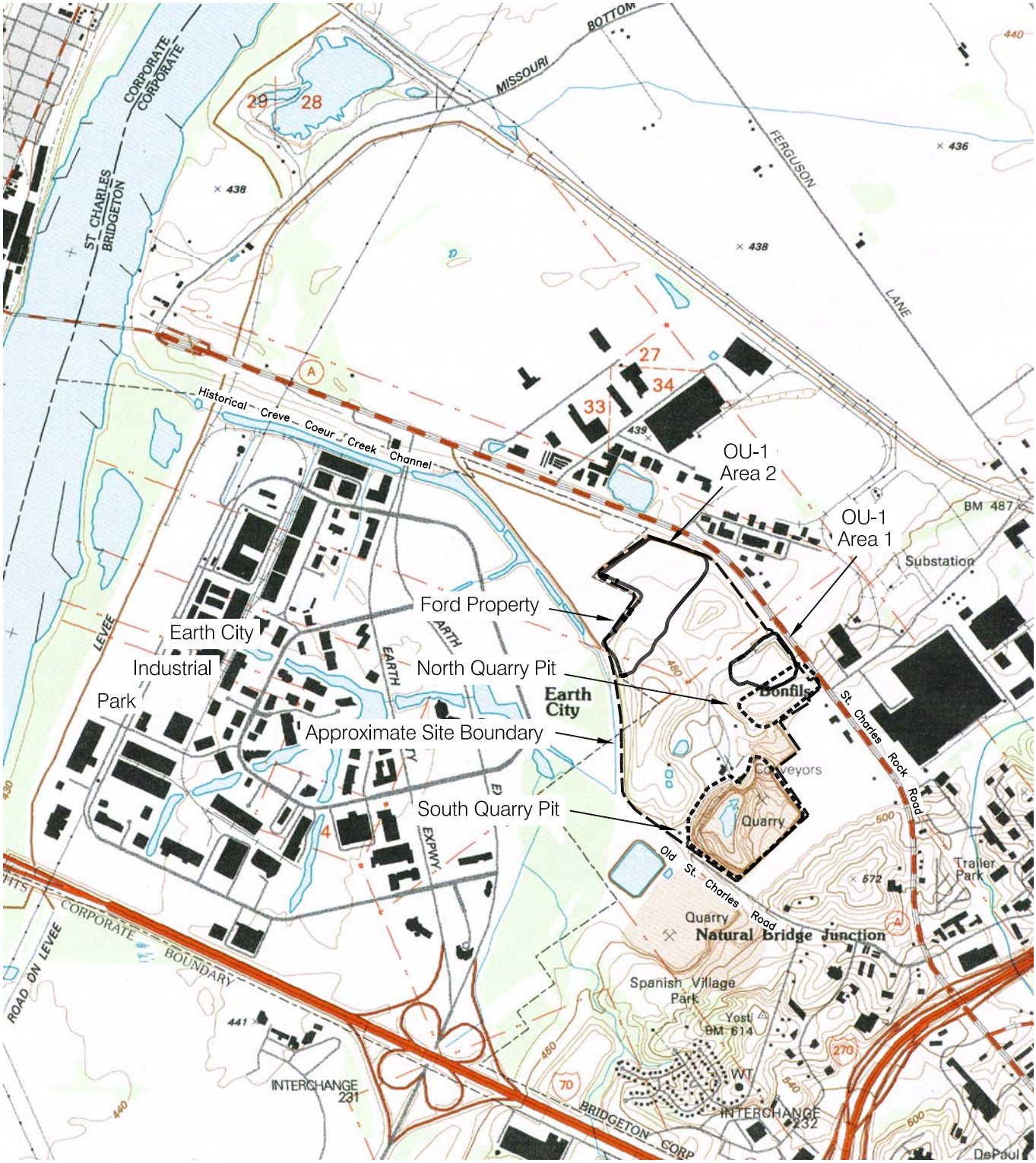


Source: St. Charles, MO USGS
7.5' Quadrangle, 1994

2000 0 2000
SCALE IN FEET

N

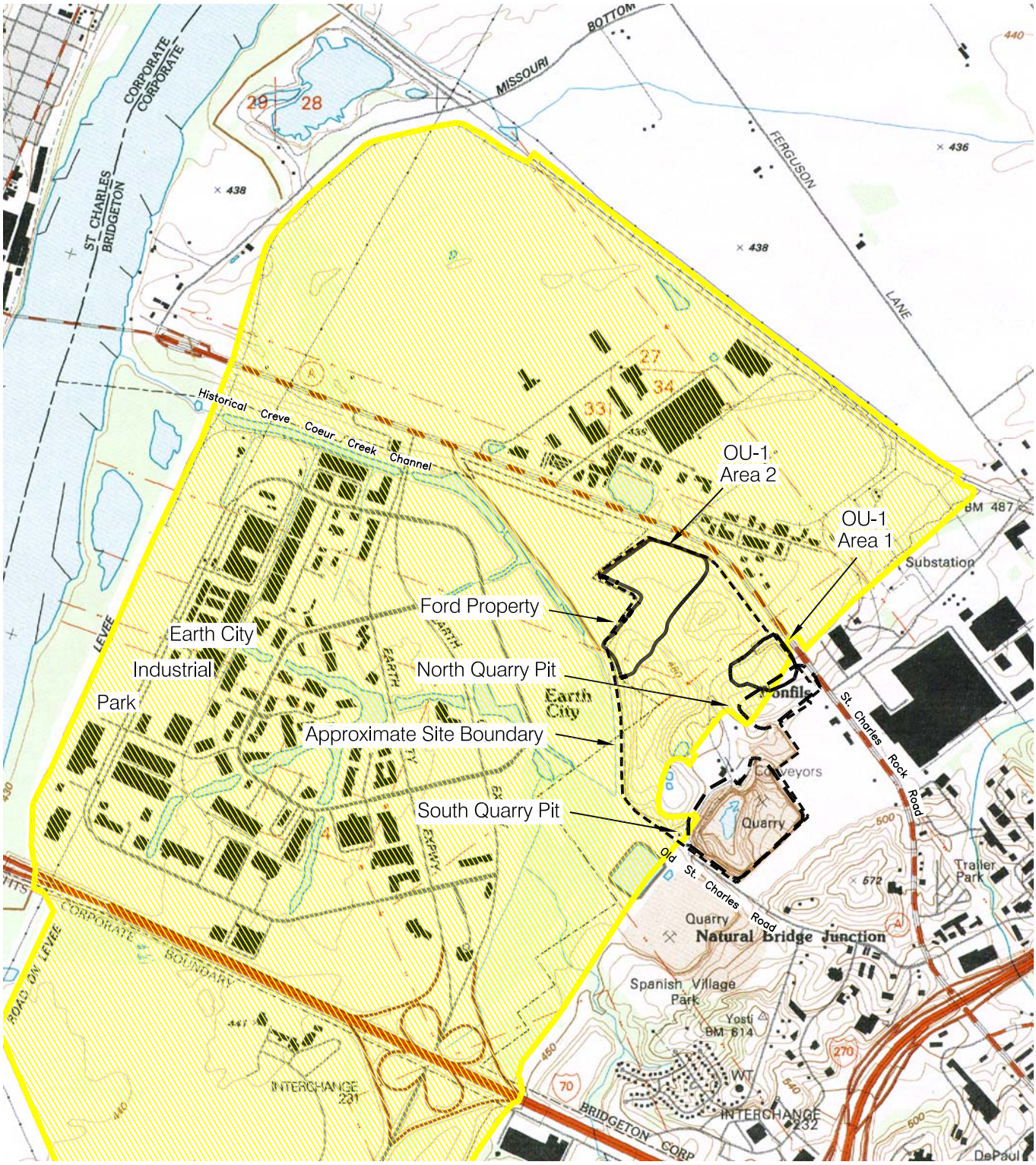
Figure 2-1

Site Location Map

West Lake Landfill OU-1 Feasibility Study

EMSI Engineering Management Support, Inc.

M:\clients\EMSI\westlake\4-04\fig2-1.DWG plotted: 04/05/2005



Source: St. Charles, MO USGS 7.5' Quadrangle, 1994

Areas of 500-year flood; areas of 100-year flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 100 year flood.

2000 0 2000

SCALE IN FEET

N

Figure 2-2

Flood Zone Map

West Lake Landfill OU-1 Feasibility Study

EMSI Engineering Management Support, Inc.

M:\clients\EMSI\westlake\11-04\fig2-2-Flood Zone Map.dwg plotted: 04/05/2005

M:\clients\EMSI\westlake\11-04\fig-2-3-Surf-Drain-Pat.dwg plotted: 04/05/2005

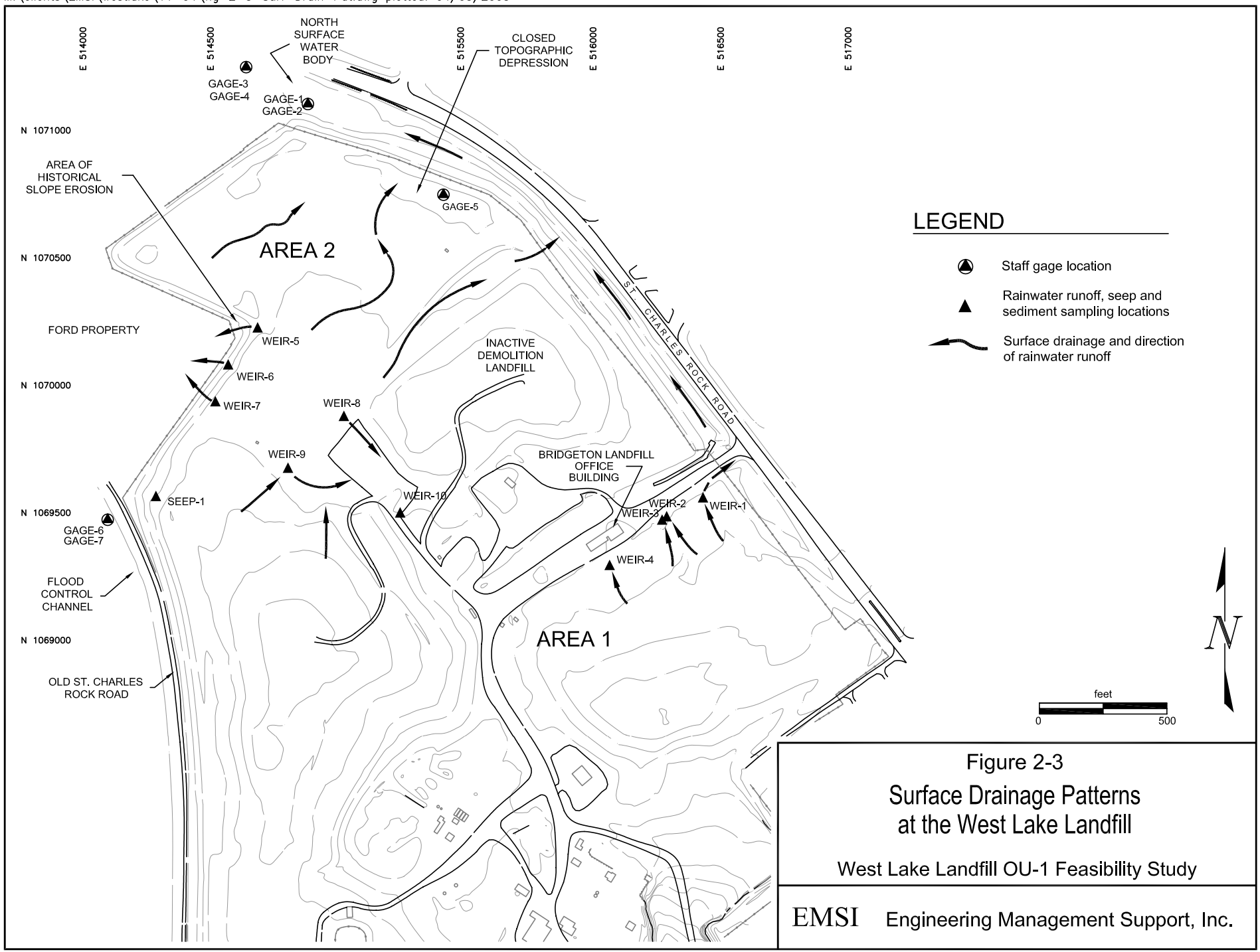


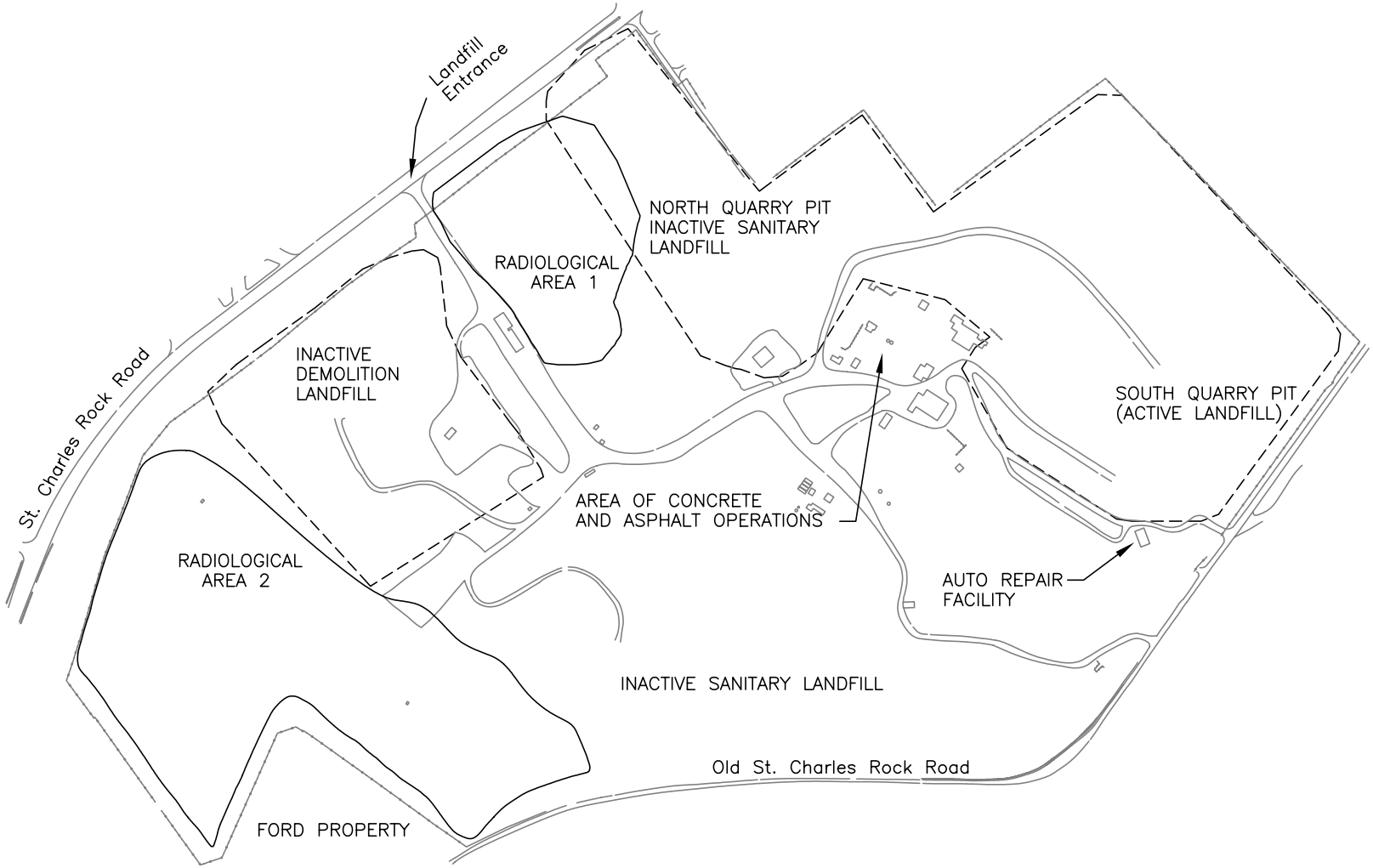
Figure 2-3

Surface Drainage Patterns at the West Lake Landfill

West Lake Landfill OU-1 Feasibility Study

EMSI Engineering Management Support, Inc.

M:\clients\EMSI\westlake\11-04\fig-2-4-Site Layout.dwg plotted: 04/05/2005



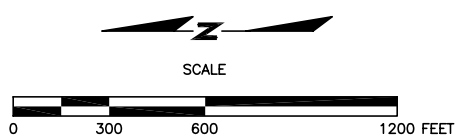


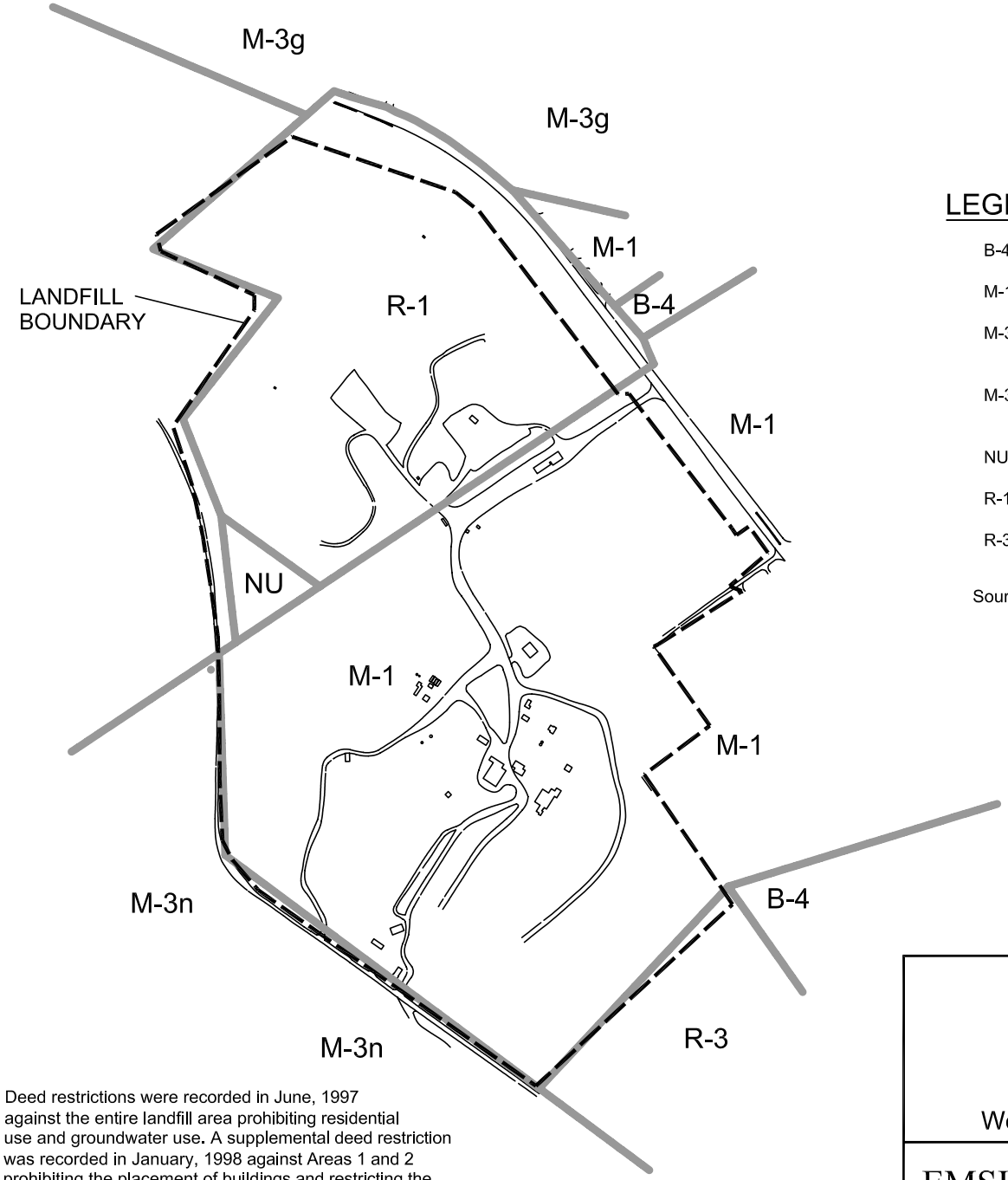
Figure 2-4

Site Layout

West Lake Landfill OU-1 Feasibility Study

EMSI Engineering Management Support, Inc.

M:\clients\EMSI\westlake\11-04\fig-2-5-Landfill-Zoning.dwg plotted: 04/05/2005



LEGEND

B-4	General commercial district
M-1	Manufacturing district, limited
M-3g	Planned manufacturing district Northwest Industrial Park
M-3n	Planned manufacturing district West Lake Quarry Tract
NU	Non-Urban
R-1	One family dwelling district
R-3	One family dwelling district

Source: Golder Associates, 1996 Physical Characterization Technical Memorandum, Figure 1-5

feet
0 600

N

Note: Deed restrictions were recorded in June, 1997 against the entire landfill area prohibiting residential use and groundwater use. A supplemental deed restriction was recorded in January, 1998 against Areas 1 and 2 prohibiting the placement of buildings and restricting the installation of underground utilities, pipes, and/or excavation.

Figure 2-5

Landfill and Surrounding Area Zoning

West Lake Landfill OU-1 Feasibility Study

EMSI Engineering Management Support, Inc.

M:\clients\EMSI\westlake\11-04\fig-2-6-Extent of Radio-Nuc.dwg plotted: 04/05/2005

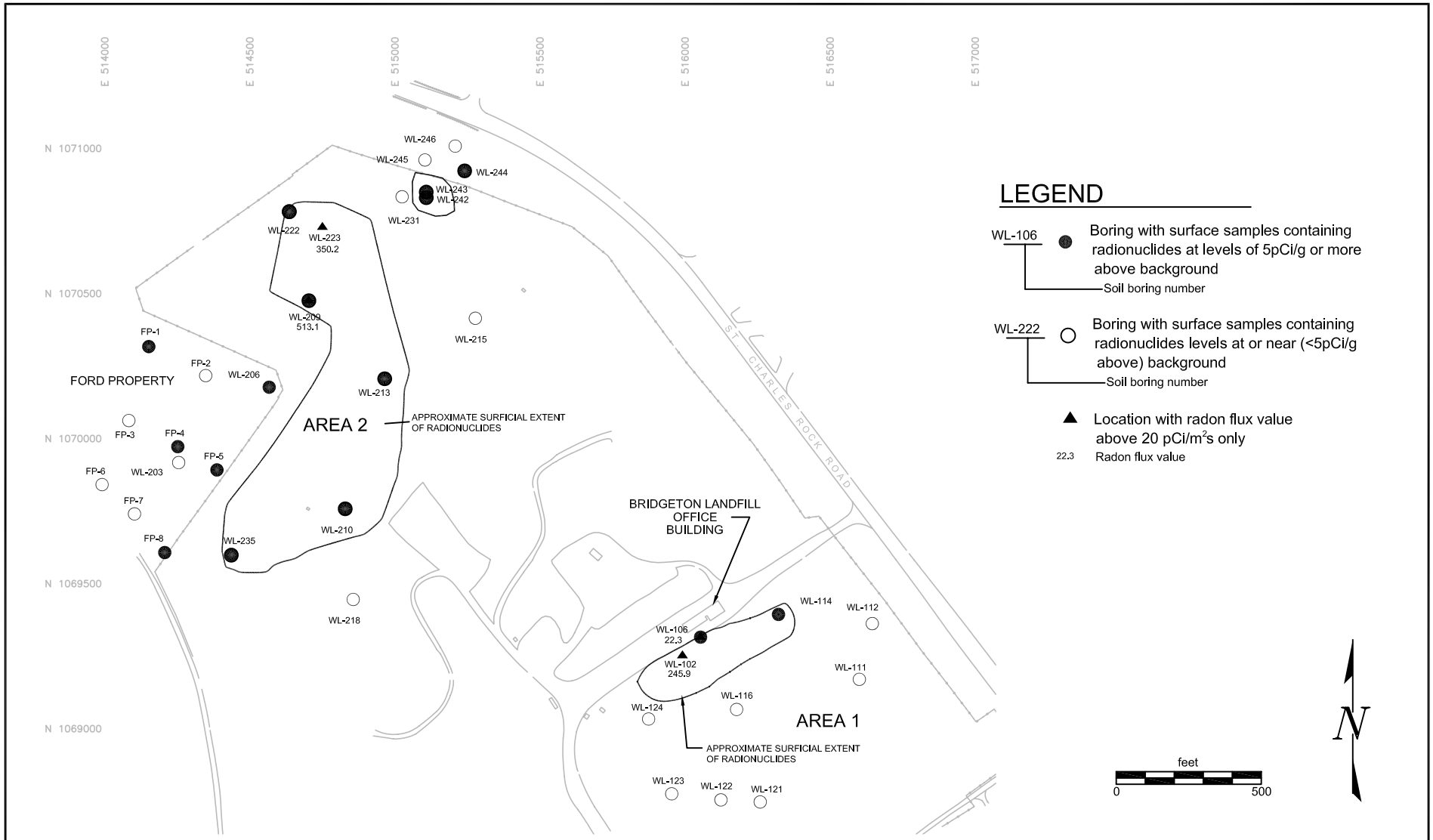


Figure 2-6

Approximate Extent of Radionuclide Impacted Materials at the Landfill Surface

West Lake Landfill OU-1 Feasibility Study

EMSI Engineering Management Support, Inc.

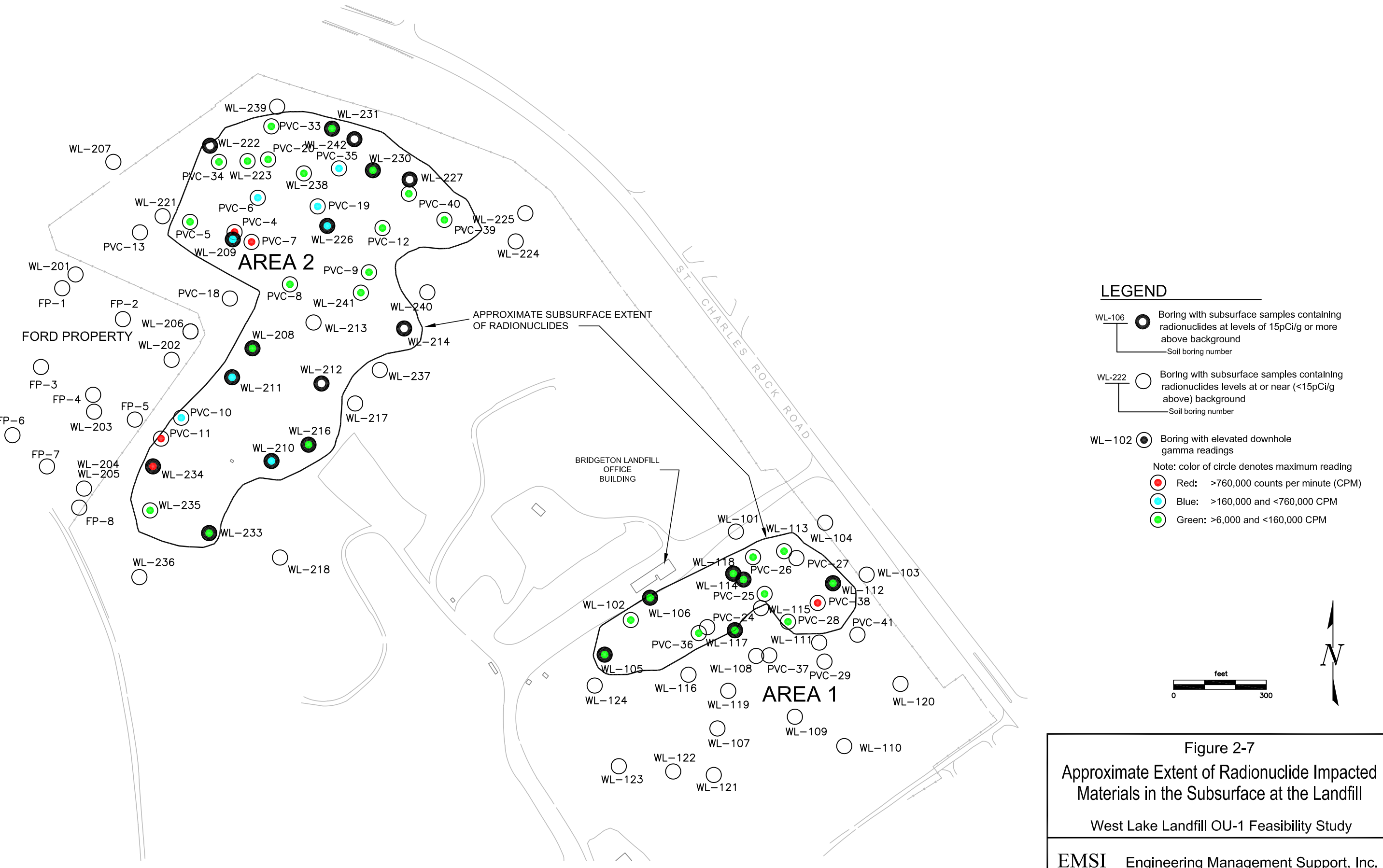


Figure 2-7

Approximate Extent of Radionuclide Impacted Materials in the Subsurface at the Landfill

West Lake Landfill OU-1 Feasibility Study

EMSI Engineering Management Support, Inc.

M:\clients\EMSI\westlake\11-04\fig-2-7-Extent of Rad-Nucs-Sub.dwg plotted: 04/05/2005

M:\clients\EMSI\westlake\11-04\FIG-2-8-Buffer Zone.dwg plotted: 04/05/2005

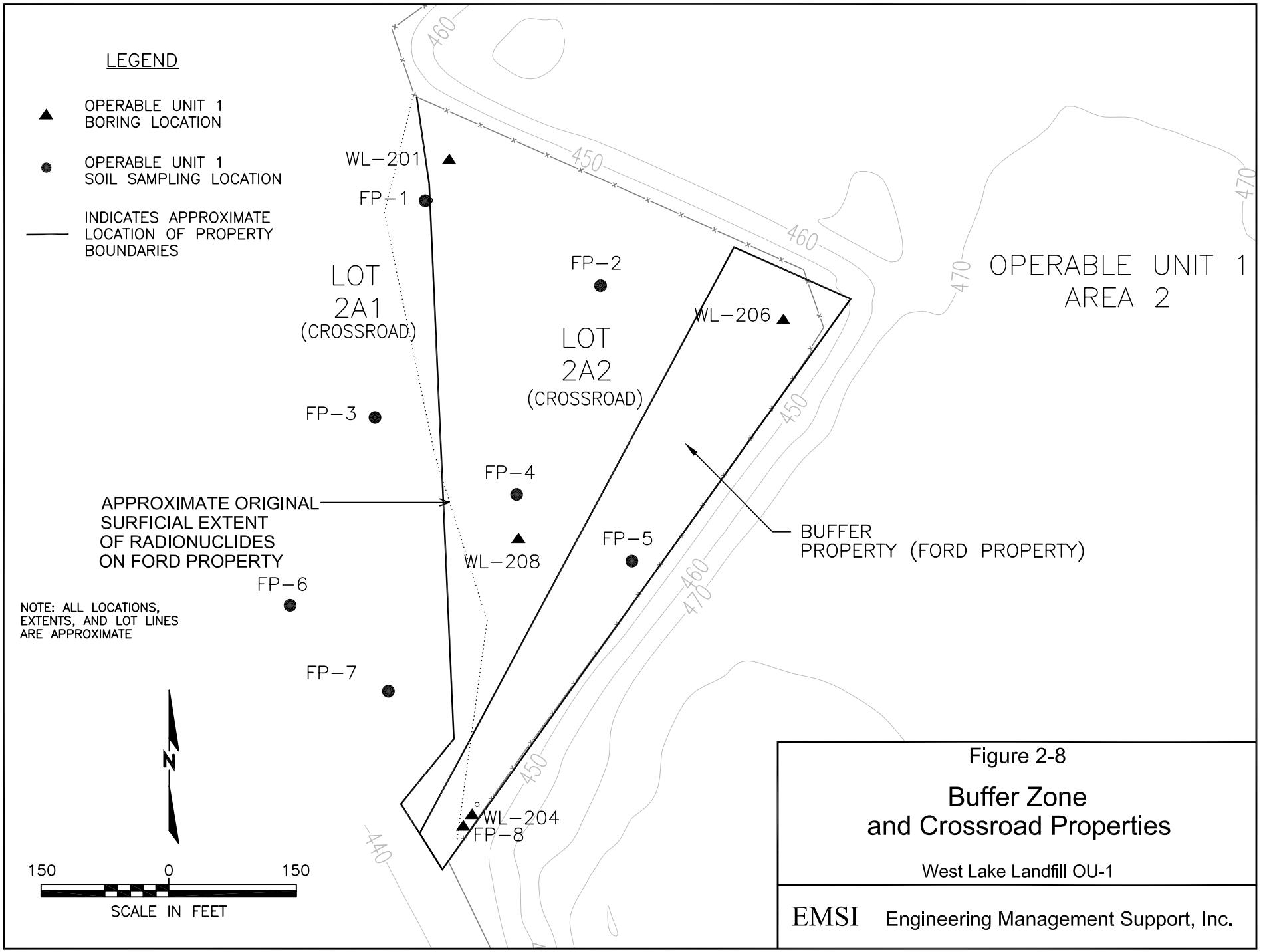


Figure 2-8

Buffer Zone and Crossroad Properties

West Lake Landfill OU-1

EMSI Engineering Management Support, Inc.

M:\clients\EMSI\westlake\2005\Fig2-9_Monitoring Wells.dwg plotted: 08/09/2005

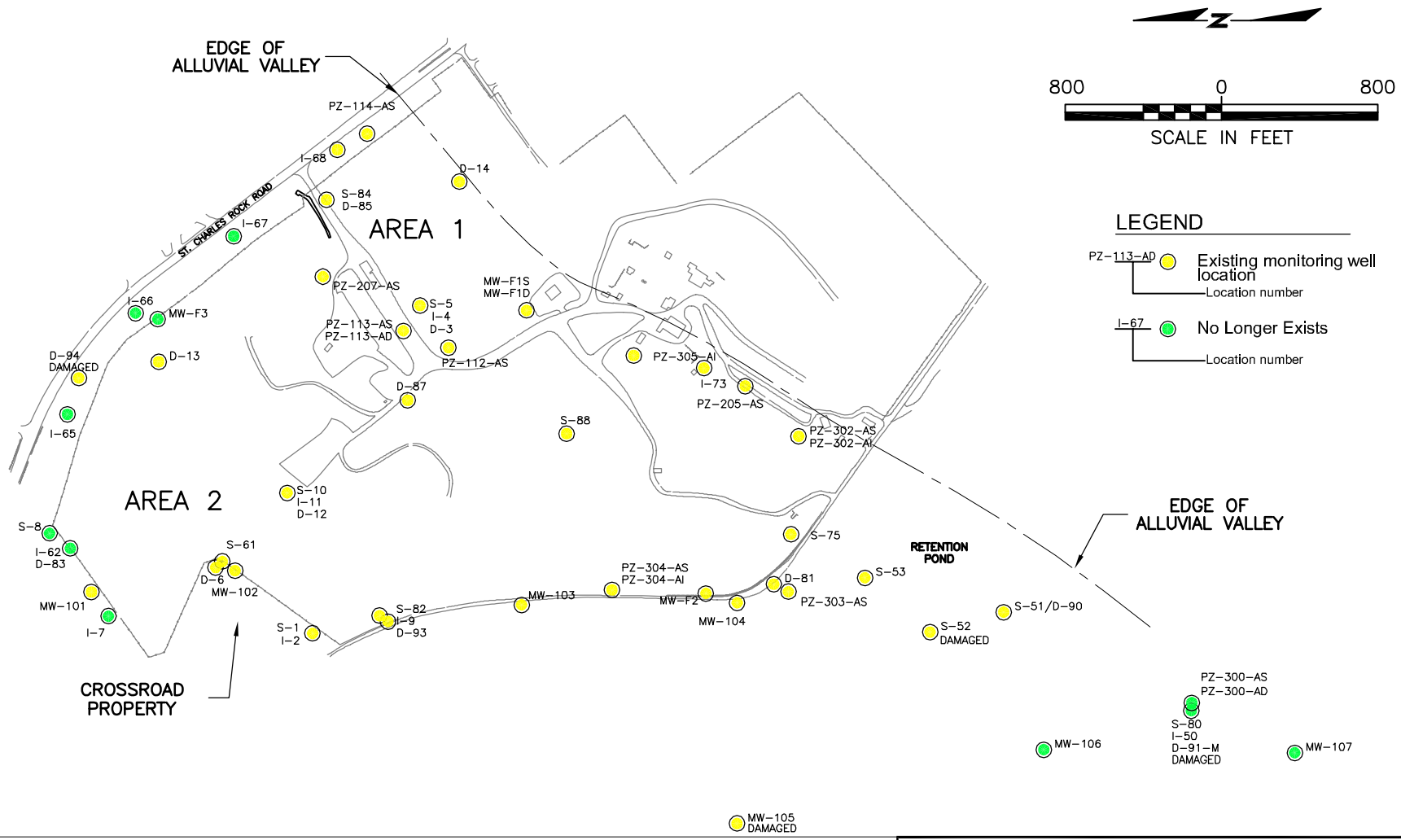
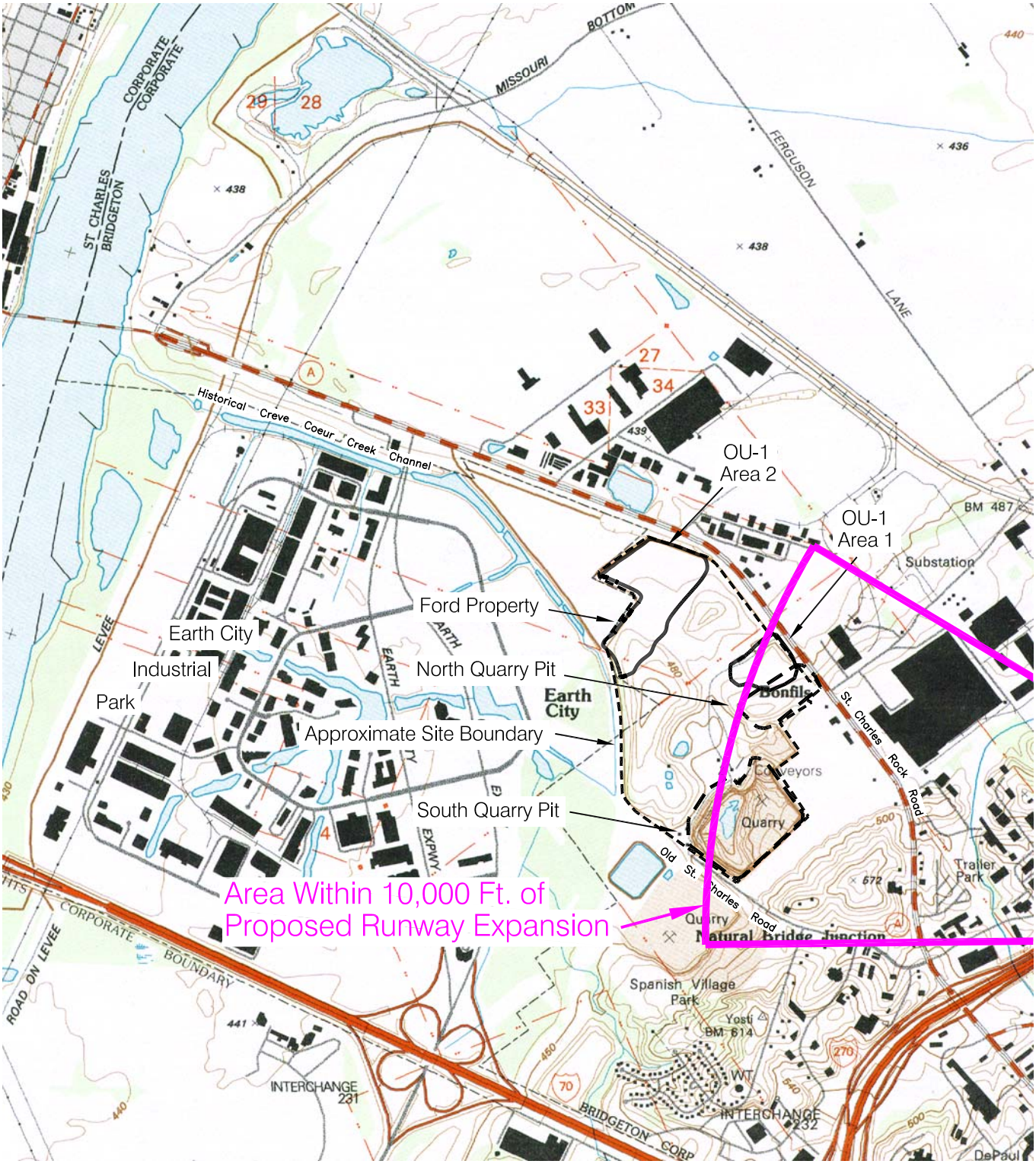


Figure 2-9

Groundwater Monitoring Well Locations

West Lake Landfill OU-1 Feasibility Study

EMSI Engineering Management Support, Inc.



Source: St. Charles, MO USGS
7.5' Quadrangle, 1994

2000 0 2000
SCALE IN FEET

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Figure 3-1
Area within 10,000 Feet of Proposed Runway Expansion St. Louis Lambert International Airport
West Lake Landfill OU-1 Feasibility Study

EMSI Engineering Management Support, Inc.

M:\clients\EMSI\westlake\11-04\fig3-1-Proprunway.dwg plotted: 04/05/2005

GENERAL RESPONSE ACTION	REMEDIAL TECHNOLOGY	PROCESS OPTIONS	DESCRIPTION	SCREENING COMMENTS
No Action	None	None	No action taken.	Required for consideration by the NCP.
Institutional Controls*	Access Restrictions	Fences and guards	Access restrictions can mitigate exposures by limiting access and use.	Already existing or planned.
	Proprietary Controls	Deed restrictions	Proprietary controls restricting land use that are legally enforceable against subsequent owners.	Already Existing. Covenant restrictions have been recorded by each of the owners against their respective parcels and the entire West Lake Landfill (including Areas 1 and 2) prohibiting residential use. Construction work, as well as commercial and industrial uses, have been precluded on Areas 1 and 2 by a Supplemental Declaration of Covenants and Restrictions recorded by Rock Road Industries, Inc., prohibiting the placement of buildings and restricting the installation of underground utilities, pipes and/or excavation upon its property.
		Deed notices	Non-enforceable informational document filed in public land records alerting anyone searching records to important information about property.	Potentially applicable.
		Easements	Property right conveyed by a landowner to another party which gives the second party rights with regard to the land of the first party.	Potentially applicable in conjunction with other response actions.
		Covenants	Promise by one landowner to another made in connection with conveyance of property. Promise to refrain from using property in a certain manner.	Potentially applicable in conjunction with other response actions.
		Groundwater use restrictions	Water or well use restrictions such as limitations on the drilling of new wells.	Already Existing. Restrictive covenants recorded by each of the fee owners against their respective parcels prohibit use of groundwater from beneath the landfill. These deed restrictions cannot be terminated without the written approval of the then owners, the Missouri Department of Natural Rescources (MDNR), and the EPA.
		Advisories	Publicly-issued warnings that provide notice to potential users of groundwater of some existing or impending risk associated with its use.	Not applicable as there is no groundwater use at or in the vicinity of the site.
Monitoring	Monitoring	Groundwater, surface water, and sediment monitoring	Monitoring to evaluate site conditions over time and/or remedial action performance.	Potentially applicable.

LEGEND

Technology and/or Process Option screened out on the basis of technical implementability.

* Indicates that General Response Action or remedial technology is component of presumptive remedy for CERCLA municipal landfill sites (USEPA, 1993)

Figure 4-1

Technical Implementability Screening of Remediation Technologies and Process Options

West Lake Landfill OU-1 Feasibility Study

EMSI Engineering Management Support, Inc.

M:\clients\EMSI\westlake\4-04\screen41.dwg plotted: 04/05/2005

GENERAL RESPONSE ACTION	REMEDIAL TECHNOLOGY	PROCESS OPTIONS	DESCRIPTION	SCREENING COMMENTS
In-situ Containment	Surface Controls/Diversions	Diversion/collection, grading, graded contours, swales and berms, and vegetation to isolate storm water from Areas 1 and 2	Surface controls can limit contaminant mobility and mitigate potential exposures and migration via surface water by attenuating storm water run-on and runoff. These processes can be implemented with conventional equipment.	Potentially applicable.
	Surface Water/ Sediment Control Barriers	Sediment traps, sedimentation basins	Surface water/sediment control barriers can limit contaminant mobility and mitigate potential exposures by preventing sediment from storm water run-on and runoff from migrating. These processes can be implemented with conventional equipment.	Potentially applicable.
	Dust Controls	Revegetation, capping	Dust controls can limit contaminant mobility and mitigate potential migration via air and storm water by attenuating radon emissions and controlling particulate resuspension. These processes can be implemented with conventional equipment.	Potentially applicable.
	Capping and Covers*	Soil, clay, and vegetation; asphalt or concrete; synthetic membrane material; and multilayer, multimedia material	Capping can limit contaminant mobility and mitigate potential migration via air, surface water, and groundwater by attenuating radon emissions and controlling particulate resuspension, storm water run-on and runoff, and precipitation-enhanced percolation and leaching. These processes can be implemented with conventional equipment.	Potentially applicable.

LEGEND

Technology and/or Process Option screened out on the basis of technical implementability.

* Indicates that General Response Action or remedial technology is component of presumptive remedy for CERCLA municipal landfill sites (USEPA, 1993)

Figure 4-1 (cont.)

Technical Implementability Screening of Remediation Technologies and Process Options

West Lake Landfill OU-1 Feasibility Study

EMSI Engineering Management Support, Inc.

M:\clients\EMSI\westlake\4-04\screen42.dwg plotted: 04/05/2005

GENERAL RESPONSE ACTION	REMEDIAL TECHNOLOGY	PROCESS OPTIONS	DESCRIPTION	SCREENING COMMENTS
Physical Treatment/ Pretreatment In-Situ	Dewatering/Drying	Solar evaporation, pumping, and gravity drainage trenches	For sediment, dewatering/drying can limit the mobility and reduce the volume of radiologically impacted material and mitigate potential exposure and migration at the affected area. These processes can be implemented with conventional methods.	Eliminated. Offsite buffer/Crossroad properties surface soil to be incorporated within existing Areas 1 and 2 is not expected to require or justify the addition of this technology insitu.
	Nonthermal Extraction	Vacuum extraction and aqueous soil flushing	Vacuum extraction can be used to remove radon gas from soil but may require a point source treatment system such as vapor phase granular activated carbon prior to discharge to the atmosphere. The primary action associated with soil flushing with water is a physical "sweeping" to accelerate contaminant migration by injection wells or spraying/ponding (surface application); thus it is discussed here as a physical technology. Water alone is typically a poor flushing solution and this process is generally ineffective for complex wastes or for treating soil with moderate to high adsorption capacity, low permeability, or the nature of subsurface soil at Areas 1 and 2 that includes refuse, debris, and fill materials.	Eliminated. Radon gas levels are below potential standards and no structures are present on Areas 1 and 2.
	Thermal Destruction	In-situ vitrification (ISV)	In-situ thermal destruction can reduce the toxicity, mobility, and volume of contaminated soil and mitigate potential exposures and migration by physically altering the contaminant source. For in-situ vitrification, an electric current is passed through electrodes to melt the soil or sediment and upon cooling, a glassy crystalline matrix is formed that incorporates inorganic contaminants such as radionuclides. In-situ vitrification has been implemented at a limited number of sites. Obtaining a continuous matrix after the melt with the nature of the subsurface soil at Areas 1 and 2 may be difficult.	Eliminated. Soils containing radionuclides are commingled with municipal wastes and construction debris. Potentially adverse effects of inducing an electric current in and heating of materials containing explosive gases.
Chemical Treatment Pretreatment In-Situ	Soil Flushing	Acid/base, surfactant, chelating agent, and organic solvent solution via surface application and injection/extraction wells	In-situ chemical flushing can reduce the mobility and volume of contaminated soil via desorptive reactions and mitigate potential exposures and migration by altering the contaminant source. This technology can be used as an initial treatment step to leach contaminants from a waste matrix (e.g., via solution mining). The solubility of radionuclides can be enhanced by solvent application and the reagent solution can be sprinkled or ponded over the contaminated zone for aggressive treatment. This technology is ineffective for complex wastes because it is very contaminant-specific and the selection of a suitable flushing fluid for a combined waste is difficult. Full-scale site cleanup has not yet been demonstrated by these processes.	Eliminated because of the inability to control process given the the nature of the subsurface soil in Areas 1 and 2.
	Stabilization/solidification	Lime-based and Portland cement-based pozzolanic reactions, asphalt-based thermoplastic microencapsulation, and catalyzed polymerization	In-situ stabilization/solidification processes are typically used to treat soil contaminated with heavy metals and high molecular weight organic compounds by binding the contaminants in place in an insoluble matrix. Drills, augers, and paddles can be used to introduce chemical reagents.	Eliminated because of the nature of the subsurface soil in Areas 1 and 2.

LEGEND

Technology and/or Process Option screened out on the basis of technical implementability.

* Indicates that General Response Action or remedial technology is component of presumptive remedy for CERCLA municipal landfill sites (USEPA, 1993)

Figure 4-1 (cont.)

Technical Implementability Screening of Remediation Technologies and Process Options

West Lake Landfill OU-1 Feasibility Study

EMSI Engineering Management Support, Inc.

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GENERAL RESPONSE ACTION	REMEDIAL TECHNOLOGY	PROCESS OPTIONS	DESCRIPTION	SCREENING COMMENTS
Physical Treatment/ Pretreatment following Removal (subject to Removal being retained as a General Response Action)	Dewatering/Drying	Rotary drum, vacuum, and belt filtration; drying bed; filter press; pressure filtration; gravity thickening; centrifugation; and evaporation	Dewatering/drying can limit the mobility and reduce the total volume of contaminated material. These processes can be implemented with conventional methods.	Offsite buffer/Crossroad properties surface soils not expected to require dewatering.
	Solids Separation	Classification (mechanical and non-mechanical); soil sorting and screening wet/dry); flotation and gravity concentration/centrifugation; magnetic and paramagnetic separation; and electrostatic separation	Solids separation processes can limit the toxicity, mobility, and volume of contaminated material and mitigate potential exposures and migration. This technology could serve as a pretreatment step for a primary treatment process and it is considered developmental for waste treatment applications. Although certain solids separation processes have been used to extract radionuclides from original ores, they are generally ineffective for separating relatively low concentrations of contaminants from soil. Solids separation will be particularly challenging for the subsurface impacted soils in Areas 1 and 2 given that the soils consist of refuse, debris, and fill materials.	Originally eliminated for Areas 1 and 2 subsurface soils because the nature of the soils is commingled refuse, debris, and fill materials. Retained in conjunction with potential "hot spot" removal as requested by EPA.
	Volume Reduction	Impact crushers, shredders, pulverizers, tumbling and hammer mills, and compactors	These processes can reduce the size and volume of contaminated material (e.g., large chunks of soil or rock), which is often required as a pretreatment step for a primary treatment process (e.g., for a chemical extraction process).	Eliminated for Areas 1 and 2 subsurface soils because the nature of the soils is commingled refuse, debris, and fill materials.
	Nonthermal Extraction	Aqueous soil washing in a reactor vessel	Soil can be mixed with water in a contact vessel to wash contaminants from the waste matrix, but water alone is typically ineffective as a washing solution, especially when the soil includes radionuclides.	Eliminated for Areas 1 and 2 subsurface soils because the nature of the soils is commingled refuse, debris, and fill materials.

LEGEND

Technology and/or Process Option screened out on the basis of technical implementability.

* Indicates that General Response Action or remedial technology is component of presumptive remedy for CERCLA municipal landfill sites (USEPA, 1993)

Figure 4-1 (cont.)

Technical Implementability Screening of Remediation Technologies and Process Options

West Lake Landfill OU-1 Feasibility Study

EMSI Engineering Management Support, Inc.

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GENERAL RESPONSE ACTION	REMEDIAL TECHNOLOGY	PROCESS OPTIONS	DESCRIPTION	SCREENING COMMENTS
Chemical Treatment/ Pretreatment following Removal (subject to Removal being retained as a General Response Action)	Contact Extraction	Non-aqueous soil washing in a reactor vessel	Various solutions can be used to separate oils, organic compounds, radionuclides, and metals from soil in an agitated vessel.	Eliminated for Areas 1 and 2 subsurface soils because the nature of the soils is commingled refuse, debris, and fill materials.
	Stabilization/Solidification	Lime-based and Portland cement-based pozzolanic reactions, asphalt-based thermoplastic microencapsulation, catalyzed polymerization, and silicate and adsorbent binding in a reactor vessel such as a pug mill blender	As described for the in-situ application except that process effectiveness is less constrained because various pretreatment options are available (e.g., dewatering and crushing) and the mix can be better controlled. This technology has been implemented for radiologically-impacted materials treatment applications and can be implemented with conventional equipment.	Eliminated for Areas 1 and 2 subsurface soils because the nature of the soils is commingled refuse, debris, and fill materials.
Removal	Excavation	Backhoe, bulldozer, scraper and front-end loader	Excavation can limit contaminant mobility and mitigate potential exposures at the affected area by removing the contaminant source. This technology can be implemented with conventional equipment.	Eliminated for Areas 1 and 2 subsurface soil because of the nature of subsurface soil (i.e., there are no obvious hot spots and soils consist of commingled refuse, debris, and fill materials) and the potential physical and exposure hazards to workers. Also, inconsistent with presumptive remedy guidance for municipal landfills. Potentially applicable for offsite buffer/Crossroad properties surface soils. Retained in conjunction with potential "hot spot" removal as requested by EPA.
Disposal (subject to Removal being retained as a General Response Action)	Offsite Disposal	Offsite disposal facility	This option would involve incorporation of removed material at an existing acceptable permitted commercial disposal facility. Land-based disposal can reduce the mobility of contaminated material and mitigate potential exposures and migration by controlling the contaminant source. In addition to engineering requirements, constraints include issues such as transportation routes and risks, costs for off-site disposal and regulator/ community acceptance.	Eliminated. In accordance with the presumptive remedy guidance, excavation and offsite disposal of all of the material in Areas 1 and 2 is not considered to be feasible. Excavation and offsite disposal of smaller "hot spot" material that may be identified in Areas 1 and 2 is also not considered to be feasible. Excavation of the radiologically-impacted soil would require screening to separate the impacted soil from the overall matrix of solid waste, debris, and other fill material and the attendant difficulties and risk associated with screening of these materials. Retained in conjunction with potential "hot spot" removal as requested by EPA. The implementability of land disposal at an off-site facility is further affected by the availability of suitable sites for disposal of the radiologically-impacted material from OU-1. In addition, the increased risk of accidents and exposures associated with off-site transport of the material and the increased cost for off-site transport and disposal would have to be balanced by an increased effectiveness compared with leaving materials onsite.

LEGEND

Technology and/or Process Option screened out on the basis of technical implementability.

* Indicates that General Response Action or remedial technology is component of presumptive remedy for CERCLA municipal landfill sites (USEPA, 1993)

Figure 4-1 (cont.)

Technical Implementability Screening of Remediation Technologies and Process Options

West Lake Landfill OU-1 Feasibility Study

EMSI Engineering Management Support, Inc.

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GENERAL RESPONSE ACTION	REMEDIAL TECHNOLOGY	PROCESS OPTIONS	EFFECTIVENESS	IMPLEMENTABILITY	COST	SCREENING COMMENTS
No Action	None	None	Does not achieve all remedial action objectives.	May be implemented with regulatory acceptance.	No cost.	Provides a baseline for comparison with action alternatives.
Institutional Controls*	Access Restrictions	Fences and guards	The perimeter of the West Lake Landfill site is fenced, and entry to the West Lake Landfill is controlled at the landfill office/weigh station; these measures mitigate potential public exposure to contamination on-site by restricting entry. A six foot high chain-link fence with a three-strand barbed wire canopy encloses the entire West Lake Landfill. The main access gate is located on the northeastern perimeter, off of St. Charles Rock Road. An additional gate is located on the southwestern perimeter to provide access to the automobile repair shop.	Fences and other such measures are easy to implement, and resources are readily available.	Low	Can effectively limit entry to contaminated areas and can be used to support other remedial actions, if any.
	Proprietary Controls	Deed restrictions	Covenant restrictions have been recorded by each of the owners against their respective parcels and the entire West Lake Landfill (including Areas 1 and 2) prohibiting residential use. Construction work, as well as commercial and industrial uses, have been precluded on Areas 1 and 2 by a Supplemental Declaration of Covenants and Restrictions recorded by Rock Road Industries, Inc., prohibiting the placement of buildings and restricting the installation of underground utilities, pipes and/or excavation upon its property. The recording information for the restrictive covenants precluding residential use is Book 11208 pages 2499, 2507, and 2514, in the Recorder of Deeds Office for St. Louis County, Missouri. The recording information for the restrictive covenant prohibiting the placement of buildings and restricting the installation of underground utilities, pipes and/or excavation is Book 11427 page 1633 in the Recorder of Deeds Office for St. Louis County, Missouri. Covenant restrictions cannot be terminated without the written approval of the then owners, the Missouri Department of Natural Resources (MDNR), and the EPA.	Deed restrictions are easy to implement, and resources are readily available.	Low	Can minimize exposures to site contaminants by limiting use of contaminated areas and can be used to support other remedial actions, if any.
		Deed notices	Long term effectiveness depends on continued future implementation.	Potentially implementable.	Low	None

(continued on next page)

* Indicates that General Response Action or remedial technology is component of presumptive remedy for CERCLA municipal landfill sites (USEPA, 1993)

Figure 4-2

Evaluation of Remediation Technologies and Process Options

West Lake Landfill OU-1 Feasibility Study

EMSI Engineering Management Support, Inc.

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GENERAL RESPONSE ACTION	REMEDIAL TECHNOLOGY	PROCESS OPTIONS	EFFECTIVENESS	IMPLEMENTABILITY	COST	SCREENING COMMENTS
	(continued from previous page)					
		Easements	Long term effectiveness depends on continued future implementation.	Implementability will depend on activity to be undertaken under easement and ease of negotiation with landowner.	Moderate capital costs depending on extent of easements required. Low O&M costs.	None
		Covenants	Long term effectiveness depends on continued future implementation.	Potentially implementable.	Low	None
		Groundwater use restrictions	Restrictive covenants recorded in June 1997 by each of the fee owners against their respective parcels prohibit use of groundwater from beneath the landfill. These deed restrictions cannot be terminated without the written approval of the then owners, the Missouri Department of Natural Rescources (MDNR), and the EPA.	These measures are easy to implement, and resources are readily available.	Low	Can minimize exposures to site contaminants by limiting use of contaminated areas and can be used to support other remedial actions, if any.
Monitoring	Monitoring	Groundwater, surface water, and sediment monitoring	This measure can support the mitigation of potential measures by providing data on the nature and extent of contamination and the effectiveness of any remedial action.	Monitoring is easy to implement, and resources (e.g., surface water and sediment sampling equipment and groundwater monitoring wells) are readily available.	Low capital costs. Low to moderate O&M costs.	Can provide data useful for minimizing exposures and can be used to support other remedial actions, if any.
In-situ Containment	Surface Controls/Diversions	Diversion/collection, grading, graded contours, swales and berms, and vegetation to isolate storm water from Areas 1 and 2	Diversions - such as graded contours, swales, or berms - can effectively reduce contaminant mobility at the Site. Such measures would not be effective for containing off-site surface water.	Can be implemented with conventional equipment and procedures, and resources are readily available.	Low	Can limit contaminant mobility by directing surface runoff around contaminated areas on-site.
	Surface Water/ Sediment Control Barriers	Sediment traps, Sedimentation basins	Sediment traps and sedimentation basins can limit mobility of contaminants in surface soil that may be mobilized via storm water run-on and run-off.	Can be implemented with conventional equipment and procedures, and resources are readily available.	Low to moderate capital costs. Low O&M costs.	Can limit contaminant mobility by containing contaminated sediment on-site.
	Dust Controls	Revegetation, capping	Revegetation and capping can limit contaminant mobility and mitigate potential migration via air and stormwater by controlling particulate resuspension.	Can be implemented with conventional equipment and procedures, and resources are readily available.	Low to moderate capital costs. Low O&M costs.	Can limit airborne emissions.
	Capping and Covers*	Soil, clay, and vegetation; asphalt or concrete; synthetic membrane material; and multilayer, multimedia material	Caps and covers can effectively limit airborne emissions (including radon) and external gamma radiation, and they can also reduce precipitation-enhanced percolation and leaching.	Can be implemented with conventional equipment and procedures. Resources are readily available. Consideration must be given to settlement of filled materials in OU-1 after a cover is placed. Surface depressions must be filled-in.	Moderate to high capital costs. Moderate O&M costs.	Soil, clay and vegetation layer covers retained. Asphalt or concrete covers screened-out because of potential settlement concerns if a cover were to be placed over Areas 1 and 2. Synthetic membrane and multilayer/multimedia material covers screened out because they are inconsistent with the existing landfill cover requirements.

* Indicates that General Response Action or remedial technology is component of presumptive remedy for CERCLA municipal landfill sites (USEPA, 1993)

Figure 4-2 (cont.)

Evaluation of Remediation Technologies and Process Options

West Lake Landfill OU-1 Feasibility Study

EMSI Engineering Management Support, Inc.

M:\clients\EMSI\westlake\4-04\FIG4-2-2.dwg plotted: 04/05/2005

GENERAL RESPONSE ACTION	REMEDIAL TECHNOLOGY	PROCESS OPTIONS	EFFECTIVENESS	IMPLEMENTABILITY	COST	SCREENING COMMENTS
Removal	Excavation	Backhoe, bulldozer, scraper and front-end loader	Can effectively remove the source of contamination to limit contaminant mobility and volume at the affected area and reduce related exposures.	Can be implemented with conventional equipment and procedures, and resources are readily available. Consideration must be given to excavations at depths greater than 25 feet, as special excavation equipment may be required. Also, consideration must be given to the type and composition of material to be excavated, which can affect the size of the excavation and ability to separate the radiologically-impacted soil from other filled materials.	Moderate if shallow. High if deep.	Needs to be combined with Disposal. Retained for surface soil from buffer/Crossroad properties. Originally screened out for subsurface soil in Areas 1 and 2 based on implementability and cost because of commingled nature of the radiologically-impacted subsurface soils and the areal extent and depth of radiologically-impacted soils in areas 1 & 2 present implementablility issues. Retained in conjunction with potential "hot spot" removal as requested by EPA.
Disposal	Offsite Disposal	Offsite Disposal Facility	Can effectively remove the source of contamination to limit contaminant mobility and volume at the affected area and reduce related exposures.	Difficult to implement; only two facilities in U.S. will accept wastes. Will require construction of a truck-to-railcar transfer facility. Will require transportation of radiologically-impacted materials by truck and railroad and the attendant risks.	High	Needs to be combined with Removal. Retained for potential small "hot spot" areas but difficult to implement and costs extremely high.
	Onsite disposal	Disposal on Area 2	Can effectively remove the source of contamination to limit contaminant mobility and volume at the affected area and reduce related exposures.	Can be implemented with conventional equipment, and procedures and resources are readily available.	Low	Needs to be combined with Removal. Retained for surface soil from buffer/Crossroads properties.

* Indicates that General Response Action or remedial technology is component of presumptive remedy for CERCLA municipal landfill sites (USEPA, 1993)

Figure 4-2 (cont.)

Evaluation of Remediation Technologies and Process Options

West Lake Landfill OU-1 Feasibility Study

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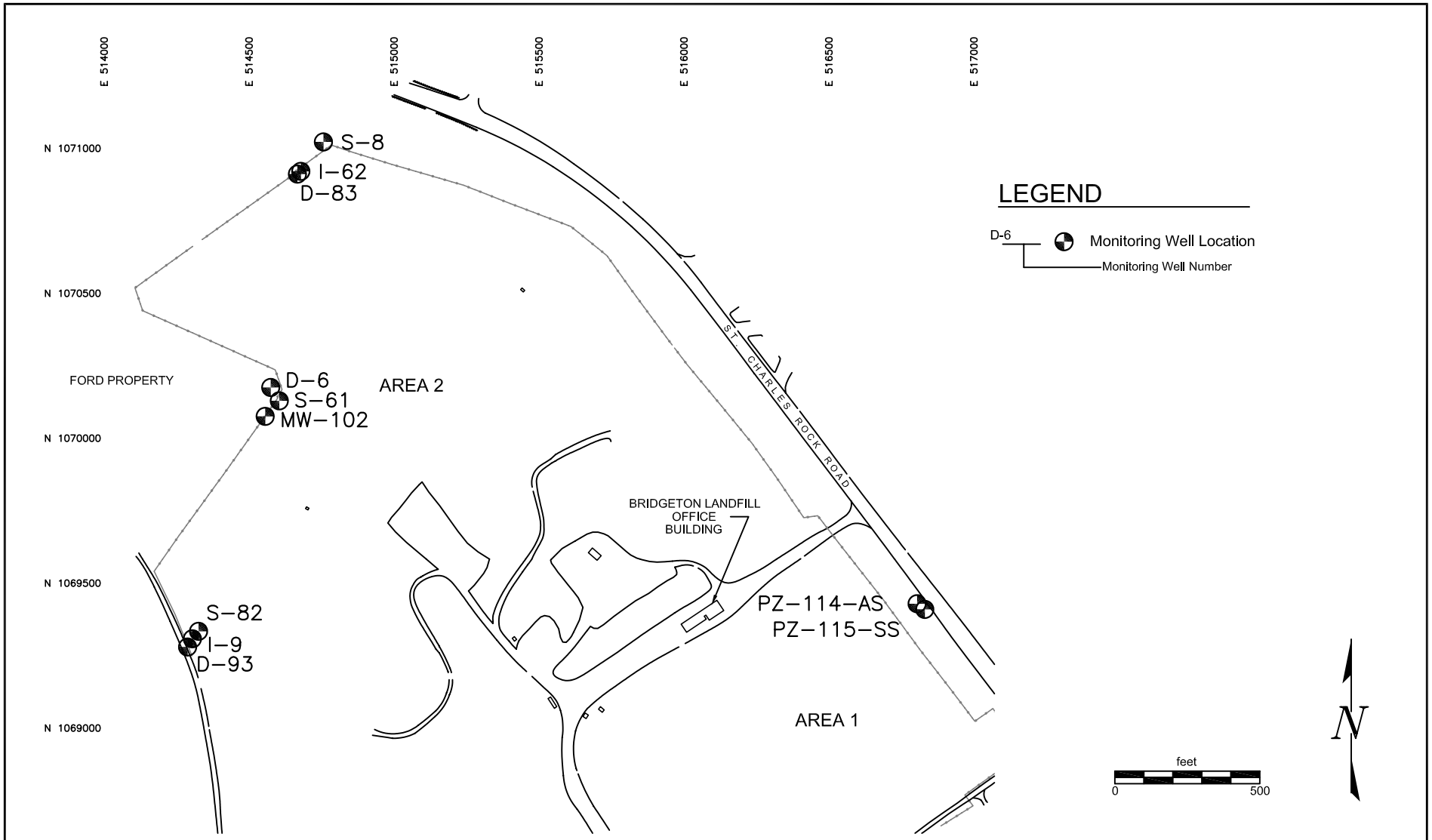

Figure 4-3

Groundwater Monitoring Locations

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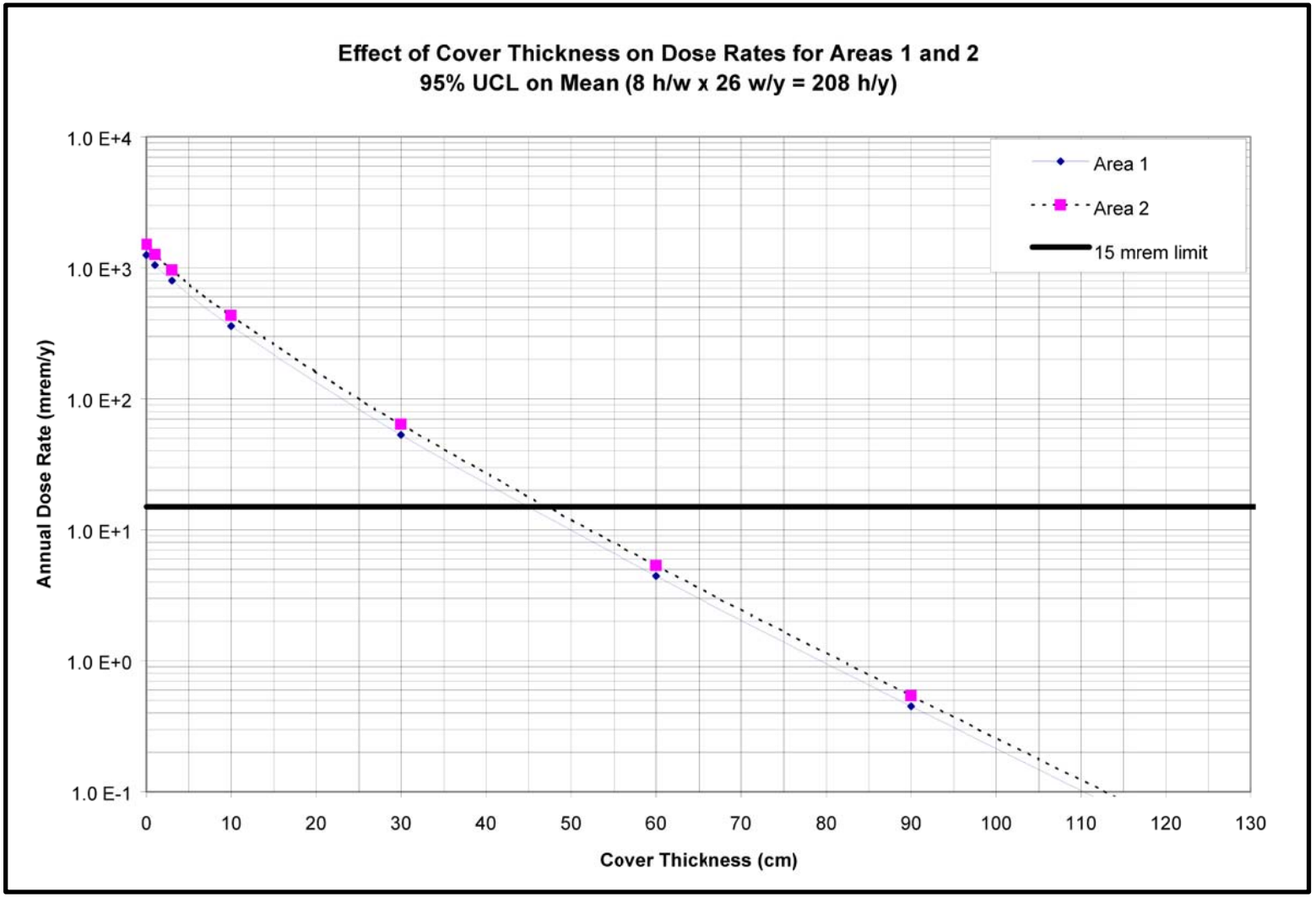

Figure 4-4

Cover Thickness Necessary For Protection Of Groundskeeper Working In Areas 1 and 2

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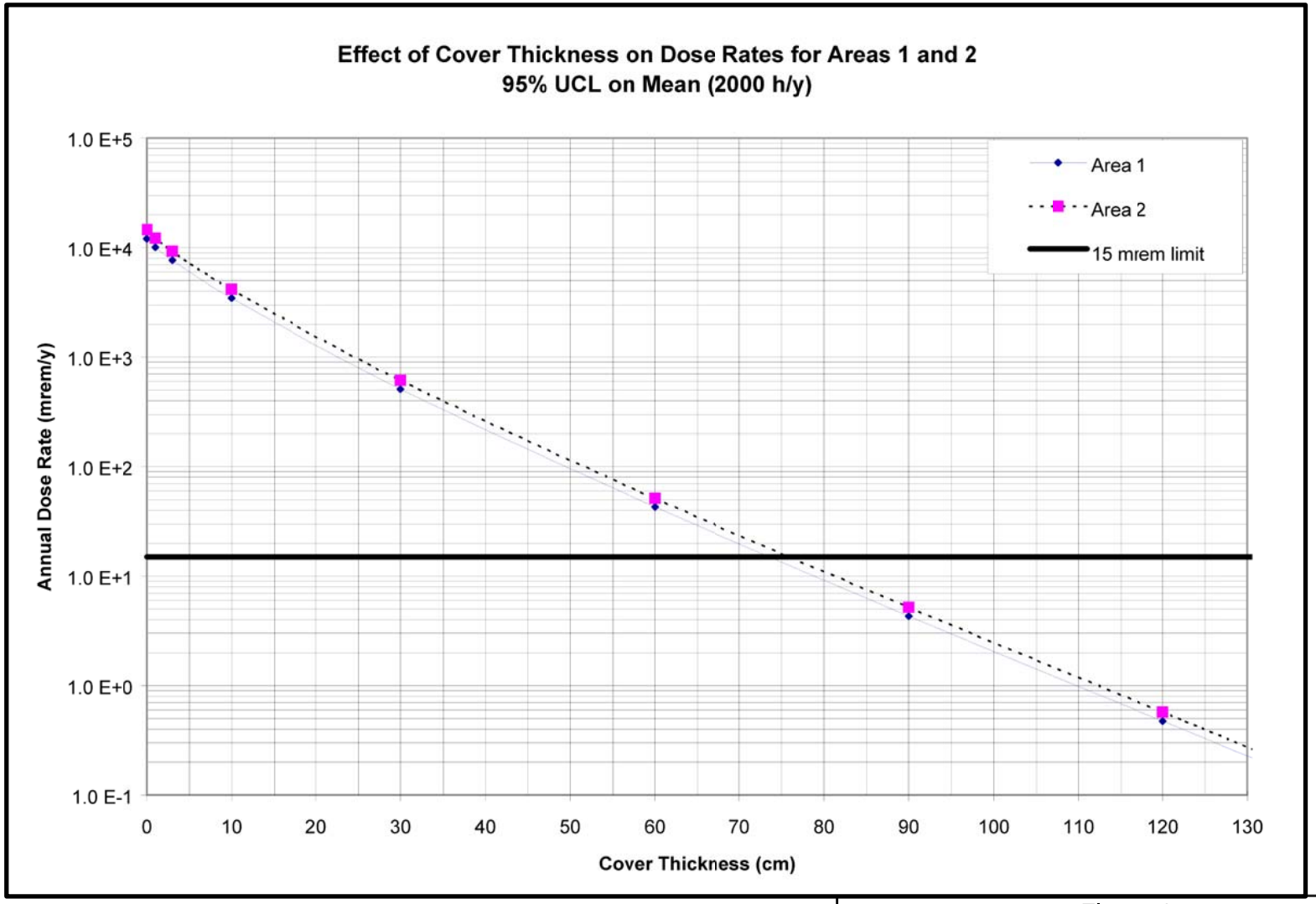

Figure 4-5

Cover Thickness Necessary For Protection Of Outdoor Storage Yard Worker Working In Areas 1 and 2

West Lake Landfill OU-1 Feasibility Study

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LEGEND

APPROXIMATE EXTENT OF COVER OVER AREAS 1 AND 2

feet
0 300

N

Figure 4-6
Approximate Extent of Soil or Landfill Cover Alternative L3

West Lake Landfill OU-1 Feasibility Study

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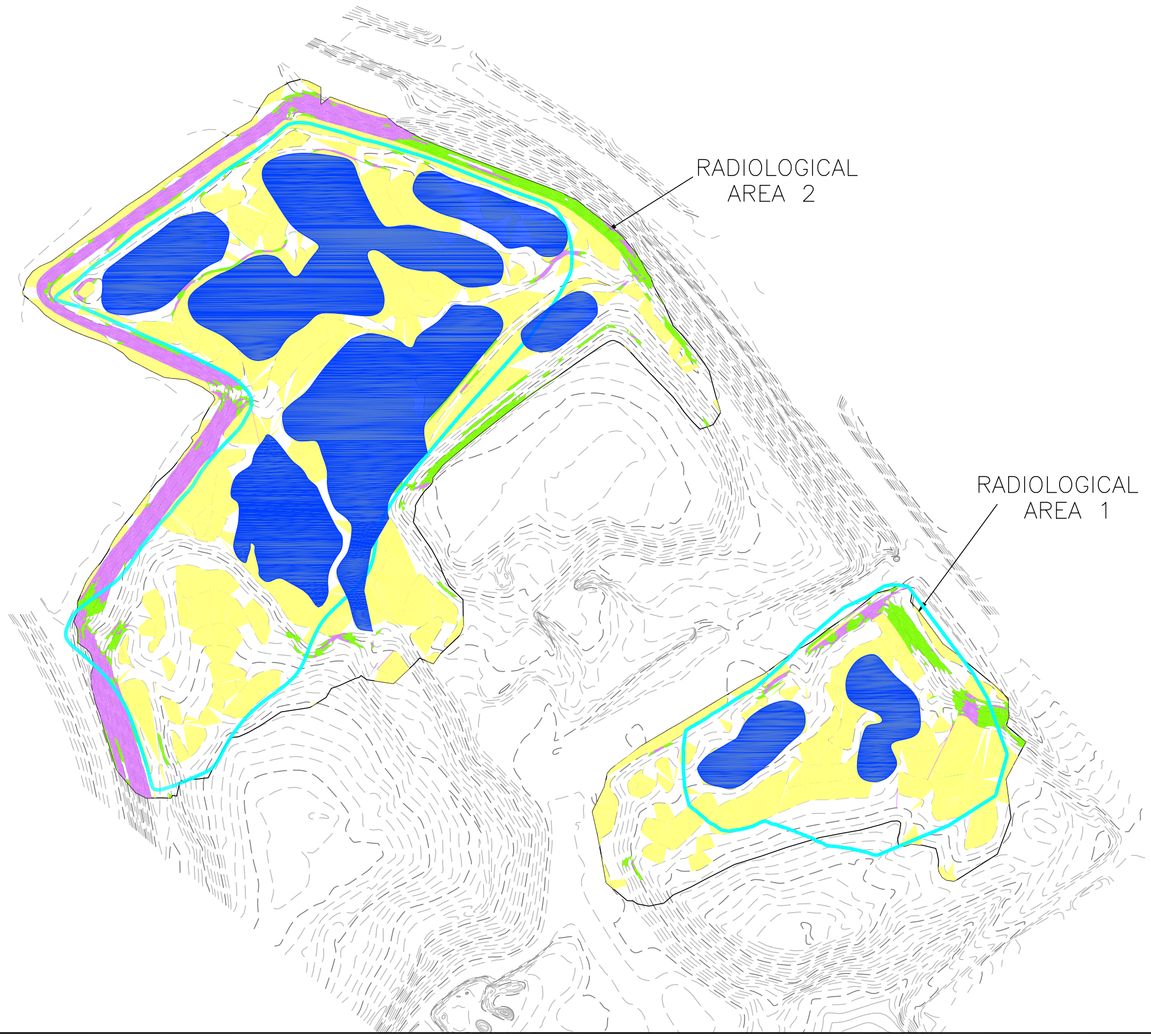

LEGEND

- EXISTING SURFACE CONTOURS
- AREAS WITH APPROXIMATE SLOPE OF 2% OR LESS
- AREAS WITH APPROXIMATE SLOPE OF >2% OR <5%
- AREAS WITH APPROXIMATE SLOPE OF 25% TO 33%
- AREAS WITH APPROXIMATE SLOPE OF 33% OR GREATER

feet
0 300

N

Figure 4-7
Portions of Areas 1 and 2
With Slopes <2% and <5%
Or >25% and >33%
West Lake Landfill OU-1 Feasibility Study

EMSI Engineering Management Support, Inc.

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LEGEND

EXISTING SURFACE CONTOURS

THICKNESS OF FILL TO ACHIEVE BOTTOM OF COVER WITH 2% SLOPE

feet
0 300

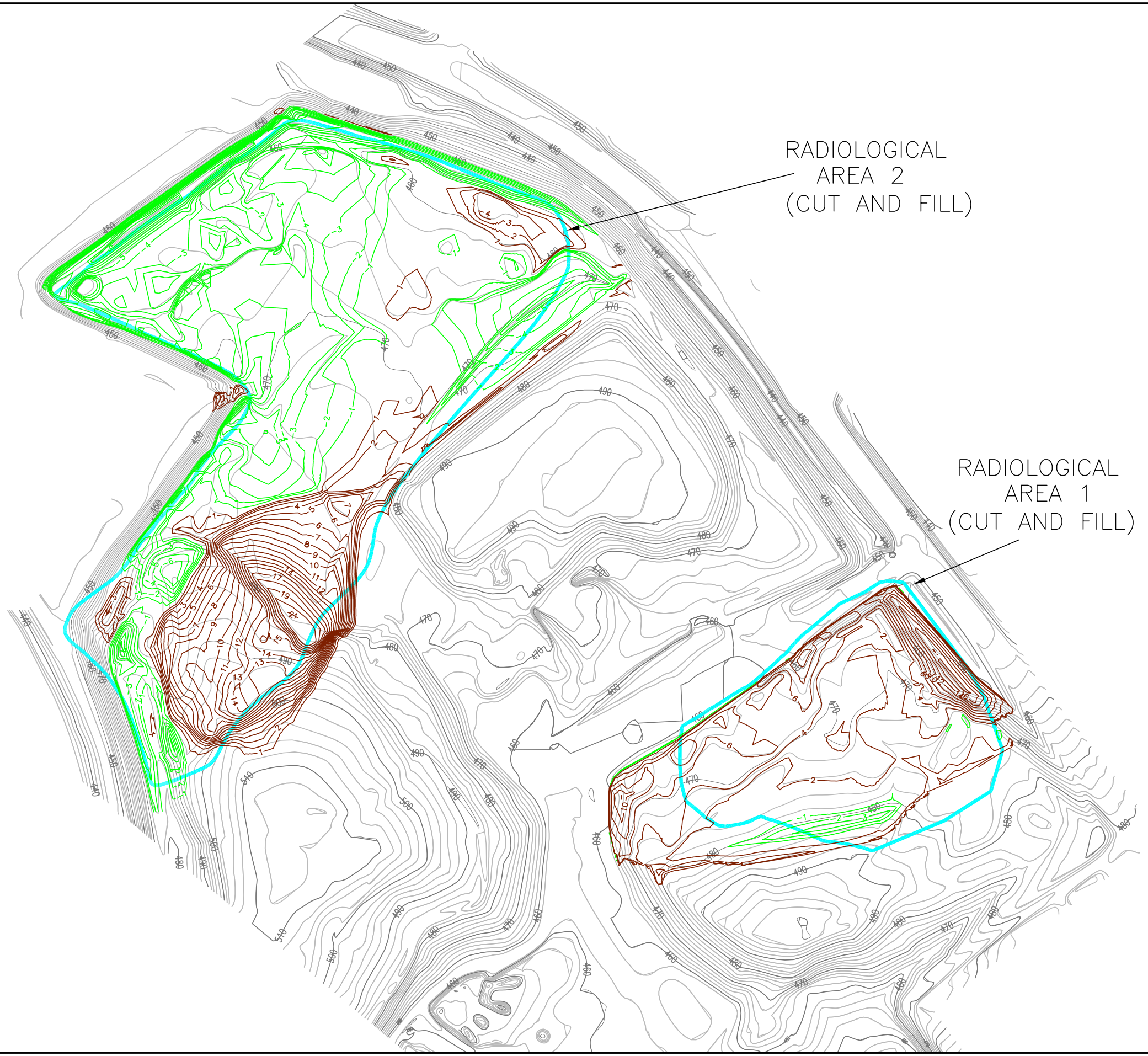
N

Figure 4-8
Thickness of Fill
(Exclusive of Cover System)
To Achieve 2% Minimum Slopes
Alternative L4

West Lake Landfill OU-1 Feasibility Study

EMSI Engineering Management Support, Inc.

M:\CLIENTS\EMSI\WESTLAKE\4-04\JOES-FIGURES\WL-AIR-ISOPACHS-2_5PERCENT.DWG-(AIR SPACE TO 2%) ISOPACH (2) 04/05/2005 12:35PM



LEGEND

- EXISTING SURFACE CONTOURS
- THICKNESS OF FILL TO ACHIEVE BOTTOM OF COVER WITH 2% SLOPE
- THICKNESS OF CUT TO ACHIEVE BOTTOM OF COVER WITH 2% SLOPE

feet
0 300

N

Figure 4-9
Thickness of Cut and Fill
(Exclusive of Cover System)
To Achieve 2% Minimum Slopes
Alternative L4

West Lake Landfill OU-1 Feasibility Study

EMSI Engineering Management Support, Inc.

M:\CLIENTS\EMSI\WESTLAKE\5-04\2 PERCENT CUT FILL ISOPACH-FIG4-9A.DWG-LAYOUT1 05/08/2006 2:58PM

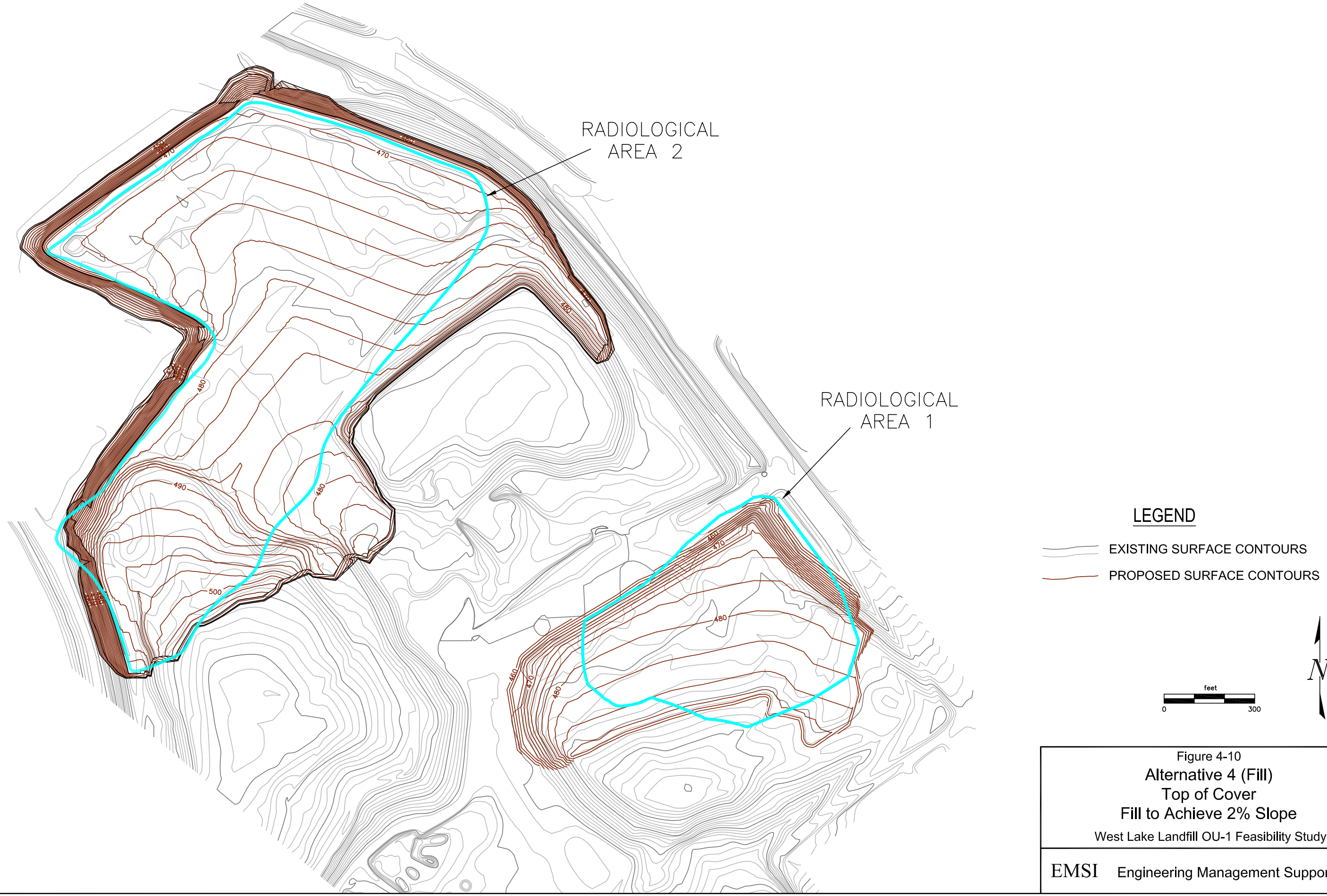


Figure 4-10
Alternative 4 (Fill)
Top of Cover
Fill to Achieve 2% Slope
West Lake Landfill OU-1 Feasibility Study

EMSI Engineering Management Support, Inc.

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Figure 4-11
Alternative 4 (Cut/Fill)
Top of Cover
Cut/Fill to Achieve 2% Slope
West Lake Landfill OU-1 Feasibility Study

EMSI Engineering Management Support, Inc.

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LEGEND

EXISTING SURFACE CONTOURS

THICKNESS OF FILL TO ACHIEVE BOTTOM OF COVER WITH 5% SLOPE

feet
0 300

N

Figure 4-12
Thickness of Fill
(Exclusive of Cover System)
To Achieve 5% Minimum Slopes
Alternative L5

West Lake Landfill OU-1 Feasibility Study

EMSI Engineering Management Support, Inc.

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Figure 4-13

Thickness of Cut and Fill
(Exclusive of Cover System)
To Achieve 5% Minimum Slopes
Alternative L5

West Lake Landfill OU-1 Feasibility Study

EMSI Engineering Management Support, Inc.

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LEGEND

EXISTING SURFACE CONTOURS

PROPOSED SURFACE CONTOURS

feet
0
300

N

Figure 4-14
Alternative L5 (Fill)
Top of Cover
Fill to Achieve 5% Slope
West Lake Landfill OU-1 Feasibility Study

EMSI Engineering Management Support, Inc.

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Figure 4-15
Alternative 5 (Cut/Fill)
Top of Cover
Cut/Fill to Achieve 5% Slope
West Lake Landfill OU-1 Feasibility Study

EMSI Engineering Management Support, Inc.

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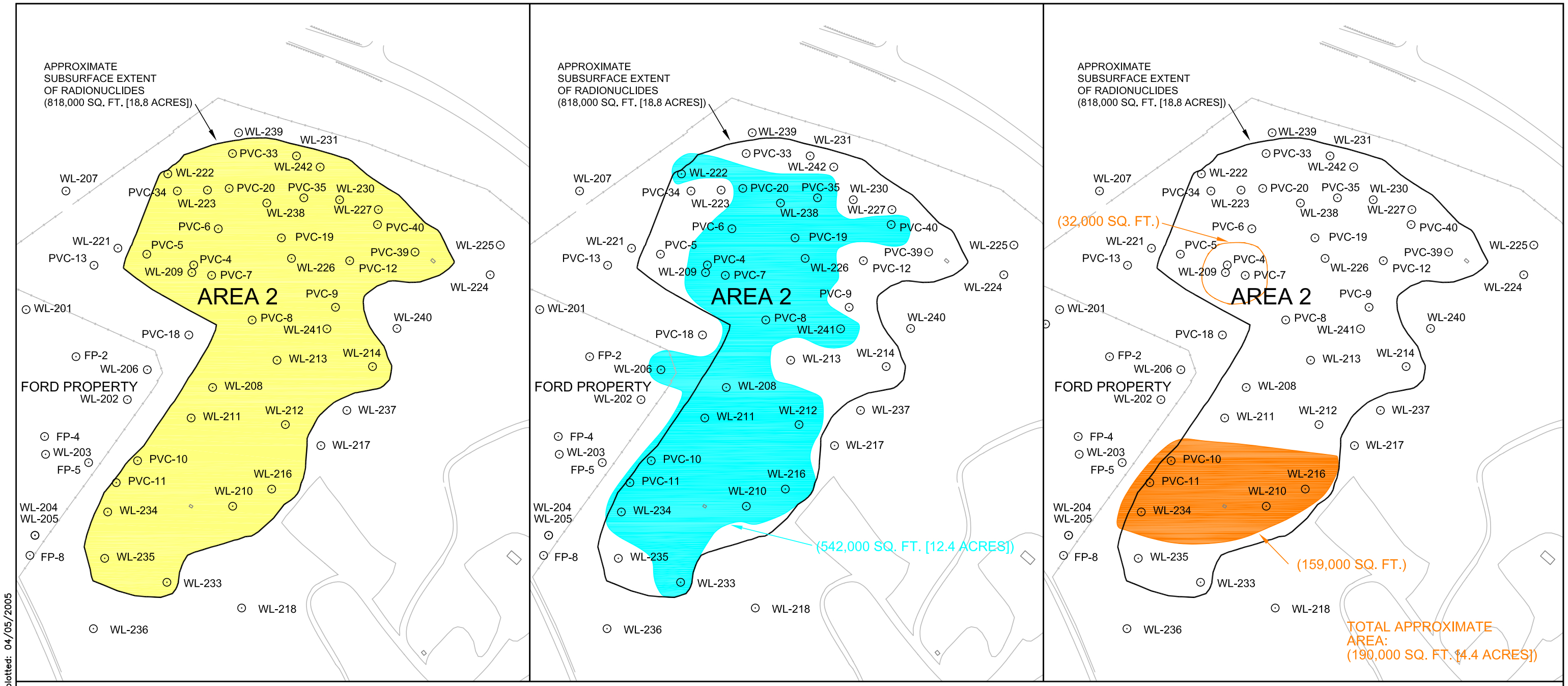

Area with downhole gamma readings above 6,000 cpm and/or occurrences of individual radionuclides above background plus 15 pci/g

Area with downhole gamma readings above 100,000 cpm and/or occurrences of individual radionuclides above 100 pci/g

Area with downhole gamma readings above 500,000 cpm and/or occurrences of individual radionuclides above 1,000 pci/g

feet
0
300

N

Figure 4-16

Approximate Extent of Area 2 with Elevated Downhole Gamma/Radionuclide Occurrences (Alternative L6)

West Lake Landfill OU-1 Feasibility Study

EMSI Engineering Management Support, Inc.

M:\clients\EMSI\westlake\11-04\Fig4-16-Area2-Alt16-.dwg plotted: 04/05/2005