CHANUTE AFB
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ADMINISTRATIVE RECORD
COVER SHEET

AR File Number 3738

DEPARTMENT OF THE AIR FORCE
AIR FORCE CIVIL ENGINEER CENTER
JOINT BASE SAN ANTONIO LACKLAND TEXAS

12 April 2013

AFCEC/CIBE
2261 Hughes Avenue Suite 121
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Mr. Christopher Hill, P.E.
Illinois Environmental Protection Agency
1021 North Grand Avenue East
Springfield, Illinois 62702

Subject: "Final Addendum 1 for Landfill 2 (LF017), Evapotranspiration Buffer Leachate Management System Installation Work Plan, Operable Unit 2: Landfill 4 (LF019), Former Chanute Air Force Base, Rantoul, Illinois"

Dear Mr. Hill:

Please find the subject document for your records. Feel free to contact me at (806) 885-5010 or Jim Husbands at (602) 684-1003 if you have any questions regarding the submitted information.

Sincerely,

PAUL CARROLL
BRAC Environmental Coordinator

Attachment:

1. "Final Addendum 1 for Landfill 2 (LF017), Evapotranspiration Buffer Leachate Management System Installation Work Plan, Operable Unit 2: Landfill 4 (LF019), Former Chanute Air Force Base"

cc: Mr. Mark Davis, AFCEC/CZRB
Mr. Ted Holly, AFCEC/CZRB
Mr. James Husbands, Booz Allen Hamilton
Ms. Sonia Gallegos, AFCEC/CIO (CD-ROM)
Dr. Nicholas Schneider, TAPP Contractor, RAPPs Engineering (CD-ROM)
Mr. Howard Sparrow, Shaw
File

ADDENDUM 1 FOR LANDFILL 2 (LF017)

EVAPOTRANSPIRATION BUFFER LEACHATE MANAGEMENT SYSTEM INSTALLATION WORK PLAN

Operable Unit 2: Landfill 4 (LF019)

Former Chanute Air Force Base
Rantoul, Illinois

Air Force Civil Engineer Center – Environmental Center of Excellence
Contract No. FA4890-06-D-0010
Task Order 0002
Shaw Project No.: 134238

Document Control No.: WPSA-014I
Revision 1

April 2013

Prepared for:
Air Force Civil Engineer Center
Installations Center of Excellence
and
Environmental Center of Excellence

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Acronyms and Abbreviations

AFB	Air Force Base
AFCEC	Air Force Civil Engineer Center
AR	Administrative Record
bgs	below ground surface
BSAP	Basewide Sampling and Analysis Plan
cm/sec	centimeter per second
ETBuffer	evapotranspiration buffer
FML	flexible membrane liner
ft/day	feet per day
Jacobs	Jacobs Engineering Group Inc.
LCS	Leachate Collection System
LMS	Leachate Management System
OM&M	operation, maintenance, and monitoring
OU	operable unit
Parsons	Parsons Infrastructure & Technology Group, Inc.
PET	potential evapotranspiration
QAPP	Quality Assurance Project Plan
SFC	Salt Fork Creek
Shaw	Shaw Environmental, Inc.
VOC	volatile organic compound

1.0 Introduction

This Addendum (hereafter inclusively referred to as Work Plan Addendum) to the *Evapotranspiration Buffer (ETBuffer) Leachate Management System (LMS) Installation Work Plan, Operable Unit 2: Landfill 4 (LF019)* (hereafter inclusively referred to as Work Plan) has been prepared by Shaw Environmental, Inc. (Shaw) for the Air Force Civil Engineer Center (AFCEC)—Installations Center of Excellence and AFCEC—Environmental Center of Excellence, under Contract No. FA4890-06-D-0010, Task Order 0002 for work to be performed at the former Chanute Air Force Base (AFB), located in the Village of Rantoul, Champaign County, Illinois. This Work Plan Addendum has been developed in order to supplement the remedial actions previously implemented at Operable Unit (OU) 2 Landfill 2 (LF017) (hereafter referred to as Landfill 2) and as described in the *Final Interim Record of Decision for Operable Unit (OU)-2 Landfills 1 - 4* (Administrative Record [AR] 1406, Jacobs Engineering Group Inc. [Jacobs], 2000).

The Selected Remedy was chosen in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended by the Superfund Act Reauthorization Amendment, and the National Contingency Plan. The Selected Remedy chosen for Landfill 2 was Alternative 3: Consolidation of Waste and Installation of a Soil and Geosynthetic Multi-layer Cover (AR1406, Jacobs, 2000). A Leachate Collection System (LCS) was installed as part of implementation of the Selected Remedy for Landfill 2. The LCS has been operated since July 2010 (AR3702, Shaw, 2012).

The Base Realignment and Closure Cleanup Team agreed that the implementation of an ETBuffer LMS would be a proactive supplemental measure to the Selected Remedy at Landfill 2 and may eventually allow the operation of the LCS at Landfill 2 to stop. At a minimum, the Landfill 2 ETBuffer LMS will complement and enhance the existing LCS.

1.1 Objective

The objective of this Work Plan Addendum is to install an ETBuffer LMS at Landfill 2 to provide a supplemental measure to the Selected Remedy to prevent possible future lateral migration of leachate from the landfill. The goal is to complete the installation of the Landfill 2 ETBuffer LMS by May 2013. The specific objectives of this Work Plan Addendum are as follows:

- Present the remedial design drawings and specifications that detail and describe the physical elements of the Landfill 2 ETBuffer LMS
- Describe the implementation requirements of the Landfill 2 ETBuffer LMS

The technical approach and rationale for conducting the field activities are presented in the Work Plan. Therefore the technical approach, rational for conducting field activities, field methods, field sampling plan, reporting requirements, and project management plan are not repeated in this Work Plan Addendum. Only information specific to installation of the Landfill 2 ETBuffer LMS is presented in this Work Plan Addendum.

1.2 Scope of Work

The major components of the supplemental measure to the Selected Remedy for Landfill 2 are anticipated to include the following:

- Mobilization of equipment and personnel to the site
- Installation of EBuffer® trees
- Operation and maintenance activities to establish initial 1-year growth of trees
- Documentation of the Landfill 2 ETBuffer LMS installation

1.3 Site Description and History

Four landfills were operated from approximately 1930 to 1974 and served as primary disposal areas for wastes generated at the former Chanute AFB. Landfill 2 began operations in the early 1950s and remained open until 1967. During the years of operation, office trash, shop wastes, waste solvents, herbicides, and construction rubble were reportedly deposited in excavated trenches or holes of depths up to 8 to 20 feet below ground surface (bgs) and backfilled with soil. Wastes reportedly were burned periodically prior to backfilling with soil at Landfill 2 (AR3, Engineering Science, Inc., 1983; AR11, Weston, 1986).

The Landfill 2 site boundary encompasses approximately 26 acres and is located in the northwest quadrant of OU-2. Figure 1 depicts the location and orientation of Landfill 2 and its geographic relationship to other landfills in the immediate area. A site plan for Landfill 2 is presented as Figure 2. Site features, including cap contours and drainage channels, are identified in the figure. Figure 2 also depicts the area of excavations resulting from waste consolidation, the landfill cap boundary, the relationship to other Installation Restoration Program sites, and waste excavation areas. The Landfill 2 site is located south and east of Landfill 1, South Perimeter Road, and Salt Fork Creek (SFC) (SD032); west of Heritage Lake (SI034); and north of Fire Training Area 2 (FT021).

In 2000, an interim remedy was selected for Landfill 2 (AR1406, Jacobs, 2000). The interim remedy included the excavation and consolidation of the landfill into a smaller footprint, and the installation of an LCS and multi-layer soil and geosynthetic cover. Soil from the Northern Excavation Area was partly consolidated into Landfills 2 and 3. The consolidation effort was completed in May 2001, and the LCS and cover were in place by July 2004 (AR2976, Parsons

Infrastructure & Technology Group, Inc. [Parsons], 2005). Approximately 65,500 cubic yards of waste, debris, and soil were excavated and consolidated into Landfill 2.

The LCS consists of corrugated high density polyethylene pipe installed to the bottom of a trench that was excavated to or below the bottom of the waste material. The LCS was installed along the eastern and western flanks of the landfill and bisects the landfill from the south to north central. The LCS piping and trenches on the landfill flanks were installed approximately 10 feet inside the landfill cap boundary and slope from the southeast, southwest, and north corners to the lift station located in the north-central portion of the landfill (AR2976, Parsons, 2005) (refer to Figure 2). The LCS at Landfill 2 began operation in July 2010 following installation of a force main to connect to the Village of Rantoul sanitary sewer system (AR3702, Shaw, 2012).

2.0 Site Conceptual Model

The site hydrogeology, surface water hydrology, soil agronomy data, phytoremediation, and climate and meteorology, as relevant to the site conceptual model for installation of the Landfill 2 ETBuffer LMS are similar to that presented in the Work Plan. Only Landfill 2 specific groundwater, surface water drainage, hazardous constituents, and conceptual site model summary are presented in this section.

2.1 Groundwater

Over most of the former Chanute AFB, the Wisconsinan groundwater system is separated from the underlying Illinoian aquifer by the hard, dry clay of the Tiskilwa Formation. Where present, the Tiskilwa Formation inhibits migration of groundwater from the Wisconsinan water-bearing zones to the Illinoian aquifer. The Tiskilwa Formation is present at approximately 35 to 55 feet bgs throughout the Landfill 2 site.

The interbedded sand lenses and layers within the Batestown Member of the Lemont Formation comprise the Wisconsinan groundwater system at the former Chanute AFB. The water-bearing zones in the Wisconsinan deposits are less continuous and much less productive than the underlying pre-Illinoian and Illinoian aquifer systems. The hydraulic conductivity values for the Wisconsinan system vary considerably due to the highly heterogeneous and anisotropic nature of the glacial sediments. There are no private or public users of Wisconsinan groundwater on the former Base.

Groundwater within the Wisconsinan system is typically encountered within 10 feet bgs, and this system extends to depths ranging from about 30 to 50 feet bgs. Figure 3 is a potentiometric surface contour map interpreted from Wisconsinan groundwater elevation measurements made during a water-level survey conducted in April 2012. The Wisconsinan groundwater monitoring

wells are screened approximately between 5 and 20 feet bgs. As shown on Figure 3, the potentiometric surface at Landfill 2 appears to slope northwest and is controlled by groundwater discharges to SFC, pumping at LCS lift station, and LCS laterals. Apparent hydraulic gradient is approximately 0.014 feet/feet from the southeast corner of Landfill 2 to the northwest.

Slug tests were conducted as part of the ETBuffer Treatability Study at Landfill 3. For the wells screened across the saturated zone, the horizontal hydraulic conductivity values ranged from 0.08 feet per day (ft/day) (2.92×10^{-5} centimeters per second [cm/sec]) to 0.92 ft/day (3.15×10^{-4} cm/sec) with an overall geometric mean value of horizontal hydraulic conductivity of 0.30 ft/day (1.05×10^{-4} cm/sec) (AR3621, Shaw, 2011a). The average groundwater flow rate is estimated to be 15.3 feet per year to the northwest using an estimated effective porosity of 10 percent and the mean hydraulic conductivity.

2.2 Surface Water Drainage

Figure 2 shows the grading, drainage plan, and surface-drainage features. The landfill cover and adjacent areas are covered in grass. The surface water drainage along the southern and southwestern portions of the landfill cap flows to the South Detention Basin, which discharges through a drainage pipe to SFC. Surface drainage along the northwestern and eastern portion of the landfill cap flows into the North Detention Basin, which also discharges to SFC.

2.3 Hazardous Constituents

A review of data to identify hazardous constituents to be monitored at Landfill 2 in accordance with Illinois Administrative Code Title 35 Part 724.193 was presented in the *Final Operation, Maintenance, and Monitoring Plan for Landfill 1 (LF016), Landfill 2 (LF017), Landfill 3 (LF018), and Landfill 4 (LF019)* (Shaw, 2013b) (hereafter referred to as the OM&M Plan) based on a review presented in the *Final Interim Landfill Groundwater Monitoring Plan, Operable Unit 2 (OU-2): Landfill 1 (LF016), Landfill 2 (LF017), and Landfill 3 (LF018)* (AR3645, Shaw, 2011b). It included a comprehensive review of the soil, groundwater, and leachate data collected since 1998 near or within Landfill 2. The review identified constituents be retained for monitoring if they have been detected and would be reasonably expected to be in or derived from waste contained in the landfill. Constituents retained for monitoring included arsenic, lead, nickel, and several volatile organic compounds (VOCs). Aluminum and iron were retained for sampling to provide geochemical data for interpretation of arsenic results.

To date, only concentrations of naturally occurring metals and VOCs (trichloroethene, cis-1,2-dichloroethene, and vinyl chloride) in groundwater or leachate have been detected above the Landfill Groundwater Monitoring Concentration Limits at Landfill 2. So far, sporadic exceedance of the Landfill Groundwater Monitoring Concentration Limits of metal

concentrations appears to be turbidity related. Operation of the LCS system at Landfill 2 is helping in reducing concentrations of chlorinated VOCs in downgradient wells (Shaw, 2013b).

2.4 Conceptual Site Model Summary

Wisconsinan deposits at the site are characterized by silty clay with discontinuous lenses of sand and silt that vary in thickness. These discontinuous lenses of transmissive material comprise the Wisconsinan saturated zone. The Wisconsinan potentiometric surface appears to be in contact with the waste at Landfill 2.

Landfill 2 has a multi-layer flexible membrane liner (FML) cap that was designed to have an annual infiltration rate of 0.0034 inches. This equates to an annual infiltration rate of 1,948 gallons for the 21.1-acre cap at Landfill 2. The estimated groundwater velocity at Landfill 2 is approximately 15.3 feet per year, which indicates limited contribution from lateral groundwater flow. Therefore, the lateral movement for groundwater in the dormant season (approximately 6 months) is expected to be 7.7 feet. The lateral movement for contaminants will be even less since contaminant migration is retarded due to adsorption potential of the majority of hazardous constituents that may leach from Landfill 2.

Soil agronomy data were collected as part of the treatability study design for Landfill 3. The soil properties were very conducive to a successful EBuffer® of hybrid poplars and willows. This was confirmed by a 94 percent EBuffer® tree survival rate at the Landfill 3 ETBuffer observed after three growing seasons under significantly lower than normal precipitation (Shaw, 2013a).

A Hydrus 1D hydrology model was used to estimate the potential evapotranspiration (PET) for the central Illinois area. The Hydrus model predicted the PET to be 44.25 inches/year (1,201,000 gallons per acre per year) (Appendix B). The annual average rainfall for Rantoul was calculated at 40.91 inches/year (1,110,800 gallons per acre per year). The model further predicted that a deep rooted ETBuffer in sandy clay loam would result in an annual evapotranspiration rate of 32.6 to 36.7 inches of water per year (approximately 885,000 to 996,000 gallons per acre per year). The soil textures are ideal for an ETBuffer LMS because they have a high available water-holding capacity where approximately 1.5 to 2.0 inches of water can be held without percolation and released for root uptake.

Depth to groundwater varies from 2 feet to 9 feet bgs. A tree-root plantation depth of up to 12 feet bgs would result in the root structure below the current groundwater table. This depth would allow the trees to draw down the groundwater table. The tap root should continue to grow deeper as the groundwater level recedes.

A review of leachate and groundwater chemistry data suggests that the anions, cations, and organic concentrations measured at Landfill 2 are below poplar and willow toxicity stress levels

experienced at other sites. The leachate pH is between 6.2 and 7.8, which is within the acceptable range for plant growth (refer to Work Plan, Table 5-1).

Metals and VOCs were identified as potential hazardous constituents in groundwater/leachate at Landfill 2. Metal concentrations appear to be at background levels (Shaw, 2011b). Although bioaccumulation of inorganic compounds (metals) is possible, the concentration within the vegetative materials would be similar to all native trees. Chlorinated VOCs have been detected in perimeter monitoring wells at low levels. The decrease in vinyl chloride concentrations at two wells at Landfill 3 may be a result of phytoremediation occurring within the ETBuffer zone (Shaw, 2013a). The fate of chlorinated VOCs in terrestrial plants including hybrid poplars has been previously studied (McCutcheon and Schnoor, 2003). These previous studies indicate that chlorinated VOCs are absorbed by trees roots and are metabolized and or transpired through plant tissue. No significant bio-accumulation of chlorinated VOCs in vegetative matter (leaves, wood pulp) was identified in the studies.

3.0 ETBuffer LMS Design

An ETBuffer LMS is a new and innovative technology for landfill leachate migration control. Published data for design criteria for an ETBuffer LMS are not available; therefore, the Landfill 3 ETBuffer Treatability Study Report (Shaw, 2013a) as well as proprietary design criteria supplied by Ecolotree®, Inc. forms the design basis for the Landfill 2 ETBuffer LMS. Design basis, design criteria, and design details are provided in the Work Plan. The Landfill 2 ETBuffer LMS uses Ecolotree®, Inc.'s EBuffer® trees as the basis of design. There are two components of the design: hydraulics design and design of tree selection and planting. Each of these design components is discussed in subsequent sections.

3.1 Hydraulics

Groundwater hydraulics at Landfill 2 are presented below. The results of the Hydrus groundwater model conducted by Ecolotree®, Inc., including the assumptions and inputs, are provided in Appendix B and summarized in the Section 3.1.1 of the Work Plan. Additionally, the water balance calculations relative to the Landfill 2 ETBuffer LMS capabilities are presented in this section.

3.1.1 Water Balance

Leachate can be generated by downward percolation of precipitation through the landfill material or by lateral migration of groundwater that may be in contact with landfill materials. Landfill 2 at the former Chanute AFB has a multilayer FML cap that reduces the leachate flow rate through the landfill materials to a fractional rate. The predicted infiltration through the 21.1-acre landfill cap using a design infiltration rate of 0.0034 inches per year at Landfill 2 is 1,948 gallons per

year. The dominant leachate source is the lateral flow of groundwater beneath the landfill that may be in contact with landfill material. This can be estimated as follows:

$$Lateral\ Flow = K \times I \times A = K \times I \times L \times b$$

Where

K = Hydraulic conductivity (0.30 ft/day) (see Section 2.1)
I = Hydraulic gradient (0.014 ft/ft) (see Section 2.1)
A = Cross-sectional area ($L \times b$)
L = Landfill 2 width perpendicular to groundwater flow moving towards Landfill 2 (1,200 ft)
b = Thickness of transmissive zone (estimated 10 feet initially and 5 feet after several years of LCS operation)

The estimated lateral flow in the Landfill 2 ETBuffer LMS zone is approximately 138,000 gallons per year initially and 69,000 gallons per year after water levels are reduced. Thus the eastern (upgradient) Landfill 2 ETBuffer LMS should be capable of water uptake for the total leachate (groundwater) migrating laterally (138,000 gallons per year initially and 69,000 gallons per year in long term) in addition to precipitation that is not lost through runoff within the Landfill 2 ETBuffer LMS zone. The Hydrus Model estimated runoff to be 2.05 inches per year out of an average precipitation of 40.91 inches per year and potential evapotranspiration (PET) for EBuffer® trees is 44.25 inches. Precipitation that is not lost to runoff through the 0.65-acre Landfill 2 ETBuffer LMS eastern zone is estimated to be 678,000 gallons per year. Therefore, the PET capacity of the 0.65-acre Landfill 2 ETBuffer LMS eastern zone (772,000 gallons) does not exceed the total estimated non-runoff precipitation and initial lateral groundwater flow of 816,000 gallons per year. However, the PET capacity of the 0.65-acre Landfill 2 ETBuffer LMS eastern zone (772,000 gallons) does exceed the total estimated non-runoff precipitation and long-term lateral groundwater flow of 747,000 gallons per year. Since the PET of the Landfill 2 ETBuffer LMS zone is greater than the sum of long-term lateral groundwater flow and non-runoff precipitation, the 0.65-acre upgradient (eastern) Landfill 2 ETBuffer LMS has the capacity to provide hydraulic control for Landfill 2 and has a potential to allow shut-down of the LCS at Landfill 2.

The downgradient (western) Landfill 2 ETBuffer LMS zone along SFC provides additional uptake capacity and buffer for phytoremediation. The hydraulic buffer capacity of this zone was not considered in the water balance since it may draw water from nearby SFC. However, it suffices to note that the 0.4-acre western Landfill 2 ETBuffer LMS zone has sufficient capacity to uptake the estimated 1,948 gallons per year of infiltration through the FML cap.

The Landfill 2 ETBuffer LMS should also be designed to prevent leachate migration during the dormant season. The groundwater velocity at Landfill 2 is estimated to be 15.3 feet per year and the lateral movement of groundwater in the dormant season is expected to be at most 7.7 feet as described in Section 2.4. The Landfill 2 ETBuffer LMS will consist of two rows of trees spaced 10 feet apart on the downgradient sides and three rows of trees spaced 10 feet apart on the upgradient side. Each mature tree will have a radius of influence of up to 7 feet; thus, the Landfill 2 ETBuffer LMS will result in a 24-foot wide buffer zone in two row plantations and a 34-foot wide buffer zone in three row plantations. The Landfill 2 ETBuffer LMS will reduce the soil moisture content from about 45 percent to less than 20 percent by the end of the growing season. The hydraulic-absorptive capacity of the soil within the 1.0-acre Landfill 2 ETBuffer LMS will be approximately 515,000 gallons for the top 6 feet. The estimated percolation (approximately 1.82 inches per year) during the dormant season is estimated to be 49,000 gallons of infiltration. Since the buffer capacity of the soil is almost ten times larger than the dormant season percolation rate, significant absorptive capacity is available to prevent any leachate migration across the buffer zone during the dormant season. The leachate will be captured and removed during the next growing season. As a result, the Landfill 2 ETBuffer LMS will create a sponge effect that will significantly exceed the dormant season percolation rate and will prevent lateral movement of leachate while the Landfill 2 ETBuffer LMS is not uptaking groundwater during the dormant season.

3.2 ETBuffer LMS Design

The Landfill 2 ETBuffer LMS will be planted using EBuffer® trees that are patented by Ecolotree®, Inc. The EBuffer® design considerations are described in Section 3.2 of the Work Plan.:

3.2.1 Selection of Trees

Hybrid poplars and willows were selected as EBuffer® trees due to the beneficial and desirable characteristics presented in Section 3.2.1 of the Work Plan. Approximately 800 2-year rooted poplars (varieties DN31 and DN21) have been selected to be planted in the shallow trenches. The two poplar varieties will be intermixed. Approximately 800 1-year unrooted poles (Laurel Leaf willows and Iowa willows) will be inter-planted between two poplars in the row either in the planting trench or in auger holes in order to ensure at least one surviving tree at each location. The unrooted poles or poplars will be selectively pruned after the initial growing season based on individual variety survival.

3.2.2 ETBuffer LMS Plantation Details

Figure 4 shows the Landfill 2 ETBuffer LMS Plantation Plan view along with Landfill 2 physical features. The basic design unit for a planted EBuffer® poplar is shown in Appendix B of the Work Plan (Figure 1). This figure has been created to help predict the water balance in the

root-zone reactor. Using the basic design unit, the EBuffer® poplar can be reliably installed. The EBuffer® poplar buffers have a specific root-zone depth and function.

Approximate 1.0 acre of poplar grove will be planted with a mixture of hybrid poplars and willow. The EBuffer® design will develop a deep poplar rhizosphere to capture organic and mineral compounds in leachate. The general depth to groundwater around Landfill 2 is approximately 2 to 9 feet bgs. The poplars will be planted at a root depth of approximately 8 to 12 feet; therefore, the initial planted root zone will be below the groundwater table and will continue to penetrate the groundwater saturated zone within the first 6 months of growth.

Planting of understory grasses will be used for sedimentation control and storm water management. Note that the inner tree row will be approximately 25 feet from the LCS pipeline and 15 feet from the landfill cap anchor trench. This will eliminate any potential damage to the LCS and landfill cap.

4.0 ETBuffer LMS Installation

The following sections describe the specific activities associated with the installation of the Landfill 2 ETBuffer LMS. In general, the Landfill 2 ETBuffer LMS installation will follow procedures outlined in the Work Plan. OM&M requirements are specified in the OM&M Plan for Landfills 1 through 4 (Shaw, 2013b).

4.1 Site-Specific Environmental Control Plan

Environmental control measures will be implemented as described in the Work Plan. Landfill 2 site-specific environmental control details are provided as an enclosure to the updated QAPP Worksheet #14 in Attachment A. Note; the Landfill 4 site-specific environmental control details were omitted from the Work Plan and have been included in this Work Plan Addendum.

4.2 EBuffer® Tree Installation

The EBuffer® trees will be planted for the Landfill 2 ETBuffer LMS as described in the Work Plan with the exception of the following:

- Individual augered 12-inch-diameter holes will be dug within the trench areas to extend the planting depth to 8 to 12 feet bgs
- In addition to compost and/or biosolids, molasses may also be added in some areas to promote anaerobic conditions that help reductive dechlorination of trichloroethene and daughter products.
- The tree spacing in the southeast corner, where a large number of extra trees will be planted, will be 15 feet.

5.0 Sampling and Analysis Plan

The protocols for screening data collection, soil sampling, and quality assurance described in the Work Plan will be followed. The only additional samples to be collected for Landfill 2 are agronomy soil samples.

5.1 Agronomy Soil Sampling

Three additional agronomy soil samples will be collected to determine soil descriptions and nutrient contents. Agronomy soil samples will be analyzed for Mehlich III extractable nutrients (Attachment 3 of Appendix A in the Work Plan). Table 5-1 of the Work Plan lists the optimal ranges of soil nutrients. Data reported using this procedure may be used to make fertilizer and compost/biosolids recommendations and to determine the fertility status of the soil.

5.2 Quality Assurance/Quality Control

This section describes the procedures to be followed to ensure the quality of the data collected and fieldwork performed.

Attachment A of this document presents the task-specific information (via updated Quality Assurance Project Plan [QAPP] Worksheets) not previously provided in the QAPP (Appendix B of the Basewide Sampling and Analysis Plan [BSAP] [AR3649, Shaw, 2011d]) or the Work Plan. The updated QAPP Worksheets for the Work Plan and this Work Plan Addendum present in specific terms the policies, organization, functions, and quality assurance/quality control requirements designed to consistently achieve the data quality goals established for environmental sampling tasks at the former Chanute AFB. The updated QAPP Worksheets are used in conjunction with the BSAP, the Work Plan, and this site-specific Work Plan Addendum to define the specific activities that are needed to address the additional sampling and analytical requirements and to install the Landfill 2 ETBuffer LMS.

The following QAPP Worksheets (presented in Attachment A) have been updated with site-specific information:

- QAPP Worksheet #9 – Project Scoping Session Participants Sheet
- QAPP Worksheet #10 – Problem Definition
- QAPP Worksheet #14 – Summary of Project Tasks
- QAPP Worksheet #16 – Project Schedule/Timeline Table
- QAPP Worksheet #17 – Sampling Design and Rationale
- QAPP Worksheet #18 – Sampling Locations and Methods/SOP Requirements Table

- QAPP Worksheet #20 – Field Quality Control Sample Summary Table

Note that a reference to an updated QAPP Worksheet #8 was listed for the Work Plan, and it was not provided because there is no need for special training for this project beyond using Ecolotree®, Inc.

6.0 References

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Weston, Roy F., 1986, AR11 – *Phase II Stage 1, Final Report, Confirmation/ Quantification, Chanute Air Force Base, Illinois,* October.

Figures

APPROVED BY:	A. BUMB
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REV:	0
DRAWN BY:	P. VIBLE
DOC DCN:	WPSA-014

List of Icons

- Area of Excavation
- Current Structure
- Current Paved Area
- Former Structure
- Landfill Cap
- Landfill Detention Basin
- Water Body
- Recreation Area
- Site Boundary
- Adjacent IRP Site Boundary
- Culvert
- Drainage Ditch
- Fence Line
- 722.57 — Monitoring Well Groundwater Level (ft MSL)
- 724 — Potentiometric Contour Line (ft MSL)
- 724 — Topographic Contour Line (ft MSL)
- Unpaved Road
- MW6018 — Groundwater Monitoring Well Location

List of Acronyms

ft	feet
IRP	Installation Restoration Program
MSL	mean sea level

LEGEND

ETBUFFER LMS INSTALLATION ADDENDUM

FORMER CHANUTE AIR FORCE BASE
RANTOUL, ILLINOIS
CONTRACT NO. FA4890-06-D-0010

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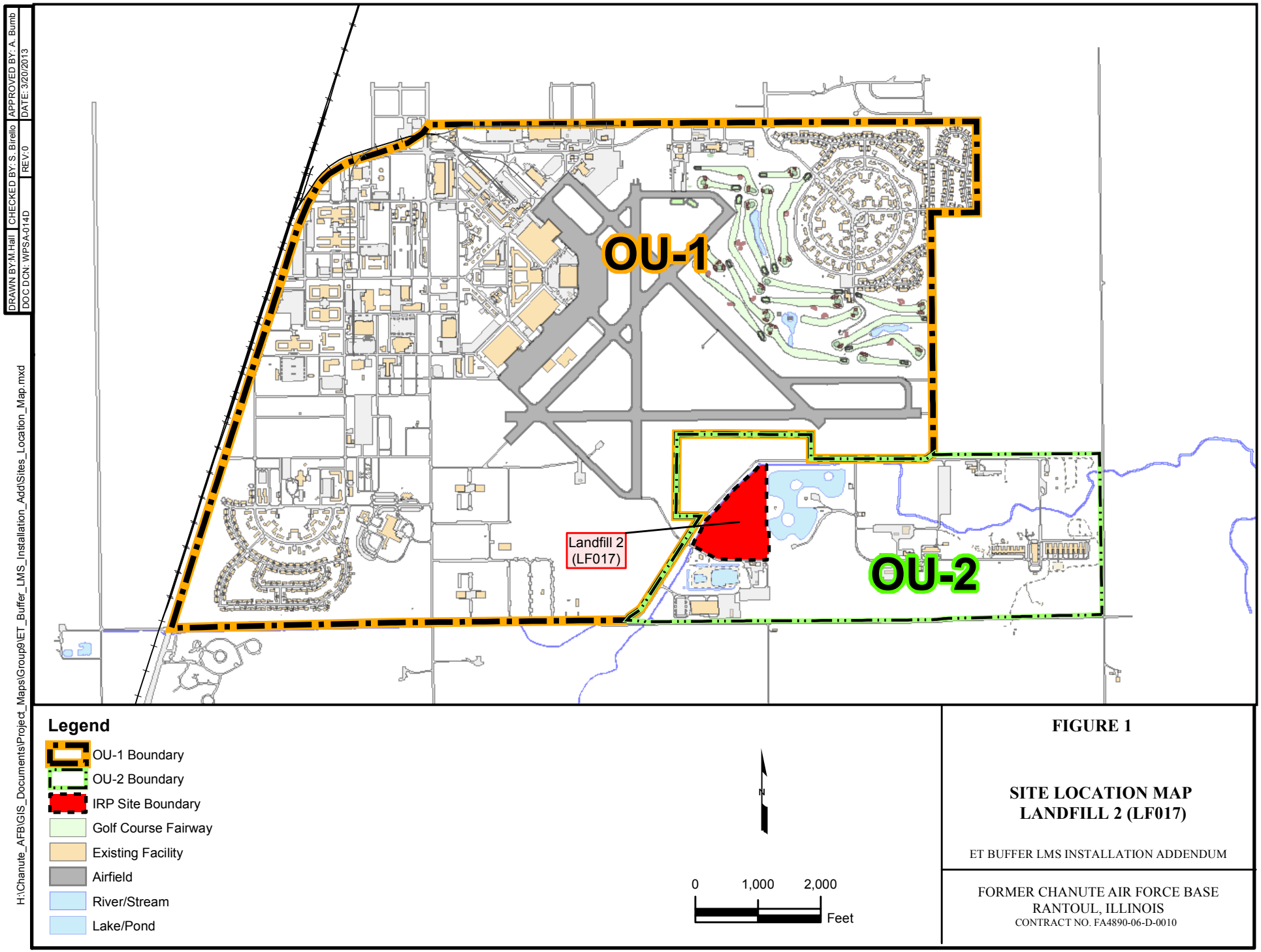


FIGURE 1

SITE LOCATION MAP
LANDFILL 2 (LF017)

ET BUFFER LMS INSTALLATION ADDENDUM

FORMER CHANUTE AIR FORCE BASE
RANTOUL, ILLINOIS
CONTRACT NO. FA4890-06-D-0010

DRAWN BY: P.VIBLE | CHECKED BY: S.BIRELLO | APPROVED BY: A. BUMB
DOC DCN: WPSA-014 | REV: 0 | DATE: 3/20/13

Landfill 1 (LF016)

Landfill 2 (LF017)

Landfill 3 (LF018)

Former Post Dump and Incinerator (SS047)

Pistol Range Area - 2 (SS043)

Former Berm

Salt Fork Creek Former Location

Voodoo Road

Fire Training Area 1 (FT020)

South Perimeter Road

Salt Fork Creek (SD032)

Heritage Lake (SI034)

Leachate transfer lines to Village of Rantoul Publicly Owned Treatment Works.

Leachate drain lines and cleanouts.

Acid Storage Building 911 (SS044)

Former Berm

Heritage Drive

Titan Drive

Fuel Storage Building 912 (SS045)

Former Berm

Fire Training Area 2 (ET021)

Northern Excavation Area

OU-1

OU-2

Note:

Refer to the Legend page at the beginning of the Figures section for icon and acronym definitions.

N

100 0 200

Feet

FIGURE 2

SITE LAYOUT MAP
LANDFILL 2 (LF017)

ET BUFFER LMS INSTALLATION ADDENDUM

FORMER CHANUTE AIR FORCE BASE
RANTOUL, ILLINOIS
CONTRACT NO. FA4890-06-D-0010

File: K:\Projects\Active\Chanute\CAD\Group 9\ETBuffer\WP\LF 2ETBufferWP\LF2 ET Buffer.dwg Layout: ET Buffer Fig 2 Plotted: Apr 02, 2013 – 12:17pm

DRAWN BY: P.VIBLE | CHECKED BY: S.BIRELLO | APPROVED BY: A. BUMB
DOC DCN: WPSA-014 | REV: 0 | DATE: 3/22/13

File: N:\Projects Active\Chanute\CAD\Group 9\ETBuffer WP\LF 2ETBufferWP\Landfill GW Monitoring.dwg Layout: 2012 Fig 3 User: steven.birello Plotted: Apr 02, 2013 - 12:38pm

Former Post Dump and Incinerater (SS047)
Landfill 1 (LF016) North Detention Basin
Pistol Range (SS043)
Former Firm
Salt Fork Creek Former Location
Fire Training Area 1 (FT020)
Landfill 2 (LF017) North Detention Basin
OU-1
OU-2
720.83 WL5009
PZ5000 721.79
Inv. 722.8
Inv. 726.9
Inv. 725.3
Inv. 718.6
Inv. 726.9
Landfill 1 (LF016)
MW6016 717.26
Inv. 718.32
Inv. 719.83
PZ5003 718.15
WL5001 715.99
PZ5004 719
MW6017 716.61
Inv. 716.28
General Groundwater Flow Direction
PZ5001 724.71
Inv. 725.28
Inv. 715.0
MW6015 718.32
WL5002 716.27
PZ5002 713.3
Salt Fork Creek
South Perimeter Road
Landfill 1 (LF016) South Detention Basin
Inv. 722.5
Inv. 720.82
Inv. 713.79
LF1 LS 722.3
Inv. 721.63
Inv. 715.49
MW6018 716.32
Inv. 714.22
LF2 LS 713.75
Inv. 716.41
Inv. 720.38
Inv. 717.75
WL5003 717.96
Inv. 716.84
Landfill 2 (LF017)
Inv. 722.29
WL1004 720.52
MW6019 717.3
WL1017 724.31
PZ5005 726.2
WL5004 718.46
Inv. 718.52
Landfill 2 (LF017) South Detention Basin
Inv. 720.87
Inv. 724.50
MW6020 725.24
723.55 WL5032
Heritage Lake (SI034)
Playground
Playground
Bldg. 911 Acid Storage Building (SS044)
Former Berm
Bldg. 912 Fuel Storage Building (SS045)

Note:

Refer to the Legend page at the beginning of the Figures section for icon and acronym definitions.

Inv. denotes invert elevation.

N

100 0 200

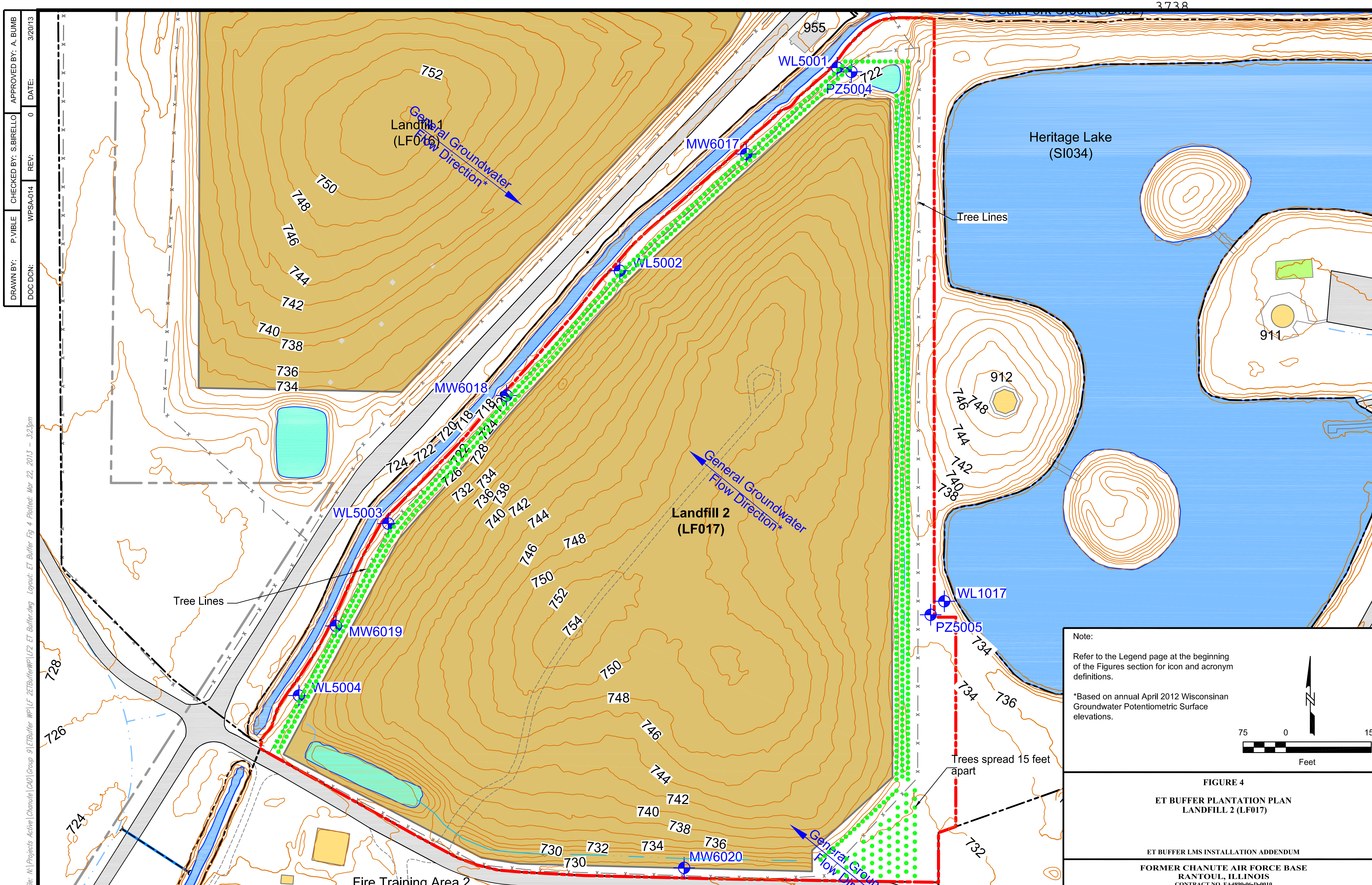
Feet

FIGURE 3

POTENTIOMETRIC SURFACE MAP FOR APRIL 2012
LANDFILL 2 (LF017)

ET BUFFER LMS INSTALLATION ADDENDUM

FORMER CHANUTE AIR FORCE BASE
RANTOUL, ILLINOIS
CONTRACT NO. FA4890-06-D-0010



Note:

Refer to the Legend page at the beginning of the Figures section for icon and acronym definitions.

*Based on annual April 2012 Wisconsinan Groundwater Potentiometric Surface elevations.

FIGURE 4

ET BUFFER PLANTATION PLAN
LANDFILL 2 (LF017)

ET BUFFER LMS INSTALLATION ADDENDUM

FORMER CHANUTE AIR FORCE BASE
RANTOUL, ILLINOIS
CONTRACT NO. FA4890-06-D-0010

Attachment A
Quality Assurance Project Plan
Site-Specific Updated Worksheets

QAPP Worksheet #9
Project Scoping Session Participants Sheet

Task Name: Landfill 2 ETBuffer Leachate Management System Installation Projected Date(s) of Monitoring and Sampling: 2013 to 2015 Project Manager: Howard Sparrow	Site Name: Landfill 2 (LF017) Site Location: Former Chanute AFB Rantoul, Illinois

Date of Sessions: 21 Feb 2013 BCT Meeting and 12 March 2013 teleconference
Scoping Session Purpose: Supplemental Measures at Landfills

Name	Title	Affiliation	Phone #	E-mail Address	Project Role
Howard Sparrow	Project Manager	Shaw	864-289-8554	Howard.Sparrow@shawgrp.com	Project Manager
Amar Bumb	Engineer	Shaw	864-289-8533	Amar.Bumb@shawgrp.com	Technical Lead
Paul Carroll	BRAC Environmental Coordinator (BEC)	AFCEC – Installations Center of Excellence	480-892-0455	paul.carroll.1@us.af.mil	Chanute BEC
Christopher Hill	Remedial Project Manager	Illinois EPA	217-782-9292	Christopher.Hill@illinois.gov	Chanute Coordinator
Ted Holly	Contracting Officer Representative	AFCEC – Environmental Center of Excellence	210-536-8781	ted.holly@us.af.mil	Contracting Officer Representative
James Husbands *	Consultant	Booz Allen Hamilton	602-684-1003	husbands_james@bah.com	AFCEC Consultant
Travis Wubker *	Construction Field Manager	Shaw	636-459-9041	travis.wubker@shawgrp.com	Construction Field Manager
Diane Gill	Geologist	Shaw	864-289-8551	diane.gill@shawgrp.com	Project Quality Assurance

Note(s):

* Were not present for the 12 March 2013 teleconference.

AFCEC denotes Air Force Civil Engineer Center . BRAC denotes Base Realignment and Closure. Illinois EPA denotes Illinois Environmental Protection Agency.

Comments/Decisions: Approved Landfill 2 ETBuffer LMS as a preventative measure and as a potential option that may allow the LCS to be turned off.

Action Items: Evaluate using a sheet pile wall along the eastern boundary of Landfill 2 as another alternative to operating the LCS and/or a French drain system as upgradient control of groundwater flow. Develop an ETBuffer LMS Installation Work Plan Addendum for Landfill 2 ETBuffer LMS, provide plantation plan to the Air Force and Illinois EPA.

Consensus Decisions: Approved Landfill 2 ETBuffer LMS as a preventative measure and as a potential option that would allow the LCS to be turned off.

Table WS9-1 Data Needs Table

Data Need Target Analyte or Characteristic of Interest	Data Need Matrix	Data Use(s) Remedy Method(s) of Interest	Data Use(s) Criteria to Be Considered	Number or Frequency of Samples	Concentration of Interest or Sensitivity of Measurement(s)	Remediation Area(s) / Sample Location(s) and Depth(s)
Soil agronomy data	Soil	Determine need for soil amendments	Nutrients needed for poplars and willows	3	See Table 5-1 for analyte list and desired ranges	Three samples at one location. One sample depth closer to water table, one mid-level, and one in the shallow soil. Actual depths to be determined by the agronomist in the field.
Tree nutrient levels	Plant Tissue	ETBuffer trees general health	Nutrient content in foliage	Near the end of growing seasons for 2013, 2014	N> 2.5% P>0.15% K>1.15% Ca> 0.43% Mg> 0.21%	ETBuffer Zone surrounding Landfill 2. Six composite samples (4 poplar & 2 willow) collected from the leaves of approximately every 15th to 20th tree along the ETBuffer Section row lengths. The leaves will be the 4th and 12th from the top of the apical stem. Folial samples will be based on a specific sample interval and not specific trees.

% denotes percentage.

> denotes greater than.

ETBuffer denotes evapotranspiration buffer.

N denotes nitrogen.

P denotes phosphorus.

K denotes potassium.

Ca denotes calcium.

Mg denotes magnesium.

PAH denotes polynuclear aromatic hydrocarbon.

PCB denotes polychlorinated biphenyls

SVOC denote semi-volatile organic compound.

VOC denote volatile organic compound.

QAPP Worksheet #10
Problem Definition

The problem to be addressed by the project:

The data gathered will be used to demonstrate that proper amendments are added to soil for optimal growth of evapotranspiration buffer (ETBuffer) trees and contaminated compost/biosolids are not brought on-site.

Can the Landfill 2 Leachate Collection System (LCS) be turned off to optimize long-term costs?

The environmental questions being asked:

Are soil nutrients sufficient for ETBuffer tree growth and survival?

Does compost/biosolids considered have contaminants at levels that pose risks to human health and environment?

What are the fertilization needs for the first 2 years of growing seasons?

Can the Landfill 2 LCS be turned off?

Observations from any site reconnaissance reports:

Landfills 1 (LF016), 2 (LF017), 3 (LF018), and 4 (LF019) were used from the 1930s through 1974 and received a variety of municipal and industrial wastes, as well as construction debris. Landfill 2 is located in the northwest quadrant of OU-2 and capped area occupies approximately 21 acres (AR2976, Parsons Infrastructure & Technology Group, Inc., [Parsons], 2005).

In June 2000, the United States Air Force entered into an agreement with the U.S. Environmental Protection Agency (USEPA) and the Illinois Environmental Protection Agency (Illinois EPA) to execute certain remedies to address potential threats to human health and the environment posed by Landfills 1, 2, 3, and 4. This agreement was documented in the *Final Interim Record of Decision (IROD) for Operable Unit 2 (OU-2) Landfills 1-4* (AR1406, Jacobs, 2000). The Selected Remedy for Landfill 2 included, but was not limited to the following: consolidating the landfill into a smaller footprint; capping the waste with a multilayer soil and geosynthetic cover; installing and operating a LCS, with treatment of the leachate (as required); and installing surface water controls for run-on and runoff. The IROD also provides ongoing review and evaluation of the Interim Remedy to develop the Final Remedy. Some of the items listed in the IROD for potential evaluation include supplemental measures such as upgradient collection or diversion of uncontaminated groundwater that is preferable to collection within or downgradient of the landfills because it can reduce or eliminate the need for treatment and disposal of any on site leachate.

Waste consolidation, multi-layer soil and geosynthetic cover installation, LCS installation, and the installation of passive gas vents was completed at Landfill 2 in November 2003 (AR2976, p. 64, Parsons, 2005).

A LCS Treatability Study was conducted in October 2004 (AR3252, URS Corporation [URS], 2006) on Landfills 1, 2, and 3, to determine the long-term sustainable flow rates and chemical composition of the leachate and what actions are needed to prevent the migration of leachate contaminants from the landfills. This study demonstrated that there are constituents of potential concern that made completion of a feasibility study (FS) necessary prior to operation of the LCS.

An ETBuffer Treatability Study was conducted at Landfill 3 from 2009 to 2011(Shaw, 2012b) to determine suitability of an ETBuffer leachate management system (LMS) to prevent the migration of leachate and contaminants from landfills. This study demonstrated that an ETBuffer LMS is capable of providing hydraulic control to prevent potential leachate migration and also potentially remove contaminants through phytoremediation.

QAPP Worksheet #10 (continued)
Problem Definition

A synopsis of secondary data or information from site reports:

Wisconsinan deposits at the site are characterized by silty clay with discontinuous lenses of sand and silt that vary in thickness. These discontinuous lenses of transmissive material comprise the Wisconsinan saturated zone, in which several groundwater monitoring wells are screened. The Wisconsinan potentiometric surface is several feet above the estimated waste depth at Landfill 2.

Landfill 2 has a multilayer geocomposite clay liner cap that was designed to have an annual infiltration rate of less than 1 gallon. The estimated groundwater velocity at Landfill 2 is approximately 15.3 feet per year which indicates limited contribution from lateral groundwater flow. Soil agronomy data collected in March 2009 at Landfill 3 indicates that site soil is suitable for an ETBuffer LMS. The soil textures are ideal for an ETBuffer LMS because they have a high available water holding capacity where approximately 1.5 to 2.0 inches of water can be held without percolation and released for root uptake.

Leachate Discharge Monitoring

Installation of the LCSs at Landfills 1, 2 and 3 were completed in 2004. However, the tie-in to the Village of Rantoul POTW was not completed until 2010. The LCSs at Landfills 1 and 3 are currently not in operation, as no hazardous constituents were detected migrating from Landfill 1, and the establishment of a ETBuffer LMS is controlling leachate migration from Landfill 3. The LCS at Landfill 2 is operational, and has not exceeded the POTW discharge criteria since beginning of operation.

A review of leachate and groundwater chemistry data suggest that the anions, cations, and organic concentrations measured at the former Chanute AFB landfills are below poplar toxicity stress levels experienced at other sites. The leachate pH is between 6.2 and 7.8, which is within the acceptable range for plant growth.

Groundwater

Groundwater monitoring has been ongoing at Landfill 2 since 2004. This data were evaluated with regard to a remedy for Landfill 2, and is presented in the Final Interim Landfill Groundwater Monitoring Plan (AR3645, Shaw, 2011a).

Based on the analytical data collected as part of the Remedial Investigation (AR3327, URS, 2007), and current groundwater monitoring program, the data collected between 2004 and 2010 around the perimeter of Landfill 2 including the downgradient wells have detected arsenic and mercury exceedance of the groundwater constituents above the Concentration Limits established in Title 35 Illinois Administrative Code (IAC) 724.194, Landfill Groundwater Monitoring Concentration Limits (LGMCLs). Detection of arsenic above the LGMCL appears to be naturally occurring. The only exceedance of mercury occurred in February 2005 at WL5003. This well has been sampled 19 times since then and mercury has not been detected above the method reporting limits. The monitoring data at Landfill 2 shows that the groundwater in the uppermost aquifer has not exceeded the LGMCL (with one exception for mercury that was not confirmed during subsequent sampling events and naturally occurring arsenic). Therefore, a compliance monitoring program is not required.

Analytical data collected between 2010 and 2012 around the perimeter of Landfill 2 including the downgradient wells have detected chlorinated volatile organic compounds above the LGMCLs. In 2011, Landfill 2 had detected concentrations of cis-1,2-dichloroethene (DCE) (ranging from 146 micrograms per liter [µg/L] to 265 µg/L) above the LGMCL of 70 µg/L in 6 of 14 samples and vinyl chloride (ranging from 4.35 µg/L to 114 µg/L) above the LGMCL of 2 µg/L in 5 of 14 samples collected in 2011. One detection of total aluminum above the LGMCL at Landfill 2 was attributed to turbidity in the sample. Although cis-1,2-DCE and vinyl chloride were detected above the LGMCLs at Landfill 2 in 2011, a Compliance Monitoring Program in accordance with 35 IAC 724.199 was not warranted at that time because the LCS had not had adequate time to begin to reverse groundwater flows. It was recommended that monitoring of Landfill 2 for an additional 2 years be conducted to allow the LSC to become effective before a Compliance Monitoring Program was considered.

Landfill 2 did have detections of aluminum, iron, cis-1,2-DCE, and vinyl chloride above LGMCLs in 2012. Aluminum was detected above the LGMCL of 3.5 milligrams per liter (mg/L) in 3 of 11 samples with a maximum value of 19.6 mg/L. Iron was detected above the LGMCL of 11.2 mg/L in 3 of 11 samples with a maximum value of 22.1 mg/L. Both detections were attributed to high turbidity in the samples. Cis-1,2-DCE was detected above the LGMCL of 70 µg/L in 2 of 11 samples with a maximum value of 113 µg/L. Vinyl

QAPP Worksheet #10 (continued)
Problem Definition

chloride was detected above the LGMCL of 2 µg/L in 3 of 11 samples with a maximum value of 4.11 µg/L. The concentrations of cis-1,2-DCE in downgradient point of compliance monitoring wells MW6018 and MW6019 have decreased steadily since operation of the LCS began. The cis-1,2-DCE in MW6018 has decreased from 265 µg/L in April 2011 to 60.8 µg/L in November 2012. The cis-1,2-DCE in MW 6019 has decreased from 237 µg/L in April 2011 to 24.3 µg/L in November 2012.

The rationale for inclusion of chemical and non-chemical analyses:

Agronomy data will be collected to determine the viability of the soil surrounding Landfill 2 supporting the ETBuffer trees and to determine the fertilizer and compost/biosolids needs when planting the trees based on an agronomists professional judgment regarding nutrient levels. The discussion of the agronomy data is provided in the text of the Work Plan (Section 2.4). Note Landfill 2 agronomy data are expected to be comparable to Landfill 3 agronomy data. Future nutrient level data will be provided in the annual reports. Compost/biosolids data will be used to ensure that contaminated media is not brought to the site. Long-term OM&M requirements for the ETBuffer LMS are specified in the OM&M Plan for Landfills 1 through 4 (Shaw, 2013b). In addition to the ETBuffer LMS requirements, groundwater monitoring requirements are specified in the OM&M Plan for Landfills 1 through 4 (Shaw, 2013b). The groundwater analytical data collected as required in the OM&M Plan will be used to evaluate if the LCS may be turned off.

Project decision conditions ("If..., then..." statements):

- If the nutrient content of the soil samples collected are below the desired minimum levels, non-contaminated compost/biosolids will be applied during plantation of the Landfill 2 ETBuffer LMS trees to improve the nutrients available for tree growth/health.

- If the nutrient content of the soil samples collected are above the desired minimum levels, non-contaminated compost/biosolids will not be applied during plantation of the Landfill 2 ETBuffer LMS trees.

- If the nutrient content of the folial samples collected are below the desired minimum macro-elemental levels for nitrogen (N), phosphorus (P), potassium (K), calcium (Ca), and magnesium (Mg), a fertilizer mixture based on the percentages of N, P, K, Ca, and Mg, will be applied to the soil adjacent to the Landfill 2 ETBuffer LMS trees to improve nutrient levels available for tree growth/health.

- If the nutrient content of the folial samples collected are at or above the desired minimum macro-elemental levels for N, P, K, Ca, and Mg, a fertilizer mixture based on the percentages of N, P, K, Ca, and Mg, will be applied to maintain the nutrients in soil available for tree growth/health.

-If the groundwater quality of the uppermost aquifer surrounding Landfill 2 is in compliance with the LGMCLs for the downgradient point-of-compliance wells as reported in the annual reports then the LCS at Landfill 2 may be turned off with the approval of the Air Force and Illinois EPA.

-If the groundwater quality of the uppermost aquifer surrounding Landfill 2 is not in compliance with the LGMCLs for the point-of-compliance wells as reported in the annual reports and water levels in the upgradient wells are not below the eastern LCS inverts, then the LCS has to continue to operate.

-If the potentiometric data indicates that the Wisconsinan groundwater elevations in the upgradient wells are below the eastern LCS inverts, the LCS shall be turned off with the concurrence of the Air Force and Illinois EPA.

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QAPP Worksheet #14
Summary of Project Tasks

The following information is task-specific. Other information for this task is provided in the updated Worksheet #14 in the Work Plan and for the overall basewide project tasks are provided in Worksheet #14 from the Basewide Sampling and Analysis Plan (BSAP), Appendix B, (AR3649, Shaw, 2011b) including more detailed descriptions of Quality Control Tasks, Documentation and Records, and Assessment/Audit Tasks. Note that groundwater sampling is per the approved OM&M Plan for Landfills 1 through 4 (Shaw, 2013b).

Fieldwork:

Installation of the Landfill 2 ETBuffer Leachate Management System.

Site-Specific Environmental Control Plan (ECP) Worksheets for Landfill 2 (Enclosure 1) and Landfill 4 (Enclosure 2) are enclosed with this attachment. Note, the Landfill 4 ECP Worksheet was inadvertently left out of the Work Plan, Appendix A.

Sampling Tasks:

The sampling tasks are to collect.

- 3 x 1 event (3) soil agronomy samples; 1 test pit, 3 depth intervals (Worksheet #16 for approximate date and Worksheet #17 for rationale)
- 1 x 1 event (1) compost/biosolids sample (Worksheet #16 for approximate date and Worksheet #17 for rationale)
- 6 x 2 events (12) composite folial samples; 4 poplars and 2 willow for each event. Sampling procedures are presented in the Work Plan Appendix A, Updated Worksheet #14, Attachment A-1 Sampling Guide for Plant Tissue Analysis and Attachment A-2 SOP/01.03.0004, approximate dates of collection are on Worksheet #16, and sampling rationale is on Worksheet #17. Note, a clean container will always be used, a metal container will never be used. Samples will be shipped as soon as possible in perforated bags to allow air movement and a degree of drying in transit. Fresh samples will never be sealed in plastic bags unless kept cool. Samples will never be frozen. Chemical or physical preservation is not necessary: Samples may be stored at room temperature in an air-conditioned environment for up to 6 months.

Analysis Tasks:

- Soil agronomy – Mehlich III (Work Plan, Appendix A, Updated Worksheet #14, Attachment A-3 SOP 01.02.0018)
- Compost/Biosolids – volatile organic compounds, semivolatile organic compounds, polynuclear aromatic hydrocarbons, pesticides, herbicides, polychlorinated biphenyls, and metals.
- Folial – Plant Tissue Sample Preparation (Work Plan, Appendix A, Updated Worksheet #14, Attachment A-2 SOP 01.03.0004) and Attachment A-4 Acid Digestion of Plant Tissue for Metals Analysis (SOP 01.02.0054)

Quality Control Tasks:

As provided in the updated Worksheet #14 in the Work Plan.

Precision

As provided in the updated Worksheet #14 in the Work Plan.

QAPP Worksheet #14 (continued)
Summary of Project Tasks

Accuracy

As provided in the updated Worksheet #14 in the Work Plan.

Representativeness

As provided in the updated Worksheet #14 in the Work Plan.

Completeness

As provided in the updated Worksheet #14 in the Work Plan.

Comparability

As provided in the updated Worksheet #14 in the Work Plan.

References:

As provided in the updated Worksheet #14 in the Work Plan.

Data Management Tasks:

As provided in the updated Worksheet #14 in the Work Plan.

Documentation and Records:

As provided in the updated Worksheet #14 in the Work Plan.

Assessment/Audit Tasks:

As provided in the updated Worksheet #14 in the Work Plan.

Data Review Tasks:

As provided in the updated Worksheet #14 in the Work Plan.

Enclosure 1 – Landfill 2 (LF017)
Site-Specific Environmental Control Plan Worksheet

	Landfill 2 (LF017)
Site Characteristics	
❑ Area (Acres)	26 Acres
❑ Cover	Open Grass, Scrubs
❑ Slope	Flat to 10%
❑ Use	Restricted Area no current use
Historical/ Arch Resources	
❑ Bldg Nat Register	None
❑ Arch Resources	None
Natural Environment	
❑ Wildlife Habitat	Open grass area, Small trees
❑ Endangered Species	None
❑ Water Features	Surface ponding, drainage to north & south
❑ Common Species	Ground birds, small mammals, rodents, deer
❑ Protection Features	Silt Control
Traffic Control	
❑ Site Traffic	Trencher, direct-push drill rig, service trucks, POVs
❑ Traffic Volume	20 vehicles per day, Ecolotree® delivery, soil delivery for backfill (if required)
❑ Vehicle Loads	Up to 80 ton trucks
❑ Road Capacity	80 ton
❑ Site Entrance	Perimeter Rd
❑ Access Routes	Hwy 45, Cty RD 2800 N, Perimeter Road,
❑ Traffic Restrictions	40 Ton per Axle
❑	
Stormwater Pollution Prevention	
❑ NOI Required	No
❑ Drainage Features	Surface Drainage pond to north and south
❑ Drainage Route	Through north detention pond directly to SFC, Drainage ditch along the west side of Heritage Lake
❑ Hydrologic Alterations	Landfill cap at 2-10% grade
❑ Perimeter BMPs	Silt Fence
❑ Vegetative BMPs	Re-seed within 30 days
❑ Operational BMPs	Minimize truck traffic off paved roads, clean equipment prior to offsite movement
❑ Structural BMPs	Two stormwater detention basins
❑ Other Erosion Control	Hay bales around all drainage features
❑	
Spill Prevention Control & Countermeasures	
❑ Oil Storage	Equipment only
❑ Chemical Storage	None
❑ Containment	Portable spill kits
❑ Spill Containment Point	Drainage ditch along the east side of the landfill, West perimeter fence line
❑	
Hazardous Substances	
❑ CERCLA Waste	None (trenching and drilling will be outside the landfill cap)
❑	
❑	

Enclosure 1 – Landfill 2 (LF017)
Site-Specific Environmental Control Plan Worksheet

Site	Landfill 2 (LF017)
Surface Water	
❑ Surface Water Volume	>1,000,000 gallons
❑ Surface Water Handling	Surface drainage through detention ponds
❑ Surface Water Character	None identified
❑ Surface Water Drainage	To surface drainage ditches
Waste Disposal	
❑ General Waste Generated	General refuse, trash, garbage
❑ General Waste Disposal	Commercial waste hauler
❑ Soil Transportation	None (soil from trenches will be placed back in the trenches and
❑ Hazwaste Disposal	mounded over the trench surface)
Air Pollution Control	
❑ Dust Suppression	Watering if required
❑ Air Emissions	Fugitive VOCs
❑ Air Emission Control	None, Monitor
Noise Control	
❑ Noise Source	Trucks, equipment
❑ Noise Control	>1,000 ft to resident, none
Other Controls	
❑	
❑	
❑	
❑	

Enclosure 2 – Landfill 4 (LF019)
Site-Specific Environmental Control Plan Worksheet

	Landfill 4 (LF019)
Site Characteristics	
❑ Area (Acres)	27 Acres
❑ Cover	Open Grass, Scrubs
❑ Slope	Flat to 3%
❑ Use	Restricted Area no current use
Historical/ Arch Resources	
❑ Bldg Nat Register	None
❑ Arch Resources	None
Natural Environment	
❑ Wildlife Habitat	Open grass area
❑ Endangered Species	None
❑ Water Features	Detention Basins, drainage to southeast & northwest
❑ Common Species	Ground birds, small mammals, rodents, deer
❑ Protection Features	Silt Control
Traffic Control	
❑ Site Traffic	Trencher, direct-push drill rig, service trucks, POVs
❑ Traffic Volume	20 vehicles per day, Ecolotree® delivery, soil delivery for backfill (if required)
❑ Vehicle Loads	Up to 80 ton trucks
❑ Road Capacity	80 ton
❑ Site Entrance	Cty Rd 2800 N, Perimeter Rd, Titan Drive
❑ Access Routes	Hwy 45, Cty RD 2800 N, Perimeter Road,
❑ Traffic Restrictions	40 Ton per Axle
❑	
Stormwater Pollution Prevention	
❑ NOI Required	No
❑ Drainage Features	Surface Drainage to northwest and south east
❑ Drainage Route	Drainage ditch along Atlas Rd to SFC, Drainage ditch along Cty Rd 1800E to SFC
❑ Hydrologic Alterations	Landfill cap at 3% grade
❑ Perimeter BMPs	Silt Fence
❑ Vegetative BMPs	Re-seed within 30 days
❑ Operational BMPs	Minimize truck traffic off paved roads, clean equipment prior to offsite movement
❑ Structural BMPs	Two storm water detention basins
❑ Other Erosion Control	Hay bales around all drainage features
❑	
Spill Prevention Control & Countermeasures	
❑ Oil Storage	Equipment only
❑ Chemical Storage	None
❑ Containment	Portable spill kits
❑ Spill Containment Point	Drainage ditch at Atlas Dr or Cty Rd 1800 E
❑	
Hazardous Substances	
❑ CERCLA Waste	None (trenching and drilling will be outside the landfill cap)
❑	

Enclosure 2 – Landfill 4 (LF019)
Site-Specific Environmental Control Plan Worksheet

Site	Landfill 4 (LF019)
Surface Water	
❑ Surface Water Volume	>1,000,000 gallons
❑ Surface Water Handling	Surface drainage through detention ponds
❑ Surface Water Character	None identified
❑ Surface Water Drainage	To surface drainage ditches
Waste Disposal	
❑ General Waste Generated	General refuse, trash, garbage
❑ General Waste Disposal	Commercial waste hauler
❑ Soil Transportation	None (soil from trenches will be placed back in the trenches and
❑ Hazwaste Disposal	mounded over the trench surface)
Air Pollution Control	
❑ Dust Suppression	Watering if required
❑ Air Emissions	Fugitive VOCs
❑ Air Emission Control	None, Monitor
Noise Control	
❑ Noise Source	Trucks, equipment
❑ Noise Control	>1,000 ft to resident, none
Other Controls	
❑	
❑	
❑	
❑	

QAPP Worksheet #16
Project Schedule/Timeline Table

Activities	Organization	Anticipated Date(s) of Initiation	Anticipated Duration	Deliverable	Deliverable Due Date
Mobilization	Ecolotree® and Shaw	Spring of 2013	1 day	None	Not applicable
Collect soil agronomy samples	Ecolotree®	One time before plantation	1 day	2013 Annual Landfills Operation, Maintenance, and Monitoring (OM&M) Report	3/20/2014
Laboratory Analysis	A&L Analytical Laboratories	Day after 1st soil agronomy sample collected	3 to 15 days	Electronic data deliverable (EDD) and hard copy	15 to 30 days after sample receipt
Compost/Biosolid Sample	Shaw	Once	1 day	2013 Annual Landfills OM&M Report	3/20/2014
Laboratory Analysis	Microbac Laboratories, Inc.	Day after compost/biosolid sample collected	3 to 15 days	EDD and hard copy	15 to 30 days after sample receipt
Plant EBuffer® trees (includes amending soil with fertilizer, regrading, and seeding)	Ecolotree®	Once	1 week	2013 Annual Landfills OM&M Report	3/20/2014
Field Quality Assurance Assessment	Shaw	Ongoing	Ongoing	Daily Field Activity Log	Not applicable
2013 Annual Landfills OM&M Report	Shaw	Once	6 months	IPRD, Draft, and Final versions	3/20/2014, 4/25/2014, 5/30/2014
Perform maintenance of EBuffer® trees. Collect folial samples	Ecolotree®	Near end of growing seasons 2013 and 2014	1 day	Annual OM&M Reports	03/30/2014; 03/30/2015; 03/30/2016
Laboratory Analysis	A&L Analytical Laboratories	Day after 1st folial sample collected	3 to 15 days	EDD and hard copy	15 to 30 days after sample receipt

QAPP Worksheet #17
Sampling Design and Rationale

Sampling Approach and Rationale:

Soil agronomy samples will be collected from 1 test pit at three intervals (includes shallow subsurface and near the water table) to provide agronomic soil parameters, nutrient elements and sodium content to the agronomist to determine the appropriate fertilizer/soil amendments required for EBuffer® tree installation. The location of the test pit will be determined to be representative of Landfill 2 soil. Only one round of sampling will be necessary to determine agronomic soil information prior to the installation of the ETBuffer leachate management system (LMS). The samples will be collected before EBuffer® installation.

Folial samples will be collected from a representative sampling of the trees in the ETBuffer LMS Zone by collecting leaves from every 15th to 20th tree evenly spaced along the length of the ETBuffer LMS Zone. Folial samples will be based on a specific sample interval and not specific trees. The purpose of the folial samples is to assess the nutrients in the trees that may be lacking based on an agronomists professional judgment. The folial samples will be collected near the end of the growing season for the first 2 years, which will be more representative of tree nutrient content. If folial samples were collected early in the growing season, the leaves are not at their full capacity of nutrient storage. Additionally, near the end of the growing season is the optimum time to apply fertilizer to insure that the appropriate nutrients are available at the beginning of the next growing season.

If compost/biosolids are needed to amend the soil, a sample will be collected to determine contaminant levels. A 4-point composite sample will be collected from the stockpile at the supplier of the compost/biosoilds.

Describe the sampling design and rationale in terms of what matrices will be sampled, what analytical groups will be analyzed and at what concentration levels. The sampling locations (including QC, critical, and background samples), the number of samples to be taken, and the sampling frequency (including seasonal considerations):

Soil agronomy samples will be analyzed by “Mehlich III” (Attachment A-3) and include K, N, P, S, B, Ca, Fe, Mg, Mn, Cu, Zn, %Na, and %Al. A total of 3 samples, from 1 test pit will be collected as representative of the type of soil that is found at Landfill 2. The agronomy sample results will be categorized as screening; therefore field duplicates will not be collected.

Folial (plant tissue): Nutrient levels will be analyzed by acid digestion of plant tissue for metals, SOP 01.02.0054 (Attachment A-4) and include K, P, S, B, Ca, Fe, Mg, Mn, Cu, Zn, %Na, and %Al. A total of 6 leaf composite samples from deep-rooted trees (4 poplar and 2 willow) will be collected near the end of the growing seasons in 2013 and 2014. The composite samples will consist of the 4th and 12th leaf from the apical stem of the approximate 15th to 20th tree along the length of the ETBuffer rows and will be collected from a total of up to 15 trees until approximately 1 cup of leaves is harvested (up to approximately 30 leaves). The folial sample results are screening data, therefore field duplicates will not be collected. The 6 composite samples are considered representative of the nutrients found in the ETBuffer trees and will provide the data needed for an agronomist to use professional judgment for fertilizer application.

Compost/Biosoilds: The compost/biosolids will be analyzed by USEPA Methods SW8260B, SW6010C/06020A/7071A, SW8270D, SW8270D-SIM, SW8082, SW8081A, and SW8151A for VOCs, metals, SVOCs, PAHs, PCBs, pesticides, and herbicides, respectively. A field duplicate will not be collected.

QAPP Worksheet #18
Sampling Locations and Methods/SOP Requirements Table

Sampling Location/ID Number	Matrix	Depth	Analytical Group	Concentration Level	Number of Samples (identify field duplicates)	Sampling SOP Reference[1]	Rationale for Sampling Location
ETBuffer LMS deep-rooted trees Landfill 2/JB8###	Plant Tissue	4th and 12th leaf from the top of the apical stem	Metals	Low	6 per event (No FD) (2 events)	01.03.0004 / 01.04.0018 (Attachment A-2 & A-4 in the Work Plan)	Worksheet #17
ETBuffer planting zones	Soil	Shallow soils; At water table	Mehlich III	Low	6 per event (No FD) (1 event)	01.02.0018 (Attachment A-3 in the Work Plan)	Agronomy samples to determine fertilizer/soil amendment quantities
Compost/Biosoilds JB8###	Soilds	At least 6 inches deep in the stockpile	VOCs, SVOCs, PAHs, PCBs, total metals, pesticides, and herbicides	Low	1 per source (1 event)	SOPs EI-FS100, EI-FS101, EI-FS103, SOP-T-FS-104, or SOP-T-FS-105	Ensure that compost/biosolids are not contaminated

Note(s):

(a) Field sampling methods are described in the Project Sampling SOP References table (Worksheet #21, BSAP (AR3649, Shaw, 2011b).

BSAP denotes Basewide Sampling and Analysis Plan.
FD denotes field duplicate.
LMS denotes leachate management system.
PAH denotes polynuclear aromatic hydrocarbon.
PCB denotes polychlorinated biphenyl.
SOP denotes standard operating procedure.
SVOC denotes semivolatile organic compound.
VOC denotes volatile organic compounds.

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QAPP Worksheet #20
Field Quality Control Sample Summary Table

Matrix	Analytical Group	Analytical/ Preparation SOP Reference	Estimated Sampling Locations (per sampling event [a])	Field Quality Control Analyses			Laboratory Quality Control Samples			Estimated Total No. of Samples to Lab
				No. of Field Duplicate	No. of Field Trip Blanks	No. of Equip. Blanks	No. of Matrix Spike	No. of Matrix Spike Duplicate	No. of Laboratory Control Samples	
Soil	*Metals*	Mehlich III	3	0	0	0	0	0	0	3
Plant Tissue	*Metals*	A&L Analtyical Laboratories SOPs 01.03.0004/ 01.02.0054	6	0	0	0	0	0	0	6
Biosolids	*VOCs*	5035A / 8260B	1	0	1	0	0	0	0	2
Biosolids	*SVOCs*	SW3545/3550B SW8270D	1	0	0	0	0	0	0	1
Biosolids	*PAHs*	SW3545/3550B SW8270D-SIM	1	0	0	0	0	0	0	1
Biosolids	*PCBs*	SW3550C/3500C / SW8082	1	0	0	0	0	0	0	1
Biosolids	*Metals*	SW3051/3051A SW6010C/6020A/ 7471B	1	0	0	0	0	0	0	1
Biosolids	*Pesticides*	SW3550C/3500C / SW8081A	1	0	0	0	0	0	0	1
Biosolids	*Herbicides*	SW3500C / SW8151A	1	0	0	0	0	0	0	1

Worksheet #20 *(continued)*
Field Quality Control Sample Summary

Note(s):

[a] Sample quantities are based on the estimated maximum number of samples to be collected. The total number of samples may decrease or increase based on the results of nutrient levels.

PAH denotes polynuclear aromatic hydrocarbon.
PCB denotes polychlorinated biphenyls.
SIM denotes selected ion monitoring.
SOP denotes standard operating procedure.
SVOC denotes volatile organic compounds.
VOC denotes volatile organic compound(s).

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