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**2013 ANNUAL OPERATION, MAINTENANCE AND  
MONITORING REPORT**

**LCP BRIDGE STREET SITE (OU-1)  
Solvay, New York**

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## ACRONYMS

GAC	granulated activated carbon
gpm	gallons per minute
LCP	Linden Chemicals and Plastics
METRO	Metropolitan Wastewater Treatment Facility
mg/kg	milligrams per kilogram
ng/L	nanograms per liter
NYSDEC	New York State Department of Environmental Conservation
OM&M	Operation Maintenance & Monitoring
OU	Operating Unit
RI	Remedial Investigation
ug/L	micrograms per liter

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## **2013 ANNUAL OPERATION, MAINTENANCE, AND MONITORING REPORT**

### **1.0 INTRODUCTION**

This report details the operation, maintenance, and monitoring (OM&M) activities conducted at the site in 2013. It has been prepared consistent with the Linden Chemicals and Plastics (LCP) Operation Maintenance and Monitoring (OM&M) Plan (Parsons, 2009a) and provides a summary of the collected data and status of OM&M activities.

Under direction of the New York State Department of Environmental Conservation (NYSDEC), the remediation of LCP involved a combination of sewer system closure, mercury removal from soil on the former plant property, excavation of impacted sediments in surrounding areas with relocation to the soil/sediment containment area, construction of an underground cut-off wall and low-permeability soil cover over the soil/sediment containment area, and installation of an on-site groundwater collection system. As part of the project, excavation areas were restored to provide habitats for wading birds, ducks, amphibians, fish, and mammals (Parsons, 2009b).

OM&M operations consist of site and equipment maintenance in addition to monitoring of groundwater, sediment, surface water, wetlands, and biota. Upgrades to the site systems are performed as needed, and more detail is provided in the respective sections below.

### **2.0 SYSTEM OPERATION**

Groundwater extracted by the 15 pumping wells within the soil/sediment containment area was pumped to two 10,000-gallon tanks in the on-site extraction building (Figure 1). On January 21, 2010, the LCP pre-treatment system began operation. The pre-treatment system consists of a filter feed pump, two 5-micron bag filters, two fiberglass-reinforced plastic granular activated carbon vessels and a flow meter. The design pumping rate is approximately 5 to 25 gallons per minute (gpm). Pre-treated groundwater is discharged to the Onondaga County West Side Trunk Sewer from which it flows to the Onondaga County Metropolitan Wastewater Treatment Facility (METRO). In 2013, approximately 1,487,659 gallons were pre-treated on-site and sent to METRO. Monthly summaries are provided in Table 1 of this report.

### **3.0 MAINTENANCE**

The OM&M contractor providing maintenance activities for the specified period was CH2M HILL OMI. Maintenance conducted included system equipment maintenance, mowing, and snow removal. Specific maintenance activities outside of the normal maintenance activities previously noted included:

- Fixed several pumping well counters
- Periodic replacement of granulated activated carbon (GAC) for the water collection system throughout the year as necessary

- Replace and install two new well pumps

Maintenance conducted to system equipment was described in the weekly inspection, operation and monitoring reports generated by OMI and submitted to the NYSDEC and associated distribution list with the monthly reports for the LCP Operating Unit (OU)-1 site.

## 4.0 MONITORING

### 4.1 Groundwater

Containment of impacted sediments in the soil/sediment containment area is monitored both hydraulically and analytically using the piezometer and monitoring well network shown in Figure 1. The piezometer monitoring system will be updated during final closure of the landfill.

The static water level elevations presented in each monthly report for 2013 have been consolidated and provided in Table 2 of this report. During the time period covered by this report, water levels measured by the piezometers have remained generally consistent and below the elevation of the top of the cut-off wall. An inward gradient will be achieved when the interior shallow, intermediate, and deep piezometer readings are less than the corresponding exterior shallow, intermediate, and deep piezometer readings. It is anticipated that it will take several years after the final low-permeability cap is constructed to fully achieve an inward and upward gradient at the site.

The piezometers outside of the cut-off wall along the north side of the containment area (PZ 1B: shallow, intermediate and deep through PZ 4B: shallow, intermediate and deep) were sampled quarterly by CH2M HILL OMI and analyzed for total mercury by SW 846 Method 7470. The analytical results are provided in Table 3 of this report.

The analytical results for the exterior piezometer sampling are predominantly non-detect and generally within the same range or lower than the pre-remediation mercury results presented in the Remedial Investigation (RI) Report for the LCP OU-1 site. While there are some expected exceedances of the New York Code of Rules and Regulations Part 703 Class GA groundwater standard for mercury in the shallow zone outside of the cut-off wall (particularly PZ-2B-S), the outboard groundwater in the intermediate and deep zones are below the Class GA standard. The exterior shallow piezometer data ranges from non-detect to 2.2 micrograms per liter ( $\mu\text{g/L}$ ). The exterior intermediate piezometer data ranges from non-detect to 0.099  $\mu\text{g/L}$ . The exterior deep piezometer data ranges from non-detect to 0.092  $\mu\text{g/L}$ .

As part of OM&M monitoring, wells 34D, 35D, and 36D located within the containment area are sampled quarterly by CH2M HILL OMI and analyzed for total mercury by SW 846 Method 7470. During 2013, none of the wells were sampled due to ongoing construction activities.

### 4.2 Surface Water

The OM&M Plan established nine monitoring locations (Figure 2) in the West Flume and Wetland A/B complex that are sampled for total mercury, methylmercury, and dissolved mercury annually (Parsons 2009a). In 2013, the data range for total mercury was 7.3 nanograms per liter

(ng/L) to 38 ng/L from the West Flume (excluding the upstream sample location (LCP1-SW-63)), 1.2 ng/L to 1.4 ng/L for Wetland A, and 6.6 ng/L to 12 ng/L for Wetland B. Individual sample results are provided in Table 4 of this report.

### 4.3 Sediment

The OM&M Plan also established nine sediment monitoring locations at the same points as surface water that are sampled for total and methylmercury annually. The total mercury data ranges were 0.12 milligrams per liter (mg/kg) to 1.4 mg/kg for the West Flume (excluding the upstream sample location (LCP1-SW-63)), 0.65 to 1.5 mg/kg for Wetland A, and 0.069 mg/kg to 0.13 mg/kg for Wetland B. Individual sample results are provided in Table 5 of this report.

### 4.4 Biota

Baseline sampling was conducted in 2005 to establish body burden at the site prior to remediation. The OM&M Plan established a long-term monitoring program that analyzes mercury concentrations in forage fish, benthic macroinvertebrates, small mammals and earthworms (Parsons 2009a). The OM&M Plan specifies that monitoring should continue regularly (every two to three years) until results indicate that the remedy has been effective and the contaminant concentrations have stabilized (Parsons 2009a). Five annual sampling events (post remediation) have been conducted following completion of initial remedial activities in 2007. Biota mercury sampling was not conducted in 2013.

### 4.5 Wetlands Monitoring

The wetlands at LCP were originally dominated by a monoculture of the invasive grass common reed and had very limited habitat value. Following the removal of impacted sediments, Wetlands A and B were restored in 2007 using a diverse assemblage of wetland plant species. The restoration design placed an emphasis on the development of aquatic bed and deep emergent marsh habitat types in order to limit invasive species (EPA, 2009). The OM&M Plan indicates that restored wetlands would be monitored for five consecutive years following restoration at which point the program would be evaluated (Parsons, 2009a). Restoration of these wetland habitats was highly successful and routine monitoring in the original restoration areas was ended after the fifth year of monitoring in 2012. However, new removals occurred in 2011 in a section of SYW-14 that contained dredge spoils (now called Wetland C) and in a small portion of previously restored Wetland A (Figure 3). Restoration of both areas occurred in 2012. Monitoring of these newly restored wetlands will be conducted for five consecutive years as indicated in the OM&M Plan at which point data will be evaluated to determine if restored conditions have been met and if they can be maintained in the future. The first year of monitoring for these newly restored areas was completed in 2013.

The parameters monitored include:

- Vegetation (type, percent cover, and frequency)
- Hydrology
- Encroachment of invasive species into restored areas will be monitored (species, location, and approximate size of patch)

- Wildlife usage

Wetland monitoring and control of invasive species is intended to facilitate restoration success by ensuring that newly created habitats are allowed to establish, mature, and diversify to a point that they can naturally defend against invasive species, disease, and weather extremes (Parsons 2009a). Habitat types in the newly restored wetlands were primarily emergent wetland, aquatic/open water, and wet meadow. A total of 67 plant species were documented, most of which were wetland species. Hydrologic conditions were maintained throughout the summer and are expected to be maintained indefinitely.

Wildlife usage of the restored wetlands was extensive. Green and northern leopard frogs were particularly abundant in with bullfrogs, being noted as well. Numerous wetland birds were observed in the area during the year, including the state-listed threatened pied-billed grebe, which has successfully nested for the fourth year at the site. Several mammals were noted, including muskrat and mink; many additional species likely utilize the area.

Overall, the newly restored areas were found to be very successful during the first years of monitoring and minimal maintenance was required. A small area of Wetland A was seeded with a wetland seed mix to encourage additional vegetation growth. Common reed occurs in several locations around the restored areas. Control measures including herbicide application and hand pulling were implemented late in the growing season in 2013. Additional treatment is planned for the spring and fall of 2014.

## **5.0 MONITORING AND MAINTENANCE PROGRAM RECOMMENDATIONS FOR 2014**

To date, the monitoring and maintenance program being implemented at the LCP site has been effective. A draft five year monitoring review report entitled 2008-2013 Operation, Maintenance, and Monitoring Report LCP Bridge Street Site (OU-1) was submitted in February 2013. The five year report summarized the first five years of OM&M activities, present site monitoring trends, and provided recommendations concerning potential long-term modifications to the site monitoring program. This report recommended that:

- No changes are recommended for the Containment Area and Cap.
- The following two monitoring activities are recommended for Wetland A and C:
  - Continue annual sediment and surface water monitoring until the effectiveness of additional removals can be verified
  - Continue restoration monitoring and maintenance for a five-year period, which began in 2013, in areas where additional removals occurred in 2011 and 2012
- Continue sediment and surface water monitoring in the West Flume.
- Additional enhancement planting and seeding be conducted in areas of Wetland A where soil removals were completed in 2011. It is recommended that approximately 300 native herbaceous plantings and three pounds of additional native wetland seeding be installed in the Spring 2015.

- The only viable option for preventing highly aggressive invasive species such as Phragmites from taking over newly restored areas at the LCP site is controlled treatment using Glyphosate or similar products. Other alternatives are not feasible due to the extent of adjacent, nearby, and upstream/up-wind stands of Phragmites that provides a constant colonization source. In the past Glyphosate applications took place in fall when it was thought to be most effective, however spring application is also effective (Mozdzer et al. 2008). Applications of Glyphosate should be expanded to include both spring and fall to more fully control invasive common reed.
- Forage fish tissue sampling for total mercury in the West Flume to monitor tissue concentrations after conclusion of remedial efforts at Geddes Brook and Ninemile Creek that are to be fully completed in 2014.

## 6.0 REFERENCES

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**APPENDIX A**

**WETLANDS MONITORING REPORT YEAR 6 - 2013**

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**WETLAND MONITORING REPORT (2013)  
LCP BRIDGE STREET SITE**

**TOWN OF GEDDES  
ONONDAGA COUNTY, NEW YORK**

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**WETLAND MONITORING REPORT (2013)  
LCP BRIDGE STREET SITE****1.0 INTRODUCTION**

The wetland restoration sites are located in the Town of Geddes, Onondaga County, New York (Figure 1). Remediation at the LCP Bridge Street site required the excavation of portions of NYSDEC wetland SYW-14. The remediation design was presented in the *Final (100%) Design Report for the LCP Bridge Street (OU-1) Site* (Parsons 2004). Details about the wetland restoration plans and monitoring program can be found in the *Wetland Monitoring Reports – Years 1 through 5* (TES 2009, 2010, 2011, 2012, 2013). Restoration of wetland habitat was highly successful and routine monitoring in the original restoration areas was ended after 2012. However, new removals occurred in 2011 in a section of SYW-14 that contained dredge spoils from the West Flume and in a small portion of previously restored Wetland A (Figure 2). Restoration of both areas occurred in 2012; the portion of Wetland A where additional removals occurred was restored as shallow emergent wetland and the dredge spoil area, now referred to as Wetland C, was restored as deeper aquatic habitat surrounded by emergent wetland, wet meadow, and riparian edges. The OM&M Plan calls for monitoring of restored wetlands for five years after restoration at which point data are to be evaluated to determine if restored conditions have been met and if they can be maintained in the future (Parsons, 2008). This report presents the findings of the 2013 monitoring effort that is the first of five years of monitoring at Wetland C and the portion of Wetland A where additional removals occurred.

**2.0 MONITORING METHODS**

Methods used to monitor the restored wetland areas are provided in Parsons (2008). The parameters to be monitored included: vegetation, hydrology, wildlife usage, and invasive species.

**2.1 Vegetation**

Vegetation monitoring included field reconnaissance surveys, qualitative assessments, and quantitative sampling. Field reconnaissance surveys occurred several times from May to October, 2013 and tracked plant and wildlife species encountered. More detailed qualitative assessments were performed in July and August, 2013, to more systematically identify plant species and finalize locations for invasive species control.

Quantitative vegetation sampling was conducted on September 10, 2013 at 13 permanent stations in the portion of Wetland A where additional removals occurred and Wetland C. At each station a 100 ft<sup>2</sup> sample plot was established to evaluate herbaceous vegetation and a 400 ft<sup>2</sup> sample plot was established to evaluate woody vegetation. Plot locations are shown on Figure 3.

Vegetation data collected in each sample plot consisted of the following:

1. The vegetation cover type present,
2. Total percent areal cover of vegetation,

3. Plant species observed
4. The percent areal cover of each species.
5. Approximate water depth

Sample plot data sheets used are presented in Appendix A. Photographs were taken at each plot and at permanent photograph points shown on Figure 3. The location and direction of the photographs are shown on Figure 3, and the photographs are presented in Appendix B.

### 2.2 Hydrology

Staff gauge reading continued to be collected in Wetlands A and B in 2013 to ensure that water levels remained within acceptable ranges and to help determine if cleanouts were needed at culverts that drain into the West Flume during periods of high water. Those data are presented in Table 6. Staff gauges will be installed during the spring of 2014 in the portion of Wetland A being monitored and in Wetland C.

### 2.3 Wildlife

During field reconnaissance visits to the restoration areas, records were kept of all wildlife species seen in or in the vicinity of the area, and tracks of larger mammals were documented. Photographs were also taken when possible.

## 3.0 MONITORING RESULTS

### 3.1 Vegetation

Vegetation growth in newly restored areas of Wetlands A and C is generally dense and diverse with a total of 67 plant species recorded in 2013, the first year following restoration (Table 1).

#### Wetland A

Plant species observed in the recently restored section of Wetland A are presented in Table 1. Vegetation plot data for Wetland A are provided in Appendix A, with a summary of the data presented in Table 2.

Wetland A contains a primarily emergent wetland cover type around the perimeter and a small section (~0.1 acre) in the middle alternates between a sparsely vegetated shallow aquatic habitat and a mudflat depending on water levels (Figure 4). The edges quickly transition into upland meadow habitat.

A total of 18 species were identified during all monitoring activities (Table 1). Four species were identified during quantitative plot sampling, all of which were obligate wetland species (Table 4). Broad-leaf cattail (*Typha latifolia*) was by far the dominant species in the plots accounting for about 70% of the overall relative cover (Table 2)

#### Wetland C

Plant species observed in Wetland C in 2013 are presented in Table 1. Vegetation plot data for Wetland C are provided in Appendix A, with a summary of the data presented in Table 3.

Four vegetation cover types were identified in 2013; aquatic, emergent wetland, wet meadow, and wetland slopes (Figure 4). The deeper aquatic pool and associated perimeter emergent wetlands and wet meadow are the dominant habitat types in this area.

A total of 64 species were identified during all monitoring activities in 2013 (Table 1). During quantitative sampling a total of 53 species were identified, of which 87% were obligate or facultative wetland species (Table 4). Broad-leaf cattail and narrow-leaf cattail (*Typha angustifolia*) were the dominant species in the quantitative sampling accounting for a combined 45% of the overall relative cover (Table 3).

### 3.2 Hydrology

Hydrologic conditions were maintained throughout the monitoring period based on the water elevation data collected at monitored locations in 2013. Additional observations made in Wetlands A and C during reconnaissance surveys and site visits throughout the growing season and indicate that both areas maintained hydrologic conditions throughout the summer and fall of 2013.

### 3.3 Wildlife

Wildlife observations from the restoration areas are presented in Table 6. These observations were made at various times during the 2013 season, mostly during the vegetation reconnaissance and quantitative plot sampling.

#### Birds

Table 6 lists the bird species seen or heard in the vicinity of the restoration areas. Species observed included several wetland species, such as Canada Goose (*Branta canadensis*), Mallard (*Anas platyrhynchos*), Pied-Billed Grebe (*Podilymbus podiceps*), Green Heron (*Butorides virescens*), Eastern Kingbird (*Tyrannus tyrannus*) and Red-Winged Blackbird (*Agelaius quiscula*). Red-Winged Blackbird is a common nesting species in the restored wetland areas. Canada Geese and Mallards were common in the open water habitat of Wetland C. Pied-Billed Grebe is listed as a threatened species by the NYSDEC. This species was observed in Wetland B and C and apparently successfully nested in Wetland B for the fourth consecutive year.



Pied-Billed Grebe in LCP  
Wetland

#### Amphibians and Reptiles

There was a large number of frogs present in both wetlands A and C, but particularly in Wetland C. Both Green frog (*Lithobates clamitans*) and Northern Leopard frog (*Lithobates pipiens*) were abundant with lesser numbers of Bullfrog (*Rana catesbeiana*) also present. Species identification was determined by both direct observations and calls. The observation of the Bullfrog in particular is of note because it is not currently known from Onondaga Lake or the adjacent wetlands.

#### Mammals

White-tailed deer (*Odocoileus virginianus*) sign were commonly observed in and around the wetlands. Muskrat (*Ondatra zibeticus*) sign, including dens, were observed in Wetland C. Eastern coyote (*Canis latrans*) sign were commonly observed on the road separating Wetland C and the West Flume from Wetland A and B. A single Mink (*Neovison vison*) was observed along the edge of Wetland A in the fall.

## 4.0 WETLAND RESTORATION SUCCESS AND MAINTENANCE

The first year of monitoring of the newly restored areas of Wetlands A and Wetland C at the LCP OU1 site, indicates that restoration has been largely successful. Areas that were previously dominated by a monoculture of the invasive common reed with little aquatic habitat component, are now diverse wetlands, supporting a mix of plant and animal species and containing an interspersed aquatic habitat. The improvement in habitat value of these areas is significant. While the restoration of the newly restored areas is considered successful based on the first year of monitoring, maintenance of the areas is considered necessary to maintain the habitat value. The two concerns that are being addressed are: 1) The encroachment of Common Reed Grass into the restored areas 2) The low vegetation coverage in the mid-section of the newly restored area of Wetland A.

### 4.1 Invasive Species Control

Common reed grass occurs in various locations around the site. Most of the common reed is in adjacent areas or along the fringes of wetlands. Measures were implemented in the early fall of 2013 to control common reed grass. These measures included the application of the herbicide Rodeo® (glyphosate) to areas where common reed grass was present in and also adjacent to the restoration sites (Figure 5). Areas outside the wetland restoration footprint were treated to reduce the likelihood of them serving as colonization sources. Post-treatment inspections indicate that the application appears to have been highly successful. Use of herbicides over water is restricted, therefore when individual plants and/or stolons (above ground rhizomes) of common reed grass were present in standing water they were pulled by hand to the extent practical.

### 4.2 Wetland A Vegetation

The perimeter of the newly restored section of Wetland A is heavily vegetated but the central portion, encompassing approximately 0.1 acres, is not. This area was submerged for most of the 2013 growing season and this may have inhibited growth of species that initially established during the hot and dry summer in 2012. In late October 2013 an additional seven pounds of native facultative/obligate wetland seed was installed in this area (species list below). The seeding will be evaluated in the spring of 2014 and additional seeding and/or installation of herbaceous plugs may occur at that time.

#### **Seed mix used in Wetland A**

20% Fox Sedge (*Carex vulpinoidea*)

20% Virginia Wildrye (*Elymus virginicus*)

10% Nodding Sedge (*Carex gynandra*)

- 9% Lurid (Shallow) Sedge (*Carex lurida*)
- 8% Eastern Bur Reed (*Sparganium americanum*)
- 8% Hop Sedge (*Carex lupulina*)
- 7% Giant Bur Reed (*Sparganium eurycarpum*)
- 6% Deertongue (*Panicum clandestinum* (*Dichantherium c.*))
- 3% Fringed (Nodding) Sedge (*Carex crinita*)
- 3% Soft Rush (*Juncus effusus*)
- 2% Cosmos (Bristly) Sedge (*Carex comosa*)
- 2% Rice Cutgrass (*Leersia oryzoides*)

### 5.0 SUMMARY

The wetland areas were originally dominated by a monoculture of the invasive grass common reed and had limited aquatic habitat. Design for the restoration targeted a wetter wetland system to diversify the habitats, provide areas unsuitable for common reed, and increase the aquatic habitat component. Monitoring of the restored areas was required and is described in the Operation, Maintenance and Monitoring Plan (Parsons 2008). Monitoring that occurred from 2008 to 2012 in areas initially restored in 2007 was completed in 2012. Monitoring began in 2013 in areas restored in 2011 and 2012. Results of the first year of monitoring (2013) for these newly restored areas are presented in the current report.

Vegetation and wildlife usage were monitored during 2013 in the restored wetlands. A vegetation cover map of the restored areas is provided. Vegetation in the restored wetlands was primarily emergent and aquatic bed. A total of 67 plant species were observed in the area, most of which were wetland species. Hydrologic conditions were maintained throughout the summer and are expected to be maintained indefinitely.

Wildlife usage of the restored wetlands was extensive. Green and northern leopard frogs were particularly abundant in with bullfrogs, being noted as well. Numerous wetland birds were observed in the area during the year, including the state-listed threatened pied-billed grebe, which has successfully nested for the fourth year at the site. Several mammals were noted, including muskrat and mink; many additional species likely utilize the area.

Overall, the newly restored areas were found to be very successful during the first years of monitoring. An area of Wetland A was seeded with a wetland seed mix to encourage additional vegetation growth in a small section that was flooded for most of the 2013 season. Common reed occurs in several locations around the restored areas. Control measures of herbicide application and hand pulling were implemented late in the growing season in 2013. Additional treatment is planned for 2014.

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