plan specified that the excavator bucket must be steam cleaned prior to start of work, between each exploratory test pit, and at completion of work. The requirement for steam cleaning between test pits was eliminated where no visual evidence of contamination was observed on the basis that the soils, being sand in nature, were not adhering to the excavator bucket. If visual evidence of contamination was encountered, the excavator bucket and related equipment that came into contact with this contamination was required to be steam cleaned. Otherwise, the excavator bucket only needed to be scraped of dirt, if present, between those test pits that did not exhibit evidence of contamination. Mr. Dylan Keenan at NYSDEC approved this modification in an e-mail dated October 24, 2001. The excavator was steam cleaned at completion of the test pits prior to leaving the site.

An ash, slag, glass and cinders material (ash material) mixed with sand, not consistent with the municipal solid waste being observed elsewhere, was encountered on the State of New York property adjacent to and west of the western side of the landfill property line (the northern half). Based on NYSDEC and NYSDOH input and approval, four additional samples of the material were collected for laboratory analyses for TCL SVOCs, TCL PCBs, TAL metals, cyanide and hazardous waste characteristics to evaluate the necessity to cap this area where the ash material was encountered.

- Groundwater Investigation

FSP Page 6: The Work Plan indicated that the soil borings would be advanced with 4.25-inch inside diameter hollow stem augers. Due to the soil stratum at the site, the sand is so fine that the sand was running into the augers causing difficulty in turning the augers and keeping the inside of the augers open for sample collection. Therefore, the intermediate soil borings, which are advanced below approximately 30 feet, required the use of 4-inch outside diameter casing instead of the hollow stem augers.

RI/FS Work Plan Page 28: The Work Plan stated that a composite soil sample was going to be collected from 0 to 6 feet for PCB laboratory analyses at each pair of soil borings (shallow and intermediate). Since the shallow and intermediate wells are within a few feet of each other, there was no need to sample both, and therefore the shallow soil boring was not sampled for laboratory analysis for PCBs. Mr. Dylan Keenan at NYSDEC agreed to this clarification during a telephone conversation on October 30, 2001.

RI/FS Work Plan Page 29: As described above, casing was used to advance the intermediate soil borings in lieu of hollow stem augers due to the subsurface conditions. The Work Plan specified a minimum separation distance between the bottom of the shallow well screen and the top of the intermediate well screen of 25 feet. However, this distance was reduced from 25 feet to 20 feet and the screen length of the intermediate wells was reduced from generally 10 feet in length to 5 feet in length to minimize additional costs for using casing instead of augers to advance the soil borings. Mr. Dylan Keenan at NYSDEC approved this modification during a telephone conversation on October 31, 2001.

- Surface Water Investigation

  RI/FS Work Plan Pages 31 and 32: No surface water samples were able to be taken during the RI field investigations since no surface water was present in the proposed surface water sampling locations (low lying wetlands area northeast of the landfill and area along the west side of the landfill). A sediment sample was taken instead in the low lying wetlands area northeast of the landfill in accordance with the Work Plan. A sediment sample was also taken along the west side of the landfill in accordance with the Work Plan. The inability to collect surface water samples was conveyed to Mr. Dylan Keenan and Mr. Shive Mittal at NYSDEC during telephone conversations on October 23, 2001 and December 3, 2001, respectively.

- Surface Leachate Investigation

  RI/FS Work Plan Page 32: No leachate seep samples could be taken during the RI field investigations since no leachate outbreaks were observed. The inability to collect surface leachate samples was conveyed to Mr. Shive Mittal at NYSDEC during a telephone conversation on December 3, 2001.

2.2 Surface Soil and Sediment Sampling

2.2.1 Surface Soil Sampling and Analyses

The surface soil sampling was conducted on October 18, 2001 and included the collection and laboratory analysis of eleven surface soil samples (SS-1 to SS-11). The surface soil samples were collected on the landfill waste mass and around the perimeter of the waste mass at sampling locations approved by NYSDOH. The surface soil sampling locations are shown on Figure 2, Site Plan and Sampling Locations Map.

Five of the surface soil samples were collected from what was to be non-waste areas outside the footprint of the landfill mass (SS-1 to SS-5) based on information available at the time. The locations were selected in the field by C.T. Male with concurrence by Ms. Maureen Schuck of NYSDOH (Ms. Schuck was present) in accordance with the locations shown on Figure 5 of the approved Work Plan. After completion of the test pit excavations to define the limits of the waste mass, two of the surface soil sample locations (SS-2 and SS-4) targeted to be outside of the landfill waste mass fell within the footprint of the landfill. The additional six locations (SS-6 through SS-11) on the landfill waste mass were selected by Ms. Maureen Schuck and were located in close proximity to dirt roadways and recreational vehicle trails on top of the landfill.

The surface soil samples were collected using a field cleaned (refer to Section 2.9) stainless steel trowel and new clean disposable gloves were worn at each sample location. The vegetative cover was removed and the surface soil sample was collected from 0 to 2 inches below the vegetative cover. The soil was immediately placed into pre-cleaned laboratory-supplied glass containers with Teflon-lined lids for TCL SVOCs, TCL PCBs, TAL metals, cyanide, TCL pesticides and RCRA herbicides analyses. The containers were labeled appropriately and placed into a cooler containing bagged ice. The sample identification, time, date, and analyses were recorded on the chain of custody record form. Field quality control (QC) samples including equipment blank, field duplicate and matrix spike/matrix spike duplicate (MS/MSD) were collected as described in Section 2.12.2.

2.2.2 Sediment Sampling and Analyses

The sediment sampling was conducted on October 23, 2001 and included collection and laboratory analysis of three sediment samples (SD-1, SD-2, and SD-3). The sampling locations were in accordance with the locations shown on Figure 4 of the approved Work Plan. Sediment sampling location SD-1 and SD-2 were collected in the low lying area northeast of the landfill waste mass, and SD-3 was collected in the low lying area west of the landfill waste mass. The sampling locations were in areas that seasonally contain surface water but were dry at the time of sampling. This low lying area west of the landfill receives storm water runoff from a culvert under Interstate 87. The sediment sampling locations are shown on Figure 2, Site Plan and Sampling Locations Map.

The sediment samples were collected using a field cleaned (refer to Section 2.9) stainless steel trowel and new clean disposable gloves were worn at each sampling location. The vegetative cover was removed and the sediment sample was collected from 0 to 6 inches below the vegetative cover. The sediment sample was immediately placed into pre-cleaned laboratory-supplied glass containers with Teflon-lined lids for TCL SVOCs, TCL PCBs, TAL metals, cyanide, TCL pesticides and RCRA herbicides analyses. The containers were labeled appropriately and placed into a cooler containing bagged ice. The sample identification, time, date, and analyses were recorded on the chain of custody record form. Field QC samples including equipment blank, field duplicate and MS/MSD were collected as described in Section 2.12.2.

Additional sediment was also placed in a sealable plastic bag and field screened for VOC vapors with a Photovac MiniRae-2000 photoionization detector (PID) meter that was calibrated daily in accordance with the manufacturer's instructions. The sample was allowed to equilibrate to ambient temperature (placed in heated van), then shaken, then the bag was pierced and the reading taken. The PID readings were recorded on Organic Vapor Headspace Analysis Logs which are presented in Appendix B. The sediment samples PID screening results are discussed in Section 4.2.2.

2.3 Test Pit Investigation

2.3.1 Waste Delineation

Forty-three exploratory test pits (TP-1 to TP-22) were advanced around the perimeter of the landfill with a track excavator (Kobelco 115 SR DZ) between October 22 through October 30, 2001. Precision Industrial Maintenance, Inc. (PIM) of Schenectady, New York provided access to the test pits and decontamination of the excavator bucket, where necessary. PIM subcontracted the actual test pit excavations to Cedar Hill Trucking, Inc. of Selkirk, New York who provided the excavator and operator for advancing the test pits.

The purpose of the test pits was to better define the extent of waste deposition associated with the former operation of the landfill. As such, each test pit was started outside the footprint of the landfill mass based on topographic observations and continued trench like until the waste was encountered. In some cases, the waste was encountered at the start and therefore, the test pit was moved until the waste diminished. Once the edge of the waste was determined field personnel field staked these locations with the test pit identification number for subsequent location by the survey crew. The soil encountered during the test pit excavations was classified using the Unified Soil Classification System in general accordance with ASTM D-2488, Standard Practice for Description and Identification of Soils. This information was recorded on a Test Pit Log along with the depth, thickness and description of the type of waste encountered, the approximate size and depth of the test pit, and whether groundwater was encountered. The test pit locations are shown on Figure 2, Site Plan and Sampling Locations Map, and represent the limit of waste at that location. Test Pit Logs are presented in Appendix C.

In general, the waste encountered during the test pits consisted of municipal solid waste (MSW). However, in an area on the east side of the landfill and in an area on the west side (northern half) of the landfill other types of waste material were encountered. Construction and demolition (C & D) debris waste, compressed paper and bulky waste (car parts, appliances) were encountered on the north end of the 55 Luzerne Road property (area of test pits TP-18A, TP-19 and TP-19A, Figure 2) adjacent to the east side of the landfill property. It is possible that some of this material could be from the previous operations at 55 Luzerne Road and 53 Luzerne Road (i.e., Luzerne Road Site), which reportedly included a cement block company, recycling facility and junk yard. A 1966 aerial photograph of the area (Appendic D.1) provided by the City was reviewed and shows a well defined line between the landfill and adjacent property at 55 Luzerne Road. The northern portion of 55 Luzerne Road is shown to be disturbed and materials can be seen stored on both the 55 and 53 Luzerne Road properties.

An ash, slag, glass and cinders material (ash material) mixed with sand was encountered on the State of New York property adjacent to and west of the western side of the landfill property line (the northern half). Additional test pits were advanced as necessary to assist in the delineation of the ash material. The ash material extended to the bottom of the swale along the east shoulder of Interstate 87. The ash material, in most cases did not appear to be mixed with municipal solid waste (MSW). City representatives interviewed regarding the findings have indicated that refuse was burned at the landfill in the early days. A New York State Department of Transportation (NYSDOT) representative interviewed regarding the findings provided a map (Appendix D.2) that showed the general area where the ash material was encountered was used for disposal of waste material from the construction of Interstate 87, which occurred in the early 1960's. The City of Glens Falls provided photographs

(Appendix D.3) taken of the landfill and surrounding area in 1977 to 1978. The photographs showed that the area of the ash material had a vegetative cover with a substantial growth of pine trees and other trees indicating that the area had not been disturbed for some time. The approximate limits of the ash material, based on the findings of the test pit excavations, is shown on Figure 2.

The depth of the ash material and refuse encountered during the test pit excavations along with the locations where samples were collected for laboratory analyses is presented in Table 2.3.1-1, Summary of Test Pit Program.

Table 2.3.1-1
Summary of Test Pit Program
Glens Falls Municipal Landfill at Luzerne Road
Remedial Investigation

Test Pit ID	Total Depth (ft bgs)	Depth of Refuse (ft bgs)	Sample Interval Analyzed in Lab (ft bgs)
TP-1	15	1-2	None
TP-2	15	2-4	None
TP-3	14	1-11	None
TP-3A	10	2-3	None
TP-4	15	2-8	None
TP-5	15	1.5-3 (1)	None
TP-5A	15	0-15 (1)	None
TP-6	12	1-2 (1)	None
TP-6A	5	1-5 (1)	None
TP-6B	7	0-7 (1)	5-6
TP-7	6	1-1.5 (1)	None
TP-7A	4	1-4 (1)	None
TP-7A1	13	0-9 (1)	8-9 (2)
TP-7B	3	1-3 (1)	None
TP-7D	8	None	None
TP-8	14	0-3	None
TP-8A	12	2-3 (1)	None
TP-8A1	3.5	0-3 (1)	1-3 (3)
TP-8B	4	1.5-3 (1)	None
TP-8B1	4	2-4 (1)	None

Table 2.3.1-1
Summary of Test Pit Program
Glens Falls Municipal Landfill at Luzerne Road
Remedial Investigation

Test Pit ID	Total Depth (ft bgs)	Depth of Refuse (ft bgs)	Sample Interval Analyzed in Lab (ft bgs)
TP-8B2	13	0-12 (1)	None
TP-8C	15.5	0-15 (1)	9-10
TP-9	12	1-3	None
TP-9A	9	1-3	None
TP-9B	14	0-1	None
TP-10	15	1-2	None
TP-10A	8	1-4	None
TP-11	15	1-2	None
TP-12	11	1-5	None
TP-13	11	0.5-3.5	3.5-4.5
TP-13A	15	6-8	None
TP-14	11	3.5-4.5	None
TP-14A	10	5-6	None
TP-15	16	5-6	6-7
TP-16	16	5-6	None
TP-17	15	0-4.5	4.5-5
TP-18	16	2-10	None
TP-18A	12	0-3	None
TP-19	15	1-5	5-6
TP-19A	15	5-7.5	None
TP-20	15	2-3	3-4
TP-21	15	2-4	None
TP-22	15	2-7	7-8

(1) Only ash material encountered.

(2) The laboratory sample was collected from a test pit advanced adjacent to the original test pit, but performed on a later date. The laboratory sample identification was TP-7A, not TP-7A1.

(3) The laboratory sample was collected from a test pit advanced adjacent to the original test pit, but performed on a later date. The laboratory sample identification was TP-8A, not TP-8A1.

ft bgs is feet below ground surface.

Based on the findings of the test pit excavations, the horizontal extent of the waste mass encountered was plotted and is shown on Figure 2. The approximate limit of refuse/waste and ash material and the property line information from the boundary survey (Drawing No. 01-601, sheet 1 of 1) were combined to determine where waste extends onto adjoining properties. As shown on Figure 3, Waste Delineation Map, the waste mass appears to extend onto a small portion of the Northway Self Storage property to the north (±0.033 acres), onto the City of Glens Falls property to the northeast (±1.34 acres), onto a small portion of the Niagara Mohawk Power Corporation property (±0.012 acres) and the 55 Luzerne Road property (±0.66 acres, Lands Now or Formerly of Fred H. Alexy and Jane A. Alexy) to the east, and onto the State of New York property (±0.79 acres) and Niagara Mohawk Power Corporation property (±0.079 acres) to the west. The area of ash material is mostly located on the State of New York property to the west (northern half, ±2.72 acres) and a small portion on the Niagara Mohawk Power Corporation property to the west (±0.017 acres). The area of waste mass (not ash material) extending onto adjoining properties, including the City of Glens Falls property, encompasses approximately 2.92 acres. The area of ash material on adjoining properties encompasses approximately 2.74 acres. Since performance of the boundary survey on the Glens Falls Municipal Landfill it has come to C.T. Male's attention through Mr. Fred Alexy that the 55 Luzerne Road property and a portion of the 53 Luzerne Road property have been sold to Bare Bones Furniture.

2.3.2 Subsurface Soil Sampling and Analyses

Subsurface soil samples were collected from six select test pits advanced on the east side of the landfill waste mass between October 22 and 24, 2001. The test pits sampled were TP-13 (3.5 to 4.5 feet), TP-15 (6 to 7 feet), TP-17 (4.5 to 5 feet), TP-19 (5 to 6 feet), TP-20 (3 to 4 feet) and TP-22 (7 to 8 feet), which are on the downgradient side of the waste mass, in accordance with Figure 5 of the approved Work Plan. Subsurface soil samples were collected from these test pit locations to correspond to areas downgradient of where PCBs were previously detected along the old Haul Road during the 1996 supplemental investigations performed by NYSDEC. In general, the soil samples were collected and analyzed from soil present at the base of the waste mass. The test pit locations are shown on Figure 2.

The subsurface soil samples were collected by first locating the edge of refuse. Then the soil immediately downgradient of and below the tapered edge of the waste mass was collected within the excavator bucket. The grab soil sample was collected using a field cleaned (refer to Section 2.9) stainless steel trowel from the center of the excavator bucket. New clean disposable gloves were worn at each sampling location. The soil sample was immediately placed in a pre-cleaned laboratory-supplied glass container with a Teflon-lined lid for TCL PCBs analyses. The container was labeled appropriately and placed in a cooler containing bagged ice. The sample identification, time, date and analyses were recorded on the chain of custody record form. Field QC samples including equipment blank, field duplicate and MS/MSD were collected as described in Section 2.12.2.

At the test pits where soil samples were collected for laboratory analyses, additional soil was also placed in a sealable plastic bag and field screened for VOC vapors with a Photovac MiniRae-2000 PID meter. The PID meter was calibrated daily in accordance with the manufacturer's instructions. The sample was allowed to equilibrate to ambient temperature (placed in heated van), then shaken, then the bag was pierced and the reading taken. The PID readings were recorded on Organic Vapor Headspace Analysis Logs which are presented in Appendix B. The test pit samples PID screening results are discussed in Section 4.3.1.

2.3.3 Ash Material Sampling and Analyses

Four subsurface ash material samples were collected on October 30, 2001 from select test pits advanced on the western side of the waste mass (off-site). The test pits sampled were TP-6B (5 to 6 feet), TP-7A1 (8 to 9 feet), TP-8A1 (1 to 3 feet) and TP-8C (9 to 10 feet). Refer to Figure 2 for the test pit locations.

The ash material samples were collected within the excavator bucket. While wearing new clean disposable gloves at each location, a grab sample of the ash material was collected from the center of the excavator bucket. The ash material sample was immediately placed in pre-cleaned laboratory-supplied glass containers with Teflon-lined lids for TCL SVOCs, TCL PCBs, TAL metals, cyanide, and hazardous waste characteristics analyses. The containers were labeled appropriately and placed in a cooler containing bagged ice. The sample identification, time, date and analyses were recorded on the chain of custody record form. Field QC samples including equipment blank, field duplicate and MS/MSD were collected as described in Section 2.12.2.

2.3.4 Ambient Air Monitoring

As required by NYSDOH, air monitoring was performed during the exploratory test pits, the only field activities that were ground intrusive. The air monitoring consisted of real time monitoring for VOCs and particulate (i.e., dust) at the designated monitoring stations in general accordance with the NYSDOH Generic Community Air Monitoring Plan. The purpose of the air monitoring was to provide a measure of protection for the downwind community such as residences, businesses and on-site workers not involved in the subject site from potential airborne contaminant release. It also provides documentation to confirm that work activities did not spread contamination downwind (i.e., off-site) through air.

The VOC air monitoring was performed with a Photovac MiniRae-2000 hand held VOC monitor operating in its industrial hygiene mode which is capable of monitoring short term exposure limit (STEL), time weighted average (TWA), and low/high peak values. The dust air monitoring was performed with a MIE DR-2000 portable aerosol monitor that measures concentrations of airborne dust, smoke, mists, haze and fume.

During the performance of the test pits, the ambient air was periodically monitored for VOCs in the breathing zone of the immediate work area and continuously monitored at downwind locations of the work area. The air monitoring with the PID did not record any readings (STEL or direct reading) above background levels which were always noted at zero parts per million.

Continuous air monitoring for particulate levels was also performed at temporary monitoring stations on the basis of wind direction. Two stations, one upwind and one downwind of the work area, were monitored using manned portable aerosol monitors. The monitors record a minimum, maximum and an average particulate level every 10 seconds and calculates a STEL accordingly. The monitoring stations were checked for particulate levels greater than 150 ug/m^3 (STEL) above the upwind monitoring station levels. Additionally, each monitor is alarmed at a STEL of 150 ug/m^3 in the event the unit was unmanned at the time of an exceedance. The monitors logged the data and were downloaded to a computer at the end of each workday and checked for elevated particulate levels.

Two station particulate air monitoring was performed on October 23 and 24, 2001. Due to delivery problems and equipment failure only one particulate air monitor was utilized for the monitoring during a portion of the test pit activities on October 22, 25, 26 and 30, 2001. With only one particulate monitor, at the start of the workday and periodically throughout the day the downwind monitor was moved to the upwind location (prior to the start of an individual test pit excavation) to evaluate the site's background conditions. Based on review of the recorded results, there were occasional direct readings above 150 ug/m^3 at the downwind monitoring stations generally less than five minutes in time, none of which caused the instrument to alarm for its STEL of 150 ug/m3. Additionally, some of the times in which the readings were elevated, there were no excavation activities being performed at that time. Otherwise, since these readings were isolated and quickly subsided, particulate levels were under control and did not require action to suppress the dust.

2.3.5 Inventory of Abandoned Drums, Contents, Sampling and Analyses

Thirty-one abandoned drums were observed on the landfill waste mass, six of which were buried within test pit TP-17 and three of which were partially buried within test pit TP-4. The remaining twenty-two drums were located across the landfill waste mass, some individually located and others grouped together. Field personnel field staked the locations of the abandoned drums with an identification number for subsequent location by the survey crew. The locations of the drums are shown on Figure 2, Site Plan and Sampling Locations Map. In general the drums did not have any visible markings, were rusted, and appeared to be empty or contained a hard white material. The hard white material had the appearance of a hardened enamel/epoxy material. A hammer and chisel were needed to facilitate sampling the material and the material would shatter into pieces when pressure was applied with the chisel and hammer. A description and condition of the abandoned drums encountered is presented in Table 2.3.5-1.

Table 2.3.5-1
Inventory of Abandoned Drums
Glens Falls Municipal Landfill at Luzerne Road
Remedial Investigation

Location/ Drums Stake ID	Number of Drums	Location	Description and Condition
TP-17	± 6	TP-17	Buried, rusted, intact. One drum broke open during digging and contains hard white material.
#1	1	± 10′ west of TP-17	Rusted, pitted, contains hard white material.
#2	3	± 5′ west of TP-17	(2) Rusted, pitted, contains hard white material. (1) Rusted, pitted, crushed.
#3	1	± 30′ southwest of TP-12	Rusted, intact, felt empty.
#4	5	± 15′ west of TP-10, drums scattered over ± 20′ x 50′ area	(1) Rusted, intact, contains rags and hard white material (hard white material also on ground). (1) Rusted, pitted, partially crushed, appeared empty. (1) Rusted, pitted, partly buried, contains hard white material.

Table 2.3.5-1
Inventory of Abandoned Drums
Glens Falls Municipal Landfill at Luzerne Road
Remedial Investigation

Location/ Drums Stake ID	Number of Drums	Location	Description and Condition
			(1) Rusted, crushed, felt empty. (1) Rusted, crushed, partially buried, appeared empty.
#5	1	± 75′ south of TP-4	Rusted, intact, contains hard white material and yarn.
#6	1	± 60′ south of TP-4	Rusted, pitted, contains hard white material.
#7	2	± 50′ south of TP-4	(2) Rusted, pitted, contains hard white material.
#8	2	± 25′ south of TP-4	(1) Rusted, pitted, contains hard white material. (1) Rusted, pitted, contains paper.
TP-4	± 3	TP-4	(2) Rusted, pitted, buried. (1) Rusted, pitted, buried, contains hard white material.
#9	3	± 25′ north of TP-4	(1) Rusted, intact, partially crushed. (2) Rusted, intact, empty.
#10	3	± 25-75′ north of TP-3	(1) Rusted, pitted, crushed, appeared empty. (1) Rusted, intact, partly crushed. (1) Rusted, intact, partially crushed, empty.

Three samples of the contents of the abandoned drums were collected for laboratory analysis on November 8, 2001. Eleven drums were observed to contain waste, which consisted of a hard white material. As approved by NYSDEC, one grab and two composite samples were taken of the contents of the eleven drums. Each composite sample consisted of a composite of the contents from five drums. The sampling was performed with the aid of a field cleaned (refer to Section 2.9) hammer and chisel, field cleaned stainless steel trowel and field cleaned stainless steel mixing bowl used to composite the sample, where applicable. New clean disposable gloves were worn at each sampling location. The samples were placed in pre-cleaned laboratory-supplied glass containers with Teflon-lined lids for hazardous waste characteristics analyses. The containers were appropriately labeled and placed in a cooler containing bagged ice.

The sample identification, time, date and analyses were recorded on the chain of custody record form.

The grab sample was taken of the hard white material located in the drum with stake ID Drums #6. One of the composite samples was a composite of the hard white material located in the drums with stake IDs Drums #5, #7, #8 and TP-4. The other composite sample was a composite of the hard white material located in the drums with stake IDs Drums #1, #2 and #4. When sampling the waste material, the TCLP VOCs sample container was filled first by transferring a representative portion of the waste directly into the sample container using a field-cleaned stainless steel trowel. Then the remaining TCLP analyses container and the corrosive, ignitable and reactive characteristics sample container were filled. For the TCLP VOC composite samples there was no mixing (i.e., each sample container of the composite sample was filled with approximately 1/5 the container's volume from each drum). For the remaining analyses, an approximate equal volume of the hard white material was taken from the 5 drums and put it in a clean stainless steel mixing bowl and homogenized/mixed using a field-cleaned stainless steel trowel before transferring the homogenized material to the sample containers.

2.4 Groundwater Investigation

2.4.1 Soil Borings

Eight soil borings (B-101-6S to B-101-10S) were completed between October 30, 2001 and November 13, 2001 around the perimeter of the landfill waste mass to collect soil samples for PID screening and laboratory analyses, and to facilitate the installation of groundwater monitoring wells (MW-101-6S to MW-101-10S). The soil borings and monitoring well installations were completed by Environmental Drilling New York, LLC of South Glens Falls, New York. The work was supervised by a Geologist from C.T. Male Associates, P.C. The soil boring locations are consistent with those depicted in Figure 4 of the approved Work Plan. The locations were adjusted slightly, with the concurrence of Mr. Dylan Keenan of NYSDEC, to account for the waste mass extending out further than anticipated based on the findings of test pit excavations. The downgradient soil boring/monitoring well locations were selected to correspond to areas downgradient of where PCBs were previously detected along the old Haul Road during the 1996 supplemental investigations performed by NYSDEC.

The soil boring/monitoring well installations are shown on Figure 2, Site Plan and Sampling Locations Map. Table 2.4.1-1 provides a summary of the boring program including boring ID, grade elevation, total depth, number of soil samples collected, and number of samples analyzed in the laboratory.

Table 2.4.1-1
Summary of Soil Boring Program
Glens Falls Municipal Landfill at Luzerne Road
Remedial Investigation

Boring ID	Elevation [(1)] @ Grade (ft)	Total Depth (ft bgs)	Number of Soil Samples Collected	Number of Samples Analyzed in Laboratory (Interval, ft bgs)
B-101-6S	377.45	26.0	None	None
B-101-6I	377.28	52.5	26	1 (0′-6′)
B-101-7S	370.04	18.0	None	None
B-101-7I	369.91	44.5	22	1 (0-6′)
B-101-8S	379.49	28.5	None	None
B-101-8I	379.43	53.0	26	1 (0-6′)
B-101-9S	379.79	28.0	14	1 (0-6′)
B-101-10S	371.56	18.0	9	1 (0-6′)

(1) Elevations are reference to NGVD 1929.
ft bgs is feet below ground surface.

2.4.1.1 Boring Advancement

An Acker 82 Soil Max truck-mounted drill rig was used to advance the soil borings except at soil borings B-101-8I and B-101-10S. A CME 55 truck-mounted drill rig was initially utilized at soil boring B-101-8I, the first soil boring advanced. However, due to the presence of running sands, this rig could not continue to turn the augers beyond 40 feet below grade. The CME 55 was replaced with the Acker 82 Soil Max drill rig, and the drilling was continued using casing instead of augers. Soil boring B-101-10S was located in a wooded area west of the landfill and not accessible to the Acker 82 Soil Max drill rig, therefore, an all-terrain Kendrick track rig was used at this location.

The borings were advanced using 4.25-inch inside diameter (ID) hollow-stem augers. At the intermediate depth soil borings (B-101-6I, B-101-7I, and B-101-8I), advancing the augers were difficult because of running sands, therefore, the augers were switched to 4-inch diameter casing once the running sands were encountered. The augers were switched to casing at 38 feet at B-101-6I, 30 feet at B-101-7I and 40 feet at B-101-8I. The drilling method implemented with the casing was hammering the casing to the desired depth and also using a roller bit to clean out the casing as appropriate.

2.4.1.2 Soil Sampling and Analyses

Continuous split-spoon samples were collected at the deepest well of each monitoring well pair and at the single shallow monitoring wells. The subsurface soil samples were collected using standard split-barrel samplers (split-spoons), which are two inches in diameter and two feet long. The split-spoon samplers were advanced inside the hollow-stem augers or casing with a 140-pound hammer dropped from a 30-inch height via an automatic hammer in accordance with ASTM D1586, Standard Method for Penetration Test and Split-Barrel Sampling of Soils.

The split-spoon samples were collected using the following procedure: A field-cleaned (refer to Section 2.9) split-spoon sampler and new clean disposable gloves were used for each sampling interval. The recovered split-spoon sampler was placed on clean polyethylene sheeting and opened. Using gloved hands, a portion of the soil was placed in a sealable plastic bag for field screening with a PID, and where applicable a portion was placed in a field-cleaned (refer to Section 2.9) stainless steel mixing bowl to be composited for laboratory analysis. The remaining soil in the split-spoon was classified using the Unified Soil Classification System in general accordance with ASTM D-2488, Standard Practice for Description and Identification of Soils. The physical description of the soil including grain size, color, odors, staining, moisture content and firmness, and the geologic description of the soil were recorded on a Subsurface Exploration Log. The Subsurface Exploration Logs are presented in Appendix E.

A portion of the soil from the first three samples or the upper six feet of overburden soils was placed in the field-cleaned stainless steel mixing bowl. The soil was then homogenized with a field-cleaned (refer to Section 2.9) stainless steel trowel and placed in a pre-cleaned laboratory-supplied glass container with a Teflon-lined lid for TCL PCBs analyses. The container was labeled appropriately and placed in a cooler containing bagged ice. The sample identification, time, date and analyses were recorded on the chain of custody record form. Field QC samples including equipment blank, field duplicate and MS/MSD were collected as described in Section 2.12.2.

The soil placed in a sealable plastic bag was field screened for VOC vapors with a Photovac MiniRae-2000 PID meter that was calibrated daily in accordance with the manufacturer's instructions. The sample was allowed to equilibrate to ambient temperature (placed in heated van), then shaken, then the bag was pierced and the reading taken. The PID readings were recorded on Organic Vapor Headspace Analysis Logs which are presented in Appendix B. The soil boring soil samples PID screening results are discussed in Section 4.3.2.

The soil cuttings and left over soil sample volume from each soil boring were stored on-site in labeled 55-gallon drums and managed as described in Section 2.11.

2.4.2 Monitoring Well Installations and Development

Eight groundwater monitoring wells (MW-101-6S to MW-101-10S) were installed in the soil borings advanced as part of this RI. Of these, three sets of a shallow and intermediate monitoring well pair and two single shallow monitoring wells were installed. The monitoring wells were installed by Environmental Drilling New York, LLC between November 1, 2001 and November 13, 2001.

2.4.2.1 Monitoring Well Installations

The monitoring wells were installed inside the hollow-stem augers or the casing. The wells were constructed of 2-inch inside diameter, flush-threaded joint, Schedule 40 PVC riser pipe, screen, bottom plug, and gripper cap. The screen type used was 0.010-inch slot screen that was 10 feet long in the five shallow wells and 5 feet long in the three intermediate wells. Each PVC section used was pre-cleaned, wrapped in plastic at the factory and no glues were used in their construction.

Once the augers or casing had reached the desired depth, one to one and a half foot layer of Filpro Industrial Quartz Sand with a grain size of #0 or #1 was placed into the bottom of the borehole. The PVC sections were assembled and lowered into the borehole and set on top of sand at the bottom of the borehole. The annular space around the well screen was then packed with Filpro Industrial Quartz Sand with a grain size of #0. This sand pack was extended 2 feet above the top of the screen followed by a one-half to one foot layer of Filpro Industrial Quartz Sand with a grain size of #000 (finer than #0). In general, the sand was added to the annular space of the augers or casing while the augers or casing were being pulled out of the borehole and the depth of sand being monitored with a tape measure.

A 3-foot bentonite seal was installed in the annulus on top of the screen sand pack (i.e., above the #000 sand). The bentonite seal consisted of bentonite chips (pellets) from Holeplug or Polymer Drilling System. Water was added to the pellets where necessary and time was allowed for hydration to occur. A cement/bentonite grout was made from Portland Cement (Type I/II), Quik-Gel Bentonite power, and water. The grout was tremied into the annular space and displaced the formation water as the casing or augers were removed. A protective steel guard pipe was set into an approximate 2-foot diameter grout pad with at least 2 feet of the guard pipe below grade and a minimum 2 feet of stick-up.

The monitoring wells were labeled accordingly and locked. A permanent mark was made at the top of the PVC riser to serve as a datum for all subsequent water level measurements and as a reference point for the survey crew. A Monitoring Well Construction Log was completed for each well, which documents the well construction details, and are presented in Appendix F. A summary of the monitoring well installation information is presented in Table 2.4.2.1-1. The monitoring wells were constructed in general accordance with applicable 6 NYCRR Part 360 requirements.

Table 2.4.2.1-1
Summary of Monitoring Well Installations
Glens Falls Municipal Landfill at Luzerne Road
Remedial Investigation

Monitoring Well ID(1)	Total Depth (ft bgs)	Screened Interval (ft bgs)	Screen Length (ft)	Sand Pack Interval (ft bgs)	Bentonite Seal Interval (ft bgs)	Elevation TOC(2) (ft above MSL)	Ground Elevation(2) (ft above MSL)
MW-101-6S (B-101-6S)	26	15-25	10	12-26	9-12	380.17	377.45
MW-101-6I (B-101-6I)	52.5	46-51	5	43-52.5	40-43	379.86	377.28
MW-101-7S (B-101-7S)	18	7-17	10	4-18	1-4	372.80	370.04
MW-101-7I (B-101-7I)	44.5	38-43	5	35-44.5	31.5-35	371.75	369.91
MW-101-8S (B-101-8S)	28.5	17-27	10	14-28.5	11-14	382.11	379.49
MW-101-8I (B-101-8I)	53	47-52	5	43-53	40-43	381.95	379.43
MW-101-9S (B-101-9S)	28	17-27	10	14-28	11-14	382.42	379.79
MW-101-10S (B-101-10S)	18	6.5-16.5	10	4-18	1-4	373.90	371.56

(1) The corresponding boring ID is identified in parentheses.

(2) Elevations are referenced to NGVD 1929.
ft bgs is feet below ground surface.
MSL is mean sea level.
TOC is top of casing (i.e., PVC riser pipe).

The damaged guard pipe at existing monitoring well MW-101-5 was removed and replaced on November 14, 2001 by Environmental Drilling New York, LLC. The old concrete pad was dug out and the damaged guard pipe cut and removed. A new grout pad was poured in a 3-foot deep by 2.5-foot diameter hole dug around the well and a new 5-inch diameter, 6-foot long guard pipe was set into the grout approximately 3 feet below grade and with 3 feet of stick-up.

2.4.2.2 Monitoring Well Development

The eight new monitoring wells and the five existing monitoring wells (MW-101-1 to MW-101-5) that were going to be sampled were developed using similar procedures. The well development was completed between November 13 to 15, 2001, which was no sooner than 24 hours after installation. The monitoring wells were first surged with a field-cleaned (refer to Section 2.9) stainless steel bailer or a field-cleaned Grundfos Red-Flo2 submersible pump to remove sediments from the well screen and sand pack to restore the natural hydraulic conductivity of the formation. The wells were then purged a minimum of five well volumes using a stainless steel bailer, a Grundfos Red-Flo2 electrical submersible pump, or a Geopump Series II peristaltic pump to remove residual sediment within the wells thereby reducing the turbidity. New clean tubing was used at each well location where the submersible and peristaltic pumps were used. Table 2.4.2.2-1 contains a Summary of Monitoring Well Development Data.

Table 2.4.2.2-1
Summary of Monitoring Well Development Data
Glens Falls Municipal Landfill at Luzerne Road
Remedial Investigation

Monitoring Well ID	Date Developed	Total Depth (ft below TOC)	Depth to Water (ft below TOC)	Total Purged (gal)	Purged Well Volumes	Initial Turbidity (NTU)	Ending Turbidity (NTU)
MW-101-1	11/14/01	28.45	24.35	4	6.1	>200	11.6
MW-101-2	11/14/01	25.62	20.67	6	7.5	>200	>200
MW-101-3	11/15/01	25.02	20.20	5	6.3	>200	>200
MW-101-4	11/14/01	14.90	8.75	5	5	178.4	6.53
MW-101-5	11/15/01	25.95	21.20	5	6.6	>200	21.4
MW-101-6S	11/13/01	27.44	20.52	6	5.5	>200	1.80
MW-101-6I	11/15/01	53.42	20.35	30	5.7	>200	17.5
MW-101-7S	11/13/01	20.20	14.38	5	5.4	>200	2.52
MW-101-7I	11/15/01	45.20	13.38	30	5.9	>200	7.6
MW-101-8S	11/14/01	30.30	23.00	6	5	>200	17.43
MW-101-8I	11/15/01	53.40	22.60	30	6.1	>200	32.2
MW-101-9S (1)	11/14/01	29.72	23.03	11	10	>200	>200
	11/15/01	29.72	23.08	2.5	2.3	>200	44.5
MW-101-10S	11/15/01	18.30	10.96	6	5	>200	1.73

(1) Well initially developed with stainless steel bailer on 11/14/01, and then purged with peristaltic pump on 11/15/01 to remove sediment in bottom of well and reduce turbidity.
TOC is top of casing (i.e., PVC riser pipe).

For the shallow monitoring wells, a field-cleaned stainless steel bailer or disposable plastic bailer (MW-101-6S only) attached to new clean rope was used to surge the well. This was accomplished by rapidly raising and lowering the bailer within the screened interval of the monitoring well. The bailer was then used to purge at least five well volumes from monitoring wells MW-101-2, MW-101-3, MW-101-5 and MW-101-9S. A peristaltic pump was used in lieu of a bailer to purge at least five well volumes from monitoring wells MW-101-1, MW-101-4, MW-101-6S, MW-101-7S, MW-101-8S and MW-101-10S. Due to field conditions and adjustments made on-site, the shallow monitoring well development procedures were slightly altered as follows:

- Existing monitoring well MW-101-4 had an obstruction in the well that prevented a 2-inch bailer (only size available on-site at the time) from reaching the water table/screened interval. Therefore, the well was surged by oscillating the field-cleaned water level meter probe and the peristaltic pump tubing up and down the screened interval of the well while purging.
- The peristaltic pump was used to purge two additional well volumes from monitoring well MW-101-9S, since the turbidity remained high from the stainless steel bailer efforts.

For the intermediate monitoring wells MW-101-6I, MW-101-7I, MW-101-8I, a Grundfos Red-Flo2 submersible pump and new clean tubing was used to surge each monitoring well. This was accomplished by raising and lowering the pump within the screened interval of the monitoring well. The pump was then used to purge the monitoring well of at least five well volumes.

During the well development procedures, the field parameters of pH, conductivity, temperature and turbidity were checked at each monitoring well after the initial surging efforts and after each well volume was removed. The equipment used for measuring the field parameters was calibrated daily according to the manufacturer's specifications. The development water from each monitoring well was stored on-site in labeled 55-gallon drums and managed as described in Section 2.11.

2.4.3 Groundwater Sampling and Analyses

Two groundwater sampling events were completed, one between November 26 and 28, 2001 and the other between March 4 and 6, 2002. Each sampling event included sampling and analyses of groundwater collected from the eight monitoring wells installed as part of this RI and the five existing monitoring wells. As requested by NYSDEC, on August 20, 2002 monitoring well MW-101-1 was re-sampled for VOCs only. In general, all of the monitoring wells were purged of at least three well volumes with a bailer, a Geopump Series II peristaltic pump or a Grundfos Red-Flo2 submersible pump and allowed to recharge to at least 90% of static water level height. Once the well recovered, laboratory samples were collected using a new clean disposable bailer at each monitoring well location.

2.4.3.1 Water Level Measurements

Water level measurements were collected on November 19, 2001, December 4, 2001, and February 27, 2002. Water level measurements were also taken prior to and during the groundwater sampling events to determine the standing water column height, so that the well water volume could be calculated. Upon arrival at each monitoring well, the well was observed for any damage, the cover of the stick-up protective guard pipe was cleared of any debris/vegetation and unbolted or unlocked. Non-vented well caps were removed allowing the water column to reach static conditions prior to taking the water level measurement.

Water levels were measured in the monitoring wells using a water level indicator probe (Solinst Model 101). The water levels in each well were measured from a surveyed reference point (top of PVC casing) to the nearest 0.01 foot with a clean water level meter. After each measurement, the water level probe and cable were decontaminated with an Alconox/tap water solution, then thoroughly rinsed with tap water, and then rinsed with distilled water prior to reuse at another location.

2.4.3.2 Monitoring Well Purging

Each monitoring well was purged of at least three well volumes prior to collecting groundwater samples for laboratory analyses. At each well, clean polyethylene plastic was placed on the ground surface around the well to prevent any purging and sampling equipment contamination. The equipment for measuring field parameters was calibrated daily according to the manufacturer's specifications. The wells were purged with a new clean disposable bailer, a field-cleaned (refer to Section 2.9) stainless steel bailer, a Geopump Series II peristaltic pump or a field-cleaned Grundfos Red-Flo2 submersible pump. A new clean piece of polypropylene rope and either new or dedicated (from well development) polyethylene tubing was used at each individual well. New polyethylene tubing was used to purge the monitoring wells during the March 2002 sampling event. A summary of the purge data including monitoring well ID, date, purge method, and gallons and well volumes purged is presented in Table 2.4.3.2-1.

Table 2.4.3.2-1
Summary of Monitoring Well Purging Data
Glens Falls Municipal Landfill at Luzerne Road
Remedial Investigation

Monitoring Well ID	Date Purged	Purge Method	Total Depth (ft below TOC)	Initial Depth to Water (ft below TOC)	Total Purged (gal)	One Well Volume (gal)	Well Volumes Purged
November 2001 Sampling Event							
MW-101-1	11/27/01	Peristaltic Pump	28.45	24.56	4.00	0.70	5.71
MW-101-2	11/26/01	Peristaltic Pump	25.62	20.97	2.50	0.74	3.38
MW-101-3	11/26/01	Peristaltic Pump	25.02	20.46	4.00	0.73	5.48
MW-101-4	11/27/01	Peristaltic Pump	14.90	8.93	3.00	1.00	3.00
MW-101-5	11/28/01	Peristaltic Pump	25.95	21.44	3.00	0.80	3.75
MW-101-6S	11/27/01	Peristaltic Pump	27.44	20.80	5.00	1.10	4.55
MW-101-6I	11/27/01	Disposable Bailer	53.45	20.50	16.00	5.30	3.19
MW-101-7S	11/27/01	Peristaltic Pump	20.20	14.56	3.00	0.90	3.33
MW-101-7I	11/27/01	Submersible Pump	45.20	13.52	15.50	5.01	3.09
MW-101-8S	11/26/01	Peristaltic Pump	30.36	23.12	5.00	1.50	3.33
MW-101-8I	11/27/01	Disposable	54.54	22.80	15.50	5.10	3.04

Table 2.4.3.2-1
Summary of Monitoring Well Purging Data
Glens Falls Municipal Landfill at Luzerne Road
Remedial Investigation

Monitoring Well ID	Date Purged	Purge Method	Total Depth (ft below TOC)	Initial Depth to Water (ft below TOC)	Total Purged (gal)	One Well Volume (gal)	Well Volumes Purged
		Bailer					
MW-101-9S	11/27/01	Peristaltic Pump	29.72	23.22	5.00	1.10	4.55
MW-101-10S	11/26/01	Peristaltic Pump	18.30	11.08	3.50	1.15	3.04
March 2002 Sampling Event							
MW-101-1	03/04/02	Peristaltic Pump	28.45	25.24	3.00	0.51	5.88
MW-101-2	03/04/02	Peristaltic Pump	25.62	21.56	4.00	0.65	6.15
MW-101-3	03/04/02	Peristaltic Pump	25.05	21.24	2.50	0.60	4.17
MW-101-4	03/06/02	Peristaltic Pump	14.90	9.42	3.00	0.88	3.41
MW-101-5	03/05/02	Peristaltic Pump	25.95	21.92	2.50	0.64	3.91
MW-101-6S	03/06/02	Peristaltic Pump	27.44	21.38	3.00	0.97	3.09
MW-101-6I	03/06/02	Stainless Steel Bailer	53.45	21.12	16.00	5.20	3.08
MW-101-7S	03/06/02	Peristaltic Pump	20.20	15.08	3.00	0.82	3.66
MW-101-7I	03/06/02	Disposable Bailer	45.20	14.08	15.00	5.00	3.00
MW-101-8S	03/05/02	Peristaltic Pump	30.36	23.82	4.00	1.05	3.81
MW-101-8I	03/05/02	Stainless Steel Bailer	54.54	23.48	15.00	5.00	3.00
MW-101-9S	03/05/02	Peristaltic Pump	29.72	23.86	3.00	0.94	3.19
MW-101-10S	03/04/02	Peristaltic Pump	18.30	11.66	4.00	1.06	3.77
August 2002 Sampling Event							

Table 2.4.3.2-1
Summary of Monitoring Well Purging Data
Glens Falls Municipal Landfill at Luzerne Road
Remedial Investigation

Monitoring Well ID	Date Purged	Purge Method	Total Depth (ft below TOC)	Initial Depth to Water (ft below TOC)	Total Purged (gal)	One Well Volume (gal)	Well Volumes Purged
MW-101-1	08/20/02	Peristaltic Pump	28.60	24.26	2.5	0.7	3.57

The procedure for purging consisted of measuring the water level and total depth of the well to determine the quantity of one well volume. When a disposable or stainless steel bailer was used to purge the well, rope was tied to the top of the bailer and the bailer was lowered into the well. The bailer was lowered to the bottom of the well, removed from the well and the contents were collected in a graduated five-gallon pail. Where a peristaltic pump was used to purge the well, the polyethylene tubing was inserted in the well, starting at the bottom of the well to remove residual sediment and resetting the tubing near the top of the screen and water column. The peristaltic pump was set at the lowest setting and slowly increased to the maximum of the pump (one liter per minute) and the discharge was collected in a graduated five-gallon pail. The purging procedure for the submersible pump was similar to the peristaltic pump except the pump was placed on the bottom and left on the bottom throughout the purging activity. The discharge was also collected in a graduated five-gallon pail. The field parameters of pH, temperature, specific conductivity, and turbidity were measured initially and then after each well volume was removed. The field parameter measurements taken at completion of the purging and prior to collecting the groundwater samples are discussed in Sections 4.5.1 and 4.5.2. The purge water from each well was stored on-site in labeled 55-gallon drums and managed as described in Section 2.11.

2.4.3.3 Sample Collection Procedures

The groundwater sampling was initiated immediately after well purging, as the purging did not lower the water level in the well much past the static water level. All of the shallow and intermediate monitoring wells were sampled with the same procedure. The groundwater samples were collected at each well with a new disposable bailer using new rope and new clean disposable gloves. The bailer was lowered slowly into the well to minimize sample aeration and turbidity. The sample containers were filled in order of decreasing volatility. The first containers filled were for VOCs, followed in order by PCBs, phenols, leachate indicator parameters, cyanide and then metals. The groundwater was poured from the bailer directly into pre-cleaned sample containers provided by the laboratory, except for metals at MW-101-10S which were collected using a peristaltic pump during the November 2001 sampling event. Monitoring well MW-101-10S was one of the first wells sampled. It was initially planned to collect the metal samples using a peristaltic pump, but then it was decided after sampling MW-101-10S to use the bailer instead of having to switch back and forth between the bailer for the other parameters and the peristaltic pump for the metals.

The containers were labeled appropriately, covered with clear tape to protect the label, and placed in a cooler containing bagged ice. The sample identification, time, date and analyses were recorded on the chain of custody record form. Field QC samples including equipment blank, field duplicate, MS/MSD and transport blanks were collected during each groundwater sampling event as described in Section 2.12.2.

2.4.3.4 Laboratory Analyses

Groundwater samples were analyzed in the laboratory for TCL VOCs (including the top ten TICs), TCL PCBs, TAL metals, cyanide and the 6 NYCRR Part 360 baseline leachate indicator parameters (effective December 31, 1988 and revised May 28, 1991). The

August 20, 2002 sample from monitoring well MW-101-1 was analyzed for TCL VOCs only.

2.5 Surface Water Investigation

Two stream gauges were installed as part of the field survey activities. The stream gauges consisted of a stainless steel rod installed in the ground with the top of the rod surveyed to a known elevation. Both stream gauges were installed within the low lying Federally designated wetland area northeast of the landfill for the purpose of gauging the water level in this area of the site. At the time of RI field investigations, there was no surface water present in this area of the site.

No surface water samples were able to be taken during the RI field investigations as discussed in Section 2.1 since no surface water was present in the proposed surface water sampling locations (low lying Federally designated wetlands area northeast of landfill and low lying area along the west side of the landfill). A sediment sample was taken instead in the low lying wetlands area northeast of the landfill as well as in the low lying area on the west side of the landfill in accordance with the Work Plan.

2.6 Explosive Gas Investigation

An explosive gas investigation was conducted On November 6, 7 and 8, 2001 to identify the presence and concentration of explosive gases at or near the landfill and to determine the extent of actual or potential gas migration off-site. Additional explosive gas monitoring was conducted on February 26 and 27, 2002 on top of the landfill to obtain better coverage and at select perimeter locations where elevated percent LEL readings were measured during the explosive gas investigation conducted in November 2001. The explosive gas sampling points are shown on Figure 2, Site Plan and Sampling Locations Map. The results are discussed in Section 4.6.

The explosive gas investigation was conducted using an Explosimeter Model 361 manufactured by Mine Safety Appliances Company (MSA). Model 361 was chosen due to its ability to detect methane at low levels of the lower explosive limit (LEL); its ability to measure levels of oxygen and hydrogen sulfide; and its use of a battery operated pump to continually draw air into the meter. Results are expressed in percent of LEL; percent oxygen; and part per million (ppm) for hydrogen sulfide. The instrument was calibrated using a MSA calibration test system before each day of use at the site. The instrument has an accuracy of ±3% LEL, ±0.3% oxygen and ±2 ppm hydrogen sulfide.

Explosive gas, oxygen and hydrogen sulfide readings were measured above grade and below grade at each respective location. Above grade readings were measured first by holding the instrument's tubing at approximately two feet above the ground surface. Below grade readings were then measured by using a slam bar to create a hole in the ground surface approximately two feet deep. The slam bar was removed and a glass tube was immediately inserted into the open hole, being careful that no soil entered the tube. Once the glass tube was in-place, sand was pressed around the glass tube, to prevent influence from the outside air. The slam bar was decontaminated (refer to Section 2.9) at the end of each day.

The explosive gas investigation was categorized into three subsets including landfill mass, landfill perimeter and property boundary, and monitoring wells and structures. The frequency of sampling varied for each subset. Explosive gas concentrations were measured approximately every 100 feet around the perimeter of the landfill, at the edge of refuse, for a total of fifty-eight locations. Explosive gas concentrations were measured on a grid pattern across the top of the landfill at approximately 100 to 200 feet spacing, for a total of forty-three locations. The explosive gas concentrations were measured approximately every 1,000 feet around the property boundary of the landfill. This only included five sampling points on the south side of the landfill, as the majority of the boundary samples were completed when the samples for the landfill perimeter were completed.

The concentrations of explosive gases within the existing monitoring wells and the monitoring wells installed as part of the RI were also measured, for a total of seventeen locations. The measurements were taken by opening the well and inserting the instrument's tubing approximately twelve inches into the well. The well cap was then placed back on the well and the measurements were recorded. The ambient air within the three on-site buildings including the attendant's building, compactor building and Quonset hut building was also sampled. In each building the levels of explosive gases, oxygen, and hydrogen sulfide were measured and recorded, first two feet above ground level and then in the breathing zone.

2.7 Surface Leachate Investigation

The surface of the landfill was observed for the evidence of leachate outbreaks on November 6, 2001 in conjunction with the explosive gas investigation. The landfill was traversed at a spacing of approximately 200 feet. There was no evidence of any leachate outbreaks on November 6, 2001 or on any other days that field work was completed at the site.

2.8 Vector Investigation

The surface and area of the landfill were observed for evidence of vectors on November 6, 2001 in conjunction with the explosive gas investigation. No vectors (i.e., rodents, seagulls, etc.) were observed on November 6, 2001 or on any other days that field work was completed at the site. Two animal burrows were identified in the northwest corner of the landfill (Figure 2).

2.9 Decontamination of Drilling and Sampling Equipment

In order to minimize the potential for cross-contamination between sample locations and intervals, standardized equipment decontamination procedures were followed during the sampling of surface soils, sediment, test pits, soil borings, abandoned drum contents, explosive gas and groundwater.

Larger equipment that came in contact with the soil being sampled was decontaminated with a high pressure-high temperature washer (i.e., steam cleaner) prior to the start of work and in between each sampling location. The equipment was also cleaned using the same procedure at the completion of the work before leaving the site to prevent contamination from leaving the site. The equipment that underwent steam cleaning included the Kobelco 115 SR DZ excavator, the drill rigs (CME 55, Acker 82 Soil Max, and Kendrick Track Rig), the hollow stem augers, the casing, the drill rods, and miscellaneous tools. The steam cleaning occurred at several locations around the site. These locations were all on the landfill surface and were chosen because they allowed the decontamination fluids to infiltrate back into the landfill. The steam cleaning of the excavator was done by Precision Industrial Maintenance (PIM) while the drill rigs and equipment were steam cleaned by Environmental Drilling New York.

The excavator was steam cleaned between each test pit for the initial test pits. On October 23, 2001, Mr. Dylan Keenan of NYSDEC verbally informed C.T. Male that it was not necessary to decontaminate the excavator between each test pit unless we encountered oily or otherwise grossly contaminated waste (see Section 2.1). The excavator was decontaminated after test pits TP-1, TP-14, TP-15, TP-16, TP-19, TP-20, TP-21 and TP-22, and prior to leaving the site.

Reusable sampling equipment was decontaminated prior to use, in between each sample, and at the completion of the work unless otherwise noted. The sampling equipment consisted of stainless steel trowels, split-spoon samplers, stainless steel mixing bowls, hammer and chisel, slam bar, stainless steel bailers and a Grundfos submersible pump. The following decontamination procedures were used:

1. Any excess soil remaining on the equipment was removed.
2. The equipment was scrubbed with a brush in a solution of tap water and non-phosphate detergent (Alconox).
3. The equipment was rinsed in copious amounts of tap water.
4. The equipment was rinsed in copious amounts of distilled water.
5. The equipment was placed on clean polyethylene sheeting, allowed to air dry when practical, and then wrapped in aluminum foil, as applicable.
6. The water in the wash and rinse buckets was changed frequently.

During the soil borings, the split-spoon sampler was usually reassembled before it was dry using new clean disposable gloves. During groundwater purging and sampling, disposable tubing was used with the peristaltic pump and the Grundfos submersible pump, and disposable plastic bailers were used thereby eliminating the necessity for those items to be decontaminated. When the Grundfos submersible pump was used, it was decontaminated as described above by pumping the detergent solution, the tap water, and the distilled water through the pump. The peristaltic pump was never in contact with the groundwater so it was not decontaminated. The decontamination fluids were disposed of over the landfill surface and allowed to infiltrate into the landfill.

2.10 Field Survey

A topographic survey of the site was performed by others in 1988 by aerial survey. An electronic copy of this map was obtained from the City of Glens Falls and utilized as the topographic survey base map for the site. A field survey was performed by C.T. Male surveyors to update the planimetric features of the site including the transfer station area.

During the RI field activities sampling locations (surface soil, sediment, test pits, explosive gas, etc.) were staked by field personnel with the identification number for subsequent location by the field survey crew. The horizontal location of surface soil and sediment sampling locations, exploratory test pits, existing piezometers, existing monitoring wells on or in close proximity to the subject site, new monitoring wells, explosive gas sampling locations, abandoned drums, significant areas of exposed refuse or concrete debris, and stream gauges were surveyed by C.T. Male surveyors under the supervision of a New York State licensed land surveyor. The vertical elevation of the top of the stream gauges, and the top of the monitoring well guard pipe, the top (reference point) of the PVC monitoring well riser pipe and grade adjacent to the monitoring well were measured for the existing monitoring wells on or in close proximity to the subject site and for the newly installed monitoring wells.

The vertical elevations were measured through differential leveling methods to the nearest 0.01 feet based on the benchmark elevation of 382.16 feet corresponding to the top of the New York State right-of-way monument benchmark located on the north side of Luzerne Road and east of Interstate 87. This elevation was utilized to check the benchmark at the Luzerne Road site of 379.90 feet corresponding to the brass rod in concrete at the base of well W-1 in the secure PCB cell area. The elevation checked within 0.06 feet (379.84 feet versus 379.90 feet) indicating both benchmarks are utilizing the same vertical datum. The vertical elevations are based on the National Geodetic Vertical Datum (NGVD), 1929. The horizontal locations are based on the New York State Plane Coordinate System, East Zone, North American Datum (NAD), 1983/1996.

The updated planimetric features and RI investigation and sampling locations were incorporated into the base map based on the horizontal coordinates, and a computer aided drawing (CAD) was generated. A tabulated copy of the land survey results including location ID, horizontal State plane coordinates (northing and easting) and vertical elevations are presented in Appendix G.

A boundary survey of the Glens Falls Municipal Landfill site including deed and mapping research and setting property corners in the field (capped iron rods) was also performed by C.T. Male surveyors under the supervision of a New York State licensed land surveyor. A copy of the Boundary Survey Map of Glens Falls Municipal Landfill At Luzerne Road is presented as Drawing No. 01-601, sheet 1 of 1.

2.11 Disposition of Investigation Derived Wastes

2.11.1 Soil Cuttings and Personal Protective Equipment

Eight 55 gallon drums of soil cuttings and excess soil sample volume, and two 55 gallon drums of spent personal protective equipment (PPE) and sampling equipment (glass tubes, rope, disposable bailers, polyethylene tubing, plastic sheeting) were generated and collected during the completion of the RI field activities. The labeled drums were stored on-site next to the transfer station. The drums of soil were identified as non-hazardous based on the PID screening and analytical results of soil samples collected from the soil boring program and analyzed for TCL PCBs. The soil sample analytical results did not detect PCBs above the CRDL or the IDL except at soil boring B-101-9S. PCBs (Aroclor 1248 and Aroclor 1254) were detected at B-101-9S and its field duplicate at concentrations of 2.5 and 2.0 mg/kg, which is below the NYSDEC hazardous waste regulatory level for PCBs of 50 ppm.

Since PCBs were detected in the soil sample from B-101-9S, the soil cuttings from this location (one 55-gallon drum) were properly disposed of off-site as non-hazardous PCB containing waste (see Section 2.11.3). The soil cuttings in the seven remaining drums were placed back onto the landfill's surface in a bermed and depressed area west of test pit TP-21, as no PCBs were detected in the soil samples analyzed from the other soil borings. This work was performed on September 16, 2002 by Precision Industrial Maintenance, Inc. (PIM). The contents of the two drums of spent PPE and sampling equipment were double bagged and disposed of as solid waste at the transfer station on-site, as only low levels of PCBs were detected within the soil samples, groundwater samples and sediment samples collected as part of the RI field activities. The empty drums were cleaned and rinsed with potable water over the landfill surface in an area west of test pit TP-22 and the rinse water allowed to infiltrate the landfill. The cleaned empty drums were taken back by PIM for re-use.

2.11.2 Monitoring Well Development and Purge Water

Eight 55 gallon drums of groundwater were generated and collected during the completion of the RI field activities. The groundwater collected was from monitoring well development, purging and sampling. The analytical results for the groundwater samples indicate that PCBs were not detected above the CRDL or the IDL except at monitoring wells MW-101-1, MW-101-4 and MW-101-5. At these locations PCBs were detected at concentrations ranging from 0.87 ug/l to 7.4 ug/l, which are above the NYSDEC groundwater standard of 0.09 ug/l, but below the NYSDEC hazardous waste regulatory level for PCBs of 50 ppm. The three drums of groundwater from monitoring wells MW-101-1, MW-101-4 and MW-101-5 were properly disposed of off-site as non-hazardous PCB containing waste (see Section 2.11.3). The groundwater in the remaining five drums was allowed to infiltrate the soil on top of the landfill surface in a bermed and depressed area west of test pit TP-21. The empty drums were cleaned and rinsed with potable water over the landfill surface in an area west of test pit TP-22 and the rinse water allowed to infiltrate the landfill. This work was performed by PIM on September 16, 2002. The cleaned empty drums were taken back by PIM for re-use.

2.11.3 Waste Transportation and Disposal Off-Site

The 55 gallon drum of soil cuttings from B-101-9S and the three 55 gallon drums of groundwater from monitoring wells MW-101-1, MW-101-4 and MW-101-5 were transported by PIM of Schenectady, New York (transporter 1) and Maumee Express, Inc. of Somerville, New Jersey (transporter 2) to CycleChem, Inc. located in Elizabeth, New Jersey for disposal. PIM (permit #4A-285) and Maumee Express (permit #NJ-334) are 6 NYCRR Part 364 permitted waste transporters. CycleChem, Inc. is a permitted hazardous waste storage, treatment and transfer facility (EPA ID #NJD002200046, New Jersey DEP #2004E2HP07). A copy of the approved waste profiles and approval letter from CycleChem, Inc., transporter and disposal facility permits, and waste transportation and disposal documents are enclosed in Appendix H.

2.12 Analytical Program Quality Control and Data Validation

This section discusses the laboratory methods of analysis, the quality assurance and quality control method of checks and audits implemented to ensure the required quantity and quality of data were obtained, the evaluation of the quality control results and the data validation performed as part of the RI field activities. The analytical program quality control and data validation were outlined in the approved Quality Assurance Project Plan.

2.12.1 Analytical Methods

The laboratory analyses of the project samples were performed by Chemtech Consulting Group, Inc. (Chemtech) of Mountainside, New Jersey. Chemtech is a NYSDOH certified laboratory under their Environmental Laboratory Approval Program (ELAP No. 11376) and NYSDEC's Analytical Services Protocol (ASP). The laboratory analysis protocol that was followed by the laboratory was the NYSDEC ASP Revised June 2000, EPA SW-846 "Test Methods for Evaluating Solid Waste," and EPA 600 4/79/20 "Methods for the Chemical Analysis of Water and Wastes", as applicable. The laboratory analyses performed and associated analytical methods are presented in Table 2.12.1-1.

Table 2.12.1-1
Analytical Parameters and Analysis Methods
Glens Falls Municipal Landfill at Luzerne Road
Remedial Investigation

Analytical Parameters	Sample Analysis Method	
	Liquid	Solid
TCL Volatile Organic Compounds Plus Top 10 TICs	EPA 8260B	
TCL Semi-Volatile Organic Compounds		EPA 8270C
RCRA Herbicides(1)		EPA 8151
TCL Pesticides		EPA 8081
TCL PCBs	EPA 8082	EPA 8082
TAL Metals, Except Mercury	EPA 6010	EPA 6010
Mercury	EPA 7470	EPA 7471
Cyanide	EPA 335.2	EPA 335.2
<u>Part 360 Baseline Leachate Indicators:</u>		
Total Kjeldahl Nitrogen	EPA 351.3	
Ammonia	EPA 350.1	
Nitrate	EPA 353.2	
Chemical Oxygen Demand	HACH 8000	
Biochemical Oxygen Demand	EPA 405.1	
Total Organic Carbon	EPA 415.1	
Total Dissolved Solids	EPA 160.1	
Sulfate	EPA 375.4	
Alkalinity	EPA 310.1	
Phenols	EPA 420.1	
Chloride	EPA 325.3	
Total Hardness as CaCO3	EPA 130.2	
Color	EPA 110.2	
Boron	EPA 6010B	
Turbidity	EPA 180.1	
<u>Hazardous Waste Characterization:</u>		
Corrosivity		EPA 9040
Ignitability		EPA 1010
Reactivity (Cyanide)		EPA 9010
Reactivity (Sulfide)		EPA 9030
TCLP Volatiles		EPA 8260B(2)
TCLP Semivolatiles		EPA 8270C(2)

Table 2.12.1-1
Analytical Parameters and Analysis Methods
Glens Falls Municipal Landfill at Luzerne Road
Remedial Investigation

Analytical Parameters	Sample Analysis Method	
	Liquid	Solid
TCLP Pesticides		EPA 8081(2)
TCLP Herbicides		EPA 8151(2)
TCLP Metals, Except Mercury		EPA 6010(2)
TCLP Mercury		EPA 7471(2)

(1) The RCRA Herbicides analyzed for on a total basis include 2,4-D and 2,4,5-TP (Silvex).
(2) The TCLP extraction was performed by EPA Method 1311 and analysis of the extract was performed by the specified method.

The laboratory developed ASP Category B data deliverable packages including analytical results summaries and quality control data deliverables as set forth in NYSDEC ASP, Revised June 2000. The data deliverable packages are referenced in Section 8.0, References of this RI Report and have been submitted to the City and NYSDEC. Category B data deliverable packages were not prepared for the hazardous waste characterization analyses in accordance with the approved Work Plan.

2.12.2 Field Quality Control Samples and Collection Procedures

Field quality control (QC) checks were performed during the RI to monitor and document the integrity and quality of the data. The field QC checks included collecting equipment blanks (EB) after the sampling equipment was decontaminated to check for cross contamination and equipment cleanliness and field duplicates (FD) to monitor analytical precision/reproducibility and sampling techniques. Matrix spike/matrix spike duplicates (MS/MSD) were also collected in the field for laboratory quality assurance/control control (QA/QC) checks. The sampling frequency for the field QC checks were one equipment blank and one field duplicate for every twenty samples submitted to the laboratory during soil, sediment and ash material sampling and during groundwater sampling. The sampling frequency for the MS/MSD was one for every twenty samples or 7 days which ever came first. A trip blank (TB) accompanied each shipment of groundwater samples submitted to the laboratory for volatile analyses to monitor sample handling and contamination during transport.

The QC samples were collected in the same sample containers and analyzed for the same parameters as the corresponding soil and groundwater samples. The sample containers were filled in the order of decreasing volatility. The QC samples were labeled and placed in coolers in the same manner as described for the soil and groundwater samples in Sections 2.2, 2.3 and 2.4. The QC samples and trip blanks were also recorded on the chain of custody record forms. The procedures for collecting the QC samples are discussed below:

Equipment Blanks: The soil sampling equipment blank, representative of samples collected with a stainless steel trowel (EB-1), was collected by pouring distilled water over a decontaminated stainless steel trowel, into a pre-cleaned laboratory-supplied container, and then immediately into the appropriate laboratory sample containers. The soil equipment blank, representative of samples collected with the split-spoon sampler (EB-2), was collected by pouring laboratory-supplied reagent grade water through a decontaminated split-spoon sampler into a decontaminated stainless steel mixing bowl containing a decontaminated stainless steel trowel, and then pouring the rinse water from the bowl into the appropriate laboratory sample containers. The groundwater sampling equipment blanks (EB-3 and EB-4) were collected by pouring laboratory-supplied reagent grade water into a new disposable bailer and from the bailer into the laboratory sample containers.

Field Duplicates: The soil field duplicate grab sample (FD-1) was collected by alternately placing half of each scoop of soil from each location into the sample container and the duplicate sample container until both containers were full. The soil field duplicate composite sample (FD-2) was collected by alternately placing half of each scoop of homogenized soil into the sample container and the duplicate sample container until both containers were full. The groundwater field duplicate samples (FD-3 and FD-4) were collected by alternately placing equal amounts of water from the sampling device (i.e., bailer) into the sample container and duplicate sample container.

Matrix Spike/Matrix Spike Duplicates (MS/MSD): The soil and groundwater MS/MSD samples were collected in the same manner as the soil and groundwater field duplicate samples.

Trip Blanks: The trip blanks were prepared and supplied by the laboratory and consisted of three 40-ml vials of laboratory-supplied water. The trip blanks accompanied the samples through collection, packaging and shipment to the analytical laboratory. All the samples for VOCs analyses and the trip blank were packaged in one cooler for each day of sampling.

Table 2.12.2-1 summarizes the field QC samples collected and analyzed as part of the RI field activities.

Table 2.12.2-1
Summary of QA/QC Samples Collected and Analyses
Glens Falls Municipal Landfill at Luzerne Road
Remedial Investigation

Sample ID	Lab Sample ID	Corresponding Sample ID	Date Collected	Analyses					
				TCL VOCs	TCL SVOCs	TCL PCBs	TCL Pesticides/ RCRA Herbicides[(1)]	TAL Metals + CN	6NYCRR Part 360 Leachate Indicators
Surface Soil/Sediment/Test Pit/Soil Boring Sampling									
FD-1	N6358-14	SS-11	10/18/01		X	X	X	X	
FD-2	N6635-5	B-101-9S	11/9/01			X			
EB-1	N6358-15	After SS-5 & Prior to SS-10	10/18/01		X	X	X	X	
EB-2	N6635-6	After B-101-9S & Prior to B-101-10S	11/9/01			X			
SS-7 MS/ MSD	N6358-8 & 9	Not Applicable	10/18/01		X	X	X	X	

Table 2.12.2-1
Summary of QA/QC Samples Collected and Analyses
Glens Falls Municipal Landfill at Luzerne Road
Remedial Investigation

Sample ID	Lab Sample ID	Corresponding Sample ID	Date Collected	Analyses					
				TCL VOCs	TCL SVOCs	TCL PCBs	TCL Pesticides/ RCRA Herbicides(1)	TAL Metals + CN	6NYCRR Part 360 Leachate Indicators
TP-8C (9-10′) MS/ MSD	N6548-01MS & 01MSD	Not Applicable	10/30/01		X	X		X	
B-101-8I (0-6′) MS/ MSD	N6548-6 & 7	Not Applicable	10/30/01			X			
B-101-9S MS/ MSD	N6635-3 & 4	Not Applicable	11/9/01			X			
B-101-10S MS/ MSD	N6751-2 & 3	Not Applicable	11/13/01			X			
Groundwater Sampling November 2001									
FD-3	N6876-16	MW-101-9S	11/27/01	X		X		X	X
EB-3	N6876-06	After MW-101-10S & Prior to MW-101-8S	11/26/01	X		X		X	X
MW-101-8S MS/ MSD	N6876-4 & 5	Not Applicable	11/26/01	X		X		X	X
Trip Blank	N6876-08	Not Applicable	11/25/01	X					
Trip Blank	N6879-17	Not Applicable	11/27/01	X					
Trip Blank	N6876-20	Not Applicable	11/28/01	X					
Groundwater Sampling March 2002									
FD-4	P1689-10	MW-101-5	3/5/02	X		X		X	X
EB-4	P1689-5	After MW-101-10S & Prior to MW-101-2	3/4/02	X		X		X	X
MW-101-2 MS/ MSD	P1689-2 & 3	Not Applicable	3/4/02	X		X		X	X

Table 2.12.2-1
Summary of QA/QC Samples Collected and Analyses
Glens Falls Municipal Landfill at Luzerne Road
Remedial Investigation

Sample ID	Lab Sample ID	Corresponding Sample ID	Date Collected	Analyses					
				TCL VOCs	**TCL SVOCs**	**TCL PCBs**	**TCL Pesticides/ RCRA Herbicides(1)**	**TAL Metals + CN**	**6NYCRR Part 360 Leachate Indicators**
Trip Blank	P1689-8	Not Applicable	3/4/02	X					
Trip Blank	P1689-14	Not Applicable	3/5/02	X					
Trip Blank	P1689-20	Not Applicable	3/6/02	X					
Groundwater Sampling August 2002									
Trip Blank	P3844-2	Not Applicable	8/20/02	X					

(1) RCRA herbicides analyzed on a total basis include 2,4-D and 2,4,5-TP (Silvex).

2.12.3 Laboratory Quality Control

Laboratory quality control checks were performed during the RI to monitor and document the integrity and quality of the data. The measurement parameters used to determine the quality of the data are precision, accuracy, completeness, representative and comparability.

The laboratory quality control checks performed by the analytical laboratory included, but were not limited to, method blanks, initial and continuing calibration, control samples, matrix spike/matrix spike duplicates, matrix spike blanks, surrogate spikes and duplicates. Documentation of the QA/QC performed by the analytical laboratory is presented in the data deliverable packages referenced in the table of contents and attached under separate cover. The laboratory's data qualifiers based on QA/QC results are included on the Form 1's within the data deliverable packages and in the summary tables of analytical results prepared by C.T. Male.

2.12.4 Evaluation of Quality Control Results

The quality control results were reviewed and evaluated to determine which analytical detections were truly present in the environmental samples, and which were the result of laboratory or sampling contamination, or contamination during transport. The QA/QC soil and sediment sampling results are presented in Tables 2.12.4-1 through 2.12.4-4, and the QA/QC groundwater sampling results are presented in Tables 2.12.4-5 through 2.12.4-8.

Where a parameter was detected in the laboratory blank, the parameter was considered a laboratory contaminant and not considered to be present in the associated environmental sample. This was the case for the detection of bis(2-ethylhexyl)phthalate within all of the surface soil samples except for one, which was non-detect.

The two equipment blanks collected during soil sampling did not detect any chemical constituents except for bis(2-ethylhexyl)phthalate, which was detected in the laboratory blank; and a few metals including aluminum, beryllium and zinc at concentrations below the contract required detection limit (CRDL). The metal detections did not significantly effect the results.

The equipment blank collected during the November 2001 groundwater sampling event did not detect any chemical constituents except for a few metals including beryllium, calcium, iron, potassium and zinc at levels below the CRDL, and cyanide at a level above the CRDL. The equipment blank collected during the March 2002 groundwater sampling event did not detect any chemical constituents except for a few metals including aluminum, beryllium and calcium at levels below the CRDL and sulfate at the CRDL. The reagent water for the equipment blanks was supplied by the analytical laboratory. The results of the equipment blank samples indicate that the sampling equipment was properly cleaned prior to us, and cross contamination was not a factor.

Although there were a few metals detected, the concentrations were below the CRDL or at trace levels thereby not at concentrations that could have effected sample results.

Four field duplicate samples were collected as part of the RI field activities. Field duplicates FD-1 and FD-2 were collected from surface soil sample location SS-11 and soil boring B-101-9S, respectively. Field duplicate FD-3 was collected from monitoring well MW-101-9S during the November 2001 groundwater sampling event and FD-4 was collected from monitoring well MW-101-5 during the March 2002 groundwater sampling event. Generally, the same compounds and analytes were detected within the sample as in the duplicate and the detections were within the same order of magnitude indicating good laboratory reproducibility. There were a few exceptions. The difference in the mercury concentration between the soil sample SS-11 and the duplicate FD-1 was greater than approximately two times the CRDL. The relative percent difference (RPD) between the groundwater sample MW-101-9S and the duplicate FD-3 was greater than 50% for total dissolved solids, laboratory turbidity, total organic carbon, color and sulfate.

Three sets of trip blanks were submitted and analyzed during each complete round of groundwater sampling as the sampling was performed over three different workdays. The trip blanks were analyzed for VOCs and no VOCs were detected above the CRDL or the IDL. No VOCs were detected in the trip blank from the August 20, 2002 sampling event of monitoring well MW-101-1.

2.12.5 Data Validation

The data deliverable packages prepared by Chemtech were externally validated by Data Validation Services of North Creek, New York, except for the March 2002 groundwater sampling event. In accordance with the approved Work Plan, data validation of the March 2002 groundwater samples data deliverable package was not required.

Validation of the laboratory data was performed in accordance with the following documents:

- NYSDEC Guidance for the Development of Data Usability Summary Report (DUSR) dated September 1997.
- USEPA National Functional Guidelines for Organic Data Review.
- USEPA National Functional Guidelines for Inorganic Data Review.
- USEPA Region 2 Validation Standard Operating Procedures (SOPs).
- NYSDEC ASP Revised June 2000.

Two separate DUSRs were generated by Data Validation Services, one for the soil, sediment and ash material samples and the other for the first round of groundwater samples collected in November 2001. A January 29, 2002 DUSR was prepared based on review of Chemtech SDG No. N6876 (November 2001 groundwater samples) and a February 4, 2002 DUSR was prepared based on review of Chemtech SDG Nos. N6358, N6431, N6548, N6588 and N6751 (soil, sediment and ash material samples). The narrative portions of the data validator's reports are included in Appendix I.1 for the soil, sediment and ash material samples and in Appendix I.2 for the groundwater samples. The data validator's qualifiers have been inserted on the laboratory's Analytical Results Summary packages. C.T. Male also has included the validator's qualifiers in parenthesis on the summary tables of analytical results.

In general, the data validator's qualifiers agreed with the laboratory's qualifiers with additional modifications as described within this section. The qualifiers present the quality control (QC) conditions of the data. The qualifiers do not imply that the data is not usable except those results flagged with the "R" qualifier, which are rejected and unusable. Most of the qualifiers identified in the data deliverable packages for this RI represent minor QC problems by the laboratory that do not affect the usability of the data or the results.

The validator changed results, where appropriate, when the parameter was detected in the laboratory blank or the parameter was not detected above the method detection limit, the result being changed to "U", the undetected qualifier. If certain QC protocols were not met or if matrix interferences occurred, then the result was flagged by the validator as "J", the estimated qualifier.

There were two instances where the data was misreported, which included the result for total hardness in the field duplicate sample FD-3. The result for total hardness was reported as non-detection at the CRDL. Using the calculation method involving total calcium and magnesium, the data validator changed the result to 175 mg/l, but qualified it as estimated due to methodology variance. The mercury result for TP-8A (1 to 3 feet) was misreported as 1.4 mg/kg. The actual value, as determined and reported in the raw data, is 1.0 mg/kg.

The only instances where the data was rejected are presented below:

- The mercury results within data deliverable package Chemtech SDG No. N6876 (applicable to the analysis of the November 2001 groundwater samples) for those samples reporting non-detection were rejected ("R" qualifier) and not usable. This rejection is the result of the lack of recovery of mercury in the laboratory standard, which was run immediately preceding the sample analyses. The detected values of mercury are usable, however, and were qualified as estimated ("J" qualifier) with a potential very low bias.

- The 2-butanone results within the data deliverable package Chemtech SDG No. N6876 (applicable to the analysis of the November 2001 groundwater samples) for monitoring wells MW-101-6S and MW-101-6I were rejected. This rejection is the result of initial calibration standards processed with these samples produced poor responses including the total lack of detection in the low calibration standard. The 2-butanone results for the other groundwater samples are usable as reported.

- Results for dichlorodifluoromethane, chloromethane, chloroethane, vinyl chloride and bromomethane within the data deliverable package Chemtech SDG No. N6876 (applicable to the analysis of the November 2001 groundwater samples) for all samples except MW-101-6S and MW-101-6I were identified as borderline usable due instrument response and therefore should be considered with caution.

- In summary, the validation process has identified that the data is acceptable and usable except as qualified and described above and in the data validator's reports (Appendix I). The results that were rejected are not identified as potential contaminants through comparison with sampling and analyses of other media at the site and resampling is not necessary.

3.0 PHYSICAL CHARACTERISTICS OF THE STUDY AREA

3.1 Topography and Drainage

In the general area of the site, the topography is relatively flat except for the Glens Falls Municipal Landfill and the area of the PCB cell on the adjoining Luzerne Road Site. The Glens Falls Municipal Landfill is mounded approximately 30 to 60 feet high with moderately steep and irregular, vegetated side slopes. The PCB cell on the Luzerne Road Site is also mounded, but to a much lesser extent than the subject site. These manmade features alter the drainage pattern whereby the surface water runoff (beyond what doesn't infiltrate the high permeability soil in this area) is radial from these mounds. In the northeastern portion of the site, the surface drainage is directed east to the Federally designated wetlands located east of the northeast portion of the landfill. These wetlands discharge to the north to Halfway Creek approximately one mile north of the landfill site.

3.2 Surface Water

There are no surface water bodies located on-site. There is a low lying area located northeast of the site and a low lying area located west of the site which retain water dependant on the quantity of precipitation and surface water runoff. The low lying area west of the site receives storm water runoff from a culvert under Interstate 87. At the time of the RI activities, there was no surface water accumulation on the subject site or in the referenced low lying areas adjoining the site.

3.3 Wetlands

No New York State designated wetlands are mapped on-site or within close proximity of the site according to the 1984 New York State Freshwater Wetlands Map (Glens Falls Quadrangle). The closest State wetland is located approximately 1.5 miles south of the subject site. Based on a review of the October 1986 National Wetlands Inventory Map of Glens Falls, New York, the low lying area northeast of the site is mapped as Federally designated wetlands (Figure 2).

3.4 Demographics and Land Use

The Glens Falls Municipal Landfill lies within the Town of Queensbury, a suburb of the City of Glens Falls and the largest community in Warren county, with approximately 22,630 people. According to the U.S. Census Bureau, the median age of the Town's residents is 39 years old. The City of Glens Falls has a population of approximately 15,023 and the median age of the City's residents is 36 years old.

The area surrounding the landfill is an urban area, encompassing residential and light commercial properties, and to a lesser extent vacant land. There is a storage facility and three residential dwellings located immediately north of the landfill. Interstate 87 (Adirondack Northway) is a six-lane highway traveling north-south, and is situated west of the landfill. The land to the east is vacant furthest north, a small business furthest south fronting Luzerne Road, and the Luzerne Road Site lies between the vacant land and the business. Residential dwellings and a cemetery occupy the land to the south.

The area is serviced by public water from the City of Glens Falls or the Town of Queensbury, depending on the location. In the immediate area surrounding the Glens Falls Municipal Landfill the public water is supplied by the Town of Queensbury. The area southeast of the landfill, which was previously identified as the West Glens Falls Water District, has reportedly been serviced by public water since approximately the 1930's. According to the 1982 New York State Atlas of Community Water System Sources, it appears that the City of Glens Falls obtains its water supply from Halfway Creek, Keenan and Wilkie Reservoirs, and Butler Pond. Halfway Creek Reservoir (also commonly referred to as Halfway Brook Reservoir) is mapped approximately one mile northwest of the Glens Falls Municipal Landfill. It is located upstream of where surface drainage from the Federally designated wetlands northeast of the landfill discharges to Halfway Creek. The Town of Queensbury obtains its water from the Hudson River and the intake is located southwest of the Glens Falls Municipal Landfill. The NYSDEC has indicated that they and the NYSDOH conducted a homeowner's well survey in August 2002 of the area downgradient of the Luzerne Road Site, which is also downgradient of the Glens Falls Municipal Landfill, and they found that the homes are served by public water. The NYSDEC has also indicated that they are in the process of compiling the responses and information obtained, and that the survey results will be available through NYSDEC.

3.5 Regional Geology and Hydrogeology

Based on a review of the 1987 Surficial Geology Map of New York (Hudson Mohawk Sheet) by Cadwell and others, the area of the site is mapped as having lacustrine sand. This mapping unit is predominantly composed of quartz sand deposits which are associated with depositional environments in large bodies of water (well sorted, stratified).

Underlying bedrock geology within the vicinity of the site is unknown according to a review of the 1970 Bedrock Geologic Map of New York (Hudson Mohawk Sheet) by Fisher and others. According to a reference (Surficial Geology of the Glens Falls Region, New York) presented within the February 1987 Phase II Investigation Report for the Glens Falls Municipal Landfill, bedrock in the immediate vicinity of the site is reported to vary between shale and limestone, and is present at an approximate depth of 120 feet.

3.6 Site Geology and Hydrogeology

3.6.1 Site Geology

According to a review of the Soil Survey of Warren County (January 1989), the site is mapped with three different soil units; one pertaining to the landfill mass (Ud), one associated with the low lying occasionally swampy area northeast of the landfill mass (OaB), and one for the remaining land surrounding the previous two soil units (OaA). These soil units are defined as follows:

- Ud (Udorthents): This map unit consists of areas that were excavated or filled with material derived from sandy, gravelly, or loamy soils. The material from most areas that were excavated was used as roadfill in the construction of the Interstate 87 (Adirondack Northway). Other areas consist of filled or leveled areas used for parking lots, for recreation areas, as sanitary landfills, and other similar uses.

- OaB (Oakville loamy fine sand): This soil unit is in the same category as OaA with the main difference being the percentage of slope this unit is typically found on. Oakville soils are well drained and are found on outwash plains. These soils are composed mainly of sand with a high permeability, which promotes rapid movement of water. Therefore, the surface water runoff is low and the capacity of the soil to store water available for plant growth is low.

Based on previously conducted subsurface investigations, site soil and groundwater have been extensively evaluated. Review of existing reports indicates that the site exhibits light brown to gray, fine to medium sands, with isolated occurrences of seams of silty fine sand or gravel. Additionally, previous geotechnical results show that the largest percentage, up to 98.8 percent, of material composition consists of sand with the remaining composition consisting of silt and clay.

During the test pit excavations, the soils were classified, and select soil samples were collected for VOC vapor screening and select laboratory analysis. Continuous soil sampling was performed at soil borings B-101-6I, B-101-7I, B-101-8I, B-101-9S and B-101-10S for the purpose of VOC vapor screening, soil classification and select laboratory analysis. The soils from the test pits and soil borings were classified in general accordance with the Unified Soil Classification System (ASTM D-2488, Standard Practice for Description and Identification of Soils). The soil classification and other pertinent observations made during the completion of the test pits and soil borings are presented on individual Test Pit Logs in Appendix C and on individual Subsurface Exploration Logs in Appendix E, respectively.

The test pits and soil borings advanced as part of the RI activities disclosed similar soils as those previously encountered on-site by others. The primary soil unit at the site is sand (very fine to medium and occasionally coarse) with periodic appearances of little to trace silt. According the Unified Soil Classification System, this soil type falls into the description of poorly graded sands with little to no fines (SP) and silty sand (SM). The sand was encountered from grade and extended to the termination depths of the soil borings, which were 52.5 feet (MW-101-6I), 44.5 feet (MW-101-7I), 53 feet (MW-101-8I), 28 feet (MW-101-9S) and 18 feet (MW-101-10S). The only exception is that fill materials (i.e., ash material or refuse) were encountered at several test pit locations, and fill materials of a different type were encountered at soil boring B-101-7I. The fill at B-101-7I was 0.3 feet of silt, some clay followed by clay and some cinders to a depth of two feet. The depth intervals where the ash material and refuse were encountered are presented in Table 2.3.1-1, Summary of Test Pit Program in Section 2.3.1.

3.6.2 Site Hydrogeology

Five monitoring wells (MW-101-1 through MW-101-5) were installed in 1985 as part of Phase II site investigations performed by others. These wells were installed to monitor groundwater quality and flow direction in the first water bearing zone. The wells are located around the perimeter of the landfill thereby providing upgradient, downgradient and cross-gradient monitoring points. Four piezometers were installed as part of the 1996 Supplemental Sampling Project including two on or in close proximity to the landfill (HR-4 and HR-8) and two on the Luzerne Road Site (53-LR-1 and 53-LR-2). Additional wells were installed in 1999 on the Luzerne Road Site as part of the RI for that site, which also have been used for monitoring groundwater quality and flow direction. The Luzerne Road Site monitoring wells closest to the landfill include MW-1S, MW-2S and MW-3S. The groundwater flow direction based on water table contouring by others suggests that the groundwater consistently flows towards the southeast. The hydraulic gradient has been reported by others to be 0.005 feet/feet, and the permeability of the saturated material was calculated by others to be 10^{-2} centimeters/second (Reference 22).

Five shallow monitoring wells and three intermediate monitoring wells were installed as part of the RI activities. Water level depths were collected from the existing monitoring wells, the newly installed wells (RI), the wells installed by others (east of the site) and piezometers HR-4 and HR-8. Groundwater was generally observed from 8 to 24 feet below the ground surface or 357 to 363 feet above mean sea level. The water level depths were converted to elevations (in feet above mean sea level) based on the site benchmark (Section 2.10) and utilized to contour the water table. Water level data was collected on November 19, 2001, December 4, 2001 and February 27, 2002 as summarized in Table 3.6.2-1, Summary of Groundwater Elevation Data. Mapping of this water level data indicates that the inferred groundwater flow direction is to the southeast. Water Level Contour Maps for November 19, 2001 and February 27, 2002 are presented as Figures 4 and 5, respectively.

Table 3.6.2-1
Summary of Groundwater Elevation Data
Glens Falls Municipal Landfill at Luzerne Road
Remedial Investigation

Well ID	Ground Elevation (1)	TOC Elevation (1)	11/19/01		12/4/01		2/27/02	
			DTW (ft below TOC)	Groundwater Elevation (1)	DTW (ft below TOC)	Groundwater Elevation (1)	DTW (ft below TOC)	Groundwater Elevation (1)
MW-101-1	380.45	382.18	24.42	357.76	24.62	357.56	25.22	356.96
MW-101-2	380.67	382.84	20.74	362.1	20.92	361.92	21.52	361.32
MW-101-3	381.48	383.50	20.27	363.23	20.46	363.04	21.18	362.32
MW-101-4	364.71	366.92	8.82	358.1	8.96	357.96	9.45	357.47
MW-101-5	377.50	379.69	21.23	358.46	21.42	358.27	21.95	357.74
MW-101-6S	377.45	380.17	20.59	359.58	20.75	359.42	21.35	358.82
MW-101-6I	377.28	379.86	20.39	359.47	20.56	359.3	21.15	358.71
MW-101-7S	370.04	372.80	14.46	358.34	14.62	358.18	15.14	357.66
MW-101-7I	369.91	371.75	13.41	358.34	13.58	358.17	14.12	357.63
MW-101-8S	379.49	382.11	23.03	359.08	23.24	358.87	23.82	358.29
MW-101-8I	379.43	381.95	22.68	359.27	22.88	359.07	23.48	358.47
MW-101-9S	379.79	382.42	23.10	359.32	23.28	359.14	23.90	358.52
MW-101-10S	371.56	373.90	10.99	362.91	11.16	362.74	11.68	362.22
MW-1S	378.02	380.04	21.37	358.67	21.92	358.12	23.35	356.69
MW-2S	378.32	380.44	20.90	359.54	21.08	359.36	21.65	358.79
MW-3S	380.66	382.51	23.66	358.85	23.84	358.67	24.38	358.13
HR-4	377.26	380.68	NM (2)	NM (2)	21.14	359.54	21.88	358.80
HR-8	377.85	380.95	NM (2)	NM (2)	21.22	359.73	Dry	Dry

(1) Feet above mean sea level (amsl).
(2) Lock was unable to be opened.
TOC is top of casing (i.e., PVC riser pipe).
DTW is depth to water.
NM is not measured.

Utilizing the water level data, the hydraulic gradients between select upgradient and downgradient wells were calculated. The hydraulic gradient ranged between 0.003 and 0.006 feet/feet. By applying Darcy's Law of Flow, an average hydraulic gradient of 0.005 feet/feet, and a coefficient of permeability of 10^{-2} centimeters/second (as calculated by others), the velocity of flow was calculated to be on the order of 0.001 feet per minute or 518 feet per year.

4.0 NATURE AND EXTENT OF CONTAMINATION

4.1 General

This section discusses the field screening (where applicable), field analyses (where applicable) and the laboratory analyses results of the samples collected during implementation of the RI for the Glens Falls Municipal Landfill at Luzerne Road.

Field screening consisted of PID meter headspace analyses of soil samples collected during sediment sampling, and during the test pit and groundwater investigations. A summary of the laboratory analyses performed on soil, sediment and ash material is presented in Table 4.1-1.

Table 4.1-1
Summary of Soil, Sediment and Ash Material Samples Collected and Analyses
Glens Falls Municipal Landfill at Luzerne Road
Remedial Investigation

Sample ID	Lab Sample ID	Date Collected	Analyses				
			TCL SVOCs	TCL PCBs	TAL Metals + CN	TCL Pesticides/RCRA Herbicides (1)	Hazardous Waste Characteristics (2)
Surface Soil							
SS-1	N6358-1	10/18/01	X	X	X	X	
SS-2	N6358-2	10/18/01	X	X	X	X	
SS-3	N6358-3	10/18/01	X	X	X	X	
SS-4	N6358-4	10/18/01	X	X	X	X	
SS-5	N6358-5	10/18/01	X	X	X	X	
SS-6	N6358-6	10/18/01	X	X	X	X	
SS-7	N6358-7	10/18/01	X	X	X	X	
SS-8	N6358-10	10/18/01	X	X	X	X	
SS-9	N6358-11	10/18/01	X	X	X	X	
SS-10	N6358-12	10/18/01	X	X	X	X	
SS-11	N6358-13	10/18/01	X	X	X	X	
Sediment							
SD-1	N6431-5	10/23/01	X	X	X	X	
SD-2	N6431-6	10/23/01	X	X	X	X	

Table 4.1-1
Summary of Soil, Sediment and Ash Material Samples Collected and Analyses
Glens Falls Municipal Landfill at Luzerne Road
Remedial Investigation

Sample ID	Lab Sample ID	Date Collected	Analyses				
			TCL SVOCs	TCL PCBs	TAL Metals + CN	TCL Pesticides/RCRA Herbicides (1)	Hazardous Waste Characteristics (2)
SD-3	N6431-7	10/23/01	X	X	X	X	
Test Pit Subsurface Soil							
TP-13	N6431-8	10/24/01		X			
TP-15	N6431-4	10/23/01		X			
TP-17	N6431-3	10/23/01		X			
TP-19	N6431-9	10/24/01		X			
TP-20	N6431-2	10/23/01		X			
TP-22	N6431-1	10/22/01		X			
Test Pit Ash Material							
TP-6B	N6548-4	10/30/01	X	X	X		X
TP-7A	N6548-3	10/30/01	X	X	X		X
TP-8A	N6548-2	10/30/01	X	X	X		X
TP-8C	N6548-1	10/30/01	X	X	X		X
Borings Subsurface Soil							
B-101-6I	N6635-1	11/6/01		X			
B-101-7I	N6588-1	11/2/01		X			
B-101-8I	N6548-5	10/30/01		X			
B-101-9S	N6635-2	11/9/01		X			
B-101-10S	N6751-1	11/13/01		X			

(1) RCRA herbicides analyzed on a total basis include 2,4-D and 2,4,5-TP (Silvex).
(2) Hazardous waste characteristics include TCLP VOCs, TCLP SVOCs, TCLP Pesticides, TCLP Herbicides, TCLP Metals, corrosivity, ignitability, and reactivity (sulfide and cyanide).

A summary of the laboratory analyses performed on the contents of the abandoned drums encountered at the landfill is presented in Table 4.1-2.

Table 4.1-2
Summary of Drum Waste Samples Collected and Analyses
Glens Falls Municipal Landfill at Luzerne Road
Remedial Investigation

Sample ID	Lab Sample ID	Date Collected	Sample Type	Analyses
				Hazardous Waste Characteristics (1)
Stake #6 Drum Waste	N6668-1	11/8/01	Grab	X
Stake #5, 7, 8 & TP-4 Drum Waste	N6668-2	11/8/01	Composite	X
Stake #1, 2 & 4 Drum Waste	N6668-3	11/8/01	Composite	X

(1) Hazardous waste characteristics include TCLP VOCs, TCLP SVOCs, TCLP Pesticides, TCLP Herbicides, TCLP Metals, corrosivity, ignitability, and reactivity (sulfide and cyanide).

Field analyses of water samples were performed for pH, specific conductance, temperature, turbidity and oxidation-reduction potential during the groundwater sampling. A summary of the laboratory analyses performed on groundwater is present in Table 4.1-3.

Table 4.1-3
Summary of Groundwater Samples Collected and Analyses
Glens Falls Municipal Landfill at Luzerne Road
Remedial Investigation

Sample ID	Lab Sample ID	Date Collected	Analyses			
			TCL VOCs	TCL PCBs	TAL Metals + CN	6NYCRR Part 360 Leachate Indicators
November 2001 Sampling Event						
MW-101-1	N6876-14	11/27/01	X	X	X	X
MW-101-2	N6876-7	11/26/01	X	X	X	X
MW-101-3	N6876-1	11/26/01	X	X	X	X
MW-101-4	N6876-18	11/28/01	X	X	X	X
MW-101-5	N6876-19	11/28/01	X	X	X	X
MW-101-6S	N6876-12	11/27/01	X	X	X	X
MW-101-6I	N6876-11	11/27/01	X	X	X	X
MW-101-7S	N6876-10	11/27/01	X	X	X	X
MW-101-7I	N6876-9	11/27/01	X	X	X	X
MW-101-8S	N6876-3	11/26/01	X	X	X	X

Table 4.1-3
Summary of Groundwater Samples Collected and Analyses
Glens Falls Municipal Landfill at Luzerne Road
Remedial Investigation

Sample ID	Lab Sample ID	Date Collected	Analyses			
			TCL VOCs	TCL PCBs	TAL Metals + CN	6NYCRR Part 360 Leachate Indicators
MW-101-8I	N6876-13	11/27/01	X	X	X	X
MW-101-9S	N6876-15	11/27/01	X	X	X	X
MW-101-10S	N6876-2	11/26/01	X	X	X	X
March 2002 Sampling Event						
MW-101-1	P1689-4	3/4/02	X	X	X	X
MW-101-2	P1689-1	3/4/02	X	X	X	X
MW-101-3	P1689-6	3/4/02	X	X	X	X
MW-101-4	P1689-19	3/6/02	X	X	X	X
MW-101-5	P1689-9	3/5/02	X	X	X	X
MW-101-6S	P1689-15	3/6/02	X	X	X	X
MW-101-6I	P1689-16	3/6/02	X	X	X	X
MW-101-7S	P1689-17	3/6/02	X	X	X	X
MW-101-7I	P1689-18	3/6/02	X	X	X	X
MW-101-8S	P1689-11	3/5/02	X	X	X	X
MW-101-8I	P1689-12	3/5/02	X	X	X	X
MW-101-9S	P1689-13	3/5/02	X	X	X	X
MW-101-10S	P1689-7	3/4/02	X	X	X	X
August 2002 Sampling Event						
MW-101-1	P3844-1	8/20/02	X			

During discussion of the analytical results, reference is made to the contract required detection limit (CRDL) and instrument detection limit (IDL). The CRDL is the lowest concentration analytes can be reliably determined within specified limits of precision and accuracy by a specified analytical method under routine laboratory operating conditions. Lower detection limits may be achieved such as the IDL.

To determine if the various media sampled at the site are potentially contaminated, the results were compared to established NYSDEC regulatory levels. The soil, sediment and ash material results were compared to the values presented in NYSDEC TAGM

4046, Determination of Soil Cleanup Objectives and Cleanup Levels. The sediment results were also compared to the sediment criteria presented in the NYSDEC Technical Guidance for Screening Contaminated Sediments. For organic compounds the sediment results were compared to the benthic aquatic life acute and chronic toxicity and wildlife bioaccumulation sediment criteria. These criteria are dependent on the organic carbon content of the sediment. The sediment samples were taken in wetland areas (Section 2.2.2) with significant amount of vegetation, therefore the organic carbon content is anticipated to be substantial. We have assumed an organic carbon content in the sediment of 10% to determine the sediment criteria. The human health bioaccumulation sediment criteria were not utilized as a completed exposure pathway for human consumption was not identified at the site (Section 6.2). Results of samples analyzed for the hazardous waste characteristics (ash material and contents of abandoned drums) were compared to the hazardous waste regulatory values presented in 6 NYCRR Part 371, Identification and Listing of Hazardous Wastes. The groundwater results were compared to the groundwater standards and guidance values presented in 6 NYCRR Part 703, Surface Water and Groundwater Quality Standards and Groundwater Effluent Standards and NYSDEC TOGS 1.1.1, Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations.

4.2 Evaluation of Surface Soil and Sediment Data

4.2.1 Surface Soil

Eleven surface soil samples (SS-1 through SS-11) were collected and analyzed for TCL SVOCs, TCL PCBs, TAL metals, cyanide, TCL pesticides and RCRA herbicides, as identified in Table 4.1-1. The locations of SS-1 through SS-11 are shown on Figure 2. In general, SS-1 was collected from a location off the landfill waste mass, SS-3 and SS-5 were collected from locations on the edge of the landfill waste mass and SS-2, SS-4 and SS-6 through SS-11 were collected on top of the landfill waste mass based on the findings of the test pit excavations. Summary tables of the analytical results for the surface soil samples are presented as Tables 4.2.1-1 through 4.2.1-4 at the end of the report text. A copy of the Data Package For Results Summary (laboratory analyses report and chain of custody record) for the surface soil samples is enclosed in Appendix J.

A total of nineteen SVOCs were detected within the surface soil, the majority of which were detected at low concentrations below the CRDL, but above the IDL and are therefore flagged as estimated values. The only SVOCs detected above the CRDL (not estimated) were benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, di-n-butylphthalate, fluoranthene, phenanthrene and pyrene all at SS-10. Bis(2-ethylhexyl)phthalate was detected at low concentrations in all of the surface soil samples, however, this compound was also detected in the laboratory blank associated with this set of samples and was therefore flagged as undetected by the data validator, except at SS-2 and SS-7. The concentrations of bis(2-ethylhexyl)phthalate detected in samples SS-2 (1.3 mg/kg) and SS-7 (2.3 mg/kg) were below its NYSDEC TAGM 4046 recommended soil cleanup objective value of 50 mg/kg.

Of those SVOCs detected, benzo(a)anthracene, benzo(a)pyrene and chrysene were the only compounds that exceeded their NYSDEC TAGM 4046 recommended soil cleanup objective value. Benzo(a)anthracene was detected at a concentration of 0.45 mg/kg at SS-10, which is slightly above its NYSDEC TAGM 4046 recommended soil cleanup objective value and USEPA Health Based criteria (carcinogens) of 0.224 mg/kg, but below its NYSDEC TAGM 4046 soil cleanup objective value to protect groundwater quality of 3 mg/kg. Benzo(a)pyrene was detected at five surface soil sample locations (SS-2, SS-5, SS-8, SS-10 and in the field duplicate (FD-1) of SS-11) at concentrations slightly above their NYSDEC TAGM 4046 recommended soil cleanup objective value and USEPA Health Based criteria (carcinogens) of 0.061 mg/kg, but did not exceed its NYSDEC TAGM 4046 recommended soil cleanup objective value to protect groundwater quality of 11 mg/kg. Chrysene was detected at six surface soil sample locations (SS-2, SS-3, SS-5, SS-8, SS-10 and SS-11), but at concentrations below its NYSDEC TAGM 4046 recommended soil cleanup objective value and NYSDEC TAGM 4046 soil cleanup objective value to protect groundwater quality of 0.4 mg/kg, except at SS-10. At this location chrysene was detected at 0.48 mg/kg, just slightly above its NYSDEC TAGM 4046 recommended soil cleanup objective value of 0.4 mg/kg.

Several tentatively identified compounds (TICs) were identified in each of the eleven surface soil samples at various concentrations. Table 4.2.1-1 includes the total TICs concentration per sample.

Aroclor 1254 was the only PCB detected within the surface soil samples, as shown in Table 4.2.1-2. The analytical results did not detect any other PCBs at any other sampling locations. Aroclor 1254 was detected within surface soil samples SS-2 through SS-6, SS-10 and SS-11 at low concentrations (0.093, 1.7, 0.2, 0.022, 0.024, 0.11, and 0.025 mg/kg, respectively), some of which were estimated values below the CRDL (SS-3, SS-5, SS-6 and SS-11). The concentration of Aroclor 1254 at surface soil sampling location SS-3 (1.7 mg/kg) was the only location that exceeded its NYSDEC TAGM 4046 recommended soil cleanup objective value and USEPA Health Based criteria (carcinogens) of 1 mg/kg. However, at this location Aroclor 1254 did not exceed its NYSDEC TAGM 4046 soil cleanup objective value to protect groundwater quality of 10 mg/kg.

Twenty metals were detected above the CRDL and/or the IDL within one or more surface soil samples, as shown in Table 4.2.1-3. The majority of these metals were detected at concentrations below their NYSDEC TAGM 4046 recommended soil cleanup objective values except for beryllium, copper, iron, mercury, nickel and zinc, as explained below:

- Beryllium was detected above the CRDL and/or the IDL within each of the eleven surface soil samples at a range of 0.41 to 0.66 mg/kg, which is above its NYSDEC TAGM 4046 recommended soil cleanup objective value of 0.16 mg/kg or site background. However, these concentrations are within the normal background range found in Eastern United States, New York State and the Albany area of New York State (see Table 4.2.1-3), and so are felt to be background levels.

- Copper was detected above the CRDL and/or the IDL within each of the eleven surface soil samples at a range of 3.9 to 173 mg/kg, four of which (SS-2, SS-6, SS-10, and SS-11) are above the NYSDEC TAGM 4046 recommended soil cleanup objective value of 25 mg/kg or site background. However, the concentrations of copper detected in those four surface soil samples are within the normal background range found in the Eastern United States and generally within the same order of magnitude as the normal background range found in the Albany area of New York State (see Table 4.2.1-3), and so are felt to be background levels.

- Iron was detected above the CRDL and/or the IDL within each of the eleven surface soil samples at a range of 4,110 to 18,500 mg/kg, which are above its NYSDEC TAGM 4046 recommended soil cleanup objective value of 2,000 mg/kg or site background. However, these concentrations are within the normal background range found in Eastern United States, New York State and the Albany area of New York State (see Table 4.2.1-3), and so are felt to be background levels.

- Mercury was detected above the CRDL and/or the IDL within seven of the eleven surface soil samples, five of which (SS-2, SS-6, SS-8, SS-10 and in the field duplicate (FD-1) of SS-11) exceeded their NYSDEC TAGM 4046 recommended soil cleanup objective value of 0.1 mg/kg. However, the concentrations of mercury in those five samples are generally within the same order of magnitude as the NYSDEC TAGM 4046 recommended soil cleanup objective value except for SS-2 (2.3 mg/kg vs 0.1 mg/kg, see Table 4.2.1-3). The concentrations of mercury are within the normal background range found in the Eastern United States and therefore are potentially at background levels.

- Nickel was detected above the CRDL and/or the IDL within eight of the eleven surface soil samples. Of those, only one surface soil sample (SS-10) revealed a concentration (13.2 mg/kg) slightly above its NYSDEC TAGM 4046 recommended soil cleanup objective value of 13 mg/kg or site background. The concentration detected at SS-10 is within the normal background range found in Eastern United States and New York State (see Table 4.2.1-3), and within the same order of magnitude as the normal background range found in the Albany area of New York State (13.2 mg/kg versus 12.5 mg/kg), and so the nickel concentrations are felt to be at background levels.

- Zinc was detected above the CRDL and/or the IDL within each of the eleven surface soil samples at a range of 14.7 to 425 mg/kg. All of the surface soil samples revealed concentrations above its NYSDEC TAGM 4046 recommended soil cleanup objective value of 20 mg/kg or site background except at SS-9. The zinc concentrations detected were within the normal background range found in the Albany area of New York State except at SS-2, SS-3, SS-4, SS-6 and SS-10 (see Table 4.2.1-3). At locations SS-3 and SS-4, the zinc concentrations were generally within the same order of magnitude as the normal background range found in the Albany area of New York State. The zinc concentrations detected were within the normal background range found in Eastern United States (see Table 4.2.1-3) and therefore potentially are at background levels.

Cyanide was detected in only one of the eleven surface soil samples, as shown in Table 4.2.1-3. Cyanide was detected at a concentration of 0.71 mg/kg within surface soil sample SS-9. All other samples were non-detect at 0.6 to 0.8 mg/kg. The NYSDEC TAGM 4046 recommended soil cleanup objective value for cyanide is site background. Since the detection at surface soil sample SS-9 is within the range of non-detect concentrations, it is inferred that cyanide at this location can be considered site background.

No pesticides or herbicides were detected above the CRDL. Table 4.2.1-4 summarizes the analytical results for these parameters.

4.2.2 Sediment

Three sediment samples (SD-1, SD-2 and SD-3) were collected and analyzed for TCL SVOCs, TCL PCBs, TAL metals, cyanide, TCL pesticides and RCRA herbicides, as identified in Table 4.1-1. Sediment samples SD-1 and SD-2 were collected from the Federally designated wetland northeast of the landfill. Sediment sample SD-3 was collected from a low lying area west of the landfill where surface water can pond. This area receives storm water runoff from a culvert under Interstate 87. Sediment samples at each of these locations were also collected for field screening with a PID. The PID screening did not detect VOC vapors above background levels. The results of the PID screening are presented in the Organic Vapor Headspace Analysis Logs in Appendix B. The sediment sample locations are shown on Figure 2. Summary tables of the analytical results for the sediment samples are presented as Tables 4.2.2-1 through 4.2.2-4. A copy of the Data Package For Results Summary (laboratory analyses report and chain of custody record) for the sediment samples is enclosed in Appendix J.

No SVOCs were detected above the CRDL or the IDL in sediment samples SD-1 and SD-2. Three SVOCs including bis(2-ethylhexyl)phthalate, fluoranthene and pyrene were detected below the CRDL in sediment sample SD-3, and are therefore flagged as estimated values. None of the compounds detected in sediment sample SD-3 exceeded its NYSDEC TAGM 4046 recommended soil cleanup objective value, its NYSDEC soil cleanup objective value to protect groundwater quality or its NYSDEC benthic aquatic life and wildlife bioaccumulation sediment criteria. The analytical results for the SVOC analyses are presented in Table 4.2.2-1.

Several TICs were identified in the three sediment samples at various concentrations. Table 4.2.2-1 includes the total TICs concentration per sample.

Aroclor 1248 and Aroclor 1254 were the only PCBs detected above the CRDL and/or the IDL within the three sediment samples, as shown in Table 4.2.2-2. Aroclor 1248 was detected within sediment samples SD-1 and SD-2 at concentrations of 0.038 and 0.041 mg/kg, respectively, below the CRDL, and are therefore flagged as estimated values. Aroclor 1254 was detected at SD-1 and SD-3 at concentrations of 0.058 and 0.041 mg/kg, respectively, below the CRDL, and are therefore flagged as estimated values; and at SD-2 at a concentration of 0.15 mg/kg, above the CRDL. All of the concentrations of Aroclor 1248 and Aroclor 1254 were below the NYSDEC TAGM 4046 recommended soil cleanup objective value of 1 mg/kg and the NYSDEC TAGM 4046 soil cleanup objective value to protect groundwater quality of 10 mg/kg. The total PCBs concentration at SD-2 of 0.191 mg/kg was within the same order of magnitude as the NYSDEC wildlife bioaccumulation sediment criteria of 0.14 mg/kg and below the benthic aquatic life acute and chronic toxicity sediment criteria (276.08 mg/kg acute and 1.93 mg/kg chronic).

Twenty-one metals were detected above the CRDL and/or the IDL within one or more sediment samples, as shown in Table 4.2.2-3. None of the detected metal concentrations exceeded the NYSDEC benthic organisms severe effect level sediment criteria. A few metal concentrations including cadmium, copper, lead, mercury and zinc slightly exceeded the NYSDEC benthic organisms lowest effect level sediment criteria as discussed below. The majority of the detected metals were also present at concentrations below their NYSDEC TAGM 4046 recommended soil cleanup objective values except for beryllium, copper, iron, mercury and zinc, as explained below:

- Beryllium was detected above the IDL, but below the CRDL within all three sediment samples. Beryllium was detected at concentrations of 0.51 mg/kg (SD-1), 0.23 mg/kg (SD-2), and 0.23 mg/kg (SD-3). The concentrations of beryllium were above its NYSDEC TAGM 4046 recommended soil cleanup objective value of 0.16 mg/kg or site background. However, these concentrations were within the normal background range found in Eastern United States, New York State and the Albany area of New York State (see Table 4.2.2-3), and so are felt to be background levels.

- Cadmium was detected within sediment sample SD-1 at 0.92 mg/kg which slightly exceeds, but is within the same order of magnitude as the NYSDEC benthic organisms lowest effect level sediment criteria of 0.6 mg/kg.

- Copper was detected within all three sediment samples at concentrations of 33.8 mg/kg (SD-1), 13.2 mg/kg (SD-2) and 12.5 mg/kg (SD-3), above its CRDL and IDL. The concentration of copper within sediment sample SD-1 was the only location, which exceeded its NYSDEC benthic organisms lowest effect sediment criteria of 16 mg/kg and its NYSDEC TAGM 4046 recommended soil cleanup objective value of 25 mg/kg or site background, but the concentration detected is within the same order of magnitude as these criteria. All of the concentrations of copper were within the normal background range found in Eastern United States and the concentrations at SD-2 and SD-3 were also within the normal background range found in the Albany area of New York State. The concentration of copper at SD-1 was within the same order of magnitude as the normal background range found in the Albany area of New York State (see Table 4.2.2-3). The concentration of copper detected in the sediment samples are therefore felt to be background levels.

- Lead was detected above the CRDL within sediment samples SD-1, SD-2 and SD-3 at concentrations of 83.6 mg/kg, 33 mg/kg and 42 mg/kg, respectively. These concentrations are slightly above, but within the same order of magnitude as the NYSDEC benthic organisms lowest effect level sediment criteria of 31 mg/kg.

- Iron was detected above the CRDL within sediment samples SD-1, SD-2 and SD-3 at concentrations of 24,700 mg/kg, 6,770 mg/kg and 10,900 mg/kg, respectively. The concentrations of iron are all above their NYSDEC TAGM 4046 recommended soil cleanup objective value of 2,000 mg/kg or site background. However, these concentrations are within the normal background range found in Eastern United States, New York State and the Albany area of New York State (see Table 4.2.2-3), and so are felt to be background levels.

- Mercury was detected above the CRDL within sediment samples SD-1, SD-2 and SD-3 at concentrations of 0.21 mg/kg, 0.09 mg/kg and 0.08 mg/kg, respectively. The concentration of mercury detected at SD-1, only, exceeds its NYSDEC benthic organisms lowest effect level sediment criteria of 0.15 mg/kg and its NYSDEC TAGM 4046 recommended soil cleanup objective value of 0.1 mg/kg, but the concentration detected is within the same order of magnitude as these criteria. The concentration of mercury detected at all three sediment samples is within the normal background range found in Eastern United States (see Table 4.2.2-3). The concentrations of mercury detected in the sediment samples are therefore felt to be background levels.

- Zinc was detected above the CRDL within sediment samples SD-1, SD-2 and SD-3 at concentrations of 187 mg/kg, 176 mg/kg and 55.9 mg/kg, respectively. The zinc concentration in sediment samples SD-1 and SD-2 slightly exceed, but are within the same order of magnitude as the NYSDEC benthic organisms lowest effect level sediment criteria of 120 mg/kg. The zinc concentrations were above its NYSDEC TAGM 4046 recommended soil cleanup objective value of 20 mg/kg or site background. However, the zinc concentrations were within the normal background range found in Eastern United States, and were generally within the same order of magnitude as the normal background range found in the Albany area of New York State (see Table 4.2.2-3). The concentrations of zinc detected in the sediment samples are therefore felt to be background levels.

Cyanide was not detected above the CRDL or the IDL in the three sediment samples.

Table 4.2.2-3 summarizes the analytical results for the TAL metals and cyanide.

No pesticides or herbicides were detected above the CRDL or the IDL. Table 4.2.2-4 summarizes the analytical results for the pesticides and herbicides.

4.3 Evaluation of Subsurface Soil and Ash Material

4.3.1 Test Pits

At the test pits where soil samples were collected for laboratory analyses, soil samples were also collected for field screening with a PID. In general, each soil sample collected for PID screening was representative of a two to three foot interval from grade to the termination depth of the test pit excavation. The PID screening did not detect VOC vapors above background levels except at test pits TP-20 and TP-22. The PID exhibited readings above background of 0.1 ppm at the 2 to 4 foot and 4 to 6 foot intervals at TP-20, and 5.9 ppm at the 6 to 9 foot interval at TP-22. The readings are not considered significant. The results of the PID screening are presented in the Organic Vapor Headspace Analysis Logs in Appendix B.

Six subsurface soil samples (one from each) were collected from select test pits (TP-13, TP-15, TP-17, TP-19, TP-20 and TP-22) and were analyzed for TCL PCBs, as identified in Table 4.1-1. The soil samples were collected just below the depth the landfill waste tapered off. These test pits were generally located on the east side or downgradient of the landfill waste mass as shown on Figure 2. The test pit locations were selected to correspond to areas downgradient of where PCBs were previously detected along the old Haul Road during the 1996 supplemental investigations. A summary table of the analytical results for the test pit soil samples is presented as Table 4.3.1-1. A copy of the Data Package For Results Summary (laboratory analyses reports and chain of custody records) for the test pit soil samples is enclosed in Appendix J.

PCBs were not detected above the CRDL or the IDL within the soil samples analyzed from TP-13, TP-19 and TP-22. PCBs, in the form of Aroclor 1248 and 1254, were detected at the other sampling locations. The analytical results detected Aroclor 1248 at

0.042 mg/kg (TP-15), 0.066 mg/kg (TP-17) and 0.17 mg/kg (TP-20), and Aroclor 1254 at 0.034 mg/kg (TP-15), 0.048 mg/kg (TP-17) and 0.11 mg/kg (TP-20). The concentrations of Aroclors detected were more than two orders of magnitude below the NYSDEC TAGM 4046 recommended soil cleanup objective value (10 mg/kg) and the NYSDEC TAGM 4046 soil cleanup objective value to protect groundwater quality (10 mg/kg), and approximately an order of magnitude below the USEPA Health Based criteria (1 mg/kg, carcinogens). The test pit soil sampling results suggest that the landfill is not a significant source of PCBs.

4.3.2 Soil Borings

Continuous (every two feet) soil samples were collected from the surface to the termination depth of the boring during the intermediate soil borings of the boring pairs (B-101-6I, B-101-7I and B-101-8I) and during the individual shallow soil borings (B-101-9S and B-101-10S). In general the PID readings ranged from non detect to a maximum of 3.2 ppm above background. The readings are not considered significant. The results of the PID screening are presented in the Organic Vapor Headspace Analysis Logs in Appendix B.

Five subsurface soil samples were collected, one each from soil borings B-101-6I, B-101-7I, B-101-8I, B-101-9S and B-101-10S and analyzed for TCL PCBs, as identified in Table 4.1-1. Each soil sample was a composite of the first six feet of soil sample recovered for that particular soil boring. The location of the soil borings is depicted on Figure 2. In general, soil boring B-101-10S is inferred to be an upgradient location based on the historical groundwater flow direction and the remaining soil borings are either downgradient or cross-gradient with respect to the landfill. A summary table of the analytical results for the soil boring soil samples is presented as Table 4.3.2-1. A copy of the Data Package For Results Summary (laboratory analyses reports and chain of custody records) for the soil boring soil samples is enclosed in Appendix J.

PCBs were not detected above the CRDL or the IDL within the soil samples analyzed from soil borings B-101-6I, B-101-7I, B-101-8I and B-101-10S. The analytical results of the soil sample collected and analyzed from soil boring B-101-9S detected Aroclor 1248 at 2.5 mg/kg, Aroclor 1254 at 2.0 mg/kg and Aroclor 1260 at 0.53 mg/kg. The concentrations of the detected Aroclors do not exceed the NYSDEC TAGM 4046 recommended soil cleanup objective value or the NYSDEC TAGM 4046 soil cleanup objective value to protect groundwater quality of 10 mg/kg for subsurface soil. The subsurface soil sampling results suggest that the landfill is not a significant source of PCBs.

4.3.3 Ash Material

Four samples of ash material were collected (one sample from each test pit) from TP-6B, TP-7A, TP-8A and TP-8C and analyzed for TCL SVOCs, TCL PCBs, TAL metals, cyanide and hazardous waste characteristics, as identified in Table 4.1-1. Each soil sample was collected from various depths, but all sampling locations were representative of the ash material present at each referenced test pit location. The location of the test pits is depicted on Figure 2. In general, all of the ash material samples were collected from the test pits advanced on the State of New York property adjacent to and west of the western side of the landfill property line (the northern half). The summary tables of analytical results for the ash material samples are presented as Tables 4.3.3-1 through 4.3.3-4. A copy of the Data Package For Results Summary (laboratory analyses report and chain of custody record) for the ash material soil samples is enclosed in Appendix J.

A total of twenty SVOCs were detected within the ash material samples, the majority of which were detected at low concentrations below the CRDL and are therefore flagged as estimated values. Of those SVOCs detected above the CRDL, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene and dibenzo(a,h)anthracene were the only compounds detected at concentrations above their NYSDEC TAGM 4046 recommended soil cleanup objective values. The concentrations detected of benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene and dibenzo(a,h)anthracene only slightly exceeded (within the same order of magnitude) their NYSDEC TAGM 4046 recommended soil cleanup objective values. Benzo(b)fluoranthene, benzo(k)fluoranthene and chrysene were the only SVOCs that slightly (within the same order of magnitude) exceeded their NYSDEC TAGM 4046 soil cleanup objective value to protect groundwater quality at test pit TP-6B and TP-8A (chrysene only).

Several TICs were identified in each of the four ash material samples at various concentrations. Table 4.3.3-1 includes the total TICs concentration per sample.

Aroclor 1254 was the only PCB detected above the CRDL and the IDL within three of the four ash material samples, as shown in Table 4.3.3-2. Aroclor 1254 was detected at 0.12 mg/kg within TP-7A, at 0.2 mg/kg within TP-8A and at 0.093 mg/kg within TP-8C. These PCB concentrations are one to two orders of magnitude below the NYSDEC recommended soil cleanup objective value and the NYSDEC TAGM 4046 soil cleanup objective value to protect groundwater quality of 10 mg/kg, and below the USEPA Health Based criteria of 1 mg/kg.

Twenty-three metals were detected above the CRDL and/or the IDL within the ash material samples, as shown in Table 4.3.3-3. The majority of these metals were present at concentrations below their NYSDEC TAGM 4046 recommended soil cleanup objective values except for arsenic, barium, beryllium, copper, iron, mercury, nickel and zinc, as explained below:

- Arsenic was detected above the CRDL at similar concentrations in all four ash material samples at 14.8 mg/kg (TP-6B), 22.2 mg/kg (TP-7A), 16.9 mg/kg (TP-8A) and 13 mg/kg (TP-8C), which are above its NYSDEC TAGM 4046 recommended soil cleanup objective value of 7.5 mg/kg or site background. However, these concentrations are within the normal background range found in Eastern United States, and generally within the same order of magnitude as the normal background range found in New York State and the Albany area of New York State (see Table 4.3.3-3), and so are felt to be background levels.

- Barium was detected above the CRDL in all four ash material samples at 280 mg/kg (TP-6B), 388 mg/kg (TP-7A), 337 mg/kg (TP-8A) and 691 mg/kg (TP-8C). Three of these concentrations were slightly above its NYSDEC TAGM 4046 recommended soil cleanup objective value of 300 mg/kg or site background. However, the concentrations of barium detected in the four ash material samples are within the normal background range found in Eastern United States and generally within the same order of magnitude as the normal background range found in New York State and the Albany area of New York State (see Table 4.3.3-3), and so are felt to be background levels.

- Beryllium was detected above the IDL, but below the CRDL in three of the four ash material samples at 0.38 mg/kg (TP-6A), 0.28 mg/kg (TP-7A) and 0.2 mg/kg (TP-8C). These concentrations were slightly above its NYSDEC TAGM 4046 recommended soil cleanup objective value of 0.16 mg/kg or site background. However, the concentrations of beryllium detected in the four ash material samples are within the normal background range found in Eastern United States, New York State and the Albany area of New York State (see Table 4.3.3-3), and so are felt to be background levels.

- Copper was detected above the CRDL in all four ash material samples at 63.4 mg/kg (TP-6B), 350 mg/kg (TP-7A), 196 mg/kg (TP-8A) and 249 mg/kg (TP-8C). These concentrations were above its NYSDEC TAGM 4046 recommended soil cleanup objective value of 25 mg/kg or site background. The concentration of copper detected at TP-6B is within the same order of magnitude as the TAGM 4046 recommended soil cleanup objective value. Also, the concentrations of copper detected in the four ash material samples are within the normal background range found in Eastern United States (see Table 4.3.3-3) and therefore potentially are at background levels.

- Iron was detected above the CRDL in all four ash material samples at 23,200 mg/kg (TP-6B), 45,000 mg/kg (TP-7A), 22,600 mg/kg (TP-8A) and 45,900 mg/kg (TP-8C). These concentrations were above its NYSDEC TAGM 4046 recommended soil cleanup objective value of 2,000 mg/kg or site background. However, the concentrations of iron detected in the four ash material samples are within the normal background range found in Eastern United States and the Albany area of New York State except at TP-7A and TP-8C. Iron concentrations at TP-7A and TP-8C were within the same order of magnitude as the normal background range found in the Albany area of New York State (see Table 4.3.3-3). The concentrations of iron detected in the ash material samples are therefore felt to be background levels.

- Mercury was detected above the CRDL in all four ash material samples at 0.31 mg/kg (TP-6B), 1.3 mg/kg (TP-7A), 1.0 mg/kg (TP-8A) and 0.56 mg/kg (TP-8C). These concentrations were above its NYSDEC TAGM 4046 recommended soil cleanup objective value of 0.1 mg/kg. However, the concentrations of mercury detected in the four ash material samples are within the normal background range found in Eastern United States (See Table 4.3.3-3) and therefore potentially are at background levels.

- Nickel was detected above the CRDL in all four ash material samples at 20.4 mg/kg (TP-6B), 34.6 mg/kg (TP-7A), 61.8 mg/kg (TP-8A) and 21.5 mg/kg (TP-8C). These concentrations were slightly above its NYSDEC TAGM 4046 recommended soil cleanup objective value of 13 mg/kg or site background. However, the concentrations of nickel detected in the ash material samples are within the normal background range found in Eastern United States and generally within the normal background range or the same order of magnitude as the normal background range found in New York State and the Albany area of New York State (see Table 4.3.3-3), and so are felt to be background levels.

- Zinc was detected above the CRDL in all four ash material samples at 766 mg/kg (TP-6B), 2,150 mg/kg (TP-7A), 1,210 mg/kg (TP-8A) and 1,450 mg/kg (TP-8C). These concentrations were above its NYSDEC TAGM 4046 recommended soil cleanup objective value of 20 mg/kg or site background. Zinc concentrations were generally within one to one and a half orders of magnitude of the normal background range found in the Albany area of New York State (see Table 4.3.3-3). Zinc concentrations were also within the normal background range found in Eastern United States and therefore potentially are at background levels.

Cyanide was not detected (less than 0.6 mg/kg) above the CRDL or the IDL in three of the four ash material samples, as shown in Table 4.3.3-3. Cyanide was detected within the sample collected from TP-6B at a concentration of 2.2 mg/kg. The NYSDEC TAGM 4046 recommended soil cleanup objective value for cyanide is site background and there are no reported typical background concentrations for this parameter.

The analyses of the ash material samples for hazardous waste characteristics included corrosivity, ignitability, reactivity (sulfide and cyanide), TCLP VOCs, TCLP SVOCs, TCLP pesticides, TCLP herbicides and TCLP metals. Table 4.3.3-4 summarizes the analytical results for these parameters.

Corrosivity is reported in Standard Units (SU) and for the ash material samples ranged from 7.51 to 8.1 SU. These levels are greater than 2.0 SU and less than 12.5 SU so the ash material does not meet the hazardous waste characteristic of corrosivity. The analytical results indicate that the ash material samples were not ignitable. The reactivity of the ash material, as analyzed on the basis of sulfide and cyanide, was below the CRDL.

No TCLP VOCs, pesticides or herbicides were detected above the CRDL. No TCLP SVOCs were detected above the CRDL except for m & p-cresol (3+4-methylphenols) at one location. M & p-cresol (3+4-methylphenols) was detected within the ash material sample collected from TP-8C at a concentration of 0.0082 mg/l. This concentration is significantly below its NYSDEC TCLP regulatory level of 200 mg/l. No TCLP metals were detected above the CRDL except for barium (all locations), cadmium (TP-7A and TP-8C) and lead (all locations). The concentrations of the detected metals were below their NYSDEC TCLP regulatory levels. Based on the sampling results, the ash material is not corrosive, ignitable, reactive or TCLP hazardous.

4.4 Evaluation of Abandoned Drums Sampling Data

Three samples (one grab, two composites) of the contents of the abandoned drums (hard white material) were collected and analyzed for the hazardous waste characteristics including corrosivity, ignitability and reactivity (sulfide and cyanide) TCLP VOCs, TCLP SVOCs, TCLP pesticides, TCLP herbicides and TCLP metals. The location of the abandoned drums is shown on Figure 2. A summary table of analytical results for the drum waste samples is presented as Table 4.4-1. A copy of the Data Package For Results Summary (laboratory analyses report and chain of custody record) for the drum waste samples is enclosed in Appendix K.

The corrosivity for the drum waste samples were 7.0, 4.53 and 5.26 SU. These levels are greater than 2.0 SU and less than 12.5 SU so the drum waste does not meet the hazardous waste characteristic of corrosivity. The analytical results indicate that the drum wastes were not ignitable. The reactivity of the drum waste, as analyzed on the basis of sulfide and cyanide, was below the CRDL. No TCLP VOCs, TCLP SVOCs, TCLP pesticides and TCLP herbicides were detected above the CRDL. NO TCLP metals were detected above the CRDL except for barium, lead and selenium. The concentrations of the detected metals were below their NYSDEC TCLP regulatory levels. Based on the sampling results, the contents of the abandoned drums are not corrosive, ignitable, reactive or TCLP hazardous.

As noted in Section 2.3.5, the hard white material had the appearance of a hardened enamel/epoxy. The source of the material is not known as no markings were visible on the drums.

4.5 Evaluation of Groundwater Data

A total of eight monitoring wells were installed as part of the RI. Five monitoring wells were installed within the shallow portion of the site's groundwater table (MW-101-6S through MW-101-10S), and three monitoring wells were installed within the intermediate level of the site's groundwater table (MW-101-6I through MW-101-8I). In addition to sampling the wells installed as part of this RI, five existing shallow monitoring wells (MW-101-1 through MW-101-5) were also sampled and analyzed for the same parameters. The analyses included TCL VOCs, TCL PCBs, TAL metals, cyanide and 6NYCRR Part 360 leachate indicator parameters, as identified in Table 4.1-3. Summary tables of analytical results for the shallow and intermediate groundwater samples are presented in Tables 4.5-1 through 4.5-4 for the November 2001 sampling event, in Tables 4.5-5 through 4.5-8 for the March 2002 sampling event and in Table 4.5-9 for the August 20, 2002 sampling event. A copy of the Data Package For Results Summary (laboratory analyses report and chain of custody records) for the groundwater samples is enclosed in Appendix L.1 for the November 2001 sampling event, Appendix L.2 for the March 2002 sampling event and Appendix L.3 for the August 20, 2002 sampling event.

The locations of the existing and newly installed monitoring wells are depicted in Figure 2. Monitoring wells MW-101-2, MW-101-3 and MW-101-10S are generally located on the western side of the landfill and are considered to be upgradient of the landfill based on the inferred groundwater flow direction to the southeast. Monitoring well MW-101-6S is at a cross gradient with respect to the landfill based on the inferred direction of groundwater flow. All other monitoring wells are downgradient with respect to the landfill waste mass.

Field observations and parameters (temperature, pH, conductivity, turbidity, and oxidation-reduction potential) were recorded during the groundwater sampling events completed November 26 through 28, 2001, March 4 through 6, 2002 and August 20, 2002. Field parameters recorded just prior to sampling are presented in Tables 4.5.1-1 and 4.5.2-1. In general, sampling personnel noted that the recharge rates for the monitoring wells were good and the wells typically recovered to static water levels almost immediately upon completion of development or purging.

4.5.1 Shallow Groundwater

4.5.1.1 Field Parameters

The pH for the shallow groundwater samples collected ranged from 4.73 to 9.15 SU at temperatures ranging from 5.8° to 13.2° Celsius. The conductivity for the shallow groundwater samples ranged from 187 to 2,260 MicroSiemens (μs). The field parameters presented represent values for each well prior to collecting the analytical samples. Turbidity values for the shallow groundwater samples during the November 2001 sampling event were very low, generally less than 3 Nephelometric Turbidity Units (NTU) except for monitoring well MW-101-2 which was 15.2 NTU. Turbidity values for the shallow groundwater samples during the March 2002 sampling event were also very low, generally less than 7 NTU except for monitoring well MW-101-4 which was 14.1 NTU. The turbidity values correlate to relatively clear groundwater samples (i.e., little to no suspended solid matter) except for monitoring well MW-101-2, which was noted to be light brown in color and monitoring well MW-101-4 which was noted to be rusty or red in color. However, during sampling turbidity increased from lowering and removing the bailer from the monitoring well to collect the samples, as the laboratory measured turbidity was generally one to two orders of magnitude higher than the field measured turbidity (November 2001 sampling event primarily). The oxidation-reduction potential (redox) varied from negative 13 to positive 239 millivolts (mV).

Table 4.5.1-1
Summary of Shallow Groundwater Sampling Field Parameters
Glens Falls Municipal Landfill at Luzerne Road
Remedial Investigation

Monitoring Well ID	Date	Temp (°C)	pH (SU)	Conductivity (μS)	Turbidity (NTUs)	Redox (mV)
November 2001 Sampling Event						
MW-101-1 (1)	11/27/01	10.2	6.48	1,905	2.17	34
MW-101-2 (1) (Upgradient)	11/26/01	12.8	5.21	523	15.2	122
MW-101-3 (1) (Upgradient)	11/26/01	13.2	5.55	737	2.2	222
MW-101-4 (1)	11/28/01	9.9	6.65	462	2.35	57
MW-101-5 (1)	11/28/01	10.0	6.64	1,126	1.22	88
MW-101-6S	11/27/01	9.1	6.51	187	1.28	171
MW-101-7S	11/27/01	10.7	6.60	1,065	1.60	-13
MW-101-8S	11/26/01	12.1	5.08	745	2.75	-10
MW-101-9S	11/27/01	10.5	6.59	604	0.69	54
MW-101-10S (Upgradient)	11/26/01	12.9	5.22	484	1.45	226
March 2002 Sampling Event						
MW-101-1 (1)	03/04/02	8.3	4.73	2,260	3.7	-6
MW-101-2 (1) (Upgradient)	03/04/02	12.1	4.76	1,031	4.51	239
MW-101-3 (1) (Upgradient)	03/04/02	6.4	9.15	280	3.95	220
MW-101-4 (1)	03/06/02	5.8	6.82	617	14.1	62
MW-101-5 (1)	03/05/02	9.2	6.87	430	2.43	1

Table 4.5.1-1
Summary of Shallow Groundwater Sampling Field Parameters
Glens Falls Municipal Landfill at Luzerne Road
Remedial Investigation

Monitoring Well ID	Date	Temp (°C)	pH (SU)	Conductivity (μS)	Turbidity (NTUs)	Redox (mV)
MW-101-6S	03/06/02	6.7	6.51	247	2.92	239
MW-101-7S	03/06/02	7.6	6.91	993	4.21	0
MW-101-8S	03/05/02	7.5	6.23	418	4.25	50
MW-101-9S	03/05/02	7.0	6.74	578	6.42	-3
MW-101-10S (Upgradient)	03/04/02	7.7	7.66	391	2.21	216
August 2002 Sampling Event						
MW-101-1 (1)	8/20/02	15.4	6.4	1,696	>200	-54

(1) Denotes existing monitoring well located at the Glens Falls Municipal Landfill Site.

4.5.1.2 November 2001 Sampling Event

Four VOCs were detected in the shallow groundwater within monitoring well MW-101-1, and one VOC was detected within monitoring well MW-101-5, as shown in Table 4.5-1. No other VOCs were detected above the CRDL or the IDL in the groundwater samples collected from the shallow wells. Benzene, chlorobenzene, cis-1,2-dichloroethene and tetrachloroethene were detected within the groundwater samples collected from monitoring well MW-101-1 at concentrations of 4, 18, 8.8 and 8.4 ug/l, respectively. The concentrations of these VOCs were slightly above their NYSDEC groundwater standards of 1 ug/l for benzene and 5 ug/l for the other VOCs. Chlorobenzene was detected at a concentration of 3 ug/l within the groundwater sample collected from MW-101-5 which is below its NYSDEC groundwater standard of 5 ug/l. The concentrations of chlorobenzene at MW-101-5 and benzene, cis-1,2-dichloroethene and tetrachloroethene at MW-101-1 are below the CRDL and therefore were flagged as estimated values. It is noted that the non-detect result for 2-butanone in the sample from monitoring well MW-101-6S was rejected by the data validator due to lack of detection in the low calibration standard.

Several tentatively identified compounds (TICs) were identified within the groundwater samples collected from monitoring well MW-101-1. The total concentration of the TICs was 57 ug/l. No TICs were identified at the other shallow monitoring well locations.

Aroclor 1242 was the only PCB detected above the CRDL and/or the IDL within the existing shallow monitoring wells MW-101-1 through MW-101-5, as shown in Table 4.5-2. Aroclor 1242 was detected within the groundwater samples collected from monitoring wells MW-101-1 (1.2ug/l), MW-101-4 (0.87ug/l) and MW-101-5 (7.4 ug/l), at concentrations that exceed the NYSDEC groundwater standard of 0.09 ug/l. The concentration of Aroclor 1242 at MW-101-4 was flagged as estimated since it was detected below the CRDL. Aroclor 1242 was not detected within the soil and sediment samples, however, Aroclor 1248 and Aroclor 1254 were detected in a few of the soil and sediment samples. No PCBs were detected above the CRDL and/or the IDL in the shallow monitoring wells installed as part of this RI (MW-101-6S through MW-101-10S).

Nineteen metals were detected above the CRDL and/or the IDL in the majority of the groundwater samples collected from the shallow monitoring wells, as shown in Table 4.5-3. The majority of these metals were present at concentrations below their NYSDEC groundwater standards or guidance values except for arsenic, barium, beryllium, chromium, copper, iron, lead, magnesium, manganese and sodium, as explained below:

- Arsenic was detected above the CRDL and/or the IDL within seven of the ten shallow monitoring wells. Arsenic was detected at concentrations ranging from 5.1 to 73.8 ug/l. The concentrations detected were below its NYSDEC water quality standard value, except for the samples from monitoring wells MW-101-6S and MW-101-7S. Arsenic was detected at concentrations of 34.6 ug/l and 73.8 ug/l at these locations, which are above, but generally within the same order of magnitude as its NYSDEC water quality standard value of 25 ug/l.
- Barium was detected above the CRDL at 1,740 ug/l within shallow monitoring well MW-101-7S. This concentration is slightly above, but within the same order of magnitude as its NYSDEC water quality standard of 1,000 ug/l.

- Beryllium was detected above the IDL, but below the CRDL within nine of the ten shallow monitoring wells. Beryllium was also detected within the tenth monitoring well, but at a concentration above its CRDL and IDL. Beryllium was detected at concentrations ranging from 0.34 to 6.9 ug/l. The concentrations detected were below its NYSDEC water quality guidance value, except for the samples from monitoring wells MW-101-6S and MW-101-7S. Beryllium was detected at concentrations of 3.2 ug/l and 6.9 ug/l at these locations, which are slightly above its NYSDEC water quality guidance value of 3 ug/l.

- Chromium was detected above the CRDL and/or the IDL within nine of the ten shallow monitoring wells. Chromium was detected at concentrations ranging from 5.2 to 141 ug/l. The concentrations detected were below its NYSDEC water quality guidance value, except for the samples from monitoring wells MW-101-6S and MW-101-7S. Chromium was detected at concentrations of 112 ug/l and 141 ug/l at these locations, which are above, but generally within the same order of magnitude as its NYSDEC water quality guidance value of 50 ug/l.

- Copper was detected above the CRDL and/or the IDL within nine of the ten shallow monitoring wells. The concentrations of copper ranged from 3.4 to 209 ug/l. Only one location had a concentration of copper that exceeded its NYSDEC water quality standard value. Copper was detected at a concentration of 209 ug/l within monitoring well MW-101-7S, which is slightly above its NYSDEC water quality standard value of 200 ug/l.

- Iron was detected above the CRDL within all ten shallow monitoring wells at concentrations ranging from 5,020 to 225,000 ug/l. These concentrations exceed the NYSDEC water quality standard value for iron of 300 ug/l.

- Lead was detected above the CRDL within nine of the ten shallow monitoring wells. The concentrations of lead ranged between 3.2 to 102 ug/l. The concentrations detected were below its NYSDEC water quality standard value of 25 ug/l except for the samples from monitoring wells MW-101-6S and MW-101-7S. At these locations lead was detected at 84.9 and 102 ug/l, respectively.

- Magnesium was detected above the CRDL within all ten shallow monitoring wells. Magnesium concentrations ranged from 5,910 to 87,100 ug/l. At monitoring wells MW-101-1, MW-101-5 and MW-101-7S the magnesium concentrations exceeded its NYSDEC water quality guidance value of 35,000 ug/l, but the levels were generally within the same order of magnitude as the water quality guidance value.

- Manganese was detected above the CRDL and the IDL within all ten shallow monitoring wells. However, it is noted that the spike recovery for manganese was not within control limits (showed slightly low recoveries) and therefore the data validator flagged them as estimated values. Manganese was detected at concentrations ranging from 214 to 15,500 ug/l, the majority of which (nine) were above its NYSDEC water quality standard value of 300 ug/l.

- Sodium was detected above the CRDL and the IDL within all ten shallow monitoring wells. The sodium concentrations were between 18,700 and 240,000 ug/l. With the exception of monitoring well MW-101-4, sodium concentrations were above its NYSDEC water quality standard value of 20,000 ug/l. The highest concentrations were at monitoring wells MW-101-1 (240,000 ug/l) near Luzerne Road and MW-101-3 (129,000 ug/l) near Interstate 87.

The non-detect results for mercury were rejected by the data validator at all shallow monitoring wells due to the lack of recovery in the low level standard. Cyanide was not detected above the CRDL or the IDL within the shallow monitoring well locations. The CRDL for cyanide for the shallow wells was 10 ug/l (Table 4.5-3).

Several leachate indicator parameters were detected above the CRDL as shown in Table 4.5-4. Ammonia, chloride, color, total dissolved solids and turbidity were the only parameters that were detected at concentrations that exceeded their NYSDEC groundwater standards. Ammonia was detected above the CRDL within six of the ten shallow monitoring wells. Ammonia was detected at concentrations ranging from 2.7 to 8.1 mg/l, all of which exceed its NYSDEC groundwater standard of 2 mg/l. Chloride was detected above the CRDL within all ten shallow monitoring wells. The concentrations of chloride were below its NYSDEC groundwater standard of 250 mg/l, except for the samples from monitoring wells MW-101-1 (420 mg/l) and MW-101-10S (270 mg/l). The color units for all shallow groundwater samples exceeded its NYSDEC groundwater standard of 15 color units, except at monitoring well MW-101-10S. Total dissolved solids were detected within all of the shallow groundwater samples in a range of 260 to 4,100 mg/l. Total dissolved solids exceeded its NYSDEC groundwater standard at nine of the ten shallow monitoring wells. Turbidity was checked in the field and in the laboratory. The laboratory turbidity values exceeded its NYSDEC groundwater standard of 5 NTU at all locations except for monitoring well MW-101-

10S. The field turbidity values as presented within Section 4.5.1.1 were below its groundwater standard except for monitoring well MW-101-2. It should be noted that not all of the leachate indicator parameters have a NYSDEC groundwater standard and/or guidance value.

4.5.1.3 March 2002 Sampling Event

Five VOCs were detected in shallow groundwater within monitoring well MW-101-1, and one VOC was detected within monitoring well MW-101-5, as shown in Table 4.5-5. No other VOCs were detected above the CRDL or the IDL in the groundwater samples collected from the shallow wells. Benzene, chlorobenzene, cis-1,2-dichloroethene, methyl tert-butyl ether (MTBE) and tetrachloroethene were detected within the groundwater samples collected from monitoring well MW-101-1 at concentrations of 1.9, 4.6, 11, 140 and 1.6 ug/l, respectively. The concentration of benzene was slightly above its NYSDEC groundwater standard of 1 ug/l and the concentration of cis-1,2-dichloroethene was slightly above its NYSDEC groundwater standard of 5 ug/l. The concentration of MTBE was more than one order of magnitude higher than its NYSDEC groundwater guidance value of 10 ug/l. Chlorobenzene and tetrachloroethene were detected at concentrations below their NYSDEC groundwater standards. Chlorobenzene was the only compound detected above the CRDL and IDL within monitoring well MW-101-5. The concentration of chlorobenzene at monitoring well MW-101-5 was below its NYSDEC groundwater standard of 5 ug/l.

Low level detections of VOCs in groundwater is not unusual at a municipal landfill as household products can contain VOCs. However, the detection of MTBE at 140 ug/l appears to be an anomaly. The source of the MTBE detected at monitoring well MW-101-1 is not known. MTBE is typically used as an additive in gasoline. In reference to a telephone conversation with a representative of the Town of Queensbury transfer station, no spillage of gasoline or petroleum products has occurred at the transfer station to his knowledge. No evidence of stressed vegetation or stained soil were observed in the area of monitoring well MW-101-1 during a site visit on July 23, 2002.

Several tentatively identified compounds (TICs) were identified within the groundwater samples collected from monitoring well MW-101-1. The total concentration of the TICs was 110 ug/l, which was flagged as an estimated concentration. No TICs were identified at the other shallow monitoring well locations.

Aroclor 1242 was the only PCB detected above the CRDL and/or the IDL within the existing shallow monitoring wells MW-101-1 through MW-101-5, as shown in Table 4.5-6. Aroclor was detected within the groundwater samples collected from monitoring well MW-101-5 at a concentration of 3.4 ug/l, which exceeds its NYSDEC groundwater standard of 0.09 ug/l. Aroclor 1242 was not detected within any other existing monitoring well, nor were any other PCBs detected. No PCBs were detected above the CRDL and/or the IDL in the shallow monitoring wells installed as part of this RI (MW-101-6S through MW-101-10S).

Nineteen metals were detected above the CRDL and/or the IDL in the majority of the groundwater samples collected from the shallow monitoring wells, as shown in Table 4.5-7. The majority of these metals were present at concentrations below their NYSDEC groundwater standards or guidance values except for iron, magnesium, manganese and sodium, as explained below:

- Iron was detected above the CRDL within all ten shallow monitoring wells at concentrations ranging from 3,030 to 88,100 ug/l. These concentrations exceed the NYSDEC groundwater standard value for iron of 300 ug/l.
- Magnesium was detected above the CRDL within all ten shallow monitoring wells. Magnesium concentrations ranged from 2,000 to 50,100 ug/l. At monitoring wells MW-101-1 and MW-101-7S the magnesium concentrations exceeded its NYSDEC groundwater guidance value of 35,000 ug/l, but the levels were generally within the same order of magnitude as the groundwater guidance value.

- Manganese was detected above the CRDL and/or the IDL within all of the ten shallow monitoring wells. Manganese was detected at concentrations ranging from 121 to 5,890 ug/l, the majority of which (nine) were above its NYSDEC groundwater standard value of 300 ug/l.
- Sodium was detected above the CRDL and the IDL within all ten shallow monitoring wells. The sodium concentrations were between 14,800 and 262,000 ug/l. With the exception of monitoring well MW-101-4 and MW-101-6S, sodium concentrations were above its NYSDEC groundwater standard value of 20,000 ug/l. The highest concentrations were at monitoring wells MW-101-1 (262,000 ug/l) near Luzerne Road and MW-101-2 (155,000 ug/l) near Luzerne Road and Interstate 87.

Lower concentrations of metals were detected during the March 2002 sampling event compared to the November 2001 sampling event. This is anticipated to be attributable to lower turbidity levels (laboratory measured) and lower dissolved solids levels during the March 2002 sampling event.

Several leachate indicator parameters were detected above the CRDL as shown in Table 4.5-8. Ammonia, chloride, color, phenols, total dissolved solids and turbidity were the only parameters that were detected at concentrations that exceeded their NYSDEC groundwater standards. Ammonia was detected above the CRDL within five of the ten shallow monitoring wells. Ammonia was detected at concentrations ranging from 0.8 to 3.3 mg/l, two of which exceed its NYSDEC groundwater standard of 2 mg/l. Chloride was detected above the CRDL within all ten shallow monitoring wells. The concentrations of chloride were below its NYSDEC groundwater standard of 250 mg/l, except for the samples from monitoring wells MW-101-1 (300 mg/l) and MW-101-2 (330 mg/l). The color units for seven of the ten shallow groundwater samples exceeded its NYSDEC groundwater standard of 15 color units. Phenols were not detected above the CRDL or the IDL at nine of the ten locations. Phenols were detected at 0.05 mg/l in the groundwater sample collected from monitoring well MW-101-4, which is above its NYSDEC groundwater standard of 0.001 mg/l. Total dissolved solids exceeded its NYSDEC groundwater standard of 500 mg/l at four of the ten shallow monitoring wells. Turbidity was checked in the field and in the laboratory. The laboratory turbidity values exceeded its NYSDEC groundwater standard of 5 NTU at all locations except for monitoring well MW-101-10S. The field turbidity values as presented within Section 4.5.1.1 were below its groundwater standard except for two locations (MW-101-4 and MW-101-9S). It should be noted that not all of the leachate indicator parameters have a NYSDEC groundwater standard and/or guidance value.

4.5.1.4 August 2002 Sampling Event

Monitoring well MW-101-1 was the only well sampled in August 2002 and for TCL VOCs only. This well was re-sampled due to the MTBE detection of 140 ug/l during the March 2002 sampling event. Four VOCs were detected within monitoring well MW-101-1, as shown in Table 4.5-9. Benzene, chlorobenzene, cis-1,2-dichloroethene, and MTBE were detected at concentrations of 3.5, 11, 8.3 and 35 ug/l, respectively.

The concentration of benzene was slightly above its NYSDEC groundwater standard of 1 ug/l and the concentrations of chlorobenzene and cis-1,2-dichloroethene were slightly above their NYSDEC groundwater standard of 5 ug/l. The concentration of MTBE was slightly above its NYSDEC groundwater guidance value of 10 ug/l, but almost an order of magnitude lower than the concentration detected during the March 2002 sampling event. No tentatively identified compounds (TICs) were identified within the groundwater sample collected from monitoring well MW-101-1.

4.5.2 Intermediate Groundwater

4.5.2.1 Field Parameters

The pH for the intermediate groundwater samples collected ranged from 6.33 to 7.99 SU at temperatures ranging from 7.7° to 10.3° Celsius. The conductivity for the intermediate groundwater samples ranged from 134.7 to 967 µs. The field parameters presented represent values for each well prior to collecting analytical samples. Turbidity values for the intermediate groundwater samples varied, but were generally less than 50 NTU except at monitoring well MW-101-8I. The turbidity values correlate to relatively clear groundwater samples at MW-101-7I (i.e., little to no suspended solid matter), and otherwise dark brown to very cloudy water. The oxidation-reduction potential (redox) varied from positive 47 to 239 mV.

Table 4.5.2-1
Summary of Intermediate Groundwater Sampling Field Parameters
Glens Falls Municipal Landfill at Luzerne Road
Remedial Investigation

MonitoringWell ID	Date	Temp (°C)	pH (SU)	Conductivity (µS)	Turbidity (NTUs)	Redox (mV)
November 2001 Sampling Event						
MW-101-6I	11/27/01	8.9	7.00	137.5	19.83	152
MW-101-7I	11/27/01	10.3	6.40	754	1.11	47
MW-101-8I	11/27/01	9.7	6.86	679	71	61
March 2002 Sampling Event						
MW-101-6I	03/06/02	7.7	7.99	134.7	13.92	239
MW-101-7I	03/06/02	8.9	6.59	661	12.2	87
MW-101-8I	03/05/02	8.7	6.33	967	>200	176

4.5.2.2 November 2001 Sampling Event

One VOC was detected within the intermediate monitoring well MW-101-7I, as shown in Table 4.5-1. No other VOCs were detected above the CRDL or the IDL in the groundwater samples collected from the intermediate wells. Chloroform was detected at a concentration of 18 ug/l, which is above but within the same order of magnitude as its NYSDEC groundwater standard of 7 ug/l. It is noted that the non-detect result for 2-butanone in the sample from monitoring well MW-101-6I was rejected by the data validator due to lack of detection in the low calibration standard.

No PCBs were detected above the CRDL and/or the IDL within the groundwater samples collected from the intermediate monitoring wells, as shown in Table 4.5-2.

Fourteen metals were detected above the CRDL and/or the IDL in the groundwater samples collected from the intermediate monitoring wells, as shown in Table 4.5-3. The majority of these metals were present at concentrations below their NYSDEC groundwater standards except for lead, manganese and sodium, as explained below:

- Iron was detected above the CRDL within the three intermediate monitoring wells. The concentrations of iron were 1,090 (MW-101-6I), 680 (MW-101-7I) and 3,160 (MW-101-8I) ug/l. These iron concentrations exceeded the NYSDEC water quality standard value for iron of 300 ug/l.

- Manganese was detected above the CRDL within all three intermediate monitoring wells. However, it should be noted that the spike recovery for manganese was not within control limits. Manganese was detected at concentrations of 20.7 (MW-101-6I), 264 (MW-101-7I) and 326 (MW-101-8I) ug/l. The NYSDEC water quality standard value for manganese of 300 ug/l was slightly exceeded at monitoring well MW-101-8I.

- Sodium was detected above the CRDL within all three intermediate monitoring wells. The sodium concentrations were 6,280 (MW-101-6I), 19,900 (MW-101-7I) and 43,000 (MW-101-8I) ug/l. With the exception of monitoring well MW-101-8I, sodium concentrations were below its NYSDEC water quality standard value of 20,000 ug/l. Monitoring well MW-101-8I is near Luzerne Road.

The non-detect results for mercury were rejected by the data validator at all intermediate monitoring wells due to the lack of recovery in the low level standard. Cyanide was detected above the CRDL within the groundwater samples collected from the three intermediate monitoring wells, as shown in Table 4.5-3. Cyanide was detected at monitoring well MW-101-6I at a concentration of 32 ug/l, at MW-101-7I at a concentration of 19 ug/l and at MW-101-8I at a concentration of 42 ug/l. None of these concentrations exceed its NYSDEC groundwater standard of 200 ug/l. The cyanide detections were flagged as non-detect by the data validator due to the presence of cyanide in the groundwater sampling equipment blank.

Several leachate indicators were detected above the CRDL and the IDL, as shown in Table 4.5-4. There were no leachate indicators that exceeded their NYSDEC groundwater standards. It should be noted that not all of the leachate indicators have a NYSDEC groundwater standard and/or guidance value.

4.5.2.3 March 2002 Sampling Event

No VOCs were detected above the CRDL or the IDL in the groundwater samples collected from the intermediate wells, as shown in Table 4.5.5. No PCBs were detected above the CRDL and/or the IDL within the groundwater samples collected from the intermediate monitoring wells, as shown in Table 4.5-6.

Sixteen metals were detected above the CRDL and/or the IDL in the groundwater samples collected from the intermediate monitoring wells, as shown in Table 4.5-7. The majority of the metals were present at concentrations below their NYSDEC groundwater standards except for iron, manganese and sodium, as explained below:

- Iron was detected above the CRDL within the three intermediate monitoring wells. The concentrations of iron were 195 (MW-101-6I), 3,030 (MW-101-7I) and 63,600 (MW-101-8I) ug/l. The iron concentrations in two of the three monitoring wells exceeded the NYSDEC groundwater standard for iron of 300 ug/l.
- Manganese was detected above the CRDL within two intermediate monitoring wells and below the CRL but above the IDL within the third well. Manganese was detected at concentrations of 3.9 (MW-101-6I), 2,970 (MW-101-7I) and 1,060 (MW-101-8I) ug/l. The NYSDEC groundwater standard for manganese of 300 ug/l was exceeded at monitoring wells MW-101-7I and MW-101-8I.
- Sodium was detected above the CRDL within all three intermediate monitoring wells. The sodium concentrations were 5,200 (MW-101-6I), 29,800 (MW-101-7I) and 73,800 (MW-101-8I) ug/l. With the exception of monitoring well MW-101-6I, sodium concentrations were above its NYSDEC groundwater standard of 20,000 ug/l. It should be noted that the concentration of sodium at monitoring well MW-101-6I was estimated because of the presence of interference. Monitoring well MW-101-8I is near Luzerne Road.

4.5.3 Upgradient and Downgradient Water Quality Comparison

A comparison of upgradient and downgradient groundwater analytical results was conducted for the shallow groundwater at the site. The same comparison for the intermediate groundwater could not be evaluated, as there are no upgradient wells installed within the intermediate groundwater zone. Monitoring wells MW-101-2, MW-

101-3 and MW-101-10S are considered to be upgradient monitoring wells and monitoring well MW-101-6S is at a cross gradient with respect to the landfill based on the inferred direction of groundwater flow. The comparison was only performed for those analytical parameters that exceeded their NYSDEC groundwater standard and/or guidance value.

Four VOCs were detected slightly above their NYSDEC groundwater standard at monitoring well MW-101-1 during the November 2001 sampling event. The same four VOCs and MTBE were detected slightly above their NYSDEC groundwater standard or guidance value at monitoring well MW-101-1 during the March 2002 sampling event. Three of the same four VOCs and MTBE were detected slightly above their NYSDEC groundwater standard or guidance value during the August 20, 2002 sampling event. None of these compounds were detected above the CRDL or IDL in the upgradient shallow monitoring wells or the other downgradient monitoring wells.

Aroclor 1242 was detected above its NYSDEC groundwater standard at monitoring wells MW-101-1, MW-101-4 and MW-101-5 during the November 2001 sampling event. Aroclor 1242 was only detected above its NYSDEC groundwater standard at monitoring well MW-101-5 during the March 2002 sampling event. This PCB was not detected above the CRDL or the IDL in the upgradient monitoring wells or the other downgradient monitoring wells.

Arsenic, beryllium and chromium were detected at most locations at similar concentrations except at monitoring wells MW-101-6S (cross gradient location) and MW-101-7S (downgradient location), where the concentrations slightly exceeded their NYSDEC groundwater standards or guidance value (beryllium) during the November 2001 sampling event. The concentrations of these metals at these two locations were higher than those detected at the upgradient locations, generally by less than an order of magnitude. Arsenic, beryllium and chromium were not detected at concentrations that exceeded their NYSDEC groundwater standards during the March 2002 sampling event.

Barium and copper were detected at most locations at similar concentrations except at monitoring wells MW-101-6S (cross gradient location) and MW-101-7S (downgradient location) during the November 2001 sampling event. The concentrations of barium and copper were higher than upgradient results by approximately one order of magnitude or less. Barium and copper concentrations slightly exceeded their NYSDEC groundwater standards only at monitoring well MW-101-7S. Barium and copper were not detected at concentrations that exceeded their NYSDEC groundwater standards during the March 2002 sampling event.

Iron was detected at all shallow monitoring well locations (upgradient and downgradient) above its NYSDEC groundwater standard. In general, the magnitude of the iron results during the November 2001 sampling event appeared to be similar, except at monitoring wells MW-101-6S (cross gradient location), MW-101-7S and MW-101-8S (downgradient locations), which appeared slightly higher than the others. The concentrations of iron at these three locations were generally less than an order of magnitude higher than those observed at some of the upgradient well locations. The concentrations of iron during the March 2002 sampling event were generally less than those observed during November 2001, and the concentration of iron between some upgradient and downgradient locations were generally within the same order of magnitude.

During the November 2001 sampling event, the concentrations of lead in the upgradient wells were consistent with the concentrations in the downgradient wells, except for monitoring wells MW-101-6S (cross gradient location) and MW-101-7S (down gradient location). Lead concentrations at these locations were higher than upgradient concentrations generally by less than one half order of magnitude. Lead was not detected at concentrations that exceeded its NYSDEC groundwater standard during the March 2002 sampling event.

Magnesium concentrations varied at each well location but were consistent with the concentrations observed at the upgradient monitoring wells except for monitoring wells MW-101-1, MW-101-5 and MW-101-7S (downgradient locations) during the November 2001 sampling event. Magnesium appeared to be higher by less than an order of magnitude at these three locations, where its NYSDEC groundwater standard was slightly exceeded. The concentrations of magnesium during the March 2002 sampling event were similar (down slightly) to that observed during November 2001.

The manganese concentrations in the upgradient and downgradient monitoring wells were consistent during both the November 2001 and March 2002 sampling events. The highest concentrations were at upgradient monitoring well MW-101-2 near Luzerne Road and Interstate 87.

Sodium concentrations were consistent when comparing upgradient results to downgradient results, except that the sodium concentration at monitoring well MW-101-1 (downgradient) appeared higher than at other locations during the November 2001 and March 2002 sampling events. The high sodium concentration at monitoring well MW-101-1 is anticipated to be attributable to its location adjacent to Luzerne Road (i.e., from use of road salt).

Ammonia, chloride, color, phenols (March 2002 only), total dissolved solids and turbidity were the leachate indicator parameters that exceeded their NYSDEC groundwater standards. Ammonia was not detected within the three upgradient monitoring well locations, but was detected slightly above its NYSDEC groundwater standard within six of the seven downgradient shallow monitoring wells during November 2001. During the March 2002 sampling event, ammonia concentrations were generally less and only slightly exceeded its NYSDEC groundwater standard at two of the seven downgradient monitoring wells. Chloride concentrations varied from 52 to 270 mg/l in the upgradient monitoring wells. A similar range was observed in the downgradient monitoring wells, therefore, there appears to be no distinct increase or decrease in chloride concentrations when comparing the upgradient and downgradient results. The chloride results during the March 2002 sampling event were of similar magnitude as the November 2001 sampling event.

Color values were generally similar in the upgradient and downgradient shallow monitoring wells during both the November 2001 and March 2002 sampling events. The exceptions were color values were below its NYSDEC groundwater standard at monitoring well MW-101-10S during both sampling events and at monitoring wells MW-101-4 and MW-101-6S during the March 2002 sampling event. Phenols were not detected above the IDL, except during the March 2002 sampling event it was detected at monitoring well MW-101-4 above its NYSDEC groundwater standard (0.05 mg/l versus 0.001 mg/l).

Total dissolved solids (TDS) were detected at nine of the ten shallow monitoring well locations (upgradient and downgradient) above its NYSDEC groundwater standard during the November 2001 sampling event and at four of the ten shallow monitoring well locations (upgradient and downgradient) during the March 2002 sampling event. In general, the magnitude of the TDS results during the November 2001 sampling event appeared to be similar, except at monitoring wells MW-101-6S (cross gradient location) and MW-101-7S (downgradient location), which appeared slightly higher than the others. The concentrations of TDS during the March 2002 sampling event were generally less than those observed during November 2001, and the concentration of TDS between upgradient and downgradient locations were generally within the same order of magnitude.

In general, field measured turbidity values (just prior to sampling) were below or within the same order of magnitude as its NYSDEC groundwater standard of 5 NTU, and were similar between upgradient and downgradient monitoring well locations. Lab measured turbidity values exceeded the NYSDEC groundwater standard at nine of the ten shallow monitoring wells during the November sampling event and at all shallow monitoring wells during the March 2002 sampling event. The turbidity varied between the monitoring wells, with the highest turbidity readings at upgradient monitoring well MW-101-3 during both sampling events. The lab measured turbidity readings in general were lower during the March 2002 sampling event.

The generally higher concentration of metals detected during the November 2001 sampling event is anticipated to be partly attributable to the higher TDS and turbidity values detected during that sampling event. The concentration of metals were down during the March 2002 sampling event when the TDS and turbidity levels were also lower.

In general, based on the groundwater sampling results and comparison of upgradient and downgradient groundwater results it appears that the landfill has had some impact on the downgradient groundwater quality as there is some contravention of groundwater standards. However, the impact does not appear to be significant.

4.5.4 Historical Water Quality Comparison

Groundwater sampling and analysis has been conducted as part of previous investigations at the site. Therefore, analytical data for groundwater samples collected and analyzed from the five original wells (MW-101-1 through MW-101-5) was reviewed and compared to the analytical results for the groundwater sampling conducted as part of this RI. The historical analytical data is summarized in Table 1.6-1. The November 6, 1985 results were taken from the Glens Falls Landfill, Phase II Investigation Report, dated February 1987, by Recra Research, Inc. The March 21, 1990 results are taken from the Monitoring Well Testing and Analysis, Glens Falls Landfill Site, by Clough, Harbour and Associates dated May 24, 1990. The November 15 and 18, 1996 results were taken from the Supplemental Sampling Project, Glens Falls Landfill Site, dated March 12, 1997 by NYSDEC. The September 1999 and September 2000 results were taken from draft Table 5-6 Organic Shallow Groundwater Analytical Data, Luzerne Road Landfill Site provided by NYSDEC. It should be noted that the list of parameters analyzed varied for each of these referenced sampling events. The comparison was performed for those parameters that were analyzed during most of the sampling events. Table 4.5-10 summarizes the historical and current analytical data where detections occurred and for those parameters analyzed during most of the sampling events.

Four VOCs (benzene, chlorobenzene, cis-1,2-dichloroethene and tetrachloroethene [November 2001 sampling event only]) were detected at monitoring well MW-101-1 slightly above their NYSDEC groundwater standards during the RI sampling events. Methyl tert-butyl ether (March 2002 and August 20, 2002 sampling events only) was also detected at monitoring well MW-101-1 above its NYSDEC groundwater guidance value. Benzene and chlorobenzene were detected in monitoring well MW-101-1 in 1990, 1996, and 1999 at concentrations nearly identical to those detected in 2001. Cis-1,2-dichloroethene, methyl tert-butyl ether and tetrachloroethene were not detected at this location during the other sampling events described. 1,4-Dichlorobenzene was also detected at monitoring well MW-101-1 in 1996 and 1999 at concentrations of 4 ug/l and 5 ug/l, respectively, just above its NYSDEC groundwater standard of 3 ug/l.

Historically, PCBs in the form of Aroclor 1016, Aroclor 1232 and Aroclor 1242 were the only PCBs detected within one or more monitoring wells. Aroclor 1016 and Aroclor 1232 were detected only once in 1985 in monitoring well MW-101-5 (62 ug/l) and MW-101-1 (4.8 ug/l), respectively. Aroclor 1016 and Aroclor 1232 have not been detected since in these or other monitoring wells on-site. In 1990, Aroclor 1242 was detected in monitoring well MW-101-5 only. In 1996, Aroclor 1242 was detected in monitoring wells MW-101-1, MW-101-4 and MW-101-5. In 1999, Aroclor 1242 was detected in the same three monitoring wells at increasing concentrations as well as in monitoring well MW-101-2. Monitoring well MW-101-2 is located southwest of the landfill adjacent to Interstate 87 and north of Luzerne Road. It is at a cross-gradient with upgradient monitoring wells MW-101-3 and MW-101-10S, and therefore considered to be an upgradient monitoring well. Aroclor 1242 was again detected in monitoring wells MW-101-1, MW-101-2, MW-101-4 and MW-101-5 in 2000, but the concentrations were generally an order of magnitude less with respect to the previous 1999 sampling event.

During the sampling events conducted as part of the RI activities, Aroclor 1242 was detected at monitoring wells MW-101-1, MW-101-4 and MW-101-5 during the November 2001 sampling event and at monitoring well MW-101-5 during the March 2002 sampling event. The concentrations detected were similar to the concentrations detected during the 2000 sampling event conducted by others. No PCBs were detected at monitoring well MW-101-2 or at the newly installed wells during the RI sampling events. The highest concentration of PCBs, primarily Aroclor 1242 have been detected at MW-101-1 and MW-101-5. Therefore, the Aroclor 1242 concentrations detected at MW-101-1 and MW-101-5 were plotted against time in Excel and a trend line added to show the current and future trend. The graphs show the Aroclor 1242 trend is slightly downward at MW-101-1 and downward at MW-101-5. A copy of the analytical data and graphs is presented in Appendix D.4.

The majority of metals detected in monitoring wells MW-101-1 through MW-101-5 were present at concentrations below their NYSDEC groundwater standards except for iron, magnesium, manganese and sodium. However, even metals that were not detected above groundwater standards were compared to historical data to determine whether metal concentrations are increasing or not. Historical metals data was available for 1990 and 1999, and also for 1985 but just for the metals copper, iron, lead, nickel and silver.

A comparison of the metals results from the RI sampling events to historical data for the metals that did not exceed groundwater standards and/or guidance values is follows:

- The concentrations for arsenic, beryllium, cadmium, calcium, mercury, potassium, selenium and silver were generally within the same order of magnitude during the RI sampling events as during the referenced historical sampling events with no noticeable increase.
- The concentrations for barium were within the same order of magnitude during the RI sampling events as during the referenced historical sampling events with no noticeable increase, except a slight increase at upgradient monitoring well MW-101-3 during the November 2001 sampling event over the 1999 results, but not the 1990 results.
- The concentrations for chromium were within the same order of magnitude during the RI sampling events as during the referenced historical sampling events with no noticeable increase, except a slight increase at upgradient monitoring well MW-101-2 during the November 2001 sampling event over the 1999 results.
- The concentrations for copper were within the same order of magnitude during the RI sampling events as during the referenced historical sampling events with no noticeable increase, except a slight increase at upgradient monitoring well MW-101-2 during the November 2001 sampling event and at downgradient monitoring well MW-101-1 during the March 2002 sampling event.
- The concentrations for lead were within the same order of magnitude during the RI sampling events as during the referenced historical sampling events with no noticeable increase, except a slight increase at downgradient monitoring well MW-101-1 during the March 2002 sampling event over the 1999 results, but within the same order of magnitude.
- The concentrations for nickel and thallium were within the same order of magnitude during the RI sampling events as during the referenced historical sampling events with no noticeable increase. A slight decrease in nickel occurred at downgradient monitoring well MW-101-5 during the RI sampling events compared to the 1985 results. A slight decrease in thallium occurred at upgradient monitoring well MW-101-2 and at downgradient monitoring well MW-101-5 during the RI sampling events compared to the 1999 results.
- The concentrations for zinc were within the same order of magnitude during the RI sampling events as during the referenced historical sampling events with no noticeable increase, except a slight increase at upgradient monitoring well MW-101-

2 and at downgradient monitoring well MW-101-1 during the November 2001 sampling event over the historical results, but less than one half order of magnitude.

A comparison of the metals results from the RI sampling events to historical data for the metals aluminum, iron, magnesium, manganese and sodium that did exceed groundwater standards and/or guidance values is follows:

- The concentrations for aluminum were generally within the same order of magnitude during the RI sampling events as during the referenced historical sampling events, except that aluminum increased approximately one half order of magnitude to over an order of magnitude at downgradient monitoring well MW-101-1 and upgradient monitoring wells MW-101-2 and MW-101-3.

- The concentrations for magnesium and manganese were generally within the same order of magnitude during the RI sampling events as during the referenced historical sampling events with no noticeable increase.

- The concentrations for iron were within the same order of magnitude during the RI sampling events as during the referenced historical sampling events, except iron increased one to two orders of magnitude at upgradient monitoring wells MW-101-2 and MW-101-3 during the RI sampling events compared to historical sampling events.

- The concentrations for sodium were generally within the same order of magnitude during the RI sampling events as during the referenced historical sampling events, except sodium increased less than one half order of magnitude at upgradient monitoring well MW-101-2 during the March 2002 sampling event and at downgradient monitoring well MW-101-1 during both sampling events compared to 1999 results (only historical data available). Sodium also decreased at downgradient monitoring wells MW-101-4 and MW-101-5 compared to the 1999 results.

Of the leachate indicator parameters analyzed, ammonia, chloride, color, total dissolved solids and turbidity were the only parameters that were detected at concentrations that exceeded their NYSDEC groundwater standards. Although ammonia was detected above groundwater standards, the concentrations of ammonia detected in November 2001 and March 2002 were less than those detected in 1990, except at monitoring well MW-101-5 where the results were similar. Chloride concentrations in November 2001 and March 2002 were generally similar to the 1985 and 1990 results, except for MW-101-

1. Chloride was detected at 420 mg/l and 300 mg/l during the RI sampling events, which is slightly higher than 1985 (184 mg/l) and 1990 (103 mg/l), but within the same order of magnitude. Color was up at all upgradient and downgradient monitoring well locations during the RI sampling events compared to 1990 results. Turbidity was up during the RI sampling events compared to 1990 results at upgradient monitoring wells MW-101-2 and MW-101-3 and at downgradient monitoring well MW-101-1. The concentration of total dissolved solids and all other leachate indicator parameters were generally within the same order of magnitude during the RI sampling events as during the 1985 (total organic carbon and sulfate only) and 1990 historical sampling events.

Based on the comparison of VOCs, metals and leachate indicator parameter results detected during November 2001 and March 2002 to limited historical data, the VOCs, metal and leachate indicator parameters in groundwater in general have not increased since 1985 (select parameters analyzed) and 1990.

4.6 Evaluation of Explosive Gases

A total of one hundred and twenty six explosive gas sampling points were performed as part of the RI. The explosive gas sampling points are shown on Figure 2, Site Plan and Sampling Locations Map. At each point, above ground and below ground readings were collected, which consisted of percent lower explosive limit (% LEL), percent oxygen (% oxygen), and parts per million of hydrogen sulfide (ppm HS). The results of the explosive gas sampling points are presented in Table 4.6.1-1 (Top of Landfill), Table 4.6.2.1-1 (Landfill Perimeter and Property Boundary), and Table 4.6.3-1 (Structures and Monitoring Wells).

The landfill does not have a history of uncontrollable fires or explosions, which could indicate the presence of significant explosive gases. In general, the % LEL readings were 9% or less, except for eleven sampling points, which are described in detail in the appropriate section. The oxygen readings varied slightly, and were noticeably lower at those locations were high % LEL readings were observed. Hydrogen sulfide was not detected at any sampling locations except at EG-49, EG-87 and EG-94 at relatively low concentrations of 2 ppm, 1 ppm and 2 ppm, respectively.

4.6.1 Top of Landfill

As shown in Table 4.6.1-1, the % LEL readings ranged between 0 and 9%, except at sampling points EG-36, EG-69, EG-87, EG-92, EG-94, EG-95, EG-101 and EG-105 (below ground only), which were notably higher than the other locations. The locations where below ground % LEL readings were elevated corresponded to higher elevations on the landfill mass, except for EG-36. Sampling point EG-36 was advanced near monitoring well MW-101-8S. Additional sampling points (EG-77 and EG-78) were advanced around EG-36, specifically along the property boundary east and south of MW-101-8S, and elevated explosive gases were not detected (i.e., readings of less than 2% LEL). All of the above ground sampling points did not detect explosive gases at concentrations of concern.

The % oxygen readings were generally near the normal range of ambient air, however, the % oxygen readings were consistently lower at those locations were the high % LEL readings were detected. There were only two locations on the top of the landfill that detected hydrogen sulfide, which were EG-87 and EG-94. The concentrations of hydrogen sulfide at these two locations were 1 ppm and 2 ppm, and were at locations were the % LEL was also high and the % oxygen was also low.

4.6.2 Landfill Perimeter and Property Boundary

As shown in Table 4.6.2-1, the % LEL readings ranged between 0 and 8%, except at sampling points EG-33 and EG-34 (below ground only), which were notably higher than the other locations. The below ground reading at EG-33 yielded a concentration of 99% LEL and the below ground reading at EG-34 yielded a reading of greater than 100% LEL. Both of these sampling locations were located on the south side of the landfill mass near the transfer station. Additional sampling points were advanced south of these two points along the property boundary (EG-74, EG-75 and EG-76) and elevated explosive gases were not detected (i.e., readings of less than 1% LEL). All of the above ground sampling points did not detect explosive gases at concentrations of concern.

All of the % oxygen readings were generally within the normal range of ambient air, however, the % oxygen readings were consistently lower at EG-33 and EG-34 (below ground only). Hydrogen sulfide was detected at only one location EG-49 (below ground) at a concentration of 2 ppm.

4.6.3 Structures and Monitoring Wells

The concentrations of explosive gases were measured in the three on-site buildings located on the south side of the landfill, at the transfer station. The buildings checked included the attendant's building, the compactor building and the Quonset hut building. The explosive gases were measured two feet above grade and in the breathing zone in each building, as shown in Table 4.6.3-1. There were no concentrations of explosive gases detected two foot above grade or in the breathing zone in any of the buildings. The oxygen levels were within the normal range of ambient air. Hydrogen sulfide was not detected at any sampling points in the on-site buildings.

The levels of explosive gases were measured from one foot inside the PVC casing of each of the seventeen monitoring wells on-site and in the area of the site, as shown in Table 4.6.3-1. Only one monitoring well location yielded elevated explosive gas concentrations. Monitoring well MW-101-8S had a concentration of greater than 100% LEL. As noted in Section 4.6.1, additional sampling points were advanced east and south of MW-101-8S, and elevated explosive gases were not detected (i.e., readings of less than 2% LEL). The % oxygen at MW-101-8S was notably lower at 5.1%. The remainder of the on-site and nearby monitoring wells had no elevated concentrations of explosive gases, with readings ranging from 0 to 5% LEL. Hydrogen sulfide was not detected in any of the on-site monitoring wells.

4.7 Summary of Nature and Extent of Contamination

The analytical results collected during the 2001 to 2002 RI field activities were compared to the NYSDEC TAGM 4046 recommended soil cleanup objectives, the NYSDEC sediment criteria, the 6 NYCRR Part 371 hazardous waste regulatory levels, and the 6 NYCRR Part 703 and NYSDEC TOGS 1.1.1 groundwater standards and guidance values. The soil and sediment analytical results (primarily metals) were also compared to normal background concentrations found in Eastern United States, New York State and the Albany area of New York State. Also previous investigations by others have generated analytical data for the site’s groundwater in 1985, 1990, 1996, 1999 and 2000, which was used to compare the findings of the RI and determine the significance of some of the parameters that exceeded NYSDEC groundwater standards and guidance values. From these comparisons, the potential site related contaminants include a select few VOCs, SVOCs, PCBs, metals and leachate indicator parameters for various media at the site as discussed below.

Three SVOCs and one PCB (Aroclor 1254) were detected in a minority of surface soil samples at concentrations slightly above their NYSDEC TAGM 4046 recommended soil cleanup objective values. The levels detected, however, were protective of groundwater quality (i.e., below their NYSDEC TAGM 4046 recommended soil cleanup objective values for protection of groundwater quality). Based on the limited sampling that was performed, the detections do not appear to be a significant threat to human health or the environment. Mercury was detected in one surface soil sample (SS-2) at a concentration potentially above background levels (2.3 mg/kg versus TAGM 4046 soil cleanup objective value of 0.1 mg/kg). Zinc was detected in two surface soil samples (SS-2 and SS-10) at concentrations potentially above background levels (325 mg/kg and

425 mg/kg, respectively, versus TAGM 4046 soil cleanup objective value of 20 mg/kg and Albany, New York area normal background range of 37 to 60 mg/kg). The mercury and zinc detections were within the normal background range found in Eastern United States (0.01 to 3.4 mg/kg and <5 to 2,900 mg/kg, respectively) and therefore potentially are at background levels. Mercury and zinc were not detected in site groundwater (new and existing monitoring wells) above NYSDEC groundwater standards. Therefore, these metals are not contaminants of concern. Although no trespassing signs are present, dirt trails that traverse the landfill appear to be utilized by off-road vehicles so there is the potential for some exposure. The surface soil sample locations where detections slightly exceeded TAGM values and/or background levels were on or at the edge of the landfill waste mass and therefore the potential exposure will be addressed during capping of the landfill.

One PCB (Aroclor 1254) was detected in one sediment sample at a concentration slightly above the NYSDEC wildlife bioaccumulation sediment criteria, but below its NYSDEC TAGM 4046 recommended soil cleanup objective value. No SVOCs or metals were detected in the sediment samples above NYSDEC TAGM 4046 recommended cleanup objective values and/or background metal concentrations. The sediment sampling results suggest that transport of contaminants with surface water runoff and deposition/retention of the contaminants in downstream sediment is not occurring at significant levels as there were no significant detections of contaminants in the sediment samples. Based on the sampling results, surface soil and sediment at and/or near the landfill site have not been significantly impacted by the landfill operations that would warrant remedial action.

Three PCBs (Aroclor 1248, Aroclor 1254 and Aroclor 1260) were detected within one to four of the eleven subsurface soil samples collected and analyzed from the test pit excavations and soil borings. These contaminants were not at levels which suggest a significant threat to human health or the environment. The concentrations of PCBs detected were below the NYSDEC TAGM 4046 recommended soil cleanup objective value of 10 mg/kg for subsurface soil. Subsurface soil samples were collected from the downgradient perimeter of the landfill waste mass (test pits) and outside of the landfill waste mass (soil borings). Soil samples within the landfill were not collected per the Work Plan. Based on the limited subsurface soil sampling results, the landfill is a potential source of PCB contamination, however, as PCBs were only detected at a few locations and at low levels, the landfill does not appear to be a significant source of PCB contamination.

Six SVOCs were detected in one or more of the ash material samples analyzed above their NYSDEC TAGM 4046 recommended soil cleanup objective values, but at relatively low levels and generally within the same order of magnitude as the soil cleanup objective values. SVOCs have historically not been detected in groundwater samples collected from the existing monitoring wells at the site. Therefore SVOCs are not identified as contaminants of concern. Three metals (copper, mercury and zinc) were detected in the ash material samples above their NYSDEC TAGM 4046 recommended soil cleanup objective values and above the normal background range for the Albany, New York area. However, the levels detected were within the normal background range found in Eastern United States (<1 to 700 mg/kg, 0.01 to 3.4 mg/kg and <5 to 2,900 mg/kg, respectively) and therefore potentially are at background levels. Mercury and zinc have not been detected in site groundwater (new and existing monitoring wells) above NYSDEC groundwater standards. Copper was detected at one monitoring well (MW-101-7S) during the November 2001 sampling event only at 209 mg/l versus the NYSDEC groundwater standard of 200 mg/l, which is not significant. Based on the above, these metals are not contaminants of concern. Analysis of the ash material samples for hazardous waste characteristics showed that the ash material is not corrosive, ignitable, reactive or TCLP hazardous. As such, it appears the ash material does not contain contaminants that would warrant remedial action.

Based on the sampling and testing results, the contents of the abandoned drums encountered at the landfill that contain a hard white material are not corrosive, ignitable, reactive or TCLP hazardous. Since the drums are rusted and pitted and do not contain hazardous waste, it is anticipated that the drums will be able to be crushed and incorporated within the landfill during closure and capping activities.

Five VOCs were detected slightly above NYSDEC groundwater standards during the November 2001 and/or March 2002 sampling events at one of thirteen monitoring well locations and one VOC was detected slightly above its NYSDEC groundwater standard at a second monitoring well location (November 2001 sampling event only). One VOC, MTBE was detected an order of magnitude above its NYSDEC groundwater guidance value during the March 2002 sampling event at monitoring well MW-101-1. The MTBE concentration was reduced to slightly above its NYSDEC groundwater guidance value during re-sampling of this well on August 20, 2002. Compared to historical data the level of VOCs have not increased except the one detection of MTBE. VOCs therefore are not considered contaminants of concern. As noted in Section 4.5.1.3, the source of the MTBE is not known. One PCB (Aroclor1242) was detected above the NYSDEC groundwater standard at three of the thirteen monitoring well locations. Similar PCBs are also present in groundwater at the adjoining Luzerne Road site. Comparison of the PCB detections during the RI sampling events to historical data shows the PCB levels are decreasing. A sharp increase occurred during the 1999 sampling event, but decreased again during the 2000 sampling event. A graph of the PCB analytical data for the two existing monitoring wells that historically have had the highest PCB concentrations show a slight decreasing trend (MW-101-1) and a distinct decreasing trend (MW-101-5) for Aroclor 1242. PCBs were also not detected in subsurface soil at the landfill above NYSDEC TAGM 4046 cleanup values. Therefore, it appears that the landfill is a potential source, but not a significant source of PCB contamination to groundwater. Storm water/precipitation infiltration and the potential leaching of contaminants from the landfill waste mass will be minimized through capping of the landfill and any remaining concentrations of parameters after capping will be reduced over time through natural attenuation.

During the November 2001 sampling event a few metals including arsenic, beryllium, barium, chromium, copper and lead were detected slightly above NYSDEC groundwater standards and/or guidance values at a minority of monitoring wells, but these metals were not detected above standards during the March 2002 sampling event when total dissolved solids (TDS) and turbidity levels were lower. Iron, magnesium, manganese and sodium were detected above NYSDEC groundwater standards and/or guidance values during the RI sampling events, but were detected in both upgradient and downgradient monitoring wells. A few leachate indicator parameters including ammonia, color, chloride, TDS and turbidity were detected above NYSDEC groundwater standards during the RI sampling events, but (except for ammonia) were detected in one or more upgradient wells and downgradient wells. Also, comparing the RI groundwater results for metals and leachate indicator parameters to historical data for the existing monitoring wells shows that in general these parameters are at similar levels compared to 1985 and/or 1990 results. In view of the above, it appears that the landfill has had some impact on the downgradient groundwater quality as some contravention of groundwater standards has occurred. The groundwater quality, however, does not appear to be worsening compared to limited historical data. Therefore, the groundwater sampling results and comparisons show that groundwater treatment is not warranted considering that the local groundwater is not used as a source of drinking water.

There were isolated areas of elevated explosive gases detected below grade, primarily at higher elevations on top of the landfill waste mass and at a few perimeter locations on the southeast and south sides of the landfill. The elevated perimeter readings did not extend beyond the property boundary. No explosive gases were detected in the buildings on-site at the transfer station. No elevated readings of explosive gases were detected at above grade sampling locations suggesting that significant levels of explosive gases are not entering the atmosphere on-site or off-site, or are dispersing or being degraded before accumulation occurs. However, due to the presence of elevated levels of explosive gases below grade on top of the landfill, venting of explosive gases is anticipated to be warranted if a low permeability cap is placed over the landfill.

During the RI, there were no leachate outbreaks observed during completion of field activities or specifically during the surface leachate investigation. In addition, there are no leachate outbreaks historically reported for the subject site. Laboratory analysis of groundwater samples for 6 NYCRR Part 360 leachate indicator parameters did not identify groundwater contamination that suggests on-going leachate outbreaks or the significant presence of leachate. As such, leachate collection and treatment is not warranted.

5.0 CONTAMINANT FATE AND TRANSPORT

5.1 General Overview

The potential site related contaminants include a select few VOCs, SVOCs, PCBs, metals and a few leachate indicator parameters in various media at the site. Table 5.1-1 lists the contaminants detected above the NYSDEC TAGM 4046 recommended soil cleanup objective values, the NYSDEC sediment criteria and the NYSDEC groundwater standards and/or guidance values, as applicable, and the frequency of the exceedance. The contaminants detected in media below regulatory levels are not included in the table. For most metals, the TAGM 4046 recommended soil cleanup objective value is a given value or site background (i.e., if site background is higher than the value given in TAGM 4046 then the soil cleanup objective value the site background value). Therefore, metals that were detected in the soil, sediment and ash material samples above the values given in TAGM 4046, but at what was felt to be background levels based on comparison to published normal background ranges are not included in the table.

Table 5.1-1
Summary of Contaminants Detected Above Regulatory Levels and Associated Media
Glens Falls Municipal Landfill at Luzerne Road
Remedial Investigation

Media	Type of Contaminant	Compound/Analyte	Frequency of NYSDEC TAGM 4046, Sediment Criteria or TOGS 1.1.1 Exceedance, As Applicable
Surface Soil			
	SVOCs	Benzo(a)anthracene	1 of 11
		Benzo(a)pyrene	3 of 11
		Chrysene	1 of 11
	PCBs	Aroclor 1254	1 of 11
	Metals	Mercury	1 of 11
		Zinc	3 of 11
Sediment			
	PCBs	Aroclor 1254	1 of 3
Ash Material			
	SVOCs	Benzo(a)anthracene	2 of 4

Table 5.1-1
Summary of Contaminants Detected Above Regulatory Levels and Associated Media
Glens Falls Municipal Landfill at Luzerne Road
Remedial Investigation

Media	Type of Contaminant	Compound/Analyte	Frequency of NYSDEC TAGM 4046, Sediment Criteria or TOGS 1.1.1 Exceedance, As Applicable	
Ash Material (Continued)				
	SVOCs	Benzo(a)pyrene	4 of 4	
		Benzo(b)fluoranthene	1 of 4	
		Benzo(k)fluoranthene	1 of 4	
		Chrysene	2 of 4	
		Dibenzo(a,h)anthracene	1 of 4	
	Metals	Copper	3 of 4	
		Mercury	4 of 4	
		Zinc	4 of 4	
Groundwater			**November 2001**	**March 2002**
	VOCs	Benzene	1 of 13	1 of 13(2)
		Chlorobenzene	1 of 13	0 of 13(2)
		Chloroform	1 of 13	0 of 13
		1,2-Dichloroethene(cis)	1 of 13	1 of 13(2)
		Methyl tert-butyl ether	0 of 13	1 of 13(2)
		Tetrachloroethene	1 of 13	0 of 13
	PCBs	Aroclor 1242	3 of 13	1 of 13
	Metals	Arsenic	2 of 13	0 of 13
		Barium	1 of 13	0 of 13
		Beryllium	2 of 13	0 of 13
		Chromium	2 of 13	0 of 13
		Copper	1 of 13	0 of 13
		Iron	13 of 13(1)	12 of 13(1)
		Lead	4 of 13(1)	0 of 13
		Magnesium	3 of 13	2 of 13
		Manganese	10 of 13(1)	11 of 13(1)
		Sodium	10 of 13(1)	10 of 13(1)
	Leachate Indicator Parameters	Ammonia	5 of 13	2 of 13
		Chloride	1 of 13	3 of 13(1)
		Color	12 of 13(1)	9 of 13(1)
		Phenols	0 of 13	1 of 13
		Total Dissolved Solids	10 of 13(1)	5 of 13(1)
		Turbidity (Lab Measured)	12 of 13(1)	11 of 13(1)

(1) Exceedance occurred in one or more upgradient monitoring wells as well as in one or more downgradient monitoring wells.

(2) Exceedance also occurred in monitoring well MW-101-1 during the August 20, 2002 sampling event.

The fate and transport of the contaminants are based on physical and chemical properties of the chemical constituent and site characteristics. This section defines and discusses the general characteristics of contaminants which affect fate and transport, the specific characteristics of the contaminants identified on-site, the site conditions which impact fate and transport, the transport of contaminants within storm water runoff/surface water, groundwater and soil vapor, and the fate of the contaminants in terms of transformation and degradation.

5.2 Contaminant Properties and Transport

The elements affecting the transport and fate of contaminants in subsurface are properties of the subsurface materials or the subsurface environment and physiochemical and biological properties of the contaminant. Characteristics which affect fate and transport include specific weight (density), organic carbon/water partition coefficient, solubility in water, volatility (in terms of Henry's Law constant) and degradation. Table 5.2-1 lists the specific chemical and physical properties of the potential site contaminants, which affect how the specific contaminant acts within the environment.

Table 5.2-1
Physical and Chemical Properties of Potential Site Related Contaminants
Glens Falls Municipal Landfill at Luzerne Road
Remedial Investigation

Compound	Density	Kow(1)	Koc(2) mg/l	Water Solubility(3)	K_h(4)
Volatile Organic Compounds:					
Benzene	0.868	2.12	83	1.75E+03	5.40E-03
Chlorobenzene	1.11	2.84	330	4.88E+02	3.93E-03
Chloroform	1.49	1.9	31	8.00E+03	3.23E-03
1,2-Dichloroethene(cis)	1.28	1.86	49	3.50E+03	7.58E-03
Methy tert-butyl ether	NDA	NDA	NDA	NDA	NDA
Tetrachloroethene	1.62	2.60	364	1.50E+02	2.59E-02
Semi-Volatile Organic Compounds:					
Benzo(a)anthracene	1.274	5.90	1,380,000	1.20E-02	2.30E-06
Benzo(a)pyrene	1.351	6.00	5,500,000	3.90E-03	2.40E-06

Table 5.2-1
Physical and Chemical Properties of Potential Site Related Contaminants
Glens Falls Municipal Landfill at Luzerne Road
Remedial Investigation

Compound	Density	Kow(1)	Koc(2) mg/l	Water Solubility(3)	K_h(4)
Benzo(b)fluoranthene	NDA	6.57	550,000	1.40E-02	1.20E-05
Benzo(k)fluoranthene	NDA	6.85	550,000	5.50E-04	1.04E-03
Chrysene	1.274	5.61	200,000	1.80E-03	7.26E-20
Dibenzo(a,h)anthracene	1.282	6.36	3,300,000	5.00E-03	7.33E-09
PCBs:					
Aroclor 1242	1.39	5.58	530,000	2.40E-01	5.60E-04
Aroclor 1254	1.505	6.47	530,000	5.00E-02	2.70E-03
Metals:					
Arsenic	5.72	NA	NA	Insoluble	NA
Barium	3.6	NA	NA	NDA	NA
Beryllium	1.85	NA	NA	NDA	NA
Chromium	7.14	NA	NA	Insoluble	NA
Copper	8.94	NA	NA	NDA	NA
Iron	7.86	NA	NA	NDA	NA
Lead	11.34	NA	NA	Insoluble	NA
Magnesium	1.74	NA	NA	NDA	NA
Manganese	7.47	NA	NA	Decomposes	NA
Mercury	13.53	NA	NA	Insoluble	NA
Sodium	0.97	NA	NA	Decomposes	NA
Zinc	7.14	NA	NA	Insoluble	NA

(1) Log octanol/water partition coefficient.
(2) Organic carbon partition coefficient. Often a range is available rather than a single number.
(3) mg/l at 25 degrees C.
(4) Henry's Law constant, atm-m^3/mole.
NDA denotes no data available in cited references (Section 8.0).
NA denotes not applicable.

The density of a contaminant describes the weight of the contaminant relative to water, where one is the weight of water. The aromatic VOCs and chlorinated VOCs typically have a specific gravity value less than one and greater than one, respectively, and the SVOCs, PCBs and metals have specific gravity values greater than one.

The organic carbon/water partition coefficient (Koc) indicates the tendency of an organic contaminant to sorb onto soil or sediment particles for nonionic, undissociated chemicals (VOCs and SVOCs). Where the Koc is not experimentally available, it can be calculated based on the log octanol/water partition coefficient. The Koc multiplied by the organic carbon content of a given soil gives the estimated absorption partition coefficient (K_d) for that soil. Some absorption may occur between contaminants and inorganic soil or sediment particles, particularly clay. However, experimental data indicates that the absorption of nonoionic, undissociated chemicals to inorganic soil or sediment is low. Once the sorption sites in soil are used up, mobility will usually increase to some extent.

Mobility is expected to be lowest in surface soils, which tend to have some organic carbon. Below several feet in depth, the organic carbon content of soils is likely to be very low, and even a compound with a high Koc will be moderately mobile. The SVOCs detected in surface soil and ash material have a range of organic carbon partition coefficients, from 200,000 mg/l for chrysene to 5,500,000 mg/l for benzo(a)pyrene, indicating high sorption and low mobility in soil. PCBs have a strong tendency to adsorb to organic matter of soils and suspended solids reducing their mobility. The amount of adsorption and retention increases as the degree of chlorination increases.

The mobility of metals is affected by geologic conditions, and is often gauged by the environment's oxidation/reduction (redox) potential. As the pH and dissolved oxygen vary, the solubility of metals can change substantially. Generally, but not always, reductive conditions favor the solid phase of the metal, so a change toward reducing conditions can precipitate soluble metals, making them immobile. Accordingly, the metals detected do not have an associated Koc value.

Water solubility indicates the tendency of a compound to dissolve in and travel in water. The chemical constituents detected at the site have a wide range of solubilities, with the VOCs being the most soluble and the SVOCs being the least soluble in water. The solubility of PCBs is low with the least chlorinated PCBs being more soluble than the higher chlorinated PCBs. The metals detected are generally insoluble except sodium and manganese decompose in water.

Volatility is quantified by Henry's constant (K_h) in diffuse aqueous conditions. The rate of volatilization increases as K_h increases. Volatility increases with decreases in atmospheric pressure, increase in temperature and when the compound vapor pressure is low relative to saturation. The volatility of PCBs decreases as the degree of chlorination increases.

Due to the chemical composition of metals, metals do not typically biodegrade. Biodegradation of SVOCs in soil has been found to occur under aerobic and to a lesser extent anaerobic conditions. The heavier SVOCs biodegrade at a slower rate. The presence of acclimatized microbes enhances biodegration. PCBs can biodegrade depending on the degree of chlorination, with less chlorinated PCBs biodegrading readily and more chlorinated PCBs biodegrading slowly.

The potential routes of contaminant transport and migration are through storm water runoff and infiltration into the landfill waste mass, surface water, groundwater, and the atmosphere.

5.2.1 Storm Water Runoff and Surface Water Migration

Storm water runoff at the site consists of sheet flow over land, which primarily infiltrates the soil surface or ponds in low lying areas. There was evidence of surface water ponding in two low lying areas near the site including an area on the west side of the landfill (soft, very moist soil with cat tails) and the area of Federally designated wetlands northeast of the landfill. The area on the west side of the landfill also receives storm water runoff from a culvert under Interstate 87. At the time of the RI field activities, there was no measurable quantity of surface water observed in these two low lying areas. Therefore, no surface water samples were collected or analyzed as part of this RI. Drainage from the low lying wetlands area northeast of the site discharges to Halfway Creek approximately one mile north of the landfill site.

There were three SVOCs, one PCB (Aroclor 1254) and two metals detected within the surface soil samples (Table 5.1-1) taken on or in near proximity to the landfill waste mass above NYSDEC TAGM 4046 recommended soil cleanup objective values. These contaminants were detected in only a minority of the soil samples analyzed and generally at concentrations only slightly above the cleanup objective values. There is a potential for these contaminants to be transported via storm water runoff across the site, as the detected contaminants are anticipated to significantly volatilize and disperse into the atmosphere. However, SVOCs, PCBs and metals generally have low solubility in water, and therefore would not tend to migrate via surface water runoff. Only one of these contaminants (Aroclor 1254) was detected above sediment criteria and none were detected above the TAGM 4046 recommended soil cleanup levels in the sediment samples taken from the low lying areas west and northeast of the site. Aroclor 1254 was detected at 0.15 mg/kg versus the wildlife bioaccumulation sediment criteria of 0.14 mg/kg. The sediment sampling results suggest that transport of contaminants with surface water runoff is not occurring at significant levels. Without the ability to sample and analyze surface water, it can only be assumed based on the surface soil and sediment analytical data that contaminants are not migrating with storm water runoff to off-site surface water since only a few contaminants at low levels were detected in the surface soil samples analyzed and only one contaminant at a low level was detected in the sediment samples analyzed.

5.2.2 Groundwater Migration

Currently, storm water/precipitation is able to infiltrate the landfill waste mass based on the primarily sandy soil/vegetative cover over the landfill surface. As the water infiltrates the landfill waste mass, leaching of contaminants from the waste mass could occur and then be carried downward into groundwater and migrate with groundwater in the direction of the groundwater flow. As discussed in Section 3.6.2, the inferred groundwater flow direction is to the southeast, hydraulic gradients range between 0.003 to 0.006 feet/feet and the velocity of flow is estimated at 518 feet per year.

Generally, groundwater contamination consists of residual levels of VOCs, PCBs, a few metals and a few leachate indicator parameters. There may be migration of these contaminants occurring within the upper portions of the aquifer. It is expected that the lighter VOCs will dissolve within groundwater and residual levels may potentially migrate in the direction of the groundwater flow. Similar migration patterns for the PCBs and metals may occur, but could also be influenced by the surface topography of silt layers. PCBs will tend to absorb onto organic matter and soil particles, thereby reducing their migration with groundwater. The majority of the metals detected have low solubility in water and tend to adsorb and absorb onto soil particles, thereby also reducing their migration with groundwater. For the metals, which are highly soluble in water (i.e., sodium and manganese), their migration in groundwater is likely occurring.

Only six VOCs were detected within three of the thirteen monitoring well locations, five of which were above groundwater standards at MW-101-1 and the remaining VOC was above groundwater standards at MW-101-7I, at concentrations within the same order of magnitude as the groundwater standards. Only one PCB (Aroclor 1242) was detected at three of the thirteen monitoring well locations during the November 2001 sampling event and at one of the monitoring well locations during the March 2002 sampling event, all of which were present at concentrations above its groundwater standard and within one to two orders of magnitude. However, historical analytical data indicates the concentrations of PCBs are decreasing as discussed in Section 4.5.4. With the exception of iron, magnesium, manganese and sodium, metals were detected above groundwater standards only in a minority of the monitoring well locations and generally only slightly above or within the same order of magnitude as the groundwater standards. The exceedances of iron, magnesium, manganese and sodium occurred in both upgradient and downgradient monitoring well locations suggesting these metal concentrations could be at background levels. The sodium concentrations were generally highest at monitoring wells located near Interstate 87 and Luzerne Road and probably the result of road salt. A few leachate indicator parameters were detected above groundwater standards, but the exceedances generally occurred in both upgradient and downgradient monitoring well locations. Considering this data, the landfill has had some impact to off-site groundwater quality as there is some contravention of groundwater standards, however, it does not appear to be significant.

5.2.3 Atmospheric Migration

Contaminants in surface soil and landfill gases (methane, carbon dioxide, nitrogen and potentially VOCs), generated from the biodegradation of landfill waste, within the unsaturated soil or waste mass will diffuse slowly upward and horizontally in soil vapor following the path of least resistance. At the soil surface, contaminants and landfill gases within the surface soil vapor will diffuse to the atmosphere. The rate of diffusion into the atmosphere depends on the differential in vapor saturation and in the atmospheric pressure. Under natural soil conditions, the differential is expected to be low within the soil. At the soil/atmosphere interface, the differential can change frequently, with great increases in differential causing contaminants to transport rapidly from surface soil to the atmosphere. Contaminants which may volatilize or diffuse from the site soils to the atmosphere will disperse or abiotically degrade, with rates dependent on wind speed and levels of atmospheric radicals, respectively.

Since the levels of organic contaminants detected at the site are relatively low, contaminants in the atmosphere are not expected to accumulate at detectable levels under existing conditions. Ambient air monitoring was performed during the completion of test pits during which the soil was disturbed and the potential for contaminant migration into the atmosphere was increased. The ambient air monitoring did not detect VOCs in air above relatively low background concentrations. This infers the site contaminants are not volatilizing into the atmosphere, or are volatilizing to the atmosphere and dispersing or being degraded before accumulation occurs.

Elevated levels of explosive gases were detected below grade during the explosive gas monitoring, primarily at higher elevations on the top of the landfill. No elevated readings of explosive gases were detected at above grade sampling locations suggesting that significant levels of explosive gases are not entering the atmosphere on-site or off-site, or are dispersing or being degraded before accumulation occurs.

5.3 Contaminant Fate

Two categories of processes affecting subsurface fate and transport of site contaminants are abiotic (nonbiological) processes and biotic processes. Abiotic processes affect contaminant transport by causing interactions between the contaminant and the stationary subsurface material (i.e., sorption, ion exchange) or by affecting the form of the contaminant (i.e., hydrolysis, redox reactions). Biotic processes can affect contaminant transport by metabolizing or mineralizing the organic contaminants or by possibly utilizing the contaminant in the metabolic process (nutrients, nitrate under denitrifying conditions) (Reference 19).

The potential site related contaminants are a select few VOCs, SVOCs, PCBs and metals. The fate of the VOCs, SVOCs and PCBs are influenced by several factors including the contaminant compounds' organic carbon/water partition coefficients, water solubility, volatility and ability to biodegrade by natural processes. Metals are not generally influenced by these factors, except for solubility. The SVOCs and PCBs generally have high organic carbon sorption capacity (water partition coefficients). This indicates that the contaminants have an affinity to be absorbed by organic carbon within the site soils, primarily within the upper soil horizon where the organic carbon within the project site would tend to be more prevalent. Since no significant organic layer or peat material was encountered within exploratory locations, it is expected that the organic carbon content of the native soils remaining in place would be low except for the surface soils. With high organic carbon content of the soil, the mobility of contaminants will typically decrease, however, in the absence of organic carbon or once the sorption sites have been expended, the mobility of the contaminants will usually increase. Some absorption may occur between the contaminants and inorganic soil and sediment particles; however, literature suggests that the absorption of nonionic chemicals to inorganic soil is low.

The VOC contaminants remaining in the groundwater are relatively soluble in water, in the range of 488 mg/l to 8,000 mg/l. The solubility in water of the PCB and SVOC contaminants remaining in the groundwater are low, in the range of 0.012 mg/l to 0.00055 mg/l. As the VOCs, SVOCs and PCBs are present within the groundwater in a dissolved state, they will generally migrate in the direction of groundwater flow. However, SVOCs and PCBs will have a tendency to adsorb onto organic matter and soil particles thereby reducing mobility and migration with groundwater. Metals are generally insoluble and will not typically migrate in the direction of groundwater flow unless attached to a colloid or are soluble in groundwater (i.e., sodium and manganese).

Metals are not capable of volatilization. The VOCS are volatile, and the SVOCs and PCBs are volatile to some degree, which indicates they will volatilize when unsaturated vapor, such as soil gas or ambient air is present. Contaminants that may volatilize from the soils or groundwater to the atmosphere will disperse or abiotically degrade at rates dependent upon wind speed and the levels of atmospheric radicals. Radicals are produced from car exhaust, furnaces and other combustion. The presence of radicals in the area of the site, being next to Interstate 87, is likely to be sufficient to promote an average or above average rate of abiotic degradation in the atmosphere.

Metals, because of their chemical composition do not biodegrade. The VOCs, SVOCs and less chlorinated PCBs are biodegradable. Biodegradation of the site contaminants has been found to occur under aerobic and anaerobic conditions. VOCs, SVOCs and less chlorinated PCBs will readily biodegrade under aerobic conditions. Anaerobic biodegradation is expected to be less for the SVOCs detected at the site and the less chlorinated PCBs. The presence of acclimatized microbes, which are likely to occur within the site, enhances biodegradation. Acclimatized microbes are soil micro-organisms which have adapted themselves to the contaminants by producing enzymes to withstand toxic effects and to allow metabolism of the contaminants. Addition of nutrients would be expected to increase the rate of biotic degradation. Biodegradation of PCBs depends on the degree of chlorination. Mono-, di- and trichlorinated biphenyls biodegrade relatively rapidly, tetrachlorinated biphenyls biodegrade slowly and higher chlorinated biphenyls are resistant to biodegradation (References 14 and 37). Aroclors 1242 detected in the groundwater at the site averages three chlorine groups per biphenyl molecule (Reference 37) and therefore should biodegrade.

6.0 QUALITATIVE EXPOSURE ASSESSMENT

6.1 Human Health

The purpose of the qualitative exposure assessment is to evaluate the potential for human exposure and adverse effects to human health and the environment from site related contamination without any additional remedial action, except the landfill waste mass being contained (i.e., capped). The EPA presumptive remedy directive for municipal landfill inactive hazardous waste sites allows a streamlined qualitative exposure assessment instead of a quantitative risk assessment based on the landfill mass being contained (i.e., capped).

In performing the qualitative exposure assessment, the potential site related contaminants were identified, and the actual or potential exposure pathways, the potentially exposed populations and the extent of actual or potential exposure were evaluated.

The potential site related contaminants were identified as those contaminants detected in various media at the site above NYSDEC regulatory levels including the NYSDEC TAGM 4046 recommended soil cleanup objective values, the normal background range of metals found in soil in this area, the NYSDEC sediment criteria, the hazardous waste regulatory levels and the NYSDEC groundwater standards and/or guidance values, as applicable. The potential site related contaminants that have been identified in various media at the site are presented below.

Parameter	**Surface Soil**	**Sediment**	**Subsurface Soil**	**Groundwater**	**Ash Material**
Benzene				Yes	
Chlorobenzene				Yes	
Chloroform				Yes	
1,2-Dichloroethene(cis)				Yes	
Methyl tert-butyl ether				Yes	

Parameter	Surface Soil	Sediment	Subsurface Soil	Groundwater	Ash Material
Tetrachloroethene				Yes	
Benzo(a)anthracene	Yes				Yes
Benzo(a)pyrene	Yes				Yes
Benzo(b)fluoranthene					Yes
Benzo(k)fluoranthene					Yes
Chrysene	Yes				Yes
Dibenzo(a,h)anthracene					Yes
Aroclor 1242				Yes	
Aroclor 1248					
Aroclor 1254	Yes	Yes(1)			
Arsenic				Yes	
Barium				Yes	
Beryllium				Yes	
Chromium				Yes	
Copper				Yes	Yes
Iron				Yes	
Lead				Yes	
Magensium				Yes	
Manganese				Yes	
Mercury	Yes				Yes
Sodium				Yes	
Zinc	Yes				Yes
Select Leachate Indicator Parameters				Yes	

(1) The exceedance occurred for the NYSDEC wildlife bioaccumulation sediment criteria and not human health criteria and therefore discussed within Section 6.2, Ecological.

Potential exposure pathways for site contaminants are a function of the contaminant, the affected media, contaminant location and the potentially impacted population. The potential exposure routes and pathways include dermal contact with exposed refuse; dermal contact and/or ingestion of potentially contaminated soil on-site; dermal contact and/or ingestion of potentially contaminated soil off-site generated from storm water runoff leaching contaminants from on-site and transporting and depositing them downgradient of the landfill; dermal contact and/or ingestion of potentially contaminated groundwater generated from potential leaching of contaminants from the waste mass during storm water infiltration/percolation and then migrating with groundwater; and inhalation of dust and/or vapor emissions transported by wind. At the Glens Falls Municipal Landfill site, potential impacted populations include residents in the neighboring community, site visitors, trespassers on the site, workers at the transfer station and workers engaged in subsurface excavation at the site.

Some areas of exposed refuse were observed on the landfill, primarily on dirt trails used by bicycles and off-road vehicles that trespass on the property and at select locations around the perimeter of the landfill. The potential exposure pathway of dermal contact with exposed refuse will be eliminated by containment of the landfill waste mass.

The three SVOCs, one PCB and two metals detected in the surface soil samples were not identified as contaminants that would warrant remedial action of the surface soil or that are a significant threat to human health since the detections only occurred in a minority of soil samples, the levels were low and within the same order of magnitude as the NYSDEC soil cleanup objective values and the levels were protective of groundwater quality. No contaminants were detected above regulatory standards in the sediment samples taken from the low lying areas west and northeast of the site that receive surface water runoff from the landfill as well as other adjacent properties suggesting that transport of contaminants with surface water runoff is not occurring at significant levels. The surface soil samples where the detections occurred are located on or at the edge of the landfill waste mass. Although surface soil is not a media of concern and storm water runoff does not appear to be a release mechanism of concern for the reasons stated above, the exposure pathway of dermal contact and/or ingestion of soil and the potential leaching of contaminants with storm water runoff will be eliminated by containment of the landfill waste mass.

A few VOCs, one PCB, metals and a few leachate indicator parameters were detected in groundwater samples above NYSDEC groundwater standards and/or guidance values. However, there were no significant exceedances. PCBs were not detected in the newly installed wells and the levels detected in the existing monitoring wells are decreasing. The exceedances for some of the metals and the leachate indicator parameter occurred in both upgradient and downgradient monitoring wells, and the concentrations of VOCs, metals and leachate indicator parameters detected in the existing monitoring wells during the RI sampling events were generally at similar levels and within the same order of magnitude as the concentrations detected during the historical sampling events.

Since there were no significant exceedances of groundwater standards and the depth to groundwater is approximately 7 to 24 feet below grade across the site, the potential for dermal contact with/exposure to contaminated groundwater and the associated impact is anticipated to be minimal. Ingestion of the contaminated groundwater is unlikely since the area surrounding and downgradient of the site is serviced by public water and no private water supply wells used for drinking water are known to exist. Therefore, groundwater treatment is not warranted. Containment of the landfill waste mass will minimize storm water/precipitation infiltration into the landfill waste mass and the potential leaching of contaminants from the waste mass and their downward migration to groundwater. The NYSDEC has indicated that they and the NYSDOH conducted a homeowner’s well survey in August 2002 of the area downgradient of the Luzerne Road Site, which is also downgradient of the Glens Falls Municipal Landfill, and they found that the homes are served by public water. The NYSDEC has also indicated that they are in the process of compiling the responses and information obtained, and that the survey results will be available through NYSDEC.

The few SVOCs and metals detected in the ash material samples were not identified as contaminants that would warrant remedial action of the ash material or that are a significant threat to human health since the SVOCs levels were low and generally within the same order of magnitude as the NYSDEC soil cleanup objective values, SVOCs have historically not been detected in groundwater samples from the existing monitoring wells and the metals have not been detected in site groundwater above groundwater standards (except copper on one occasion in one well when it was detected just slightly above the standard which is not felt to be significant). The area of the ash material is covered with a vegetative cover and trees. Access to the area is also restricted by a chain link fence on the north, east and south sides and by Interstate 87 on the west side. The potential for dermal contact with/exposure to the ash material and the associated impact is, therefore, anticipated to be minimal.

Ambient air monitoring performed during the completion of test pits on-site did not detect VOCs in air above relatively background concentrations and did not detect particulate levels above the STEL. No elevated readings of explosive gases were detected at above grade sampling locations, in the structures at the transfer station or at below grade sampling locations around the perimeter of the property. Therefore the potential for inhalation of dust and/or vapor emissions or exposure to explosive gases under current conditions by the area residents, site visitors, trespassers and workers at the transfer station is anticipated to be minimal or non-existent.

6.2 Ecological

A Step I Fish and Wildlife Impact Assessment (FWIA) was completed by C.T. Male pursuant to the NYSDEC Fish and Wildlife Impact Analysis for Inactive Hazardous Waste Sites. The objectives of the Step I FWIA were to identify the fish and wildlife resources, land use and habitat types that exist in the vicinity of the subject site, and to assess the effect the subject site may pose on fish and wildlife species present at the site. This information is necessary to allow identification of potential pathways of contaminant migration into and through fish and wildlife resources. Step I consisted of a site description, a delineation of covertype, a description of fish, wildlife and other resources, and a description of fish and wildlife resource values. The Step I FWIA document is presented in Appendix M. A summary of the findings is discussed within this section.

The Glens Falls Municipal Landfill site is a small portion of a fragmented successional southern forest located within an urban setting. The value of this habitat as a resource value for species tends to be low because most species require contiguous tracts of habitat for survival. The value of wildlife inhabiting the study area to humans is very limited. Signage and fencing restrict access to portions of the site, and recreational activities such as hunting, hiking and ATV riding are not permitted on the site. For these reasons the value of wildlife in the study area for humans is considered to be low. Significant wildlife resources do not exist at the site. No fish resources were identified as no surface water bodies are present on the subject site. A completed exposure pathway for human consumption of fish and wildlife was not identified.

Comparison of the sediment sampling results to the NYSDEC benthic aquatic life and organisms sediment criteria and the wildlife bioaccumulation sediment criteria identified no exceedences, except for one PCB detection. At sediment sample location SD-2, total PCBs were detected at 0.191 mg/kg which is slightly above but within the same order of magnitude as the NYSDEC wildlife bioaccumulation sediment criteria of 0.14 mg/kg, and therefore not considered significant.

7.0 SUMMARY AND CONCLUSIONS

A remedial investigation (RI) was implemented for the Glens Falls Municipal Landfill At Luzerne Road site by C.T. Male in accordance with Order on Consent Index #A7-0383-9903 and the NYSDEC approved RI/FS Work Plan and associated documents. The field investigations were performed during the period of October 18, 2001 through August 20, 2002. The RI included:

- Planimetric and boundary survey,
- Surface soil and sediment sampling,
- Test pit investigation,
- Groundwater investigation,
- Data validation of results by a third party,
- Surface water investigation,
- Explosive gas investigation,
- Surface leachate and vector investigations, and
- Qualitative exposure assessment including Step I Fish and Wildlife Impact Assessment.

The findings of the RI with respect to extent of landfill waste mass, type and extent of contamination in soil, sediment, ash material and groundwater, the fate and transport of the chemicals, and the qualitative exposure assessment are summarized below with associated conclusions.

7.1 Extent, Fate and Transport of Contamination

The findings of the test pit investigation and property line information from the boundary survey performed during the RI identified the presence of waste mass on adjoining properties. In general, the waste encountered during the test pits consisted of municipal solid waste (MSW). However, in an area on the east side of the landfill and in an area on the west side (northern half) of the landfill other types of waste material were encountered. Construction and demolition (C & D) debris waste, compressed paper and bulky waste (car parts, appliances) were encountered on the north end of the 55 Luzerne Road property (area of test pits TP-18A, TP-19 and TP-19A, Figure 2) adjacent to the east side of the landfill property. Based on review of aerial photography and historical uses of the adjacent properties, it is possible that some of this material could be from the previous operations at 55 Luzerne Road and 53 Luzerne Road (i.e., Luzerne Road Site), which reportedly included a cement block company, recycling facility and junk yard.

An ash, slag, glass and cinders material (ash material) mixed with sand was encountered on the State of New York property adjacent to and west of the western side of the landfill property line (the northern half, Figure 2). City representatives interviewed regarding the findings have indicated that refuse was burned at the landfill in the early days. A New York State Department of Transportation (NYSDOT) representative interviewed regarding the findings provided a map that showed the general area where the ash material was encountered was used for disposal of waste material from the construction of Interstate 87, which occurred in the early 1960's. Photographs taken in 1977 to 1978 and supplied by the City of Glens Falls showed that the area of the ash material had a vegetative cover with a substantial growth of pine trees and other trees indicating that the area had not been disturbed for some time. The landfill proper including the area of the transfer station encompasses approximately 14.25 acres and of just the waste mass encompasses approximately 12.93 acres. The area of waste mass (not ash material) on adjoining properties is approximately 2.92 acres. The total area within the limit of waste mass both on-site and off-site is approximately 15.85 acres. The area of ash material on adjoining properties encompasses approximately 2.74 acres.

The potential site related contaminants identified during the RI include a select few VOCs, SVOCs, PCBs, metals and a few leachate indicator parameters in various media at the site. A few SVOCs were detected in a minority of surface soil samples above NYSDEC TAGM 4046 soil cleanup objective values, but have the tendency to adsorb to that media and not migrate with storm water runoff. SVOCs have historically not been detected in groundwater samples collected from the existing monitoring wells at the site. PCBs were only detected slightly above NYSDEC TAGM 4046 soil cleanup objective values in one surface soil sample and above NYSDEC sediment criteria in one sediment sample. PCBs also have a strong tendency to adsorb to organic matter of soils and suspended solids reducing their mobility. A few metals (mercury and zinc) were detected in a minority of surface soil samples above regulatory levels, but within the normal background range found in Eastern United States and therefore are potentially at background levels. These metals were also not detected in groundwater samples collected at the site above groundwater standards. The surface soil and sediment sampling results suggest that transport of contaminants with storm water runoff is not occurring at significant levels. Based on the sampling results, surface soil and sediment at and/or near the landfill site have not been significantly impacted by the landfill operations and remedial action is not warranted.

A few SVOCs were detected in the ash material samples slightly above NYSDEC TAGM 4046 soil cleanup objective values, but have the tendency to adsorb to that media and not migrate with storm water runoff. SVOCs have historically not been detected in groundwater samples collected from the existing monitoring wells at the site. No PCBs were detected in the ash material samples above its NYSDEC TAGM 4046 soil cleanup objective value. A few metals (copper, mercury and zinc) were detected in the ash material samples above regulatory levels, but within the normal background range found in Eastern United States and therefore are potentially at background levels. These metals were also not detected in groundwater samples collected at the site above groundwater standards, except copper at one monitoring well. Copper was detected at

209 ug/l versus the groundwater standard of 200 ug/l at one monitoring well, MW-101-7S, during the November 2001 sampling event only, and therefore is not considered significant. Analysis of the ash material samples for hazardous waste characteristics showed that the ash material is not corrosive, ignitable, reactive or TCLP hazardous. Based on the sampling results, it appears the ash material does not contain contaminants that would warrant remedial action.

Three PCBs (Aroclor 1248, Aroclor 1254 and Aroclor 1260) were detected within one to four of the eleven subsurface soil samples collected and analyzed from the test pit excavations and soil borings, however, the concentrations were below the NYSDEC TAGM 4046 recommended soil cleanup objective value of 10 mg/kg for subsurface soil. The detections were not at levels which suggest a significant threat to human health or the environment. Based on the limited subsurface soil sampling results, the landfill is a potential source of PCB contamination, however, it does not appear to be a significant source of PCB contamination.

Based on the sampling and testing results, the contents of the abandoned drums encountered at the landfill that contain a hard white material are not corrosive, ignitable, reactive or TCLP hazardous. Since the drums are rusted and pitted and do not contain hazardous waste, it is anticipated that the drums will be able to be crushed and incorporated within the landfill during closure and capping activities.

Currently, storm water/precipitation is able to infiltrate the landfill waste mass based on the primarily sandy soil/vegetative cover over the landfill surface and potentially leach contaminants from the waste mass into groundwater and migrate with groundwater in the direction of the groundwater flow. A few VOCs were detected in groundwater (five in one well, one in another well), but generally at concentrations only slightly above groundwater standards and within the same order of magnitude as the groundwater standards. One VOC, MTBE was detected over an order of magnitude above its NYDEC groundwater guidance value in one existing monitoring well (MW-101-1). MTBE is typically used as an additive in gasoline. No evidence of stressed vegetation or stained soil were observed in the area of the monitoring well. The source of the MTBE is not known. During re-sampling of monitoring well MW-101-1 on August 20, 2002, the MTBE concentration was reduced from 140 ug/l (March 2002 sampling event) to 35 ug/l, slightly above its NYSDEC groundwater guidance value of 10 ug/l. PCBs were detected above groundwater standards in one to three of the existing monitoring wells only, but historical analytical data indicates the concentrations are decreasing. With the exception of iron, magnesium, manganese and sodium, a few metals were detected above groundwater standards in a minority of the monitoring well locations, but generally only slightly above or within the same order of magnitude as the groundwater standards. The exceedances of iron, magnesium, manganese and sodium occurred in both upgradient and downgradient monitoring well locations suggesting these metal concentrations could be at background levels. A few leachate indicator parameters were detected above groundwater standards, but the exceedances generally occurred in both upgradient and downgradient monitoring well locations.

Based on the comparison of VOCs, metals and leachate indicator parameter results to limited historical data for the existing wells, the VOCs, metal and leachate indicator parameters in groundwater in general have not increased since 1985 (select parameters analyzed) and 1990. In view of the above, it appears that the landfill has had some impact on the downgradient groundwater quality as some contravention of groundwater standards has occurred. The groundwater quality, however, does not appear to be worsening compared to limited historical data. Therefore, the groundwater sampling results and comparisons show that groundwater treatment is not warranted considering that the local groundwater is not used as a source of drinking water.

There were isolated areas of elevated explosive gases detected below grade, primarily at higher elevations on top of the landfill waste mass and at a few perimeter locations on the southeast and south sides of the landfill. The elevated perimeter readings did not extend beyond the property boundary. No explosive gases were detected in the buildings on-site at the transfer station. No elevated readings of explosive gases were detected at above grade sampling locations suggesting that significant levels of explosive gases are not entering the atmosphere on-site or off-site, or are dispersing or being degraded before accumulation occurs. However, due to the presence of elevated levels of explosive gases below grade on top of the landfill, venting of explosive gases is anticipated to be warranted if a low permeability cap is placed over the landfill.

During the RI, there were no leachate outbreaks observed during completion of field activities or specifically during the surface leachate investigation. In addition, there are no leachate outbreaks historically reported for the subject site. Laboratory analysis of groundwater samples for 6 NYCRR Part 360 leachate indicator parameters did not identify groundwater contamination that suggests on-going leachate outbreaks or the significant presence of leachate. As such, leachate collection and treatment is not warranted.

7.2 Qualitative Exposure Assessment

Some areas of exposed refuse were observed on the landfill, primarily on dirt trails used by bicycles and off-road vehicles that trespass on the property and at select locations around the perimeter of the landfill.

The concentrations of contaminants detected in surface and subsurface soil, sediment and groundwater samples are not at levels that indicate the landfill is a significant threat to human health and the environment or at levels that would warrant remedial action of these media. Based on air monitoring and explosive gas investigation results, the potential for inhalation of contaminated dust and/or vapor emissions or exposure to explosive gases under current conditions by the area residents, site visitors, trespassers and workers at the transfer station is anticipated to be minimal or non-existent.

Containment of the landfill under the EPA presumptive remedy will eliminate the potential exposure routes and pathways of dermal contact with exposed refuse, dermal contact and/or ingestion of contaminated soil and potential leaching of contaminants with storm water runoff, and minimize storm water/precipitation infiltration and potential leaching of contaminants from the waste mass that could be carried downward to and migrate with groundwater. The area of the site is serviced by public water and therefore ingestion of contaminated groundwater is unlikely.

The concentrations of contaminants detected in the ash material samples are not at levels that indicate the ash material is a significant threat to human health or at levels that would warrant remedial action of the ash material. The area of the ash material is covered with a vegetative cover and trees, and access to the area is restricted. The potential for exposure to the ash material is anticipated to be minimal.

The Step I FWIA did not identify significant wildlife resources at the site. The sediment sampling of low lying areas west and northeast of the site did not identify contaminants present at levels that would have a significant impact on benthic aquatic life or organisms or on wildlife.

If you have any questions regarding this report, please contact this office at (518)786-7400.

Respectfully submitted,
C.T. MALE ASSOCIATES, P.C.

Jeffrey Marx, E.I.T.
Environmental Engineer

Elizabeth W. Rovers, P.E.
Managing Engineer

k:\projects\006801\admin\ri files\ri report\r final ri report october 02_master.doc

8.0 REFERENCES

1. Cadwell et al.: Surficial Geologic Map of New York, Hudson Mohawk Sheet, 1987.
2. Chemtech Consulting Group, Inc.: Data Deliverable Packages for Glens Falls Landfill Project, 2001-2002, as follows:

   Data Deliverable Packages For Soil, Sediment and Ash Material Samples Entitled:

   Chemtech SDG Nos. N6358 & 6431, Data Package For Semivolatile Organics (Part I, 1,033 pages), Data Package For PCBs (Part II, 254 pages), Data Package For Pesticides (Part III, 211 pages), Data Package For Herbicides (Part IV, 136 pages), Data Package For Total Metals (Part V, 386 pages), Data Package For General Chemistry (Part VI, 53 pages).

   Chemtech SDG Nos. N6548 & N6588, Data Package For TCLP Volatile Organics (Part I, 106 pages), Data Package For Semivolatile Organics (Part II, 339 pages), Data Package For TCLP Semivolatile Organics (Part III, 175 pages), Data Package For PCBs (Part IV, 133 pages), Data Package For TCLP Pesticides (Part V, 87 pages), Data Package For TCLP Herbicides (Part VI, 68 pages), Data Package For Metals & TCLP Metals (Part VII, 339 pages), Data Package For General Chemistry (Part VIII, 44 pages).

   Chemtech SDG No. N6635, Data Package For PCBs (121 pages).

   Chemtech SDG No. N6751, Data Package For PCBs (85 pages).

   Quality Control Data Package For Abandoned Drums Samples Entitled:

   Chemtech SDG No. N6668, Data Package For Volatile Organics, Semi-Volatile Organics, GC Semi-Volatile Organics, Metals & General Chemistry (94 pages).

   Data Deliverable Packages For Groundwater Samples Entitled:

   Chemtech SDG No. N6876, Data Package For Volatile Organics (Part I, 410 pages), Data Package For PCBs (Part II, 144 pages), Data Package For Metals (Part III, 217 pages) and Data Package For General Chemistry (Part IV, 118 pages).

   Chemtech SDG No. P1689, Data Package For Volatile Organic (Part I, 408 pages), Data Package For PCBs (Part II, 134 pages), Data Package For Metals (Part III, 235 pages) and Data Package For General Chemistry (Part IV, 122 pages).

3. Chou, S.F.J and R.A. Griffin: PCBs and the Environment, 1986.

4. Clough, Harbour & Associates: Monitoring Well Testing and Analysis, Glens Falls Landfill Site, CHA Project No: 2049-07.01, May 24, 1990.

5. C.T. Male Associates, P.C.: Citizen Participation Plan, Glens Falls Municipal Landfill At Luzerne Road, NYSDEC Site No. 5-57-003, Town of Queensbury, Warren County, New York, August 2001.

6. C.T. Male Associates, P.C.: Field Sampling Plan, Glens Falls Municipal Landfill At Luzerne Road, NYSDEC Site No. 5-57-003, Town of Queensbury, Warren County, New York, August 2001.

7. C.T. Male Associates, P.C.: Health and Safety Plan, Glens Falls Municipal Landfill At Luzerne Road, NYSDEC Site No. 5-57-003, Town of Queensbury, Warren County, New York, August 2001.

8. C.T. Male Associates, P.C.: RI/FS Work Plan, Glens Falls Municipal Landfill At Luzerne Road, NYSDEC Site No. 5-57-003, Town of Queensbury, Warren County, New York, August 2001.

9. C.T. Male Associates, P.C.: Quality Assurance Project Plan, Glens Falls Municipal Landfill At Luzerne Road, NYSDEC Site No. 5-57-003, Town of Queensbury, Warren County, New York, August 2001.

10. Environmental Protection Agency: Presumptive Remedy for CERCLA Municipal Landfill Sites; Office of Solid and Emergency Response, Directive 9355. 8-49FS; EPA 540-F-93-035, PB 93-963339, September 1993.

11. Environmental Protection Agency: Conducting Remedial Investigations/Feasibility Studies for CERCLA Municipal Landfill Sites, OSWER Directive 9355. 3-11, February 1991.

12. Environmental Protection Agency: Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA, Office of Emergency and Remedial Response, OSWER Directive 9355. 3-01; EPA 540/G-89 004, October 1988.

13. Environmental Protection Agency: National Oil and Hazardous Substances Pollution Contingency Plan, 40 CFR Part 300, July 1, 1999.

14. Environmental Protection Agency: National Primary Drinking Water Regulations, Technical Factsheet on: Polychlorinated Biphenyls (PCBs), from the EPA website, this page last updated April 12, 2001.

15. Environmental Protection Agency: Superfund Public Health Evaluation Manual, EPA/540/1-86/060, October 1986.

16. Fetter, C.W.: Contaminant Hydrogeology, 1993.

17. Fisher et al.: Geologic Map of New York, Hudson Mohawk Sheet, 1970.

18. Howard, Philip H.: Handbook of Environmental Fate and Exposure Data For Organic Chemicals, 1990.

19. Knox et al.: Subsurface Transport and Fate Processes, 1983.

20. Lewis, Richard J., Sr.: Hawley's Condensed Chemical Dictionary, 1993.

21. New York State Department of Environmental Conservation: Glens Falls Landfill, New York State Superfund Phase I Summary Report, 557003, Sept. 6, 1983; by Recra Research, Inc.

22. New York State Department of Environmental Conservation: Glens Falls Landfill, Phase II Investigation, Site No. 5-57-003; February 1987; by Recra Environmental, Inc.

23. New York State Department of Environmental Conservation: Guidance for Development of Data Usability Summary Reports, Revised September 1997.

24. New York State Department of Environmental Conservation: Hazardous Waste Disposal Site Report, February 1980.

25. New York State Department of Environmental Conservation: Landfill Closure Letter, November 15, 1977.

26. New York State Department of Environmental Conservation: 6 NYCRR Part 371, Identification and Listing of Hazardous Wastes, January 14, 1995.

27. New York State Department of Environmental Conservation: Supplemental Sampling Project, Glens Falls Landfill Site, Site No. 5-57-003, March 12, 1997.

28. New York State Department of Environmental Conservation: Technical and Administrative Guidance Memorandum (TAGM) 4025, Guidelines for Remedial Investigations/Feasibility Studies, March 31, 1989.

29. New York State Department of Environmental Conservation: TAGM 4030, Selection of Remedial Actions at Inactive Hazardous Waste Site, May 15, 1990.

30. New York State Department of Environmental Conservation: TAGM 4044, Accelerated Remedial Actions at Class 2 Non-RCRA Regulated Landfills, March 9, 1992.

31. New York State Department of Environmental Conservation: TAGM 4046, Determination of Soil Cleanup Objectives and Cleanup Levels, January 24, 1994 and Addendum dated December 20, 2000.

32. New York State Department of Environmental Conservation: Technical Guidance For Screening Contaminated Sediments, January 25, 1999.

33. New York State Department of Environmental Conservation: Technical and Operational Guidance Series (TOGS 1.1.1), Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations, June 1998 and April 2000 Addendum.

34. New York State Department of Environmental Conservation: Water Quality Regulations, Surface Water and Groundwater Classifications and Standards, New York State Codes, Rules and Regulations, Title 6, Chapter X, Parts 700-705.

35. Soil Conservation Service: Soil Survey for Warren County, New York, January, 1989.

36. United States Geological Survey: Topographic Map of Glens Falls Quadrangle, 1980, 7.5 Minute Series.

37. Wilson, David J. and Ann N. Clarke: Hazardous Waste Site Soil Remediation, Theory and Application of Innovative Technologies, 1994.

FIGURES/DRAWINGS

Figure 1:Site Location Map
Figure 2:Site Plan and Sampling Locations Map
Figure 3:Landfill Waste Delineation Map
Figure 4:Water Level Contour Map (11/19/01)
Figure 5:Water Level Contour Map (2/27/02)
Drawing No. 01-601: Boundary Survey of Glens Falls Municipal Landfill At Luzerne Road

FIGURE 1

SITE LOCATION MAP

FIGURE 2

SITE PLAN AND SAMPLING LOCATIONS MAP

FIGURE 3

BOUNDARY SURVEY OF GLENS FALLS MUNICIPAL LANDFILL AT LUZERNE ROAD

FIGURE 4

LANDFILL WASTE DELINEATION MAP

FIGURE 5

WATER LEVEL CONTOUR MAP (11/19/01)

FIGURE 6

WATER LEVEL CONTOUR MAP (2/27/02)

APPENDICES

APPENDIX A

CORRESPONDENCE WITH BORDERING PROPERTY OWNERS

APPENDIX B

ORGANIC VAPOR HEADSPACE ANALYSIS LOGS

APPENDIX C

TEST PITS LOGS

APPENDIX D

MISCELLANEOUS DOCUMENTS

D.1 1966 Aerial Photograph
D.2 Portion of NYSDOT Map of Ash Material Area
D.3 1977-1978 Photographs of Landfill
D.4 Analytical Data and Trend Graph for PCB Detections at Monitoring Wells MW-101-1 and MW-101-5

APPENDIX D.1

1966 AERIAL PHOTOGRAPH

APPENDIX D.2

PORTION OF NYSDOT MAP OF ASH MATERIAL AREA

APPENDIX D.3

1977-1978 PHOTOGRAPHS OF LANDFILL

KEY TO 1977-1978 PHOTOGRAPHS

NUMBER	DESCRIPTION
1.	View of southeastern portion of landfill facing Luzerne Road.
2.	View of 55 (closest to landfill) and 53 Luzerne Road property east of landfill.
3.	View of eastern and northeastern portions of landfill and north end of 55 Luzerne Road property.
4.	View of access road on east side of landfill and northeastern portion of landfill.
5.	View of wet area in area east of landfill with east edge of landfill shown.
6.	View of eastern portion of landfill, looking southeast.
7.	View of eastern portion (northern half) of landfill, looking south.
8.	View of east and southeastern portion of landfill looking south southwest.
9.	View of the north slope exhibiting slope failure of cover material.
10.	View of southern portion of landfill from top of landfill.
11.	View of west side of landfill and area southwest of landfill, looking southwest.
12.	View of southwest side of landfill and low lying area west of landfill, looking southwest.
13.	View of western portion of landfill and area along Interstate 87.
14.	View of west side of landfill and the area where MW-101-10S has been installed. The south side of ash material area also shown with trees present (i.e., northeast quadrant of the photo).
15.	View of west edge of landfill and area of ash material showing pine trees and other trees. The edge of Interstate 87 and a guard rail can be seen in photo.
16.	View of northwest edge of landfill and northern portion of ash material area showing mature trees. Interstate 87 is also visible.

APPENDIX D.4

ANALYTICAL DATA AND TREND GRAPH FOR PCB DETECTIONS AT MONITORING WELLS MW-101-1 AND MW-101-5

APPENDIX E

SUBSURFACE EXPLORATION LOGS

APPENDIX F

MONITORING WELL CONSTRUCTION LOGS

APPENDIX

GROUNDWATER SERVICES FIELD LOGS

APPENDIX G

LAND SURVEY STATE PLANE COORDINATES DATA

APPENDIX H

INVESTIGATION DERIVED WASTE TRANSPORTATION AND DISPOSAL DOCUMENTS

APPENDIX I

NARRATIVE PORTION OF DATA VALIDATION REPORT BY DATA VALIDATION SERVICES

I.1 Soil, Sediment and Ash Material Samples
I.2 Groundwater Samples

APPENDIX I.1

SOIL, SEDIMENT AND ASH MATERIAL SAMPLES

APPENDIX I.2

GROUNDWATER SAMPLES

APPENDIX J

SOIL, SEDIMENT AND ASH MATERIAL LABORATORY ANALYSES REPORTS AND CHAIN OF CUSTODY RECORDS

APPENDIX K

DRUM WASTE LABORATORY ANALYSES REPORT AND CHAIN OF CUSTODY RECORD

APPENDIX L

GROUNDWATER LABORATORY ANALYSES REPORTS AND CHAIN OF CUSTODY RECORDS

L.1 November 2001 Sampling Event
L.2 March 2002 Sampling Event
L.3 August 2002 Sampling Event

APPENDIX L.1

NOVEMBER 2001 SAMPLING EVENT

APPENDIX L.2

MARCH 2002 SAMPLING EVENT

APPENDIX L.3

AUGUST 2002 SAMPLING EVENT

APPENDIX M

FISH AND WILDLIFE IMPACT ASSESSMENT (STEP 1), GLENS FALLS MUNICIPAL LANDFILL AT LUZERNE ROAD

TABLES

TABLE 1

Summary of Historical Groundwater Sampling Analytical Results, Glens Falls Municipal Landfill At Luzerne Road

Report Drawings

The drawings for this report are in separate AutoCAD files located in eDocs in an associated folder.