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Division of Emergency and Remedial Response

Old Delaware City Landfill Site Assessment Report

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Governor Ted Strickland
Director Chris Korleski

OHIO ENVIRONMENTAL PROTECTION AGENCY (OHIO EPA)
DIVISION OF EMERGENCY & REMEDIAL RESPONSE (DERR)

SITE ASSESSMENT REPORT

OLD DELAWARE CITY LANDFILL
DELAWARE COUNTY
DERR ID # 121-000606-001
U.S. EPA CERCLA ID # OHD980510366

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EXECUTIVE SUMMARY

The Ohio EPA, Division of Emergency and Remedial Response, Central District Office (DERR CDO) conducted a state site assessment of the Old Delaware City Landfill in the city of Delaware, Delaware County, Ohio. The site assessment included a field investigation conducted December 4 – 6, 2006 in which soil, ground water and landfill leachate were collected and submitted for laboratory analysis. An additional ground water sample was collected on September 19, 2007. The purpose of this site assessment was to provide an update on site conditions including leachate and shallow ground water discharge to the Olentangy River, a state scenic river, which borders the landfill on the east and south.

The landfill is located along the west bank of the Olentangy River, east of U.S. Route 23 and north of Olentangy Avenue on city-owned property. The city's municipal wastewater treatment plant, maintenance garage, salt sheds and recycling center are also located on the site.

The landfill was operated as a municipal solid waste landfill by the city of Delaware from approximately 1951 to 1975 and received municipal, commercial and industrial wastes. The landfill was closed prior to Ohio EPA's 1976 solid waste rules with no liner or engineered cap system in place. The footprint of the landfill was determined to be 33.4 acres in a 2000 study commissioned by the city. Beginning in the late 1970s, waste has been periodically relocated and reconsolidated on the site under Ohio Administrative Code (OAC) 3745-27-13 authorizations to allow for expansion of the wastewater treatment plant.

The landfill has a documented history of leachate outbreaks to the Olentangy River and has been inspected or investigated by the Ohio Department of Health, Delaware County Health Department, Ohio EPA and U.S. EPA. Samples of shallow soil, leachate, surface water and sediment from the site and well water samples from off-site residents have been previously collected and analyzed. Site ground water samples, however, had not been previously collected prior to this site assessment.

During December 2006, soil and ground water samples were collected from five Geoprobe® sample locations along the west bank of the Olentangy River at presumed downgradient locations from the landfill. Minor amounts of debris in four of the sample locations indicate that landfilling activities occurred in close proximity to the river. One boring, GP-05, was potentially located in the main body of waste at the far south end of the landfill because the Geoprobe® rig could not access a location down the river bank at this point. Only one apparent leachate seep was accessible during the December 2006 field investigation and was sampled. River bank seeps could not be sampled due to high water levels in the Olentangy River. Evidence of former seeps, not actively flowing at the time, were present at higher elevations along the landfill slopes. During September 2007, an additional ground water sample was also collected from an upgradient explosive gas monitoring well located along Cherry Street west of the landfill.

Soil sample results from the December 2006 field investigation yielded detections of volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), polychlorinated biphenyls (PCBs), metals and pesticides. Vinyl chloride, benzo(b)fluoranthene, PCBs, heptachlor expoxide and several metals were detected above their respective U.S. EPA Region 9 preliminary remediation goals (PRGs) for direct contact with residential soil.

Ground water sample results from the December 2006 field investigation indicate the presence of ground water contamination at the site. Benzene, vinyl chloride, bis (2-ethylhexyl) phthalate (BEHP), PCBs and arsenic were detected above their respective U.S. EPA maximum contaminant levels (MCLs) for drinking water. Additional VOCs, SVOCs, pesticides and metals were detected above U.S. EPA Region 9 PRGs for tap water. VOCs only were analyzed from the upgradient explosive gas monitoring well in September 2007 and were not detected.

Shallow ground water at the site flows toward the Olentangy River or may discharge to the river through seeps along the river bank or topographically higher seeps on the landfill slopes. Seeps located along the landfill slopes may be active only during periods of higher precipitation when ground water levels are higher. In either case, contaminated leachate/ground water continues to discharge to the river.

A leachate sample collected during the December 2006 field investigation yielded detections of VOCs, PCBs and elevated nutrient and general water quality parameters. A water sample collected from a 24-inch storm sewer outfall to the river during May 2006 contained VOCs as well as elevated ammonia, total Kjedahl nitrogen (TKN), chemical oxygen demand (COD) and chlorides.

As a follow up to the December 2006 sampling event, additional investigation consisting of surface water, sediment and leachate sampling was conducted during July 2007 under a U.S. EPA supplemental expanded site investigation (SESI). The purpose of the SESI was to determine if hazardous constituents are migrating off of the site and to determine if the site warrants listing on U.S. EPA's national priority list (NPL). The results of the SESI are presented in a separate SESI report.

1.0. INTRODUCTION

Ohio EPA completed a state site assessment of the Old Delaware City Landfill, which includes the results of a field investigation conducted during December 2006. An additional ground water sample was also collected on September 19, 2007. The purpose of the field investigation was to provide an update on site conditions at the landfill with respect to leachate seeps, which have been an on-going problem, and to determine shallow ground water quality at the site.

The landfill is located on city-owned property between Cherry Street and the Olentangy River south of the municipal wastewater treatment plant. The city operated the landfill from approximately 1951 to 1975. The landfill is bordered by the Olentangy River on the east and south and there have been numerous documented occurrences of leachate outbreaks to the river over the years. Past investigations have been conducted by Ohio EPA, U. S. EPA and the Ohio Department of Health in which soil, surface water, sediment, off-site residential well and leachate samples have been collected and submitted for laboratory analysis.

Soil, ground water and leachate samples were collected during the December 2006 field investigation at the landfill. An additional ground water sample was also collected during September 2007. The methods, results conclusions and recommendations for the site are presented in this site assessment report.

2.0. BACKGROUND

Site Name: Old Delaware City Landfill **Alias:** Cherry Street Landfill

DERR I.D. No.: 121-000606-001 **U.S. EPA I.D. No.:** OHD980510366

District: Central District **County:** Delaware

Site Address: 241 Cherry Street, Delaware, OH 43015

Directions to Site: From Central District Office: North on State Route 315 to Interstate 270 (I-270). Take I-270 east to U.S. Route 23 North. Continue on U.S. Route 23 north to Stratford Road. Follow Stratford Road north approximately 2 miles. Stratford Road becomes Cherry Street north of the Olentangy Avenue intersection. Continue north on Cherry Street to the wastewater treatment plant. The landfill is on city-owned property on the east side of Cherry Street and south of the municipal wastewater treatment plant.

Latitude: N 40E 17' 25" **Longitude:** W 83E 03' 30"

2.1. Map(s) Attached (List): Figure 1 – Site Location Map, Figure 2 – Site Features Map, Figure 3 – Sample Location Map

2.2. Site Description

The Old Delaware City Landfill, also known as the Cherry Street Landfill, is located on property owned by the city of Delaware north of Olentangy Avenue between U.S. Route 23 and the Olentangy River. The site location is displayed on Figure 1. In addition to the landfill, the city-owned property is occupied by the municipal wastewater treatment plant, recycling center, maintenance garage and salt sheds. The footprint of the original landfill has changed due to periodic waste removal and relocations to allow for expansion of the wastewater treatment plant. The area of waste placement was determined to be approximately 33.4 acres according to a waste delineation survey conducted in 2000 (Malcolm Pirnie). The most recent waste relocation occurred in 2003. Site features are displayed on Figure 2. Site photographs are included in Attachment 1.

2.3. Regulatory Information

The landfill is currently regulated by the Ohio EPA Division of Solid and Infectious Waste Management (DSIWM) for explosive gas migration monitoring only. DSIWM does not otherwise regulate the landfill although DSIWM has reviewed applications for periodic waste relocations under OAC Rule 3745-27-13.

Ohio EPA DERR CDO and U.S. EPA have conducted field investigation activities as described in Section 2.6 – Previous Site Investigations in response to a history of leachate outbreaks at the site.

In July 1999, the U.S. EPA Region 5 Regional Site Assessment Team recommended the site for listing on the NPL based on a Hazard Ranking System (HRS) site score of 50. The site is not currently listed as an NPL site, however. The site is currently listed on the U.S. EPA CERCLIS (OHD980510366) and has been referred for removal with further assessment needed.

2.4. Site History

The landfill was operated by the city of Delaware as a municipal solid waste landfill from 1951 to 1975 and accepted municipal, commercial and industrial wastes. The landfill was licensed by the Delaware County Health Department from 1969 to 1974. The site accepted municipal solid waste from the city of Delaware and surrounding areas as well as industrial waste from a number of local industries and businesses. The landfill was closed prior to enactment of Ohio EPA's 1976 solid waste rules with no liner or engineered cap system in place. Beginning in the late 1970s, solid waste has been periodically removed from the north end of the landfill under OAC 3745-27-13 authorization and reconsolidated within the landfill area to the south to allow for expansion of the wastewater treatment plant.

The landfill has a documented history of leachate outbreaks to the Olentangy River. The Ohio Department of Health, Delaware County Health Department, Ohio EPA and U.S.

EPA have visited or conducted site investigations at the site as described in Section 2.6 – Previous Site Investigations.

2.5 Redevelopment Activities

Several municipal operations are located on or near the former landfill footprint. The city of Delaware's municipal wastewater treatment plant is located north of and adjacent to the landfill. As stated above, periodic expansions of the wastewater treatment facilities have required the removal and relocation of waste to the south under OAC 3745-27-13 authorization. A new regional sanitary trunk sewer was recently installed along Cherry Street to connect to the treatment plant. The city's Department of Public Works garage and salt sheds are located immediately south of the treatment plant. The city recycling center is located on the southern end of the landfill.

2.6. Previous Site Investigations

Ohio EPA files indicate that the Ohio Department of Health (ODH) inspected the landfill on February 16 and 18, 1965 and August 27, 1969. The 1965 inspection documented no compliance issues; however, the 1969 inspection documented several violations and recommended construction of a dike to prevent leachate from entering the Olentangy River. In 1973, Ohio EPA and the Delaware County Health Department inspected the site and documented that many of the 1969 violations had not been corrected. Ohio EPA recommended that the city of Delaware submit plans for controlling the leachate discharges. (PRC, 1994)

Ohio EPA and ODH collected leachate samples for limited parameters including some metals and general water quality parameters in 1973 and 1974. Ohio EPA inspected the site again on April 2, 1976 and April 29, 1977. The 1977 inspection noted a "considerable degree" of leachate flowing from the landfill to the Olentangy River. (PRC, 1994)

Ohio EPA completed a U.S. EPA Potential Hazardous Waste Site Identification and Preliminary Assessment form for the site in January 1980. The form notes that sludge, oily wastes, glue and paints were disposed of at the landfill. The form also notes that leachate problems still existed.

The Ohio EPA conducted a U.S. EPA Preliminary Assessment (PA) of the landfill in February 1987. The PA noted that operation records for the closed landfill indicated improper daily and final cover had been a reoccurring problem as well as a 30 to 40 feet long leachate outbreak on the south side of the landfill. The 1987 PA gave the site a high priority rating.

A Screening Site Inspection (SSI) was conducted in August 1988 (report issued March 1989) by Ecology and Environment (E&E) under contract with U.S. EPA as a Field Inspection Team. Soil, river sediment and leachate sediment samples were collected at

the site. Residential well samples were collected from three residences within one-half mile of the site including two residences to the northeast and one residence to the south of the landfill. The samples were analyzed for target analyte list/target compound list (TAL/TCL) parameters including VOCs, SVOCs, PCBs, pesticides, metals and cyanide. Soil and sediment samples yielded detections of VOCs, SVOCs, PCBs, pesticides and metals. The results of the residential well sampling did not appear to indicate contamination attributable to the landfill.

An explosive gas migration monitoring plan was approved by Ohio EPA's former Division of Solid and Hazardous Waste Management in 1991. A network of 16 explosive gas monitoring wells was completed along Cherry Street and near the wastewater treatment plant and recycling center buildings by 1997. Buildings within 200 feet of the landfill were also equipped with explosive gas alarms. Several of the wells along Cherry Street were replaced in 2005 following construction of a new sanitary trunk sewer. Methane has been detected in several of the gas wells. Additional temporary monitoring points were installed in 2007 following an increasing trend of methane concentrations in several wells along Cherry Street.

Ohio EPA CDO DERR conducted a site visit in June 1992 to observe conditions and noted the presence of leachate seepage. Ohio EPA CDO DERR collected soil and sediment samples at the landfill during May 1993 and included the sampling data in a revised PA in September 1993. Five soil/sediment samples were collected including two soil samples from the Olentangy River floodplain, one sediment sample from a leachate seep, one background soil sample and one duplicate leachate sediment sample and analyzed for TAL/TCL parameters. The soil and sediment samples yielded detections of VOCs, SVOCs, PCBs, pesticides and metals. The 1993 PA revised the site priority to medium.

An Expanded Site Inspection (ESI) was conducted in 1994 (report issued September 1994) by PRC Environmental Management (PRC) for U.S. EPA in which four soil samples, eight sediment samples and nine surface water samples were collected and analyzed for TAL/TCL parameters. The soil and sediment samples yielded detections of VOCs, SVOCs, PCBs, pesticides and metals. The surface water samples, collected from the Olentangy River at locations upstream and downstream of the landfill, yielded no detections above background except for magnesium and sodium.

In January 2000, ODH published a Health Consultation Report (HCR) under a cooperative agreement with the U.S. Agency for Toxic Substances and Disease Registry at the request of US EPA Region 5, which summarized the site history and provided conclusions and recommendations for the site. The HCR concluded that the landfill was currently a health hazard based on the potential physical hazards associated with methane and recommended installing a methane gas abatement system, sampling the landfill gas for VOCs and resampling leachate seeps discharging to the river.

In March 2000, a waste delineation survey was conducted for the city of Delaware by Malcolm Pirnie to determine the limits and volume of waste placement at the landfill. The report, issued in April 2000, determined that, at that time, there was approximately 772,000 cubic yards of waste occupying approximately 33.4 acres. During the waste delineation survey, grab samples of ground water/leachate were collected from two borings placed in the landfill. The samples yielded detections of VOCs, SVOCs, metals and nutrient analytes (Malcolm Pirnie).

Ohio EPA DERR CDO conducted a site visit on August 17, 2005 to observe site conditions. No active flowing seeps were observed at the time; however, several bare soil areas indicative of former seeps were noted. During the site visit the river level was high following a recent rain event although conditions had been dry previously. Vegetation along the river was dense making observation difficult.

Ohio EPA DERR CDO and the Site Investigation Field Unit (SIFU) conducted a site reconnaissance visit in May 2006 to determine potential sampling and access locations. During the site visit, orange-stained water was observed discharging from a 24-inch diameter storm sewer outfall to the Olentangy River at the south end of the landfill. It was determined that the storm sewer passes through or under the landfill. The Ohio EPA Division of Surface Water (DSW) CDO sampled the outfall in May 2006 and detected VOCs, pesticides, and nutrients including elevated ammonia, TKN and COD in the discharge indicating leachate infiltration to the storm sewer. Elevated concentrations of chlorides were also detected and may be attributable to salt and brine handling practices at the city garage salt operations in addition to leachate from the landfill. Based on the sample results, DSW issued a notice of violation (NOV) to the city of Delaware in August 2006 for discharge of pollutants to waters of the state without a National Pollutant Discharge Elimination System (NPDES) permit.

Ohio EPA DERR CDO and SIFU conducted a field investigation December 4-6, 2006 during which soil, ground water and leachate samples were collected for laboratory analysis. An additional ground water sample was also collected during a follow up visit on September 19, 2007. The field investigation methods, results and conclusions are discussed in this report.

Ohio EPA DERR CDO and SIFU conducted a site visit on May 9, 2007 to observe site conditions. The river level at this time was low and limestone bedrock was exposed along the river edge. Ground water was observed actively seeping from the limestone along the river bank near the southern end of the landfill. The seepage had stained the bedrock along the river bank orange probably due to elevated iron content, a possible indication of leachate seepage. Other areas along the river, particularly near the southern end of the landfill, were observed that had orange-stained soil, sediment or bedrock.

The 24-inch diameter storm sewer outfall noted during the May 2006 site visit was still discharging orange-stained water to the Olentangy River. In previous discussions, the

city has stated that they had the pipe televised and found that the pipe had a breakage under the landfill. The city removed debris from the breakage area but still was unable to get equipment past the broken section. The city has had engineering plans prepared to seal the existing storm sewer and reroute a new storm sewer with an outfall to the north and east. Another 27-inch diameter storm sewer outfall near the city recycling center was observed to be dry during the May 2007 site visit but exhibited orange staining from recent flow at the pipe's outlet to the river. Seepage was also noted coming from the north side of the relocated waste area south of the city salt sheds. Seepage that was pooled at the bottom of the slope near the edge of the gravel parking lot was orange.

A U.S. EPA SESI field investigation was conducted by Ohio EPA DERR CDO and SIFU on July 10, 2007 in which surface water and sediment samples were collected from the Olentangy River. A ground water seep at the south end of the landfill was also sampled. The samples were submitted for laboratory analysis for TCL/TAL analytes as well as nutrient and other general water quality parameters. The SESI sample results will be reported in a separate SESI report.

2.7. Topography, Geology, Hydrogeology and Hydrology

The Old Delaware City Landfill is located in the Till Plains Section of the Central Lowland Physiographic Province (Brockman). The site is located on an inside bend of the Olentangy River and is bounded by the river on the east and south. The edge of the landfill is generally less than 100 feet from the river and less than 20 feet from the river in some areas. Much of the site is also within the 100-year regulatory floodplain of the Olentangy River.

The unconsolidated surficial deposits in the vicinity of the site are mapped as Late Wisconsinan ground moraine with outwash terrace deposits along the Olentangy River (ODNR). The site is located near the contact of the Devonian Age Olentangy Shale and the underlying Delaware Limestone. The Olentangy Shale is overlain by the Ohio Shale, which is visible outcropping on a high bluff on the east side of the river. Limestone bedrock is exposed in the bed of the Olentangy River.

According to the U.S. Department of Agriculture Soil Conservation Service Bulletin for Delaware County, the soils at the site are mapped as Made Land, a soil classification for disturbed lands. Soils immediately to the west of the site, however, are mapped as Westland Silty Clay Loam indicating that this soil type may have been the original soil type at the site before landfilling activities occurred.

Geotechnical borings were conducted at the site in 1982 prior to an expansion of the wastewater treatment plant. The borings were completed to the top of fragmented or competent bedrock with bedrock cores being collected in several of the borings. The borings encountered bedrock at approximately 11 to 17 feet below ground surface (bgs). Several feet of sand and gravel were encountered immediately overlying bedrock in the

1982 borings. The bedrock was described as the Olentangy Shale and the underlying Delaware Limestone (Mason, Sandover and deVertiull, 1982).

Six replacement explosive gas monitoring wells were installed along Cherry Street in 2005 following installation of a new sanitary trunk sewer. The borings encountered up to six feet of silty clay overlying silty fine to coarse sand and gravel. Limestone bedrock was encountered in one boring at 12 to 15 feet bgs and auger refusal occurred at 10 to 12 feet bgs in the remaining borings (Resource International, 2005).

Ground water occurs in the unconsolidated glacial deposits and the underlying bedrock. The limestone bedrock comprises the principal aquifer in the area although some wells may be completed in the overlying sand and gravel.

Ground water was encountered at depths of seven to 15 feet bgs in the 1982 borings or at the approximate level of the Olentangy River (Mason, Sandover and deVertiull, 1982). Ground water flow direction in the sand and gravel deposits at the site is anticipated to be toward the Olentangy River and has been observed discharging from fissures in the limestone along the west river bank during times of low river flow. Ground water flow direction at depth in the limestone may vary from the shallow ground water flow direction.

2.8. Land Use and Demographic Information

The landfill is located on city-owned property within the city of Delaware, which has a population of approximately 33,000, in central Delaware County. In addition to the landfill, the city-owned land is also occupied by various municipal operations including the wastewater treatment plant, maintenance garage and salt sheds and recycling center. Land use surrounding the landfill is a mixture of residential, commercial, industrial, and agricultural and undeveloped usage. Land to the east and south of the landfill on the opposite side of the Olentangy River is primarily residential, agricultural and undeveloped land. Ohio Wesleyan University athletic fields are located west of U.S. Route 23. Commercial, industrial and residential land is located west of the athletic fields. Land use to the north of the landfill and wastewater treatment plant is residential and commercial. Another closed landfill operated by the city of Delaware from approximately 1974 to 1990, the Delaware Landfill, DERR ID # 121-000222-001, U.S. EPA ID # OHD000721357, is located at 991 Curve Road approximately 3700 east of the Olentangy River.

The city of Delaware provides municipal water service to its residents. Unincorporated areas to the east of the Olentangy River across from the landfill are in the city service area but are not presently served by municipal water and rely on private wells. A search of located water well logs from the Ohio Department of Natural Resources, Division of Water on-line database found 30 water well logs within a one mile radius of the landfill indicating 26 wells screened in the limestone bedrock and four screened in the overlying sand and gravel. Five of the 30 water well logs were identified within a 1000 feet radius of the approximate landfill boundary. These five wells were reported as being screened

in the limestone bedrock aquifer. It has not been verified if all the reported wells are still in service or if there are additional wells in the search radius that are not included in the database.

The Olentangy River is impounded approximately seven miles upstream of the landfill and forms Delaware Lake, a flood control and recreational reservoir. Approximately six and a half miles downstream from the landfill is a surface water intake for the Del-Co water utility. The Olentangy River is a state-designated scenic river from the Delaware Lake dam downstream to Wilson Bridge Road in Worthington.

3.0. FIELD INVESTIGATION METHODS

3.1. Sampling Locations and Rationale

Ohio EPA conducted a field investigation at the site during December 4-6, 2006. Ohio EPA DERR CDO and SIFU conducted a site reconnaissance visit on December 4, 2006 to determine the suitability and accessibility of soil boring locations and to locate active leachate seeps. Soil, ground water and leachate samples were collected on December 5 and 6, 2006. An additional ground water sample was collected during a follow-up site visit on September 19, 2007. The sample locations are displayed on Figure 3.

Five Geoprobe® borings were completed at the site during the December 2006 field investigation. The locations were selected to determine shallow ground water quality downgradient of the landfill and representative of ground water discharging to the Olentangy River. At each Geoprobe® location, one soil sample and one ground water sample were collected.

An attempt was made during the December 2006 field investigation to collect potential upgradient or background ground water samples from two existing explosive gas monitoring wells located along Cherry Street. One well was dry and the other well contained insufficient volume for a full sample and was bailed dry after purging one well volume. On September 19, 2006, Ohio EPA decided to collect an upgradient ground water sample after relatively abundant rainfall events in August, which, in turn, had followed several months of dry weather. Wells P-15, P-16 and P-5 were gauged to determine if there was sufficient water volume to allow sample collection. Wells P-5 and P-15 were dry. Well P-16 still contained insufficient volume to allow collection of a full set of sample parameters. The well did contain enough water to collect a VOC sample prior to purging so only a VOC sample was collected. The well was then purged and did not recover approximately three hours after purging so the pre-purged sample was submitted for screening purposes.

One leachate sample was collected from a pooled area that contained a sheen located above the 24-inch diameter storm sewer outlet that discharges to the Olentangy River. Several non-vegetated areas of possible former leachate seepage were also observed at the landfill but no soil samples were collected at these locations.

Samples were analyzed by Ohio EPA's contract laboratory, Kemron Environmental Services, Inc. of Marietta, Ohio. Soil and ground water samples collected during the December 2006 field investigation were analyzed by U.S. EPA SW 846 Methods for TAL/TCL analytes including VOCs (8260B), SVOCs (8270C), pesticides (8081), PCBs (8082), TAL metals (6000/7000 Series) and cyanide (9014). Ground water samples were collected for total (unfiltered) and dissolved (field filtered) TAL metals.

Ground water samples and the leachate sample collected during December 2006 were also analyzed for ammonia (350.1), chloride (325.2), five-day biochemical oxygen demand (BOD_5) (SM5210B), COD (410.4 Mod.), nitrate-nitrite (353.2), TKN (351.2), phosphorus (365.4), sulfate (375.4) and total dissolved solids (160.1). Ground water samples were analyzed for these additional nutrient and general water quality parameters because these constituents are typically found in landfill leachate and the samples were taken in close proximity to the Olentangy River. The river is expected to receive the shallow ground water discharge from the site; therefore, the shallow ground water has the potential to affect surface water quality in the river adjacent to the site.

Surface water and sediment samples were collected from the Olentangy River by Ohio EPA on July 10, 2007 as part of the U.S. EPA SESI of the Old Delaware City Landfill. The SESI samples were submitted for analysis for TCL/TAL analytes. Surface water and leachate samples were also analyzed for nutrient and general water quality parameters as well. The SESI sampling results are briefly summarized in Section 5.1 - Migration and Exposure Pathways of this report and are presented in detail in the SESI report.

3.2. Sampling Methods

Soil

At each Geoprobe® boring location, a Macrocore® sampler with dedicated four feet polyacetate liners was used to collect soil samples to depths up to 15.5 feet bgs. The soil samples were described and logged in a field notebook and screened with a photoionization detector (PID). One soil sample was collected from each boring for laboratory analysis based on PID readings, visual observations or stratigraphic position. The Geoprobe® field core logs are included in Attachment 2.

Ground Water

A ground water sample, designated with a GW prefix, was collected at each Geoprobe® boring location by advancing a second borehole approximately one foot away from the initial soil boring location to a depth where ground water was encountered and could be readily sampled. A duplicate sample from GW-03 was also collected and designated GW-DUP. At each sampling location, a length of dedicated polyethylene tubing was inserted through the Geoprobe® rods. The boreholes were purged and the samples collected through the use of a peristaltic pump set to a low setting to avoid excess sample disturbance. Approximately one half gallon of water was purged at each location before sample collection. For metals analyses, samples were submitted for both total and dissolved metals. Samples collected for dissolved metals were field filtered using an

in-line 0.45 micron disposable filter. The samples were placed in laboratory-supplied glassware containing appropriate preservatives and were placed in a cooler with ice after collection. Field parameters, including pH, specific conductance and temperature, were measured and recorded upon sample collection.

Explosive Gas Monitoring Wells P-15 and P-16 were measured with an electronic water level gauge during the December 2006 sampling event to determine if sufficient ground water was present that could be sampled at these presumed upgradient locations adjacent to Cherry Street west of the landfill. Well P-15 was dry and Well P-16 contained an insufficient water volume to collect a full sample. On September 19, 2007, the water level in Well P-16 was measured and a ground water sample was collected. The well was not purged prior to sampling, however, and only VOCs were sampled due to the low sample volume available. The sample was collected with a disposable bailer and carefully decanted into laboratory-supplied glassware with appropriate preservative. The sample was placed in a cooler with ice after collection.

Leachate

A leachate sample was collected from a pooled area located near the 24-inch diameter storm sewer headwall that discharges to the Olentangy River. The storm sewer outfall, sampled by Ohio EPA DSW CDO in May 2006, was under water during the December 2006 field investigation and could not be sampled. The sample was collected from a pooled area on the ground surface several feet behind the headwall and above the pipe. At this location, a shovel was used to break the ice that had formed on the seep. The sample was transferred into the appropriate laboratory-supplied sample containers with appropriate preservatives with a stainless steel spoon. The leachate sample, designated L-1, was placed in a cooler with ice after collection. Field parameters, including pH, specific conductance and temperature, were measured and recorded upon sample collection.

4.0. FIELD INVESTIGATION RESULTS

4.1 Geologic Characterization

Five Geoprobe® soil borings were completed between the east side of the landfill and the west bank of the Olentangy River at the locations displayed on Figure 3. The boring locations were selected to be as close to the river as possible to try to avoid being placed in buried landfill waste to allow collection of soil and ground water samples downgradient of the landfill. Borings GP-01 through GP-04 encountered traces of debris in the upper portions of the borings but did not appear to be located in the main body of solid waste. Boring GP-05, located near the former recycling building and at a higher elevation, encountered more debris and appeared to be within the landfill.

The borings encountered four to 13 feet of orange-brown to brown to black clayey silt and silty clay overlying silty to clayey sand and gravel. Gray clayey shale was encountered at 13.5 to 14.5 feet bgs in GP-02 and 9.0 to 10.6 feet bgs in GP-03. Refusal was encountered at 10.6 to 15.5 feet bgs in the five Geoprobe® borings. Depth

to ground water in the open boreholes upon completion of the borings ranged from 1.2 feet to 10 feet bgs.

Several of the existing or replacement explosive gas monitoring wells along Cherry Street had been reported dry by Burgess & Niple prior to the December 2006 sampling event and have been reported as dry following construction of a new sanitary trunk sewer along Cherry Street in 2005. Wells P-15 and P-16 were probed with an electronic water level gauge on December 6, 2006. Well P-15 was dry and Well P-16 contained approximately 0.33 feet of water and soft sediment and was bailed dry with one bailer volume. Both of these wells are completed to the top of limestone bedrock. The new sanitary sewer is constructed well below the top of bedrock and may be intercepting shallow ground water flow above the bedrock in this area upgradient of the landfill. Well P-16 has contained only minimal water in recent months and was sampled for VOCs only during September 2007.

4.2. Sampling Results

Soil

Soil samples collected at the site during the December 2006 field investigation yielded detections of VOCs, SVOCs, PCBs, TAL metals and cyanide. Several VOCs, including chlorinated and petroleum related compounds, were detected in soil samples from every boring except GP-03. The sample collected from GP-03 yielded low level detections of only acetone and 2-butanone, which may be attributable to the laboratory or site related. SVOCs were detected in GP-02, GP-03 and GP-04. PCBs and pesticides were detected in all samples except GP-01. Cyanide was detected in GP-04, GP-05 and the GP-02 duplicate sample. Soil sample results are presented in Tables 1-A through 1-C.

Ground Water

VOCs and metals were detected in all the shallow Geoprobe® ground water samples that were collected in December 2006. The majority of VOC detections, including chlorinated and petroleum related compounds, occurred in GW-04 and GW-05. SVOCs were detected in GW-02, GW-04 and GW-05. Pesticides and PCBs were detected in GW-04 and GW-05. No VOCs were detected in the sample collected from Well P-16 on September 19, 2007 (only VOCs were sampled at Well P-16). Inorganics and nutrients were detected in all the Geoprobe® ground water samples. Ground water sample results for the December 2006 field investigation are presented in Tables 2-A through 2-E. The ground water sample results for September 2007 are presented in Table 3. Ground water field parameters are included in Table 4.

Leachate

Leachate detections from the sample collected at L-1 included VOCs, PCBs, metals and nutrients and general water quality parameters. Leachate sample results are presented in Table 5.

4.3. Comparison of Sampling Results to Screening Levels Criteria

Soil

Soil results were compared to U.S. EPA Region 9 PRGs for direct contact with residential soils. The PRGs for analytes with a non-cancer basis were adjusted with a 0.1 multiplier. The PRGs for analytes with a cancer basis were not adjusted.

Vinyl chloride was detected above its PRG of 79 ug/kg with a concentration of 214 ug/kg in the soil sample collected from GP-01. Benzo(b)fluoranthene was detected above its PRG of 620 ug/kg in two soil samples and a duplicate sample with concentrations up to 2390 ug/kg. PCBs (Arochlor 1254) were detected above the PRG of 220 ug/kg with concentrations of 2270 ug/kg and 35,300 ug/kg, from samples collected from GP-04 and GP-05, respectively. Heptachlor epoxide, a pesticide, was detected in one soil sample from GP-05 at a concentration of 1550 ug/kg exceeding the PRG of 53 ug/kg. Several metals were also detected at concentrations above their respective PRGs.

Ground Water

Ground water analytical results were compared to U.S. EPA primary MCLs for drinking water and U.S. EPA Region 9 PRGs for tap water. The PRGs for analytes with a non-cancer basis were adjusted with a 0.1 multiplier. The PRGs for analytes with a cancer basis were not adjusted.

MCLs were exceeded for two VOCs. Benzene was detected above the MCL of 5 ug/l in GW-04 and GW-05 at concentrations of 11 ug/l and 142 ug/l, respectively. Vinyl chloride was detected above its 2 ug/l MCL in GW-01, GW-03 and GW-DUP at concentrations of 24.9 ug/l, 6.67 ug/l and 6.59 ug/l, respectively. One SVOC, BEHP, exceeded its MCL of 6 ug/l in two samples, GW-02 and GW-05, at concentrations of 12 ug/l and 66.8 ug/l, respectively. Total PCBs (all arochlors) were detected above the MCL of 0.5 ug/l in two samples, GW-04 and GW-05, at concentrations of 1.47 ug/l and 5.93 ug/l, respectively. Several total (unfiltered) metals yielded results above their respective MCLs; however, only arsenic exceeded the MCL of 10 ug/l for dissolved (field filtered) metals samples with concentrations ranging from 10.3 ug/l to 54.3 ug/l in three samples plus the duplicate sample.

Several petroleum and chlorinated VOCs, which do not have MCLs, including chloroethane, 1, 4-dichlorobenzene, naphthalene, 1, 2, 4-trimethylbenzene and 1, 3, 5 – trimethylbenzene, were detected above their respective tap water PRGs in several ground water samples. One pesticide, 4, 4'-DDD, and two dissolved metals, iron and manganese, were detected at concentrations above their respective PRGs. Additionally, several analytes were detected below their respective MCLs but above the tap water PRGs.

Leachate

The analytical results from the leachate sample, LS-01, were compared to surface water standards as leachate has been historically documented discharging to the Olentangy River. The detections were compared to the outside mixing zone average (OMZA) standards for aquatic life and non-drinking water human health standards as appropriate. The surface water standards for several metals are based on the hardness of the receiving stream. For those metals, an average hardness of 220, as measured upstream of the landfill during the July 2007 SESI was used. Because the surface water standard for ammonia is for a 30 day average and is pH, temperature, waterbody designation and seasonally dependent, the ammonia detection was compared to a range of values.

PCBs were detected at a concentration of 1.01 ug/l and would exceed the surface water standard of 0.0017 ug/l although turbidity may have affected the sample result. Barium was detected at 261 ug/l, which would exceed the OMZA standard of 220 ug/l for the receiving stream. Ammonia was detected at 2.3 mg/l during the December 2006 field investigation, which may exceed the surface water standard depending on the receiving stream pH and temperature. The leachate results are presented in Table 5.

In addition to the leachate sample, the sample results from the 24-inch diameter storm sewer outfall collected by DSW in May 2006 were compared to surface water standards. Barium was detected at 1280 ug/l in the sample collected by DSW from the 24-inch diameter storm sewer outfall in May 2006 exceeding the OMZA standard of 220 ug/l. The total dissolved solids concentration of 2920 mg/l exceeded the OMZA standard of 1500 mg/l. The ammonia concentration was 42.3 mg/l and exceeds Ohio's maximum surface water standard for ammonia in warm water habitat. Other analytes detected that did not exceed surface water standards are still not permitted as this outfall does not have an NPDES permit. The May 2006 storm sewer outfall sample results are presented in Table 6.

5.0 DISCUSSION

5.1. Migration and Exposure Pathways

Soil: VOCs, SVOCs, metals, and PCBs were detected in site soils. Soil exposure at the site is not expected to be significant provided the soil cover on the landfill is adequately maintained. Exposure through direct contact could be a concern, however, if erosion occurs or if excavation activities associated with construction or utility repair occur in the waste area. Runoff from precipitation and from flooding of the river may also provide a transport mechanism to the river.

Access to the site is only partially restricted by fencing and is achieved from the city maintenance garage complex or by the recycling center. Access from the river is not controlled and the landfill may be accessed by recreational users such as canoers and fisherman.

Ground Water: Ground water samples collected from the site yielded MCL exceedances of vinyl chloride, benzene, BEHP and arsenic. The ground water also contains elevated detections of ammonia and other nutrients. Ground water discharge is anticipated to be toward the Olentangy River. Shallow ground water at the site is not used for potable purposes although non-potable exposure pathways such as indoor vapor intrusion may potentially be complete especially if the site is developed in the future.

Ground water within the limestone bedrock was not accessible with the Geoprobe® rig and was not characterized as part of this site assessment. Ground water in the uppermost bedrock likely discharges to the Olentangy River as has been observed in bedrock seeps along the river bank although recharge to deeper bedrock could occur if there if there is a significant downward vertical hydraulic gradient at the site.

Surface Water: Shallow ground water from the unconsolidated deposits and the uppermost part of the underlying limestone is anticipated to discharge to the Olentangy River. Areas of seepage were noted along the west river bank south of the city recycling center where orange-stained ground water was observed discharging from the limestone bedrock to the river. This shallow ground water flow may, at times have a local effect on surface water quality or use up some of the river's assimilative capacity especially in times of low river flow.

The 24-inch diameter storm sewer discharging to the river contained elevated concentrations of ammonia believed to be from the landfill as well as chlorides and sodium, which are likely from the city salt storage and handling area. The outfall does not have an NPDES permit.

Surface water samples were collected from the Olentangy River as part of the U.S. EPA SESI on July 10, 2007. Surface water samples collected from the river adjacent to and downstream from the site were collected and compared to background samples collected upstream from the landfill and wastewater treatment plant outfall. The downstream sample results were not impacted relative to the upstream samples during the SESI sampling event. The surface water sample results are presented in the SESI report.

Surface water is not used as a potable water supply in the vicinity of the landfill; however, the Del-Co water utility has two surface water intakes approximately six and a half miles downstream. The river is a designated state scenic river adjacent to the landfill and is used for recreational purposes such as canoeing and fishing.

Sediment: Sediment samples were collected as part of the U.S. EPA SESI on July 10, 2007. The sediment samples were collected in the same general locations as the corresponding surface water sample locations. Downstream sediment sample results were compared to background samples collected upstream from the landfill and wastewater plant outfall. The river runs primarily on bedrock near the site so sediment

had to be collected from several locations surrounding each sample point to ensure enough sample was collected for laboratory analysis.

PCBs, pesticides and polynuclear aromatic hydrocarbons (PAHs) were elevated in downstream locations relative to upstream locations and may be partially or fully attributable to the landfill. The sediment sample results are presented in the SESI report.

Air: The site is mostly vegetated. The air exposure pathway is not considered to be significant; however, disturbing soil could release dust-borne contaminants locally. As long as adequate soil and vegetative cover is maintained on the former landfill, exposure to airborne or dust-borne contaminants should be not be significant.

Explosive gas migration monitoring is conducted at the site through a series of explosive gas monitoring wells, which are sampled periodically. The results of the monitoring are reported to Ohio EPA DSIWM. The buildings on site are equipped with explosive gas monitoring alarms.

Ecological Targets: The Olentangy River is a designated state scenic river. The river in the vicinity of the landfill is categorized as warm water habitat. Leachate and contaminated ground water entering the river from the landfill could locally affect the biota especially during times of low river flow particularly if effluent from the wastewater treatment plant is not at its optimum quality.

The Olentangy River is currently under a Waterbody Specific Advisory, issued by the Ohio EPA, DSW, from State Route 95 (Claridon) to the mouth (Scioto River). This includes the section of the river that borders the site. The advisory includes the limitation of consumption of one smallmouth bass per month 12" and over. The specific contaminant of concern is mercury.

6.0. CONCLUSIONS

Leachate discharge from the landfill, in the form of direct seepage through outbreaks, infiltration into storm sewer lines and contamination of shallow ground water, is occurring. The primary receptor of the discharge is the Olentangy River.

Sample results indicate that shallow ground water contamination is present with detections of TAL/TCL parameters including VOCs, SVOC, PCBs, pesticides and metals. Benzene, vinyl chloride, BEHP and arsenic were detected above U.S. EPA MCLs. Nutrients, including ammonia, were also detected at elevated concentrations.

Shallow ground water is not utilized for potable purposes on the site but discharges to the Olentangy River. Leachate outbreaks have historically been and continue to be a problem at the site. Ground water seepage observed along the banks of the river during low river level were orange stained from iron and likely include leachate. Leachate outbreaks have occurred at higher elevations on the landfill slopes, as evidenced by bare

spots on the slopes and during previous investigations, during periods of higher ground water elevations. An apparent leachate outbreak was also observed along the northern slope of the relocated waste area south of the city salt sheds during the May 2007 site visit. The city subsequently added more soil cover to the outbreak area.

The 24-inch diameter storm sewer, which passes beneath the landfill, has been impacted by leachate infiltration that discharges directly to the river. The city received an NOV for an NPDES violation from Ohio EPA for this discharge and is currently seeking bids to seal and reroute this storm sewer outfall. A second, 27-inch diameter storm sewer, though dry when observed in May 2007, exhibited orange staining at its outfall and may also act as a conduit for leachate migration.

7.0. SITE RECOMMENDATIONS

Ohio EPA DERR-CDO recommends referral of this site to DSW for enforcement of NPDES and storm water violations including unpermitted discharges at storm sewer outfalls that enter the Olentangy River. Further evaluation will be conducted by DERR to determine if the landfill should be referred for a remedial investigation/feasibility study. DERR will initiate this process with an information request from potentially responsible parties.

8.0. REFERENCES

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FIGURES

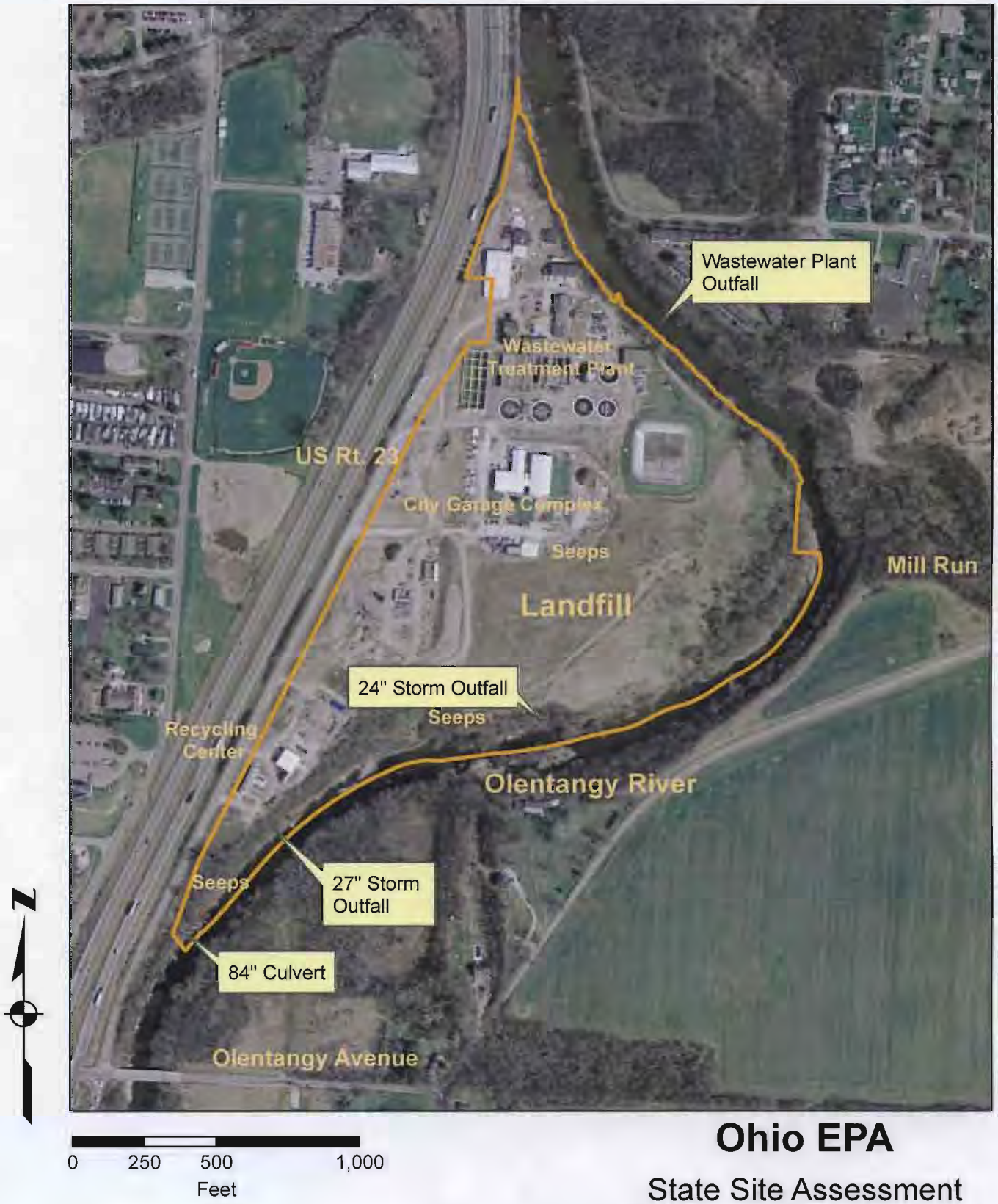
N

0 1,000 2,000 4,000
Feet

Ohio EPA

State Site Assessment
Old Delaware City Landfill
Site Location Map

Figure 1



Ohio EPA

State Site Assessment
Old Delaware City Landfill
Site Features

Figure 2

N

0 250 500 1,000
Feet

Soil / Ground Water Sample Location 12/05/06
Ground Water Sample Location 9/19/07
Leachate Sample Location 12/06/06

Ohio EPA
State Site Assessment
Old Delaware City Landfill
Sample Locations

Figure 3

TABLES

Table 1-A
Old Delaware City Landfill Soil Sample Results - December 5, 2006

Boring No.	Units	GP-01		GP-02			GP-03	GP-04		GP-05			GP-DUP	PRG
Depth		8 -11.5'		4 - 8'			0 - 4'	0 - 4'		8 - 12'				
Sample Tag		01	A1	01	02	DL1	01	01	02	01	DL01	DL02	02	
Dilution		1x	1x	1x	1x	50x	1x	1x	1x	1x	50x	500x	1x	
VOCs	ug/kg													
Acetone		23.1	26.2	73.2	166	<608	87.5	565I	338	45.7	<727	<7270	88.5	1,400,000
Benzene		1.93J	1.51J	5.04J	10.3J	<60.8	<0.678	7.56	4.04J	71.9	<72.7	<727	<0.688	640(ca)
2-Butanone		<2.90	5.68J	20.2	39.8J	<304	13.3J	57.6	<17.4	50.1	<364	<3640	14.2	2,200,000
n-Butylbenzene		<0.580	<0.580	96.9	488	200J	<0.678	111E	29.2J	31.0E	339J	<727	<0.688	24,000
sec-Butylbenzene		<0.580	<0.580	70.8	331	104J	<0.678	80.4E	19.8J	21.4E	155J	<727	<0.688	22,000
tert-Butylbenzene		<0.580	<0.580	8.57	38.3	<60.8	<0.678	7.51E	<3.47	3.09E	<72.7	<727	<0.688	39,000
Carbon disulfide		<0.580	<0.580	5.01J	<3.20	<60.8	<0.678	<0.699	<3.47	2.69J	<72.7	<727	<0.688	36,000
Chlorobenzene		8.11	8.24	15.8	17.6J	<60.8	<0.678	443I	171	21.8	<72.7	<727	<0.688	15,000
Chloroethane		2.19J	3.28J	<1.22	6.41	<122	<1.36	<1.40	<6.94	23.5	<145	<1450	<1.38	3000(ca)
1,2-Dichlorobenzene		<0.580	<0.580	7.27	<3.20	<60.8	<0.678	<0.699	<3.47	4.37E	77.2J	<727	<0.688	60,000
1,4-Dichlorobenzene		<0.580	<0.580	5.09J	<3.20	<60.8	<0.678	114E	34.8	20.4E	116J	<727	<0.688	340
1,1-Dichloroethane		<1.16J	1.43J	<1.22	<6.41	<122	<1.36	<1.40	<6.94	<1.35	<145	<1450	<1.38	51,000
cis-1,2-Dichloroethene		4.16J	1.19J	0.769J	<3.20	<60.8	<0.678	<0.699	<3.47	<0.673	<72.7	<727	<0.688	4,300
Ethylbenzene		<0.580	<0.580	13.7	63.1	<60.8	<0.678	2.88J	<3.47	1100I	9500	11,200	<0.688	40,000
Isopropylbenzene		<0.580	<0.580	41.1	167	72.8J	<0.678	42.4	13.2J	219	1300	1810J	<0.688	57,000
p-Isopropyltoluene		<0.580	<0.580	21.4	112	<60.8	<0.678	55.5E	11.2J	69.4E	700J	<727	<0.688	---
4-Methyl-2-pentanone		<2.9	<2.9	<3.04	<16.0	<304	<3.39	<3.49	<17.4	9.24J	<364	<3640	<3.44	530,000
Naphthalene		<0.580	<0.580	438I	256	647J	<0.678	202E	70.4	79.1E	605J	<727	<0.688	5,600
n-Propylbenzene		<0.580	<0.580	99.1	435	107J	<0.678	139E	34.0J	133E	821	926J	<0.688	24,000
Toluene		0.940J	0.649J	1.83J	7.72J	<60.8	<0.678	1.99J	<3.47	18.6	<72.7	<727	<0.688	52,000
1,2,4-Trimethylbenzene		<0.580	<0.580	1130I	4900I	1340	<0.678	684I n	170	320E	1550	1660J	<0.688	5,200
1,3,5-Trimethylbenzene		<0.580	<0.580	296I	1420I	305J	<0.678	70.6E	17.4J	48.8E	308J	<727	<0.688	2,100
Vinyl Chloride		**214**	**98.6**	<1.22	<6.41	<122	<1.36	<1.40	<6.94	<1.35	<145	<1450	<1.38	79(ca)
o-Xylene		<0.580	<0.580	26.3	128	<60.8	<0.678	2.62J	<3.47	297I	4880	5350J	<0.688	27,000*
m,p-Xylene		<0.580	0.652J	315	1250	266J	<0.678	70	25.8J	6580I	64,700I	91,400	<0.688	27,000*

GP-DUP is a duplicate of GP-03
PRG - U.S. EPA preliminary remediation goal for direct contact with residential soils. PRG value adjusted by 0.1 multiplier for non-cancer PRGs.
(ca) - PRG carcinogen
PRG Exceedance **214**
* PRG for total xylenes
J - Analyte positively identified but below reporting limit.
E - Estimated concentration due to sample matrix interference.
I - Semiquantitative result (out of instrument calibration range).

Table 1-B
Old Delaware City Landfill Soil Sample Results - December 5, 2006

Boring No.	Units	GP-01	GP-02	GP-03	GP-04	GP-05	GP-DUP	PRG
Depth		**8-11.5'**	**4-8'**	**0-4'**	**0-4'**	**8-12'**		
SVOCs	ug/kg							
3,4-Methylphenol		<102	<1010	661J	<1040	<5480	1220	31,000*
Naphthalene		<102	1910J	<524	<1040	<5480	<513	5,600
bis(2-Ethylhexyl) phthalate		<102	5630	<524	<1040	<5480	<513	35,000(ca)
Benzo(b)fluoranthene		<102	<1010	**1280**	**2390**	<5480	**1240**	620(ca)
PCBs	ug/kg							
Arochlor-1254		<9.51	121	**323**	**2270**	**35,300**	**698**	220(ca)
Metals	mg/kg							
Aluminum		**4120**	**7490**	**10,400**	**7970**	**6930**	**6960**	7,600
Antimony		0.132	0.0624J	0.405J	0.225	0.389	<0.317	3.1
Arsenic		**15.1**	**8.92**	**15.4**	**12.6**	**12.1**	**17.7**	0.39(ca)
Barium		79.6	113	393	156	195	175	540
Beryllium		0.323J	0.607	0.648	0.556	0.294J	0.439	15
Cadmium		0.844	0.794	3.33	2.3	**3.79**	2.18	3.7
Calcium		49,100	2670	47,300	5450	91,500	14,900	---
Chromium		10.6	19.6	**45.5**	18.4	**95.8**	**57.9**	21
Cobalt		5.54	7.87	8.73	14.6	8.9	14	900(ca)
Copper		16.5	25.5	137	49.2	**484**	102	310
Iron		**30,500**	**20,000**	**23,700**	**25,800**	**69,500**	**19,100**	2300
Lead		11.5	28	**508**	85.2	343	357	400
Magnesium		17,800	1970	10,700	3200	20,900	4580	---
Manganese		**283**	94	**334**	**402**	**525**	**467**	180
Mercury		0.0338J	0.0777J	0.216J	0.360	1.54	0.318	2.3
Nickel		19.3	23	32	45.2	32.4	23.9	160
Potassium		672	1350	2270	1390	1080	1580	---
Selenium		1.04	2.72	9.74	3.46	5.79	5.85	39
Silver		0.778J	0.543J	1.84J	1.10J	1.57J	1.87	39
Sodium		194	207	963	91.2	663	321	---
Thallium		0.494	0.255	0.401	0.297	0.300	0.391	0.52
Vanadium		**21.4**	**25.3**	**27.5**	**26.2**	**22.5**	**19.1**	7.8
Zinc		173	143	911	191	692	568	2,300
Cyanide	mg/kg	<0.283	<0.289	<0.321	0.416J	0.956	0.722	120

GP-DUP is a duplicate of GP-03
PRG - U.S. EPA preliminary remediation goal for direct contact with residential soils
PRG value adjusted by 0.1 multiplier for non-cancer PRGs. (ca) - PRG carcinogen
PRG Exceedance **15.1**
* PRG for 4-Methylphenol
J - Analyte positively identified but below reporting limit.

Table 1-C
Old Delaware City Landfill Soil Sample Results- December 5, 2006

Boring No.	**Units**	**GP-01**	**GP-02**		**GP-03**		**GP-04**		**GP-05**		**GP-DUP**		**PRG***
Depth		**8 - 11.5'**	**4 - 8'**		**0 - 4'**		**0 - 4'**		**8 - 12'**				
Sample Tag		01	01	CF01	DL01	CFDL1	DL01	CFDL1	DL01	CFDL1	DL01	CFDL1	
Dilution		1x	1x	1x	10x	10x	200x	200x	200x	200x	5x	5x	
Pesticides	ug/kg												
Heptachlor epoxide		<0.381	<0.395	<0.395	<4.14	<4.14	<86	<86	**385J**	**1550P**	<2.05	<2.05	53(ca)
Dieldrin		<0.381	4.34	3.88	<4.14	<4.14	<86	<86	<84.8	<84.8	<2.05	<2.05	30(ca)
4,4' -DDE		<0.381	3.08P	4.67P	11.5J	16.0J	98.2J	530	<84.8	<84.8	21.1	16.8	1700(ca)
4,4' -DDD		<0.381	27.9	25.3	14.5J	9.99J	287J	253J	<84.8	<84.8	41	33.8	2400(ca)
Endosulfan sulfate		<0.381	<0.395	<0.395	<4.14	<4.14	<86	<86	<84.8	<84.8	<2.05	<2.05	---
alpha Chlordane		<0.381	1.68J	1.64J	<4.14	<4.14	<86	<86	<84.8	<84.8	<2.05	<2.05	1600(ca)

GP-DUP is a duplicate of GP-03
PRG - U.S. EPA preliminary remediation goal for direct contact with residential soils
PRG value adjusted by 0.1 multiplier for non-cancer PRGs. (ca) - PRG carcinogen
PRG Exceedance **385J**
* PRGs are for DDE,DDD and technical chlordane
J - Analyte positively identified but below reporting limit.
P - Concentrations > 40% difference between the two GC columns.

Table 2-A
Old Delaware City Landfill Ground Water Analytical Results - December 5, 2006

Sample No.	Units	GW-01	GW-02	GW-03	GW-04	GW-05		GW-DUP	Trip Blank	MCL	PRG
Sample Tag		**01**	**01**	**01**	**01**	**01**	**DL01**	**01**	**01**		
Dilution		**1x**	**1x**	**1x**	**1x**	**1x**	**50x**	**1x**	**1x**		
VOCs	**ug/l**										
Acetone		<2.50	2.56J	<0.250	3.69J	2.90J	<125	<2.50	<2.50	---	550
Benzene		0.245J	***3.69***	***0.351J***	**11**	**142**	**123**	0.295J	<0.125	5	0.35(ca)
n-Butylbenzene		<0.250	<0.250	<0.250	0.999J	11.1	<12.5	<0.250	<0.250	---	24
sec-Butylbenzene		<0.250	<0.250	<0.250	0.752J	2.86	<12.5	<0.250	<0.250	---	24
tert-Butylbenzene		<0.250	<0.250	<0.250	<0.250	0.673J	<12.5	<0.250	<0.250	---	24
Chlorobenzene		0.333J	0.134J	<0.125	***17.6***	***35.7***	***34.5J***	<0.125	<0.125	100	11
Chloroethane		3.23	<0.500	<0.500	<0.500	***189***	***158***	<0.500	<0.500	---	4.6(ca)
1,2-Dichlorobenzene		<0.125	<0.125	<0.125	0.277J	2.86	<6.25	<0.125	<0.125	600	37
1,3-Dichlorobenzene		<0.250	<0.250	<0.250	<0.250	0.306J	<12.5	<0.250	<0.250	---	18
1,4-Dichlorobenzene		<0.125	<0.125	<0.125	***7.07***	***12.4***	***12.0J***	<0.125	<0.125	75	0.5(ca)
1,1-Dichloroethane		0.538J	<0.125	<0.125	<0.125	0.489J	<6.25	<0.125	<0.125	---	81
cis-1,2-Dichloroethene		<0.250	<0.250	0.378J	<0.250	<0.250	<12.5	0.379J	<0.250	70	6.1
trans-1,2-Dichloroethene		<0.250	<0.250	<0.250	<0.250	0.496J	<12.5	<0.250	<0.250	100	12
Ethylbenzene		<0.250	<0.250	<0.250	<0.250	***187***	102	<0.250	<0.250	700	130
Isopropylbenzene		<0.250	<0.250	<0.250	1.78	44.4	41.1J	<0.250	<0.250	---	66
p-Isopropyltoluene		<0.250	<0.250	<0.250	<0.250	10.4	<12.5	<0.250	<0.250	---	---
Methylene chloride		<0.250	<0.250	<0.250	<0.250	0.855J	<12.5	<0.250	1.85J	---	4.3(ca)
Naphthalene		<0.200	<0.200	<0.200	***44.9***	***147***	***74.8***	<0.200	<0.200	---	0.62
n-Propylbenzene		<0.125	<0.125	<0.125	2.43	23.9	16.7J	<0.125	<0.125	---	24
Styrene		<0.125	<0.125	<0.125	<0.125	0.631J	<6.25	<0.125	<0.125	100	160
Toluene		<0.250	<0.250	0.254J	0.327J	1.48	<12.5	<0.125	<0.125	1000	72
1,2,4-Trichlorobenzene		<0.200	<0.200	<0.200	<0.200	0.259J	<10.0	<0.200	<0.200	70	0.72
1,2,4-Trimethylbenzene		<0.250	<0.250	<0.250	***9.21***	***168***	***124***	<0.250	<0.250	---	1.2
1,3,5-Trimethylbenzene		<0.250	<0.250	<0.250	0.951J	***26.7***	***29.7J***	<0.250	<0.250	---	1.2
Vinyl Chloride		**24.9**	<0.250	**6.67**	<0.250	<0.250	<12.5	**6.59**	<0.250	2	0.02(ca)
o-Xylene		<0.250	<0.250	<0.250	<0.250	5.73	<12.5	<0.250	<0.250	10,000*	21
m,p-Xylene		<0.500	<0.500	<0.500	2.32	***1550 I***	***2430***	<0.500	<0.500	10,000*	21

GW-DUP is a duplicate of GW-03
MCL - U.S. EPA primary maximum contaminant limit for drinking water
MCL Exceedance **142**
PRG - U.S. EPA Region 9 preliminary remediation goal for tap water. PRG value adjusted by 0.1 multiplier for non-cancer PRGs. (ca) - PRG carcinogen
PRG Exceedance ***189***
J - Analyte positively identified but below reporting limit. I - Semiquantitative result (out of instrument calibration range).

Table 2-B
Old Delaware City Landfill Ground Water Sample Analytical Results - December 5, 2006

Sample No.	Units	GW-01	GW-02	GW-03	GW-04	GW-05	GW-DUP	MCL	PRG
SVOCs	ug/l								
1,3-Dichlorobenzene		<2.60	<2.66	<2.66	4.57J	7.28J	<2.60	---	18
1,4-Dichlorobenzene		<2.60	<2.66	<2.66	***4.69J***	***7.48J***	<2.60	---	0.50(ca)
2,4-Dimethylphenol		<2.60	<2.66	<2.66	<2.50	19.3	<2.60	---	73
Naphthalene		<2.60	<2.66	<2.66	***33.1***	***82.4***	<2.60	---	0.62
2-Methylnaphthalene		<2.60	<2.66	<2.66	4.18J	8.97J	<2.60	---	---
bis(2-Ethylhexyl)phthalate		<3.13	**12**	<3.19	3.80J	**66.8**	<3.13	6	4.8
PCBs	ug/l								
Arochlor-1242		<0.250	<0.275	<0.275	<0.255	**2.36**	<0.255	0.5*	0.034(ca)
Arochlor-1254		<0.250	<0.275	<0.275	**1.47**	**3.57**	<0.255	0.5*	0.034(ca)
BOD_5	mg/l	7.60J	6.40J	14.8J	43.6J	28.0J	17.3J	---	---
COD	mg/l	100	52.7	35.7	86.3	76.1	32.7	---	---
Nitrate-Nitrite	mg/l	<0.100	<0.100	<0.100	0.632	0.336	<0.100	---	---
Ammonia	mg/l	28.3	25.9	7.56	39.4	37	5.31	---	---
Phosphorus	mg/l	2.65	2.57	3.8	1.14	0.322	1.16	---	---
TKN	mg/l	32.6	40.5	7.47	35.8	33.8	7.05	---	---
Sulfate	mg/l	75.1	3.57J	53.5	5.39	6.39	48	---	---
Chloride	mg/l	33.1	95	15.4	58.9	17	17.1	---	---
TDS	mg/l	732	722	608	1000	924	582	---	---
Cyanide	mg/l	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.2	0.073

GW-DUP is a duplicate of GW-03
MCL - U.S. EPA primary maximum contaminant limit for drinking water
MCL Exceedance **66.8**
* - MCL for total PCBs
PRG - U.S. EPA Region 9 preliminary remediation goal for tap water.
PRG value adjusted by 0.1 multiplier for non-cancer PRGs. (ca) - PRG carcinogen.
PRG Exceedance ***33.1***
J - Analyte positively identified but below reporting limit.

Table 2-C
Old Delaware City Landfill Ground Water Sample Results - December 5, 2006

Sample No.	Units	GW-01	GW-02	GW-03	GW-04	GW-05	GW-DUP	MCL	PRG
Total Metals	**ug/l**								
Aluminum		***29,300***	***19,200***	***99,100***	***10,300***	2810	***9920***	---	3600
Antimony		**10.7**	**9.58**	**17.8**	**8.46**	**82.1**	**6.82**	6	1.5
Arsenic		**190**	**117**	**348**	**47.9**	**37.7**	**60.6**	10	0.045(ca)
Barium		***1490***	***1260***	**3370**	**2190**	***1340***	***597***	2000	260
Beryllium		<0.5	<0.5	**4.84J**	<0.5	<0.5	<0.5	4	7.3
Cadmium		***3.52J***	<2.5	**14.7**	***2.9J***	<2.5	<2.5	5	1.8
Calcium		307,000	145,000	342,000	134,000	162,000	114,000	---	---
Chromium		42.2	25.9	**207**	37.5	8.69J	13.4J	100	5500
Cobalt		37.6	31.7	***137***	17J	6.71J	10.5J	---	73
Copper		144	103	***579***	97.2	38	36.2	1300	150
Iron		***151,000***	***114,000***	***380,000***	***61,700***	***55,000***	***28,700***	---	1100
Lead		**93.1**	**54.5**	**717**	**336**	**263**	**79.2**	15	---
Magnesium		130,000	57,600	124,000	56,600	53,800	34,700	---	---
Manganese		***1860***	***2890***	***3400***	***839***	***287***	***257***	---	88
Mercury		0.147J	0.148J	0.438	***1.78***	0.151J	<0.100	2	1.1
Nickel		***105***	***82.6***	***463***	38.2J	29.2J	32J	---	73
Potassium		28,000	28,900	24,300	40,000	41,600	9820	---	---
Selenium		7.55J	<5	15.6	<5	<5	<5	50	18
Silver		<5	<5	<10	<5	<5	<5	---	18
Sodium		81,300	123,000	128,000	152,000	108,000	96,700	---	---
Thallium		***1.94***	***1.7***	**7.97**	***0.342***	0.089J	***0.499***	2	0.24
Vanadium		***109***	***77.9***	***289***	***23.2***	<5	***25.8***	---	3.6
Zinc		491	379	***2550***	726	404	217	---	1100

GW-DUP is a duplicate of GW-03
MCL - U.S. EPA primary maximum contaminant limit for drinking water
MCL Exceedance **17.8**
PRG - U.S. EPA Region 9 preliminary remediation goal for tap water.
PRG value adjusted by 0.1 multiplier for non-cancer PRGs. (ca) - PRG carcinogen.
PRG Exceedance ***23.2***
J - Analyte positively identified but below reporting limit.

Table 2-D
Old Delaware City Landfill Ground Water Sample Results - December 5, 2006

Sample No.	Units	GW-01	GW-02	GW-03	GW-04	GW-05	GW-DUP	MCL	PRG
Dissolved Metals	**ug/l**								
Aluminum		56.6J	84.4J	103	94.1J	103	76.1J	---	3600
Antimony		0.340J	0.549J	0.472J	0.530J	0.505J	0.269J	6	1.5
Arsenic		**54.3**	**52.5**	**17.6**	<5	<5	**10.3**	10	0.045(ca)
Barium		***898***	***981***	***378***	***1740***	***1230***	***408***	2000	260
Beryllium		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	4	7.3
Cadmium		<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	5	1.8
Calcium		114,000	87,600	93,300	121,000	150,000	97,400	---	---
Chromium		<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	100	5500
Cobalt		2.96J	8.26J	3.64J	11J	2.88J	3.15J	---	73
Copper		<5	<5	<5	<5	<5	<5	1300	150
Iron		***13,700***	***18,200***	***9,990***	***34,200***	***45,500***	***11,500***	---	1100
Lead		<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	15	---
Magnesium		55,100	43,900	28,500	53,200	51,200	30,100	---	---
Manganese		***219***	***96.1***	***88.6***	***552***	***203***	80.2	---	88
Mercury		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	2	1.1
Nickel		<5	<5	<5	<5	8.65J	<5	---	73
Potassium		21,800	26,000	8520	37,800	40,500	8140	---	---
Selenium		<5	5.51J	<5	6.01J	<5	<5	50	18
Silver		<5	<5	<5	<5	<5	<5	---	18
Sodium		79,900	131,000	109,000	153,000	106,000	94,700	---	---
Thallium		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	2	0.24
Vanadium		<5	<5	<5	<5	<5	<5	---	3.6
Zinc		21.1	6.03J	10.1J	17J	<5	<5	---	1100

GW-DUP is a duplicate of GW-03
MCL - U.S. EPA primary maximum contaminant limit for drinking water
MCL Exceedance **17.6**
PRG - U.S. EPA Region 9 preliminary remediation goal for tap water.
PRG value adjusted by 0.1 multiplier for non-cancer PRGs. (ca) - PRG carcinogen.
PRG Exceedance ***203***
J - Analyte positively identified but below reporting limit.

Table 2-E
Old Delaware City Landfill Ground Water Sample Analytical Results - December 5, 2006

Sample No.	Units	GW-01	GW-02	GW-03	GW-04		GW-05		GW-DUP	MCL	PRG
Sample Tag		01	01	01	01	CF-01	01	CF-01	01		
Dilution		1x	1x	1x	1x	1x	1x	1x	1x	1x	
Pesticides	**ug/l**										
4,4'-DDD		<0.0100	<0.0110	<0.0110	***0.377J***	***0.0337J***	0.0457J	0.0340J	<0.0102	---	0.28(ca)
Heptachlor epoxide		<0.0100	<0.0110	<0.0110	***0.02J***	***0.0177J***	<0.0119	<0.0119	<0.0102	0.20	0.0074(ca)
alpha Chlordane		<0.0100	<0.0110	<0.0110	0.0481J	0.0234J	<0.0119	<0.0119	<0.0102	2*	0.19(ca)

GW-DUP is a duplicate of GW-03
MCL - U.S. EPA primary maximum contaminant limit for drinking water
MCL Exceedance **2**
* - MCL for chlordane
PRG - U.S. EPA Region 9 PRG for tap water. PRG value adjusted by 0.1 multiplier for non-cancer PRGs. (ca) - PRG carcinogen.
PRG Exceedance ***0.02***
J- Analyte positively identified but below reporting limit.

Table 3
Old Delaware City Landfill Ground Water Sample Analytical Results
September 19, 2007

Sample No.	Units	P-16	MCL	PRG
Sample Tag		**1**		
Dilution		**1x**		
VOCs	**ug/l**			
Acetone		<2.50	---	550
Benzene		<0.125	5	0.35(ca)
n-Butylbenzene		<0.250	---	24
sec-Butylbenzene		<0.250	---	24
tert-Butylbenzene		<0.250	---	24
Chlorobenzene		<0.125	100	11
Chloroethane		<0.500	---	4.6(ca)
1,2-Dichlorobenzene		<0.125	600	37
1,3-Dichlorobenzene		<0.250	---	18
1,4-Dichlorobenzene		<0.125	75	0.5(ca)
1,1-Dichloroethane		<0.125	---	81
cis-1,2-Dichloroethene		<0.250	70	6.1
trans-1,2-Dichloroethene		<0.250	100	12
Ethylbenzene		<0.250	700	130
Isopropylbenzene		<0.250	---	66
p-Isopropyltoluene		<0.250	---	---
Methylene chloride		<0.250	---	4.3(ca)
Naphthalene		<0.200	---	0.62
n-Propylbenzene		<0.125	---	24
Styrene		<0.125	100	160
Toluene		<0.250	1000	72
1,2,4-Trichlorobenzene		<0.200	70	0.72
1,2,4-Trimethylbenzene		<0.250	---	1.2
1,3,5-Trimethylbenzene		<0.250	---	1.2
Vinyl Chloride		<0.250	2	0.02(ca)
o-Xylene		<0.250	10,000*	21
m,p-Xylene		<0.500	10,000*	21

GW-DUP is a duplicate of GW-03
MCL - U.S. EPA primary maximum contaminant limit for drinki
PRG - U.S. EPA Region PRG for tap water.
PRG value adjusted by 0.1 multiplier for non-cancer PRGs.
(ca) - PRG carcinogen

Table 4
Old Delaware City Landfill
Ground Water and Leachate Field Parameters
December 5-6, 2006

Sample	Medium	pH	Specific Cond.	Temperature
Units		(s.u.)	(uS/cm)	°C
GW-01	Ground Water	6.71	2435	9.8
GW-02	Ground Water	6.86	1523	12.3
GW-03	Ground Water	7.04	1100	11.8
GW-04	Ground Water	6.73	1864	10.2
GW-05	Ground Water	6.71	1984	12.3
L-1	Leachate	7.16	1173	1.6

Table 5
Old Delaware City Landfill
Leachate Sample Results - December 6, 2006

Sample No.	Units	L-1	Aquatic Life	Human Health
			OMZA	Non-Drink
VOCs	ug/l			
Benzene		0.178J	160	710
Chlorobenzene		0.988J	47	21,000
1,4-Dichlorobenzene		0.297J	9.4	2600
SVOCs	ug/l	ND		
PCBs	ug/l			
Arochlor-1254		**1.01**	---	0.0017
Pesticides	ug/l	ND		
BOD5	mg/l	22.7	---	---
COD	mg/l	78.7	---	---
Nitrate-Nitrite	mg/l	<0.100	---	---
Ammonia	mg/l	2.3	0.3 - 13.0**	---
Phosphorus	mg/l	17.1	---	---
TKN	mg/l	94.5	---	---
Sulfate	mg/l	28.8	---	---
Chloride	mg/l	12.6	---	---
TDS	mg/l	646	1500	---
Metals	ug/l			
Aluminum		1860	---	---
Antimony		5.17	190	4300
Arsenic		27	150	---
Barium		**261**	220	---
Beryllium		<0.5	39*	280
Cadmium		<2.5	4.2*	---
Calcium		173,000	---	---
Chromium		<2.5	141*	---
Cobalt		3.24J	24	---
Copper		12.5J	18*	1300
Iron		5570	---	---
Lead		11.1	18*	---
Magnesium		43,000	---	---
Manganese		895	---	---
Mercury		<0.1	0.91	0.012
Nickel		<5	102*	4600
Potassium		14,300	---	---
Selenium		<5	5	11,000
Silver		<5		---
Sodium		26,300	---	---
Thallium		0.0843J	17	6.3
Vanadium		<5	44	---
Zinc		30.4	233*	69,000
Cyanide	mg/l	<0.005	0.012	220

Leachate concentrations compared to surface water standards for receiving stream
OMZA - Outside Mixing Zone Average
* - Based on receiving stream (Olentangy River) hardness of 220
** - Range of values for warmwater habitat 30 day OMZA (December - February) Varies with pH and temperature of receiving stream.
J - Analyte positively identified but below reporting limit
Exceedance of human health or aquatic life standard - **261**

Table 6
Old Delaware City Landfill
24" Storm Outfall Sample Results
May 25, 2006

Analyte	Units	Result	Aqautic Life	Human Health
VOCs	ug/l		**OMZA**	**Non-Drink**
Chlorobenzene		0.66	47	21,000
Chloroethane		0.88	---	---
4-Isopropyltoluene		0.72	16	---
SVOCs	ug/l	ND		
PCBs	ug/l	ND		
Pesticides	ug/l			
alpha-BHC		0.0034	---	0.13
delta-BHC		0.0055	---	---
BOD_5	mg/l	9.9	---	---
COD	mg/l	155	---	---
Nitrate-Nitrite	mg/l	0.13	---	---
Nitrite	mg/l	<0.020	---	---
Ammonia	mg/l	**42.3**	0.1 to 2.3**	---
Phosphorus	mg/l	0.14	---	---
TKN	mg/l	51.3	---	---
Sulfate	mg/l	22.5	---	---
TDS	mg/l	**2920**	1500	---
TSS	mg/l	91	---	---
TOC	mg/l	27	---	---
pH	s.u.	7.28	---	---
Hardness	mg/l	680	---	---
Metals	ug/l			
Aluminum		773	---	---
Arsenic		18.9	150	---
Barium		**1280**	220	---
Cadmium		<0.20	4.2*	---
Calcium		152,000	---	---
Chromium		<30	141*	---
Copper		<10	18*	1300
Iron		16,200	---	---
Lead		3.4	18*	---
Magnesium		73,000	---	---
Manganese		399	---	---
Nickel		<40	102*	4600
Potassium		40,000	---	---
Selenium		<4.0	5	11,000
Sodium		872,000	---	---
Strontium		1060	5300	---
Zinc		21	233*	---

Storm outfall concentrations compared to surface water standards for receiving stream
OMZA - Outside Mixing Zone Average
* - Based on receiving stream (Olentangy River) hardness of 220
** - Range of values for warmwater habitat 30 day OMZA (March - November) - Varies with pH and temperature of the receiving stream.
J - Analyte positively identified but below reporting limit
Exceedance of human health or aquatic life standard - **1280**

ATTACHMENT 1

Site Photographs

Old Delaware City Landfill
241 Cherry Street
8-17-05 Site Visit

1 View of landfill looking south from waste relocation area south of equalization basin.

2 Olentangy River looking downstream

3 View from top of construction soil stockpile to northeast. Public works building and old salt shed in background. Landfill on right.

4 View from top of soil stockpile to east looking across landfill.

5 View from top of soil stockpile to southwest. City recycling building in background. Construction equipment staging area on right.

6 Storm outfall to Olentangy River south of landfill and recycling building.

7 Bare ground on river bank on south side of landfill. Possible former seep area.

8 Wastewater plant outfall north of landfill.

Old Delaware City Landfill Site Reconnaissance Photos
05/01/06

Figure 1. Possible former seep.

Figure 2. Olentangy River. View to south.

Figure 3. Discharge from 24” storm sewer outfall.

Figure 4. Potential river bank seep.

Figure 5. Potential seep along river bank.

Figure 6. Low wet area south of equalization basin.

Figure 7. Seep near waste relocation area.

Figure 8. Bare soil area along east side of landfill.

Figure 9. Bare soil area along east side of landfill.

Old Delaware City Landfill Field Investigation
December 5-6, 2006

Figure 1: GP-01 Boring Location **12/05/06**

Figure 2: GP-01 Boring Location **12/05/06**

Old Delaware City Landfill Field Investigation
December 5-6, 2006

Figure 3: Collecting Ground Water Sample at GP-02 **12/05/06**

Figure 4: GP-03 Boring Location **12/05/06**

Old Delaware City Landfill Field Investigation
December 5-6, 2006

Figure 5: GP-04 Boring Location **12/05/06**

Figure 6: GP-05 Boring Location **12/05/06**

Old Delaware City Landfill Field Investigation
December 5-6, 2006

Figure 7: L-1 Leachate Seep Sample Location **12/06/06**

Figure 8: L-1 Location Close Up **12/06/06**

Figure 9: Taking GPS Reading at P-16 **12/06/06**

Old Delaware City Landfill Site Visit - May 8, 2007

Figure 1**:** 27” Storm sewer outfall at bank of Olentangy River. No flow but staining present.

Figure 2: Seepage along river bank.

Figure 3: River bank seepage.

Figure 4: Seepage area from limestone bedrock along River bank south of recycling building.

Figure 5: Bedrock seepage along river bank.

Figure 6: 84 “diameter culvert south of recycling building.

Figure 7: Wet seep area with reeds on south side of landfill

Figure 8: 24” diameter storm sewer outfall. Storm Line passes through or under landfill.

Figure 9: River bank with landfill slope to right.

Figure 10: Leachate outbreak at toe of slope in waste relocation area on north side of landfill (south of Public Works complex.) Soil was added to this area By city later.

Figure 11: Leachate outbreak in waste relocation area.

Figure 12: Close up of leachate outbreak.

Figure 13: Bare soil area near fence by Public Works area.

Figure 14: View of landfill.

Figure 15: View of landfill from construction access road.

Photo No: 1 **Sample No:** LS-01 **Date:** July 10, 2007
Description: Ground water seep south end of landfill along river. The seep is about 100 feet long.

Photo No: 2 **Sample No:** LS-01 **Date:** July 10, 2007
Description: The same ground water seep at the south end of landfill along the Olentangy River.

Old Delaware City Landfill
Site Photos – September 19, 2007

Figure 1 - Catch basin near Public Works building leading to 24”outfall

Figure 2 - Storm catch basins

Figure 3 - View to south of catch basins with landfill waste relocation area in background

Figure 4 - City salt shed

Figure 5 – Public Works office and garage

Figure 6 – Public works office and garage

Figure 7 - View to east of salt/grit mixing shed

Figure 8 – View of landfill waste relocation area behind fence

9/19/07

Figure 9 –Soil recently added to repair leachate breakout along slope of waste relocation area

Figure 10 – Ditch receives runoff from leachate outbreaks along north slope and salt/gritmixing operations

9/19/07

Figure 11 – Ditch enters culvert which ties into 24" storm sewer

Figure 12 – Bare soil area - possible dry former seep on east side of landfill

9/19/07

Figure 13 – Olentangy River view to north from Olentangy Avenue bridge. Note orange-red staining along river bank in background.

Figure 14 – Olentangy River

9/19/07

Figure 15 - View of culvert near salt/grit mixing area.

Figure 16 – Leachate sample collection point LS-02. See SESI report.

ATTACHMENT 2

Geoprobe® Core Logs

Geoprobe Core Log Sheet

Site: Old Delaware City Landfill Date/Time: 12/5/2006

Location Description: **GP-01**

Latitude/Longitude: Logger: RRM

Core A (0-4 ft) Recovery: 36" PID: 1.5

Brown clayey SILT, trace glass fragments at 24", moist

Core B (4-8 ft) Recovery: 48" PID: 0.0

Orange-brown clayey SILT, wet

Core C (8-11.5' ft) Recovery: 42" PID: 2.1

0-28" Brown clayey SILT, wet
28-42" Clayey SAND & GRAVEL w/ limestone fragments, wet - Refusal @ 11.5'
EOB - 11.5'

Geoprobe Core Log Sheet

Site: Old Delaware City Landfill Date/Time: 12/5/2006

Location Description: **GP-02**

Latitude/Longitude: Logger: RRM

Core A (0-4 ft) Recovery: 33" PID: 7.5

0-28" Brown clayey SILT and silty CLAY, stiff, moist
28 - 33" Black stained clayey SILT and silty CLAY, trace wood fragments, moist to wet

Core B (4-8 ft) Recovery: 27" PID: 12.0

Brown to black clayey SILT, trace gravel, little foam rubber debris, oily odor, wet

Core C (8-12 ft) Recovery: 48" PID: 1.2

0-24" Dark brown to black silty CLAY, little gravel, wet
24 - 48" Brown clayey SILT, wet

Core D (12-15.5 ft) Recovery: 42" PID: 1.0

0-12" Gray clayey SILT, soft, wet
12 - 30" Brown-gray clayey SAND & GRAVEL, wet
30 -42" Gray clayey SHALE - Refusal @ 15.5'
EOB @ 15.5'

Geoprobe Core Log Sheet

Site: Old Delaware City Landfill Date/Time: 12/5/2006

Location Description: **GP-03**

Latitude/Longitude: Logger: RRM

Core A (0-4 ft) Recovery: 30" PID: 0.5

Dark brown to black clayey SILT, little gravel and limestone, wood and brick fragments, moist

Core B (4-8 ft) Recovery: PID: 0.3

Dark brown to black clayey SAND & GRAVEL, little limestone fragments, trace metal debris -moist

Core C (8-10.6 ft) Recovery: 32" PID: 0.7

0 - 13" Brown clayey SAND & GRAVEL, little limestone fragments, wet
13 - 32" Gray clayey SHALE, pyrite @ bottom of core, dry - Refusal @ 10.6'
EOB 10.6'

Geoprobe Core Log Sheet

Site: Old Delaware City Landfill Date/Time: 12/5/2006

Location Description: **GP-04**

Latitude/Longitude: Logger: RRM

Core A (0-4 ft) Recovery: 27" PID:

0 - 18" Brown clayey SILT and silty CLAY, trace gravel, moist
18" - 27" Dark brown to black clayey SILT, trace gravel, trace metal debris, wet

Core B (4-8 ft) Recovery: 25" PID:

Dark brown to black clayey SILT, trace gravel, trace plastic debris, wet

Core C (8-11.8 ft) Recovery: 32" PID:

0-27" Dark gray clayey SILT and silty CLAY, wet
27 -32" Brown SAND & GRAVEL, wet - Refusal @ 11.8'
EOB @ 11.8'

Geoprobe Core Log Sheet

Site: Old Delaware City Landfill Date/Time: 12/5/2006

Location Description: **GP-05**

Latitude/Longitude: Logger: RRM

Core A (0-4 ft) Recovery: 34" PID: 3.5

Brown clayey SILT, little sand & gravel, moist

Core B (4-8 ft) Recovery: 18" PID: 9.7

0 -6" Brown clayey SILT and GRAVEL with brick fragments and plastic debris, moist
6-18" Black clayey SILT, wet

Core C (8-12 ft) Recovery: 18" PID: 129

Black clayey, silty GRAVEL, some plastic debris, odor, wet

Core D (12-14.3 ft) Recovery: 17" PID: 49.4

Black clayey SAND & GRAVEL w/ plastic, paper, wood & glass debris,limestone fragment in tip, odor, wet
Refusal @ 14.3'
EOB @ 14.3'