DESCRIPTION OF CURRENT CONDITIONS (DOCC)
OTTER CREEK ROAD FACILITY
ENVIROSAFE SERVICES OF OHIO, INC.
OREGON, OHIO

U.S. EPA I.D. No. OHD 045 243 706
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Prepared for

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1.1 INTRODUCTION

Envirosafe Services of Ohio, Inc. (ESOI) owns and operates a treatment, storage, and disposal facility (TSDF) in Oregon, Ohio. The location of the facility is shown on the map included as Figure 1-1. In accordance with Sections 3004(u) and 3004(v) of the Resource Conservation and Recovery Act (RCRA) and regulations promulgated pursuant thereto, ESOI is conducting a Corrective Action Program (CAP) at its Ohio TSDF to assess releases of hazardous wastes or hazardous constituents, if any, for the purpose of protecting human health and the environment.

This Description of Current Conditions (DOCC) describes the Solid Waste Management Units (SWMUs) and Areas of Concern (AOCs) at the facility that are subject to the CAP, and describes available information from previous investigations and ongoing monitoring that assess the potential for releases. This document is being provided in accordance with the corrective actions provisions of the September 30, 1999 Federal Part B Permit which became effective on April 24, 2000. Under the CAP, ESOI is required to evaluate past waste management practices at SWMUs and AOCs identified at its Ohio facility. As part of this on-going evaluation, this DOCC Report for the facility has been prepared to assist with decision making regarding recommendations for future investigation activities.

One of the major provisions of the Hazardous and Solid Waste Amendments (HSWA) of 1984 to RCRA (Section 3004(u)) requires corrective action for releases of hazardous wastes or hazardous constituents from SWMUs at hazardous waste treatment, storage, or disposal facilities. Under Section 3004(u), a facility applying for a RCRA hazardous waste management facility permit is subject to the corrective action process, which begins with a RCRA Facility Assessment (RFA). The RFA was designed to identify SWMUs and AOCs that are, or are suspected to be, potential sources of routine and systematic releases to the environment. Based on the results of the RFA, a RCRA Facility Investigation/Corrective Measures Study (RFI/CMS) may be required. At SWMUs identified as potential sources, the facility is required to perform an RFI to obtain information on the nature and extent of the release so that the need for interim corrective measures (ICMs) or a CMS can be determined. Information collected during the RFI also can be used by the facility to aid in formulating and implementing appropriate corrective measures.

As a result of ESOI's submittal of a RCRA Part B Permit Application for the facility, the required RFA phase of the RCRA corrective action process was initiated by the United States Environmental Protection Agency (USEPA) Region 5 in 1987. In 1987, Metcalf and Eddy, Inc. (M&E) completed a RFA for the facility on behalf of USEPA Region 5 and in association with the Jacobs Engineering Group. The RFA report was submitted to USEPA Region 5 on September 8, 1987. The RFA consisted of a Preliminary Review (PR) of existing facility information and a visual site inspection (VSI) of the SWMUs. The PR consisted of a review of federal and Ohio state records to investigate the facility's waste disposal operations, identify the facility's SWMUs, determine the geologic and hydrogeologic setting, and evaluate the facility's release potential. The VSI was conducted to inspect the facility for physical evidence of a release, evaluate the groundwater monitoring system, and assess the need for additional information or investigation. M&E reported that no releases had been detected at the facility that would require further investigation.

The additional investigations recommended by the USEPA Region 5 when transmitting the RFA were "the installation of the additional wells agreed to in the Compliance Order." The USEPA further stated "The PR/VSI report recommends that additional groundwater monitoring wells be installed and tested for hazardous waste constituents. The company [ESOI] has agreed to install the additional wells and do the requisite sampling and analysis. The agreed to well locations are not all in the locations where the Contractor recommended; placement of additional wells that the company proposes will provide equivalent coverage."

The Federal RCRA Permit, dated November 8, 1988 states in Permit Condition VI.A.1.: "Within 90 days of the effective date of this permit, the Permittee shall submit to the USEPA a plan for completing the RCRA Facility Assessment, in accordance with 40 CFR 270.14(d)(3), and the Scope of Work in Attachment V-UU of this Permit." Attachment V-UU outlined the scope of work to accomplish the task of submitting a report to the USEPA describing the lateral and vertical extent of all SWMUs. This scope of work included sampling releases from SWMUs, sampling of trench backfill and soil sampling at areas of known releases from past disposal activities. A RFI Work Plan was submitted to the USEPA on October 15, 1991 and approved by the USEPA on March 6, 1995. The approved RFI Work Plan details the investigation to be performed along the northern property line adjacent to the Northern Sanitary Landfill (SWMU 6).

The environmental investigation of the Northern Sanitary Landfill (SWMU 6) was conducted by Midwest Environmental Consultants, Inc. (MEC) on behalf of ESOI pursuant to the requirements of the USEPA approved RFI Work Plan (MEC, 1995) and a Supplemental RFI Work Plan (USEPA, 1996) prepared and issued by the USEPA in September 1996. These documents are referred to as the Initial RFI Work Plan and the Supplemental RFI Work Plan in the subsequent parts of this document. A description of the SWMU 6 RFI activities and the RFI results is provided in Appendix E.

In addition to SWMU 6, this DOCC presents information on the other SWMUs and AOCs identified in the Federal RCRA Part B Permit, three additional AOCs recommended by Ohio EPA and one additional AOC requested by USEPA, as follows (see Figure 1-2):

SWMU/AOC	UNIT NAME
SWMU 1	Landfill Cell F
SWMU 2	Landfill Cell G
SWMU 3	Landfill Cell H
SWMU 4	Landfill Cell I
SWMU 5	Millard Road Landfill
SWMU 6	Northern Sanitary Landfill
SWMU 7	Central Sanitary Landfill
SWMU 8	Old Oil Pond #1 (South Pond)
SWMU 9	New Oil Pond #2 (North Pond)
SWMU 10	Ash Disposal Area
SWMU 11	Former Teepee Burner
SWMU 12	Former Bill’s Road Oil Operation
AOC 1	Toledo Water Lines
AOC 2	Truck Scale
AOC 3	Building “C” Equipment Maintenance Area
AOC 4	Building “C” Septic Tank and Leach Field
AOC 5	Decontamination Building

AOC 6	Oily Waste Above Ground Storage Tanks
AOC 7	Butz Crock – Concrete Utility Vault
AOC 8	Staging Area
AOC 9	Cell M Water Retention Basin
AOC 10	Rail Spur
AOC 11	Former Truck Scale

The remainder of this section of the report contains information on the facility background, environmental setting, site ownership, operational history (including past permits, spills, and maintenance/upgrade activities), and the site's RCRA regulatory history. Section 2 of this report contains a summary of previous site investigations. Section 3 contains information on each specific SWMU and AOC identified for inclusion in the CAP. Section 4 contains a discussion on groundwater characterization on a sitewide basis. Section 5 contains information on previous investigations and available monitoring data used to preliminarily identify the migration pathways and potential impacts to human health and the environment from releases from the facility. Section 6 contains a discussion on the areas requiring further investigation and Section 7 contains a list of the references used in the preparation of this report.

In order to aid the reviewers of this document, data and information relevant to each SWMU and AOC are referenced and attached as appendices to this document.

1.2 FACILITY LOCATION, DESCRIPTION, AND SETTING

ESOI owns and operates a TSDF located at the intersection of Otter Creek Road and York Street in the City of Oregon, Lucas County, Ohio, containing approximately 133.9 acres (see Figure 1-1). The facility is located at Latitude 41° 41' 00" and Longitude 83° 27' 56".

The site was initially operated as a solid waste landfill, starting in 1954. In the 1970's, the site received municipal, commercial, and industrial wastes. In November 1988, the site received a hazardous waste operating permit which became effective in October 1990.

Current activities at this facility include treatment, storage and disposal at an on-site landfill(s) of industrial and hazardous wastes. ESOI serves several types of industries including chemical, manufacturing, steel, petroleum and pharmaceutical industries. Furthermore, some hazardous wastes are generated on-site from various site activities. These activities include leachate generation from landfills, liquids collected from various containment areas/systems and other waste streams generated during the operation of the Stabilization/Containment Building (SCB), which includes stabilization of hazardous wastes and treatment of hazardous debris utilizing macroencapsulation and microencapsulation technologies, landfill(s) and other existing hazardous waste management units and support facilities.

The active disposal portion of the facility is comprised of one active waste disposal cell, designated as Cell "M," located in the southern portion of the property. Closed landfill cells located at the facility, designated as Cells "F," "G," "H" and "I" are located in the northern portion of the property. Figure 1-2 depicts ESOI's site arrangement while Figure 1-19 is an aerial photograph of the site identifying all of the SWMUs and AOCs.

1.2.1 Land Use

The General Facility Topographic Map, Drawing Number PRMO-T01, included in Appendix A, shows the surrounding land usage. Generally, the area surrounding the facility has been zoned as "industrial" by the City of Oregon. This industrial area encompasses various chemical, petroleum, waste management, recycling, and manufacturing facilities. Industrial and commercial facilities within a radius of 1,000 feet of the facility are also shown on this drawing. The drawing was prepared by MEC (April, 1996).

Of particular importance are two inactive landfills located in the vicinity of ESOI's property which are not owned by ESOI. One of these is the Commercial Oil landfill located to the north and immediately adjacent to the facility (also known as Gradel Landfill), and the other is the Westover Landfill located west of the facility across Otter Creek Road and immediately adjacent to Otter Creek. There are no adjacent properties owned by private individuals. The Gradel Landfill is an abandoned landfill identified by Environmental Data Resources, Inc., of Southport, Connecticut as an Ohio, State Hazardous Waste Site, based upon a review of the Ohio EPA Master Site List. The Gradel Landfill is owned by Commercial Oil Services, Inc.

North of the Gradel Landfill is the Commercial Oil Services, Inc. site which until 1999 included abandoned oil lagoons. The site is listed on the USEPA's Comprehensive Environmental Response, Compensation and Liability Information System (CERCLIS) and in 1999 the sludge and liquids within the lagoons was solidified and placed into a landfill constructed on the Commercial Oil site. CERCLIS sites are commonly referred to as Superfund sites. North of the Commercial Oil Services property is a BP refinery. Located to the south of the facility is the Norfolk and Southern Railroad Homestead Yard. Located to the west of the facility is the City of Toledo water treatment sludge lagoons, a Buckeye Pipeline Company pump station, and the inactive Westover Landfill. Located to the east of the facility is Toledo Edison property (currently operated as farmlands) and a Buckeye Pipeline Company storage tank farm.

1.2.2 Climate

The nearest National Weather Service station is at the Toledo Express Airport located near Swanton, Ohio. The climate of Toledo, Ohio is continental in nature which means that the winters are cold and unmoderated and the summers are moderately warm and humid. In the summer, there are occasional days when temperatures exceed 100ºF. Winters are reasonably cold, with an average of about 2 days of subzero weather, and autumns are predominately cool and dry. The mean daily maximum temperature for Toledo, Ohio is 59.9ºF, while the mean daily minimum temperature is 38.8ºF. Annual precipitation averages about 38 inches with most of the precipitation occurring in the spring.

A wind rose is presented on the General Facility Topographic Map, Drawing Number PRMO-T01 (Appendix A). This wind rose represents meteorological records from 1991 to 1995. The 1991 to 1995 wind rose is consistent with meteorological data which was derived from research into meteorological records spanning the previous 20 years to 1994. Meteorological conditions represented by the wind rose should be generally representative of the overall wind distribution at the facility. The data indicate that the predominant wind direction in the area is from the south-southwest.

1.2.3 Topography and Drainage

The General Facility Topographic Map, Drawing Number PRMO-T01 (Appendix A), is a topographic map showing the facility and a distance of one thousand (1,000) feet around the facility at a scale of 1 inch = 200 feet, with a two-foot contour interval. The facility boundary and buildings are depicted to scale on this drawing.

The facility is located on the drainage divide that separates Otter Creek from Driftmeyer Ditch, both of which flow northeasterly to Maumee Bay. Stormwater runoff from the ESOI Otter Creek Road facility is currently discharged via nine outfalls (001, 002, 003, 004, 006, 009, 010, 011, and 012) to the Gradel Ditch, Driftmeyer Ditch or Otter Creek. Outfalls 007 and 008 were utilized during the initial construction of Cell M. Upon completion of the construction of Cell M - Phase 2, the stormwater runoff was rerouted to the Cell M Water Retention Basin and Outfalls 007 and 008 were closed. Outfall 005 is located at ESOI's land treatment facility at Wynn Road in Oregon, Ohio (this outfall is listed in the outfall sequence because Ohio EPA provided one NPDES permit to ESOI for both facilities). The current outfalls and related drainage areas at the ESOI Otter Creek Road facility are:

- **Outfall 001:** Discharge consists of stormwater runoff from the following areas north of York Street:
  - Closed Cell G (SWMU 2);
  - Closed Central Sanitary Landfill (SWMU 7);
  - Area outside of the out-of-service nonhazardous oil storage tank berm (AOC 6); and
  - Facility support building/services area, parking area, and access roads.
- **Outfall 002:** Discharge consists of stormwater runoff from the closed Cell I (SWMU 4).
- **Outfall 003:** Discharge consists of stormwater runoff from the following areas north of York Street:
  - Closed Cell F (SWMU 1);
  - Portions of closed North Sanitary Landfill (SWMU 6) and Central Landfill (SWMU 7); and

- Access roads.

- **Outfall 004:** Discharge consists of stormwater runoff from the following areas north of York Street:
  - Closed Cell H (SWMU 3);
  - Portions of closed North Sanitary Landfill (SWMU 6) and Central Landfill (SWMU 7); and
  - Access roads.
- **Outfall 006:** Discharge consists of stormwater runoff from areas outside the hazardous waste limits of active Cell M, storage units and the SCB; sources of runoff are from the following areas south of York Street:
  - Closed (interim cap, awaiting final cap installation) portion of hazardous waste management unit - Cell M;
  - Hazardous waste management unit Cell M new cell construction area (outside hazardous waste limits); and
  - Facility parking areas and access roads.
- **Outfall 009:** Discharge consists of stormwater runoff from the southern portion of the closed Millard Road Landfill (SWMU 5).
- **Outfall 010:** Discharge consists of stormwater runoff from the northwest portion of the closed Millard Road Landfill (SWMU 5).
- **Outfall 011:** Discharge consists of stormwater runoff from the northeast portion of the closed Millard Road Landfill (SWMU 5).
- **Outfall 012:** Discharge consists of stormwater runoff from the northern portion of the closed Northern Sanitary Landfill (SWMU 6) and the northeast corner of the closed Cell F (SWMU 1).

The drainage areas for each of these outfalls is shown on the Plates 2 and 3 provided in Appendix Z. Monitoring of stormwater discharges is conducted in accordance with ESOI's current NPDES permit (Ohio EPA 2IN00013*ED).

Stormwater from Outfalls 001, 002, 006, 009, 010, 011, 012 is discharged to Otter Creek west of the facility either directly or via storm sewer. Stormwater from Outfalls 003 and 012 is discharged to the Gradal Ditch on the northside of facility. Stormwater from Outfall 004 is discharged to the field on the east side of the facility where it then flows toward the Driftmeyer Ditch located 0.5 to 1 mile away from the facility.

Otter Creek is approximately 6 miles long and has a total drainage area of approximately 7.5 square miles. From the point adjacent to the facility, Otter Creek flows approximately 2 miles north through a railyard before discharging to Maumee Bay (which is directly connected with Lake Erie). Gradel Ditch is a storm water drainage ditch located between the facility's northern property line and the adjoining Gradel landfill. The Gradel Ditch flows westerly and discharges into Otter Creek adjacent to the facility. Driftmeyer Ditch is about 2 miles long, originating approximately 0.4 miles south of the BP Oil Refinery along Cedar Point Road northeast of the facility. The ditch drains agricultrual land, and flows northeasterly through the BP Oil Refinery before discharging into Maumee Bay.

Figure 1-3 shows the extent of the 100-year floodplain for Otter Creek, which flows adjacent to the northwest corner of the ESOI site. This information was obtained from Federal Insurance Administration Maps - Panel numbers 390361-0005 B and 390361-0010 B. The 100-year flood elevation is approximately 579 feet above mean sea level (MSL). No portion of the facility is located within the 100-year floodplain of Otter Creek. Therefore, floodplain standards, protection measures and other requirements are not applicable to this facility.

1.3 SUMMARY OF SITE CHARACTERIZATION

Site characterization activities at the facility date back to the 1960s. The following subsections summarize the geological, hydrogeological, and ecological conditions at the facility.

1.3.1 Site Geology

The regional geology is characterized by generally horizontal and parallel layers of sediments deposited in glacial and postglacial environments over bedrock composed of Silurian Age sedimentary rock. Detailed descriptions of the regional and site-specific geology and hydrogeology are provided in the ESOI State Part B Permit Renewal Application originally submitted to the Ohio EPA on May 24, 1996 and in revisions/addenda submitted by ESOI in response to Ohio EPA's NOD's. The following subsections summarize the site geological information, contained in these previous submittals (i.e., RCRA Part B Permit Renewal Application) to Ohio EPA. Figure 1-4 shows a fence diagram around and through the facility. Figures 1-5, 1-6 and 1-7 show three cross-sections through the facility, while Figure 1-18 shows the cross-section locations. These Figures are all reproduced from the ESOI Part B Renewal Application submitted to Ohio EPA.

Bedrock Geology

Bedrock beneath the facility is first encountered at depths of 70 to 90 feet below ground surface and is known as the Greenfield dolomite, a member of the Salina Group (Silurian Age, approximately 410 million years old). The Greenfield dolomite is a brown, microcrystalline medium-bedded dolomite. It characteristically contains partings of carbonaceous material that may appear shaley, and styolites and stromatolites. The styolites are wavy carbonaceous partings produced by solutioning. Stromatolites are laminated structures that are commonly attributed to fossil algae. Gypsum and anhydrate are present in small quantities, sometimes as disseminated brown grains. Regionally the Greenfield dolomite ranges in thickness from 32 to 65 feet and averages about 45 feet thick.

The Greenfield dolomite originated as a shallow-water evaporite during Upper Silurian time (approximately 410 million years ago). In the areas of Lucas and Ottawa Counties, the Greenfield was part of an extensive system of reefs and shallow banks that existed in the area.

The Greenfield dolomite is underlain by the Lockport Group dolomite which, in the Toledo area, consists of approximately 175 feet of white to gray, or brown dolomite. It is coarsely crystalline, vuggy, and fossiliferous. Detailed site-specific information on the Greenfield Formation and Lockport Group is available in the descriptions of rock cores provided in Appendix E.10 of the Investigation Compendium [1].

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[1] The Investigation Compendium was originally part of Section E of the ESOI Part B Permit Renewal Application submitted to Ohio EPA in May 1996. Since that time, ESOI has re-written Section E, including the removal of the Investigation Compendium, main text of Section E, in response to a notice of deficiency (NOD) from the Ohio EPA. The Investigation Compendium is now incorporated by reference in Appendix E.1 of the current Part B Permit Renewal Application.

The sub-Lockport Silurian rocks are a dolomite facies of the Rochester shale and the Cabot Head and Dayton formations. These are all gray, green and brown argillaceous microcrystalline dolomites.

The next underlying formation, the Brassfield, marks the base of the Silurian rocks in northwest Ohio. The Brassfield formation is a distinctive white, light gray or medium brown fine-to-coarse-grained cherty dolomitized limestone. The Brassfield formation is about 50 feet thick in the Toledo area.

The formation underlying the Brassfield is the western equivalent of the Ordovician Queenstone shale in New York. The Brassfield formation is a green shale or an argillaceous greenish-gray dolomitic limestone.

Glacial Geology

The bedrock surface of the Greenfield formation is overlain by three distinct Late Wisconsinan deposits: a lower till, an upper till, and a proglacial lacustrine deposit. Evidence of earlier glacial activity at the facility has not been found.

Lower Till

The lower till, overlying the bedrock at the facility, is a firm, continuous, compact, silty clay rich till. It exists at the facility at thicknesses ranging from 12 to 30 feet, depending on the elevation of the underlying bedrock. The upper surface of the lower till is between 525 and 530 feet MSL.

In soil borings collected at the facility, the lower till is gray and does not exhibit the characteristic features of weathering (subareal exposure). The unit is not discolored, jointed, or bio-turbated.

When retrieved through hollow stem augers by a split spoon or continuous sampler, the lower till often appears hard, friable, and slightly moist to dry. The dry nature of the till is the result of the heat involved in extracting the sample; the lower till is so dense and compact that the friction generated in obtaining the sample dries out (and in some cases bakes) the extracted soil. When obtained by water rotary coring techniques, the lower till is very plastic. A constant head permeability test on the lower till conducted in 1985 in Boring M-3 as part of the ESOI characterization study indicated a permeability of 8.1 x 10^{-9} cm/sec demonstrating that the lower till is a significant aquitard.

In some areas to the west and north of the facility, a lens of sand or sand and gravel lies between the lower till and the bedrock. Only one boring (SB-6) at the facility, located along the northern property boundary immediately east of Otter Creek Road, showed any evidence of this older deposit (one foot of silty, clayey sand on top of rock). The absence of these older sand, gravel, and lacustrine deposits at the facility is probably related to the geographically higher elevation of the rock beneath the facility. Such deposits, if they existed in the area of the facility, were eroded away prior to the deposition of the lower till.

Upper Till

Directly overlying the lower till is the upper till. This unit is similar to the lower till in sand-silt-clay percentages in the matrix. It is very soft by comparison, often appears to be less stoney (fewer pebble and gravel-size sediment) than the lower till, and is characteristically more plastic when retrieved by split spoon or continuous samplers. The upper till ranges in thickness from 35 to 50 feet. Gravel in the unit ranges from 2 to 8 percent; sand, 17 to 26 percent; silt, 28 to 38 percent; and clay, 30 to 48 percent. Mineralogically, the upper till and lower till are very similar consisting of 45 to 60 percent illite; 30 to 45 percent chlorite/kaolinite; and less than 10 percent each of vermiculite, quartz, feldspar and calcite/dolomite. The similarities in the upper and lower tills likely result from having similar parent materials.

The upper portions of the upper till have slightly less sand as a result of incorporating basal inclusions. Some of the samples of this till unit appear to contain laminations typical of water-lain till deposited into a proglacial lake. This appears to be particularly true of the upper 5 to 10 feet of this deposit.

This till is usually soft near the top and becomes stiffer and more consolidated with depth. Constant head permeability tests indicate the permeability for the Late-Wisconsinan till ranges from 3.1 x 10^{-7} cm/sec to 1.4 x 10^{-8} cm/sec. The upper till also contains a few isolated inclusions. All available permeability and grain size data are presented in Appendices E.10.1, E.10.3, E.10.5 and E.10.13 through E.10.16 of the Investigation Compendium.

Contact Zone

North of York Street, the contact zone between the lower till and upper till is often characterized by inclusions of sand, silt, or clay. South of York Street, minimal inclusions of sand, silt or clay were found during the excavation activities at Cell M.

The contact zone on-site was examined directly during the excavation of Phases 1, 2 and 3 of Cell M. Contact zone sand and silt deposits were excavated during the Cell M construction. A representative from Earth Tech (Phases 1 and 2) and Lawhon and Associates (Phase 3) supervised the work and verified that the contact zone deposits in the Cell M excavation were removed. The contact zone between the two tills is an easily distinguishable layer that can be located both in soil borings and within the Cell M excavation. Over much of the facility, the transition from the upper till to the lower till is very uniform and, except for differences in hardness, both formations look very similar.

Investigations have also shown a limited area of potentially higher permeability along the western portion of the facility at the contact zone between the upper till and lower till. This area has been defined utilizing all of the geotechnical borings for Cell G and the monitoring wells for Cell G and Cell M. An isopach map, Figure 1-8, shows the limited areal extent of the deposits at the contact zone beneath Cell G. Figure 1-9, shows the thickness of glacial drift (i.e., the unconsolidated sediments) over the facility.

However, not all sand and/or gravel layers encountered in the tills are considered contact zones. For instance, in 1992, after completing the Phase I excavation of Cell M, it was apparent that the sand and silts encountered below the base of the upper till were in fact deposits associated with the lower till and were not deposited during an interglacial period. Additional information regarding the contact zone sands are included in the ESOI Part B Permit Renewal Application submitted to Ohio EPA. These inclusions are englacial features found randomly throughout the body of the glacier and after deposition become part of the till unit. The isolated sand inclusions do not increase the hydraulic conductivity of a till unit because they are discontinuous and separated by the fine grained portion of the till. As evidenced at the facility, there is little or no water associated with the sand inclusions. Since these inclusions are not inter-connected and are separated by low permeability clay, they do not serve as conduits for fluid flow in the subsurface and therefore cannot promote any potential migration of groundwater constituents. These inclusions are part of the till and are not considered to be contact zone sands. As the lower till was exposed during excavation, any inclusions found were treated as contact zone deposits and removed.

Proglacial Lacustrine Deposits

The lacustrine material at the facility is generally 10 feet to 20 feet thick and is comprised of laminated silt and clay layers with traces of sand and gravel. These laminations were created by preferential deposition of the fine grained material within the deep quiet water of the proglacial lakes. These laminations are seldom preserved in the upper part of the soil profile at ESOI because of weathering processes. The laminations may also have been destroyed by wave and current action shortly after the initial deposition as the lake became more shallow.

As the glacier that deposited the upper till began to stagnate and melt about 10,000 years ago, a pro-glacial lake began to form in the Lake Erie basin. Portions of the glacial ice became buoyant and probably floated several times as the ice melted. During floating episodes, glacial sediment settled down through the water, sorting into laminations with occasional pebbles. When the ice regrounded, till was deposited. The contact between the upper till and lacustrine unit is characterized by this glacio-lacustrine material.

The entire sequence of postglacial lakes in the Erie Basin probably took place in a period of about one thousand years (Forsyth, 1973). The last major lake to cover the facility was Lake Warren III. The postglacial lakes drained catastrophically when the ice had retreated far enough north to open the Niagara outlet. Once the outlet was opened, the entire volume of water contained in the Erie Basin emptied, carving the present Niagara Falls gorge as well as several other valleys.

Grain size analysis of the lacustrine material indicates that the material contains between 1 and 7 percent sand, 48 to 69 percent silt and 30 to 45 percent clay. Mineralogically, the lacustrine deposits are more variable than the tills and contain 45 to 60 percent illite; 15 to 45 percent chlorite/kaolinite; 0 to 30 percent smectite; 0 to 15 percent vermiculite; and less than 15 percent each of quartz, feldspar and calcite/dolomite.

Measured vertical constant head permeabilities range from 2.0 x 10^{-7} cm/sec to 3.8 x 10^{-8} cm/sec. Torr Vane shear test results range from 447 to 1,866 pounds per square foot (psf). Unconfined compressive strength tests range from 475 to 3,605 psf. The dry density ranges from 88 to 125 pounds per cubic foot.

Soils

The soils map published by the United State Department of Agriculture shows some of the more specific details of the surficial geology in and around the area of facility (see Figure 1-10 and Table 1-1). The majority of the soils around the area belong to the Latty-Toledo-Fulton Association.

All of these soils are silty clays or silty clay loams developed on the lacustrine deposits. Associated with these deep-water deposits are somewhat coarser, stratified Del Rey and Lenawee soils formed in shallower water on outwash plains, deltas and beaches. However, none of these coarser soils are found at the facility.

More extensive deposits are formed about 1.5 miles to the southwest of the facility and to the north across the Maumee River. St. Clair silty clay loams, which formed in glacial till, were evident along the banks of Duck and Otter Creeks where the streams cut down through the lacustrine material and exposed the underlying glacial till. Man's influence can be seen in the vast areas mapped as udorthents where the natural soil has been bulldozed, cut, filled and dredged to the point where the original soils are unrecognizable.

1.3.2 Site Hydrogeology

Regional Information

The 1991 USGS publication *Geohydrology and Quality of Water in Aquifers in Lucas, Sandusky, and Wood Counties, Northwestern Ohio,* describes the research of Kevin J. Breen and Denise H. Domouchelle regarding the unconfined sand aquifer in western Lucas County and the carbonate bedrock aquifer underlying the region. The following is excerpted from the publication abstract pertaining to the bedrock aquifer:

"In the carbonate aquifer, fractures, bedding-plane joints, and other secondary openings are the principal water-bearing zones. These zones can be areally and stratigraphically separated by low-permeability rock. Leaky artesian or semiconfined conditions predominate beneath most of the 1,400-mi^2 study area. The aquifer is confined by relatively impermeable underlying shale of Silurian age and overlying clay-rich drift of Quaternary age. Unproductive strata, including evaporites, within the sequence of carbonate rocks also confine some water-bearing zones."

"The carbonate aquifer is part of a regional ground-water-flow system; however, subsystems such as the eastern karst and central outcrops are locally important. The Potentiometric surface indicates that recharge from areas south and west of the study area flows toward discharge areas along major rivers (Maumee, Portage, and Sandusky), to a buried bedrock valley in central Sandusky County, and to springs and flowing wells. The potentiometric surface flattens markedly near the southern shore of Lake Erie, where ground-water levels approximate those of the lake indicating a hydraulic connection between the lake and the aquifer. Hydrogeologic characteristics and water-quality data indicate that Lake Erie is not a major source of recharge to the aquifer. Ground-water ages inferred from tritium concentrations and potentiometric-surface maps indicate that recharge from precipitation enters the aquifer by subsurface drainage in karstified strata in eastern Sandusky County and by infiltration in shallow bedrock areas where drift is less than 20 ft thick."

"The quality of water in the carbonate aquifer is described with reference to 52 properties and constituents that characterize chemical, radiochemical, bacteriological, and physical conditions. Ground-water samples from 135 wells and 11 springs are used in the characterization. On the basis of these data, water from the aquifer is generally suitable for drinking and for most domestic purposes. The most areally widespread aesthetic factors limiting the use of ground water are hardness, concentrations of dissolved solids, sulfate, and iron, and the presence of hydrogen sulfide."

"Selected bacteria are commonly present and may compromise the potability of water from the aquifer. Coliform bacteria from surface sources were found in 47 of 143 water samples. Analyses for total coliform bacteria indicate that 36 of the 125 samples from wells maintained for potable water supply have bacteria counts of 4 or more colonies per 100 mL—counts that are bacteriologically unsafe."

"Concentrations for alpha- and beta-particle radioctivity equaled or exceeded 5 pCi/L in many areas. The largest concentrations of beta-particle radioactivity are in waters with large potassium concentrations."

"The trace elements of selenium, silver, lead, antimony, cadmium, and copper are rarely detected in the samples analyzed. Concentrations detected are generally less than 5 ug/L and never exceeded the SMCL or MCL's for these elements. Arsenic, chromium, lithium, mercury, barium, nickel, aluminum, and zinc are commonly detected in the samples analyzed. Concentrations of 10 ug/L or greater are commonly reported for zinc, lithium, and barium. Few aluminum and nickel concentrations exceeded 10 ug/L. Few arsenic and mercury concentrations exceed 2 ug/L. Chromium concentrations greater than 50 ug/L are reported in 3 of 54 wells sampled."

"Volatile-organic compounds in concentrations greater than 3 ug/L were only detected in 1 of the 45 wells sampled. Cyanide in concentrations greater than 10 ug/L was not detected in any of the 48 wells sampled."

"Variations in water quality are related to the geochemical makeup of rock units, the thickness of drift overlying the aquifer, and past and current uses of land in areas of shallow bedrock. The presence or absence of calcium sulfate minerals in the rock causes a bimodal distribution of concentrations of dissolved solids, hardness, and sulfate in waters from the Bass Islands Group. Dissolution of calcium sulfate minerals contributes to excessive concentrations of sulfate that approach 2,000 mg/L. Sulfate reduction probably contributes to excessive hydrogen sulfide concentrations in some sulfate-rich waters."

"Waters derived solely form the Lockport Dolomite are relatively dilute and are calcium magnesium bicarbonate type. Strontium concentrations as large as 50 mg/L characterize sulfate-poor waters and are the result of dissolution of strontium-bearing minerals in the aquifer matrix. Shale mineralogies naturally soften water and increase sodium concentrations, most notably in western Lucas County."

"Br:Cl ratios were useful in tracing the source of large chloride concentrations. Sources were the dissolution of salt in evaporite-bearing strata and brine produced by oil and gas development."

"Ground water in shallow bedrock areas is most likely to indicate effects of past and current uses of the land. Concentrations of nitrogen, phosphorous, chloride, and dissolved organic carbon generally are elevated only in areas of shallow bedrock."

Bedrock Groundwater Conditions

Groundwater in the bedrock formation beneath the facility is under artesian conditions, with the overlying upper and lower till units acting as an aquitard. Although some sand and gravel inclusions are occasionally encountered within the thick glacial clays at the facility, these deposits are discontinuous, limited in areal extent, and lack direct recharge. Therefore, all known groundwater supplies in the vicinity of the facility are found in the bedrock formation; which is the uppermost aquifer and a confined aquifer. Potable water supplies in the area of the facility are provided by municipal sources (i.e., city water) which is obtained from Lake Erie and are not dependent on local bedrock groundwater. Further, groundwater in areas to the north and west of the facility have received an Urban Setting Designation indicating the widespread use of public drinking water supplies and the lack of potable ground water use in the area (see Appendix C).

The bedrock aquifer in northwest Ohio consists of Devonian and Silurian limestone and dolomite. Groundwater in these carbonate rocks moves through a series of complex interconnected openings. Therefore, even though the aquifer comprises different geologic formations, it is considered as a single hydraulic unit. This is illustrated by comparing the hydrograph of a well in Hardin County with that for well DUG-2 which is located on the facility (Figure 1-11). The two wells exhibit an almost parallel response to changes in barometric pressure and both show a similar response to recharge over a one month period even though these wells are over 60 miles apart. The hydrograph for on-site well DUG-2 is also compared with that of on-site well DDG-1 for the same period of time (January 1985) in Figure 1-12. Wells DUG-2 and DDG-1 are less than 1/2 mile apart on the facility. Water level responses in these two wells, which tap the bedrock aquifer, show virtually identical short-term fluctuations and one month trends over the same period of time as the Hardin County well, over 60 miles away. This suggests that these wells likely tap the same expansive hydraulic unit.

The potentiometric surface of the bedrock aquifer in the region of the facility has historically been, and is currently, influenced by pumping from nearby industrial supply wells. A map of the potentiometric surface of the bedrock in 1970 (generated from individual water well drilling reports, continuous recording water level gauges, random hand measurements, and regional and site-specific hydrogeologic investigations) indicates a general northeastern gradient in northwest Ohio as shown in Figure 1-13 (ODNR, 1970). A depression in the potentiometric surface in the south Toledo area (i.e., southwest of the facility) was created by heavy industrial pumping that began in 1947. Until 1958, the cone of depression in south Toledo was the major controlling factor governing groundwater flow and direction in the area. The depression in the potentiometric surface of the bedrock aquifer created a zone of influence over 10 miles wide. During that time, pumping rates probably exceeded recharge rates as increased seasonal drawdowns and a noticeable declining trend were observed (ODNR, 1970). The period from roughly 1958 to 1970 represented a balance between withdrawals and recharge within this pumping center (ODNR, 1970). Groundwater at the facility at that time had a gradient to the southwest, toward the cone of depression of the industrial supply wells. In 1958, when industrial pumping volumes decreased, the water levels at ESOI began to stabilize toward their current levels.

Although some individuals mistakenly assumed that a large cone of depression continued to exist in the south Toledo area after 1958 (Venturoli, 1978), the hydrograph of the Toledo State Hospital Well, Lu-1, indicates a steady rise in water levels from 95 feet below ground surface in 1967 to a recorded high of 59 feet below ground surface in May 1985 (see Appendix E.10, Figure 7-4 (A)-(E), pgs. E.10-7-8 through E.10-7-13 in the Investigation Compendium). This rise in water levels represents the slow but gradual return to the prepumping potentiometric surface. After 1987, water levels in Lu-1 began to decline. Seasonal low water levels observed in 1994 were about seven feet below the seasonal readings taken in 1986. This decline in water levels appears to be the result of increased pumping rates during the summer months, perhaps for air conditioning or other seasonal water use.

Influence of Seasonal Pumping at BP Oil Company

As described above, groundwater level data collected at the Facility prior to 1983 indicated a groundwater flow direction generally to the southwest. However, since 1984, groundwater flow has been predominantly in a northerly or northeasterly direction. Because of this change in observed groundwater flow direction, ESOI implemented a water level monitoring program to study the groundwater flow in the bedrock aquifer at the Facility. The subsequent four year study of groundwater levels (1984 through 1988) determined that the flow direction and gradient at the Facility was being influenced by the cyclical pumping of groundwater at the BP Oil refinery located approximately 0.5 miles northeast of the Facility. The timing of this pumping is controlled by an automatic system that responds to the refinery's demands for cooling water, which occurs primarily during the period of April to October. Additional groundwater level monitoring conducted at the Facility during the period of 1990 through 1992 further confirmed that the gradient of the potentiometric surface in the bedrock aquifer, and consequently the groundwater velocity, is highly dependent on groundwater pumping at the BP Oil refinery. For example, as shown on Figure 1-14, during non-pumping periods, the observed gradient is relatively flat (i.e., on-site water levels all within a few tenths of a foot of each other), but when BP Oil is withdrawing groundwater (spring through fall), the groundwater levels at the Facility decline and the gradient is steeper toward the northeast (see Figure 1-15).

Influence of Pumping Fire Well L-1

In August of 1995, a 24-hour pumping test was conducted on site at fire Well L-1 (located in the southwestern corner of the facility) to determine how pumping would influence the bedrock potentiometric surface during peak seasonal pumping at BP Oil (see Appendix E.10.20 in the Investigation Compendium).

The potentiometric surface of the bedrock aquifer as recorded on the day before the pumping test is illustrated on Figure 1-16. Water level measurements taken after 24 hours of pumping at a constant rate of 100 gallons per minute indicate a drawdown of up to 5.99 feet in wells located roughly 100 feet from Well L-1 to drawdown of less than 1.25 feet in wells located on the northeast corner of ESOI Figure 1-17.

It was determined during this pumping test that the bedrock potentiometric surface was affected during the pumping test at Fire Well L-1. Within less than 24 hours after shutting off the Well L-1 pump, the potentiometric surface rapidly recovered to its prepumping surface. Based on these results it was concluded that the use of this well should only affect the normal site gradient and flow direction during periods of pumping. Well L-1 may be pumped for a total of three times during the summer season, typically for a duration of 24 hours or less to obtain additional fire water stored in Pond M. Based on the rapid and complete recovery after pumping Well L-1, limited use of Well L-1 should have no long term effect on the potentiometric surface.

Aquifer Testing

In addition to the August 1995 pumping test describee above, pumping tests were conducted in 1985 and 1992 on bedrock test wells at the facility to evaluate and characterize the hydraulic properties of the confined carbonate bedrock aquifer.

- In September 1985, a bedrock test well (designated DR-1) was installed at the facility near the intersection of Otter Creek Road and York Street . A step-drawdown pumping test was conducted on this well on October 22, 1985 whereby the well was pumped at rates of 150, 250, 350 and 385 gallons per minute (gpm) with each rate being held constant for 45 minute periods. Based upon the data collected during the step-drawdown pumping test, a constant rate pumping test was initiated on October 23, 1985 from this well. A pumping rate of 350 gpm was held constant for a period of 25 hours. For the duration of this constant rate pumping test, water levels were measured from 13 on-site monitoring wells installed into the carbonate bedrock aquifer, from the pumping well and from on-site monitoring wells G-3D and M-5D screened at the contact between the upper and lower tills.

Data generated from the pumping tests conducted in October 1985 were used to characterize conditions within the confined bedrock aquifer beneath the facility. The average transmissivity of the bedrock aquifer was calculated to be approximately 27,000 gallons per day (gpd) per foot and the coefficient of storage was determined to be 9.37×10^{-5}. These values are considered typical for this formation. Additionally, water levels measured in on-site monitoring wells G3-D and M-5D did not show any measurable drawdown in response to the pumping test, although bedrock monitoring well DDG-1 (located within 5 feet horizontally of well G3-D) did show significant drawdown. A plot of water level elevations between DDG-1 and G3-D as a function of time did not show any demonstrable hydraulic interconnection between these two hydrogeologic units (see Appendix C).

- In 1992, ESOI conducted pumping tests to determine the hydraulic properties of the Greenfield and Lockport formations, and to estimate the hydraulic communication between the two formations. These pumping tests were conducted in May and June 1992 in accordance with a work plan approved by Ohio EPA on March 3, 1992. Specifically, a new well, DR-1 was installed into the Lockport formation. For the Greenfield formation test, a 46-hour pumping test was conducted at well DR-1 (packered to isolate the borehole section within the Greenfield formation) using a constant pumping rate of 190 gpm. Subsequently for the Lockport formation test, a 24-hour pumping test was conducted at well DR-1 (packered to isolate the borehole section within the Lockport formation) using a constant pumping rate of 68 gpm. A 24-hour pumping test was conducted on the Lockport formation based on the results of the Greenfield formation test, which indicated that little useful data was provided beyond the

24 hour time. In addition to the pumping tests, a continuous core of the Greenfield and Lockport dolomite was obtained for petrographic analysis to estimate the porosity of the bedrock.

Based on the test results, the estimated average hydraulic properties for the Greenfield formation were:

- Transmissivity: 3,120 ft^2/day;
- Storativity: 1×10^{-3} ;
- Hydraulic conductivity: 2×10^{-3} cm/sec
- Porosity: 0.08

The estimated average hydraulic properties of the Lockport formation were:

- Transmissivity: 2,410 ft^2/day;
- Storativity: 5.5×10^{-4};
- Hydraulic conductivity: 5.3×10^{-4} cm/sec
- Porosity: 0.22

In addition, this study determined that the Lockport and Greenfield formations could be treated as a single unit, although flow within the upper portion of the Lockport formation appears to be much slower than flow in the Greenfield formation. Also, an upward component of flow was detected between the Lockport and Greenfield formations.

<u>Groundwater Flow Rate and Direction</u>

Groundwater within the confined bedrock aquifer beneath the facility is under sufficient upward hydrostatic pressure that the water levels in ESOI's bedrock wells typically range between 33 feet to 49 feet below ground surface; well above the top elevation of the bedrock formation. The upper and lower tills at ESOI act as an aquitard. Groundwater recharge through the thick overlying glacial deposits around the facility is theoretically possible; however, based on the measured low permeabilities of the till (on the order of 10^{-8} to 10^{-9} cm/sec) and the upward hydrostatic pressure in the bedrock aquifer, vertical seepage through the lower till would be negligible (9×10^{-4} gallons/day/square foot).

As documented in ESOI's annual groundwater monitoring program reports, groundwater elevations in the bedrock aquifer are continuously recorded in several on-site wells. These data indicate that the effects of pumping at the BP Oil refinery continue to be evidenced in bedrock groundwater levels at the Facility. For example, as reported in ESOI's 1999 Annual Groundwater Monitoring Report (see Appendix BB) the hydrograph generated for on-site well DDG-1 for the 1999 monitoring period shows that beginning in April 1999, the water levels began to drop in response to the pumping of the production wells at BP Oil. The water levels continued to drop until October 1999 when pumping at BP Oil was halted. Water levels then gradually rose through the end of the year, except for brief periods when BP Oil pumped from the production wells. The pumping conducted at BP Oil resulted in a nearly 25 foot drawdown at the ESOI facility during the period of May though September 1999. This drawdown created a steep gradient from the ESOI facility towards the BP Oil wells, with the observed on-site water levels varying several feet across the site. In contrast, during the non-pumping periods, water levels in the bedrock aquifer recovered steadily and returned to a fairly flat potentiometric surface (i.e., on-site water levels all within a few tenths of a foot of each other) typical for the aquifer under non-stressed conditions. Based on these more recent measurements of bedrock gradients, the maximum calculated flow velocity during periods when BP Oil is pumping is approximately 71 ft/yr (as measured in October 1998). During periods of non-pumping the flow velocity is near zero or has a very low gradient toward the south or southwest (a maximum flow velocity of 13 ft/yr toward the south was observed in January 2000). Based on monthly flow calculations prepared for the 1996 and 1998 monitoring years, the net annual groundwater flow across the Facility is approximately 21 ft/yr to 38 ft/yr to the north/northeast (see Appendix C). As indicated by water level monitoring conducted at the Facility over the last 15 years, the predominant flow direction in the bedrock aquifer is to the north/northeast.

Breen and Dumouchelle (1991) describe the unconsolidated deposits over most of their study area as being "clay-rich lacustrine or till deposits of Quaternary age". They also describe recharge to the carbonate bedrock aquifer through three primary processes: 1) leakage through the semi-confining drift overlying the aquifer; 2) due to direct infiltration to the carbonate bedrock in areas where the drift is very thin or absent; and 3) via induced infiltration resulting from groundwater withdrawl. Clearly, ESOI's facility is overlain by a relatively thick sequence of glacial drift and the pumping tests previously conducted at the site did not demonstrate the inducement of groundwater from the till to the bedrock aquifer.

Groundwater Conditions in the Glacial Deposits

The thick tills that overlay the dolomite bedrock in the vicinity of the facility contain trapped pore water (Appendix E.10.18 in the Investigation Compendium). In fact, a study conducted of the age of the groundwater in the glacial deposits using naturally occuring isotopes of hyrdogen, oxygen and carbon to date the time of recharge of the groundwater and to characterize the climate at the time of the recharge indicated that water recovered from the upper and lower till units underlying the facility is of ancient origin, with adjusted ^{14}C isotope dates ranging from about 9,000 to 13,000 years before the study. In addition, the results indicated that groundwater in these deposits is of ancient origin with little or no component of modern, post-1952 recharge present.

Further, as described below, these units are incapable of providing usable supplies to wells because of low horizontal and vertical permeabilities of the tills. In addition, the sand inclusions within the tills are not interconnected and do not serve as conduits for flow. These characteristics are also demonstrated during the routing groundwater monitoring events where wells are frequently pumped dry during purging prior to sampling and then tak several days to recharge. Therefore, the glacial deposits cannot be regarded as aquifers but as semi-confined water bearing zones. Prior evaluations of groundwater elevations in the shallow and deep till wells have shown that there is no discernable regional gradient in these water bearing zones. The most recent ESOI annual groundwater monitoring program report, which provides groundwater elevation data for the shallow till, deep till and bedrock wells, is included in Appendix BB.

Measured vertical permeabilities of samples from the upper lacustrine sediments range from 10^{-7} to 10^{-8} cm/sec (Appendix E.10, Table 5-2 pg. E.10-5-35 to 36 in the Investigation Compendium). Computer analysis of slug tests performed on shallow test wells screened at the contact between the lacustrine sediments and the upper till indicate that horizontal permeability is on the order of 10^{-5} to 10^{-7} cm/sec (Appendix E.10, Table 3-1 pg. 5.10-3-35 in the Investigation Compendium).

Due to inherent differences between test methodologies between vertical permeability (i.e., triaxial permeability laboratory testing) and horizontal permeability (i.e., slug testing in the field), four Shelby sample tubes were horizontally driven into the lacustrine deposit in the wall of Cell I to ascertain a horizontal permeability from laboratory analysis and correlate this to laboratory-measured vertical permeability for this stratum. The laboratory measured horizontal permeability ranges from 1.37×10^{-7} to 1.36×10^{-8} cm/sec (Appendix E.10, Table 5-2 pg. E.10-5-35 to 36 in the Investigation Compendium). The small difference in magnitude between the laboratory-measured vertical permeability (1.4×10^{-7} to 1.2×10^{-8} cm/sec) and the laboratory-measured horizontal permeability is the result of the lamination of the lacustrine unit. One-quarter-inch-thick laminae of alternating clayey silt and clay are common in the saturated portion of the lacustrine unit.

Therefore, given the vertical and horizontal permeability of the tills, the vertical and lateral movement of water is negligible, such that the water between the two till units is essentially trapped.

Isolated sand pockets and lenses found within the till usually contain limited quantities of trapped water; however, the limited size of the sand pockets and the lack of interconnection to sources of recharge prohibits their classification as an aquifer. The opportunity to observe these deposits during the excavation of Cell M verified these characteristics. Sand lenses exposed during construction weeped limited volumes of water for a period of several minutes to several hours, then ceased to flow. These lenses were isolated within the upper till. The area of more continuous sand from left of well M-9D to right of I-6D is shown in Figure 1-6.

During the 72-hour pumping test of upper till/lower till contact zone (Hydrogeology of Area "G," Appendix E.10.17 in the Investigation Compendium) conducted in September 1990, response to pumping was indicated as far south as Well M5. The response of well M5 to pumping was slight. However, the log of M5 (Appendix E.10.3-87 in the Investigation

Compendium) shows sand at the contact between the two tills. Well M7, located south of M5, did not show response to pumping. The log for M7 (Appendix E.10.3-93 in the Investigation Compendium) does not show sand at the contact between the two tills. A similar pump test was conducted in Area M (Appendix E.10.23 in the Investigation Compendium) to determine potential connectivity of the contact zone deposits. This test was conducted prior to the excavation of Cell M. Response to the pumping well was limited to the north and west edge of Area M; these areas correspond to the sand as shown on the isopach map in Figure 1-8. Wells to the south and east of the pumping well showed no response. Wells M4, M5, M21, and M22 responded to the pumping while wells M8, M9, M10, M11, M12, M13, M14, M15, M16, M17, M18 and 35 other observation wells did not respond. Later, this was verified during the excavation of the contact zone during construction of Cell M; only a very small isolated contact zone deposit was revealed. This pumping test and subsequent visual observations confirmed that the sand deposits observed in Cell G did not extend beneath the base of Cell M (see Appendix C).

In addition, as described in documents provided in Appendix C, based on monitoring of 44 wells screened at the lucustrine/upper till contact, this test determined that there is no measurable hydraulic communication between the lacustrine/upper till contact zone and the upper till/lower till contact zone. These results confirm the pumping test of bedrock test Well DR-1 (Appendix E.10 Figure 6-5, pg. E.10-6-13 in the Investigation Compendium), during which wells in the lacustrine sediments and lower tills showed no evidence of water level changes during pumping tests. The water level measurements made in the wells in the glacial sediments actually showed slight increases in water levels during the pumping test. These results suggest that there is no direct hydraulic connection between the glacial sediments and the bedrock aquifer.

1.3.3 Ecological Conditions

During the previous RFI at SWMU 6, ESOI completed an ecological assessment to identify ecological receptors that might be affected by potential releases from the facility. MEC's *June 1997 Draft Final RFI Report for the Northern Sanitary Landfill* summarizes the findings of the ecological assessment (see Appendix E). During this assessment, terrestrial and aquatic habitats were characterized both on and around the facility. Surface water and sediment samples were collected and analyzed from five currently operating NPDES permit discharge locations, the Gradel Ditch, and at four locations in Otter Creek. Sampling and analysis of surface water runoff and sediments were conducted to identify potential releases from the facility in accordance with the Initial RFI Work Plan. Fish, macroinvertebrate, and periphyton communities were also characterized from four Otter Creek sampling locations to determine potential effects, if any, to the ecology of Otter Creek.

All chemical, and biological data from the ecological assessment suggest that the facility has not had an adverse impact on Otter Creek or the surrounding environment. Periphyton, macroinvertebrate and fish populations in Otter Creek are all affected by gross organic enrichment from a variety of sources not related to the facility. Water quality in Otter Creek appears to be influenced most by ammonia-nitrogen and pesticides which are likely to originate from farmfield runoff, leachfields, or sources other than ESOI. Sediment quality in Otter Creek appears to be influenced most by metals, PAHs and other organic compounds and were detected at their highest concentrations upstream of any ESOI NPDES discharges to the creek.

In addition to the ecological assessment conducted during the previous RFI at SWMU 6, ESOI obtained information on the occurrences of threatened, endangered, or special concern species, or protected habitats at and around the facility as part of its Ohio RCRA Part B Permit Renewal. The letters to the Ohio Department of Natural Resources (ODNR) and U.S. Fish and Wildlife Service (USFWS) requesting this information and the information provided by these agencies are included as Appendix CC to this DOCC Report.

According to information provided by ODNR, there are no known recent occurrences (1990 or later) of threatened, endangered, or special concern species on the site. There are two known recent occurrences of Ohio-listed species, both plants, within a 2-mile radius of the facility. Both of these occurrences are about a mile southeast of the facility. Since both of these species are plants, and are thus sedentary, no direct impacts to these species are expected from activities at the facility. In addition, there are two managed ecological areas within a 5-mile radius of the facility. The first is Pearson Park, which is located approximately two miles southeast of the facility. The second is Maumee Bay State Park, which is located approximately three miles northeast of the facility. There is an indirect hydraulic connection between the facility and Maumee Bay via Otter Creek and Driftmeyer Ditch which discharge into Maumee Bay. However, the potential for discharges to Otter Creek and Driftmeyer Ditch to impact water quality at Maumee Bay State Park is considered minimal given that the flow in Otter Creek and Driftmeyer Ditch are expected to be less than 0.1 % of the flow in the Maumee River which also discharges into Maumee Bay.

According to information provided by the USFWS, there are six threatened or endangered species that "may be" present in the area around the facility, based on a county-wide assessment of species known or historical range. However, as noted in the USFWS letter (Appendix CC) none of these species is known to occur on or near the facility based on actual sightings.

There are no known recreational users of Otter Creek, Gradel Ditch or Driftmeyer Ditch, and available data does not indicate that any of these waters contain or support viable fisheries. However, incidental contact may occur in these waterways. According to the Maumee RAP (January 1999), "Otter Creek contained a well-balanced warm water fish population prior to 1895. The first documented industrial development began in 1895 as the Crystal Oil Company. In 1919, the Standard Oil Company constructed its first plant in the watershed. These and other environmental pressures had a profound effect [on] the health of the creek. Between 1895 and 1920s, the Otter Creek fish community declined, until it was eliminated in the mid-1920s. Otter Creek is still essentially devoid of fish, with the exception of occasional strays." An assessment of Otter Creek conducted by USEPA in 1976 concluded that the "lower two-thirds of Otter Creek was not conducive to support or maintain aquatic biota…" A copy of this report is provided in Appendix CC.

Ohio EPA's 1997 Biennial 305(b) Report indicated that the quality of Otter Creek was still suffering, and was ranked 105 out of 106 principal rivers and streams in Ohio. Further, the most recent information presented by the Ohio EPA Division of Surface Water for the Lake Erie Tributaries (Maumee R. to Portage R.) indicates the following for Otter Creek and Driftmeyer Ditch:

- **Otter Creek**

  Ohio Administrative Code (OAC) 3745-1 considers the segment of Otter Creek from river mile 7.0 to the mouth a Modified Warm Water Habitat (MWH). However, recent sampling conducted by Ohio EPA showed that Otter Creek does not attain the Modified Warm Water Habitat (as designated in the OAC 3745-1) from River Mile 2.1 to 2.4 (Ohio EPA automatically extends this "non-attainment" designation for 0.5 mile in each direction, i.e., non-attainment is from RM 1.6 to 2.8). Further, the 1996 Ohio Water Resource Inventory Report also includes the following characterization of Otter Creek:

  1) Ohio EPA Ecological Priority List: Ultimate Aquatic Life Restorability Factors
     - Aquatic Life Uses – Limited Resource Water (LRW), MWH-C
     - Restorability Rating – "Essentially None"

       (The major factors in the restorability rating include site-segment scale habitat quality, river scale habitat quality, watershed scale habitat conditions, stream gradient or energy (i.e., energy needed to restore degraded habitat conditions), and specific "high influence" habitat attributes that may limit achievement of biological attainment of biocriteria. Stream segments classified as LRW or MWH, on the basis of a biosurvey, are considered the least restorable conditions.)

  2) Comparative Ranking of the Biological Integrity of Ohio Rivers and Streams
     - Biological Integrity Equivalents (BIE) – 10-20
     - Narrative Rating – "Very Poor"

- **Driftmeyer Ditch**

  The 2000 Ohio Water Resource Inventory reports that, "Basically this in an agricultural drainage ditch with fish. Channelization and siltation severely limit the potential of the stream. Some problem with poorly performing septic systems along the end of the ditch. Nutrient enrichment is obvious from the upstream farms."

The following information is presented in the 2000 Ohio Water Resource Inventory Report:

1) Ohio EPA Ecological Priority List: Ultimate Aquatic Life Restorability Factors
   - Aquatic Life Uses – None
   - Restorability Rating – "Essentially None"

2) Aquatic Life Use Attainment
   - None – 2.43 miles (full length)

Information on the Ohio EPA DSW current characterization of these water bodies is provided in Appendix CC.

Otter Creek and Driftmeyer Ditch drain into the Maumee Bay, which is directly connected with Lake Erie. OAC 3745-1-31 designates Lake Erie as an exceptional warmwater habitat, superior high quality water, public water supply, agricultural water supply, industrial water supply and bathing waters. However the 2000 Ohio Water Resource Inventory Report concluded that "none of the lake or lacustuary sites in this study attained an integrity level of exceptional and only a few attained the good level. This was reflective of the widespread and pervasive nature of environmental impacts in the region." Examples of localized pollution impacts were found in the Maumee Bay and Cuyahoga River areas where IBI values remained in the poor range. One site in the study, just east of the Maumee Bay area, fell in the very poor classification. This site was a rip-rapped beach in an area where extensive settling of organic debris and urban waste was occurring.

As indicated above, a site-specific ecological assessment was conducted by MEC as part of the Northern Sanitary Landfill RFI (see Appendix E). This assessment identified the following plant and animal habitats in the vicinity of the ESOI site, including the locations of Otter Creek, the Gradel Ditch and Driftmeyer Ditch.

Periphyton Communities

Analysis of periphyton communities within Otter Creek was completed by Rex Lowe, Ph.D. of Bowling Green State University in Bowling Green, Ohio.

The study indicated that none of the four sampling sites established in Otter Creek supported "healthy" periphyton communities. However, Sites 1 and 2, the downstream sites, exhibited significant differences in total cell density, dominant taxa and species diversity than Sites 3 and 4, the more upstream sites. For example, Sites 1 and 2 supported significantly higher phytoplankton (free-floating algae) densities than Sites 3 and 4.

Species diversity, as measured by the Shannon-Weaver Diversity Index, was significantly lower at Sites 1 and 2. In addition, *Stigeoclonium tenue*, a green algae which thrives on water that is "grossly enriched with nutrients", was the dominant taxon at Sites 1 and 2, whereas the diatom *Gomphonema parvulum*, a species which is also highly tolerant of nutrient enriched waters, was dominant at Sites 3 and 4.

The difference in dominant taxa between Sites 1 and 2 and Sites 3 and 4 are generally observed in reverse order downstream of sewage outfalls. That is, *Stigeoclonium tenue* is typically observed immediately downstream of sewage outfalls, with *Gomphonema parvulum* appearing further downstream of the discharge, before the zone of recovery.

Periphyton community structure at Sites 1 and 2 may be influenced by the presence of the Buckeye Pipe Line Company's Toledo Operations Center, which occupies a parcel located at 3321 York Street, at the northwest corner of York Street and Otter Creek Road, along the east bank of Otter Creek. Built in 1987, the facility disposes of its sanitary waste via a 1,000-gallon septic tank and 440-lineal-foot leachfield which is situated along the north side of the property. The leach field also lies along the south bank of a drainage ditch that flows into Otter Creek, and 750-feet upstream of Site 2. The current condition of the leachfield is not known.

In summary, the periphyton data indicate gross nutrient enrichment in the water column, which is more prounced down-stream at Locations 1 and 2. This condition is not likely a result of the

ESOI facility, but rather from some other source (i.e., agricultural runoff, leach-field seepage, etc.).

Benthic Macroinvertebrate Communities

Benthic macroinvertebrate samples collected from the four Otter Creek sampling sites by MEC, were sorted, identified, and tabulated by Aquatic Resources Center (ARC) in Franklin, Tennessee. Macroinvertebrate communities are an indication of general sediment quality.

In summary, 23 macroinvertebrate taxa were identified in Otter Creek. Oligochaetes and chironomids were the predominant organisms found, comprising 99.9% of all individuals collected. Only 13 other individuals in five taxa were not oligochaetes or chironomids.

Oligochaetes were represented by six taxa, all of which are reported to be tolerant of organic pollution. Chironomids were represented by 13 taxa, of which 12 are reportedly common and pollution tolerant.

Mouthpart deformities are reportedly a common characteristic of larval chironomid populations in areas subjected to heavy metal and toxic industrial discharge pollution. In this study, only three (0.9% of total) deformed chironomids were found in the samples.

Sigtree analysis of the macroinvertebrate data indicated that benthic communities from Sites 1, 2 and 3 were significantly similar to one other, while the macroinvertebrate community at Site 4 was significantly different. ARC credits the large number of oligochaetes collected at Site 4 as the reason for the discrepancy. The report also suggests that while organic enrichment was present at all of the sampling sites in Otter Creek, a predominance of organic enrichment is present in the sediment at Site 4, the most upstream site.

In summary, the oligochaete fauna of Otter Creek are tolerant of organic enrichment, are found at all sites, and are especially predominant at Site 4 (upstream of the Envirosafe facility). The chironomid fauna of Otter Creek are characteristic of a slow moving, organically enriched stream with a predominantly mud or silt substrate and little or no submerged vegetation. <u>No</u>

relationship was observed between macroinvertebrate community structure in Otter Creek and the ESOI facility.

Fish Communities

Electrofishing in Otter Creek produced a total of 917 fish representing 18 species. The most abundant species collected was fathead minnow (*Pimephales promelas*), with 515 individuals collected. The second and third most abundant species collected were emerald shiner (*Notropis atherinoides*) and bluntnose minnow (*Pimephales notatus*) with 201 and 59 individuals collected, respectively.

Six of the 18 species and 622 of the 917 fish, or 68% of the individuals collected are classified as omnivores. The fathead minnow was the most abundant omnivore with 515 individuals collected. Omnivores typically dominate polluted or nutrient enriched areas.

Insectivores represented the second largest feeding guild, consisting of eight of the 18 species and 282 of the 917, or 31% of the individuals collected. One generalist, the creek chub (*Semotilus atromaculatus*); one carnivore, large mouth bass (*Micropterus salmoides*); and one piscivore, white bass (*Monrone chrysops*), were also collected in Otter Creek.

The tolerance of each fish species to pollution stress was also considered in this study to assist in assessing the water quality of the creek. Seven of the 18 species, representing 644 of the 917 fish, or 70% of the individuals collected, were found to be highly tolerant to pollution. Eight individuals (0.9%) representing two species were found to be moderately intolerant to pollution. Forty individuals (4%) also representing two species were found to be moderately tolerant to pollution, and 225 individuals (25%), representing seven species, do not have a tolerance listing available at this time. All but two of the individuals that are moderately intolerant were found at Location 1, downstream of all ESOI discharges to the creek.

- **IBI Calculations**

  The Index of Biotic Integrity (IBI), as defined by Ohio EPA, was calculated for each of the four Otter Creek sampling sites. The IBI incorporates 12 community metrics which are compared to expected values from referenced sites located in a similar geographic region (in this case the Huron/Erie Lake Plain, or HELP ecoregion) where human influence has been minimal. All 12 IBI metrics assess fish community attributes which have been shown to correlate, either positively or negatively with biotic integrity.

Ratings of five, three or one are assigned to each metric according to whether its value approximates (5), deviates somewhat from (3), or strongly deviates from (1) the value expected at an undisturbed reference site. The maximum IBI score is 60 and the minimum is 12. Within the HELP ecoregion, relatively undisturbed headwater sites were found to have IBI scores which varied from 24 to 30, with a mean score of 27 and a median score of 26. IBI scores that are lower than these values are considered to be indicative of a loss of biotic integrity.

Results from the fish sampling study indicate that the IBI score was highest at location 4 (IBI = 24), upstream of all ESOI NPDES discharges. However, the IBI score then declined to a low of 18 at site 3, which also lies upstream of the ESOI discharges. At Site 2, located just downstream of the NPDES discharges for Cells G, I and M, the IBI score remained at 18, indicating no negative impact to fishes from the upstream Envirosafe NPDES discharges. The IBI score increased to 20 at site 1, suggesting a slight improvement to fish community conditions over site 2.

It should be noted that none of the four sampling locations in Otter Creek exhibited IBI scores sufficiently high enough to meet the criteria for warmwater habitat (i.e., IBI = 28) and only fishes at Location 4 exhibited an IBI score that was higher than the biological criteria established for modified warmwater habitat (i.e., IBI = 20). These results parallel those presented by Ohio EPA in which IBI scores for Otter Creek sampling sites failed to attain warmwater habitat status, and do not indicate an adverse impact from the Envirosafe site.

- **Iwb Calculations**

The Index of Well Being (Iwb), which has also been demonstrated to be positively correlated with the quality of water and habitat in Ohio streams and rivers, was also calculated at the four Otter Creek sampling sites. The Iwb incorporates four measures of fish communities; numbers of individuals, biomass, and the Shannon diversity index (H) based on numbers and weight. For sites such as Otter Creek, fish numbers and biomass data are standardized to a 0.3 kilometer sampling length so that comparisons to state-wide reference data collected from relatively undisturbed sites of similar size can be made.

Iwb scores varied little among the 4 sampling sites, exhibiting a low value of 7.96 at Site 2 and a high of 9.59 at Site 1. Fish communities at sites 3 and 4 exhibited Iwb scores of 8.15 and 8.96, respectively.

Although these Iwb scores appear relatively high for a lower quality stream such as Otter Creek, the important point to note for this study is that the Iwb are similar at all locations. Thus, they indicate that the ESOI facility is not adversely impacting the stream. Also, a notably larger number of fish and number of species of fish were captured during this study than were captured during a 1989 OEPA survey.

Vegetative Communities

- **Terrestrial Plant Communities**

The ESOI facility is located on the west side of the City of Oregon, Ohio, in a heavily industrialized area which contains a number of former solid waste landfills, active and inactive oil refineries and tank farms, active railroad yards and railroad lines, a cemetery, the City of Toledo's municipal water treatment plant, a petroleum pipeline company and agricultural land. Over most of the non-agricultural areas, existing vegetation consists of grasses and other non-native, weedy species that colonize disturbed ground. More mature stands of shrubs and trees can be found along a narrow riparian corridor along

Otter Creek, surrounding the inactive Westover Landfill to the west of the ESOI facility, to the northeast of Cell H along the unnamed ditch which flows to Cedar Point Road, and south of the facility, just north of the cemetery.

The area to the south of the ESOI facility contains an adjacent railroad yard and a salvage yard which is used by the City of Oregon to stage stockpiled soils, roadway construction debris, and wood from various tree removal projects. The northern edge of the salvage yard contains a ditch dominated by narrow-leaved cat-tail (*Typha angustafolia*) and, to a lesser extent, common reed (*Phragmites australis*). Also observed in abundance were river bank grape (*Vitis riparia*), common burdock (*Arctium minus*), and white campion (*Lychnis alba*).

The eastern edge of the salvage yard contains scattered stands of narrow-leaved cat-tail, woodland sedge (*Carex blanda*) and crested sedge (*Carex cristatella*). This area also contained box elder (*Acer negundo*) and silver maple (*Acer saccharinum*) saplings.

The remainder of the salvage yard area is dominated by cottonwood (*Populus deltoides*) and common burdock. Catnip (*Nepeta cataria*), green ash (*Fraxinus pennsylvanica*) saplings, yellow goat's beard (*Tragopogon pratensis*) and common milkweed (*Asclepias syriaca*) were also found here with notable regularity. Other species include Queen Anne's lace (*Daucus carota*), garlic mustard (*Allaria petiolata*), common teasle (*sylvestris*), tall ironweed (*Vernonia gigantea*). White campion (*Silene pratensis*), orchard grass (*Dactylis glomerata*), bull thistle (*Cirsium vulgare*), and curly dock (*Rumex crispus*) were also dominants. Several other species were also common to this area, including white daisy (*Chrysanthemum leucanthemum*), moth mullein (*Verbascum blattaria*), field pennycress (*Thlaspi arvense*), common yarrow (*Achillea millefolium*), yellow sweet clover (*Melilotus officinalis*), peach leaf willow (*Salix amygdaloides*), and crack willow (*Salix fragilis*).

The riparian corridors along Otter Creek and the ditch that flows from the northeast of the property consist of a narrow band of cottonwood, box elder, green ash, rough-leaved dogwood (*Cornus drummondi*), garlic mustard, reed canary grass (*Phalaris arudinacea*), multiflora rose (*Rosa multiflora*), and river bank grape. Smooth sumac (*Rhus glabra*) and Virginia creeper (*Parthenossisus) quinquefolia*) are also present, as are Timothy (*Phleum pratense*), poison ivy (*Toxicodendron radicans*), catnip, bull thistle, orchard grass, and white campion. Both riparian corridors are relatively narrow, being confined to the banks of their respective water courses.

The area to the east of Otter Creek and south of York Street contains disturbed ground dominated by cottonwood trees and orchard grass and wetter, lower, marsh-like habitat dominated by narrow-leaved cat-tail and reed canary grass, scattered with abundant spotted touch-me-not (*Impatience capensis*). Other species commonly found in this area include poison ivy, New England aster (*Aster novae-angliae*), rough-leaved dogwood, fox sedge (*Carex vulpinoidea)*, catnip, Queen Anne's lace, awnless brome (*Bromus inermis*), riverbank grape, multiflora rose, and silver maple.

- **Wetlands**

  - **Gradel Ditch**

Several wetland areas were also noted adjacent to the ESOI facility or Otter Creek. Although these habitats were not formally delineated, their general features are described below.

The Gradel Ditch consists of a narrow, 1,400-foot long drainage ditch which receives NPDES stormwater runoff from the northern portion of the ESOI facility and the Gradel Landfill north of the facility, and has been the documented recipient of leachate discharges from Gradel Landfill.

The Plant community within this ditch consists of a mixed stand of common reed and narrow-leaved cat-tail, along with small cottonwood trees, smooth sumac, staghorn sumac, and rough-leaved dogwood.

- **Emergent Marsh**

Emergent wetlands occupy four areas around the Envirosafe facility:

1) approximately 10 acres along the east side of Otter Creek, northwest of Cell F (a large portion of this wetland was recently filled to accommodate the extension of Millard Avenue);
2) approximately 3 acres along the east side of Otter Creek, south of the Norfolk Southern Railroad tracks, between the City of Toledo Water Treatment Plant and Otter Creek Road;
3) approximately 14 acres south of Cell M, on property owned by Norfolk Southern Railroad Company; and
4) approximately 8.5 acres east of Cell M.

Dominant vegetation within the first two wetlands consist of narrowleaf cattail (*Typha angustifolia)*, common reed (*Phragmites australis*), spotted touch-me-not, and reed canarygrass. Both marshes are lower in elevation than their surroundings, and are separated from Otter Creek by what appear to be sidecast piles from the channelization of the creek. Vegetation which surrounds both wetlands consists of dense stands of various shrubs and trees, including eastern cottonwood, smooth sumac, black willow, riverbank grape, rough-leaved dogwood, Virginia creeper, and an assortment of forbs and grasses. Tree-of-heaven (*Ailanthus altissima*), poison ivy, common buckthorn (*Rhamnus cathartica*) and stinging nettle (*Urtica dioica*) are also present along the borders of each marsh.

The wetland located south of Cell M was originally characterized in 1990 by Elliot Tramer, Ph.D. of the University of Toledo. Here plants consist of narrowleaf and broadleaf cattail in the eastern two-thirds of the wetland, and various grasses, sedges and herbaceous dicots.

The wetland located east of Cell M was first characterized by MEC in May, 1997. This wetland, which comprises approximately 8.5 acres on parcels owned by the Buckeye Pipeline Company, Wolverine Pipeline Company, the Toledo Edison Company and Quality Environmental Contractors, has become established only since 1995, as a result of the construction of a temporary haul road, which occurred in 1992. The majority of the wetland consists of emergent marsh dominated by narrowleaf cattail and sparsely scattered stands of purple loosestrife (*Lythrum salicaria*) and water plantain (*Alisma* sp.). The southern edge of the emergent portion of this wetland is bordered by a transitional wetland area which contains various rushes, sedges, grasses and flowering monocots.

- **Otter Creek Floodplain Wetland**

A narrow floodplain lies along Otter Creek. Dominant trees, located primarily along Otter Creek, included silver maple and white willow (*Salix alba*). Dominant vines were riverbank grape, summer grape (*Vitis aestivales*), and poison ivy. Reed canary grass is the dominant herbaceous species in the area, covering most of the floodplain. Other species commonly observed in this area included Timothy, Queen Anne's lace, garlic mustard, fox sedge, *Carex stipata*, larger straw sedge (*Carex normalis)*, orchard grass, and green bulrush (*Scirpus astrovirens*).

<u>Fauna</u>

- **<u>Avifauna</u>**

An avifaunal survey was conducted for the ESOI site and vicinity during several sampling events on-site. Species were listed as they were observed within the project area or as they were identified by their individual calls.

The majority of the avian species observed on site were common migrants and summer residents of the area, including Great Blue Heron (*Ardea herodias*), Killdeer (*Cjaradrois vpcoferis*) Barn Swallow (*Hirundo rustica*), and Indigo Bunting (*Passerina cyanea*).

Three species noted on site are listed as uncommon or common migrants only, including Solitary Sandpiper (*Tringa solitaria*), Eastern Phoebe (*Sayornis phoebe*), and White-throated Sparrow (*Zonotrichia albicollis*). All of the other species noted on site are classified as fairly common to common, or common to abundant permanent residents of the area including American Kestrel (*Falco sparverius*), Ring-billed Gull (*Larus macroura*), American Crow (*Corvus brachyrhyncos*), Northern Cardinal (*Cardinalis cardinalis*), House Finch (*Carpodacus mexicana*). The House Sparrow (*Passer domesticus*) and European Starling (*Sturnus vulgaris*) are also abundant permanent residents.

- **Mammals**

  Although no mammals were observed during the site inspections conducted as part of the ecological assessment, several species would be likely to inhabit the studied area.

Muskrats (*Ondatra zibethica*) would likely live along Otter Creek and the unnamed creek. They typically dwell in burrows along creek banks. These burrows could range from a small depression under vegetation to complex burrows that extend along the bank or lead inland from the waters edge. Muskrats are also capable of building lodges out of vegetation, that either float on the water or rest on solid ground. No muskrat lodges were observed during field studies for the ecological assessment.

- **Reptiles and Amphibians**

  Only one reptile was observed during site inspections, although several reptiles and amphibians could possibly inhabit the site. The snakes would possibly include the Common Garter Snake (*Thamnophis butleri*), Common Water Snake (*Natrix sipedon sipedon*), and possibly the Fox Snake (*Elaphe vulpina*). Turtles would include the Snapping Turtle (*Chelydra serpentina*) and the Painted Turtle (*Chrysemys belii marginata*). One snapping turtle was found in Otter Creek during sampling.

  The number of amphibians could vary in this area. The most probable would be the American Toad (*Bufo americanus americanus*) and the Leopard Frog (*Rana pipiens*).

Other species of turtles and frogs may exist in the area due to the close proximity of the Lake Erie Marshes, however, their presence is unlikely due to the high level of disturbance in the area.

1.4 HISTORY AND DESCRIPTION OF OWNERSHIP AND OPERATION

The facility is authorized to operate as a TSD facility in accordance with the Solid and Hazardous Waste regulations of the Ohio Administrative Code (OAC Chapter 3734) and is permitted under an Ohio Hazardous Waste Installation and Operations Permit (Permit No. 03-48-0092) and the Resource Conservation and Recovery Act (RCRA) (USEPA Permit No. OHD 045 243 706).

The facility has been owned and operated by ESOI since the 1950's, although the name of this owner changed from Fondessy Enterprises, Inc. (FEI) to Envirosafe Services of Ohio, Inc. ESOI was incorporated as FEI on March 26, 1956. FEI changed its name to Envirosafe Services of Ohio, Inc. on March 27, 1987. Thus, the facility has been continuously owned and operated by the same entity since 1956. Until 1983, 100% of the stock of this entity, then known as Fondessy Enterprises, Inc., was privately held and owned by members of the Fondessy family. On June 23, 1983 all of the outstanding shares in FEI were sold to ESOI, an indirectly held, wholly-owned subsidiary of IU International Corporation, Inc. (IU). Currently, ESOI is a privately-held corporation. ETDS, Inc. is the immediate parent corporation of ESOI and owns 100 percent of the outstanding shares of common stock issued by ESOI. Envirosource Technologies, Inc. owns 100 percent of the stock issued by ETDS, Inc. Thus, Envirosource Technologies, Inc. is the immediate parent of ETDS, Inc. IU International Corporation owns 100 percent of the common stock issued by Envirosource Technologies, Inc. EnviroSource Inc., owns 100 percent of the common stock issued by IU International Corporation. Thus, ESOI is an indirectly-held, wholly-owned subsidiary of EnviroSource, Inc. EnviroSource, Inc. is a publicly-traded corporation.

Operations at the site have included: solid and hazardous waste landfilling, burning of waste in a Teepee Burner, land treatment and storage operations, and oil recovery. A portion of the property which is now located under the Stablization/Containment Building (SCB) was once used as an oil recycling facility known as Bill's Road Oil. This property was obtained by FEI in 1982 and consisted of two small aqueous lagoons and five storage tanks. Other pieces of property located south of York Street were acquired from the City of Toledo, American Tank Service, Norfolk and Southern Railroad, and C Systems. A summary of past and current waste disposal activities at the facility is included in Section 3.

1.4.1 Summary of Past and Existing Permits

Prior to 1987, the facility operated an incinerator, oil recovery pond and ash disposal area at the facility. Throughout the 1950's and 1960's there may have been intermittent waste disposal activities at the facility in addition to the ash disposal, according to reported interviews with site operators. Disposal of solid waste began in about 1970. Under permits issued by the Ohio EPA, the operator at the facility disposed of commercial, industrial and municipal wastes in landfills. In 1980, the facility obtained "interim status" under RCRA for the disposal of certain hazardous wastes, but continued to dispose of municipal wastes in the landfill cells.

In August, 1983, ESOI filed its RCRA Part B Permit Application with the USEPA seeking approval to treat, store and dispose of hazardous wastes at the facility. In 1988, USEPA issued a final RCRA Part B Permit to the facility which became effective in October 1990. During this time period, the State of Ohio received RCRA authorization and required ESOI to submit a Part B Permit Application to the State. In July 1991 the Ohio Hazardous Waste Facility Board (HWFB) issued a State RCRA Permit to the facility. Since this time, ESOI has maintained both Federal and State RCRA permits.

The facility's Environmental Permits are summarized on Table 1-2.

1.4.2 Summary of Spills

A number of spills and releases have occurred during normal operations at the facility. A detailed list of readily available reported spills from 1991 to April 2000 is provided in Appendix W. The list of spills that occurred between 1991 and 1994 does not include the exact location of the spills; however, it has been reported that some of the spills took place along the on-site roadway to the old scale unit (AOC 11). This area was excavated and removed during the construction of Cell G. A review of Appendix W clearly indicates that a majority of the reported spills involve minor amounts of materials. All spills/releases have been addressed through the implementation of the applicable requirements of the facility's contingency plan and/or standard operating procedures. Details for each incident are presented in the applicable incident reports submitted to Ohio EPA.

1.4.3 Compliance History

A detailed listing of the facility's regulatory compliance history and present actions taken by USEPA and Ohio EPA relating to the TSDF facility under RCRA and National Pollutant Discharge Elimination System (NPDES) permit programs is provided in Appendix B of this report.

2 SITE INVESTIGATIONS

This section contains summaries of on-going and previously performed site investigations conducted either by or at the ESOI facility. These investigations were typically performed either voluntarily or under the oversight of Ohio EPA and/or USEPA pursuant to the requirements of various regulatory programs, and were conducted in accordance with relevant and applicable standard operation procedures (SOPs), RCRA protocols, and state and federal regulations/guidance. Data from these historical and on-going site investigations have been used later in this report to describe the current conditions at the facility.

2.1 GENERAL SITE INVESTIGATIONS

Many investigations have been performed over the years at the ESOI facility. The history of investigations at the facility has been compiled into a Compendium of Geological, Hydrogeological, and Investigation Reports and Data (Investigation Compendium), which is included as an appendix in the Part B Permit Renewal Application submitted by ESOI to the Ohio EPA. The history of investigations at the facility is based upon available information and the studies pertinent to developing the RFI work plan are summarized in this Subsection.

In 1964, a series of six shallow geotechnical soil borings (25 feet deep) were drilled prior to the installation of the 60-inch raw water line traversing the facility by the Department of Public Utilities, Division of Water Engineering, City of Toledo. The soil borings along the proposed water main alignment throughout the ESOI facility typically encountered fill material consisting of a mixture of cinders, clay, brick, wood, tin and concrete to a depth of approximately 8 feet below the existing ground surface. Beneath this fill material brown to grey mottled silty clay is identified throughout the soil boring logs.

In 1969, George R. Kunkle, Consulting Geologist prepared the *Groundwater Site Survey for Proposed Sanitary Landfill Development, Fondessy Enterprises, Inc., Otter Creek Road, Oregon, Ohio* which detailed the findings, conclusions, and recommendations regarding the groundwater occurrence, movement, and hazards associated with possible pollution at the proposed landfill site. The 1969 Kunkle report concluded that "the proposed landfill presents a minimum hazard to ground and surface water outside the site area."

In May 1974, Bowser-Morner Testing Laboratories, Inc. prepared a three-page report documenting the installation of eight shallow groundwater monitoring wells (approximately 20 to 22 feet deep). These monitoring wells were installed at the request of Ohio EPA to evaluate the occurrence of groundwater within the lacustrine sediments at the facility. The Bowser-Morner report documented the well installation specifications but did not include any groundwater findings or conclusions. A review of subsequent groundwater monitoring reports indicates that these monitoring wells were typically analyzed for indicator parameters including: pH; total alkalinity; total hardness; total iron; chloride; sulfate; and nitrate.

In June 1976, three soil borings were drilled to depths ranging from 50 to 65 feet for an investigation of the Millard Road Landfill performed by Jording and Associates. These soil borings were installed to characterize the area prior to the construction of the Millard Road Landfill (SWMU 5). These soil borings describe the area as being typically comprised of a medium to stiff silty clay with some "pebbles" and trace amounts of sand. A "dense moist gray silty clayey medium to coarse grained sand" stratum is identified in one of the boring logs from 38 to 50 feet in depth. The unconsolidated sediments described in the soil boring logs are reported to be overlain with fill material ranging from 0 feet to 9.3 feet in thickness. The fill material is described as a mixture of sand, silt and clay with brick, wood, stone, gravel and asphalt

In 1981, a hydrogeological exploration program was performed by Bowser-Morner to determine the physical characteristics of the soil strata and hydrogeologic conditions at the ESOI site. This was completed to identify existing conditions that could affect the design or construction of proposed additional landfill units at the facility. The exploration program included the installation of eight soil borings ranging in depth from 10 to 98.5 feet. A total of five piezometers were constructed which ranged in depth from 58.5 feet in depth to 97.5 feet. There were no adverse geologic or hydrogeologic conditions identified within the 1981 report which would affect the design or construction of additional landfill cells.

In 1982, Bowser-Morner drilled nine soil borings south of York Street in the area where Cell M currently exists. This soil boring program was initiated to evaluate Area M for a potential future landfill. The soil borings ranged in depth from 5 to 86.5 feet and soil boring logs indicate site soils to typically consist of brown to grey, stiff to hard silty clays. No appreciable thickness of sand is noted on any of the soil boring logs. The study findings are summarized in the statement "that the soil found within the entire soil profile is relatively impermeable and contains no free water, which makes the site very conducive to the construction of a landfill."

In 1983, Fred C. Hart Associates, Inc. (FCHA) was contracted as part of due diligence study to conduct an environmental and engineering assessment of the ESOI facility to evaluate the depth and chemistry of both the waste fill materials and in-situ glacial deposits. The areas of fill material investigated by FCHA were: the Ash Disposal Area (SWMU 10); the Old Oil Pond (SWMU 8); the New Oil Pond (SWMU 9); the Millard Road Landfill (SWMU 5); the Northern Sanitary Landfill (SWMU 6); the Central Sanitary Landfill (SWMU 7); and the Former Bill's Road Oil Operation (SWMU 12). Ten soil borings and two piezometers were installed and groundwater and surface water samples were collected as part of the assessment. The 1983 FCHA report concluded that managerial and operational practices at the facility were good and that there was no evidence of migration of contaminants to the groundwater or surface water at that time. Additionally, FCHA concluded that existing site managerial practices in combination with favorable geology and topography reduced the likelihood that significant quantities of contaminants would migrate beyond the boundaries of the facility; that there were no evident receptors which might be damaged if migration of contamination were to occur; and that the level of contamination in the area surrounding the facility was already significant due to other industrial activity. The facility was given an overall Hazard Ranking Score of 0.79 out of a possible 100 by FCHA. This was noted to be significantly less than the lowest score assigned to the top 418 Superfund Sites nationally (27.5 in 1983). Details of this investigation can be found in Environmental and Engineering Assessment of the Fondessy Enterprise, Inc. facility in Oregon, Ohio (FCHA, 1983).

On January 10, 1985, Ohio EPA issued a Director's Final Findings and Orders relating to the operational plans for Cell H and the closure of the Millard Road, Northern Sanitary and Central Sanitary landfills. The Findings and Orders required that ESOI prepare and implement an operational plan addressing the concerns of Ohio EPA, complete the closure of the three solid waste landfills, and prepare and submit a plan to close the oil pond adjacent to the Central Sanitary Landfill.

In 1985, Risk Science International (RSI) conducted an environmental risk assessment of the facility to evaluate the "potential for sudden and nonsudden environmental impairment" resulting from site operations. The details of the assessment are presented in the RSI's Final Report, dated 26 August 1985, titled *Environmental Risk Assessment of Fondessy Enterprises, Inc. , in Oregon, Ohio.* RSI's investigations included site visits and reviews of facility permits and other documentation. The risk assessment was based on four factors to evaluate the facility's risk, including environmental routes, target population, facility operations and practices, and characteristics of materials. Results of the assessment indicated that "the Fondessy facility is rated as presenting a low-to-moderate risk of nonsudden and sudden releases that could cause serious, long-term, environmental impacts off-site. The risk rating is relatively low due to the lack of a nearby target population and the low probability of materials moving off-site."

In 1986, Ohio EPA contracted ERM-Midwest, Inc. to complete an independent assessment of the facility. In June 1986, ERM-Midwest, Inc. submitted a report entitled, *Geotechnical/ Hydrological Assessment of Fondessy Enterprises, Inc. Hazardous Waste Landfill* which documented geotechnical and hydrogeological conditions at the facility. In general, the assessment concluded that the site was geologically and hydrogeologically suitable for hazardous waste disposal.

Following the hydrogeologic investigations listed above, the main investigation that was undertaken to acquire data for the initial RCRA Part B Permit Application was conducted from December 1984 through December 1986 by WW Engineering & Science (WWES) (formerly Ohio Groundwater Consultants, Inc.), WESTON, and Toledo Testing Laboratory, Inc. During these investigations, a total of 52 piezometers were installed into the unconsolidated sediments beneath the ESOI facility. Thirteen groundwater monitoring wells and one 8-inch test well were also installed into the confined bedrock aquifer as part of this facility evaluation.

In 1986, the USEPA's Hazardous Waste Groundwater Task Force conducted an evaluation of the facility as part of their Federal program. The facility was the twelfth TSDF investigated by the Task Force. The purpose of the evaluation was to determine the adequacy of the groundwater monitoring system in regard to federal RCRA groundwater monitoring requirements. The Task Force recommended that additional groundwater monitoring wells be installed at the site since at the time of their inspection, the spacing between some of the downgradient wells as much as 700 feet, and additional wells would decrease the downgradient spacing along the point of compliance. The Task Force also recommended additional monitoring of the till zones since the Task Force considered the till zones under the facility to be preferential pathways for contamination migration. The complete Task Force findings can be found in their December 1986 report entitled *Hazardous Waste Groundwater Task Force Evaluation of Fondessy Enterprises, Inc., Oregon, Ohio*. The results from the Task Forces's sampling are included as Appendix Y to this DOCC Report.

As a result of the Task Force's recommendations, a Consent Agreement and Final Order was issued to ESOI in July 1987. The Order required that ESOI (1) follow all chain-of-custody procedures identified in the facility sampling and analysis plan, (2) submit a report on the interim status bedrock aquifer groundwater monitoring system, (3) submit a plan for the installation and sampling of one bedrock monitoring well located along the northern perimeter of Cell F, and (4) make improvements to the interim status groundwater monitoring system. The improvements implemented by ESOI included a plan for monitoring a series of wells from the shallow lacustrine zone and the upper till/lower till contact zone, groundwater analysis for the proposed Appendix IX list at wells in the system for which the analysis was not already conducted, a proposed "continuing parameter" list for on-going monitoring, sampling and analysis for the approved continuing parameter list and development of statistical analysis to determine whether significant increases in metal concentration occur.

Since 1987, several additional subsurface monitoring events and investigations were initiated at ESOI. These activities primarily involved the installation of additional monitoring wells near Cell G and Cell M. During the summer of 1988, additional wells required by Section D of the Consent Agreement Findings and Orders between ESOI and the USEPA were installed at multiple locations at ESOI. During the summer of 1990, the groundwater monitoring network for Cell M was installed.

The locations of monitoring wells are included on Plate 1 and Drawing Numbers GW-1 through GW-4 in Appendix E.6 in the Investigation Compendium. The boring logs for the various investigations are in Appendix E.10.1 through E.10.3 and E.10.13 through E.10.18 in the Investigation Compendium. Appendix U contains water well logs on file with the Ohio Department of Natural Resources for Oregon Township, Ohio as well as the approximate locations of the wells plotted on a USGS map.

Starting in December 1988 and continuing into 1989, the former Ash Disposal Area (SWMU 10) was excavated, sampled, analyzed and disposed in accordance with a sampling and analysis plan approved by Ohio EPA. The ash was removed in the area that is now occupied by Cell G (SWMU 2) up to the north side of the waterline easement. Most of the ash was removed as solid waste and disposed at BFI's Hagman Road Landfill in Erie Township, Michigan. Some of the ash was disposed into Cell I while approximately 200 cubic yards of ash found to contain PCBs above 50 parts per million were transported to ESOI's corporate sister landfill, Envirosafe Services of Idaho, Inc., in Grand View, Idaho. The ash disposal was documented as part of the March 1991 Construction Quality Assurance report for Cell G and is summarized in Section 3.10 of this DOCC.

As a result of ESOI's federal RCRA Part B permit application submittal process, Metcalf and Eddy Inc., (M&E) completed a remedial facility assessment (RFA) for the facility in 1987 on behalf of the USEPA. Based on the RFA results, which are reported in the *1987 Preliminary Review/Visual Site Inspection Report*, M&E recommended to USEPA that additional groundwater monitoring wells be installed at the northeastern corner of the northern property boundary, and that the groundwater in that area be tested for hazardous waste constituents to determine if a release from a waste disposal cell had occurred. Subsequently, the Initial RFI was initiated by ESOI in 1995 which focused on the northeast corner of ESOI, specifically the Northern Sanitary Landfill (NSL-SWMU 6), a unit operated and closed in accordance with the State of Ohio regulations and the provisions of Order No. 8 of Ohio EPA's January 10, 1985 Final Findings & Orders. Documentation regarding the closure of SWMU 6 was submitted to Ohio EPA on June 17, 1985. Based upon the Initial RFI findings, a supplemental investigation was requested by USEPA in September 1996. This Supplemental RFI involved the installation of multiple shallow soil boring along ESOI's northern and eastern property lines in the vicinity of the Northern Sanitary Landfill as wells as the installation several soil borings on the southern edge of the adjacent Gradel Landfill (i.e., north of ESOI's property line). The RFI of the NSL was conducted by Midwest Environmental Consultants, Inc., (MEC) on behalf of ESOI and documented to the USEPA in the June 1997 *Draft Final RFI Report, Northern Sanitary Landfill* and the February 1998 *Second Draft Final RFI Report, Northern Sanitary Landfill.*

The Initial RFI also included an ecological evaluation of the ESOI facility and the surrounding area, including and evaluation of Otter Creek both upstream and downstream of the facility. There were no ecological findings of significance and Otter Creek was found to be essentially the same upstream of the facility as downstream. The ecological assessment report was documented in Appendix G of the June 1997 *Draft Final RFI Report, Northern Sanitary Landfill.*

Six soil borings were installed by MEC in June 1992 in Area M just to the north of the former Bill's Road Oil Operation (SWMU 12). In May 1993 petroleum containing soils were identified in the area of the Former Bill's Road Oil Operation during the construction of the Stabilization/Containment Building. Approximately 750 cubic yards of petroleum impacted soils were removed from this area and disposed in Cell M in August 1993. Ohio EPA concurred in a letter dated September 14, 1993 that the "excavation of the stabilization plant area has been completed in accordance with the Revised Sampling and Analysis Plan." Additional information pertaining to the Former Bill's Road Oil Operation can be referenced in Section 3.12.

In October 1996, ESOI submitted results of an investigation regarding liquid accumulation observed periodically during regular inspections between the secondary HDPE liner and the secondary recompacted clay liner. The “bubble” liquid was drained and sampled several times between the fall of 1994 and September 1996. Sample analysis indicated that low levels of benzene, ethylbenzene, toluene, trichloroethene, and xylenes were present in the bubble liquid. Comparison of concentrations of constituents in the bubble liquid to the contaminant concentrations in groundwater and leachate, along with studies of the integrity of the liner system, concluded that the source of liquid was most likely a combination of surface water infiltration from the shallow ‘V’ side slope anchor trench and clay consolidation water.

Surficial samples were collected from the recompacted clay beneath the secondary liner and from the base of the sideslope near the bubble location, as well as from the area of the former waste unloading pad/access ramp, the current clay stock pile area, and the former location of Bill’s Road Oil facility, to investigate the possibility of contamination to surface water runoff from these sources. While some constituents were detected at low concentrations in the secondary recompacted clay, the analytical results of samples collected from the waste unloading pad and clay stock pile did not provide a correlation with those constituents detected in the bubble liquid. However, the former Bill’s Road Oil facility was identified as a potential source of contamination to surface water runoff.

In response to a request from the Ohio EPA, additional sampling and analysis was conducted in 1997 to identify or eliminate potential sources of the bubble liquid. The following six potential source areas were identified and sampled three times for comparison to the bubble liquid:

- Groundwater monitoring wells – MB-1S, MB-2S, MB-1D, MB-2D, MB-1R
- Primary leachate collection system
- Secondary leachate collection system
- Surface water retention pond – Area M pond
- Consolidation water from clay samples

Comparison of geochemical signatures, isotopic signatures and organic constituents concluded that the bubble liquid originated from consolidation of the recompacted clay beneath the liner. Deuterium and Oxygen-18 concentrations indicated that the bubble liquid and clay pore water have similar isotopic concentrations and are therefore of similar age. Analysis of tritium levels in the samples indicated that the deep groundwater and bedrock aquifers are not the source of the bubble liquid and were recharged prior to the 1950's. The shallow till groundwater and primary leachate also had clearly different levels of tritium than the bubble liquid and therefore were eliminated as a source of the bubble liquid. The collective results of the analyses conclusively ruled out the possibility of a leak in the primary and/or secondary liner systems, migration of groundwater to the bubble, and recent surface water migration as sources of liquid. Further investigation regarding the source of contamination concluded that the minor constituent concentrations in the bubble liquid were the result of historic activities related to the construction of Cell M and the adjacent area known as the former Bill's Road Oil facility. Finally, a risk assessment conducted on the current conditions concluded that there is little to no potential for exposure to chemicals detected on the surface of the recompacted clay. The fate and transport evaluation, specifically the modeling of benzene transport to the bedrock aquifer concluded that the low concentrations of benzene do not pose a significant risk to human health or the environment. Additional information on this study is provided in Appendix P.

In early 1997, ESOI detected levels of radionuclide parameters (gross alpha and gross beta) from wells R-4 and G-3S that exceeded the prediction limits set for those specific wells. ESOI retained Malcolm-Pirnie, Inc. to perform an investigation into these detections. In the resulting July 1997 report, *Demonstration Regarding Radioactivity in Groundwater Monitoring Wells R-4 and G-3S* it was concluded that the excursions from the production limit for gross beta in R-4 and for gross alpha in G-3S do not indicate a release from the facility. The report also highlights that the excursions were a result of suspended solids found in some groundwater samples. These data were not indicative of the dissolved radionuclide concentrations in the groundwater. The report highlighted ineffectiveness of the sampling and analysis procedures for gross alpha and gross beta in accurately monitoring the integrity of the facility and requested a meeting with Ohio EPA and USEPA to discuss the results.

In March 1997, MEC completed an analysis of estimated leachate generation rates for Cells F, H, I and G. This estimation was completed with the Hydrologic Evaluation of Landfill Performance (HELP) computer program which is a quasi-two-dimensional model of water movement across, into, through and out of landfills. This modeling was conducted in an effort to assist ESOI with estimating the leachate generation rates during a 30-year post closure period but has the added benefit of being able to compare precipitation to leachate generation.

In September 1997, USEPA, Region 5 published the reported entitled *Aerial Photographic Analysis of the Envirosafe Services of Ohio, Oregon, Ohio* (Doc. No. TS-PIC-9705528R, USEPA, Region 5, 1997). This report presented the results of an aerial photographic analysis of the facility site from the years 1940 through 1997. The report provided remote sensing support to field investigators in the USEPA Region 5 Office, under the RCRA program. The report documented some of the aerial photographic evidence of past waste disposal activities. However, the report does contain several inaccuracies, primarily the identification of ESOI's property line. ESOI does not own the property on the south side of Millard Avenue known as the Westover Landfill. The report is included in Appendix D.

In September 1998, a *Northern Sanitary Landfill Pipes Sampling Report* was submitted to USEPA to document the results of the testing performed at the request of USEPA on the eighteen pipes located along the perimeter and slopes of the Northern Sanitary Landfill. The liquid within six of the pipes was sampled and analyzed for volatile organic compounds (VOC), semi-volatile organic compounds (SVOC), pesticides, herbicides, dioxins & furans, metals, cyanide, sulfate, and hazardous waste characteristics. VOCs were detected in three samples, SVOCs were detected in two samples, a pesticide was detected in two samples, a dioxin was detected in one sample, a furan was detected in one sample, metals were detected in four samples, cyanide was detected in one sample and sulfate was detected in all six samples.

In response to a significant constituent detection in wells MR-2D and F-2S in 1997, ESOI implemented a groundwater sampling program during 1998 to evaluate all 117 monitoring wells within the groundwater detection monitoring network at the facility for Appendix IX constituents. The majority of the Appendix IX constituents were not reported above the laboratory method detection limits in the detection monitoring wells. There were, however, several organic constituents detected at relatively low levels at monitoring well F-2S in the area between Cell F (SWMU 1) and the Northern Sanitary Landfill (SWMU 2); and at MR-1S, MR-2S and MR-2D in the vicinity of the Millard Road Landfill (SWMU 5).

As a follow-up to the statistically significant increase in the constituent concentration during the October 1997 monitoring event, a Class 3 permit modification was submitted to Ohio EPA to incorporate provisions of compliance monitoring into ESOI's groundwater monitoring program. The permit modification request proposed to institute an Integrated Groundwater Monitoring Program at the facility. The Integrated Groundwater Monitoring Program consists of two separate programs that accommodate both detection monitoring (OAC Rule 3745-54-98) and compliance monitoring (OAC Rule 3745-54-99). These programs are referred to as the Detection Monitoring Program and the Compliance Monitoring Program. The purpose of the Integrated Groundwater Monitoring Program is to address statistically significant constituent detections in the groundwater monitoring system and to allow for corrective action as necessary (OAC Rules 3745-55-01 and 3745-55-011). ESOI proposed to use the exceedance of the practical quantitation limit (PQL) as an indication of hazardous waste constituents in the groundwater for non-naturally occurring parameters. If a constituent is detected and confirmed in a well at a level above an MCL or PQL as described in Section 4.1.1, or above the established background concentration for naturally occurring constituents, the well is considered an Affected Well and is then subject to the Compliance Monitoring Program.

A *Groundwater Monitoring Program Sampling and Analysis Plan* was developed to establish the objectives for sampling activities associated with the Integrated Groundwater Monitoring Program currently being implemented at ESOI. It documents the methods and procedures that will be used to consistently and accurately meet these objectives. The SAP was developed based on both the requirements of the facility's current Ohio RCRA permit and Ohio EPA guidance document "Sampling and Analysis Plan Content Requirements under Hazardous Waste Interim Status Regulations". The latest revision to the SAP, dated June 1, 2000 (Revision 5) is provided in Appendix EE.

On February 25, 2000, the *1999 Annual Groundwater Monitoring Report* was submitted to Ohio EPA. This report is the latest annual monitoring report for the facility, and summarizes the April and October 1999 groundwater monitoring events in accordance with the Ohio Administrative Code. During the April event two new constituents (vinyl chloride and chloroethane) were detected in well F-2S, one new constituent (1,4-dioxane) was detected in well MR-1SA, and one new constituent (acetone) was detected in well MR-3D. The results of the October event were still pending at the time of the submittal of the annual report. The following table summarizes the current list of "Affected Wells" and "Affected Parameters" which are being monitored as part of ESOI's compliance monitoring program (the remaining RCRA program monitoring wells are currently in ESOI's detection monitoring program):

AFFECTED WELLS & CONSTITUENTS OF CONCERN	
Well ID	**Constituents of Concern**
MR-2D	Benzene, 1,4-Dioxane, Tetrahydrofuran
MR-3D	1,4-Dioxane, Tetrahydrofuran
SW-3D	1,4-Dioxane, Tetrahydrofuran
MR-1SA	1,4-Dioxane, Trichlorofluoromethane
MR-2S	1,4-Dioxane, Tetrahydrofuran, a,b,d-BHC
MR-3S	1,4-Dioxane
F-2S	1,1-Dichloroethane, 1,2-Dichoroethane, Benzene, Vinyl Chloride, Chloroethane
SW-1S	1,4-Dioxane
SW-2S	1,4-Dioxane
H-1S	Tetrahydrofuran

ESOI conducts explosive gas monitoring at the site as required by Ohio Administrative Code (OAC) 3745-27-12(I) and ESOI's *Explosive Gas Monitoring, Sampling, and Reporting Procedures Document*. The explosive gas monitoring system consisting of both punch bars and monitoring probes was installed in accordance with Ohio solid waste regulations. Specifically, the explosive gas monitoring system was designed in accordance with OAC 3745-27-12(D)(5), Explosive Gas Monitoring for a Sanitary Landfill Facility, with the intent to protect occupied structures from gases migrating from sanitary landfills. A total of 25 punch bars and 16 monitoring probes located in the vicinity of the Millard Road Landfill (SWMU 5), the Northern Sanitary Landfill (SWMU 6), Cell I (SWMU 4) and near the northeast corner of the intersection of York Street and Otter Creek Road are sampled on a semi-annual basis. These punch bars and monitoring probes are strategically located due to the presence of commercial buildings within 1000 feet of the limits of the facility which may or may not be occupied. Due to previously measured high methane gas readings (5.0 to 39% methane by volume), a cluster of punch bars and monitoring wells (PB2, PB2A, PB3, PB3A, PB4, PB4A, PB5 and PB5A) are monitored on a weekly basis.

A revised Explosive Gas Monitoring Plan was developed in September 1999 as a result of detections of elevated concentrations of methane on the northern property line and at the Millard Road landfill. The report recommends the installation of six vents and the conversion of 2 probes to vents to address these detections. In addition, a revised monitoring scheme of existing punch bars and the installation of a new permanent punch bar north of Cell F were recommended.

2.2 CLOSURE ACTIVITIES

The following section summarizes the closure activities for the permitted and pre-RCRA disposal units at the ESOI facility. This information is more completely described on a SWMU by SWMU basis within Section 3 of this DOCC report.

SWMU 1 – Cell F

- Operated from 1980 to 1983
- Partial Closure and Post Closure Plan was submitted in June 1984 and approved by Ohio EPA on January 31, 1986
- Plan was updated and received by Ohio EPA in March 1987
- Closure construction began June 10, 1986
- Closure construction completed on January 5, 1987
- Documentation of Cell F Closure Construction submitted on March 18, 1987
- Cell F Closure Certification submitted on June 17, 1987

SWMU 2 – Cell G

- Operated from 1990 to 1994
- Above-grade closure drawings submitted to Ohio EPA on October 30, 1991
- Above-grade closure drawings approved by Ohio EPA January 31, 1992
- Phase II closure began on June 9, 1994
- Phase II closure completed on November 15, 1994
- Closure inspection conducted by Ohio EPA on March 30, 1995
- Closure approved by Ohio EPA on July 31, 1995

SWMU 3 – Cell H

- Former location of a land treatment unit operated from August 1980 to November 1984
- Land treatment area converted in the spring of 1983 and spring of 1985 for a landfill cell
- Conversion was approved by US EPA in August 1989
- Cell H operated from December 1983 through May 1987
- Partial Closure and Post Closure Plan submitted in March 1987
- Partial Closure and Post Closure Plan approved by Ohio EPA on December 21, 1987 and US EPA on June 8, 1989
- Closure Construction Quality Assurance Report submitted to Ohio EPA on January 3, 1991
- Closure inspection conducted by Ohio EPA on November 10, 1992
- Closure approved by Ohio EPA on April 2, 1993

SWMU 4 – Cell I

- Former location of a land treatment unit operated from August 1980 to November 1984
- Land treatment area converted in the spring of 1983 and spring of 1985 for a landfill cell
- Operated from March 1987 to November 1990
- Partial Closure and Post Closure Plan was submitted to Ohio EPA in June 1990
- Partial Closure and Post Closure Plan was approved by Ohio EPA on June 18, 1991
- Closure Construction Quality Assurance report (August 1992) was submitted to Ohio EPA on September 1, 1992
- Closure inspection was conducted by Ohio EPA on September 30, 1992
- Closure approved by Ohio EPA on April 2, 1993

SWMU 5 – Millard Road Landfill

- Operated from approximately 1976 to 1981
- Closed in accordance with the January 10, 1985 Findings & Orders

SWMU 6 – Northern Sanitary Landfill

- Operated from 1976 through 1981
- Closed in accordance with the January 10, 1985 Findings & Orders
- RFI began in May 1995
- Supplemental RFI Work Plan issued in September 1996
- Second Draft Final, Northern Sanitary Landfill report issued February 1998

SWMU 7 – Central Sanitary Landfill

- Operated from 1969 to 1983
- Closed in accordance with the January 10, 1985 Findings & Orders

SWMU 8 – Old Oil Pond #1 (South Pond)

- Operated from early 1960's through 1969
- Contents pumped to New Oil Pond #2 (SWMU 9) in late 1960's and covered with a silty clay cap

SWMU 9 – NEW OIL POND #2 (NORTH POND)

- Operated from the late 1960's through 1980
- Received material from Old Oil Pond #1 (SWMU 8) in late 1960's
- Attempts to reclaim the used oil were made in the early 1980's
- Samples were collected from the pond in 1983
- Attempts to reclaim the used oil were abandoned in 1984
- Waste oil sludge was solidified in place with cement kiln dust in 1985
- Unit capped and closed in 1988

SWMU 10 – Ash Disposal Area

- Operated from the late 1960's through the 1970's
- Consisted of ash from the former Teepee Burner (SWMU 11)
- Subsurface investigation conducted in 1983
- 123,000 cubic yards were excavated and sampled as part of Cell G construction and documented within the March 1991 Cell G CQA report

SWMU 11 – Former Teepee Burner

- Installed at the site in the mid to late 1960's and operated into the 1970's
- Ash was placed into the Ash Disposal Area (SWMU 10)
- Removed prior to 1980

SWMU 12 – Former Bill's Road Oil Operation

- Obtained by the site in 1982
- Liquid was removed from the lagoons during the period 1982 to 1984
- Cleanup activities were conducted in 1987/1988
- Cell M and Stabilization/Containment Building construction activities began on the area of Bill's Road Oil in June 1992
- In May 1993 construction/grading activities began in this area
- In August 1993 the excavation of the petroleum contaminated soils within the remediation area was started and completed
- September 14, 1993 Ohio EPA issues letter indicating remediation in vicinity of stabilization building completed in accordance with revised Sampling and Analysis Plan

3 DESCRIPTION AND PRELIMINARY ASSESSMENT

In this section of the document, information is presented on each SWMU and AOC at the Facility which was identified in ESOI's Federal RCRA permit for evaluation under the CAP, as well as three additional AOCs requested by Ohio EPA on May 31, 2000 and one additional AOC requested by USEPA on September 18, 2000. The locations of all these SWMUs and AOCs are shown in Figure 3-1.

Specifically, the following information is presented for each SWMU and AOC, as available:

1. Description of the unit, including
   a. Location and physical description;
   b. Quantities of hazardous waste or constituents present within the unit, to the extent known; and
   c. Approximate dates or periods of any past spills or releases, identification of the materials spilled or released, and a description of the completed response actions.

2. A summary of previous investigations conducted at or related to the unit and a summary of available monitoring data, including
   a. Locations for existing sampling points and monitoring points;
   b. Scope of sampling/frequency of monitoring; and
   c. Summary of data.

3. An assessment of sampling/monitoring data, including
   a. A description of the nature and extent of any observed contamination;
   b. Identification of potential ongoing releases;
   c. An assessment of whether off-site migration of contaminants has occurred.

4. An assessment of potential migration pathways and potential impacts on human health and the environment associated with spills or releases from the unit, if any. Typical exposure pathways generally consist of four elements:
   a. A source and mechanism of chemical release;
   b. A retention or transport medium;
   c. A point of potential contact by human and/or ecological receptors with the contaminated medium (referred to as the exposure point); and
   d. An exposure route (e.g., ingestion) at the contact point.

5. Conclusions and recommendations for further actions, including
   a. Identification of areas where additional information is necessary; and
   b. Identification of any ongoing releases that would warrant use of interim corrective measures.

3.1 SWMU 1 – LANDFILL CELL F

3.1.1 Description of SWMU

Cell F is a permitted RCRA hazardous waste landfill unit located within the northwest portion of the ESOI site. The cell was operated from 1980 to 1983 for the disposal of both non-hazardous industrial and RCRA hazardous waste. The cell encompasses an area measuring approximately 3 acres (250 x 450 feet). Wastes disposed within the cell were solid in bulk and containers. Wastes disposed of within this cell were primarily treated sludges, landfarm soil, ignitable solids, refinery solids, paint solids and contaminated soils, along with non-hazardous industrial waste solids. Cell F has an estimated waste thickness of 50 to 55 feet, with a total disposed volume of waste of approximately 146,000 tons. Design of this cell, the materials utilized for construction and closure, and the closure procedures reflect applicable regulatory requirements at the time of these activities. Documentation for Cell F is provided in Appendix F.

The landfill was constructed by excavating into insitu clay soils and installing a leachate collection and removal system. The bottom soils consist of approximately 25 feet of in-situ gray silty clay till located on top of dolomite. This till has a permeability ranging from 3.1 x 10^{-7} cm/sec to 1.4 x 10^{-8} cm/sec. The side wall is also comprised of in-situ soils consisting of brown and gray silty lacustrine clay, blue and gray silty clay till, and gray silty clay till. As part of the cell construction, a soil berm consisting of the same in-situ soils as the cell sidewalls was left in place to separate Cell F (SWMU 1) and the Northern Sanitary Landfill (SWMU 6). The leachate collection and removal system consists of a network of pipes leading to a manhole for removal. The pipes leading to the leachate removal manhole are 6-inch diameter perforated PVC pipes. The leachate removal manhole is a 36-inch diameter reinforced concrete pipe. When the cell reached final grade, lacustrine brown clay was used as clean fill for rough grading and as an interim cover have a varying thickness of 1 to 8 feet.

A *Partial Closure and Post Closure Plan for Cell F* was prepared for FEI by MEC in June 1984 and was approved by OEPA on January 31, 1986. The final cap design consisted of at least 3 feet of upper till compacted clay covered by 1 foot of vegetative cover (6-inches of lacustrine soil and 6 inches of topsoil). As constructed, the intermediate clay cover and final clay cap resulted in a landfill cover over 5 feet thick. The plan was updated March 1987 after closure to reflect the final "as-built" plan and was received by Ohio EPA on March 23, 1987. According to the *Documentation of Cell F Closure Construction*, prepared by MEC and dated March 18, 1987, the closure construction began June 10, 1986 and was completed January 5, 1987. Lab testing of the clay layer of the cap indicated an average permeability of 2.25 x 10^{-8} cm/sec.

In addition to meeting the design requirements under RCRA, the final cap was constructed to accommodate a utility easement that traverses the footprint of the cell. Specifically, the Toledo Edison Company holds a 100 foot wide easement which traverses the central portion of Cell F. In order to comply with clearance requirements within the National Electric Safety Code, the final grading plan was designed to provide an approximate clearance of 20 feet between the lowest transmission wire and highest ground surface directly beneath it. This necessitated lowering the final cap elevation within this easement relative to the surrounding crown portion of the cap. However, the minimum 5-foot landfill thickness cover was maintained within this easement area.

On June 17, 1987 the Cell closure certification was prepared and submitted to Ohio EPA. Copies of data and information relevant to Cell F are provided in Appendix F. Cell F is currently maintained and monitored in accordance with the substantive requirements of the post-closure plan, which was included with the facility's State RCRA Part B Permit Application. This post-closure plan was developed to satisfy the requirements for post-closure care, monitoring and maintenance in accordance with OAC 3745-55-17 through 3745-55-20 and the landfill-specific post-closure requirements of OAC 3745-57-10. ESOI's post-closure activities include the following tasks:

- maintenance of facility security systems;
- groundwater monitoring;
- leachate collection and removal;
- maintenance of landfill covers;
- maintenance of support facilities (e.g., access roadways and storm water management systems); and
- periodic inspection of the unit.

These ongoing post-closure activities are designed to maintain the integrity of the final cover, liners and other components of the containment system, and the function of the unit's monitoring systems.

3.1.2 Previous Investigations and Available Monitoring Data

Previous Investigations with regard to Cell F include the closure activities presented in the previous subsection. In addition, as described in Section 4, as part of the ESOI's effort to establish the baseline or current condition of groundwater quality, ESOI implemented a groundwater sampling plan in 1998 which included sampling nine wells located near Cell F for Appendix IX constituents (shallow till wells F-1S, F-2S, F-3S; Deep Till Wells F-1D(A), F-2D, F-3D; deep sand wells G-6 and G-7; bedrock well R-9). The locations of these wells are presented on Figure 4-1.

Monitoring of Cell F includes routine leachate monitoring, groundwater monitoring, and visual inspections of the cover and associated systems. As part of the facility's post-closure activities, leachate is routinely removed from the Cell F leachate collection system. Leachate extraction data are presented in Appendix X. The collected leachate is also characterized on a quarterly basis; the characterization data for the most recent four quarterly sampling events is provided on Table 3-1. In addition, wells in the vicinity of Cell F are monitored quarterly as part of the RCRA groundwater monitoring program. A description and current status of the groundwater monitoring program is provided in Section 4. A summary of the most recent four quarters of groundwater monitoring events for the nine wells in the vicinity of Cell F is also provided in Section 4.

In addition, as required by its NPDES stormwater discharge permit, ESOI collects and analyzes stormwater discharges from Outfall 003 located on the northwest corner of Cell F. This outfall receives stormwater runoff from Cell F and portions of the Northern and Central Sanitary Landfill (SWMUs 6 and 7). This monitoring includes routine (i.e., weekly and monthly) sampling for general water quality (e.g., BOD, COD, TSS, TDS), semi-annual sampling for inorganics and metals, and annual sampling for priority pollutant VOCs, SVOCs, and pesticides.

3.1.3 Assessment of Existing Degree of Contamination

The Appendix IX groundwater sampling conducted in 1998 for wells located in the vicinity of Cell F identified one of the nine wells near Cell F as an "Affected[2]" Well. Specifically, well F-2S was defined as an Affected Well based on the confirmed presence of 1,1-dichloroethane (1,1-DCA) and 1,2-dichloroethane (1,2-DCA). Well F-2S is a shallow till zone well located at the northeast corner of Cell F and northwest corner of the Northern Sanitary Landfill (SWMU 6),

[2] An Affected well is defined as a well where there has been a confirmed detection of a parameter in the groundwater at a concentration greater than: 1) the prediction limit or control limit value for those parameters on ESOI's permitted groundwater monitoring parameter list; or 2) the laboratory's practical quantitation limit, if the parameter is not on ESOI's parameter list; or 3) interwell background level for inorganic parameters.

along the facility's northern property line. Subsequent groundwater monitoring has continued to detect 1,1-DCA and 1,2-DCA in Well F-2S. In addition, as discussed in Section 4, low concentrations of other VOCs including benzene, vinyl chloride and chloroethane have been confirmed in one or more recent quarterly monitoring events. These VOCs have not been detected in the remaining eight wells located near Cell F.

No SVOCs, pesticides, PCBs, or herbicides were confirmed to be present in groundwater samples collected in the nearby monitoring wells during the 1998 Appendix IX sampling program. Therefore, these constituents were determined to not be a concern with respect to the groundwater near Cell F. As stated in the Appendix IX groundwater sampling report (Malcolm Pirnie, Inc. March 1999), there were multiple detections of metals in the analytical results of samples collected during the Appendix IX sampling events. However, as discussed in Section 4, the on-site data did not indicate that metals were a concern with respect to the quality of groundwater at the facility.

As reported in the *Appendix IX Sampling Report* (Malcolm Pirnie, July 1999), the two confirmed VOCs in the well F-2S, 1,1-DCA and 1,2-DCA, were either not detected or detected at only a low concentration in the leachate. In addition, as shown on Table 3-1, the last four available quarters of leachate sampling indicates that the VOC constituents detected in Well F-2S have either not been detected or have only been detected at low levels (i.e., benzene) in the Cell F leachate. Further, the most predominant VOCs (based on highest detected concentrations) present in the Cell F leachate samples, acetone and 2-butanone (which are also among the more mobile VOCs), were not detected in the groundwater samples collected from any of the wells around Cell F. This dissimilarity in the types of VOCs and the relative concentrations of the VOCs suggests that the constituents found in the well F-2S sample may not be related to the Cell F leachate, but rather the adjacent Northern Sanitary Landfill (SWMU 6; see Section 3.6).

As shown in the NPDES reports provided in Appendix Z, no VOCs, SVOCs, or pesticides have been detected in the stormwater runoff discharged from Cell F via Outfall 003 and concentrations of metals and inorganics have not been identified as a concern under the NPDES program.

3.1.4 Potential Migration Pathways and Potential Impacts on Human Health and the Environment

As discussed in Section 3.1.3, VOCs have been confirmed to be present in shallow monitoring well F-2S located at the northeast corner of this unit, although except for one constituent (benzene) the detected constituents do not appear to be present in the Cell F leachate and this Affected Well is also located at the northwestern corner of the Northern Sanitary Landfill (SWMU 6). However, a facility inspection conducted by Ohio EPA in 1998 reportedly identified an orange liquid, which Ohio EPA believed could be related to a leachate discharge from this unit, in the drainage ditch located along the northern edge of the unit (Ohio EPA, April 1999). In addition, as shown in Appendix X, leachate generation rates appear to be influenced by precipitation events, suggesting that the landfill cover may not be functioning adequately (i.e., designed to minimize to the extent technically practicable the infiltration of precipitation). These observations suggest the potential for release from this unit. The potential migration/exposure pathways for this unit are:

- Leachate migration to shallow groundwater, with subsequent potential exposures via (1) migration to the potable bedrock aquifer, and/or (2) migration and discharge to the off-site Gradel ditch (which then discharges to Otter Creek west of the site) located immediately north of this unit, and/or (3) direct contact with shallow groundwater during excavation activities.
- Leachate release through the landfill cap resulting from short-circuiting[3] within the cell with subsequent potential exposures via (1) direct contact with leachate and impacted cover soils, and/or (2) discharge to the off-site Gradel Ditch located immediately north of this unit.

No current human exposures associated with these potential exposure pathways have been identified. In particular, contaminated shallow groundwater has not contaminated the uppermost aquifer which is considered a potential drinking water supply in the region. Further, the

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[3] Short-circuiting refers to the potential for lower permeability layers within the cell to cause leachate to move laterally to the landfill sideslope rather than vertically to the leachate collection system.

uppermost aquifer is not currently used for drinking water purposes at, or in the vicinity of, the ESOI facility. Potable water is supplied by the City of Oregon with Lake Erie serving as the water supply. In addition, there is very little opportunity for contact with any shallow groundwater that exists at the ESOI facility due to the existing facility controls on conducting on-site excavation activities (including ESOI's health and safety program), and the actual limited availability of water in the shallow lacustrine and shallow till zones.

Current human exposure to surface water and sediment in the Gradel Ditch and Otter Creek is considered infrequent given the current industrial land use in the area of the ESOI facility, including both ESOI and neighboring solid waste landfills, as described in Section 1. Ecological exposures are anticipated to be minimal considering the limited extent of the surrounding habitat area. In addition, stormwater discharge monitoring conducted by ESOI has not detected any unacceptable discharges to the Gradel Ditch.

Finally, the potential direct contact with leachate and impacted cover soils is limited to ESOI maintenance workers and contractors since existing fencing restricts access from the general public; exposures to on-site maintenance workers are controlled under ESOI's health and safety program. Ecological exposures are also expected to be infrequent given the current industrial land use in the area of the facility, and since the cell cover and surrounding area is maintained to minimize intrusions by animals that could damage the cover. These maintenance activities deter the development of habitat that could be attractive to ecological receptors.

3.1.5 Conclusions and Recommendations with Regard to SWMU 1

SWMU 1, Landfill Cell F was closed in accordance with a Closure Plan approved by Ohio EPA. Closure included the installation of a compacted clay cap and vegetated soil cover over an interim soil cover to minimize the percolation of precipitation through the cell. The cell is also equipped with a leachate collection system from which leachate is regularly removed. In addition, the natural site conditions (i.e., geology and hydrogeology), as discussed in Section 1.3, restrict the potential leachate migration from this unit and the movement of groundwater from the facility. Finally, the cell cover is monitored and maintained in accordance with the substantive provisions of the facility's post-closure plan.

However, based on the observed leachate generation rates, detection of VOCs in shallow groundwater near Cell F, and observations of orange liquid in the drainage ditch along the side of Cell F, further assessment of this unit is warranted. Specifically, an assessment of the detection of VOCs in the shallow groundwater as observed at well F-2S, should be conducted to confirm, if possible, that the presence of these VOCs is not attributable to Cell F. ESOI will provide details regarding shallow groundwater investigation for this SWMU in the RFI Work Plan. In addition, impacts to soil, surface water and sediment from potential surficial leachate outbreaks should be investigated. Finally, an assessment of the original cap design and existing cap conditions should be conducted as part of the RFI to determine if repairs to the cap are warranted to reduce leachate generation rates.

3.2 SWMU 2 – LANDFILL CELL G

3.2.1 Description of the SWMU

Cell G is a permitted RCRA hazardous waste landfill unit located in the southwest corner of the ESOI site, north of York Street. The cell was operated from 1990 to 1994 for the disposal of RCRA hazardous wastes and non-hazardous wastes. The majority of the waste in Cell G consists of electroplating sludges. Other waste types include wastewater treatment sludges, paint wastes, incinerator ashes and RCRA contaminated soils. The specific types and quantities of wastes disposed in Cell G are identified in ESOI's Annual Report submitted to Ohio EPA in accordance with Ohio Administrative Code (OAC) 3745-54-75, and submitted to USEPA in accordance with 40 CFR Part 264.75. Cell G covers approximately 7.1 acres with an average waste thickness of 89 feet. The total disposed volume of waste within Cell G is approximately 479,200 cubic yards. Design of this cell, the materials utilized for construction and closure, and the closure procedures reflect applicable regulatory requirements at the time of these activities. Documentation for Cell G is provided in Appendix G.

The landfill cell was constructed with below grade double geomembrane liners, a primary leachate collection system and a secondary leak detection system. The design included a double composite liner system along its entire bottom and a composite secondary liner system with a single primary liner system along its below grade side slopes. The double composite liner system includes a primary system (2 feet of recompacted natural clay and 80 mil geomembrane liner on the base of the cell and 80 mil geomembrane liner along the sideslopes) overlain on an independent secondary system (3 feet of recompacted natural clay and 60 mil geomembrane liner).

Incorporated into Cell G's construction is a below grade sheet piling wall system along the eastern, southern and southwestern limits of the Cell G area. The system acts as a physical barrier and provides additional structural support between the adjacent sanitary landfill and the City of Toledo raw waterlines. The system was constructed between March 1988 and March 1989 in accordance with an agreement between ESOI and the Ohio EPA for the construction of Cell G. The wall system consists of approximately 1,930 lineal feet of sheet piling. Along the eastern 473 foot radius of Cell G, the sheet piling extends to a depth of 60 feet to 70 feet, into the lower till. Along the remaining portion of the wall system, the sheet piling ranges in depth from 30 feet to 55 feet, depending on location.

Former support facility structures (i.e., weigh scales, laboratories, manifest offices, etc.) and equipment had been located within Cell G's area. These support facilities were relocated prior to the construction of Cell G. In addition, as reported in the "*Cell G Closure, Construction Quality Assurance Report*" (MEC, 1994), a portion of the area on which Cell G was constructed had been used for the disposal of solid waste (Pre-RCRA) materials, consisting primarily of ash. This historical disposal area has been identified as the Ash Disposal Area (SWMU 10; see Section 3.10). Within the Cell G area these materials were encountered at a depth of 3 feet below the original ground surface and extending to a maximum depth of approximately 17 feet. This material was removed up to the limits of the sheet pile wall and disposed of during "Phase I" of Cell G's construction. Waste characterization and verification of waste removal was conducted in accordance with ESOI's revised "Sampling and Analysis Plan for Area G" submitted to Ohio EPA on January 22, 1988. A summary of the analytical data for the excavated ash characterization and clean area verification sampling is included within the discussion on SWMU 10 (Section 3.10).

Cell G was closed in accordance with the approved closure plan, which was contained in the approved drawings and specifications, the Hazardous Waste Facility Installation and Operation Permit (Permit No. 03-48-0092), and the RCRA Part B Permit. The final cover system design included a 2 foot recompacted clay layer, a 40 mil smooth geomembrane liner, a geocomposite drainage layer, and 4 feet of protective cover/vegetative soil. The Cell G above-grade closure drawings were submitted to the Ohio EPA by ESOI on October 30, 1991 (prepared April 28, 1991) and were approved by the OEPA on January 31, 1992. The closure of Cell G was implemented in two distinct phases. First, the "perimeter above grade dikes" were constructed during above grade waste placement activities. The construction of the dikes provided for the installation of the cap, which consisted of a recompacted clay layer and an additional 1.5 foot sacrificial clay layer. The sacrificial clay layer provided protection of the recompacted clay layer from erosion and desiccation during the interim closure period.

The second and final phase of the closure was initiated upon receipt of the final waste on June 9, 1994. Closure of Cell G was required within 180 days of receipt of final waste. Therefore, completion of closure activities was required by December 5, 1994. In a letter dated November 29, 1994, ESOI provided Ohio EPA certification that closure of Cell G had been completed on November 15, 1994 in accordance with the specifications of the approved closure plan. Ohio EPA personnel completed a certification of closure inspection and a review of documents on March 30, 1995, and subsequently approved the final closure in a letter dated July 13, 1995. Copies of data and documents relevant to this SWMU are referenced in Appendix G.

Cell G is currently maintained and monitored in accordance with the substantive requirements of the post-closure plan, which was included with the facility's state and federal RCRA Part B Permit Applications. ESOI's post-closure activities include the following:

- maintenance of facility security systems;
- groundwater monitoring;
- leachate collection and removal;

- maintenance of landfill cover and gas venting systems;
- maintenance of support facilities (e.g., access roadways and storm water management systems); and
- periodic inspection of the unit.

These ongoing activities are designed to maintain the integrity of the final cover, liners and other components of the containment system, and the function of the unit's monitoring systems.

3.2.2 Previous Investigations and Available Monitoring Data

Previous investigations conducted in this SWMU were associated with (1) the removal of ash prior to construction (see SWMU 10; Section 3.10) and (2) the design, construction and closure of this SWMU. Details from the design, construction and closure investigations can be found in ESOI's federal RCRA Part B Permit Application filed in 1985 (and its revisions) and in the Cell G Closure Construction Quality Assurance Report (MEC, 1994). In addition, as described in Section 4, as part of the ESOI's effort to establish the baseline or current condition of groundwater quality, ESOI implemented a groundwater sampling plan in 1998 which included sampling 14 wells located near Cell G for Appendix IX constituents (shallow till wells G-1S, G-2S, G-3S, G-4S; deep till wells G-1D(A), G-2D(A), G-3D; deep sand wells G-6, G-7, G-8, G-9, G-10(A), G-11; and bedrock well R-2). The locations of these wells are presented on Figure 4-1.

Monitoring of Cell G includes routine leachate and leak detection monitoring, groundwater monitoring, and visual inspections of the cover and associated systems. In accordance with the facility's monitoring activities, leachate is routinely removed from the Cell G leachate collection system. Leachate extraction data are presented in Appendix X. The collected leachate is also characterized on a quarterly basis; the characterization data for the most recent four quarterly sampling events is provided on Table 3-1. In addition, the 14 wells in the vicinity of Cell G are monitored quarterly as part of the RCRA groundwater monitoring program. A description and current status of the groundwater monitoring program is provided in Section 4. A summary of the most recent four quarters of groundwater monitoring events for the 14 wells near Cell G is also provided in Section 4.

In addition, as required by its NPDES stormwater discharge permit, ESOI collects and analyzes stormwater discharges from Outfall 001 located at the southwest corner of Cell G. This outfall receives stormwater runoff from Cell G and portions of the Central Sanitary Landfill (SWMU 7), the office and laboratory parking lots, and the access roadway. This monitoring includes routine (i.e., weekly and monthly) sampling for general water quality (e.g., BOD, COD, TSS, TDS), semi-annual sampling for inorganics and metals, and annual sampling for priority pollutant VOCs, SVOCs, and pesticides.

3.2.3 Assessment of Existing Degree of Contamination

The Appendix IX groundwater sampling conducted in 1998 for wells located in the vicinity of Cell G did not detect VOCs, SVOCs, PCBs or pesticides/herbicides. Therefore, none of the 14 wells was identified as an Affected Well and none of these constituents were determined to be a concern with respect to the groundwater near Cell G. As stated in the Appendix IX groundwater sampling report (Malcolm Pirnie, Inc., March 1999), there were multiple detections of metals in the analytical results of samples collected during the Appendix IX sampling events. However, as discussed in Section 4, the on-site data did not indicate that metals were a concern with respect to the quality of groundwater at the facility.

As discussed in Section 4, monitoring conducted since the 1998 Appendix IX sampling has not detected constituents that would identify any of these wells as an Affected Well or indicate a potential release from Cell G. Thus all 14 wells remain in detection monitoring.

As shown on Table 3-1, constituents that have been detected in the primary leachate collection system have generally not been detected in the secondary leachate collection system. Further, as shown in Appendix X, leachate generation in Cell G has been declining over time, thus showing that the existing cap is functioning properly.

As shown in the NPDES monitoring reports in Appendix Z, no VOCs, SVOCs, or pesticides have been detected in the stormwater runoff discharged from Cell G via Outfall 001 and with the exception of TSS, concentrations of metals and inorganics have not been identified as a concern under the NPDES program.

3.2.4 Potential Migration Pathways and Potential Impacts on Human Health and the Environment

Prior investigations and ongoing monitoring and maintenance activities have identified no observed releases from this unit. The potential migration/exposure pathways for this unit would include the following, if a release from the unit were to occur:

- Leachate migration to shallow groundwater, with subsequent potential exposures via (1) migration to the potable bedrock aquifer, and/or (2) migration and discharge to Otter Creek located west of the unit, and/or (3) direct contact with shallow groundwater during excavation activities.
- Leachate release through the landfill cap resulting from short-circuiting within the cell with subsequent potential exposures via (1) direct contact with leachate and impacted cover soils, and/or (2) discharge to Otter Creek via the NPDES-permitted outfall.

However, because there is no evidence of release from this unit, no current exposures via these pathways have been identified, although these pathways do represent potential future pathways of concern. Therefore, monitoring of these pathways should continue in accordance with ESOI's existing monitoring programs.

3.2.5 Conclusions and Recommendations with Regard to SWMU 2

SWMU 2, Landfill Cell G was closed in accordance with a Closure Plan approved by Ohio EPA. Closure included the installation of a 2 foot recompacted clay cap, a 40 mil geomembrane liner, a geocomposite drainage layer and 4 feet of vegetated soil cover to minimize the percolation of precipitation through the cell. The cell is also equipped with a leachate collection and detection system from which leachate is regularly removed. In addition, the natural site conditions (i.e., geology and hydrogeology), as discussed in Section 1.3, restrict the potential leachate migration from this unit and the movement of groundwater from the facility. Finally, the cell cover is being monitored and maintained in accordance with the substantive provisions of the facility's post-closure plan.

Since Cell G was designed, permitted, and closed in accordance with RCRA requirements, and there have been no problems with the cap and liner systems or other evidence of release from this unit, no further action with regard to this SWMU is warranted in the RFI. Monitoring and maintenance of this unit will continue in accordance with ESOI's ongoing programs.

3.3 SWMU 3 – LANDFILL CELL H

3.3.1 Description of the SWMU

Cell H is a permitted RCRA landfill unit located in the northeast portion of ESOI property. ESOI operated Cell H for the disposal of industrial and hazardous wastes from December 1983 through May 1987. Cell H covers approximately 9 acres and has an average waste thickness of 90 feet. The total volume of waste disposed in this cell is 737,639 tons. Design of this cell, the materials utilized for construction and closure, and the closure procedures reflect applicable regulatory requirements at the time of these activities. Documentation for Cell H is provided in Appendix H.

The cell was constructed with a 4-foot recompacted clay liner, a single 60 mil geomembrane liner and a leachate collection system. The cell design and conceptual operation plans were approved by the Ohio EPA and the cell was operated in accordance with these approved plans.

Cell H was constructed in the area of a former land treatment unit (referred to as the York Street Landfarm) which covered an area of approximately 8.9 acres in size (see Appendix H). The land treatment unit area also extended into the area currently occupied by Cell I (SWMU 4; see Section 3.4). The land treatment unit was used for the treatment of various biodegradable wastes during the period of August 1980 to November 1984. Approximately 13,200 tons of waste were treated at this unit during its operational life. The wastes were typically oil bearing waste which were tested for hazardous waste characteristics and results indicated them as non-hazardous, however, the wastes were hazardous on the basis of the specific source.

The treatment zone for this former unit was surrounded with a recompacted earthen dike for run-on/run-off water control. Originally the containment dike surrounded the entire land treatment unit, however, as part of the facility's long-term plans to construct two landfill cells at this same location, the dike was reconstructed to divide the unit into two separate areas, Areas A and B. Area A covered approximately 4.9 acres and was located entirely within the footprint of existing Cell H. Area B covered approximately 4.0 acres and was located entirely within the footprint of Cell I. Surface soils located between Areas A and B boundaries were removed and placed into the land treatment unit's treatment zone, and clean soils were backfilled into this area. The land treatment unit was converted into disposal Cells H and I. Conversion of the land treatment Area A occurred during the spring of 1983, and Area B occurred during the spring of 1985. Approximately 12,000 cubic yards of soil were excavated from Area A when it was converted; approximately 2,000 cubic yards were placed into Cell F, with the remaining soils being incorporated into the Area B treatment zone. Approximately 25,000 cubic yards of excavated soils from Area B were placed into Cell H when this area was converted for Cell I construction. The land treatment unit was completely removed and no longer exists; removal of the land treatment unit was completed under a closure plan approved by the USEPA in a letter dated August 3, 1989 (See Appendix H).

In March 1987, ESOI submitted the *Partial Closure and Post Closure Plan for Cell H*, to Ohio EPA and USEPA. After agency reviews and subsequent revisions (September 1, 1987 and April 14, 1989), the closure plan received final approval from the Ohio EPA on December 21, 1987, and from USEPA on June 8, 1989. During this period an interim clay cover was installed to minimize infiltration of precipitation. The closure of Cell H was implemented in two distinct phases. During cell operations, perimeter dikes were constructed in place with above grade waste placement activities. The construction of the dikes provided for the cap construction, which required 2 foot minimum clay layer and an additional 2 feet (minimum) sacrificial clay layer. The sacrificial clay layer provided protection of the required 2 foot clay cap layer from erosion and desiccation during the interim closure period.

Upon approval by the Ohio EPA and USEPA of the Cell H Closure Plan, the final phase of closure included the clay cap surface preparation, and the installation of the 40 mil geomembrane liner, geocomposite drainage layer, cover soils, vegetation and the drainage system.

The approved Closure Plan required the preparation of the final CQA Report for the Cell H closure. This *Cell H Closure Construction Quality Assurance Report*, prepared by MEC, dated December 1990, was submitted to Ohio EPA by ESOI on January 3, 1991, and serves as the documentation supporting the independent engineer's certification of closure according to RCRA closure requirements specified in 40 CRF 265.115. Ohio EPA personnel completed a certification of closure inspection and a review of documents on November 10, 1992, and subsequently approved the final closure in a letter dated April 2, 1993.

Cell H is currently maintained and monitored in accordance with the substantive requirements of the post-closure plan, which was included with the facility's State RCRA Part B Permit Application. ESOI's post-closure activities include the following tasks:

- maintenance of facility security systems;
- groundwater monitoring;
- leachate collection and removal;
- maintenance of landfill cover;
- maintenance of support facilities (e.g., access roadways and storm water management systems); and
- periodic inspection of the unit.

These ongoing activities are designed to maintain the integrity of the final cover, liners and other components of the containment system, and the function of the unit's monitoring systems.

3.3.2 Previous Investigations and Available Monitoring Data

Previous investigations conducted in this SWMU were associated with (1) the closure of the York Street Landfarm prior to cell construction, and (2) the design, construction and closure of this SWMU. Details from these investigations can be found in ESOI's federal RCRA Part B

Permit Application filed in 1985 (and its revisions) and in the Cell H Closure Construction Quality Assurance Report (MEC, 1990). In addition, as described in Section 4, as part of the ESOI's effort to establish the baseline or current condition of groundwater quality, ESOI implemented a groundwater sampling plan in 1998 which included sampling 17 wells located near Cell H for Appendix IX constituents (shallow wells H-1S, H-2S, H-3S, H-4S, H-5S, H-6S; deep till wells H-1D, H-2D, H-3D, H-4D, H-5D, H-6D; and bedrock wells R-1, R-5, R-8, R-10, R-15). The locations of these wells are presented on Figure 4-1.

Monitoring of Cell H includes routine leachate monitoring, groundwater monitoring, and visual inspections of the cover and associated systems. In accordance with the facility's monitoring activities, leachate is routinely removed from the Cell H leachate collection system. Leachate extraction data are presented in Appendix X. The collected leachate is also characterized on a quarterly basis; the characterization data for the most recent four quarterly sampling events is provided on Table 3-1. In addition, the 17 wells in the vicinity of Cell H are monitored quarterly as part of the RCRA groundwater monitoring program. A description and current status of the groundwater monitoring program is provided in Section 4. A summary of the most recent four quarters of groundwater monitoring events for the 17 wells in the vicinity of Cell H is also provided in Section 4.

In addition, as required by its NPDES stormwater discharge permit, ESOI collects and analyzes stormwater discharges from Outfall 004 located at the northeast corner of Cell H. This outfall receives stormwater runoff from Cell H, portions of the Northern and Central Sanitary Landfills (SWMUs 5 and 6), and access roads. This monitoring includes routine (i.e., weekly and monthly) sampling for general water quality (e.g., BOD, COD, TSS, TDS), semi-annual sampling for inorganics and metals, and annual sampling for priority pollutant VOCs, SVOCs, and pesticides.

3.3.3 Assessment of Existing Degree of Contamination

The Appendix IX groundwater data sampling conducted in 1998 for wells located in the vicinity of Cell H did not detect VOCs, SVOCs, PCBs or pesticides/herbicides. Therefore, none of the 17 wells was identified as an Affected Well and none of these constituents were determined to be a concern with respect to the groundwater near Cell H. As stated in the Appendix IX groundwater sampling report (Malcolm Pirnie, Inc., March 1999), there were multiple detections of metals in the analytical results of samples collected during the Appendix IX sampling events. However, as discussed in Section 4, the on-site data did not indicate that metals were a concern with respect to the quality of groundwater at the facility.

As discussed in Section 4, monitoring conducted between the 1998 Appendix IX assessment and 1999 did not confirm the presence of constituents that would identify any of these wells as an Affected Well or indicate a potential release from Cell H. Thus all 17 wells have been in detection monitoring. However, in January 2000, tetrahydrofuran was detected in well H-1S. Therefore, Appendix IX sampling of this well and the neighboring wells is scheduled as part of ESOI's Integrated Monitoring Program to further assess this detection.

As shown in Appendix X, leachate generation in Cell H has been declining over time, thus showing that the existing cap is functioning properly.

As shown in the NPDES monitoring reports provided in Appendix Z, no VOCs, SVOCs, or pesticides have been detected in the stormwater runoff discharged from Cell H via Outfall 004 and concentrations of metals and inorganics have not been identified as a concern under the NPDES program.

3.3.4 Potential Migration Pathways and Potential Impacts on Human Health and the Environment

Prior investigations and ongoing monitoring and maintenance activities have identified no observed releases from this unit. The potential migration/exposure pathways for this unit would include the following, if a release from the unit were to occur:

- Leachate migration to shallow groundwater, with subsequent potential exposures via (1) migration to the potable bedrock aquifer, and/or (2) direct contact with shallow groundwater during excavation activities.

- Leachate release through the landfill cap resulting from short-circuiting within the cell with subsequent potential exposures via (1) direct contact with leachate and impacted cover soils, and/or (2) discharge to Driftmeyer Ditch via the NPDES-permitted outfall.

However, because there is no evidence of release from this unit, no current exposures via these pathways have been identified, although these pathways do represent potential future pathways of concern. Therefore, monitoring of these pathways should continue in accordance with ESOI's existing monitoring programs.

3.3.5 Conclusions and Recommendations with Regard to SWMU 3

SWMU 3, Landfill Cell H was closed in accordance with a Closure Plan approved by Ohio EPA. Closure included a clay cap surface preparation, the installation of the 40 mil geomembrane liner, a geocomposite drainage layer, cover soils, vegetation and the drainage system. The cell is also equipped with a leachate collection system from which leachate is regularly removed. In addition, the natural site conditions (i.e., geology and hydrogeology), as discussed in Section 1.3, restrict the potential leachate migration from this unit and the movement of groundwater from the facility. Finally, the cell cover is being monitored and maintained in accordance with the substantive provisions of the facility's post-closure plan.

Since Cell H was designed, permitted, and closed in accordance with RCRA Part B requirements, and there have been no problems with the cap and liner systems or other evidence of release from this unit, no further action with regard to this SWMU is warranted in the RFI. Monitoring and maintenance of this unit will continue in accordance with ESOI's ongoing programs.

3.4 SWMU 4 – LANDFILL CELL I

3.4.1 Description of the SWMU

Landfill Cell I, is a permitted RCRA landfill unit located in the east-central portion of the property, between Cell H (SWMU 3) and York Street. ESOI operated Cell I as a commercial landfill for the disposal of industrial and hazardous wastes from March 1987 to November 1990. The total disposed volume of waste within Cell I was approximately 954,067 tons. Cell I covers approximately 8 acres and has an average waste thickness of approximately 88 feet. Design of this cell, the materials utilized for construction and closure, and the closure procedures reflect applicable regulatory requirements at the time of these activities. Documentation for Cell I is provided in Appendix I.

The cell was constructed with double geomembrane liners, a primary leachate collection system and a secondary leak detection system. The design included a double composite liner system along its entire bottom and a composite secondary liner system with a single primary liner system along its below grade side slopes. The double composite liner system includes a primary system (2 feet of recompacted clay and 80 mil synthetic liner on the base of the cell and 80 mil synthetic liner along the sideslopes) overlain on an independent secondary system (3 feet of recompacted clay and 60 mil synthetic liner).

As described in Section 3.3.1, Cell I was constructed in the area of a former land treatment unit (referred to as the York Street Landfarm) which covered an area of approximately 8.9 acres in size (see Appendix H). The land treatment unit was completely removed and no longer exists; removal of the land treatment unit was completed under a closure plan approved by the USEPA in a letter dated August 3, 1989 (See Appendix H).

In June of 1990, ESOI submitted a *Partial Closure and Post Closure Plan for Cell I* (hereafter referred to as the Closure Plan), to the Ohio EPA. After agency reviews and subsequent revisions, the Plan received final approval from the Ohio EPA on June 18, 1991. During this period, an interim clay cover was installed to minimize infiltration of precipitation.

The final cover system design included a 2 foot recompacted clay, a 40 mil textured geomembrane liner, a geocomposite drainage layer, 2 feet of protective cover soils and a vegetative cover. The closure of Cell I was implemented in two distinct phases. First, the perimeter dikes were constructed in place with above grade waste placement activities. The construction of the dikes provided for the required 2 foot (minimum) recompacted clay layer and an additional 2 foot sacrificial clay layer. The sacrificial clay layer provided protection of the required 2 foot minimum clay layer from erosion and desiccation during the interim closure period. The second and final phase of closure was initiated upon the approval by the Ohio EPA of the Cell I Closure Plan. The final phase included the clay surface preparation, and the installation of the 40 mil geomembrane liner, geocomposite drainage layer, cover soils, vegetation and the drainage system.

The *Cell I Closure Construction Quality Assurance (CQA) Report*, prepared by MEC and dated August 1992, was submitted to Ohio EPA on September 1, 1992. Ohio EPA personnel completed a certification of closure inspection and a review of documents on September 30, 1992. Based on this inspection and review, as stated in the letter dated April 2, 1993, Ohio EPA determined "that hazardous waste Cell I has been closed in accordance with the approved closure plan and Rules 3745-66-12 through 3745-66-15 of the OAC."

Cell I is currently maintained and monitored in accordance with the substantive requirements of the post-closure plan, which was included with the facility's state and federal RCRA Part B Permit Application. ESOI's post-closure activities include the following tasks:

- maintenance of facility security systems;
- groundwater monitoring;
- leachate collection and removal;
- maintenance of landfill cover;
- maintenance of support facilities (e.g., access roadways and storm water management systems); and
- periodic inspection of the unit.

These ongoing activities are designed to maintain the integrity of the final cover, liners and other components of the containment system, and the function of the unit's monitoring systems.

3.4.2 Previous Investigations and Available Monitoring Data

Previous investigations conducted in this SWMU were associated with (1) the closure of the York Street Landfarm prior to the cell construction, and (2) the design, construction and closure of this SWMU. Details from these investigations can be found in ESOI's federal RCRA Part B Permit Application filed in 1985 (and its revisions) and in the Cell I Closure Construction Quality Assurance Report (MEC, 1992). In addition, as described in Section 4, as part of the ESOI's effort to establish the baseline or current condition of groundwater quality, ESOI implemented a groundwater sampling plan in 1998 which included sampling 10 wells located near Cell I for Appendix IX constituents (shallow till wells I-3S(A), I-4S, I-5S(A), I-6S, I-7S, I-8S; and deep till wells I-3D, I-4D, I-5D, I-6D). The locations of these wells are presented on Figure 4-1.

Monitoring of Cell I includes routine leachate monitoring, groundwater monitoring, and visual inspections of the cover and associated systems. In accordance with the facility's monitoring activities, leachate is routinely removed from the Cell I leachate collection system. Leachate extraction data are presented in Appendix X. The collected leachate is also characterized on a quarterly basis; the characterization data for the most recent four quarterly sampling events is provided on Table 3-1. In addition, the 10 wells in the vicinity of Cell I are monitored quarterly as part of the RCRA groundwater monitoring program. A description and current status of the groundwater monitoring program is provided in Section 4. A summary of the most recent four quarters of groundwater monitoring events for the ten wells in the vicinity of Cell I is also provided in Section 4.

In addition, as required by its NPDES stormwater discharge permit, ESOI collects and analyzes stormwater discharges from Outfall 002 located at the southeast corner of Cell I. This outfall receives stormwater runoff from Cell I and access roads. This monitoring includes routine (i.e., weekly and monthly) sampling for general water quality (e.g., BOD, COD, TSS, TDS), semi-annual sampling for inorganics and metals, and annual sampling for priority pollutant VOCs, SVOCs, and pesticides.

Explosive gas monitoring is also conducted in the vicinity of this SWMU as required by Ohio Administrative Code (OAC) 3745-27-12(I) and ESOI's *Explosive Gas Monitoring, Sampling, and Reporting Procedures Document*. Both punch bars and a monitoring probe are monitored near this SWMU site on a semi-annual basis. A total of six punch bars and one monitoring probe are sampled. The monitoring probe (MP8) is located along the northeast side of the landfill. The punch bars (PB15, PB16, PB17, PB18, PB19, PB20) are located along the south side of the landfill. Information on this monitoring program is provided in Appendix AA.

3.4.3 Assessment of Existing Degree of Contamination

The Appendix IX groundwater sampling conducted in 1998 for wells located in the vicinity of Cell I did not detect VOCs, SVOCs, PCBs or pesticides/herbicides. Therefore, none of the 10 wells were identified as Affected Wells and none of these constituents were determined to be a concern with respect to the groundwater near Cell I. As stated in the Appendix IX groundwater sampling report (Malcolm Pirnie, Inc., March 1999), there were multiple detections of metals in the analytical results of samples collected during the Appendix IX sampling events. However, as discussed in Section 4, the on-site data did not indicate that metals were a concern with respect to the quality of groundwater at the facility.

As discussed in Section 4, monitoring conducted since the 1998 Appendix IX sampling has not confirmed the presence of constituents that would identify any of these wells as an Affected Well or indicate a potential release from Cell I. Thus all 10 wells remain in detection monitoring.

As shown on Table 3-1, constituents that have been detected in the leachate collection system have generally not been detected in the leak detection layer. Further, as shown in Appendix X, leachate generation in Cell I has been declining over time, thus showing that the existing cap is functioning properly.

As shown in the NPDES monitoring reports provided in Appendix Z, no VOCs, SVOCs, or pesticides have been detected in the stormwater runoff discharged from Cell I via Outfall 002 and concentrations of metals and inorganics have not been identified as a concern under the NPDES program.

3.4.4 Potential Migration Pathways and Potential Impacts on Human Health and the Environment

Prior investigations and ongoing monitoring and maintenance activities have identified no observed releases from this unit. The potential migration/exposure pathways for this unit would include the following, if a release from the unit were to occur:

- Leachate migration to shallow groundwater, with subsequent potential exposures via (1) migration to the potable bedrock aquifer, and/or (2) direct contact with shallow groundwater during excavation activities.
- Leachate release through the landfill cap resulting from short-circuiting within the cell with subsequent potential exposures via (1) direct contact with leachate and impacted cover soils, and/or (2) discharge to Otter Creek via the NPDES-permitted outfall.

However, because there is no evidence of release from this unit, no current exposures via these pathways have been identified, although these pathways do represent potential future pathways of concern. Therefore, monitoring of these pathways should continue in accordance with ESOI's existing monitoring programs.

3.4.5 Conclusions and Recommendations with Regard to SWMU 4

SWMU 4, Landfill Cell I was closed in accordance with a Closure Plan approved by Ohio EPA. Closure included a 2 foot recompacted clay layer, a 40 mil textured geomembrane liner, a geocomposite drainage layer, 2 feet of protective cover soils and a vegetative cover. The cell is also equipped with a leachate collection/detection system from which leachate is regularly removed. In addition, the natural site conditions (i.e., geology and hydrogeology), as discussed in Subsection 1.3 restrict the potential leachate migration from this unit and the movement of groundwater from the Facility. Finally, the cell cover is being monitored and maintained in accordance with the substantive provisions of the facility's post-closure plan.

Since Cell I was designed, permitted, and closed in accordance with RCRA Part B requirements, and there have been no problems with the cap and liner systems or other evidence of release from this unit, no further action with regard to this SWMU is warranted in the RFI. Monitoring and maintenance of this unit will continue in accordance with ESOI's ongoing programs.

3.5 SWMU 5 – MILLARD ROAD LANDFILL

3.5.1 Description of SWMU

SWMU 5, the Millard Avenue Landfill, is a pre-RCRA unit located northwest of the Otter Creek Road intersection with Millard Avenue. It is bounded by Millard Avenue on the south, by Otter Creek on the west, by Otter Creek Road on the east and by the Millard Avenue Extension to the north. It was operated from approximately 1976 to 1981. The landfill was used primarily for disposal of construction and demolition material and solid waste. Site representatives indicated that the disposed material was principally construction debris from the demolition of an oil refinery. The approximate size of the SWMU is 500 ft x 700 ft with an approximate waste thickness of 24 to 50 ft. The in-place waste volume is reported to be 224,600 cubic yards. The landfill was constructed in accordance with the commonly accepted practices at the time of construction by excavating into in-situ clay soils.The bottom soils consist of approximately 25 feet of in-situ gray silty clay till located on top of dolomite. The till has a permeability ranging from 3.1×10^{-7} cm/sec to 1.4×10^{-8} cm/sec. The side wall soils are also comprised of in-situ soils consisting of brown and gray silty lacustrine clay, blue and gray silty clay till, and gray silty clay till. The landfill was not equipped with a leachate collection system

The status of the landfill closure was submitted to Ohio EPA on June 17, 1985 in response to Ohio EPA's January 10, 1985 Findings and Orders. The final "as-built" closure grading plan was submitted to Ohio EPA on January 28, 1987. The as-built grading plan indicates that the thickness of the final soil cover ranges from 2 to 7 feet. The landfill is equipped with a gas monitoring system. Copies of data and documents relevant to this SWMU are provided in Appendix J.

ESOI's monitoring and maintenance program for the Millard Road Landfill includes the following:

- maintenance of facility security systems;
- groundwater monitoring;
- maintenance of landfill cover;
- maintenance of support facilities (e.g., access roadways and storm water management systems); and
- periodic inspection of the unit.

These activities are designed to maintain the integrity of the final cover, and the function of the unit's monitoring systems.

3.5.2 Previous Investigations and Available Monitoring Data

In the 1983 FCHA Investigation (see Section 2), two test borings, designated as CS-8 and CS-9, were drilled within the landfill to depths of 31.5 and 51.5 feet bgl, respectively (see Appendix J for the boring logs). In one boring, the natural clay material was encountered at an approximate depth of 24 feet. There was no leachate evident in the borehole, so a sample could not be obtained. The borehole was plugged with 15 gallons of bentonite and remaining space was backfilled with the drill cuttings. In the second boring, a change in material was noted by the driller at a depth of approximately 44 feet. The previous subsurface sample, at 40 feet, was composed of fill materials. Samples were driven at 45 to 47.5 feet, but in both cases, no material was recovered. At 50 feet, full recovery of the plastic grey clay with some silt was achieved. Although an oily fluid was detected in the boring at approximately 35 feet, the material sampled below this depth was dry. No sample was collected because no leachate existed in the borehole.

The boring was plugged with 15 gallons of bentonite and the remaining space was backfilled with drill cuttings.

As described in Section 1.3.3, during the RFI conducted for the Northern Sanitary Landfill (SWMU 6), ESOI conducted a an ecological assessment which included the collection of sediment and surface water samples from various locations around the facility and at 4 locations in Otter Creek, including upstream and downstream of the Millard Road Landfill. Fish, macroinvertebrate and periphyton communities were also characterized from the Otter Creek sampling locations.

In addition, as described in Section 4, as part of the ESOI’s effort to establish the baseline for current condition of groundwater quality, ESOI implemented a groundwater sampling plan in 1998 which included sampling 14 wells located near the Millard Road Landfill for Appendix IX constituents (shallow till wells MR-1S(A), MR-2S, MR-3S, MR-4S, F-1S; deep till wells MR-1D(A), MR-2D, MR-3D, MR-4D, F-1D(A); deep sand wells G-6, G-8; and bedrock wells R-4, R-14). The locations of these wells are presented on Figure 4-1.

Monitoring of the Millard Road Landfill includes ground water monitoring and visual inspections of the cover and associated systems. The 14 wells in the vicinity of this SWMU are monitored as part of the RCRA Groundwater Monitoring Program, which is discussed in Section 4. A description and current status of the groundwater monitoring program is provided in Section 4. A summary of the most recent four quarters of groundwater monitoring events for the 14 wells in the vicinity of the landfill is also provided in Section 4.

Explosive gas monitoring is also conducted in the vicinity of this SWMU as required by Ohio Administrative Code (OAC) 3745-27-12(I) and ESOI's *Explosive Gas Monitoring, Sampling, and Reporting Procedures Document*. Both punch bars and monitoring probes are monitored at this SWMU on a semi-annual basis. A total of one punch bar and eight monitoring probes are sampled. The monitoring probes (MP9, MP10, MP11, MP11A, MP12, MP12A, MP13, MP14) are located along the west side of the Millard Road Landfill. The punch bar (PB21) is located on the south side of the landfill. Information on this monitoring program is provided in Appendix AA.

3.5.3 Assessment of Existing Degree of Contamination

Existing information on the Millard Road Landfill indicates that the toe of the slope on the west side of the unit extends beyond the facility boundary. The Appendix IX groundwater data sampling conducted in 1998 for wells located in the vicinity of the Millard Road Landfill identified three of the 14 wells near the unit as Affected Wells. Specifically, wells MR-1S(A), MR-2S, and MR-2D were defined as Affected Wells based on the confirmed presence of trichlorofluoromethane at well MR-1S(A), 1,4-dioxane at well MR-2S, and 1,4-dioxane and benzene at well MR-2D. Wells MR-1S(A) and MR-2S are shallow till zone wells located along the north side of this SWMU. Well MR-2D is a deep till well located adjacent to MR-2S. As discussed in Section 4, subsequent groundwater monitoring has continued to detect similar concentrations of these constituents in these wells, and has detected 1,4-dioxane at well MR-1S(A) and tetrahydrofuran at well MR-2D. In addition, this subsequent monitoring has identified well MR-3D (a deep till well), located on the west side of this SWMU, as an Affected Well based on the confirmed detection of 1,4-dioxane.

The presence of semivolatile organic compounds (SVOCs), PCBs, pesticides or herbicides was not confirmed in any of the 14 wells sampled during the 1998 Appendix IX sampling program. Therefore, these constituents were determined to not be a concern with respect to the groundwater quality near the Millard Road Landfill. In addition, as discussed in Section 4, the on-site data did not indicate that metals were a concern with respect to the quality of groundwater at the facility.

As reported in the RFI Report for SWMU 6, all chemical and biological data collected during the ecological assessment suggest that the Facility has not had an adverse impact on Otter Creek or the surrounding environment. Periphyton, macroinvertebrate and fish populations in Otter Creek are all affected by gross organic enrichment from a variety of sources not related to the Facility. Sediment quality in Otter Creek appears to be influenced most by metals, PAHs and other organic compounds and were detected at their highest concentrations upstream of any ESOI

NPDES discharges to the creek. The organic constituents detected in the shallow groundwater near this unit were not detected in the surface water or sediment samples collected in Otter Creek adjacent to this unit.

3.5.4 Potential Migration Pathways and Potential Impacts on Human Health and the Environment

As discussed in Section 3.5.3, VOCs have been confirmed to be present in two shallow till zone wells and two deep till wells located adjacent to this SWMU. Three of these wells are located along the north side of the unit, between the unit and the Gradel Ditch. One well is located on the west side of this unit, between the landfill and Otter Creek. These data suggest the potential for release from this unit. In addition, prior investigations indicated that the limits of the landfill extend off the facility property. The potential migration/exposure pathways for this unit are:

- Leachate migration to shallow groundwater, with subsequent potential exposures via (1) migration to the potable bedrock aquifer, and/or (2) direct contact with shallow groundwater during excavation activities, and/or (3) migration and discharge to the Gradel Ditch and/or Otter Creek located immediately adjacent to this unit.

- Leachate release through the landfill cap resulting from short-circuiting within the cell with subsequent potential exposures via (1) direct contact with leachate and impacted cover soils, and/or (2) discharge to the Gradel Ditch and Otter Creek via three stormwater outfalls.

No current human exposures associated with these potential exposure pathways have been identified. In particular, contaminated shallow groundwater has not contaminated the uppermost aquifer which is a considered a potential drinking water supply in the region. Further, the uppermost aquifer is not currently used for drinking water purposes at, or in the vicinity of, the ESOI facility. Potable water is supplied municipally by the City of Oregon with Lake Erie serving as the water supply. In addition, there is very little opportunity for contact with any shallow groundwater that exists at the ESOI facility due to the existing facility controls on conducting on-site excavation activities (including ESOI's health and safety program), and the actual limited availability of water in the shallow lacustrine and shallow till zones. Exposure to surface water and sediment in the Gradel Ditch and Otter Creek is considered unlikely given the current industrial land use in the area of the ESOI facility, including both ESOI and neighboring solid waste landfills, as described in Section 1. Finally, potential direct contact with cover soils is limited to ESOI maintenance workers and contractors since existing fencing restricts access from the general public; exposures to on-site maintenance workers are controlled under ESOI's health and safety program.

Ecological exposures to surface water and sediment are anticipated to be minimal given the current industrial land use in the area of the facility and the limited extent of the surrounding habitat area. On-site ecological exposures are also expected to be insignificant since the cell cover and surrounding area is maintained to minimize intrusions by animals that could damage the cover. These maintenance activities deter the development of habitat that could be attractive to ecological receptors.

3.5.5 Conclusions and Recommendations with Regard to SWMU 5

SWMU5, the Millard Road Landfill, was operated from approximately 1976 through 1981. The cell was closed in approximately 1986, although documentation regarding the closure procedures could not be confirmed. In addition, the natural site conditions (i.e., geology and hydrogeology), as discussed in Section 1.3, restrict the potential leachate migration from this unit and the movement of groundwater from the Facility. Finally, the unit's cover is monitored and maintained as part of ESOI's ongoing post-closure activities.

However, based on the observed detection of VOCs in shallow groundwater near this SWMU, the lack of an engineered landfill leachate collection system, and the western limit of the toe of the slope extending over the property boundary, further assessment of the detection of VOCs in the groundwater and potential impacts to nearby surface water is warranted. The extent of waste and the impacts of possible releases to the environment will be investigated as part of the RFI. Additionally, given the uncertainty regarding the construction of the landfill cover, investigation of the integrity of the cap and its performance relative to reducing infiltration into the landfill is also necessary to determine if repairs to the cap are warranted.

3.6 SWMU 6 – NORTHERN SANITARY LANDFILL

3.6.1 Description of SWMU

SWMU 6, the Northern Sanitary Landfill (NSL), is a pre-RCRA unit located in the northern portion of the ESOI site, east of Cell F (SWMU 1) and north of the Central Sanitary Landfill (SWMU 7). Located to the north and immediately adjacent to the NSL is the Gradel Landfill, owned by Commercial Oil Services, Inc. The NSL was operated from 1976 through 1981 for disposal of solid waste and was approximately 400 ft x 700 ft in size. The landfill was constructed in accordance with the commonly accepted practices at the time of construction by excavating into in-situ clay soils. The bottom soils consist of in-situ gray silty clay till located on top of dolomite. The till has a permeability ranging from 3.1 x 10^{-7} cm/sec to 1.4 x 10^{-8} cm/sec. The NSL was capped in March 1984 with a minimum of two feet of brown clay. The unit was closed in accordance with the provisions of the Ohio EPA's January 10, 1985 Final Findings & Orders. Documentation regarding the closure of SWMU 6, including a Final Grading Plan was submitted to Ohio EPA on June 17, 1985. Copies of data and documents relevant to this SWMU are provided in Appendix K.ESOI's monitoring and maintenance program for the NSL includes the following:

- maintenance of facility security systems;
- groundwater monitoring;
- maintenance of landfill cover and passive gas venting systems;
- maintenance of support facilities (e.g., access roadways and storm water management systems); and
- periodic inspection of the unit.

These monitoring activities are designed to maintain the integrity of the final cover and the function of the unit's monitoring systems.

3.6.2 Previous Investigations and Available Monitoring Data

3.6.2.1 1983 Environmental and Engineering Assessment

As discussed in Section 2, in 1983, FCHA conducted investigations (see Appendix K for boring logs) to determine the extent of the fill and characterize the leachate at this SWMU. During drilling, extensive amounts of landfill gas was observed by the field crew. Sampling of the subsurface material began at a depth of 30 feet and continued at 5 foot intervals. Drilling continued to a depth of 48 feet, providing a number of samples of assorted fill materials which were wet and tar-soaked. At 48 feet, the driller reported a change in material and a sample was collected. This sample was composed of a brown and grey silty clay with some intermixed trash. Another sample was taken at a depth of 54 feet and indicated a grey silty clay with some brown silt and gravel. It is estimated that the extent of fill material at the particular location is approximately 52 feet bgs.

Although fluid was detected at a depth of 45 feet, only two feet of leachate was present in the augers after drilling to a depth of 55.5 feet. The augers were advanced another five feet and a sample of the leachate was obtained. After sampling a 15 gallon bentonite plug was placed in the bottom of the hole and the remaining space was backfilled with drill cuttings. The leachate sample was analyzed for RCRA metals, TOC, phenols, cyanide, pH, and oil and grease. A composite leachate sample[4] was also analyzed for VOCs, SVOCs and pesticides. The results are presented in Appendix K.

3.6.2.2 RFI

As outlined in Section 2, ESOI performed an RFI at SWMU 6 in 1995 and 1996, and submitted an RFI Report to USEPA in June 1997. A summary report was also submitted to Ohio EPA in September 1997 (a copy of this summary report is provided in Appendix E). A summary of the RFI activities are presented below.

[4] The leachate composite was comprised of samples from the NSL, Central Sanitary Landfill (SWMU 7) and the Old Oil Pond (SWMU 8).

3.6.2.2.1 Initial RFI Activities

In May, October and November 1995, ESOI drilled soil borings and collected subsurface soil samples at selected locations along the Facility's northern property boundary to determine the extent of solid waste in the vicinity of the NSL. The soils borings were drilled along five north-south traverses (i.e., rows of borings perpendicular to the northern property line) designated as QD-1 through QD-5, with QD-1 being the easternmost traverse and QD-5 the westernmost traverse. In addition, as part of the Initial RFI, an ecological assessment of the facility and surrounding area was also conducted. This assessment included the collection of surface water and sediment samples from the Gradel Ditch located between the facility property boundary and the Gradel Landfill. The locations of soil borings and monitoring wells installed as part of the Initial RFI are shown on the initial RFI Soil Boring and Monitoring Well Location Plan (Figure 2-1 in Appendix E). The USEPA provided oversight during soil boring, monitoring well installation and sampling activities.

The RFI Work Plan established a definition that would constitute a finding of a solid waste for the purposes of the Initial RFI (Solid Waste) as "*…the identification of solid waste at depths to exceed one inch and extend over a three foot diameter of waste found at a depth exceeding 10 inches and less than 3 foot diameter.*" The presence of paper, plastic, metal, construction debris or other materials that represented residential solid waste which met the definition stated above was considered a finding of Solid Waste. Soil borings were installed in a northerly direction until the soil borings did not indicate the presence of any solid waste materials or any oil stained soils. This boring was considered the northernmost extent of the Solid Waste for that traverse. It should be noted that for the purposes of the RFI, ESOI conservatively assumed that the solid waste materials found in any soil boring were continuous from the previous soil boring in which similar materials were considered. A variety of materials in the upper 7 to 10 feet of the soil profile were encountered in the soil borings installed along the northern property line including: miscellaneous fill soils, road base materials, oil-stained soils (which could be considered evidence of former road oiling/dust control activities), and occasional paper or plastic materials.

After delineating the extent of Solid Waste at each of the five traverses (QD-1 through QD-5), soil borings were installed 5 feet beyond the northernmost limit of the solid waste materials in each traverse for collection of subsurface soil samples. At each of these boring locations, one soil sample was collected from the boring and analyzed for parameters including: volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), metals, cyanide, total phenolics, pesticides, herbicides, and polychlorinated biphenyls (PCBs). A complete list of the analyzed constituents is provided in Appendix D of the approved RFI Work Plan. The results of the soil and groundwater sampling events were provided to the USEPA in monthly progress reports.

Upon delineating the northernmost extent of Solid Waste along any of the soil boring traverses, two monitoring wells were installed 5 feet north of the Solid Waste findings along each traverse; one monitoring well was screened at the contact between the lacustrine and the upper till, and the second was screened at the contact between the upper till and the lower till. The well designations corresponding to the five boring traverses are indicated on Figure 2-1 in Appendix E as QD-1S (well) through QD-5S (well) for the shallow monitoring wells (contact between lacustrine and upper till), and QD-1D (well) through QD-5D (well) or the deep monitoring wells (connect between upper till and lower till). At one location, the boring traverse at QD-3, a third monitoring well (QD-3R) was installed which was screened within the underlying bedrock aquifer. The location of the monitoring wells installed as part of the Initial RFI are shown on Figure 2-1. In accordance with the approved RFI Work Plan groundwater samples were collected from these monitoring wells and were analyzed for: VOCs, SVOCs, metals, cyanide, phenols, pesticides, herbicides, and PCBs. A complete list of the analyzed constituents is provided in Appendix D of the approved RFI Work Plan. The monitoring wells were sampled and analyzed in December 1995 and July 1996. The results of these sampling and analysis events were provided to the USEPA in monthly progress reports.

3.6.2.2.2 Supplemental RFI Activities

Based on the findings of the initial RFI activities conducted in 1995, USEPA required ESOI to conduct a supplemental investigation of soil and groundwater along the northern and eastern boundaries of the NSL. The USEPA prepared and issued a Supplemental RFI Work Plan in September 1996, the purpose of which was to determine the nature and extent of soil and shallow groundwater (15' to 20' below existing grade) constituents and examine site soils for the presence of solid waste outside the NSL limits. The requirements for further investigation and delineation of identified constituents were based on a comparison of constituent concentrations to conservative Preliminary Remediation Goals (PRGs) provided by the USEPA in the Supplemental RFI Work Plan. The Supplemental RFI Work Plan stated: *"To determine the need for further investigation of the Northern Sanitary Landfill, the results of confirmatory soil and groundwater sample analyses will be compared (via baseline risk assessment evaluation) to USEPA Region 9 preliminary remediation goals (PRG) and USEPA Region 5 data quality levels (DQLs), respectively."* As several of the soils sample analytical results were greater than the USEPA Region 9 PRGs for industrial land use and several groundwater sample results exceeded the USEPA Region 5 DQLs, additional investigation along the northern and eastern property lines was conducted in accordance with the Supplemental RFI Work Plan.

The Supplemental RFI Work Plan specified the sampling, field screening, laboratory, and analytical methods to be implemented by ESOI to further investigate potential releases from the NSL. The Supplemental RFI Work Plan called for the collection of additional soil and groundwater samples along the northern and eastern property lines adjacent to the NSL, and on the south slope of the Gradel Landfill. In general, these field activities included the installation of soil borings and the collection of soil samples using the GeoProbe direct-push sampling method and the installation of piezometers. The collected soils samples were field screened and analyzed to aid in sample selection. Initially, soil samples were evaluated based on the presence or absence of solid waste materials. If waste materials were encountered, then an additional soil boring was drilled five feet beyond the original boring. However, if no waste material was encountered, then the soil samples from the boring were screened with a photoionization detector (PID) or flame ionization detector (FID) and the depth interval with the highest PID or FID reading was selected for analysis in the field for Total Petroleum Hydrocarbons (TPH), Polynuclear Aromatic Hydrocarbons (PAHs) and PCBs using immunoassay field test kits. If no elevated readings were detected with the PID or FID, then a sample depth interval for immunoassay field testing was selected by the MEC geologist and USEPA's on-site representative based on visual identification of suspect areas or areas of saturated soils. If constituents were detected using the immunoassay test kits, then an additional soil boring was required to be drilled five feet beyond the original boring and the entire process was repeated. If no constituents were detected using the immunoassay field test kits then the Supplemental RFI Work Plan specified that the samples would be analyzed for gasoline range organic compounds (GRO) using a field gas chromatograph (GC). If the GRO analysis was positive, then an additional soil boring was required to be drilled five feet beyond the boring and the entire process was repeated. If however, the GRO field screening was negative, the Supplement RFI Work Plan specified that a sample selected by both MEC's geologist and USEPA's on-site representative would be sent to an analytical laboratory for VOCs, SVOCs, PAHs, PCBs, 1,4-dioxane, Diesel Range Organics (DRO), and pentachlorophenol (PCP) analyses.

In addition to the samples required by USEPA's field screening criteria, ESOI collected and analyzed additional soils samples. These samples were selected in areas where ESOI felt that additional investigation was warranted to evaluate the presence/absence of constituents on a 3-dimensional basis. The additional samples were collected from areas where the field immunoassay test kit or field GC indicated organic constituents but the drilling of the five foot "stepped out" boring was delayed due to access difficulties or delays in access authorization for the adjacent properties. The collection of these samples was also performed under the oversight and concurrence of USEPA's on-site representative.

In addition to the installation of the GeoProbe soil borings, 34 piezometers were installed. The locations of the piezometers installed as part of the Supplemental RFI are included with Figure 2-2 in Appendix E. It should be noted that a piezometer was not installed along every soil boring traverse; however, the locations of the piezometers were spaced to provide coverage along the NSL's northern and eastern property lines, and on the south slope of the Gradel Landfill. The piezometers were screened in the lacustrine deposits in accordance with the Supplemental RFI Work Plan. No piezometers were required by the USEPA to be installed in the upper till/lower till contacts zones or in the bedrock aquifer since the groundwater sampling performed during the Initial RFI did not indicate any adverse impact to those water-bearing strata. In accordance with the Supplemental RFI Work Plan, these groundwater samples were collected from the piezometers and sent to the laboratory for analysis of PCBs, PCP, PAHs, DRO, VOCs, SVOCs, and 1,4 dioxane.

A total of 99 GeoProbe soil borings were completed in October, November, and December 1996, and February and March 1997. A total of 150 samples (143 soil samples and 7 groundwater samples) from 34 borings/temporary piezometers were field screened during this period. All 143 soil samples were field screened with either a PID or a FID. Of the 150 total field screening samples, 117 were field screened using immunoassay techniques (IA) and field gas chromatograph, 30 were analyzed by field GC only, and 3 were analyzed by immunoassay only. The sample number used to identify field screening samples was the same number used to identify a sample submitted to the laboratory. There were 85 soil samples and 118 groundwater samples submitted for analysis. The locations of the soil borings, monitoring wells, and piezometers installed as part of the initial RFI and Supplemental RFI are shown on Figure 2-2 in Appendix E.

Northern Property Line

In the Supplemental RFI Work Plan, the USEPA required additional soil borings be installed to the west of QD-5 at 40-foot intervals along the Facility's northern property line to further investigate and delineate the extent of Solid Waste. Additionally, the USEPA required ESOI to install several soil borings between existing soil boring traverses installed during the initial RFI to better delineate the extent of Solid Waste found during the Initial RFI.

Upon completion of the soil boring activities, piezometers were installed in accordance with the Supplemental RFI Work Plan along the northern property line. These piezometers were installed at location QD-5.25BB (5 feet inside the property line), QD-7, QD-9 (both on the property line), and QD-9C (10 feet north of the property line), and were all screened in the lacustrine deposits. The locations of the piezometers are shown on Figure 2-2 in Appendix E. In addition to those soil samples required to be analyzed by the Supplemental RFI Work Plan, additional soil samples were collected by ESOI with the concurrence of the USEPA representative.

Eastern Property Line

In the Supplemental RFI Work Plan, the USEPA also required ESOI to install soil borings along the Facility's eastern property line at the NSL. Soil boring traverses were required to be installed at 40-foot (maximum) intervals from the northeast property corner south to a point where the Facility fenceline extends east along Cell H; a distance of approximately 480 feet.

For the purpose of the Supplemental RFI, soil borings along ESOI's eastern property line were designated with the prefix "QE" and a number designating the distance south from the northeast property corner. For example, QE-00 indicates the soil boring installed at the Facility's northeastern property corner and QE-360 indicates the soil boring 360 feet south of the northeastern property corner. Suffix designations were similar to those soil borings installed along the northern property line (i.e., single letter suffixes indicates soil borings beyond the property line and double letter suffixes indicate soil borings within the property line).

Upon completion of the soil boring activities, 22 piezometers were installed in accordance with the Supplemental RFI Work Plan in the lacustrine deposits along the eastern property line. The locations of the piezometers are shown on Figure 2-2 in Appendix E.

South Slope of Gradel Landfill

The Supplemental RFI Work Plan also required the drilling of off-site soil borings within the Gradel Landfill north of the Gradel Ditch (located immediately north of the facility's northern property line). A total of eight soil borings designated with the prefix "GR-" were installed on the south slope of the Gradel Landfill directly across from soil borings installed on the Facility's side of the Gradel Ditch. The boring designations further corresponded with the same soil boring number on the Facility side of the ditch. For example, GR-1 was installed on the Gradel Landfill near the ditch across from QD-1. GR-2 was installed on the Gradel Landfill near the ditch across from QD-2, and so on. Soil boring GR-3.75 was installed at the request of USEPA to verify the depth of the Gradel Landfill wastes.

Samples of the solid waste materials encountered in the Gradel Landfill were collected, screened and analyzed in accordance with the procedures described in the Work Plan. No soil samples were collected from GR-3.75 for analysis. Upon completion of the soil boring activities, piezometers were installed in accordance with the Supplemental RFI Work Plan on the south slope of the Gradel Landfill. These piezometers were installed at locations GR-1, GR-2, GR-3, GR-4, GR-5, GR-7 and GR-9 and were screened within the encountered waste materials or in the lacustrine deposits. The locations of the piezometers are shown on Figure 2-2 in Appendix E.

3.6.2.3 1998 Appendix IX Sampling Program

As described in Section 4, as part of the ESOI's effort to establish the baseline or current condition of groundwater quality, ESOI implemented a groundwater sampling plan in 1998 which included sampling 14 wells located near the NSL for Appendix IX constituents (shallow till wells F-2S, SW-1S, SW-2S, SW-3S and H-2S; deep till wells F-2D, SW-1D, SW-2D, SW-3D, H-2D; and bedrock wells R-3, R-8 R-9, R-16). The locations of these wells are presented on Figure 4-1.

3.6.2.4 NSL Pipe Sampling

At the request of USEPA, ESOI implemented sampling of fluids from five of eighteen pipes (P-2, P-5, P-9, P-13 and P-16) located along the side slopes of the landfill. This sampling was conducted in 1998 in accordance with the USEPA-approved *Northern Sanitary Landfill Pipe-Sampling and Analysis Plan*. Fluid samples were collected and analyzed for chemical composition (Appendix IX constituents) and hazardous waste characteristics (TCLP constituents, ignitability, corrosivity and reactivity). An oil sample was collected from P-2. The data collected was used to characterize the fluid contained within the pipes for management and disposal purposes. A summary of the data is provided in Appendix K.

3.6.2.5 Routine Monitoring

Monitoring of the Northern Sanitary Landfill includes groundwater monitoring, and visual inspections of the cover and associated systems. The 14 wells in the vicinity of the landfill are monitored quarterly as part of the RCRA groundwater monitoring program. A description and current status of the groundwater monitoring program is provided in Section 4. A summary of the most recent four quarters of groundwater monitoring events for the 14 wells in the vicinity of the Northern Sanitary Landfill is also provided in Section 4.

In addition, as required by its NPDES stormwater discharge permit, ESOI collects and analyzes stormwater discharges from Outfall 003 located on the northwest corner of Cell F. This outfall receives stormwater runoff from a portion of the NSL, from Cell F (SWMU 1) and from a portion of Central Sanitary Landfill (SWMU 7). This monitoring includes routine (i.e., weekly and monthly) sampling for general water quality (e.g., BOD, COD, TSS, TDS), semi-annual sampling for inorganics and metals, and annual sampling for priority pollutant VOCs, SVOCs, and pesticides.

Explosive gas monitoring is also conducted in the vicinity of this SWMU as required by Ohio Administrative Code (OAC) 3745-27-12(I) and ESOI's *Explosive Gas Monitoring, Sampling, and Reporting Procedures Document*. Seventeen punch bars monitoring probes at this SWMU on a semi-annual basis. The punch bars (PB2, PB2A, PB3, PB3A, PB4, PB4A, PB5, PB5A, PB6, PB7, PB8, PB9, PB10, PB11, PB12, PB13, PB14) are located on the north side of the landfill. The punch bars PB2, PB2A, PB3, PB3A, PB4, PB4A, PB5 and PB5A are also monitored on a weekly basis. Details regarding the results of explosive gas monitoring can be found in Appendix AA.

3.6.3 Assessment of Existing Degree of Contamination

3.6.3.1 1983 Environmental and Engineering Assessment

The results from the 1983 investigation are presented in Appendix K. As shown on the data summary provided in Appendix K, the results indicate levels of metals and oil and grease that could be expected in landfill leachate. The composite leachate sample also had PCBs detected at a concentration of less than 100 parts per billion.

3.6.3.2 RFI

The RFI report for SWMU 6 contains all of the data collected during the initial and supplemental RFI. A summary RFI report with tables of all of the analytical data for soil and groundwater samples collected during the RFI are included in Appendix E. In addition, the Ecological

Assessment Report documenting the findings of the ecological assessment, including sediment and surface water data is also included in Appendix E.

Extent of Solid Waste

As reported in the RFI, solid waste (plastic, paper, metal, wood, styrofoam, glass and fibrous material) was identified in two discrete locations as extending north of ESOI's property boundary near the NSL. The waste did not extend to the Gradel Ditch located on the southern portion of the Gradel Landfill in any of the investigated locations. Further, no waste was encountered along or outside the eastern property boundary of the NSL, although road base materials were encountered in soil borings installed along this side of the NSL. The extent of the waste beyond the northern NSL boundary has been adequately delineated at all locations through visual observations of soil borings drilled along the entire northern boundary of the NSL. All waste was identified within 10 feet of the NSL fenceline, and was covered by a layer of soil with an average depth to top of waste of about six feet below grade.

Solid waste was encountered at a thickness of at least 4 to 10 feet in every soil boring installed on the south slope of the Gradel Landfill with the exception of GR-9. The locations of these "Gradel" soil borings were less than ten feet north of the Gradel Ditch. However, the southern extent of this material was not determined during this investigation. Based on the thickness of the solid waste materials encountered in the "Gradel" borings and their proximity to the Gradel Ditch, it is suspected that solid waste materials from the Gradel Landfill extend to the Gradel Ditch.

Groundwater

Chemical constituents detected in shallow groundwater along the northern property boundary of the NSL at concentrations greater than DQLs include: arsenic, chromium, lead, 1,4-dioxane, benzene, 1,1-dichloroethane, 1,2-dichloroethane, chloroethane, vinyl chloride, methylene chloride, heptachlor epoxide, benzo(a)pyrene, benzo(a)anthracene, and bis(2-ethylhexyl)phthalate. The source of these constituents is difficult to determine due to the existence of waste materials and associated groundwater constituents of the adjacent Gradel Landfill, located in close proximity to the property line.

In shallow groundwater samples collected from the southern perimeter of the Gradel Landfill, chemical constituents reported at concentrations greater than their respective DQL values included: 1,4-dioxane, benzene, toluene, xylenes, naphthalene, 1,4-dichlorobenzene, benzo(a)pyrene, benzo(a)anthracene, benzo(b)fluoranthene, bis(2-ethylhexyl)phthalate, and PCB Aroclors 1248 and 1260. Based on the areal extent of the waste and constituents detected at the Gradel Ditch, the reported observations of leachate seeping from the Gradel Landfill side slope, it is probable that the Gradel Landfill is the source of many of the constituents identified in the Gradel Ditch.

With respect to the investigation of shallow groundwater quality along the eastern property line, several constituents were detected at concentrations above their respective DQLs. The constituents with concentrations above the DQLs included: 1,4-dioxane, vinyl chloride, bis(2-ethylhexyl)phthalate, benzene, benzo(a)pyrene, naphthalene, benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, indeno(1,2,3-cd)pyrene, and pentachlorophenol. Based on the decreasing constituent concentration gradients from the property line outward, it appears that the constituents in shallow groundwater in this area may be related to the ESOI Facility. Another possible scenario for the identified groundwater constituents is dissolution of constituents from the identified former road base, or migration of constituents originating elsewhere through the road base material.

The initial RFI Investigation included groundwater sampling from deep wells QD-1D through QD-5D (screened across the upper till/lower till contact zone) and from one bedrock well QD-3R. Results from this sampling indicated that there was no impact to groundwater quality in the uppermost (bedrock) aquifer, or at the upper/lower till contact. No subsequent groundwater sampling was required by the USEPA for the upper till/lower till contact zone or bedrock aquifer.

Soils

Soil sampling along the northern property line has identified the presence of benzo(a)pyrene, benzo(a)anthracene, benzo(b)fluoranethene, and dibenzo(a,h)anthracene at concentrations exceeding the PRGs defined for the RFI. Soil sampling along the eastern property line identified the presence of benzo(a)pyrene at concentrations exceeding the PRGs defined for the RFI. Similar constituents were also detected in soil samples collected from the south slope of the Gradel Landfill in addition to PCBs.

Surface Water and Sediment

One surface water and sediment sample was collected in the Gradel Ditch separating ESOI and the Gradel Landfill. This sample location was downstream of ESOI's NPDES Outfall 003 located at the northwestern corner of Cell F. Constituents detected in surface water included metals, pesticides, anthracene, VOCs (tetrahydrofuran, trichlorofluoromethane and xylene) and total phenolics. Constituents detected in the sediment sample included metals, acrylonitrile, total phenolics and xylene. However, based on the areal extent of the waste and constituents detected at the Gradel Ditch, the reported observations of leachate seeping from the Gradel Landfill side slope, the RFI concluded that the Gradel Landfill is the source of many of the constituents identified in the Gradel Ditch.

3.6.3.3 1998 Appendix IX Sampling Program

The Appendix IX groundwater sampling conducted in 1998 for wells located in the vicinity of the NSL identified three of the 14 wells near this unit as Affected Wells. Specifically, wells F-2S, SW-1S and SW-2S were defined as an Affected Wells based on the confirmed presence of 1,1-DCA and 1,2-DCA at well F-2S, and 1,4-dioxane at wells SW-1S and SW-2S. Well F-2S is a shallow till zone well located at the northeast corner of Cell F (SWMU 1) and northwest corner of NSL, along the facility's northern property line. Well SW-1S is a shallow till well located on the north side of the NSL. Well SW-2S is a shallow till well located on the northeastern corner of the NSL. As noted above in Section 3.6.3.2, 1,4-dioxane, 1,1-DCA and 1,2-DCA had been previously identified during the RFI in shallow groundwater along the northern side of the NSL (1,4-dioxane had also been detected in groundwater along the eastern side of the NSL).

No SVOCs, pesticides, PCBs, or herbicides were confirmed to be present in groundwater samples collected in the nearby monitoring wells during the 1998 Appendix IX sampling program. Therefore, these constituents were determined to not be a concern with respect to the groundwater near NSL. As stated in the Appendix IX groundwater sampling report (Malcolm Pirnie, Inc., March 1999), there were multiple detections of metals in the analytical results of samples collected during the Appendix IX sampling events. However, as discussed in Section 4, the on-site data did not indicate that metals were a concern with respect to the quality of groundwater at the facility.

3.6.3.4 NSL Pipe Sampling

Four fluid samples and one oil sample was collected from the pipes located on the NSL. As summarized in Appendix K, up to nine VOCs (out of 55 targeted VOCs) including 1,1-DCA were detected inconsistently in three of the pipe fluids; up to nineteen SVOCs (out of 120 targeted SVOCs) including 1,4-dioxane (listed as a SVOC during this program) were detected inconsistently in two of the pipe fluid samples; one pesticide was detected in two fluid samples; no herbicides were detected; one dioxin was detected in one sample; one furan was detected in one sample; five out of 17 targeted metals were detected in all four fluid samples, and 11 other metals were detected inconsistently in the four samples. No VOCs, PCBs, pesticides or herbicides were detected in the oil sample; sixteen SVOCs were detected.

3.6.3.5 Routine Monitoring

Subsequent groundwater monitoring has continued to detect 1,1-DCA and 1,2-DCA in well F-2S, and 1,4-dioxane in wells SW-1S and SW-2S. As discussed in Section 4, low concentrations of other VOCs including benzene, vinyl chloride and chloroethane have been confirmed in one or more recent quarterly monitoring events well F-2S. These VOCs have not been confirmed in the remaining 11 wells near this unit.

As shown in the NPDES monitoring reports provided in Appendix Z, no VOCs, SVOCs, or pesticides have been detected in the stormwater runoff discharged from via Outfall 003 and concentrations of metals and inorganics have not been identified as a concern under the NPDES program.

3.6.4 Potential Migration Pathways and Potential Impacts on Human Health and the Environment

The RFI for SWMU 6 determined that

- Off-site impacted soils lie between ESOI's northern property line and up to, but not including, the Gradel Ditch;
- Constituents detected in soil and ground water north of the Gradel Ditch indicate that the presence of these constituents north of the ditch did not result from a release from the NSL;
- The extent of constituents in groundwater along the northern property line has been defined, although the source of constituents in shallow groundwater north of the property line is difficult to determine due to the existence of waste materials and associated groundwater constituents at the adjacent Gradel Landfill;
- The extent of constituents in shallow groundwater along the eastern side of the NSL has been generally delineated, and the decreasing constituent concentrations in shallow groundwater from the eastern property line outward indicates that the presence of these constituents in groundwater may be related to the NSL.

Based on the findings of the RFI for SWMU 6, the USEPA has stated that the ESOI site is responsible for most of the contamination south of the Gradel Ditch, north of the ESOI property line. It is also USEPA's determination that ESOI is responsible for the contamination in the shallow groundwater zone on its property and north to the southern bank of the drainage ditch.
In addition to the RFI data, VOCs have been confirmed to be present in three shallow till zone wells located near this SWMU. The RFI data and the routine monitoring data suggest the potential for a release from this unit. The potential migration/exposure pathways for this unit are:

- Leachate migration to shallow groundwater, with subsequent potential exposures via (1) migration to the potable bedrock aquifer, and/or (2) migration and discharge to the off-site Gradel ditch (which then discharges to Otter Creek west of the site) located immediately north of this unit, and/or (3) direct contact with shallow groundwater during excavation activities.
- Leachate release through the landfill cap resulting from short-circuiting within the cell with subsequent potential exposures via (1) direct contact with leachate and impacted cover soils, and/or (2) discharge to the off-site Gradel Ditch located immediately north of this unit.

No current human exposures associated with these potential exposure pathways have been identified. In particular, contaminated shallow groundwater has not contaminated the uppermost aquifer which is a considered a potential drinking water supply in the region. Further, the uppermost aquifer is not currently used for drinking water purposes at, or in the vicinity of, the ESOI facility. Potable water is supplied municipally by the City of Oregon with Lake Erie serving as the water supply. In addition, there is very little opportunity for contact with any shallow groundwater that exists at the ESOI facility due to the existing facility controls on conducting on-site excavation activities (including ESOI's health and safety program), and the actual limited availability of water in the shallow lacustrine and shallow till zones. Exposure to surface water and sediment in the Gradel Ditch and Otter Creek is considered infrequent given the current industrial land use in the area of the ESOI facility, including both ESOI and neighboring solid waste landfills, as described in Section 1. Finally, the potential direct contact with the cover soils is limited to ESOI maintenance workers and contractors since existing fencing restricts access from the general public; exposures to on-site maintenance workers are controlled under ESOI's health and safety program.

Ecological exposures are anticipated to be minimal considering the industrial land use in the area of the facility and the limited extent of the surrounding habitat area. On-site ecological exposures are also expected to be insignificant since the cell cover and surrounding area is maintained to minimize intrusions by animals that could damage the cover. These maintenance activities deter the development of habitat that could be attractive to ecological receptors.

3.6.5 Conclusions and Recommendations with Regard to SWMU 6

SWMU 6, the NSL was operated from 1976 through 1981 for disposal of solid waste and was capped in March 1984. In addition, the natural site conditions (i.e., geology and hydrogeology), as discussed in Section 1.3, restrict the potential leachate migration from this unit and the movement of ground water from the facility. Finally, the unit's cover is monitored and maintained as part of ESOI's ongoing post-closure activities.

As described above, ESOI has completed an extensive RFI for this SWMU which determined that chemical constituents that may be of landfill origin are present in shallow groundwater and soil samples collected in the area of the NSL. The presence of VOCs has also been confirmed in shallow groundwater wells near the NSL, with several of these VOCs also detected in fluids present in vertical pipes located on the sideslopes of the landfill. These existing RFI data will be used as appropriate during the RFI to assess possible releases, and additional sampling will be undertaken, if necessary.

In addition, based on the findings of the RFI, a CMS was requested by USEPA for the northern and eastern property lines adjacent to the NSL. ESOI submitted the CMS Work Plan to USEPA (Malcolm Pirnie, Inc., 1997). The recommendations presented in the CMS Work Plan and the Agency's comments dated July 8, 1997 on the Draft CMS Work Plan, where relevant to the current RFI, will be addressed in the RFI Work Plan. Additionally, investigation of the integrity of the cap and its performance relative to reducing infiltration into the landfill is also necessary to determine what corrective action measures may be warranted.

3.7 SWMU 7 – CENTRAL SANITARY LANDFILL

3.7.1 Description of SWMU

SWMU 7, the Central Sanitary Landfill (CSL), is a pre-RCRA unit located immediately south of the Northern Sanitary Landfill (SWMU 6) and north of the New Oil Pond (SWMU 9). The CSL was the first major cell which received solid waste at the site. Historical data indicate that this landfill was operated from 1969 to 1983. The landfill was constructed in accordance with the commonly accepted practices at the time of construction by excavating into in-situ clay soils. The bottom soils consist of in-situ gray silty clay till located on top of dolomite. The till has a permeability ranging from 3.1 x 10^{-7} cm/sec to 1.4 x 10^{-8} cm/sec. The side wall soils are also comprised of in-situ soils consisting of brown and gray silty lacustrine clay, blue and gray silty clay till, and gray silty clay till. The approximate size of the landfill is 500 ft wide by 600 ft long and 30 ft deep. The landfill was reported to have accepted industrial and commercial waste, along with municipal solid waste (MSW) throughout its lifetime. The CSL was capped with a minimum of two feet of brown clay. The unit was closed in accordance with the provisions of the Ohio EPA's January 10, 1985 Final Findings & Orders. Documentation regarding the closure of SWMU 7, including a Final Grading Plan was submitted to Ohio EPA on June 17, 1985.Copies of available data and documents relevant to this SWMU are provided in Appendix L.

ESOI's monitoring and maintenance program for this SWMU includes the following:

- maintenance of facility security systems;
- groundwater monitoring;
- maintenance of landfill cover and passive gas venting systems;
- maintenance of support facilities (e.g., access roadways and storm water management systems); and
- periodic inspection of the unit.

These monitoring activities are designed to maintain the integrity of the final cover and other components of the containment system, and the function of the unit's monitoring systems.

3.7.2 Previous Investigations and Available Monitoring Data

As discussed in Section 2, the 1983 FCHA investigative program called for drilling one boring through the landfill to identify the leachate level, obtain a leachate sample, and determine the vertical extent of fill material. One boring was drilled in the southwest section of this landfill to a depth of 76.5 feet below the cap. Site personnel estimated a 30 foot excavation at this location prior to landfilling. A previous hydrogeologic report on the site contained a cross-section indicating this landfill's elevation above grade to be approximately 55 feet (Bowser/Morner 1981). Based on these two pieces of information, the plan was to drill to a depth of 70 feet before sampling the subsurface. During the drilling, fill materials were evident in the drill cuttings. A pocket of oil fluid was found on the hollow stem auger plug at approximately 49 feet. At a depth of approximately 50 to 55 feet, the drill cuttings or fill material appeared oil soaked. The first subsurface sample was taken at a depth of 70 feet and was identified as a very plastic grey clay with some silt. The boring was advanced another five feet to ensure this material was the natural ground material. This sample showed the same grey clay. Care was taken during the removal of the augers to attempt to identify the precise clay/trash interface. Because this clay is very plastic in certain intervals, it tends to bind itself around the auger flights with a limited amount of vertical movement. The clay was bound with some fill material at an approximate depth of 63 feet. Therefore, it was estimated that 63 feet of fill material was present at that location.

Fluid, or leachate, was measured in the hole at a depth of 56 feet. A leachate sample was obtained with a 2-inch diameter PVC top loading bailer inside the auger flights. After sampling, the bailer and nylon rope were left in the borehole and 35 gallons of bentonite was pumped down the hole. The remaining space was backfilled with drill cuttings. The sample was analyzed for RCRA metal, cyanide, TOC, pH, oil and grease, and phenols. A leachate sample was also composited with a leachate sample from the NSL boring (see Section 3.1.1.1) and a fluid sample from the Old Oil Pond (SWMU 8) and analyzed for VOCs, SVOCs and pesticides. The boring logs and sample results are presented in Appendix L.

Monitoring of this the CSL includes visual inspections of the cover and associated systems. In addition, monitoring wells located near this SWMU include well G-10A (deep sand well), located at the northwest corner of the SWMU, and wells H-2S (shallow till well), H-2D (deep till well), and R-8 (bedrock well) located the northeast of the SWMU (see Figure 4-1). As discussed in Section 4, as part of ESOI's effort to establish the baseline or current condition of groundwater quality, ESOI implemented a groundwater sampling program in 1998 which included sampling these four wells located near the CSL for Appendix IX constituents. These four wells are also monitored as part of the facility's groundwater monitored program. A description and current status of the groundwater monitoring program is provided in Section 4. A summary of the most recent four quarters of groundwater monitoring events for the four wells in the vicinity of the landfill is also provided in Section 4.

In addition, as required by its NPDES stormwater discharge permit, ESOI collects and analyzes stormwater discharges from Outfalls 001, 003 and 004 which receive stormwater runoff from this SWMU. This monitoring includes routine (i.e., weekly and monthly) sampling for general water quality (e.g., BOD, COD, TSS, TDS), semi-annual sampling for inorganics and metals, and annual sampling for priority pollutant VOCs, SVOCs, and pesticides.

3.7.3 Assessment of Existing Degree of Contamination

The results from the 1983 investigation are presented in Appendix K. As shown on the data summary provided in Appendix K, the results indicate levels of metals and oil and grease that could be expected in landfill leachate. The composite leachate sample also had PCBs detected at a concentration of less than 100 parts per billion.

The Appendix IX groundwater sampling conducted in 1998 for wells located in the vicinity of the CSL did not detect VOCs, SVOCs, PCBs or pesticides/herbicides. None of the four wells was identified as an Affected Well. As stated in the Appendix IX groundwater sampling report (Envirosafe Services of Ohio, Inc. July 1998 Appendix IX Sampling Report, March 9, 1999. Malcolm Pirnie, Inc.), there were multiple detections of metals in the analytical results of samples collected during the Appendix IX sampling events. However, as discussed in Section 4, the on-site data did not indicate that metals were a concern with respect to the quality of groundwater at the facility. In addition, as discussed in Section 4, monitoring conducted since the 1998 Appendix IX sampling has not confirmed the presence of constituents that would identify any of these wells as an Affected Well or indicate a potential release from this SWMU.

As shown in NPDES monitoring reports provided in Appendix Z, no VOCs, SVOCs, or pesticides have been detected in the stormwater runoff discharged from via Outfalls 001, 003 or 004, and concentrations of metals and inorganics have not been identified as a concern under the NPDES program.

3.7.4 Potential Migration Pathways and Potential Impacts on Human Health and the Environment

As discussed in Section 3.7.3, prior investigations and ongoing groundwater and stormwater monitoring have not indicated a release from this unit. The potential migration/exposure pathways for this unit would include the following, if a release were to occur:

- Leachate migration to shallow groundwater, with subsequent potential exposures via (1) migration to the potable bedrock aquifer, and/or (2) direct contact with shallow groundwater during excavation activities.
- Leachate release through the landfill cap resulting from short-circuiting within the cell with subsequent potential exposures via (1) direct contact with leachate and impacted cover soils, and/or (2) discharge to the Gradel Ditch, Driftmeyer Ditch, and Otter Creek via three stormwater outfalls.

However, because there is no evidence of release from this unit, no current exposures via these pathways have been identified, although these pathways do represent potential future pathways of concern.

3.7.5 Conclusions and Recommendations with Regard to SWMU 7

SWMU 7, the Central Sanitary Landfill, was operated from 1969 to 1983, although documentation regarding closure of this unit is not available. In addition, the natural site conditions (i.e., geology and hydrogeology), as discussed in Section 1.3, restrict the potential leachate migration from this unit and the movement of groundwater from the facility relative to the distance to the nearest possible receptor location. Finally, the unit's cover is monitored and maintained as part of ESOI's ongoing post-closure activities, and available monitoring data do not indicate that a release has occurred from this unit.

However, due to the limited data for this SWMU, this SWMU should be retained for further investigation during the RFI. In addition, an assessment of the existing cap integrity and its performance relative to reducing infiltration into the landfill should be conducted to determine if repairs to the cap are warranted.

3.8 SWMU 8 – OLD OIL POND #1 (SOUTH POND)

3.8.1 Description of SWMU

SWMU 8, the Old Oil Pond #1, is a closed pre-RCRA unit located immediately north of York Street, west of Cell I (SWMU 4). Based on available information, it is understood that at least part of the maintenance building (Building C, shown on Figure 3-1) was constructed on top of the Old Oil Pond. The USGS Quadrangle map (Oregon Ohio-Michigan dated 1965) (See Figure 1-1), and various aerial photographs (See Appendix D) show the extent of the Old Oil Pond to be approximately 2.6 acres. This oil recovery pond operated from the early 1960's through 1969. It was abandoned in the late 1960's by pumping the remaining oil into a newly constructed oil pond located immediately north of the old pond (SWMU 9 – New Oil Pond #2). The area was backfilled with assorted sanitary and municipal waste and covered with a clay cap. Copies of data and documents relevant to this SWMU are referenced in Appendix M.

3.8.2 Previous Investigations and Available Monitoring Data

In 1983, FCHA conducted investigations at SWMU 8. Two test borings, designated CS-3 and CS-4 were drilled to a depth of 36.5 feet bgs, and one boring, CS-4A was drilled to 15 feet bgs. Their locations are shown in Figure II-5 of the FCHA Report (July 1983) (See Appendix M for the boring logs and locations). In boring CS-3, cover was encountered to a depth of 10 feet and fill material was encountered at a depth of 10 to 16 feet bgs. This material was reported to be soaked with oil from 10 to 16 feet bgs. Beyond 16 feet bgs, an unsaturated grey clay with some silt and medium gravel extended to the termination of the boring. Boring CS-4 revealed fill material to a depth of 15 feet bgs. The interval between 11.5 feet and 15 feet was also reported to be soaked with oil. Below 15 feet bgs, the material was a grey clay with some silt and traces of gravel.

One objective of this investigation was to sample the oily leachate, if any, present within the unit. Oil soaked samples in each borehole provided evidence of some liquids. However, an insufficient amount of leachate for sample collection was presented in the boreholes CS-3 and CS-4 at the completion of each boring. Therefore, a third hole, boring CS-4a, was drilled to a depth of 15 feet bgs – the approximate base of the old pond – and the augers were left overnight to allow seepage of leachate into the borehole. The liquid level was then sufficient to collect a sample of leachate. The sample was collected using a 2-inch diameter PVC top loading bailer. After sampling, the bailer was disposed of in the borehole. All three borings were grouted with a mixture of bentonite and cement pumped into the holes to ground surface.

The leachate sample was analyzed for RCRA metal, cyanide, TOC, pH, oil and grease, and phenols. A leachate sample was also composited with a leachate sample from the NSL boring (see Section 3.6.2.1) and CSL boring (see Section 3.7.2) and analyzed for VOCs, SVOCs and pesticides. The boring logs and sample results are presented in Appendix M.

Monitoring of this SWMU includes visual inspections of the cover. In addition, monitoring wells located near this SWMU (all to the south) include shallow till wells M-21S, M-22S, M-23S, G-4S; deep till wells M-4D, M-5D, M-21D, M-22D; and bedrock wells R-18, R-19, R-20 (see Figure 4-1). As discussed in Section 4, as part of ESOI's effort to establish the baseline or current condition of groundwater quality, ESOI implemented a groundwater sampling program in 1998 which included sampling these eleven wells located near the Old Oil Pond for Appendix IX constituents. These wells are also monitored as part of the facility's groundwater monitoring program. A description and current status of the groundwater monitoring program is provided in

Section 4. A summary of the most recent four quarters of groundwater monitoring events for these wells is also provided in Section 4.

As required by its NPDES stormwater discharge permit, ESOI collects and analyzes stormwater discharges from Outfall 001 which receives stormwater runoff from this SWMU. This monitoring includes routine (i.e., weekly and monthly) sampling for general water quality (e.g., BOD, COD, TSS, TDS), semi-annual sampling for inorganics and metals, and annual sampling for priority pollutant VOCs, SVOCs, and pesticides.

In addition, waste oil has been observed seeping into the Building C floor drains (AOC 3) and Butz Crock (AOC 7) from this oil pond.

3.8.3 Assessment of Existing Degree of Contamination

The sample of leachate from the Old Oil Pond contained high metals concentrations and, as would be expected, was high (16.5%) in oil and grease content. PCBs were detected in the composite sample, but at a concentration of 92 parts per billion (ppb). The results are presented in Appendix M.

The Appendix IX groundwater sampling conducted in 1998 for wells located in the vicinity of the Old Oil Pond did not detect VOCs, SVOCs, PCBs or pesticides/herbicides. None of the eleven wells was identified as an Affected Well. As stated in the Appendix IX groundwater sampling report (Malcolm Pirnie, Inc., March 1999), there were multiple detections of metals in the analytical results of samples collected during the Appendix IX sampling events. However, as discussed in Section 4, the on-site data did not indicate that metals were a concern with respect to the quality of groundwater at the facility. In addition, as discussed in Section 4, monitoring conducted since the 1998 Appendix IX sampling has not confirmed the presence of constituents that would identify any of these wells as an Affected Well or indicate a potential release from this SWMU.

As shown in NPDES monitoring reports provided in Appendix Z, no VOCs, SVOCs, or pesticides have been detected in the stormwater runoff discharged from via Outfall 001, and concentrations of metals and inorganics have not been identified as a concern under the NPDES program.

3.8.4 Potential Migration Pathways and Potential Impacts on Human Health and the Environment

As discussed in Section 3.8.3, prior investigations and ongoing groundwater and stormwater monitoring have not identified a release from this unit. However, seepage of oil into Butz Crock and the Building C floor drains has been observed. The potential migration/exposure pathways for this unit would include the following:

- Leachate migration to shallow groundwater, with subsequent potential exposures via (1) migration to the potable bedrock aquifer, and/or (2) direct contact with shallow groundwater during excavation activities.
- Leachate release through the cap with subsequent potential exposures via (1) direct contact with oil and impacted cover soils, (2) releases through the cap into Building C floor drains (AOC 3) and/or (3) discharge to Otter Creek via the stormwater outfall.
- Direct contact with waste materials during on-site excavation within the limits of the SWMU.
- Direct contact with waste oil accumulating in Butz Crock (AOC 7).

No current human exposures associated with these potential exposure pathways have been identified. In particular, contaminated shallow groundwater has not contaminated the uppermost aquifer which is a considered a potential drinking water supply in the region. Further, the uppermost aquifer is not currently used for drinking water purposes at, or in the vicinity of, the ESOI facility. Potable water is supplied municipally by the City of Oregon with Lake Erie serving as the water supply. In addition, there is very little opportunity for contact with any shallow groundwater that exists at the ESOI facility due to the existing facility controls on conducting on-site excavation activities (including ESOI's health and safety program), and the actual limited availability of water in the shallow lacustrine and shallow till zones. Exposure to surface water and sediment in Otter Creek is considered infrequent given the current industrial land use in the area of the ESOI facility, including both ESOI and neighboring solid waste landfills, as described in Section 1. Finally, the potential direct contact with subsurface waste materials is limited to ESOI maintenance workers and contractors since existing fencing restricts access from the general public; exposures to on-site maintenance workers are controlled under ESOI's health and safety program.

Ecological exposures are anticipated to be minimal considering the current industrial land use in the area of the facility and the limited extent of the surrounding habitat area. On-site ecological exposures are also expected to be insignificant since this SWMU is located within an active area of the facility subject to routine vehicle traffic. These activities deter the development of habitat that could be attractive to ecological receptors.

3.8.5 Conclusions and Recommendations with Regard to SWMU 8

SWMU 8, the Old Oil Pond, was operated from the early 1960s to 1969 and is covered with a silty clay cap. In addition, the natural site conditions (i.e., geology and hydrogeology), as discussed in Section 1.3, restrict the potential leachate migration from this unit and the movement of groundwater from the facility. Finally, the unit's cover is monitored by ESOI, and available groundwater monitoring data do not indicate that a release has occurred from this unit.

However, due to the limited data for this SWMU, the proximity of this unit to the Toledo raw waterlines (AOC 1), and the seepage of oil into Butz Crock and the Building C floor drains, this SWMU should be retained for further investigation during the RFI.

3.9 SWMU 9 – NEW OIL POND #2 (NORTH POND)

3.9.1 Description of SWMU

SWMU 9, the New Oil Pond #2, is an approximately 1.6 acre pre-RCRA unit located in the center of ESOI's site, North of York Street, between the Central Sanitary Landfill (SWMU 7) and the Old Oil Pond (SWMU 8). This unit was used for waste oil recovery after the old pond (SWMU 8) was abandoned in the late 1960's; the unit was operated through 1980. The pond bottom was excavated into native clay soils. When operation of the unit ended, the waste oil sludge was solidified in place with cement kiln dust and the pond was closed in October 1988, as follows:

- In the early 1980's, efforts were made to reclaim oil from the pond material. By mid 1984, this work was stopped because it was shown to be impractical. At the time the oil reclaiming activities were halted, a program of landfarming the pond material was started. During the later part of 1984, material was removed from the pond and placed at FEI's landfarms.

- An effort to find a suitable solidification agent for the pond material was also started at the end of 1984. Various materials were considered and evaluated. It was determined that cement kiln dust was the best alternative and a plan for the insitu solidification of the pond material using kiln dust was developed. By October 1985, the waste oil sludge was solidified in place with cement kiln dust and capped with a clay and topsoil cover. The clay varies in thickness from approximately 2 feet to 8.5 feet. The thickness of the topsoil layer is approximately 1 foot. During May 1986, the area was final graded and vegetated.

During construction of the waterline easement trench (see Section 3.13, AOC 1 – Toledo Water Lines) to the south of this SWMU, waste was encountered. The waste consisted mostly of tomato pulp believed to be from the Central Sanitary Landfill (SWMU 7). Copies of data and documents relevant to this SWMU are referenced in Appendix N.

3.9.2 Previous Investigations and Available Monitoring Data

As discussed in Section 2, FCHA's 1983 investigation included physical (circumference and depth of the pond) and chemical characterization of SWMU 9. The depth measurements were made by lowering an 1800 lb. steel ball from a crane stationed on the bank of the lagoon. This weight was required to penetrate the thick sludge present in the lagoon. Movement of the crane was limited by an access problem around the lagoon. However, a sufficient amount of measurements were taken in two quadrants to estimate the depth of the lagoon. The circumference measurements and the location of depth measurements are shown on Figure II-6 of the FCHA Report (July 1983) (See Appendix N). The average depth of the pond in the southwestern quadrant was 15.3 feet, while the average depth of the southeastern quadrant was 11.8 feet. The estimated volume of material in the pond prior to closure was estimated at 35,000 cubic yards.

As part of FCHA's 1983 investigation, samples of the sludge, oil, and an aqueous layer were collected at a variety of points in the pond. A total of six composite samples were collected from the oil pond; each composite was of a particular phase present in the pond. Sample OL-1 was a sludge composite obtained directly off the steel ball at two locations in the southwest quadrant of the pond. Sample OL-2 was a sludge composite collected at two locations in the southeast quadrant of the pond. OL-3 was a sample of the oil film surface at the western bank of the lagoon. OL-4 was a sample of the aqueous layer beneath the oil film collected at the same location. OL-5 and OL-6 were collected from the platform in the northeast quadrant of the pond and represented an oil and aqueous layer, respectively (FCHA reported that sample OL-6 contained more oil than water). These six samples were analyzed for VOCs, SVOCs, RCRA metals, cyanide, flash point, pesticides and PCBs. The analytical results are presented in Section 3.9.3, below.

Monitoring and maintenance of this SWMU includes visual inspections of the cover and recovery of oil from pipes installed into the stabilized pond material. Recovered oils are separated into a liquid phase and a sludge phase; these materials are then analyzed for TCLP VOCs, SVOCs, metals, pesticides/herbicides PCBs, and RCRA hazardous waste characteristics.

As required by its NPDES stormwater discharge permit, ESOI collects and analyzes stormwater discharges from Outfalls 001 and 003 which receive stormwater runoff from this SWMU. This monitoring includes routine (i.e., weekly and monthly) sampling for general water quality (e.g., BOD, COD, TSS, TDS), semi-annual sampling for inorganics and metals, and annual sampling for priority pollutant VOCs, SVOCs, and pesticides.

There are no monitoring wells in the near vicinity of SWMU 9.

According to the water line monitoring reports, an oily sheen was detected in one of the monitoring sumps (Phase 3 east - 4N) beginning in 1991, and has been observed sporadically in subsequent events. According to the April 2000 Monitoring Report, the Raw Waterline Security Task Force determined that there was no imminent danger to the City's water lines (see Appendix Q).

3.9.3 Assessment of Existing Degree of Contamination

Based on the results of FCHA's sampling of the pond materials (provided in Appendix N), the primary constituents of the oil pond samples are polynuclear aromatic hydrocarbons (PAH's) typical of heavy oils. A high level N-Nitro-sodiphenylamine was also noted. This is a plasticizer, probably from the production of rubber. Detected VOCs included benzene and chlorinated hydrocarbons (e.g., 1,1,1-trichloroethane, trichloroethene, 1,1-DCA and methylene chloride). PCBs were detected in the oil samples at concentrations of 11 to 12.5 parts per million. The oil is not ignitable as defined by RCRA.

The results for recent analysis of recovered oil from this unit are provided in Appendix N. These results indicated that the materials are nonhazardous. The analysis also identified the presence of PCBs at a concentration of less than 50 mg/kg.

As shown in the NPDES monitoring reports provided in Appendix Z, no VOCs, SVOCs, or pesticides have been detected in the stormwater runoff discharged from via Outfalls 001 and 003, and concentrations of metals and inorganics have not been identified as a concern under the

NPDES program. However, an oil sheen has been observed in City of Toledo raw waterline monitoring trench (see AOC 1, Section 3.13).

3.9.4 Potential Migration Pathways and Potential Impact on Human Health and the Environment

As discussed in Section 3.9.3, prior investigations and ongoing stormwater monitoring have not identified a release from this unit although an oily sheen has been observed in the adjacent raw water line monitoring trench. The potential migration/exposure pathways for this unit include the following:

- Leachate migration to shallow groundwater, with subsequent potential exposures via (1) migration to the potable bedrock aquifer, and/or (2) direct contact with shallow groundwater during excavation activities.
- Leachate release through the cap with subsequent potential exposures via (1) direct contact with leachate and impacted cover soils, and/or (2) discharge to the Gradel Ditch and Otter Creek via two stormwater outfalls.
- Direct contact with waste materials during on-site excavation activities within the limits of this SWMU.

No current human exposures associated with these potential exposure pathways have been identified. In particular, contaminated shallow groundwater has not contaminated the uppermost aquifer which is a considered a potential drinking water supply in the region. Further, the uppermost aquifer is not currently used for drinking water purposes at, or in the vicinity of, the ESOI facility. Potable water is supplied municipally by the City of Oregon with Lake Erie serving as the water supply. In addition, there is very little opportunity for contact with any shallow groundwater that exists at the ESOI facility due to the existing facility controls on conducting on-site excavation activities (including ESOI's health and safety program), and the actual limited availability of water in the shallow lacustrine and shallow till zones. Exposure to surface water and sediment in Otter Creek is considered infrequent given the current industrial land use in the area of the ESOI facility, including both ESOI and neighboring solid waste landfills, as described in Section 1. Finally, the potential direct contact with subsurface waste materials is limited to ESOI maintenance workers and contractors since existing fencing restricts access from the general public; exposures to on-site maintenance workers are controlled under ESOI's health and safety program.

Ecological exposures are anticipated to be minimal considering the the current industrial land use in the area of the facility and the limited extent of the surrounding habitat area. On-site ecological exposures are also expected to be insignificant since the pond cover and surrounding area is maintained to minimize intrusions by animals that could damage the cover. These maintenance activities deter the development of habitat that could be attractive to ecological receptors.

3.9.5 Conclusions and Recommendations with Regard to SWMU 9

SWMU 9, the New Oil Pond, was operated from the late 1960s to 1980. The unit was closed by stabilizing the oil waste and installing a clay cap. In addition, the natural site conditions (i.e., geology and hydrogeology), as discussed in Section 1.3, restrict the potential leaching from this unit and the movement of groundwater from the facility. Finally, the unit's cover is monitored by ESOI, and available cover monitoring data do not indicate that a release has occurred from this unit. However, due to the limited data for this SWMU and the oil sheen observed in the adjacent raw water line monitoring trench, this SWMU should be retained for further investigation during the RFI.

3.10 SWMU 10 – ASH DISPOSAL AREA

3.10.1 Description of SWMU

During the late 1960's and through the 1970's FEI operated a Teepee Burner (SWMU 11) for burning selected (dry combustible material) solid waste and some liquid waste accepted at the facility. It was located north of Building C. Based on a review of the aerial photographs provided by the USEPA, the Teepee Burner was removed prior to 1980. The ash generated from the Teepee Burner was disposed in the Ash Disposal Area, an unregulated unit, which was located on the western side of the facility north of York Street. This disposal area, which overlaps with Cell G (SWMU 2) comprised a borrow pit that was used during the 1950's, 1960's and early 1970's as a source of soil for surrounding port development and highway construction. The approximate extent of ash disposal, based on interviews with site owners, reviews of aerial photographs and previous investigations, is approximately 375 feet by 375 feet.

Ash materials were removed from this SWMU in 1988 in preparation for the construction of Cell G (SWMU 2). During this work, the ash material was encountered at approximately 3 feet below the original surface and extended to a depth of approximately 17 feet in some areas. Approximately 123,000 cubic yards of ash material were excavated during construction of Cell G. In accordance with the *Revised Sampling and Analysis Plan for ESOI's Area G Excavation Project* (provided in Appendix O), the limits of ash removal were determined based on visual inspection during excavation. Post-excavation verification sampling was then conducted to confirm that all of the ash material was removed. The excavated material was also characterized for disposal purposes. Not all the ash was removed, only the areas where it encountered the footprint of G.

3.10.2 Previous Investigation

The 1983 FCHA investigation described in Section 2 included the drilling of two test borings within this SWMU (See Figure II-4 of the FCHA Report in Appendix O for boring logs and locations). These two borings (CS-1, CS-2) were completed to a depth of 31.5 feet below ground level (bgl). The upper 6.5 feet of boring CS-1 encountered a relative dry mixture of grey silty clay and assorted fill materials, including road gravel, ash, foam, wire, and cement. At approximately 6.5 feet bgl, an approximately 3.5 foot thick layer of ash mixed with assorted fill materials, including layers of saturated black ash, was detected. From 10 feet to 31.5 feet bgl, subsurface soil samples indicated the presence of a tight plastic grey clay with some silt which was reported to be the natural material underlying the site. This natural material was moist to dry beneath the perched saturated ash layer. Boring CS-2 encountered the ash layer between 6.5 and 9 feet bgl. Assorted fill materials were identified above the ash layer, while the tight, plastic, grey clay was evident from approximately 9 to 31.5 feet bgl. After drilling was completed, each hole was sealed with a mixture of cement and bentonite. This grout seal was introduced into the bottom of the borehole and filled the hole to ground surface. No samples were reported as being collected for laboratory analysis.

As indicated in Section 3.10.1, during the removal of the ash material as part of the Cell G construction, post-excavation verification sampling was conducted to determine if all of the ash material was removed. In addition, each load of excavated material was tested. These samples were analyzed for EP toxicity (metals and pesticides/herbicides), PCBs, and ignitability, corrosivity. The results of these analyses and a drawing showing the extent of ash removal are included in Appendix O. In addition, as described in Section 4, as part of the ESOI's effort to establish the baseline or current condition of groundwater quality, ESOI implemented a groundwater sampling in 1998 which included sampling 9 wells located near SWMU 10 for Appendix IX constituents (shallow till wells G-1S, G-2S, G-3S; deep till wells G-1D(A), G-2D(A), G-3D; deep sand wells G-9, G-11; and bedrock well R-2). The locations of these wells are presented on Figure 4-1. These 9 wells in the vicinity of SWMU 10 are monitored quarterly as part of the RCRA groundwater monitoring program. A description and current status of the groundwater monitoring program is provided in Section 4. A summary of the most recent four quarters of groundwater monitoring events for the 14 wells near Cell G is also provided in Section 4.

3.10.3 Assessment of Existing Degree of Contamination

Analytical data results from the ash sampling and post excavation sampling from within the Ash Disposal Area are included in Appendix O. Barium, cadmium, lead, mercury, 2,4-D, silver, copper and zinc were detected in the EP Toxicity analysis of the excavated materials. PCBs were also detected in the excavated material at concentrations up to 120 mg/kg. The only detected constituents in the post-excavation samples was barium, cadmium and mercury in the EP Toxicity analysis; PCBs were not detected in the post-excavation samples.

The Appendix IX groundwater sampling conducted in 1998 for wells located in the vicinity of SWMU 10 did not detect VOCs, SVOCs, PCBs or pesticides/herbicides. None of the 9 wells was identified as an Affected Well. Therefore, these constituents were determined to not be a concern with respect to the groundwater near SWMU 10. As stated in the Appendix IX groundwater sampling report (Malcolm Pirnie, Inc., March 1999), there were multiple detections of metals in the analytical results of samples collected during the Appendix IX sampling events. However, as discussed in Section 4, the on-site data did not indicate that metals were a concern with respect to the quality of groundwater at the facility.

As discussed in Section 4, monitoring conducted since the 1998 Appendix IX sampling has not detected constituents that would identify any of these wells as an Affected Well or indicate a potential release from SWMU 10. Thus all 9 wells remain in detection monitoring.

3.10.4 Potential Migration Pathways and Potential Impacts on Human Health and the Environment

As discussed in Section 3.10.3, prior investigations and ongoing groundwater monitoring have not identified a release from this unit. The potential migration/exposure pathways for this unit would include the following, if a release were to occur:

- Leachate migration to shallow groundwater, with subsequent potential exposures via (1) migration to the potable bedrock aquifer, and/or (2) direct contact with shallow groundwater during excavation activities, and/or (3) migration and discharge to Otter Creek located west of the unit.
- Direct contact with any ash deposits located outside the limits of Cell G during on-site excavation activities.

However, because there is no evidence of release from this unit, no current exposures via these pathways have been identified, although these pathways do represent potential future pathways of concern.

3.10.5 Conclusions and Recommendations with Regard to SWMU 10

SWMU 10, the Ash Disposal Area was removed during the construction of Cell G, with removal of ash material verified by post-excavation sampling. This removal and verification was conducted under Ohio EPA oversight. In addition, the natural site conditions (i.e., geology and hydrogeology), as discussed in Section 1.3, restrict the potential leaching from this unit and the movement of groundwater from the facility. Further, part of this SWMU overlaps with Cell G (SWMU 2) which was designed, permitted and closed in accordance with RCRA requirements. Finally, available monitoring data do not indicate that a release has occurred from this unit.

Given these circumstances, no further investigation is warranted for the portion of SWMU 10 that was removed before construction of Cell G and which was verified with post-excavation sampling.

However, due to the limited data for this SWMU outside the limits of the ash removal and Cell G construction, an investigation of any ash remaining beyond these limits should be included as part of the RFI.

3.11 SWMU 11 – FORMER TEEPEE BURNER

3.11.1 Description of SWMU

SWMU 11, the former Teepee Burner was a pre-RCRA unit located north of Building C, within the limits of the current Cell G. Based on the available aerial photographs (USEPA, 1997), this unit was installed in the mid to late 1960's, operated into the 1970's and was removed prior to 1980. There are no records pertaining to quantity or nature of materials combusted in the Teepee Burner. As discussed in Section 3.10, ash from this unit was disposed in the on-site Ash Disposal Area (SWMU 10).

3.11.2 Previous Investigations and Available Monitoring Data

No previous investigations of the former Teepee Burner have been identified.

3.11.3 Assessment of Existing Degree of Contamination

There is no available data associated with SWMU11. However, aerial photographs indicate that it was located within the limits of Cell G (SWMU 2).

3.11.4 Potential Migration Pathways and Potential Impacts to Human Health and the Environment

This SWMU was located within the limits of Cell G. Therefore, the potential migration/exposure pathways would be the same as for Cell G, as described in Section 3.2.4 if a release were to occur.

3.11.5 Conclusions and Recommendations with Regard to SWMU 11

Although this unit has been removed, and its former location is within the limits of SWMU 10 and existing Cell G where excavation of materials was conducted prior to cell construction, as requested by USEPA this unit will be assessed in conjunction with SWMU 10 during the current RFI.

3.12 SWMU 12 – FORMER BILL'S ROAD OIL OPERATION

3.12.1 Description of the SWMU

The former Bill's Road Oil Site, is a pre-RCRA unit located south of York Street in a portion of the facility currently occupied by the Stabilization/Containment Building. This portion of the existing facility was obtained by FEI (ESOI's predecessor company) in 1982. Bill's Road Oil was an oil recycling facility that consisted of two small aqueous lagoons and five storage tanks (two tanks adjacent to the aqueous lagoons and three tanks at the south end of the property adjacent to the railroad tracks). The FCHA Environmental and Engineering Assessment Report prepared in July 1983 indicates that the lagoons held liquids, but the tanks were found to be empty. It was reported that the "east" lagoon, with an average depth of 3.5 feet, contained an estimated 120,000 gallons. The liquid in the eastern lagoon was primarily rainwater with a thin film of oil. The "west" lagoon was slightly larger, with an average depth of approximately 6.5

feet and a total volume of 345,000 gallons. This lagoon was also reported to contain a larger percentage of oil sludge and tar products.

Historical aerial photographs indicate that during the period of 1982 to 1984, the liquid from both the lagoons was removed. During the period of 1987-1988, a clean-up of the two aqueous lagoons, the storage tanks, and the adjacent areas was conducted by ESOI. Additionally, during this clean-up action, the two tanks adjacent to the aqueous lagoons were disassembled, and the area which contained three tanks at the south end of the property was converted into vehicle storage/maintenance sheds.

From the time that the clean-up was completed in 1987/1988 until the start of Cell "M" construction, this area was used for storage of vehicles, including heavy construction equipment. In February 1992, Cell M landfill Phase I construction was initiated. Beginning in June 1992, the Bill's Road Oil area was used to stockpile and condition the clay for the Cell M clay liners. Also, in June 1992, activities for the construction of the Stabilization/Containment building (SCB) began in this area. Geotechnical soil borings installed in this area as part of the designs studies for the SCB indicated traces of waste materials, and, during the remainder of 1992 until early 1993 work plans for the remediation of these materials were submitted to and subsequently approved by Ohio EPA. In July 1993, removal and stockpiling of overburden materials was conducted to prepare for the necessary soil remediation work.

Based upon the information reported from the geotechnical soil borings and the soil borings installed by MEC in June 1992, a sampling and analysis plan was submitted to Ohio EPA to address the petroleum compounds identified within this area. Based upon Ohio EPA comments on this sampling and analysis plan, the plan was revised and re-submitted to Ohio EPA. The Revised Sampling and Analysis Plan proposed the excavation of petroleum contaminated soils and the collection of post-excavation samples to confirm that the waste materials had been adequately removed.

In August 1993, the excavation of the waste materials within the SCB area was conducted. This work included the removal of approximately 750 cubic yards of soil that were determined to be potentially impacted by prior waste management activities in this area. These soils were disposed into Cell M and BFI's Hagman Road Landfill in Erie Township, Michigan. Finally, in October 1993 backfilling of the excavation within the remediation area was conducted. This allowed for the resumption of excavation and foundation construction for the SCB. The sampling and analysis associated with this remedial action was documented to Ohio EPA in a September 2, 1993 report. A letter from Ohio EPA dated September 14, 1993 indicates that the remedial action was completed in accordance with the approved Revised Sampling and Analysis Plan. Relevant information regarding this SWMU is provided in Appendix P.

A large portion of this SWMU is now covered by the operating SCB unit.

3.12.2 Previous Investigations and Available Monitoring Data

As indicated in Section 3.12.1, investigation of this area was conducted as part the FCHA study in 1983 and as part of preconstruction activities for the SCB. The FCHA investigation included the collection of aqueous samples from the two lagoons. The aqueous samples were composited and the composite sample was analyzed for VOCs, SVOCs, pesticides, PCBs, RCRA metals, and cyanide. The results for this sampling is provided in Appendix P.

The remediation activities conducted by ESOI in this SWMU included the collection and analysis of post-excavation soil samples. In addition, background soil samples were collected in the surrounding area to gather data to be used in the assessment of the post-excavation sampling results. These samples were analyzed for D039 and D040 hazardous waste constituents (PCE and TCE, respectively), benzene, metals, PCBs, total petroleum hydrocarbons (TPH). The results for this sampling is provided in Appendix P.

In October 1996, ESOI submitted results of an investigation regarding liquid accumulation observed periodically during regular inspections between the secondary HDPE liner and the secondary recompacted clay liner. The "bubble" liquid was drained and sampled several times between the fall of 1994 and September 1996. Sample analysis indicated that low levels of benzene, ethylbenzene, toluene, trichloroethene, and xylenes were present in the bubble liquid.

Surficial samples were also collected from the recompacted clay beneath the secondary liner and from the base of the sideslope near the bubble location, as well as from the area of the former waste unloading pad/access ramp, the current clay stock pile area, and the former location of Bill's Road Oil facility, to investigate the possibility of contamination to surface water runoff from these sources. While some constituents were detected at low concentrations in the secondary recompacted clay, the analytical results of samples collected from the waste unloading pad and clay stock pile did not provide a correlation with those constituents detected in the bubble liquid. However, the former Bill's Road Oil facility was identified as a potential source of contamination to surface water runoff.

In response to a request from the Ohio EPA, additional sampling and analysis was conducted in 1997 to identify or eliminate potential sources of the bubble liquid. The following six potential source areas were identified and sampled three times for comparison to the bubble liquid:

- Groundwater monitoring wells – MB-1S, MB-2S, MB-1D, MB-2D, MB-1R
- Primary leachate collection system
- Secondary leachate collection system
- Surface water retention pond – Area M pond
- Consolidation water from clay samples

This additional investigation regarding the source of contamination concluded that the minor constituent concentrations in the bubble liquid were the result of historic activities related to the construction of Cell M and the adjacent former Bill's Road Oil area. Information on this investigation is provided in Appendix P.

In addition, monitoring wells located near this SWMU include shallow till wells M-6S, M-16S, M-17S, M-18S, M-19S; deep till wells M-6D, M-16D, M-17D, M-18D, M-19D; and bedrock wells R-6, R-14 (see Figure 4-1). As discussed in Section 4, as part of ESOI's effort to establish the baseline or current condition of groundwater quality, ESOI implemented a groundwater sampling program in 1998 which included sampling these 12 wells located near the SWMU 12 for Appendix IX constituents. These wells are also monitored as part of the facility's groundwater monitored program. A description and current status of the groundwater monitoring program is provided in Section 4. A summary of the most recent four quarters of groundwater monitoring events for these wells is also provided in Section 4.

3.12.3 Assessment of Existing Degree of Contamination

The composite sample of liquids from the lagoons contained PCBs at a concentration of 13 ppm. With the exception of bis(2-ethylhexyl)phthalate, methylene chloride and toluene, no other organics were detected. The results are presented in Appendix P.

The final post-excavation soil samples collected during the remediation of this unit in 1993 did not detect PCE, TCE, benzene or PCBs. Low concentrations of TPH and metals were detected; these concentrations were deemed to be within the background levels established for the remediation project. The results for the post-excavation and background samples are presented in Appendix P.

The Appendix IX groundwater sampling conducted in 1998 for wells located in the vicinity of the SWMU 12 did not detect VOCs, SVOCs, PCBs or pesticides/herbicides. None of the 12 wells was identified as an Affected Well. As stated in the Appendix IX groundwater sampling report (Envirosafe Services of Ohio, Inc. July 1998 Appendix IX Sampling Report, March 9, 1999. Malcolm Pirnie, Inc.), there were multiple detections of metals in the analytical results of samples collected during the Appendix IX sampling events. However, as discussed in Section 4, the on-site data did not indicate that metals were a concern with respect to the quality of groundwater at the facility. In addition, as discussed in Section 4, monitoring conducted since the 1998 Appendix IX sampling has not confirmed the presence of constituents that would identify any of these wells as an Affected Well or indicate a potential release from this SWMU.

3.12.4 Potential Migration Pathways and Potential Impacts on Human Health and the Environment

As discussed in Section 3.12.3, post-excavation sampling for the selected indicator parameters was performed. None of the organic indicator parameters were detected. In addition, ongoing groundwater monitoring has not identified a release from this unit. Finally, a large portion of this former unit is now covered by the operating SCB. The potential migration/exposure pathways for this unit would include the following, if a release were to occur:

- Leachate migration to shallow groundwater, with subsequent potential exposures via (1) migration to the potable bedrock aquifer, and/or (2) direct contact with shallow groundwater during excavation activities, and/or (3) migration and discharge to Otter Creek located west of the unit.
- Direct contact with any residual waste deposits located outside the limits of SCB during on-site excavation activities.

However, because there is no evidence of release from this unit, no current exposures via these pathways have been identified, although these pathways do represent potential future pathways of concern.

3.12.5 Conclusions and Recommendations with Regard to SWMU 12

SWMU 12, Bill's Road Oil, was operated prior to 1983. Cleanup of this unit was conducted in 1987/1988 and 1993; in addition, the natural site conditions (i.e., geology and hydrogeology), as discussed in Section 1.3, restrict the potential leaching from this unit and the movement of groundwater from the facility. Ongoing groundwater monitoring in the area of this SWMU has also not detected a release from this unit. Finally, a large portion of this unit is currently covered by the active SCB. Therefore, consistent with permit condition VI.C.3, this SWMU will be investigated in conjunction with the RCRA closure of SWMU 15 (the SCB). However, as requested by USEPA, shallow groundwater in the vicinity of this unit will be resampled during the RFI.

3.13 AOC 1 TOLEDO WATER LINES

3.13.1 Description of AOC

AOC 1, the Toledo Water Lines, consists of two low-pressure raw water transmission lines that bisect the facility in an east/west direction north of York Street. These lines carry raw Lake Erie water to the city of Toledo Collins Park Water Treatment Plant. One of the transmission lines is a 78 inch, bituminous coated steel pipe was constructed in 1939-1940. It was installed at a depth ranging from 11 to 21 ft bgs. Backfilling was accomplished with "selected clay", compacted to 24 inches above the top of the pipe.[5] In 1973-1974 this line was improved by adding, a ½ inch thick cement grout lining to the intercore of the pipe. The interior of this line was inspected in 1984 and determined to be in good condition.

The second line, a 60-inch steel encased prestressed concrete pipe was installed in 1967. It was installed at a depth ranging from 9 to 18 ft bgs. During the early 1960's, the easements for the second line were secured and it was determined by the City of Toledo, that waste disposal had occurred in the area of the new easement; as discussed in Section 3.9, waste materials from a cannery (waste tomato skin and pulp) were encountered. Installation specifics for this line required that any waste material found would be removed from the excavation and hauled away for off-site disposal, and clean soil would be used for backfill.

The easement in which these two lines are located ranges from 80 to 105 feet in width, leaving the outside edges of the lines 7 to 22 feet from the easement. In 1983, the City of Toledo began negotiating with the owner of FEI to obtain safeguards pertaining to the water lines. These negotiations resulted in the March 22, 1984, Fondessy Enterprises, Inc. - City of Toledo Low Pressure Raw Water Line Security Agreement. The security agreement addressed (1) waste area locations, including setbacks for all regulated waste areas, (2) survey and monument installation,

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[5] Independent Technical Evaluation of the Waterlines Security Agreement for City of Toledo, Ohio, Draft Report, by Woodward-Clyde Consultants, Chicago, Illinois, January 10, 1986.

(3) waste area design and construction, (4) monitoring systems, (5) site inspection, and (6) termination of the agreement. A copy of this agreement is included in Appendix Q.

Perhaps the most significant portion of the agreement resulted in the installation of monitoring trenches along both sides of the water lines midway between the waste areas and the water lines. Each trench was installed at least one foot below the depth of the adjacent water line and is approximately 2.5 feet wide. Trenches are sloped at one percent grade with collection sumps at 200 foot intervals. According to the 1986 Hazardous Waste Groundwater Task Force Evaluation of Fondessy Enterprises , Inc. Oregon, Ohio, the trench along the north side of the waterlines was backfilled with gravel to a level of 2 feet from the surface and then was sealed with recompacted blue clay to prevent infiltration of surface water. The trench on the south side of the waterlines was backfilled with gravel up to 4.5 feet from the surface and was also sealed with recompacted blue clay to prevent infiltration of surface water. A 4-inch slotted polyethylene flex hose is located at the bottom of each trench to enhance collection of any liquids. These trenches were installed in various phases from 1984 to 1987.

Copies of documents relevant to this AOC are referenced in Appendix Q.

3.13.2 Previous Investigations and Available Monitoring Data

The monitoring trenches required by the Low Pressure Raw Water Line Security Agreement were installed in various phases from 1984 to 1987. The sumps in the six trenches are required to be inspected for the presence of liquids on at least a monthly basis. Currently, an individualized schedule is maintained for the inspection of each trench. Each trench is inspected at least once per week. If liquid is present, the trench is pumped. These inspections typically indicate a presence of liquid. The inspection includes a review of disposal cell boundaries, monitoring trench cap, water line easement, easement markers, collection sumps, and record keeping. Any liquid collected in the sumps is analyzed quarterly for the indicator parameters specified in the Low Pressure Raw Water Line Security Agreement (e.g., pH, specific conductance, TOX, TOC, oil & grease, sulfates, chlorides and redox). Water line monitoring reports for the years 1986 to

1995 and 1999, and analytical data from quarterly monitoring conducted in 1999 are included in Appendix Q.

As part of the installation of 3 of the monitoring trenches (Phase 3, 4 and 5 monitoring trenches), soil samples were collected and analyzed for EP Toxicity metals, VOCs, PCBs; a copy of ESOI's August 31, 1987 transmittal of this data to Ohio EPA is provided in Appendix Q.

In addition to these activities, in 1989 the Ohio EPA Division of Public Drinking Water conducted an evaluation of the integrity and safety of the raw water lines. A copy of this report is provided in Appendix Q.

Toledo Environmental Services conducts, quarterly inspections of the water line. No water line integrity concerns have been raised as a result of these inspections.

3.13.3 Assessment of Existing Degree of Contamination

Data for soil samples collected by ESOI during the installation of three of the Phase 3, 4 and 5 monitoring trenches monitoring trenches is provided in Appendix Q. All of the organics and most of the inorganics were reported as not detected in these samples.

According to the water line monitoring reports, an oily sheen was detected in one of the monitoring sumps (Phase 3 east – 4N) beginning in 1991, and has been observed sporadically in subsequent events. In addition, the monitoring reports indicate that testing of liquids at three of the sumps (Phase 3 east - 4N, Phase 3 west - 5N and Phase 5 east - 6N) have also sporadically detected the presence of benzene, xylenes and toluene in the monitoring trench waters. The Phase 3 and 5 trenches are located between the Old Oil Pond (SWMU 8) and the New Oil Pond (SWMU 9). According to the November 1996 Monitoring Report, the Raw Waterline Security Task Force determined that there was no imminent danger to the City's waterlines.

3.13.4 Potential Migration Pathways and Potential Impacts to Human Health and the Environment

The section of the Toledo raw water line that crosses the ESOI facility (AOC 1) is monitored in accordance with the City of Toledo waterline agreement and the conditions of the ESOI's State RCRA Part B Permit. As discussed in Section 3.13.3, monitoring of liquids in the monitoring trenches adjacent to the raw water line indicate that a potential release into this AOC from neighboring SWMU 9 may have occurred. The potential migration/exposure pathways for this AOC are:

- Infiltration into the raw water line trench bedding;
- Direct contact with contaminated soils and/or liquids within the waterline easement during excavation activities.

No current exposures associated with these potential pathways have been identified. Any release into AOC 1 from the facility is designed to be detected and intercepted by the trenches. Since the waterlines are under pressure, any breaks in the line would result in raw water being released into the trenches. Therefore, the potential for infiltration into the raw water line from releases into this AOC is considered highly unlikely. In fact, the 1989 Ohio EPA Division of Public Water Supply evaluation concluded that the protective measures undertaken by the City of Toledo and ESOI provide adequate protection to the water lines to prevent any immediate threat to public health and safety. Further, the potential for direct contact with soils and liquids in this AOC is limited to ESOI maintenance workers and contractors since existing fencing restricts access from the general public; exposures to on-site maintenance workers are controlled under ESOI's health and safety program.

3.13.5 Conclusions and Recommendations with Regard to AOC 1

Since this AOC is monitored within the auspices of the Low Pressure Raw Water Line Security Agreement between ESOI and the City of Toledo, and the City of Toledo has determined that there is no threat to the raw water line, no further action is warranted for this AOC as a source of contamination. As indicated in Sections 3.8 and 3.9, further investigation of potential releases into this AOC from neighboring SWMUs 8 and 9, respectively, is recommended. In addition, an assessment of the potential for migration of constituents along the waterline easement is recommended.

3.14 AOC 2 – TRUCK SCALE

3.14.1 Description of AOC 2

AOC 2 is the facility's active truck scale located just northeast of the facility offices and south of Landfill Cell G (SWMU 2). These scales are used to weigh the quantities of wastes trucked into the site prior to disposal. These scales are above grade and inspected on a routine basis for leaks or spills. Shipments of waste arriving at ESOI have occasionally been noted to drip liquids from the transport container. The point of discovery is generally at the Truck Scale area (AOC 2). Plastic swimming pools are used to collect liquids until the truck is temporarily repaired prior to off-loading. Any material remaining at the Scale as a result of this type of incident is cleaned, either manually or by powerwasher. Small amounts of waste may also be spilled at the Scale area due to sampling activities; specifically, waste is occasionally released from truck surfaces as the cover tarps are rolled back on the inbound truck. All spills are remediated in compliance with appropriate requirements of the facility's Contingency Plan or Standard Operating Procedures for Minor Spills. In addition, Ohio EPA inspectors are on-site to ensure compliance with the procedures. The Scale is inspected for spills and other compliance issues on a daily basis.

3.14.2 Previous Investigations and Available Monitoring Data

On May 15, 1995, ESOI documented a potential release from a collection drum located at AOC 2. This 55-gallon collection drum had been installed by ESOI to accumulate rainwater that collects in a sampling tool storage trough located on its Scale Platform. The tools are used for collecting samples of wastes from incoming trucks, and are stored in a metal trough when not in use. This trough is connected to the drum by a hose and a valve. Rainwater falling on the tools or inside the trough is normally drained to this collection drum along with small amounts of the waste materials which may adhere to the shovels and other tools. The collection drum sustained freeze damage during the winter of 1994-1995, causing a small hole in the seam on the bottom of the drum. Based on rainfall records for the ESOI site over that time period of July 1, 1994 through May 15, 1995, ESOI estimated the maximum amount of water that could have been introduced into the drum was 122 gallons. Since some of the rainwater evaporates while it is in the shovel trough, the actual amount of water that was introduced into the drum during this period was most likely less than 122 gallons.

Following the detection of the damaged collection drum, in consultation with Ohio EPA, ESOI reviewed its records of waste receipts for the time period from July 1, 1994 through May 15, 1995 and determined that the most prevalent EPA HW Numbers sampled at the Truck Scale were D008, D006 and K061. Accordingly, soil samples were collected near the collection drum, in the probable path of potential rainwater runoff and in several unrelated areas. In addition, a sample of the accumulated rainwater was also collected. The samples were analyzed for the metal constituents listed for the three EPA HW Numbers noted above. These sampling activities were conducted under Ohio EPA oversight.

Monitoring of this unit is conducted as part of routine facility inspections. In addition, as described in Section 4, as part of the ESOI's effort to establish the baseline or current condition of groundwater quality, ESOI implemented a groundwater sampling plan in 1998 which included sampling 4 wells located near this AOC for Appendix IX constituents (shallow till wells G-2S, G-3S; deep till wells G-2D(A), G-3D). The locations of these wells are presented on Figure 4-1. These 4 wells are also monitored quarterly as part of the RCRA groundwater monitoring program. A description and current status of the groundwater monitoring program is provided in Section 4. A summary of the most recent four quarters of groundwater monitoring events for the 14 wells near Cell G is also provided in Section 4.

In addition, as required by its NPDES stormwater discharge permit, ESOI collects and analyzes stormwater discharges from Outfall 001 via the stormwater detention basin located at the southwest corner of Cell G. This outfall receives stormwater runoff from Cell G and portions of the Central Sanitary Landfill (SWMU 7) the office and laboratory parking lots and the access roadway, which includes this AOC. This monitoring includes routine (i.e., weekly and monthly) sampling for general water quality (e.g., BOD, COD, TSS, TDS), semi-annual sampling for inorganics and metals, and annual sampling for priority pollutant VOCs, SVOCs, and pesticides.

3.14.3 Assessment of Existing Degree of Contamination

The analytical results for soil sampling conducted after the damage to the collection drum was identified confirmed that the level of selected indicator constituents were below the levels specified in 40 CFR 268.48, the Universal Treatment Standards for all of the UTS metals. Analysis results for soils from the areas unrelated to the drum collection area were similar to the analysis results for the area directly below the drum. An analysis of a then-current accumulation of rainwater showed low levels of metals, well below RCRA toxicity characteristic (TC) levels and UTS limits, and no detectable TC organic constituents. It was therefore concluded that no adverse impact to the area soils resulted from any leakage which may have occurred during the period the collection drum was damaged. Documentation of these activities is provided in Appendix DD.

The Appendix IX groundwater sampling conducted in 1998 for wells located in the vicinity of this AOC did not detect VOCs, SVOCs, PCBs or pesticides/herbicides. Therefore, none of the 4 wells were identified as an Affected Well and none of these constituents were determined to be a concern with respect to the groundwater near the Truck Scale. As stated in the Appendix IX groundwater sampling report (Malcolm Pirnie, Inc., March 1999), there were multiple detections of metals in the analytical results of samples collected during the Appendix IX sampling events. However, as discussed in Section 4, the on-site data did not indicate that metals were a concern with respect to the quality of groundwater at the facility.

As discussed in Section 4, monitoring conducted since the 1998 Appendix IX sampling has not detected constituents that would identify any of the wells G-2S, G-3S, G-2D(A), and G-3D as

Affected Wells or indicate a potential release from the Truck Scale. Thus all 4 wells remain in detection monitoring.

As shown in NPDES monitoring reports provided in Appendix Z, no VOCs, SVOCs, or pesticides have been detected in the stormwater runoff discharged via Outfall 001 and with the exception of TSS, concentrations of metals and inorganics have not been identified as a concern under the NPDES program.

3.14.4 Potential Migration Pathways and Potential Impacts to Human Health and the Environment

Soil sampling data from the investigation of 1994-1995 incident and ongoing monitoring have identified no observed releases from this AOC. The potential migration/exposure pathway for this AOC would include the following, if a release were to occur:

- Migration to shallow groundwater, with subsequent potential exposures via (1) migration to the potable bedrock aquifer, and/or (2) migration and discharge to Otter Creek located west of the unit, and/or (3) direct contact with shallow groundwater during excavation activities.
- Direct contact with impacted soils; and
- Runoff to Outfall 001 with subsequent discharge to Otter Creek.

However, because there is no evidence of release from this unit, no current exposures via these pathways have been identified, although these pathways do represent potential future pathways of concern.

3.14.5 Conclusions and Recommendations with Regard to AOC 2

AOC 2 is the active Truck Scale area located north of York Street. This area is routinely inspected for potential releases. Since this area is operated in accordance with ESOI's RCRA Part B Permit, and there is no evidence of release from this area subsequent to the investigation of the damaged collection drum, no further action appears warranted with regard to this AOC. However, at the request of USEPA, ESOI will retain this AOC in the RFI for surficial soil sampling to evaluate past releases from this AOC. Monitoring of this area will continue in accordance with ESOI's ongoing programs.

3.15 AOC 3 – BUILDING "C" EQUIPMENT MAINTENANCE AREA

3.15.1 Description of AOC 3

AOC 3, Building C, is located north of York Street and is used for the storage and maintenance of site equipment as well as office space. This area coincides with the footprint of the Old Oil Pond (SWMU 8). Potential environmental concerns associated with this AOC may be related to the possible spillage of materials carried in by facility vehicles.

3.15.2 Previous Investigations and Available Monitoring Data

No previous investigations are known to have been conducted at AOC 3. One monitoring well is located near AOC 3. Well G-4S, a shallow till well, routinely monitored as part of the RCRA groundwater monitoring program. In addition, as discussed in Section 4, as part of ESOI's effort to establish the baseline or current condition of groundwater quality, ESOI implemented a groundwater sampling program in 1998 which included sampling this well for Appendix IX constituents. A description and current status of the groundwater monitoring program is provided in Section 4. A summary of the most recent four quarters of groundwater monitoring events for these wells is also provided in Section 4.

In addition, as required by its NPDES stormwater discharge permit, ESOI collects and analyzes stormwater discharges from Outfall 001 which receives stormwater runoff from the area surrounding Building C. This monitoring includes routine (i.e., weekly and monthly) sampling for general water quality (e.g., BOD, COD, TSS, TDS), semi-annual sampling for inorganics and metals, and annual sampling for priority pollutant VOCs, SVOCs, and pesticides.

3.15.3 Assessment of Existing Degree of Contamination

The Appendix IX groundwater sampling conducted in 1998 for the well located in the vicinity of AOC 3 did not detect VOCs, SVOCs, PCBs or pesticides/herbicides. Therefore, this well was not identified as an Affected Well and none of these constituents were determined to be a concern with respect to the groundwater near Building C. As stated in the Appendix IX groundwater sampling report (Malcolm Pirnie, Inc., March 1999), there were multiple detections of metals in the analytical results of samples collected during the Appendix IX sampling events. However, as discussed in Section 4, the on-site data did not indicate that metals were a concern with respect to the quality of groundwater at the facility.

As discussed in Section 4, monitoring conducted since the 1998 Appendix IX sampling has not detected constituents that would identify well G-4S as an Affected Well or indicate a potential release from AOC 3. Thus this well remains in detection monitoring.

As shown in NPDES monitoring reports provided in Appendix Z, no VOCs, SVOCs, or pesticides have been detected in the stormwater runoff discharged from this area via Outfall 001 and with the exception of TSS, concentrations of metals and inorganics have not been identified as a concern under the NPDES program.

However, occasional infiltration of oil into the building floor drains is noted by ESOI. Given the building location, it is believed that the source of the oil is the underlying oil pond (SWMU 8).

3.15.4 Potential Migration Pathways and Potential Impacts to Human Health and the Environment

ESOI's ongoing monitoring have identified no observed releases from this AOC. The potential migration/exposure pathway for this AOC would include the following, if a release were to occur:

- Migration to shallow groundwater, with subsequent potential exposures via (1) migration to the potable bedrock aquifer, and/ or (2) direct contact with shallow groundwater during excavation activities.
- Direct contact with impacted soils; and
- Runoff to Outfall 001 with subsequent discharge to discharge to Otter Creek.

However, because there is no evidence of release from this unit, no current exposures via these pathways have been identified, although these pathways do represent potential future pathways of concern.

3.15.5 Conclusions and Recommendations with Regard to AOC 3

AOC 3 is an active maintenance and office building located north of York Street. There have been no reported releases from this AOC. However, since there is limited data available for AOC 3 and oil infiltration has been noted in floor drains, it is recommended that AOC 3 be retained for investigation as part of the RFI. Because AOC 3 is within the limits of SWMU 8, this AOC can be investigated as part of the recommended investigation of SWMU 8.

3.16 AOC 4 – BUILDING "C" SEPTIC TANK AND LEACH FIELD

3.16.1 Description of AOC 4

Wastewater and other liquids disposed in Building C (AOC 3) are reported to have drained to a septic tank and leach field (identified as AOC 4). The leach field was located west of Building C (as shown on Figure 1-2) and was partially removed during the construction of the water line monitoring trenches in May 1987. The septic tank was removed in April 1989 concurrent with the installation of a 4,000-gallon capacity, double-wall fiberglass holding tank, which remains in existence. The septic tank was also located west of Building C and is shown on Figure 1-2.

3.16.2 Previous Investigations and Available Monitoring Data

No previous investigations are known to have been conducted at AOC 4. One monitoring well is located near AOC 4. Well G-4S, a shallow till well, is routinely monitored as part of the RCRA groundwater monitoring program. In addition, as discussed in Section 4, as part of ESOI's effort to establish the baseline or current condition of groundwater quality, ESOI implemented a groundwater sampling program in 1998 which included sampling this well for Appendix IX constituents. A description and current status of the groundwater monitoring program is provided in Section 4. A summary of the most recent four quarters of groundwater monitoring events for this well is also provided in Section 4.

3.16.3 Assessment of Existing Degree of Contamination

The Appendix IX groundwater sampling conducted in 1998 for the well located in the vicinity of AOC 4 did not detect VOCs, SVOCs, PCBs or pesticides/herbicides. Therefore, this well was not identified as an Affected Well and none of these constituents were determined to be a concern with respect to the groundwater near the former septic tank and leachfield. As stated in the Appendix IX groundwater sampling report (Envirosafe Services of Ohio, Inc. July 1998 Appendix IX Sampling Report, March 9, 1999. Malcolm Pirnie, Inc.), there were multiple detections of metals in the analytical results of samples collected during the Appendix IX sampling events. However, as discussed in Section 4, the on-site data did not indicate that metals were a concern with respect to the quality of groundwater at the facility.

As discussed in Section 4, monitoring conducted since the 1998 Appendix IX sampling has not detected constituents that would identify well G-4S as an Affected Well or indicate a potential release from AOC 4. Thus this well remains in detection monitoring.

3.16.4 Potential Migration Pathways and Potential Impacts to Human Health and the Environment

There are no known releases from the former septic tank and leachfield associated with Building C (AOC 3). If a release would occur from a subsurface tank, the potential migration/exposure pathways associated with a subsurface release may include the following:

- Migration to shallow groundwater, with subsequent potential exposures via (1) migration to the potable bedrock aquifer, and/or (2) direct contact with shallow groundwater during excavation activities; and
- Direct contact with impacted soils during excavation activities.

Due to the lack of information regarding this AOC, it is unknown whether a release has occurred from AOC 4.

3.16.5 Conclusions and Recommendations with Regard to AOC 4

AOC 4 is the former septic tank and leachfield associated with Building C. There is limited available data with respect to the AOC 4. Therefore, it is recommended that AOC 4 be retained for further investigation under the RFI. Because AOC 4 is within the limits of SWMU 8, this AOC can be investigated as part of the recommended investigation of SWMU 8.

3.17 AOC 5 – DECONTAMINATION BUILDING

3.17.1 Description of AOC 5

This AOC is located at the northeast corner of SWMU 8 (Old Oil Pond). For a short period of time, Cell G and Phase 1 of Cell M were operated simultaneously. During this period, construction of the SCB and its decontamination area were completed and became operational. Both the new and old decontamination areas were utilized until operations in Cell G ceased. Use of AOC 5 ceased when operations in Cell G ceased. Decontamination water generated in this area was collected in an underground storage tank. The decontamination underground storage tank, as well as another wastewater underground storage tank remain in this area.

No previous investigations are known to have been conducted at AOC 5.

3.17.2 Assessment of Existing Degree of Contamination

No monitoring data are known to be available for AOC 5.

3.17.3 Potential Migration Pathways and Potential Impacts to Human Health and the Environment

There are no known releases from the decontamination operations and underground storage tanks at AOC 5. If a release would occur from decontamination operations or from a subsurface tank, the potential migration/exposure pathways associated with a release may include the following:

- Migration to shallow groundwater, with subsequent potential exposures via (1) migration to the potable bedrock aquifer, and/or (2) direct contact with shallow groundwater during excavation activities;
- Runoff and subsequent discharge to Otter Creek via Outfall 001; and
- Direct contact with impacted surface soils, and with subsurface soils during excavation activities.

Due to the lack of information regarding this AOC, it is unknown whether a release has occurred from AOC 5.

3.17.4 Conclusions and Recommendations with Regard to AOC 5

AOC 5 is the former decontamination area and associated underground storage tanks. There is limited available data with respect to AOC 5. Therefore, it is recommended that AOC 5 be retained for further investigation under the RFI. Because AOC 5 is within the limits of SWMU 8, this AOC can be investigated as part of the recommended investigation of SWMU 8.

3.18 AOC 6 – OILY WASTE ABOVEGROUND STORAGE TANKS

3.18.1 Description of AOC

AOC 6 is the set of six Oily Waste Above Ground Storage Tanks located at the southeast corner of the CSL (SWMU 7), which were erected and placed into operation by FEI in approximately 1969 to 1970 (no records are available). Tank size information is presented in Appendix R. All tanks have manways on the top or side which allow access for steam wash decontamination. Ancillary equipment consist of above ground, exposed pipes and valves. Runoff from this tank area is prevented by a soil berm that surrounds this area; stormwater falling within the bermed area is removed and managed with the facilities leachate.

The tanks were used through 1983 for storage of various non-hazardous waste liquids resulting from contracted tanks cleaning and/or spill responses. These materials were primarily refinery products such as crude oil tank cleanings, water with low levels of gasoline, and oils. The materials were then removed for recycling, treatment, or disposal.

After 1983, one of the tanks was used for waste oil storage. The remaining tanks (S-6, S-7 and S-8) were used to store excess leachate, which collected in the operating secure cell in the northwestern portion of the property. The leachate was stored until its suitability for co-disposal is determined. The leachate was co-disposed with an absorbent material to decrease the potential for leachate generation.

The storage tanks were not used for storage of any material or waste beyond 90 days. The facility management directed operation personnel to use the tanks as emergency storage only for liquids waste generated by the facility and not for off-site wastes. As part of the tank management practices, all materials placed into the tanks were to be removed expeditiously to comply with 40 CFR 262.34(a) (1).

This internal policy of using the storage tanks for the facility's own wastes and expeditious removal was continued by ESOI. The agencies were informed and concurred that the tanks were for ESOI generated waste (rain water and leachate), for emergency back-up in the event that storage capacity was needed, and that ESOI's policy to minimize storage time was a good practice.

These interim status storage tanks were not included in the facility's Part B application, and as directed by USEPA, they would need to be closed after the issuance of a final Part B permit. A Closure Plan was submitted by ESOI for partial closure on November 8, 1988. A November 16, 1988 internal memorandum generated by the Chief of the Ohio Section of the USEPA Region 5's RCRA Branch indicates that since these tanks never had interim status, ESOI should withdraw them from their Part A Permit, and that no closure plan was necessary. Copies of documents relevant to this AOC are provided in Appendix R.

3.18.2 Previous Investigations and Available Monitoring Data

In 1983, FCHA conducted sampling of liquids contained within Oily Waste ASTs. The samples were analyzed for VOCs, SVOCs, pesticides, PCBs, pH, cyanide, RCRA, metals, oil and grease, and phenols.

3.18.3 Assessment of Existing Degree of Contamination

The data from the 1983 FCHA sampling are provided in Appendix R. The data indicate the presence of VOCs, SVOCs, and other constituents expected for waste oil and leachate. PCBs were not detected in either of the samples. No other data was identified for AOC 6.

3.18.4 Potential Migration Pathways and Potential Impacts to Human Health and the Environment

There are no known releases from the Oily Waste ASTs at AOC 6. If a release would occur from this area, the potential migration/exposure pathways associated with a release may include the following:

- Migration to shallow groundwater, with subsequent potential exposures via (1) migration to the potable bedrock aquifer, and/or (2) direct contact with shallow groundwater during excavation activities;
- Runoff to stormwater Outfall 001 near the southeast corner of Cell G, and subsequent discharge to Otter Creek; and
- Direct contact with impacted surface soils, and with subsurface soils during excavation activities.

Due to the lack of information regarding this AOC, it is unknown whether a release has occurred from AOC 6.

3.18.5 Conclusions and Recommendations with Regard to AOC 6

AOC 6 is the set of Oily Waste Storage Tanks. There is limited available data with respect to the AOC 6. Therefore, it is recommended that AOC 6 be retained for further investigation under the RFI.

3.19 AOC 7 - BUTZ CROCK CONCRETE UTILITY VAULT

3.19.1 Description of AOC

AOC 7, the Butz Crock Utility Vault is located south of Building C within the footprint of SWMU 8. It is a concrete utility vault for access to a water line serving Building C. Butz Crock is constructed of cement sewer piping installed vertically, oval in shape and has the following inside dimensions: length is 60 inches; width is 38 inches; and depth is 108 inches (including the above-ground section).

3.19.2 Previous Investigations and Available Monitoring Data

On December 4, 1997, the Ohio EPA conducted a Compliance Evaluation Inspection (CEI) of the ESOI facility. AOC 7 was investigated as part of this CEI. During the week of January 5, 1998, Ohio EPA reported oil stained soil and/or vegetation related to AOC 7. ESOI then investigated the area around Butz Crock and found a small (4 inches by 1 inch) strip of soil abutting the cement wall of the crock that had been stained by some oil. ESOI removed the stained soil. In June 1999 a waterline break occurred resulting in an overflow of the utility vault. A small amount of dirt/grass around the vault was found contaminated with an oily material. A ring of oil booms was placed around the vault upon discovery of the incident. The water was shut off and the vault was emptied with a vacuum truck to allow for repairs. Any standing water in the vicinity of the vault was also vacuumed at that time. Once the waterline was repaired, the booms were properly disposed and a small amount (less than 5 pounds) of oil-contaminated soil/grass at the base of the vault was shoveled back into it. The oily water was tested and found not to exhibit any D-code characteristics.

Additionally, oily water has been observed to accumulate within Butz Crock, which ESOI periodically pumps out for off-site disposal. ESOI performs waste characterization sampling to determine the appropriate waste management (TCLP VOCs, SVOCs and metals, PCBs, and PAHs). Based on its location relative to the Old Oil Pond (SWMU 8), it is believed that the source of oil observed in AOC 7 is from the Old Oil Pond.

No other previous investigations are known to have been conducted at AOC 7. One monitoring well is located near AOC 7. Well G-4S, a shallow till well, routinely monitored as part of the RCRA groundwater monitoring program. In addition, as discussed in Section 4, as part of ESOI's effort to establish the baseline or current condition of groundwater quality, ESOI implemented a groundwater sampling program in 1998 which included sampling this well for Appendix IX constituents. A description and current status of the groundwater monitoring program is provided in Section 4. A summary of the most recent four quarters of groundwater monitoring events for this well is also provided in Section 4.

3.19.3 Assessment of Existing Degree of Contamination

Appendix S contains the analytical data results from sampling conducted in December 1997 and June 1999. Also included in Appendix S is a table of the amount of liquid pumped from Butz Crock during the period of January 1, 1998 to April 1, 1998.

The Appendix IX groundwater sampling conducted in 1998 for well G-4S located in the vicinity of AOC 7 did not detect VOCs, SVOCs, PCBs or pesticides/herbicides. Therefore, this well was not identified as an Affected Well and none of these constituents were determined to be a concern with respect to the groundwater near Butz Crock. As stated in the Appendix IX groundwater sampling report (Malcolm Pirnie, Inc., March 1999), there were multiple detections of metals in the analytical results of samples collected during the Appendix IX sampling events. However, as discussed in Section 4, the on-site data did not indicate that metals were a concern with respect to the quality of groundwater at the facility.

As discussed in Section 4, monitoring conducted since the 1998 Appendix IX sampling has not detected constituents that would identify this well as an Affected Well or indicate a potential release from AOC 7. Thus this well remains in detection monitoring.

3.19.4 Potential Migration Pathways and Potential Impacts to Human Health and the Environment

As discussed in Section 3.19.2, observed releases from this AOC are limited to detection of soil staining immediately adjacent to Butz Crock; impacted soils were removed by ESOI. Available information suggests that Butz Crock is a collection point for oily liquids associated with SWMU 8, rather than a source of these liquids. If a release would occur from this area, the potential migration/exposure pathways associated with a release may include the following:

- Migration to shallow groundwater, with subsequent potential exposures via (1) migration to the potable bedrock aquifer, and/or (2) direct contact with shallow groundwater during excavation activities;
- Runoff and subsequent discharge to Otter Creek; and
- Direct contact with impacted surface soils, and with subsurface soils during excavation activities.

However, because there is no evidence of release from this unit, no current exposures via these pathways have been identified, although these pathways do represent potential future pathways of concern.

3.19.5 Conclusions and Recommendations with Regard to AOC 7

AOC 7 is the water line valve vault identified as Butz Crock. A small amount of stained soil from this area has been removed by ESOI. Oily liquids occasionally observed to accumulate in Butz Crock are believed to originate from the Old Oil Pond (SWMU 8) and have been noted since the 1997 soil sampling event. Therefore, it is recommended that AOC 7 be retained for further investigation under the RFI. Since AOC 7 is within SWMU 8 it may be investigated concurrently as a sub-unit of the recommended investigation of the Old Oil Pond (SWMU 8).

3.20 AOC 8 - STAGING AREA EAST OF BUILDING C

3.20.1 Description of AOC

AOC 8 is the Staging Area which is identified as the horseshoe shaped roadway located east of Building C and located on the Old Oil Pond (SWMU 8). Incoming trucks use the staging area as a turn around and parking area. It is believed that the area has been used as a staging area since at least the 1980's. Any releases in this area would be subject to ESOI's Contingency Plan or the facility's Standard Operating Procedures for Minor Spills.

3.20.2 Previous Investigations and Available Monitoring Data

No previous investigations are believed to have been conducted at AOC 8. One monitoring well is located near AOC 8. Well G-4S, a shallow till well, routinely monitored as part of the RCRA groundwater monitoring program. In addition, as discussed in Section 4, as part of ESOI's effort to establish the baseline or current condition of groundwater quality, ESOI implemented a groundwater sampling program in 1998 which included sampling this well for Appendix IX constituents. A description and current status of the groundwater monitoring program is provided in Section 4. A summary of the most recent four quarters of groundwater monitoring events for this well is also provided in Section 4.

In addition, as required by its NPDES stormwater discharge permit, ESOI collects and analyzes stormwater discharges from Outfall 001 which receives stormwater runoff from the area surrounding Building C. This monitoring includes routine (i.e., weekly and monthly) sampling for general water quality (e.g., BOD, COD, TSS, TDS), semi-annual sampling for inorganics and metals, and annual sampling for priority pollutant VOCs, SVOCs, and pesticides.

3.20.3 Assessment of Existing Degree of Contamination

The Appendix IX groundwater sampling conducted in 1998 for the well located in the vicinity of AOC 8 did not detect VOCs, SVOCs, PCBs or pesticides/herbicides. Therefore, this well was not identified as an Affected Well and none of these constituents were determined to be a concern with respect to the groundwater near Building C. As stated in the Appendix IX groundwater sampling report (Malcolm Pirnie, Inc., March 1999), there were multiple detections of metals in the analytical results of samples collected during the Appendix IX sampling events. However, as discussed in Section 4, the on-site data did not indicate that metals were a concern with respect to the quality of groundwater at the facility.

As discussed in Section 4, monitoring conducted since the 1998 Appendix IX sampling has not detected constituents that would identify well G-4S as an Affected Well or indicate a potential release from AOC 8. Thus this well remains in detection monitoring.

As shown in the NPDES monitoring reports provided in Appendix Z, no VOCs, SVOCs, or pesticides have been detected in the stormwater runoff discharged from this area via Outfall 001 and with the exception of TSS, concentrations of metals and inorganics have not been identified as a concern under the NPDES program.

3.20.4 Potential Migration Pathways and Potential Impacts to Human Health and the Environment

There are no known releases from the Staging Area. If a release would occur from this area, the potential migration/exposure pathways associated with a release may include the following:

- Migration to shallow groundwater, with subsequent potential exposures via (1) migration to the potable bedrock aquifer, and/or (2) direct contact with shallow groundwater during excavation activities;
- Runoff to stormwater Outfall 001 near the southeast corner of Cell G, and subsequent discharge to Otter Creek; and
- Direct contact with impacted surface soils, and with subsurface soils during excavation activities.

Due to the lack of information regarding this AOC, it is unknown whether a release has occurred from AOC 8.

3.20.5 Conclusions and Recommendations with Regard to AOC 8

AOC 8 is the Staging Area located north of York Street. There have been no reported releases from this AOC. However, since there is limited data available for AOC 8, it is recommended that AOC 8 be retained for investigation as part of the RFI. This work can be performed as part of the investigation of SWMU 8.

3.21 AOC 9 - CELL M SURFACE WATER RETENTION BASIN

3.21.1 Description of AOC

AOC 9 is the Cell M Surface Water Retention Basin. The surface water management system was designed to control surface water in the Cell M area generated by a 100 year, 24 hour storm and to prevent this water from entering the active cell. The system consists of drainage ditches, a stormwater basin, and the necessary equipment to discharge the collected water. This AOC has a permitted discharge under ESOI's NPDES Permit.

ESOI, by their own accord, had a soil liner constructed for the stormwater basin. This soil liner was not required by the design plans or specifications. As-built configurations of the excavation and recompaction of the stormwater basin can be found in Appendix T.

Discharge into this basin consists of stormwater runoff from areas outside the hazardous waste limits of active Cell M, storage units, and the SCB; sources of runoff are from the following areas south of York Street:

- Closed (with an interim cap, awaiting final cap installation) portion of Cell M;
- Cell M new cell construction area (outside the hazardous waste limits);
- Facility parking areas and access roads.

Stormwater captured in this retention basis undergoes sedimentation before it is discharged to Otter Creek via Outfall 006 to the storm sewer inlet located west of this basin, along Otter Creek Road. All waste management areas in the Outfall 006 drainage area are managed to prevent the contact of stormwater with waste materials, including the use of curbing to prevent runoff from the active waste management areas. In addition, gates have been installed on drainage ditch culverts leading to this basin to allow for the capture of spills in these ditches and to prevent spills from reaching the basin.

3.21.2 Previous Investigations and Available Monitoring Data

During the SWMU 6 RFI, surface water and sediment samples were collected from the NPDES Outfall 006 and from locations along Otter Creek upstream and downstream of this outfall. Summary tables from this sampling and analysis are provided in Appendix E.

Five monitoring well are located near AOC 9. Wells M-6S and M-20S (shallow till wells), wells M-6D and M-20D (deep till wells), and well R-17 (bedrock well) are routinely monitored as part of the RCRA groundwater monitoring program. In addition, as discussed in Section 4, as part of ESOI's effort to establish the baseline or current condition of groundwater quality, ESOI implemented a groundwater sampling program in 1998 which included sampling these wells for Appendix IX constituents. A description and current status of the groundwater monitoring program is provided in Section 4. A summary of the most recent four quarters of groundwater monitoring events for these wells is also provided in Section 4.

In addition, as required by its NPDES stormwater discharge permit, ESOI collects and analyzes stormwater discharges from this basin at Outfall 006. This monitoring includes routine (i.e., weekly and monthly) sampling for general water quality (e.g., BOD, COD, TSS, TDS), semi-annual sampling for inorganics and metals, and annual sampling for priority pollutant VOCs, SVOCs, and pesticides.

3.21.3 Assessment of Existing Degree of Contamination

As reported in the RFI Report for SWMU 6, all chemical and biological data collected during the ecological assessment suggest that the Facility has not had an adverse impact on Otter Creek or the surrounding environment. Periphyton, macroinvertebrate and fish populations in Otter Creek are all affected by gross organic enrichment from a variety of sources not related to the Facility. Sediment quality in Otter Creek appears to be influenced most by metals, PAHs and other organic compounds and were detected at their highest concentrations upstream of any ESOI NPDES discharges to the creek. The organic constituents detected in the shallow groundwater near this unit were not detected in the surface water or sediment samples collected in Otter Creek adjacent to this unit.

The Appendix IX groundwater sampling conducted in 1998 for the well located in the vicinity of AOC 9 did not detect VOCs, SVOCs, PCBs or pesticides/herbicides. Therefore, these wells were not identified as an Affected Well and none of these constituents were determined to be a concern with respect to the groundwater near this basin. As stated in the Appendix IX groundwater sampling report (Malcolm Pirnie, Inc., March 1999), there were multiple detections of metals in the analytical results of samples collected during the Appendix IX sampling events. However, as discussed in Section 4, the on-site data did not indicate that metals were a concern with respect to the quality of groundwater at the facility.

As discussed in Section 4, monitoring conducted since the 1998 Appendix IX sampling has not detected constituents that would identify wells M-6S, M-20S, M-6D, M-20D, and R-17 as Affected Wells or indicate a potential release from AOC 9. Thus these wells remain in detection monitoring.

As shown in the NPDES monitoring reports provided in Appendix Z, no VOCs, SVOCs, or pesticides have been detected in the stormwater runoff discharged from this area via Outfall 006 and concentrations of metals and inorganics have not been identified as a concern under the NPDES program. In addition, as detailed in the April 1999 NPDES report, a spill of diesel fuel was captured in this basin. The spill material was isolated and removed. Samples taken at the basin prior to and during water discharge indicated that the spill had been adequately remediated.

3.21.4 Potential Migration Pathways and Potential Impacts to Human Health and the Environment

Available information indicates that there have been no releases (other than through Outfall 006) from this unit. If an unpermitted release would occur from this area, the potential migration/exposure pathways associated with a release may include the following:

- Migration to shallow groundwater, with subsequent potential exposures via (1) migration to the potable bedrock aquifer, and/or (2) migration and discharge to Otter Creek located west of the area, and/or (3) direct contact with shallow groundwater during excavation activities;
- Discharge to Otter Creek via Outfall 006; and
- Direct contact with surface water during routine maintenance activities.

However, because there is no evidence of release from this unit, no current exposures via these pathways have been identified, although these pathways do represent potential future pathways of concern.

3.21.5 Conclusions and Recommendations with Regard to AOC 9

AOC 9 is the active stormwater detention basin located south of York Street. There is no evidence of unpermitted release from this basin, although, some spilled material may have migrated to the basin during rain events or power washing of pavement which drains to this basin. Therefore, at the request of USEPA, ESOI will conduct sampling during the RFI to determine whether a release to the environment has occurred from this AOC, as well as from all identified storm water outfalls.

3.22 AOC 10 - RAIL SPUR

3.22.1 Description of AOC

AOC 10 is the portion of the rail spur which is located between Gate #9 and Rail Storage Area N (a RCRA-permitted storage unit). Rail traffic to the site is controlled by Norfolk Southern operating procedures. The rail siding entrance to the facility is a chain link fence gate which is kept closed, except when receiving rail shipments. The rail area between the west end of Rail Storage Area N and the Norfolk Southern property, is constructed with a minimum of 6 inches of compacted subballast above the subgrade. Appendix V contains an as-built drawing of the rail siding.

3.22.2 Previous Investigations and Available Monitoring Data

No known previous investigations have been conducted at AOC 10. Three monitoring wells are located near AOC 10. Wells M-19S (shallow till well), wells M-19D (deep till well), and well R-6 (bedrock well) are routinely monitored as part of the RCRA groundwater monitoring program. In addition, as discussed in Section 4, as part of ESOI's effort to establish the baseline or current condition of groundwater quality, ESOI implemented a groundwater sampling program in 1998 which included sampling these wells for Appendix IX constituents. A description and current status of the groundwater monitoring program is provided in Section 4. A summary of the most recent four quarters of groundwater monitoring events for these wells is also provided in Section 4.

In addition, as required by its NPDES stormwater discharge permit, ESOI collects and analyzes stormwater discharges from this area which discharge via the stormwater detention basin (AOC 9) at Outfall 006. This monitoring includes routine (i.e., weekly and monthly) sampling for general water quality (e.g., BOD, COD, TSS, TDS), semi-annual sampling for inorganics and metals, and annual sampling for priority pollutant VOCs, SVOCs, and pesticides.

3.22.3 Assessment of Existing Degree of Contamination

The Appendix IX groundwater sampling conducted in 1998 for the well located in the vicinity of AOC 10 did not detect VOCs, SVOCs, PCBs or pesticides/herbicides. Therefore, these wells were not identified as Affected Wells and none of these constituents were determined to be a concern with respect to the groundwater near this basin. As stated in the Appendix IX groundwater sampling report (Malcolm Pirnie, Inc., March 1999), there were multiple detections of metals in the analytical results of samples collected during the Appendix IX sampling events. However, as discussed in Section 4, the on-site data did not indicate that metals were a concern with respect to the quality of groundwater at the facility.

As discussed in Section 4, monitoring conducted since the 1998 Appendix IX sampling has not detected constituents that would identify wells M-19S, M-19D, and R-6 as Affected Wells or indicate a potential release from AOC 10. Thus these wells remain in detection monitoring.

As shown in NPDES monitoring reports provided in Appendix Z, no VOCs, SVOCs, or pesticides have been detected in the stormwater runoff discharged from this area via Outfall 006 and concentrations of metals and inorganics have not been identified as a concern under the NPDES program.

3.22.4 Potential Migration Pathways and Potential Impacts to Human Health and the Environment

Available information indicates that there have been no releases to or from this unit. If a release would occur from this area, the potential migration/exposure pathways associated with a release may include the following:

- Migration to shallow groundwater, with subsequent potential exposures via (1) migration to the potable bedrock aquifer, and/or (2) migration and discharge to Otter Creek located west of the area, and/or (3) direct contact with shallow groundwater during excavation activities;
- Discharge to Otter Creek via Outfall 006; and
- Direct contact with impacted surface soils and subsurface soils during on-site excavation activities.

However, because there is no evidence of release from this unit, no current exposures via these pathways have been identified, although these pathways do represent potential future pathways of concern.

3.22.5 Conclusions and Recommendations with Regard to AOC 10

AOC 10 is the Rail Spur located between the SCB and the property boundary. There have been minor spills, but no releases to areas outside the rail spur area.

In addition, this area is and will continue to be an active area of the facility. Removal of the rail spur, including any contaminated soils, is included in the facility closure plan. Although the closure plan requires the clean closure of the spur and although there are no reported releases from this unit, investigation of this AOC (i.e., the segment between SWMU 15/18 to the property boundary) will be retained as part of the RFI. Any contamination that does not pose a significant risk or an immediate danger to human health and the environment will be addressed in conjunction with the RCRA closure of the SCB (SWMU 15) and the Rail Storage Area M and N (SWMU 18). Permit condition VI.C.3 allows SWMUs 15 and 18 to be investigated during RCRA closure.

3.23 AOC 11 – FORMER TRUCK SCALE

3.23.1 Description of AOC

Based on a review of historical aerial photographs and interviews with former employees knowlegable about the site operations at the time that the former scales were in use, ESOI determined that two truck scales were located within the excavation footprint of Cell G (SWMU 2). The approximate locations for these former scales are shown on a Figure 3-1. The inbound scale was located along the facility's roadway system within the western portion of what is now Cell G, while the outbound scale was located within the central portion of Cell G. The inbound scale was placed into service during the 1983-1984 time period. At that time, this was the only scale present, and was used for both inbound and outbound truck traffic. In approximately 1985-1986, the outbound scale was added. Both of the scales were removed prior to the construction of Cell G (i.e., between March 1988 and April 1989).

3.23.2 Previous Investigations and Available Monitoring Data

No previous investigations of the former Truck Scales have been identified.

3.23.3 Assessment of Existing Degree of Contamination

There is no available data associated with AOC 11. However, available information indicates that it was located within the limits of Cell G (SWMU 2).

3.23.4 Potential Migration Pathways and Potential Impacts to Human Health and the Environment

This AOC was located within the limits of Cell G. Therefore, the potential migration/exposure pathways would be the same as for Cell G, as described in Section 3.2.4 if a release were to occur.

3.23.5 Conclusions and Recommendations with Regard to AOC 11

Because the former truck scales were located within the footprint of the area excavated for the construction of Cell G no further action is warranted for this AOC.

4 SITEWIDE GROUNDWATER CHARACTERIZATION

4.1 OVERVIEW

As required by the ESOI's federal and state RCRA permits, ESOI has maintained and implemented a groundwater monitoring program that allows for protection of groundwater quality in the uppermost aquifer at the facility's Point of Compliance. The existing federal and state RCRA permits specify the collection of representative samples from the groundwater monitoring wells located along the perimeter of the ESOI facility on a quarterly and semi-annual basis, respectively. The locations of the monitoring wells are shown in Figure 4-1. Samples are analyzed for the following parameters specified in Table G.2 of the state RCRA permit on a quarterly basis:

1. Methylene Chloride
2. Xylenes
3. Toluene
4. 1,1-Dichloroethane
5. Chloroform
6. Ethylbenzene
7. Benzene
8. 1,1,1-Trichloroethane
9. Trichloroethylene
10. 1,2-Dichloroethane
11. Methyl Ethyl Ketone
12. Vinyl Chloride
13. Lead (Dissolved)
14. Cadmium (Dissolved)
15. Chromium (Dissolved)
16. Cyanide
17. Phenols
18. Total Organic Carbon
19. Specific Conductance
20. pH
21. Chloride
22. Sodium
23. Sulfate
24. Fluoride
25. Total Iron
26. Total Manganese
27. Radium
28. Gross Alpha
29. Gross Beta

Sampling, analysis and data validation are conducted in accordance with the facility's sampling and analyis plan, standard laboratory operating procedures and standard procedures for data validation. A copy of ESOI's current groundwater monitoring program procedures is provided in Appendix EE.

The groundwater monitoring specified in the existing permits consists of detection monitoring only. In response to the finding of a statistically significant increase in constituent concentrations during the October 1997 groundwater monitoring event, a Class 3 permit modification request was submitted to Ohio EPA on August 19, 1998 to incorporate provisions of compliance monitoring into ESOI's groundwater monitoring program. The permit modification request proposed to institute an Integrated Groundwater Monitoring Program at the facility. The Integrated Groundwater Monitoring Program consists of two separate programs that accommodate both detection monitoring (OAC Rule 3745-54-98) and compliance monitoring (OAC Rule 3745-54-99). These programs are referred to as the Detection Monitoring Program and the Compliance Monitoring Program. The purpose of the Integrated Groundwater Monitoring Program is to address statistically significant constituent detections in the groundwater monitoring system and to allow for corrective action as necessary (OAC Rules 3745-55-01 and 3745-55-011). The Integrated Groundwater Monitoring Program also revises the Detection Monitoring parameter list to more accurately reflect constituents that are most likely to be detected in the groundwater if there is a release from a waste management unit. An Alternate Concentration Limit Model (ACL) has also been developed and was included in conjunction with the Integrated Groundwater Monitoring Program (OAC Rules 3745-54-94 and 3745-54-98). The ACL Model provides a mechanism whereby groundwater data results are examined to determine the need for corrective action.

4.1.1 Integrated Monitoring Program

Detection Monitoring Program

In developing the Integrated Monitoring Program, ESOI proposed to eliminate the use of the Control Limit Value (CLV) as a statistical limit for groundwater monitoring parameters. In lieu of the CLV, ESOI proposed to use the exceedance of the practical quantitation limit (PQL) as an indication of hazardous waste constituents in the groundwater for non-naturally occurring parameters. The PQL is the “lowest level that can be reliably achieved within the specified limits of precision and accuracy during routine laboratory operating conditions” as defined in EPA Test Methods, SW-846. Constituents may be detected below the PQL and are still considered to be a positive detection, however, their concentrations can only be estimated. The laboratory typically identifies these concentrations with a “J” qualifier. Specifically, ESOI employs the use of the PQL in the following manner:

- When the PQL is below the MCL, an exceedance of the PQL will be used as an indication of hazardous waste constituents in the groundwater;
- When the PQL is above the MCL, an exceedance of the MCL will be used as an indication of hazardous waste constituents in the groundwater. The “J” value will then be used to determine whether the constituent concentration is above the MCL; and
- When there is no MCL for a given parameter, an exceedance of the PQL will be used as an indication of hazardous waste constituents in the groundwater.

For naturally occurring parameters, ESOI proposed to establish background concentrations to which the groundwater monitoring data will be compared to determine the need for compliance monitoring or corrective action.

The Detection Monitoring Program also maintains the option of performing confirmational sampling and analysis after a statistically significant detection to minimize the number of “false positive” analytical results. The confirmational sampling consists of obtaining a second sample from the well in which the initial determination of a statically significant constituent concentration was observed. The sample is then split and submitted to two separate laboratories for analysis of only those constituents initially observed at an elevated concentration. The results of both analyses must confirm the statistically significant increase for the initial concentration to be confirmed. The highest concentration from between the initial result and the spilt sampling analyses will be used for assessing potential risks in the ACL Model.

If a constituent is detected and confirmed in a well at a level above an MCL or PQL as described in the bulleted items above, or above the established background concentration for naturally occurring constituents, the well is considered an Affected Well and is then subject to the Compliance Monitoring Program.

<u>Compliance Monitoring Program</u>

Subsequent to the designation of a Detection Monitoring Program well as an Affected Well, the following actions are taken by ESOI:

- The Affected Well, all wells in the same monitoring cluster, and the two wells immediately adjacent to the Affected Well within the same geologic horizon, are sampled and analyzed for the constituents specified in the Appendix to OAC Rule 3756-54-98 (Appendix IX). As in the Detection Monitoring Program, the option to perform confirmational sampling is maintained;
- If non-naturally occurring constituents, or naturally occurring constituents above background concentrations, are detected and confirmed in any of the other cluster wells or adjacent wells within the same geologic horizon during the Appendix IX analyses, then this well(s) will also be considered an Affected Well(s); and
- Well(s) determined to be Affected Wells in accordance with the preceding bullet item will result in the performance of Appendix IX sampling for wells in that well's monitoring cluster and that well's adjacent wells in the same geologic horizon. This process continues until no non-naturally occurring constituents, or naturally occurring constituents above background concentrations, are detected and confirmed during the Appendix IX sampling. There may be some overlapping of cluster wells and adjacent horizon wells during this procedure. Wells only need to be sampled and analyzed once for Appendix IX constituents to be in compliance with the above requirements.

Upon completion of the Appendix IX sampling as described in the bulleted items above, a single well or a number of wells could then be considered Affected Wells based upon a single statistically significant analytical result. Affected Wells are then subject to an annual Appendix IX sampling and analysis. This annual analysis is conducted during the April sampling event. These wells are not, however, analyzed for dioxins or furans unless those constituents were detected in the initial Appendix IX sampling event. In addition, during the other quarterly sampling events, the non-naturally occurring Appendix IX constituents detected, and the naturally occurring constituents above the background concentrations, are added to the Affected Well's Compliance Monitoring parameters.

A well may be in the same monitoring cluster as a well determined to be Affected or adjacent to such a well in the same geologic horizon, but whose own Appendix IX sampling and analysis did not identify any non-naturally occurring constituents, any naturally occurring constituents above background concentrations, or did not identify that particular constituent(s). In these instances, those wells will have that Affected Well's non-naturally occurring detected constituents/above background constituents added to its Detection Monitoring parameters during all quarterly sampling events. These parameters will be referred to as "Constituents of Concern.

If one of an Affected Well's Compliance Monitoring parameters is not detected, i.e., the laboratory indicates a "non-detect", or is below background concentrations for three consecutive semi-annual monitoring events, that constituent is removed from the Affected Well's Compliance Monitoring parameters. In addition, that particular constituent is no longer considered a constituent of concern for the same cluster and adjacent horizon wells. If all Compliance Monitoring parameters are not detected or are below background concentrations for three consecutive semi-annual monitoring events, the well is removed from Compliance Monitoring and returned to Detection Monitoring.

4.1.2 Alternate Concentration Limit Model

An alternate concentration limit model (ACL) is a site specific, risk-based criterion that takes into account the present and future land use, relevant facility conditions such as hydrology and hydrogeology, and potential migration pathways of groundwater constituents. The ACL Model also considers the potentially complete exposure pathways to human and ecological receptors.
A complete exposure pathway includes a constituent source, mechanisms of constituent release and transport to other environmental media, potential points of exposure to the constituents, and potential receptors that may be exposed to the constituent via one or more routes of exposure.

Specifically, when a groundwater monitoring well is designated as an Affected Well, all detected constituents will be subject to the ACL model to determine the risk presented by the total number and concentration of constituents in that well. Risk in the ACL model is evaluated on a unit by unit basis as well as cumulative with adjacent units. The model will also be adjusted to evaluate site-wide groundwater risk as necessary.

The following potential exposures, which include exposures that are possibly current and those that are hypothetical future exposures are proposed to be evaluated in the ACL model:

- Surface water ingestion through the recreational use of Otter Creek or Gradel Ditch;
- Surface water dermal contact through the recreational use of Otter Creek or Gradel Ditch;
- Surface water contact by ecological receptors of Otter Creek or Gradel Ditch;
- Worker or resident dermal contact of groundwater through infiltration into an excavation;
- Worker or resident inhalation of vapors through groundwater infiltration into an excavation;
- Resident ingestion of potable groundwater, including the effects that till waters may have on the bedrock aquifer;
- Resident dermal contact of potable groundwater, including the effects that till waters may have on the bedrock aquifer; and
- Resident vapor inhalation from potable groundwater, including the effects that till waters may have on the bedrock aquifer.

4.2 ASSESSMENT OF THE EXISTING GROUNDWATER MONITORING SYSTEM

The ESOI Integrated Groundwater Monitoring Program includes a network of 117 wells that are screened primarily in three geologic zones found at the facility. Shallow till wells are screened at the lacustrine/upper till contact zone, deep till wells are screened at the upper till/lower till contact zone, and bedrock wells are screened in the aquifer. There are also a limited number of wells screened in localized sand lenses found near Cell G. Figure 4-1 is a scaled facility map that shows the locations of wells in ESOI's monitoring well network.

In 1982, quarterly sampling commenced using 4 wells selected by ESOI as RCRA monitoring wells. An additional 12 wells were sampled to meet solid waste requirements. Eventually the Monitoring System evolved into one consisting of 16 bedrock wells and 73 shallow and deep till wells. The progression from 4 to the current 117 wells evolved as a result of program improvement, the monitoring requirements for additional RCRA units, and a consent order resulting from the 1986 Hazardous Waste Groundwater Taskforce Evaluation. The Taskforce recommended that additional groundwater monitoring wells be installed at the facility and that contact zones between the lacustrine/upper till and the upper till/lower till be monitored as preferential pathways.

Prior to 1990, ESOI monitored groundwater conditions under the provisions of ESOI's RCRA Part A Interim Status Permit. Information on the groundwater monitoring wells that were part of the interim status network is provided in Tables 4-1 through 4-4. This information includes the well installation dates, construction details, the dates that these wells were included in the interim status network, and whether or not the wells are still in use in the current Groundwater Monitoring Program. Additional information about these groundwater monitoring wells can be obtained from the May 1996 RCRA Part B Permit Renewal Application, previously submitted revisions of Sampling and Analysis Plans, and previously submitted Annual Groundwater Reports.

Description of Current RCRA Part B Permitted Network

Of the 117 groundwater monitoring wells comprising the current Groundwater Monitoring Program network, there are 22 bedrock (R-series) wells, 6 deep sand (G-series) wells, 44 deep (D-series) wells, and 45 shallow (S-series) wells. Detailed information on these wells, including well construction details and dates of installation, is summarized in Tables 4-1 through 4-4. Well logs, boring logs and well abandonment logs (where appropriate and available) associated with ESOI's Groundwater Monitoring Program are provided in Appendix E.2 of the ESOI state Part B Permit Renewal Application.

Bedrock Wells

The bedrock groundwater monitoring wells, designated R-1 through R-22, were installed between 1985 and 1990 to monitor groundwater quality in the uppermost aquifer. The locations of the bedrock wells are shown on Figure 4-1. The depths of the bedrock wells range from approximately 85 feet to 120 feet below ground surface. Detailed information on the wells such as installation dates, construction details, and whether or not the wells were included in the interim status well network, is provided in Table 4-1.

Cell G Deep Sand Wells

The Cell G deep sand monitoring wells, designated G-6 through G-9, G-10A, and G-11, were installed between 1989 and 1990 to monitor groundwater quality in isolated sand lenses identified near Cell G. The locations of the deep sand wells are shown on Figure 4-1. The depths of the deep sand wells range from approximately 63 to 74 feet below ground surface. Detailed information such as installation dates, construction details, and whether or not the wells were included in the interim status well network, is provided in Table 4-2.

Deep Wells

The deep groundwater monitoring wells were installed between 1985 and 1996 to monitor groundwater quality in the contact zone between the upper till and lower till units of ESOI. The locations of the deep till wells are shown on Figure 4-1. The depths of the deep wells range from approximately 57 feet to 73 feet below ground surface. Detailed information on the deep wells, such as installation dates, construction details, and whether or not the wells were included in the interim status well network, is provided in Table 4-3.

Shallow Wells

The shallow groundwater monitoring wells were installed between 1985 and 1996 to monitor groundwater quality in the contact zone between the lacustrine unit and the upper till unit at ESOI. The locations of the shallow wells are shown on Figure 4-1. The depths of the shallow wells range from approximately 12 feet to 28 feet below ground surface. Detailed information on the shallow wells, such as installation dates, construction details, and whether or not the wells were included in the interim status well network, is provided in Table 4-4.

4.3 SITEWIDE GROUNDWATER CONDITIONS

Bedrock Groundwater Conditions

Although some sand and gravel pockets are occasionally encountered within the thick glacial clays at the ESOI facility, these deposits are discontinuous, limited in areal extent, and lack direct recharge. Therefore, all known groundwater supplies at and in the vicinity of the ESOI facility are found in the bedrock formation which is the uppermost aquifer. Potable water in the area of the ESOI facility is provided by municipal sources (i.e., city water), who obtain water from Lake Erie and are not dependent on local bedrock groundwater.

The bedrock aquifer in northwest Ohio consists of Devonian and Silurian limestone and dolomite. Groundwater in these carbonate rocks moves through a series of complex interconnected openings. Therefore, even though the aquifer comprises different geologic formations, it is considered as a single hydraulic unit.

Groundwater Flow Rate and Direction

Groundwater in the bedrock aquifer beneath the ESOI facility is under upward hydrostatic pressure with water levels in ESOI's bedrock wells between 33 feet to 49 feet below ground surface; well above elevation of the bedrock formation.

The upper and lower tills at ESOI act as an aquitard. Groundwater recharge through the thick overlying glacial deposits around the ESOI facility is theoretically possible, however, based on the measured low permeabilities of the till (on the order of 10^{-8} to 10^{-9} cm/sec) and the hydrostatic pressure in the bedrock aquifer, vertical seepage through the lower till would be negligible (9×10^{-4} gallons/day/square foot). As described in Section 1.3.2, pumping tests conducted at the ESOI facility revealed no direct hydraulic connection between the bedrock aquifer and pore water in the overlying till.

As described in Section 1.3.2, based on the results of the bedrock aquifer pumping tests, groundwater velocity in the bedrock aquifer was determined. In particular,, the gradient of the potentiometric surface in the bedrock aquifer, and consequently, groundwater velocity, is dependent on the pumping of wells at the BP Oil facility northeast of ESOI. Based on these more recent measurements of bedrock gradients, the maximum calculated flow velocity during periods when BP Oil is pumping is approximately 71 ft/yr to the north (as measured in October 1998). During periods of non-pumping the flow velocity is near zero or has a very low gradient toward the south or southwest (a maximum flow velocity of 13 ft/yr toward the south was observed in January 2000). Based on monthly flow calculations prepared for the 1996 and 1998 monitoring years, the net annual groundwater flow across the Facility is approximately 21 ft/yr to 38 ft/yr to the north/northeast (see Appendix C). As indicated by water level monitoring conducted at the Facility over the last 15 years, the predominant flow direction in the bedrock aquifer is to the north/northeast. The most recent ESOI annual groundwater monitoring report which provides groundwater elevation data for the bedrock is included in Appendix BB.

Groundwater Conditions in the Glacial Deposits

The thick tills that overlay the dolomite bedrock in the vicinity of the ESOI facility contain trapped pore water (Appendix E.10.18 in the Investigation Compendium). In fact, a study conducted of the age of the groundwater in the glacial deposits using naturally occurring isotopes of hydrogen, oxygen and carbon to date the time of recharge indicated that water recovered from the upper and lower till units underlying the facility is of ancient origin with little or no component of modern, post-1952 recharge present. Further, these units, are incapable of supplying usable supplies to wells because of low horizontal and vertical permeabilities of the tills. In addition, the sand inclusions within the tills are not interconnected and do not serve as conduits for flow. Therefore, the glacial deposits cannot be regarded as aquifers. However, as previously described, the potential exists for groundwater in the shallow glacial deposits to discharge into surface water adjacent to the facility, including Otter Creek and the Gradel Ditch.

The most recent ESOI annual groundwater monitoring report which provides groundwater elevation data for the lacustrine/upper till contact zone and the upper till/deep till contact zone is included in Appendix BB.

4.4 ASSESSMENT OF SITE WIDE GROUNDWATER QUALITY

4.4.1 SWMU 6 RFI

As described in Section 3.6, under the USEPA RCRA corrective action program, USEPA and ESOI investigated the NSL (SWMU 6) as a possible source of releases of constituents beyond ESOI's northern and eastern property lines near the NSL. This investigation began in 1995, when a RFI was initiated by ESOI and USEPA. The purpose of the RFI was to collect information necessary to determine whether the historic disposal activities at the NSL have impacted the soil and groundwater in that area. The results of the RFI indicated that:

- There have been releases from the NSL;
- Groundwater quality in the lacustrine zone has been impacted by these releases; and
- Groundwater quality in the underlying till or bedrock zones have not been impacted by the releases.

A summary of this RFI is provided in Appendix E.

4.4.2 Appendix IX Groundwater Sampling Program

In 1998, ESOI conducted a program to establish the baseline, or current condition of groundwater quality at the facility, in part, to respond to the determination of a statistically significant increase during its October 1997 semi-annual groundwater monitoring event. As part of this program, all 117 groundwater monitoring wells in the monitoring well network at ESOI were sampled between March 1998 and August 1998 for the parameters listed in the Appendix to OAC 3745-54-98 (Appendix IX), with the exception of dioxins and furans. These wells were also sampled for the dissolved metals (filtered) listed in the Appendix to OAC 3745-54-98, and calcium, magnesium, sodium, potassium, alkalinity, sulfate, and chloride. Analysis of samples for dissolved metals was performed because it allows for a more accurate assessment of actual groundwater quality than analysis for total metals (unfiltered samples). The anion and cation analyses were added to the baseline sampling event to provide additional information on background groundwater chemistry at each well. This additional baseline analytical data will allow for more effective evaluation of a suspected release from a unit in the future. Details of the Appendix IX Sampling Events, including the sampling activities, quality assurance procedures, data validation procedures, as well as resampling and confirmation sampling procedures, are presented in the 1 July 1998, *Envirosafe Services of Ohio, Inc. Appendix IX Sampling Event Report*, prepared by Malcolm Pirnie (provided in Appendix BB).

In March and April 1998, ESOI conducted a groundwater sampling event at the Facility. This sampling event was conducted in response to confirmed concentrations of two volatile organic compounds (VOCs) in excess of the established control limit values (CLVs) in the October 1997 groundwater monitoring event. The parameters exceeding their respective CLVs were benzene in well F-2S and 1,1 dichloroethane (1,1-DCA) in well MR-2D. As agreed upon in discussions with Ohio EPA, ESOI collected groundwater samples from 19 monitoring wells adjacent to the northern property boundary of the facility in the March 1998 sampling event for analysis of an Appendix IX parameter list.

In July 1998, an additional Appendix IX sampling event was conducted by ESOI for groundwater at the facility. This sampling event was conducted in response to the Ohio EPA's November 26, 1997 NOD regarding Section E of ESOI's May 1996 RCRA Part B Permit Renewal Application. In the NOD, Ohio EPA requested that ESOI sample all monitoring wells listed in the RCRA permit for the Appendix IX parameters, dissolved metals, and a number of cations and anions. ESOI complied with this request during the sampling event performed in July and August 1998. During this event all wells (not previously sampled for the Appendix IX constituents in April 1998) were sampled.

Appendix IX Data Summary

The results of the initial round of the March 1998 sampling event and of a confirmatory round sampling event conducted in April 1998, indicated that one or more volatile VOCs existed in isolated locations of the groundwater at concentrations above the laboratory reporting limit. The confirmed VOC detections included: 1,1-DCA and 1,2-DCA in well F-2S; trichlorofluoromethane in well MR-1S(A); 1-4-dioxane and benzene in well MR-2D; and 1,4-dioxane in well SW-1S. Several other VOCs were detected above the respective laboratory reporting limits, either in the initial or confirmation sampling rounds; however, not in both sampling rounds. These detected compounds were, therefore, not considered to be confirmed. However, none of the detected parameters were confirmed at concentrations greater than their respective USEPA MCLs for drinking water. The parameters and associated concentrations are presented in Appendix BB. SVOCs, PCBs, pesticides or herbicides were not confirmed as being present in any of the groundwater samples collected in this event. As discussed below, dissolved metals were detected in the collected samples at concentrations within the range of regional background concentrations for the collected samples.

The results of this July/August 1998 sampling event and the confirmation/resampling event performed in early December 1998 indicate that VOCs were confirmed at concentrations above their respective laboratory reporting limits in groundwater samples collected from wells MR-2S (1,4-dioxane) and SW-2S (1,4-dioxane). The parameters and associated concentrations are presented in Appendix BB. SVOCs, PCB, pesticides or herbicides were not confirmed as being present in any of the groundwater samples collected in this event. As discussed below, dissolved metals were detected in the collected samples at concentrations within the range of regional background concentrations for the collected samples. Total metals were detected in the collected samples at a range of concentrations, based primarily on the sediment content of the sample.

As stated in ESOI's Appendix IX report (see Appendix BB), there were multiple detections of metals in the analytical results of samples collected during the 1998 Appendix IX sampling program. A number of these metals including barium, lead and zinc and others are reported to be naturally occurring in the carbonate aquifer underlying Lucas County Ohio (USGS 1991). In addition to the metals reported to be prevalent in a carbonate aquifer, arsenic, chromium and mercury were also detected in a number of wells sampled in the USGS study at similar concentrations (i.e., less than 1 mg/L) to those identified in the 1998 Appendix IX sampling (see Appendix BB). Although it was noted that there are a number of limitations in making a direct comparison with the USGS study results, such as differences in depths of wells, groundwater unit being sampled, and land use, the comparison with the USGS study indicated many of the dissolved metals detected at the facility were within the same general range as the dissolved metals data reported by USGS for Lucas County (see Appendix BB). In addition, data from the Appendix IX analysis were compared to Appendix IX results obtained from prior events beginning in 1989. This comparison indicated similar detections at similar concentrations for arsenic, barium, chromium, copper, nickel, and zinc. Therefore, metals were not identified as a concern with respect to the quality of groundwater at the facility.

Conclusions of the Appendix IX Sampling Event

No SVOCs, pesticides, PCBs, or herbicides were confirmed to exist in the groundwater samples collected in the 1998 Appendix IX sampling program. In addition, dissolved metals were determined to be within the expected range for regional background and concentrations have been stable over a period of nearly 10 years. Therefore, these constituents were not identified as a concern with respect to the groundwater at the facility.

Based on the results of the Appendix IX sampling events, ESOI classified wells F-2S, MR-1SA, MR-2D, MR-2S, SW-1S and SW-2S as Affected Wells for the respective "constituents of concern" noted for each well above. The source of the VOC constituents may be due to one of several reasons. One possibility is historical remnants at the Facility. The Facility has been used for industrial activities and waste disposal since the 1950s. In addition, it is surrounded by other industrial sites. Hence these historical activities could have resulted in a release(s) to groundwater of trace levels of constituents, similar to those observed in these wells that are not a result of current site operations or a release of leachate from a landfill cell. Another possible source may be related to migration of landfill gas and dissolution of the gas constituents into the till groundwater. Recent detections of landfill gases in the area of the affected wells warrants further investigation of this potential migration pathway. A detection in an explosive gas monitoring punch bar may be an indication of gas migration from a unit. This gas may be carrying trace amounts of volatile organic compounds from the units to the groundwater. As indicated in Section 3, ESOI is currently implementing explosive gas monitoring at certain units.

As shown on Figure 4-1, all Affected Wells are located along the northern property line adjacent to the pre-RCRA Millard Road Landfill (SWMU 5) and the NSL (SWMU 6). No Affected Wells were identified around Cell G (SWMU 2), Cell H (SWMU 3), Cell I (SWMU 4) or south of York Street.

Current Conditions

Based on the results of the 1998 Appendix IX sampling program which included all wells in ESOI's RCRA permit, wells F-2S, MR-1S(A), MR-2D, SW-1S, MR-2S and SW-2S were identified as Affected Wells. As discussed in Section 4.1, all Affected Wells are monitored according to the Compliance Monitoring Program. Since 1998, wells MR-3D, MR-3S, SW-3D, and H-1S have been identified as Affected Wells. A summary of all detected constituents from the last 4 quarterly groundwater monitoring events leading to confirmational sampling and the identification of additional "Affected Wells" is provided on Table 4.5. The following table summarizes the current list of "Affected Wells" and "Affected Parameters" which are being monitored as part of ESOI's compliance monitoring program (the remaining RCRA program monitoring wells are currently in ESOI's detection monitoring program):

AFFECTED WELLS & CONSTITUENTS OF CONCERN	
Well ID	**Constituents of Concern**
MR-2D	Benzene, 1,4-Dioxane, Tetrahydrofuran
MR-3D	1,4-Dioxane, Tetrahydrofuran
SW-3D	1,4-Dioxane, Tetrahydrofuran
MR-1SA	1,4-Dioxane, Trichlorofluoromethane
MR-2S	1,4-Dioxane, Tetrahydrofuran, a,b,d-BHC
MR-3S	1,4-Dioxane
F-2S	1,1-Dichloroethane, 1,2-Dichoroethane, Benzene, Vinyl Chloride, Chloroethane
SW-1S	1,4-Dioxane
SW-2S	1,4-Dioxane
H-1S	Tetrahydrofuran

4.5 SUMMARY OF CONCLUSIONS WITH REGARD TO GROUNDWATER QUALITY

The results of the 1998 Appendix IX sampling program indicated that one or more VOCs were confirmed at concentrations above the laboratory reporting limit in samples collected from wells F-2S, MR-1S(A), MR-2D, SW-1S, MR-2S, and SW-2S. However, none of the detected parameters were confirmed at concentrations greater than their respective USEPA federal drinking water MCLs which are conservative levels since groundwater in the shallow and deep till zones is not used as a potable water source. The presence of semivolatile organic compounds (SVOCs), PCBs, pesticides or herbicides from the sampled wells was not confirmed. Dissolved metals were detected within the range of regional background concentrations for the collected samples. Since 1998 four additional wells have had a confirmed detection of a VOC.

These confirmed VOC detections have only been identified in wells screened in the shallow contact zone (lacustrine/shallow till) and the deep contact zone (shallow till/deep till interface). No confirmed detections were observed in any of the uppermost aquifer (bedrock) wells. Further, as presented in Appendix BB, the concentrations of detected constituents of concern in the Affected Wells vary little over the evaluated monitoring events. In addition, concentrations of non-naturally occurring constituents do not have an observable upward trend in concentration.

As discussed in Section 5, based on the historical groundwater data and the current Appendix IX sampling results, as well as the hydrogeologic conditions under the facility which restrict the potential movement of groundwater from the facility, the existing groundwater conditions at the ESOI facility do not pose a significant threat to human health and the environment.

5 ASSESSMENT OF CURRENT EXPOSURES

5.1 PURPOSE AND SCOPE

The preceding sections of this report have described the results of previous investigations and ongoing monitoring at the facility, which identify the presence of hazardous constituents in environmental media that may be related to releases from certain SWMUs and AOCs. Potential exposures to these constituents under current land and groundwater use conditions at and around the facility and the significance of these potential exposures are discussed in this section. The purpose of the assessment is to determine whether existing data indicate that unacceptable exposures are occurring, so that ESOI can determine whether interim measures are warranted at this time.

For this purpose, the data collected during the previous RFI at the Northern Sanitary Landfill (SWMU 6) and recent data from the ongoing RCRA groundwater monitoring program for the facility are relevant to the assessment. Other existing data include data characterizing wastes that are within a SWMU (e.g., leachate from inside a landfill or from a leachate collection system) or wastes that were previously removed and properly disposed (e.g., ash removed prior to construction of Landfill Cell G). These data do not characterize releases from a SWMU. They were discussed in the previous sections of this report in relation to hazardous constituents detected in environmental media, to help determine whether the presence of these constituents in an environmental medium near a SWMU might be related to a release from the SWMU. The waste characterization data also can be useful for evaluating the potential significance of a release from a unit, if a release were to occur in the future. However, these data are not relevant to the purpose of this assessment, which is concerned with current exposures.

The assessment of current exposures discussed in this section is focused on current human exposures. ESOI had conducted an ecological assessment during the previous RFI at the Northern Sanitary Landfill (see Appendix E). The ecological assessment included a survey of habitats near the facility, a qualitative assessment of existing conditions, and a quantitative assessment of chemical data for surface water and sediment samples, which concluded that there was no observable evidence of adverse impact attributable to releases of constituents from the facility. No additional survey of field conditions or collection of ecological data has been performed subsequent to that assessment. Therefore, there is no indication that unacceptable ecological exposures are occurring which would warrant interim measures. The need to update or supplement the 1997 ecological assessment will be considered during the development of the RFI Work Plan.

5.2 CONSTITUENTS IN ENVIRONMENTAL MEDIA

Existing data from the previous RFI at the Northern Sanitary Landfill (SWMU 6) and the ongoing RCRA groundwater monitoring program for the facility show that hazardous constituents have been detected in soil, groundwater, sediment, and surface water at or near the facility. Table 5-1 shows the constituents that have been detected in the soil, groundwater, sediment, and surface water data during the previous RFI at the Northern Sanitary Landfill. Table 5-2 shows the constituents that have been detected in the groundwater data collected during the most recent four quarters of the RCRA groundwater monitoring program for the facility and in the data from the most recent Appendix IX sampling event in April 1999.

Tables 5-1a through 5-1d and Table 5-2 also show the following summary information for each constituent detected in each environmental medium:

- The number of times the constituent was analyzed.
- The number of time the constituent was detected.
- The minimum, mean, and maximum concentrations detected.

For the purposes of this assessment, these summary statistics for the data are based on counting replicate analyses separately.

As shown in these tables, many constituents were detected in these media, particularly in the soil and groundwater data collected during the previous RFI at the Northern Sanitary Landfill. However, many constituents were detected at low frequencies (e.g., less than 20%) and at low concentrations (e.g., less than 1 mg/kg). To identify constituents that may be of potential concern for the purposes of this assessment, the highest detected concentration of each constituent in each medium is compared with the following conservatively risk-based screening criteria:

Soil	USEPA Region 9 Preliminary Remediation Goals (PRGs) for "Residential Soil" at target cancer risk of 10^{-6} and target hazard quotient of 1.
Groundwater	Maximum Contaminant Levels (MCLs), and for chemicals without MCLs, USEPA Region 9 PRGs for "Tap Water" at target cancer risk of 10^{-6} and target hazard quotient of 1.
Sediment	USEPA Region 9 Preliminary Remediation Goals (PRGs) for "Residential Soil" at target cancer risk of 10^{-6} and target hazard quotient of 1.
Surface Water	Maximum Contaminant Levels (MCLs), and for chemicals without MCLs, USEPA Region 9 PRGs for "Tap Water" at target cancer risk of 10^{-6} and target hazard quotient of 1.

The ratio of each constituent's maximum detected concentration to its generic screening criteria is also shown on Tables 5-1 and 5-2. Ratios greater than 1 are shown in bold font and with a shaded background. Constituents with ratios greater than 1 are considered potential constituents of concern and are further evaluated below.

The criteria used for identifying constituents of potential concern in soil and groundwater are highly conservative generic risk-based criteria, which are often used for evaluating potential exposures under residential land use and potable groundwater use. However, current land and groundwater uses at and around the facility do not include either residential land use or potable groundwater use. Therefore, the presence of constituents in soil and groundwater at concentrations higher than these generic risk-based screening criteria does not necessarily indicate that unacceptable human exposures are occurring. Current land and groundwater uses at and around the facility and the significance of potential exposures associated with such uses are discussed below in the next section.

Likewise, using the generic risk-based soil and groundwater criteria to identify constituents of potential concern in sediment and surface water is also highly conservative. Potential exposures to sediment and surface water under current site-specific conditions at the facility are much lower than the potential exposures assumed in the development of the generic soil and groundwater criteria. The significance of potential exposures to sediment and surface water associated with site-specific conditions is also discussed below in the next section.

5.3 POTENTIAL HUMAN EXPOSURES

5.3.1 Current Land Use

According to the *Comprehensive Plan Update, City of Oregon* (Poggemeyer 1994), Oregon has generally developed into three major sections of land use. The northwest portion of the City is an industrial corridor. The southwest portion of the City is fully developed with residential and industrial uses; and the eastern portion of the City is primarily used for agriculture, open space and recreation. Overall, 15% of the land in Oregon is used for industrial purposes, 53% is used for agricultural purposes, 21% is used for residential purposes, 3% is used for commercial purposes, and 8% is used for institutional (e.g., school, hospitals, churches) and recreational purposes. The facility is located in the northwest commercial/industrial part of the City.

As discussed above in Section 1.2.1 of this report, the facility is surrounded by other waste management facilities, refineries, utility properties, chemical and oil pipeline pumping stations, and miscellaneous industrial and manufacturing facilities. The property immediately north of the facility is used by Commercial Oil and includes the inactive Westover Sanitary Landfill Disposal Area (the Gradel Landfill). Another closed Westover Sanitary Landfill occupies the land to the west of the facility. The facility is bordered to the south by the Norfolk Southern Railroad Homestead Yard. To the east, a Toledo Edison property that is currently used for agriculture borders the facility. A Buckeye Pipeline tank farm also borders the facility to the east.

Future land use at and around the facility is expected to remain the same as the current land use. According to Poggemeyer (1994), land use planning objectives include increasing industrial development in and around the Cedar Point Development Park east of the facility (located north of Seaman Road and west of Wynn Road), to 21% of total land use (as compared to a current industrial land use of 15%). In fact, the general policy recommendation is for industrial development to be promoted, particularly at the Cedar Point Development Park (Poggemeyer 1994). Potential human exposures under current and expected future land uses on-site and off-site are discussed below in Section 5.3.3.

5.3.2 Current Groundwater Use

As discussed in Sections 1.3.1 and 1.3.2 of this report, the uppermost aquifer underlying the facility is the bedrock aquifer, which is located approximately 70 to 90 feet below ground surface. The bedrock aquifer is considered a potential drinking water supply in the region, but it is not used currently to supply drinking water to the facility or areas around the facility. Potable water for the facility and the surrounding areas is provided by the City of Oregon, which obtains its water from Lake Erie. Further, groundwater in areas to the north and west of the facility have received an Urban Setting Designation indicating the widespread use of public drinking water supplies and the lack of potable groundwater use in the area (see Appendix C).

The bedrock aquifer is a confined aquifer that is overlain by a lower till (generally 12 to 30 feet thick), an upper till (generally 35 to 50 feet thick), and proglacial lacustrine deposits (generally 10 to 20 feet thick). The very low hydraulic conductivity of these overlying geologic units (e.g., on the order of 10^{-9} to 10^{-8} cm/sec for the lower and upper tills) isolates the bedrock aquifer from surface recharge at and near the facility. In fact, an upward hydraulic gradient exists between the bedrock aquifer and the lower till unit.

The low permeability of the geologic units overlying the bedrock aquifer also makes these units incapable of supporting uses of groundwater that might be found in them. Groundwater in these geologic units is found primarily in contact zones between the lower till and upper till, and between the upper till and the proglacial lacustrine deposits. At the facility, these contact zones are relatively thin and aquifer pumping tests at the facility have shown that these zones are hydraulically isolated from the bedrock aquifer.

The facility's groundwater monitoring network includes many monitoring wells that are screened in the contact zones, in addition to monitoring wells that are screened in the bedrock aquifer. In fact, the presence of hazardous constituents in groundwater that might be related to a release from a SWMU or AOC has been identified in only the monitoring wells that are screened in the contact zones. No hazardous constituents that might be related to a SWMU or AOC has been detected in groundwater from any of the monitoring wells screened in the bedrock aquifer.

5.3.3 Current Surface Water Use

Groundwater in the upper contact zone (between the upper till and the proglacial lacustrine deposits) has a potential to migrate to two nearby surface water features--the Gradel Ditch and Otter Creek. The Gradel Ditch is a storm water ditch that runs from east to west just north of the facility's property line. This ditch separates the ESOI facility from the Gradel Landfill. Surface water in the ditch discharges to Otter Creek, which is located approximately 500 feet west of the ESOI facility.

As discussed in Section 1.3.3, surface water quality in Otter Creek is severely affected by industrial effluent discharges from facilities upstream of the ESOI facility. In fact, as discussed in Section 1.3.3, recent Ohio EPA sampling of Otter Creek showed that Otter Creek does not attain the Modified Warm Water Habitat (as designated in OAC 3745-1) from River Mile 2.1 to 2.4 (Ohio EPA automatically extends this “non-attainment” designation for 0.5 mile in each direction, i.e., non-attainment is from RM 1.6 to 2.8). There are no known current uses of surface water in the reach of Otter Creek adjacent to or downstream of the ESOI facility for potable, industrial, agricultural, or recreational purposes. Otter Creek drains to the Maumee Bay, which is directly connected with Lake Erie. Ohio Administrative Code 3745-1-31 designates Lake Erie as an exceptional warmwater habitat, superior high quality water, public water supply, agricultural water supply, industrial water supply and bathing waters, although as discussed in Section 1.3.3, none of the areas recently studied by Ohio EPA, including the Maumee Bay area, attained this designated exceptional integrity level.

5.3.4 Current Potential Exposures

For the purposes of this assessment, only current human exposures are evaluated. A conceptual site model that includes potential exposures under future land and groundwater uses on-site and off-site will be developed as part of the RFI Work Plan. Under the current on-site and off-site land, groundwater, and surface water uses discussed above, potential human exposures to constituents in environmental media at and around the facility consist of the following:

On-Site

The potentially exposed population on-site consists of ESOI's waste management workers and outside contractors at the facility. During performance of routine duties and occasional subsurface maintenance work, these workers could be exposed to constituents in soil and in groundwater in the upper contact zone. Potential routes of exposure would include incidental ingestion of soil and groundwater, dermal contact with soil and groundwater, and inhalation of airborne vapors or soil particles.

Trespassers on the facility are highly unlikely because the facility is surrounded by a chain-link fence with three strands of barbed wire mounted on top. Entrances to the facility are secured or monitored at all times. An ESOI security officer is present at the main entrance of the facility 24 hours per day, 7 days per week. Also, the facility is essentially surrounded by industrial properties with no nearby residential areas.

On-site residential exposures do not exist and are not expected in the future, because the facility is an operating RCRA TSDF and will remain under RCRA post-closure care when it closes. The operating requirements and post-closure care requirements under RCRA, among other things, are designed to prevent on-site residential use of the site.

Off-Site

Potentially exposed populations off-site include workers at adjacent industrial properties who could be exposed to airborne vapors and soil particles from the ESOI facility. They also could be exposed to constituents in off-site soil and groundwater. The nature of these potential exposures would be similar to those for on-site workers, as discussed above (i.e., incidental ingestion, dermal contact, and inhalation of vapors and soil particles).

To the extent that constituents in shallow groundwater has migrated to the Gradel Ditch or Otter Creek, off-site workers and trespassers could be exposed to these constituents through incidental contact with surface water and possibly sediment. Potential routes of exposure would include incidental ingestion and dermal contact with surface water and sediment, and inhalation of vapors from surface water.

No residential properties are adjacent to the ESOI facility. The nearest residences are located beyond the industrial properties adjoining the facility. Therefore, there is virtually no current potential for exposures of residents via direct contact with contaminated soil, groundwater, surface water, or sediment. Potential exposures to constituents from the facility via inhalation of airborne vapors and soil particles are possible. However, such exposures are expected to be lower than those of off-site workers at properties adjacent to the ESOI facility, since air dispersion over the greater distances would reduce the concentrations of airborne contaminants.

5.4 SIGNIFICANCE OF CURRENT EXPOSURES

The significance of current potential exposures to the constituents of potential concern identified above in Section 5.2 is assessed in the following subsections.

5.4.1 Soil

Table 5-1a shows that only 14 of the 58 constituents detected in soil have a maximum concentration higher than the generic screening criteria for residential soil. These 14 constituents of potential concern are primarily polynuclear aromatic hydrocarbons (PAHs). To assess the significance of current potential exposures to these constituents in soil, the concentrations of these constituents are compared with USEPA Region 9 Preliminary Remediation Goals (PRGs) for "Industrial Soil" at target cancer risk of 10^{-5} and a target hazard quotient of 1. These generic risk-based screening criteria are conservative screening levels for evaluating potential worker exposures to soil. That is, site-specific worker exposures to constituents in soil are expected to be lower than those assumed in deriving these PRGs. Also, using PRGs at a target risk of 10^{-5} (instead of 10^{-6}) in this case is expected to be adequate for identifying unacceptable cumulative cancer risk (i.e., cumulative risk higher than 10^{-4}) because relatively few carcinogens are of potential concern.

Table 5-3 shows the constituents that have concentrations higher than their PRGs for industrial soil and the sample locations where these concentrations were found. As shown in Table 5-3, three constituents (2-methylnaphthalene, benzo(a)pyrene, and naphthalene) were detected at concentrations higher than their PRGs at a sample location north of the Gradel Ditch [Sample ID GR-7 (4-12)]. Two constituents (benzo(a)pyrene and dibenz(a,h)anthracene) were detected at concentrations higher than their PRGs at two on-site sample locations east of and north of the Northern Sanitary Landfill [Sample ID 360BB-0-5.5' and Sample ID QD6, 2-3].

Sample locations north of the Gradel Ditch, including Sample ID GR-7 (4-12), is located on the Gradel Landfill which adjoins the ESOI facility. As such, the presence of constituents in soil north of the Gradel Ditch is believed to be attributable the Gradel Landfill, rather than the ESOI facility. USEPA and Ohio EPA have both indicated that they concur with this belief (USEPA and Ohio EPA 2000).

At sample location 360BB-0-5.5', which is located on-site east of the Northern Sanitary Landfill, the concentrations of benzo(a)pyrene and dibenz(a,h)anthracene are approximately two to three times higher than their industrial PRGs. However, these concentrations are limited to a small area bounded by sample locations QE-360CC, QE-350, QE-360C, and QE-370, where these constituents have not been detected at a concentration higher than their PRGs (see Figure 2-2 in Appendix E). These samples are within an approximately 10-foot radius of sample 360BB-0-5.5'.

At sample location "QD6, 2-3", which is located on-site north of the Northern Sanitary Landfill, the concentration of benzo(a)pyrene is approximately six times higher than its PRGs. However, this concentration is limited to a small area bounded by sample locations QD-6.5, QD-6B, and QD-5.25CC, where this constituent has not been detected a concentration higher than their PRGs (see Figure 2-2 in Appendix E). These samples are within an approximately 30-foot radius of sample QD6, 2-3.

In summary, both on-site locations where constituents have been detected at concentrations higher than their PRGs are relatively small, as verified by surrounding soil samples collected during the previous RFI for the Northern Sanitary Landfill. These sample locations are also located in areas of the facility where workers do not typically spend much of their workday. As such, current potential exposure of on-site workers to the higher concentrations would be limited, and expected to be much lower (i.e., at least 10-fold lower) than the daily exposure assumed in the derivation of the PRGs. Therefore, the existing soil characterization data do not show that current potential exposures to constituents in soil would pose an unacceptable risk.

5.4.2 Groundwater

Table 5-1b shows that only 28 of the 70 Appendix IX constituents detected in groundwater have a maximum concentration higher than the generic screening criteria for drinking water. All of the constituents detected in groundwater during the previous RFI were detected in shallow groundwater in the till units overlying the bedrock aquifer, which is the uppermost aquifer. Table 5-2 shows that only 7 of the 27 Appendix IX constituents detected during the most recent four quarters of the RCRA groundwater monitoring program for the facility and in the April 1999 Appendix IX data have a maximum concentration higher than the generic screening criteria for drinking water. All the detected constituents were detected in groundwater in the contact zones between the till units overlying the bedrock aquifer, but not in the bedrock aquifer.

To assess the significance of current potential exposures to these constituents in groundwater, the concentrations of these constituents are compared with Michigan Department of Environmental Quality (DEQ) Part 201 generic Groundwater Contact Criteria (GCC). These generic groundwater criteria are conservative screening levels for evaluating potential worker exposures to groundwater during occasional excavation activities that encounter groundwater. The

Michigan DEQ developed these generic risk-based criteria as a highly conservative means for evaluating this specific exposure scenario (Michigan DEQ 1998).

Table 5-4 shows the constituents that have concentrations higher than the GCC and the sample locations where these concentrations were found. As shown in Table 5-3, one constituent (bis(2-ethylhexyl)phthalate) was detected at a concentration higher than its GCC at a sample location north of the Gradel Ditch (Sample ID GR-3). Five constituents (bis(2-ethylhexyl)phthalate, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, and chrysene) were detected at concentrations higher than their GCC at two on-site sample locations along the east side of the Northern Sanitary Landfill (QE-160BB and QE-440BB). None of these locations are monitoring wells that are part of the facility's RCRA groundwater monitoring network.

As discussed above in Section 5.4.1, sample locations north of the Gradel Ditch, including Sample ID GR-3, are located on the Gradel Landfill and the presence of constituents in groundwater north of the Gradel Ditch is believed to be attributable the Gradel Landfill, rather than the ESOI facility.

At sample location QE-160BB, the concentration of bis(2-ethylhexyl)phthalate is less than two times higher than its GCC. This concentration is limited to a small area bounded by sample locations QE-160 (10 feet east), QE-80 (80 feet north), and QE-200BB (40 feet south), where the constituent has not been detected at a concentration higher than its GCC (see Figure 2-2 in Appendix E).

At sample location QE-440BB, the concentrations of benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, and chrysene are approximately two to three times higher than their GCC. However, these concentrations are limited to a small area bounded by sample locations QE-440B (10 feet east), QE-370 (70 feet north), and QE-480B (40 feet south), where these constituents have not been detected at a concentration higher than their GCC (see Figure 2-2 in Appendix E).

In summary, both on-site locations where constituents have been detected at concentrations higher than their GCC are relatively small, as verified by surrounding groundwater samples collected during the previous RFI for the Northern Sanitary Landfill. These sample locations are also located in areas of the facility where workers would rarely, if ever, excavate into groundwater. As such, current potential exposure of on-site workers to the higher concentrations would be limited, and expected to be much lower (i.e., at least 10-fold lower) than the 20 days/year exposure assumed in the derivation of the GCC. Therefore, the existing groundwater characterization data do not show that current potential exposures to constituents in groundwater would pose an unacceptable risk.

5.4.3 Sediment

Table 5-1c shows that only 6 of 31 constituents detected in sediment have a maximum concentration higher than the generic screening criteria for residential soil. These 6 constituents of potential concern are primarily PAHs. To assess the significance of current human potential exposures to these constituents in sediment, the concentrations of these constituents are conservatively compared with USEPA Region 9 PRGs for "Industrial Soil" (i.e., the same PRGs discussed above in Section 5.4.1 for assessing current human exposures to soil). These generic risk-based screening criteria for soil are highly conservative screening levels for evaluating potential human exposures to sediments, because exposures to sediments would be much lower than exposures to soil in general, and much lower than the exposures assumed in deriving the soil PRGs. This comparison shows that the maximum concentrations of all six constituents (arsenic, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, chromium, and indeno(1,2,3-cd)pyrene) in sediment are lower than their industrial soil PRGs. Therefore, the existing sediment characterization data do not show that current potential exposures to constituents in sediment would pose an unacceptable risk.

5.4.4 Surface Water

Table 5-1d shows that only 5 of 23 constituents detected in surface water have a maximum concentration higher than the generic screening criteria for drinking water. These constituents are 1,4-dioxane, bis(2-ethylhexyl)phthalate, aldrin, α-BHC, and β-BHC. To assess the significance of current human potential exposures to these constituents in surface water, the concentrations of these constituents are conservatively compared with the Michigan DEQ's GCC (i.e., the same criteria discussed above in Section 5.4.2 for assessing current human exposures to shallow groundwater). These generic risk-based screening criteria for contact with groundwater are appropriate screening levels for evaluating potential human exposures to surface water, because exposures to surface water in the Gradel Ditch and Otter Creek likely would be lower than the exposures assumed in deriving the GCC. This comparison shows that the maximum concentrations of 1,4-dioxane, bis(2-ethylhexyl)phthalate, α-BHC, and β-BHC in surface water are lower than their GCC. Only aldrin had concentrations higher than its GCC, but these concentrations were from surface water samples collected in Otter Creek upstream of the ESOI facility (Sample IDs E58W, E59W, and E61W). Therefore, the existing surface water characterization data do not show that current potential exposures to constituents in surface water would pose an unacceptable risk.

5.5 SUMMARY

This assessment of current exposures evaluated the existing data for soil, groundwater, sediment, and surface water collected during the previous RFI for the Northern Sanitary Landfill and the most recent four quarters of the RCRA groundwater monitoring program for the facility (including the April 1999 Appendix IX sampling event). The evaluation considered current potential exposures under current land, groundwater, and surface water use at and near the facility and used conservative risk-based screening criteria in the evaluation of these current potential exposures. The evaluation shows that the existing data do not indicate that unacceptable exposures are occurring. Therefore, there is no basis for initiating interim measures at this time. ESOI will reevaluate the need for interim measures as new data are collected during the upcoming RFI. In addition, ESOI will address the need for and the scope of additional ecological investigation in the upcoming RFI Work Plan.

6 AREAS FOR FURTHER INVESTIGATION

This section summarizes the recommendations for whether further investigation in the RFI is warranted for each SWMU and AOC, and the basis for the recommendations. More detailed discussion of the recommendations and bases are presented above in Section 3 of this report.

SWMU 1 - Landfill Cell F

Further investigation of Landfill Cell F (SWMU 1) is warranted based on observed leachate generation rates, detection of VOCs in shallow groundwater near the unit, and observations of orange liquid in the drainage ditch along the side of the unit. Further investigations should focus on the following:

- Determining whether the detection of VOCs in shallow groundwater as observed at well F-2S is attributable to a release from Landfill Cell F. ESOI will provide details regarding shallow groundwater investigation for this SWMU as part of the RFI Work Plan;

- Determining whether potential surface leachate outbreaks through the landfill cover have occurred, and if so, whether there is an impact to soil, surface water, and sediment near the unit; and

- Assessing the current landfill cover's integrity and determining whether repairs to the cover, as part of the ongoing post-closure activities, are warranted to reduce the rate of leachate generation.

SWMU 2 - Landfill Cell G

Further investigation of Landfill Cell G (SWMU 2) is not warranted. This permitted RCRA landfill was designed, constructed, operated, and closed in accordance with RCRA requirements. ESOI has and is currently monitoring and providing maintenance for Landfill Cell G in accordance with the substantive provisions of the facility's post-closure plan. Such monitoring has not identified any release from the unit or problems with the cap and liner systems. As such, further investigation of this SWMU in the RFI is not warranted. ESOI will continue post-closure monitoring and maintenance of this unit.

SWMU 3 - Landfill Cell H

Further investigation of Landfill Cell H (SWMU 3) is not warranted. This permitted RCRA landfill was designed, constructed, operated, and closed in accordance with RCRA requirements. ESOI has and is currently monitoring and providing maintenance for Landfill Cell H in accordance with the substantive provisions of the facility's post-closure plan. Such monitoring has not identified any release from the unit or problems with the cap and liner systems. Although the January 2000 RCRA groundwater monitoring detected tetrahydrofuran in well H-1S, this detection is being further assessed as part of ESOI's Integrated Monitoring program. As such, further investigation of this SWMU in the RFI is not warranted. ESOI will continue post-closure monitoring and maintenance of this unit.

SWMU 4 - Landfill Cell I

Further investigation of Landfill Cell I (SWMU 4) is not warranted. This permitted RCRA landfill was designed, constructed, operated, and closed in accordance with RCRA requirements. ESOI has and is currently monitoring and providing maintenance for Landfill Cell I in accordance with the substantive provisions of the facility's post-closure plan. Such monitoring has not identified any release from the unit or problems with the cap and liner systems. As such, further investigation of this SWMU in the RFI is not warranted. ESOI will continue post-closure monitoring and maintenance of this unit.

SWMU 5 - Millard Road Landfill

Further investigation of the Millard Road Landfill (SWMU 5) is warranted based on the detection of VOCs in shallow groundwater near the unit, the lack of an engineered landfill leachate collection system, and proximity of the western limit of the toe of the slope to Otter Creek. Further investigations should focus on the following:

- Determining whether the detection of VOCs in shallow groundwater near the Millard Road Landfill is attributable to a release from the unit;

- Investigating the extent of waste and impacts a release may have had to the environment; and

- Assessing the current landfill cover's integrity and determining whether repairs to the cover are warranted to reduce infiltration into the landfill.

SWMU 6 - Northern Sanitary Landfill

ESOI has conducted an extensive RFI for this SWMU which determined that chemical constituents that may be of landfill origin are present in shallow groundwater and soil samples collected near the unit. The presence of VOCs has also been confirmed in shallow groundwater monitoring wells near the unit, with several of the VOCs also detected in fluids present in vertical pipes located on the side slopes of the landfill.

ESOI had also submitted a CMS Work Plan for the Northern Sanitary Landfill to USEPA. Because this CMS Work Plan has not yet been approved, ESOI believes that work proposed in the work plan, as appropriate, should be performed during the current RFI. Additionally, given the limited documentation regarding the construction of the landfill cover, investigation of the integrity of the cap and its performance relative to reducing infiltration into the landfill is also necessary to determine if repairs to the cap are warranted. Further work during the current RFI should focus on the following:

- Assessing the long-term significance of the constituents that have been detected in shallow groundwater at the unit, including potential impact on surface water and sediment in the Gradel Ditch;

- Assessing the long-term significance of the constituents that have been detected in soil near the unit; and

- Assessing the current landfill cover's integrity and determining whether repairs to the cover are warranted to reduce infiltration into the landfill.

SWMU 7 - Central Sanitary Landfill

Further investigation of the Central Sanitary Landfill (SWMU 7) is warranted based on the limited availability of information regarding the design, operation, and closure of the unit (including construction of the landfill cover), although existing data do not indicate that a release from the unit has occurred. Further investigations should focus on assessing the current landfill cover's integrity and determining whether repairs to the cover are warranted to reduce infiltration into the landfill.

SWMU 8 - Old Oil Pond #1 (South Pond)

Further investigation of the Old Oil Pond #1 (SWMU 8) is warranted based on the limited availability of information regarding the design, operation, and closure of the unit. Additionally, this unit is believed to be the source of oil identified in the Building "C" floor drains (AOC 3) and Butz Crock (AOC 7). Further investigations should focus on determining the nature and extent of releases of constituents from the unit (including releases into Building "C" and Butz Crock), and the potential for releases into the Toledo raw waterline monitoring trenches (AOC 1).

SWMU 9 - New Oil Pond #2 (North Pond)

Further investigation of the New Oil Pond #2 (SWMU 9) is warranted based on the limited availability of information regarding the design, operation, and closure of the unit. Additionally, this unit is believed to be the source of the oil sheen and VOCs occasionally observed in the City of Toledo raw waterline monitoring trench (AOC 1). Further investigations should focus on determining the nature and extent of releases of constituents from the unit (including releases into the monitoring trenches).

SWMU 10 - Ash Disposal Area

A portion of the Ash Disposal Area (SWMU 10) was removed during the construction of Landfill Cell G (SWMU 2). ESOI removed ash material and verified the adequacy of removal through post-excavation sampling. The removal and verification were conducted under OEPA oversight. As such, further investigation of the portion of SWMU 10 that was removed during construction of Cell G is not warranted.

However, further investigation of the remaining portion of the Ash Disposal Area is warranted based on the constituents detected in the ash material removed during construction of Cell G. Further investigations should focus on the following:

- Determining the physical extent of ash disposal;
- Characterizing the constituents of the ash material in the remaining portion of the unit; and
- Determining the nature and extent of releases of constituents from this unit.

SWMU 11- Former Teepee Burner

Further investigation of the Former Teepee Burner (SWMU 11) is not warranted. Aerial photographs indicate that the Former Teepee Burner was located within the limits of Landfill Cell G (SWMU 2) and the ash disposal area (SWMU 10), where waste material was removed and post-excavation sampling was conducted to verify the adequacy of removal prior to construction of Cell G. As such, further investigation of the Former Teepee Burner is not warranted. However, at the request of USEPA SWMU 11 will be assessed as part of the ESOI's investigation of SWMU 10.

SWMU 12 - Former Bill's Road Oil Operation

A large portion of Former Bill's Road Oil Operation (SWMU 12) is currently covered by the Containment Building, which is an operating hazardous waste management unit identified as SWMU 15 in permit condition VI.C.3. According to permit condition VI.C.3, investigation of the Containment Building (SWMU 15), as well as other operating units, can be undertaken during RCRA closure of the unit. Because most of SWMU 12 is under SWMU 15, ESOI will investigate SWMU 12 in conjunction with the RCRA closure of SWMU 15. However, as requested by USEPA, the shallow wells (M-6S, M-16S, M-17S, M-18S, M-19S, MB-1S, MB-2S) will be resampled during the RFI.

AOC 1 - Toledo Water Lines

The Toledo Water Lines are two low-pressure raw water transmission lines, which carry raw water from Lake Erie to the City of Toledo's Collins Park Water Treatment Plant. Under the auspices of the Low Pressure Raw Water Line Security Agreement between ESOI and the City of Toledo, ESOI has been and continues to monitor several monitoring trenches at the ESOI facility along these lines. This monitoring has occasionally identified VOCs in Monitoring Trenches 3 and 5, and an oil sheen in Monitoring Trench 3, which are believed to have originated from the New Oil Pond #2 (SWMU 9). However, no threat to the raw water lines has been identified. Because ESOI will continue monitoring of the trenches along the water lines under the Agreement, further investigation of this AOC in the RFI as a source of contamination is not warranted. However, an assessment of this AOC as a potential migration pathway will be conducted as part of the RFI. In addition, further investigation of potential releases to this AOC from neighboring SWMUs 8 and 9 will also be included in the RFI Work Plan.

AOC 2 - Truck Scale

Further investigation of the Truck Scale (AOC 2) is not warranted. ESOI had assessed the potential for a release from the damaged collection drum at this AOC by soil sampling, which was conducted under Ohio EPA oversight. Results of the soil sampling showed no measurable evidence of impact. Additionally, ESOI addresses releases from this area in accordance with its Contingency Plan (Section G of its State Part B Permit) and Standard Operating Procedures, which specify the procedures for responding to spills of hazardous wastes. However, at the request of USEPA, ESOI will retain this AOC for surficial soil sampling to evaluate past releases.

AOC 3 - Building “C” Equipment Maintenance Area

Further investigation of the Building "C" Equipment Maintenance Area (AOC 3) is warranted as part of ESOI's investigation of Old Oil Pond #1 (SWMU 8), which underlies this AOC. The oil infiltrating into the floor drains of Building "C" is suspected to originate from SWMU 8.

AOC 4 - Building "C" Septic Tank and Leach Field

Further investigation of the Building "C" Septic Tank and Leach Field (AOC 4) is warranted as part of ESOI's investigation of Old Oil Pond #1 (SWMU 8), which underlies at least part of this AOC.

AOC 5 - Decontamination Building

Further investigation of the Decontamination Building (AOC 5) is warranted as part of ESOI's investigation of Old Oil Pond #1 (SWMU 8), which underlies this AOC.

AOC 6 - Oily Waste Above Ground Storage Tanks

Further investigation of the Oily Waste Above Ground Storage Tanks (AOC 6) is warranted based on the lack of secondary containment for these tanks and limited information regarding potential for past releases from their operation.

AOC 7 - Butz Crock – Concrete Utility Vault

Further investigation of Butz Crock (AOC 7) is warranted as part of ESOI's investigation of Old Oil Pond #1 (SWMU 8), which is believed to be the source of oily material observed in this AOC.

AOC 8 - Staging Area

Further investigation of the Staging Area (AOC 8) is warranted as part of ESOI's investigation of Old Oil Pond #1 (SWMU 8), which underlies this AOC.

AOC 9 - Cell M Water Retention Basin

Further investigation of the Cell M Water Retention Basin (AOC 9) is not warranted. Existing NPDES monitoring data on the effluent from the basin show no evidence of a significant release of constituents from the basin. Also, groundwater monitoring wells near AOC 9 have not detected a release from the basin. Therefore, further investigation of AOC 9 is not warranted. However, at the request of USEPA, ESOI will conduct sampling during the RFI to determine whether a release to the environment has occurred from this AOC, as well as from all identified storm water outfalls.

AOC 10 - Rail Spur

The Rail Spur (AOC 10) is a section of the same rail spur that runs into Areas M and N, which are designated as (SWMU 18) in permit condition VI.C.3. The Rail Spur, along with Areas M and N service the Containment Building which is designated as (SWMU 15) in permit condition VI.C.3. According to permit condition VI.C.3, investigation of Areas M and N (SWMU 18), as well as investigation of the Containment Building (SWMU 15), can be undertaken during RCRA closure of the units. Although the closure plan requires the clean closure of the spur and although there are no reported releases from this unit, investigation of this AOC (i.e., the segment between SWMU 15/18 to the property boundary) will be retained as part of the RFI. Any contamination found that does not pose a significant risk or an immediate danger to human health and the environment will be addressed in conjunction with the RCRA closure of the SCB (SWMU 15) and the Rail Storage Area M and N (SWMU 18).

AOC 11- Former Truck Scale

Further investigation of the Former Truck Scale (AOC 11) is not warranted. Available information indicates that the two former truck scales were located within the limits of area excavated as part of the construction of Landfill Cell G (SWMU 2). As such, further investigation of the Former Truck Scale is not warranted.

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