PHASE II ENVIRONMENTAL SITE ASSESSMENT
DRESSER RAND COMPANY
1106 WASHINGTON STREET, BURLINGTON, IOWA
USEPA BROWNFIELDS ASSESSMENT GRANT
SOUTHEAST IOWA BROWNFIELDS REDEVELOPMENT INITIATIVE

USEPA Cooperative Agreement No. BF-98747801
Terracon Project No. 07087052
September 17, 2009

Prepared for:

Southeast Regional Commission
seirpc

BURLINGTON, IOWA

Prepared by:

Terracon

BETTENDORF, IOWA

Terracon

September 17, 2009

Mr. Mike Norris
Southeast Iowa Regional Planning Commission
200 Front Street, Suite 400
Burlington, Iowa 52601

Re: Phase II Environmental Site Assessment
Dresser Rand Company
1106 Washington Street
Burlington, Des Moines County, Iowa 52601
Project No. 07087052

Dear Mr. Norris:

Terracon presents to the Southeast Iowa Regional Planning Commission (SEIRPC) and the United States Environmental Protection Agency - Region 7 (EPA 7) this Phase II Environmental Site Assessment (ESA) report for the property locate at 1106 Washington Street.

This Phase II ESA was completed as part of an EPA 7 Brownfields Assessment Grant project known as the Southeast Iowa Brownfields Redevelopment Initiative (the Project). Brownfields are considered real property of which the expansion, redevelopment, or reuse may be complicated by the presence or potential presence of a hazardous substance, pollutant, or contaminant. The USEPA provides financial and technical assistance for brownfields revitalization, including grants for environmental assessment, cleanup, and job training. The USEPA awarded the SEIRPC with a $200,000 assessment grant to assess brownfield sites located in southeast Iowa.

This Phase II ESA report presents and evaluates data from recent field activities including the completion of soil borings and the collection of soil and water samples for chemical analyses. Terracon conducted field activities in compliance with plans developed specifically for the Project. Specifically, these plans were as follows.

- *Project Plan - Part 1: General Management and Phase I Environmental Site Assessment,* January 20, 2009, EPA approval not required.
- *Generic Quality Assurance Project Plan*, February 20, 2006, and updated on March 4, 2009, conditionally approved by EPA7 on April 4, 2006
- *Property-Specific Sampling and Analysis Checklist,* February 26, 2009, approved by EPA 7 on March 16, 2009.

The Phase II ESA provides preliminary intrusive information specific to the needs of the SEIRPC as part of determining redevelopment potential of the site. Although the report

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ACRONYMS AND ABBREVIATIONS

95UCL .... 95% Upper Confidence Limit on the Mean
ATSDR .... Agency for Toxic Substances and Disease Registry
CERCLA .... Comprehensive Environmental Response, Compensation, and Liability Act
Checklist .... Property-Specific Sampling and Analysis Checklist
CSM .... Conceptual Site Model
CY .... cubic yard
EDD .... Electronic Data Deliverable
EPA 7 .... United States Environmental Protection Agency Region 7
EQL .... Estimated Quantitation Limit
ESA .... Environmental Site Assessment
ESC .... Environmental Science Corporation
eV .... electron-volt
Grant .... Brownfields Assessment Grant
HAL .... Health Advisory Level
IAC .... Iowa Administrative Code
IDNR .... Iowa Department of Natural Resources
LEED® .... Leadership in Energy & Environmental Design
LRP .... Land Recycling Program
m/day .... meters per day
MCL .... Maximum Contaminant Level
MDL .... Method Detection Limit
mg/kg .... milligrams per kilogram, generally equivalent to ppm
mg/L .... milligrams per liter, generally equivalent to ppm
MOA .... Memorandum of Agreement
NFA .... No Further Action
NPL .... National Priorities List
PAH .... Polycyclic Aromatic Hydrocarbon
PID .... Photoionization Detector
POTW .... Publicly Owned Treatment Works
ppm .... parts per million
ppmi .... parts per million isobutylene equivalents
Project .... Southeast Iowa Brownfields Redevelopment Initiative
QA .... Quality Assurance
QAPP .... Generic Quality Assurance Project Plan
QC .... Quality Control
RACER .... Remedial Action Cost Engineering and Requirements
RBCA .... Risk-Based Corrective Action
REC .... Recognized Environmental Condition
RPD .... Relative Percent Difference
SARA .... Superfund Amendments and Reauthorization Act
SEIRPC .... Southeast Iowa Regional Planning Commission
SVE .... Soil Vapor Extraction
TDS .... Total Dissolved Solids
TSOP .... Terracon Standard Operating Procedure-Bettendorf Office
USEPA .... United States Environmental Protection Agency
USGBC .... United States Green Building Council
USGS .... United States Geological Survey

EXECUTIVE SUMMARY

The USEPA awarded the SEIRPC a $200,000 Brownfields Assessment Grant to help address the adverse impacts associated with a large number of brownfield properties located in southeast Iowa. The purpose of the Project is to promote area development and commercial activity. This Phase II ESA is part of the SEIRPC's evaluation of redevelopment feasibility.

A Phase I ESA previously conducted for the site identified conditions of potential environmental impairment. This Phase II ESA physically and chemically evaluated if actual environmental impairment had occurred in association with the conditions. Terracon evaluated the site through sampling and testing of soil and groundwater using a combination of judgmental and statistical sampling designs approved by EPA 7. Laboratory analyses of samples measured chemicals in soil and groundwater above laboratory reporting limits.

Soils and groundwater of the property are environmentally impacted. Arsenic, lead, and PAH concentrations in excess of statewide standards for soil were identified in numerous locations, generally distributed throughout the soils. Concentrations of cadmium, lead and pentachorophenol in excess of statewide standards were identified in or more groundwater at sample locations.

The Phase II evaluation developed cost estimates of remedy for a range of scenarios relative to restoration to statewide and site-specific standards for soil and groundwater. Cost models calculated estimates for combinations of remedies for restoration of the affected areas to land uses ranging from commercial to unrestricted residential occupancy, ranging from approximately $84,000 to $2,170,000. If the property is redeveloped for commercial or public open use scenarios other than single-family dwellings, remedies can include risk-based management of many conditions rather than physical.

The affected areas defined by this Phase II ESA appear eligible for enrollment in the LRP to seek closure and a NFA certificate transferable to future successors to title.

PHASE II ENVIRONMENTAL SITE ASSESSMENT
DRESSER RAND
1106 WASHINGTON STREET
USEPA BROWNFIELDS ASSESSMENT GRANT
SOUTHEAST IOWA BROWNFIELDS REDEVELOPMENT INITIATIVE

USEPA Cooperative Agreement No. BF-98747801
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September 17, 2009

1.0 INTRODUCTION

The USEPA awarded the SEIRPC a $200,000 Brownfields Assessment Grant to help address the adverse impacts associated with a large number of brownfield properties located in southeast Iowa. The purpose of the Project is to promote area development and commercial activity. This Phase II ESA is part of the SEIRPC's evaluation of redevelopment feasibility.

The following sequential decision elements are necessary to determine feasibility for redevelopment.

- Does the potential for environmental impairment implied by site conditions exist?
- If identified, has a potential actually resulted in environmental impairment?
- If impaired, does the degree of impairment negatively affect the feasibility for redevelopment of the property?

1.1 Purpose

The purpose of the Project is to provide a mechanism to supplement existing efforts to evaluate parcels for redevelopment and stimulate economic reuse of Brownfield properties in southeast Iowa.

1.2 Problem Statement

Data collected using the USEPA grant is subject to specific QA/QC requirements. The Phase II ESA must evaluate the observed chemical concentrations relative to the primary project decision, that being, "Is the property environmentally impacted?" The primary project decision consists of a comparison of site conditions to Statewide Standards established by 567 IAC 137: *Iowa Land Recycling Program and Response Action Standards.* The IDNR implements these regulations through the LRP.

This report discusses other secondary, but important, decisions affecting feasibility for redevelopment. The cost-to-remedy evaluation addresses the following.

- Can the property be considered feasible for "normal" redevelopment without environmental remedy?
- Can the property be reasonably considered for redevelopment if environmental remedy is required?
- What might be the magnitude of corrective action required for a specific future land use?
- What might be the potential magnitude of remedial costs associated with typical approaches to corrective action?

Iowa has established rules and programs for evaluation of environmental impairment. These include RBCA programs and the LRP. The appropriate programs overlap in some instances regarding regulation of environmental impairment and releases to soil, groundwater, and air. In certain circumstances, environmental issues overlap regulatory programs. These overlaps must be resolved for evaluation. The IDNR has indicated a preference to conduct soil and groundwater evaluations for public risk under the LRP.

1.3 Background

Since the Grant award, significant planning, assessment, and preparation have occurred.

On January 20, 2009, Terracon submitted Project Plan - Part 1: *General Project Management and Phase I Environmental Site Assessment*. This document is a technical and management supplement to the preliminary Work Plan submitted by the City during grant planning, and did not require EPA 7 review or approval.

On February 20, 2006, Terracon submitted the QAPP for the Project. This document provides a baseline for planning and implementation of Phase II ESAs and evaluation activities. EPA 7 conditionally approved the QAPP on April 4, 2006. Terracon submitted an addendum to the QAPP, addressing EPA 7 comments, on April 5, 2006.

On February 26, 2009, Terracon submitted a Checklist for this site. This document guides the assessment of the site using the procedures documented in the QAPP. EPA 7 approved the Checklist on March 16, 2009.

1.4 Historical Site Information

The Phase I ESA for this property, dated February 24, 2009, did not identify conditions of imminent hazard to public health or the environment. A cursory summary of the recognized environmental conditions (RECs) from the Phase I ESA is provided as follows.

- REC 1: Historic oil and solvent storage on the site
- REC 2: Documented fill material on the site
- REC 3: Historic coal storage on the site
- REC 4: Historic fuel oil underground storage tanks (USTs) and aboveground storage tanks (ASTs) on the site
- REC 5: Historic manufacturing operations at the site
- REC 6: Historic filling station on the north adjoining property
- REC 7: Historic auto service facility and filling station northeast of the site
- REC 8: Historic filling station adjoining the southern portion of the site to the east
- REC 9: Pioneer Linseed Oil Works facility and associated ASTs northeast of the site
- REC 10: Potential for past releases to a floor drain located near the paint booth and acid pickling tank
- REC 11: Air compressor oils on cracked concrete floor and near a floor drain
- REC 12: Historic transformer oils used in current-day transformers
- REC 13: Documented contamination on the site
- REC 14: Possible discharge of oil through machine pits to the soil beneath the floor of the Turbine Plant building
- REC 15: Surface staining on the concrete surrounding the acetylene generators

This Phase II ESA evaluated if the RECs have resulted in actual environmental impairment. This was accomplished through sampling and testing of soil and groundwater using a combination of judgmental and statistical sampling designs approved by EPA 7. Laboratory analyses of samples measured chemicals in soil and groundwater above laboratory reporting limits.

Measurement of chemicals does not mean excess chemical risk is present for public health or the environment. The concentration of a chemical, the chemical's ability to do harm, the degree to which the public could be exposed to the chemical, and the degree to which the public requires protection determine if measured chemicals are at "safe" levels. These factors vary significantly with different types of land use (e.g., less chemical is acceptable for residential or family land use than is considered "safe" for industrial land use). In considering the feasibility of redeveloping a brownfield, the future land use is not yet known. This Phase II ESA must consider a range of possible land uses and present possible planning considerations to remedy chemical impairment consistent with different land uses.

Terracon evaluated the range of potential remedies associated with two types of possible land use: residential (unrestricted) and non-residential.

In evaluating the secondary issues the City must consider for redevelopment, remedy to conditions for unrestricted land use through physical corrective action and treatment could be expensive. Remedy to conditions for non-residential land use using some physical corrective action combined with institutional controls is often feasible with a resultant cost of remedy much lower than that required for unrestricted use.

1.5 Principal User

The SEIRPC is the principal end user of this information. Although the report is available for review by the public, further reliance by others is beyond the scope of the grant and USEPA funding.

The SEIRPC will make primary use of the data to aid in decision-making relative to considering properties for redevelopment. The data will not constitute the sole or final factor in the positive or negative feasibility determination for redevelopment. It is anticipated that this Phase II ESA is for preliminary characterization and, if needed, will be used as the basis for secondary phases of remedial investigation.

The information contained in this report is for the sole benefit of the SEIRPC in determining feasibility for redevelopment and restoration of the property. The information and funding expended to produce it does not provide windfall or extraneous benefits to property owners.

2.0 PROPERTY DESCRIPTION

2.1 Site Location

The site is located within the Southwest ¼ of Section 32, Township 70 North, Range 2 West in Des Moines County, Iowa. The site was located at the northwest corner of Central and Washington Streets, Parcel No. 1132455002 in Burlington, Des Moines County, Iowa. The site was a 5.14-acre tract of land located at 1106 Washington Street in Burlington, Des Moines County, Iowa. The site is currently developed with two ~50,000-square foot vacant industrial buildings separated by a BNSF main line. The property was bounded by Agency Street to the north, Osborn Street to the northeast, North Central Avenue to the east, residential development to the south, and the Flexible Plastic Foam Company to the west.

Figure 1 in Appendix A depicts the site's location on a portion of the USGS 7.5-minute series topographic map for the area.

2.2 Natural Setting

2.2.1 Flood Plains

According to the Federal Emergency Management Agency (FEMA) flood insurance rate map, community panel number 190114005C, dated July 2, 1981, the site is located within Zones A and C. Zone A is defined as areas of 100-year flood with base flood elevations and flood hazard factors not determined. Zone C is defined as areas of minimal flooding.

2.2.2 Soil Conditions

According to the Soil Survey Map website by the United States Department of Agriculture Soil Conservation Service, soils in the project area predominantly Urban Land. Urban land consists of areas in which more than 85 percent of the surface is covered by asphalt, concrete, buildings, or other impervious materials. These areas exist on land that has been extensively reshaped by cutting and filling to achieve a nearly level surface.

2.2.3 Geologic Conditions

According to the Geologic Map of Iowa, published by the Iowa Geological Survey in 1969, the site is underlain by Devonian system, Osage Series, Burlington Limestone. Burlington Limestone is characterized by grey fossiliferous limestone and darker grey dolomite; white and grey mottled fossiliferous chert, locally contains dolomite crystals; and two widespread glauconite zones; basal sandstones in southeastern Iowa.

2.2.4 Hydrogeologic Conditions

According to Principal Aquifers Map published by the United States Geological Survey, revised 2003, the subject site is characterized by Silurian-Devonian aquifers. Historically Post and Hawkeye Creeks flowed through the site. Prior to 1950, the City of Burlington constructed a sewer (Hawkeye Sewer) underneath the site to contain the flow of the creeks.

2.2.5 Surface Water

Surface water features do not adjoin the subject site. The nearest body of surface water is the Mississippi River, located approximately 3,000 feet east of the site. The site is located in a valley with regional drainage to the east southeast.

3.0 PHASE II ESA

Terracon completed the following tasks.

- Terracon mobilized equipment and field personnel to the site.
- Terracon advanced a total of 35 borings designated B-1 to B-35 to varying depths. Figure 2 in Appendix A depicts the soil boring locations.
- Terracon collected soil samples from the borings continuously. Terracon field screened the soil samples for organic vapors using a PID.
- In each soil boring, Terracon selected a soil sample from the zero to two foot depth interval and one soil sample from below two feet. Terracon based the sample selection on the field screening results and visual observations. Soil samples were analyzed for VOCs/BTEX, SVOCs/PAHs, pesticides, PCBs, and RCRA metals using USEPA Methods 8260B, 8270C, 8081A, 8082, and 6010/7000, respectively.
- Terracon installed and developed groundwater monitoring wells at locations B-1, B-3, B-4, B-6, B-7, B-14, B-16, B-17, B-18, B-21, B-23, B-26, B-28, B-29, B-32, B-33, B-34, and B-35. Groundwater was not encountered in monitoring wells B-1, B-4, and B-14. In the absence of groundwater, Terracon performed a permeability test on soil samples collected from the bottom of the borings.
- Terracon collected groundwater samples from the monitoring wells for analysis of VOCs/BTEX, SVOCs/PAHs, pesticides, PCBs, and RCRA metals using USEPA Methods 8260B, 8270C, 8081A, 8082, and 6010/7000, respectively.
- Terracon conducted hydraulic conductivity testing on monitoring wells B-6, B-18, and B-33.

- Preliminary laboratory data indicated a highly elevated lead concentration in the groundwater sample and duplicate collected from boring B-28. Soil samples at that location did not exhibit highly elevated lead concentrations.

- As a deviation to the Checklist, Terracon mobilized equipment and field personnel to the site to resample the monitoring well and to advance four soil borings, B-36, B-37, B-38, and B-39, in each cardinal direction from boring B-28. Terracon collected a soil sample from each boring for analysis of lead using USEPA Method 6010.

3.1 Methodology

Terracon followed standard procedures for sampling, physical measurements, equipment cleaning, construction of wells, and equipment calibration. The TSOPs that accompanied the sampling team incorporate industry protocols, internal procedures, and equipment operation manuals. The Checklist specified the appropriate TSOPs for use at the site. Terracon recorded discrepancies, clarifications, and corrective actions for QA, if applicable, in the field logbook (Appendix D).

3.2 Property-Specific TSOPs

The Checklist specified the following TSOPs. Terracon implemented these TSOPs during the fieldwork portion of the ESA.

Table 3-1 Phase II ESA TSOPs

NEEDED FOR THIS SITE	REFERENCE NO.		TITLE OF PROCEDURE
☒	E.10		Project Mobilization
☒	E.20		Standard Safe Operating Procedures for Hazardous Waste Operations
☒	E.30		Chain of Custody Documentation
☒	E.50		Sampling – Environmental Representativeness
☒	E.300		Sampling & Drilling Platforms
☒		E.310	Auger Drilling and Sampling
☒		E.320	Hollow-stem Auger Drilling
☒		E.340	Air Rotary Drilling and Sampling
☒	E.410		Subsurface Sampling – General Push-Probe Technology
☒	E.460		Subsurface Sampling – Shelby Tube
☒	E.465		Subsurface Sampling – Split Barrel
☒	E.468		Sample Handling – Soil (Level D)
☒	E.470		Sample Handling – Groundwater (Non-Hazardous)
☒	E.5XX		Field Screening
☒		E.552	Field Headspace Screening – Soil / Photoionization Detector
☒		E.554	Field Screening – Air / Photoionization Detector
☒	E.700		Well Construction – Temporary
☒	E.905		Well Security – Type B (Locking Expansion)
☒	E.1300		Well Development – Volumetric
☒	E.1500		Boring Abandonment – Commercial Sealant
☒	E.1700		Well Abandonment – Iowa IAC39 Criteria

NEEDED FOR THIS SITE	REFERENCE NO.		TITLE OF PROCEDURE
☒		E.1800	Field Measurement – Surface Layout
☒		E.1805	Field Measurement – Elevations
☒		E.1810	Field Measurement – Subsurface Soils
☒		E.1820	Field Measurement – Groundwater
☒		E.1840	Field Measurement – Hydraulic Conductivity Testing (Slug)
☒	E.1900		Groundwater Sampling – Bailer
☒		E.2210	General
☒		E.2220	Disposal of Spent Supplies
☒		E.2230	Handling and Storage of Drill Cuttings (Non-Hazardous)
☒		E.2405	Cleaning - General
☒		E.2410	Cleaning - Manual Washing
☒		E.2420	Cleaning - High-Pressure, Hot-water Washing

4.0 ASSESSMENT RESULTS

4.1 Physical Measurements and Field Screening

4.1.1 Soil Lithology

Generally, Terracon encountered fill material consisting of sandy clay with cinders, cinders, brick, gravel, slag, and other fill indicators in the upper three to six feet. Fill material was not observed in borings located on the west and southwest portion of the site. Below the fill, Terracon generally encountered silty clay and silty clay with some sand and gravel. Limestone was encountered in boring B-7 at approximately eight feet below the ground surface (bgs). Glacial till was encountered at depths below ten to 14 feet bgs in borings north and south of the Hawkeye sewer.

4.1.2 Field Screening

Terracon field screened the soil samples for organic vapors using a PID. This device provides a direct reading in ppmi. The PID is a nonspecific total vapor detector and cannot be used to identify unknown substances; it can only roughly quantify them. Upon removal of the sampler from the borehole, Terracon cut a portion of each sample and sealed it in a Ziplock™ bag. After a stabilization period, Terracon screened the headspace above the soil using the PID equipped with a 10.2 eV ultraviolet lamp source. Terracon gas-calibrated the PID in accordance with the manufacturer's recommendations before the field activities. The boring logs include the field screening results for each soil boring.

In general, PID readings were approximately 10 ppmi or less in each of the samples screened. The field screening results were not indicative of impact by VOCs.

4.1.3 Shallow Groundwater Flow

Terracon obtained groundwater elevation data from the monitoring wells to estimate groundwater flow direction. Terracon modeled the data using a Kriging data evaluation method packaged with Surfer™ contouring software. Terracon created groundwater contours using the water levels and contours generated by the software. The groundwater contours indicate that groundwater flow beneath the site is generally towards the south with localized flow toward the Hawkeye sewer. Figure 3 in Appendix A depicts the groundwater contours. The gradient between borings B-34 and B-16 was measured to be approximately 0.0176.

4.1.4 Hydraulic Conductivity Testing

Terracon determined in-situ hydraulic conductivity using the Bouwer and Rice model. Terracon conducted bail-down tests were conducted on monitoring wells B-6, B-18, and B-33. In a bail-down test, water is removed from the well using a bailer and the recovery of the water level is measured using an electronic water tape. The data is evaluated to find the hydraulic conductivity of the aquifer at each test point. The wells exhibited hydraulic conductivities of 0.785 m/day (B-6), 1.57 m/day (B-18), and 0.219 m/day (B-33). Appendix F contains slug test printouts from the evaluation.

In Iowa, groundwater is classified as Protected or Nonprotected. In most cases, the primary determining factor for classification is hydraulic conductivity. Protected Groundwater has a hydraulic conductivity greater than 0.44 m/day. Based on the conductivities measured, the average hydraulic conductivity of the aquifer at the site meets the definition of a Protected Groundwater.

Groundwater was not encountered in borings B-3, B-4, and B-14. At the boring termination in each of the borings, Terracon encountered fine silty clay. Terracon collected a soil sample from the bottom of each boring using a Shelby tube. Terracon extruded the samples from the tubes and performed a permeability test on each soil samples by Method ASTM D 5084. Laboratory results indicated a permeability of 5.4×10^{-8} centimeters per second (cm/sec) (4.6×10^{-5} m/day) for boring B-3, 3.6×10^{-8} cm/sec (2.1×10^{-5} m/day)for boring for boring B-4, and 3.4×10^{-8} cm/sec (2.9×10^{-5} m/day) for boring B-14. Based upon the laboratory results, the encountered soil at the bottom of each of the borings represents a hydraulic barrier and potential chemical impairment encountered above the clay layer would not likely migrate into the groundwater. Appendix F contains the permeability results.

4.2 Laboratory Measurements

Terracon submitted soil and groundwater samples for laboratory analysis in accordance with the Checklist. In addition, soil samples from soil borings B-36, B-37, B-38, and B-39 were also collected and submitted for laboratory analysis. The following table summarizes the chemical measurements for each soil boring and monitoring well.

Table 4-1 Summary of Soil Laboratory Measurements

Location	REC #(s)	Number of Soil						
		VOCs	SVOCs	PCBs	Metals	pH	BTEX	PAHs
B1	5	2	2	2	2			
B2	5	2	2	2	2			
B3	5, 15	2	2	2	2			
B4	5	2	2	2	2			
B5	3, 5	2	2	2	2	2		
B6	3, 5	2	2	2	2	2		
B7	3, 5	2	2	2	2	2		
B8	3, 5	2	2	2	2	2		
B9	5	2	2	2	2			
B10	12		2	2				
B11	11							2
B12	5, 12	2	2	2	2			
B13	12		2	2				
B14	12		2	2				
B15	12		2	2				
B16	5, 8	2	2	2	2			
B17	8						2	2
B18	2, 5	2	2	2	2			
B19	2, 14	2	2	2	2			
B20	2	2	2	2	2			
B21	2, 5, 14	2	2	2	2			
B22	2, 5	2	2	2	2			
B23	2, 13	2	2	2	2			
B24	2, 13	2	2	2	2			
B25	2, 13	2	2	2	2			
B26	2, 5, 13	2	2	2	2			
B27	2, 5, 13	2	2	2	2			
B28	2, 7, 9	2	2	2	2			
B29	2, 13	2	2	2	2			
B30	13				2			2
B31	2, 13	2	2	2	2			
B32	2, 7, 9	2	2	2	2			
B33	2, 13	2	2	2	2			
B34	6, 13				2		2	2
B35	2, 6, 13	2	2	2	2			

Location	REC #(s)	Number of Soil						
		VOCs	SVOCs	PCBs	Metals	pH	BTEX	PAHs
B36	2, 7, 9				1			
B37	2, 7, 9				1			
B38	2, 7, 9				1			
B39	2, 7, 9				1			
	Totals:	54	62	62	62	8	2	10

Table 4-2 Summary of Groundwater Laboratory Measurements

Location	REC #(s)	Number of Water Samples						
		VOCs	SVOCs	PCBs	Metals	pH	BTEX	PAH
B1	5	1	1	1	1			
B3	5, 15	1	1		1			
B4	5	1	1	1	1			
B6	3, 5				1	1		1
B7	3, 5	1	1	1	1			
B14	12		1	1				
B16	5, 8	1	1	1	1			
B17	8						1	1
B18	2, 5	1	1	1	1			
B21	2, 5, 14	1	1	1	1			
B23	2, 13				1			1
B26	2, 5, 13				1			1
B28	2, 7, 9	1	1	1	1			
B29	2, 13				1			1
B32	2, 7, 9	1	1		1			
B33	2, 13	1	1	1	1			
B34	6, 13						1	1
B35	2, 6, 13						1	1
	Totals:	10	11	9	14	1	3	7

Laboratory analytical methods were in accordance with the Checklist. Appendix B contains tables summarizing the laboratory analytical results.

4.2.1 Laboratory Reporting Limits and Non-Detect Values

Laboratory technology cannot detect to concentrations of zero. Acknowledged by the USEPA, analytical methods dictate MDLs as the lower limit to which the procedures can accurately and repeatedly "see." The MDL is a minimum concentration of a substance that can be measured and reported with 99% confidence that the compound concentration is greater than zero. The MDL is determined from analysis within the given matrix of the sample and affected by matrix materials and/or other compounds within the matrix. EQLs are matrix-dependent and represent the minimum concentrations that can be routinely identified and measured within specified limits of precision and accuracy under normal laboratory operating conditions. EQLs are typically five to ten times the MDLs.

When the laboratory reports that a concentration of a chemical is "non-detect," or lower than the EQL, it does not mean that the chemical is not present in the sample. These compounds may actually be present but at levels lower than what the laboratory can accurately measure.

Some of the compounds have extremely low primary action limits, even below the reporting capabilities of typical laboratory equipment. This is especially true for the primary action limits for groundwater. In addition, the EQLs for some of the analyses for some of the samples were elevated due to matrix intereferences and other, not atypical, difficulties with the sample analyses. Interpreting these instances as indicators of chemical impact would result in determination of impact across the entire site. To avoid an extremely conservative approach that results in impact above primary action limits for the entire site, Terracon's evaluation progressed in the following fashion.

1. Was a concentration for the chemical reported by the laboratory (includes J-Flagged results)?
   - If no, further evaluation of the chemical was not conducted.
   - If yes, proceed to step 2.
2. Was the chemical detected above the primary action limit?
   - If no, further evaluation of the chemical was not conducted.
   - If yes, proceed to step 3.
3. Were there instances where the EQL exceeded the (primary or secondary) action limit?
   - If no, only detections above the action limit were evaluated as impacted areas.
   - If yes, the chemical was assumed present at the EQL when the EQL exceeded the action limit.

4.2.2 VOC/BTEX Analyses

4.2.2.1 Background

This chemical group is known as Volatile Organic Compounds, or VOCs. Benzene, toluene, ethylbenzene and xylnes (BTEX) are a petroleum indicator sub-set of VOCs. In lay terms, these chemicals readily evaporate to produce vapor. Many are often used as solvents in industry and manufacturing. Sampling and analysis require special care in the field and laboratory to guard against "losing" some of the materials from the soil/fill or groundwater samples before measurement takes place. The project methods provided this level of care.

The ATSDR describes VOCs as substances containing carbon and varying proportions of other elements such as hydrogen, oxygen, fluorine, chlorine, bromine, sulfur, or nitrogen. These substances easily become vapors or gases at room temperatures. A significant number of the VOCs are commonly used as solvents (paint thinners, lacquer thinner, degreasers, and dry cleaning fluids) or in petroleum hydrocarbon fuels (e.g., gasoline). Other information sources generally describe VOCs as organic compounds that evaporate easily.

When released into the atmosphere, VOCs contribute to the formation of ozone and smog, which have been linked to human health issues. In addition, VOCs can have direct adverse effects on human health. VOCs in the atmosphere come from combustible engines, industry, fuel spills, etc. Certain other fumes, such as those released from industrial plants, coating operations, and print shops can contain significant amounts of VOCs.

In addition to contributing to ozone and smog formation, VOCs can have direct adverse effects on human health. Many VOCs have been classified as toxic and carcinogenic (cancer causing) and it is therefore unsafe to be exposed to these compounds in large quantities or over extended periods. Some health effects from overexposure to VOCs are dizziness, headaches, and nausea. Long-term exposure to certain VOCs, such as benzene, has also been shown to cause cancer, and eventually death.

4.2.2.2 Results

Three VOCs were detected in one or more soil samples and four VOCs were detected in one or more groundwater samples. The following tables summarize the frequency of detection and maximum concentrations (in mg/kg for soil and mg/L for groundwater) for each VOC detected.

Table 4-3 Summary of VOCs Detected in Soil Samples

Chemical	Frequency of Detection	Maximum Detected Concentration	Location of Maximum Concentration	Exceeds Statewide Standard
Acetone	1 of 55 (2%)	0.29	B-27 12-16	No
Methylene Chloride	1 of 55 (2%)	0.04	B-6 6-8	No
Naphthalene	1 of 55 (2%)	.17	B-21 0-2	No
Tetrachloroethene	3 of 55 (54%)	0.016	B-27 12-16	No

Table 4-4 Summary of VOCs Detected in Groundwater Samples

Chemical	Frequency of Detection	Maximum Detected Concentration	Location of Maximum Concentration	Exceeds Statewide Standard
Bromo-dichloromethane	1 of 8 (12%)	0.0012	B-16	No
Chloroform	1 of 8 (12%)	0.0062	B-16	No
Ethylbenzene	1 of 12 (8%)	0.0014	B-18	No
p-Isopropyltoluene	1 of 8 (12%)	0.0023	B-33	No

4.2.3 SVOC Analyses

4.2.3.1 Background

This chemical group is known as Semi-Volatile Organic Compounds, or SVOCs. Poly-aromatic hydrocarbons (PAHs) are a sub-set of SVOCs. In lay terms, these are generally chemicals that less readily evaporate to produce vapor and are used in industry in a variety uses. Many of the compounds are also less soluble in water or other materials. Sampling and analysis do not require the same stringent care as for VOCs in the field and laboratory necessary to guard against vaporization of the materials from the soil/fill or groundwater samples before measurement takes place. The project methods provided the appropriate level of care required by the USEPA and the QAPP.

SVOCs, like VOCs, are organic compounds containing carbon and different proportions of other elements such as hydrogen, oxygen, fluorine, chlorine, bromine, sulfur, or nitrogen. Unlike VOCs, these compounds do not typically become vapors or gases at room temperature. A common group of SVOCs is the PAHs. The ATSDR describes PAHs as a group of over 100 different chemicals that are formed during the incomplete burning of coal, oil and gas, garbage, or other organic substances like tobacco or charbroiled meat. PAHs are usually found as a mixture containing two or more of these compounds, such as soot.

Some PAHs are manufactured. These pure PAHs usually exist as colorless, white, or pale yellow-green solids. PAHs are found in coal tar, crude oil, creosote, and roofing tar, but a few are used in medicines or to make dyes, plastics, and pesticides.

Animal studies have shown that PAHs can cause harmful effects on the skin, body fluids, and ability to fight disease after both short- and long-term exposure. These effects, however, have not been seen in people. The Department of Health and Human Services has determined that some PAHs may reasonably be expected to be carcinogens. Some PAHs have caused cancer in laboratory animals when they breathed air containing them, ingested them in food, or had them applied to their skin.

4.2.3.2 Results

A total of 16 SVOCs were detected in one or more soil samples and four SVOCs were detected in one or more groundwater samples. The following tables summarize the frequency of detection and maximum concentrations (in mg/kg for soil and mg/L for groundwater) for each SVOC detected.

Table 4-5 Summary of SVOCs Detected in Soil Samples

Chemical	Frequency of Detection	Maximum Detected Concentration	Location of Maximum Concentration	Exceeds Statewide Standard
Acenaphthene	7 of 69 (10%)	0.38	B-23 (0-2)	No
Acenaphthylene	7 of 69 (10%)	0.47	B-24 (0.5-2.5)	No
Anthracene	15 of 69 (22%)	1.1	B-23 (8-10)	No
Benzo-(a)anthracene	27 of 69 (39%)	3.5	B-23 (8-10)	Yes
Benzo(a)pyrene	26 of 69 (38%)	4.8	B-24 (0.5-2.5)	Yes
Benzo-(b)fluoranthene	28 of 69 (40%)	5.9	B-24 (0.5-2.5)	Yes
Benzo-(g,h,i)perylene	21 of 69 (30%)	2.6	B-24 (0.5-2.5)	No
Benzo-(k)fluoranthene	24 of 69 (35%)	2.5	B-24 (0.5-2.5)	No
Bis(2-ethylhexyl)-phthalate	1 of 69 (1.5%)	0.4	B-20 (0.5-2.5)	No
Chrysene	28 of 69 (41%)	3.1	B-23 (8-10)	No
Dibenz-(a,h)anthracene	14 of 69 (20%)	0.72	B-24 (0.5-2.5)	Yes
Fluoranthene	32 of 69 (46%)	9.1	B-23 (0-2)	No
Fluorene	5 of 69 (7%)	0.38	B-23 (0-2)	No
Indeno-(1,2,3-cd)pyrene	21 of 69 (30%)	2.8	B-24 (0.5-2.5	No
Naphthalene	12 of 65 (18%)	0.64	B-23 (0-2)	No
Phenanthrene	32 of 69 (46%)	7.6	B-23 (0-2)	No
Pyrene	34 of 69 (49%)	9.5	B-23 (0-2)	No

Table 4-6 Summary of SVOCs Detected in Groundwater Samples

Chemical	Frequency of Detection	Maximum Detected Concentration	Location of Maximum Concentration	Exceeds Statewide Standard
4-Nitrophenol	1 of 15 (7%)	0.0025	B-29	No
Di-n-octyl phthalate	1 of 15 (7%)	0.0016	B-23	No
Pentachlorophenol	1 of 15 (7%)	0.0011	B-23	Yes
Phenol	1 of 15 (7%)	0.002	B-23	No

4.2.4 PCB Analyses

4.2.4.1 Background

According to the ATSDR, PCBs are a group of synthetic organic chemicals that can cause a number of different harmful effects. There are no known natural sources of PCBs. They are either oily liquids or solids and are colorless to light yellow. Some PCBs are volatile and may exist as a vapor in air. They have no known smell or taste. PCBs enter the environment as mixtures containing a variety of individual chlorinated biphenyl components, known as congeners, as well as impurities. Because the health effects of environmental mixtures of PCBs are difficult to evaluate, most available information is in regards to about seven types of PCB mixtures that were commercially produced. These seven kinds of PCB mixtures include 35% of all the PCBs commercially produced and 98% of PCBs sold in the United States since 1970. Some commercial PCB mixtures are known in the United States by their industrial trade name, Aroclor. For example, the name Aroclor 1254 means that the mixture contains approximately 54% chlorine by weight, as indicated by the second two digits in the name. Because they don't burn easily and are good insulating materials, PCBs were used widely as coolants and lubricants in transformers, capacitors, and other electrical equipment. The manufacture of PCBs stopped in the United States in 1977 because there was evidence that PCBs build up in the environment and may cause harmful effects. Consumer products that may contain PCBs include old fluorescent lighting fixtures, electrical devices or appliances containing PCB capacitors made before PCB use was stopped, old microscope oil, and old hydraulic oil.

Once in the environment, PCBs do not readily break down. They can easily cycle between air, water, and soil, and are found all over the world. PCBs stick strongly to soil and will not usually be carried deep into the soil with rainwater. They do not readily break down in soil and may stay in the soil for months or years. Generally, the more chlorine atoms that the PCBs contain, the more slowly they break down.

PCBs are taken up into the bodies of small organisms and fish in water. They are also taken up by other animals that eat these aquatic animals as food. PCBs especially accumulate in fish and marine mammals (such as seals and whales), reaching levels that may be many thousands of times higher than in water. PCB levels are highest in animals high up in the food chain.

Many studies have looked at how PCBs can affect human health. Skin conditions, such as acne and rashes, may occur in people exposed to high levels of PCBs. These effects on the skin are well documented, but are not likely to result from exposures in the general population. Most human studies have many shortcomings, which make it difficult for scientists to establish a clear association between PCB exposure levels and health effects. Some studies in workers suggest that exposure to PCBs may also cause irritation of the nose and lungs, gastrointestinal discomfort, changes in the blood and liver, and depression and fatigue. Workplace concentrations of PCBs, such as those in areas where PCB transformers are repaired and maintained, are higher than levels in other places, such as air in buildings that have electrical devices containing PCBs or in outdoor air, including air at hazardous waste sites. Most of the studies of health effects of PCBs in the general population examined children of mothers who were exposed to PCBs.

Rats that ate food containing large amounts of PCBs for short periods of time had mild liver damage, and some died. Rats, mice, or monkeys that ate smaller amounts of PCBs in food over several weeks or months developed various kinds of health effects, including anemia, acne-like skin conditions, and liver, stomach, and thyroid gland injuries. Other effects caused by PCBs in animals include reductions in the immune system function, behavioral alterations, and impaired reproduction. Some PCBs can mimic or block the action of hormones from the thyroid and other endocrine glands. Because hormones influence the normal functioning of many organs, some of the effects of PCBs may result from endocrine changes. PCBs are not known to cause birth defects. Only a small amount of information exists on health effects in animals exposed to PCBs by skin contact or breathing. This information indicates that liver, kidney, and skin damage occurred in rabbits following repeated skin exposures, and that a single exposure to a large amount of PCBs on the skin caused death in rabbits and mice. Breathing PCBs over several months also caused liver and kidney damage in rats and other animals, but the levels necessary to produce these effects were very high.

Both EPA and the International Agency for Research on Cancer have determined that PCBs are probably carcinogenic to humans.

4.2.4.2 Results

PCB 1260 was detected in the soil sample collected from B-25 (8-12). The reported concentration of 0.069 mg/kg was below the soil Statewide Standard. PCBs were not detected above the laboratory reporting limit in the remaining soil samples or in the groundwater samples collected for PCB analysis.

4.2.5 Inorganic Analyses

4.2.5.1 Background

Inorganic compounds are generally considered reasonably stable, non-hydrocarbon based chemicals of concern. These compounds are typically elemental metals. This is not to say that some metals do not have other properties of volatilization or solubility (e.g., mercury, lead).

Metals occur naturally, and can result from activities related to our lifestyles (e.g., automobile exhaust, industrial activity, etc.). Heavy metals generally cause the most problems, since even low doses are toxic. Municipal and industrial wastes are the main sources. Heavy metals include mercury, lead, and cadmium. In most cases, we are exposed to these metals from the air and the food we eat, however, they can also be inhaled as dust particulate in the air we breathe or absorbed through the skin.

This assessment addressed the eight metals addressed by RCRA. These metals can cause a variety of health effects, including gastrointestinal disturbances, muscular weakness, kidney, liver, bone, and blood damage, and others.

4.2.5.2 Results

Arsenic, barium, cadmium, chromium, lead, mercury, and selenium were detected in one or more soil samples. Silver was not detected above laboratory reporting limits in the soil samples submitted for metals analysis. Barium, cadmium chromium, and lead were detected in one or more groundwater samples. Arsenic, mercury and selenium were not detected above laboratory reporting limits in groundwater samples submitted for metals analysis.

Table 4-7 Summary of Inorganics Detected in Soil Samples

Chemical	Frequency of Detection	Maximum Detected Concentration	Location of Maximum Concentration	Exceeds Statewide Standard
Arsenic	35 of 56 (62%)	110	B-27 (0.5-2.5)	Yes
Barium	56of 56 (100%)	170	B-28 (0-2)	No
Cadmium	42 of 56 (75%)	12	B-4 (2-4)	Standard Not Established
Chromium	55 of 56 (98%)	52	B-26 (0-2)	No
Lead	60 of 60 (100%)	13,000	B-23 (0-2), B-29 (0-2)	Yes
Mercury	40 of 56 (71%)	10	B-23 (0-2)	No
Selenium	22 of 56 (39%)	38	B-7 (0-2)	No

Table 4-8 Summary of Inorganics Detected in Groundwater Samples

Chemical	Frequency of Detection	Maximum Detected Concentration	Location of Maximum Concentration	Exceeds Statewide Standard
Barium	11 of 11 (100%)	0.63	B-28	No
Cadmium	1 of 11% (17%)	0.051	B-28	Yes
Chromium	3 of 11% (27%)	0.049	B-28	No
Lead	9 of 11% (82%)	0.041	B-7	Yes
Selenium	1 of 11% (17%)	0.023	B-33	No

5.0 FIELD DATA QUALITY

The QAPP set forth the procedures and methods for data collection. The Checklist defined the specific procedures and adjustments necessary to maintain data quality to support the project decision. The Phase II ESA required both field and laboratory checks to monitor conformance to project quality limits.

5.1 Property-Specific Corrective Actions

A field methods audit was not conducted during the fieldwork for this site; however, field practices were completed in accordance with the QAPP.

5.2 Quality Control Parameters

To assess whether quality assurance objectives for this project have been achieved, the following QC parameters were considered: precision, accuracy, representativeness, comparability, completeness, and sensitivity.

5.2.1 Precision and Accuracy

As described in the QAPP, precision is evaluated using the RPD between an actual sample and a duplicate sample. Accuracy is evaluated using a percent recovery measured in spiked and unspiked samples. Accuracy is a function of the laboratory method, and parameters regarding accuracy are included in the data quality package provided by the laboratory. These packages are included on CD-R with this Phase II ESA report in the interest of paperwork reduction.

Duplicate soil samples were collected from borings B-6, B-8, B-15, B-17, and B-39. Duplicate groundwater samples were collected from borings B-28 and B-35. For each compound, Terracon compared the maximum detected concentrations from each sample and its corresponding duplicate. The absolute values of the RPDs for soil ranged from approximately 0% to 137%. The absolute values of the RPDs for groundwater ranged from approximately 12% to 105%. The variability is likely due to a combination of laboratory uncertainty and variability in site conditions. For soil, the duplication of non-homogeneous samples is difficult due to matrix interference and commonly results in elevated RPDs. For groundwater, suspended solids in the samples commonly result in elevated RPDs.

Terracon evaluated the effects of the elevated RPDs on the project decisions. In Terracon's opinion, the elevated RPDs are not sufficiently elevated to influence the project decisions. Laboratory accuracy controls were documented in accordance with the laboratory's internal QA Manual. The laboratory followed SW-846 procedures.

5.2.2 Representativeness

Terracon has evaluated the representativeness of the Phase II ESA activities to document the degree to which the sample data accurately and precisely represents a characteristic of a population, parameter variations at a sampling point, or an environmental condition. Review of field methods and procedures indicated that sample collection, handling, and transportation were conducted in accordance with the QAPP and Checklist. Review of analytical results indicates that the analytical data is generally uniform and consistent between sampling points and with previous sampling and analysis activities.

5.2.3 Completeness

Laboratory analysis was completed on each of the samples collected in the field and submitted for analysis. Laboratory completeness was determined to be 100%.

5.2.4 Comparability

To produce comparable data, the units specified for analytical results obtained during the field activities are consistent throughout this project and standardized analytical methods have been used for each parameter.

5.2.5 Sensitivity

The EQLs were not sufficient to report concentrations below the statewide standards in all cases. Based upon the general guidelines discussed in Section 4.2.1, it is Terracon's opinion that the elevated EQLs do not affect the project decisions.

6.0 LABORATORY DATA QUALITY

The laboratory completed validation and verification of laboratory processes and data, and delivered a Level II data package to the Terracon Project Manager. The package, including laboratory written reports, documents compliance to the QAPP. In the interest of paperwork reduction, one copy of the document is available for viewing on file with the following.

- Southeast Iowa Regional Planning Commission, Burlington, Iowa
- EPA 7 Brownfields, Kansas City, Kansas
- Terracon, File #07087052, Bettendorf, Iowa

7.0 COMPARISONS USED IN MAKING THE PROJECT DECISIONS

Iowa has programs for evaluation of environmental impairment. The appropriate programs overlap in some instances regarding regulation of environmental impairment and releases to soil, groundwater, and air. The IDNR has indicated a Department preference to conduct soil and groundwater evaluations for public risk relative to the LRP.

7.1 Regulatory Setting

The LRP is a voluntary, risk-based cleanup program for properties with environmental impacts. The LRP is designed to meet the dual objectives of addressing contaminated sites and promoting the redevelopment of these sites. The primary means of meeting these objectives is by encouraging voluntary participation to address contamination, establishing a set of risk-based response action standards, and providing a measure of liability protection to participants and future property owners. Iowa has finalized an MOA with the USEPA. Under the MOA, the USEPA agrees not to act at sites enrolled in the LRP.

7.2 Iowa Statewide Comparison

The LRP establishes Statewide Standards that represent concentrations of contaminants in specific media of an affected area. These are values at which normal, unrestricted exposure through a specific exposure pathway are considered unlikely to pose a threat to human health, safety, or the environment. Risk-based contaminant concentrations for soil and groundwater are calculated using a formula that takes into account chemical specific properties concerning toxicity and assumptions about human exposure. The formula is used for each contaminant at a site, except for lead, which has default values specified in the regulations.

The comparison of reported chemical concentrations to the Statewide Standards is the primary project decision.

7.2.1 Statewide Soil Standards

Equation (1) is used to calculate the risk-based concentrations for compounds (other than lead).

$$C = \frac{RF \times AT \times 365\ days/year}{Abs \times [(ER_c \times EF_c \times ED_c) \div BW_c + (ER_a \times EF_a \times ED_a) \div BW_a] \times CF} \quad (1)$$

Where:

C = Risk-based concentration of contaminant
RF = Risk factor, which differs for carcinogenic and noncarcinogenic effects
AT = Averaging time
Abs = Absorption factor
ER_c = Exposure rate by a child
EF_c = Exposure frequency by a child
ED_c = Exposure duration by a child
BW_c = Body weight of exposed child
ER_a = Exposure rate by an adult
EF_a = Exposure frequency by an adult
ED_a = Exposure duration by an adult
BW_a = Body weight of exposed adult
CF = Conversion Factor

For lead, the IDNR has established a statewide standard of 400 mg/kg. The IDNR has also set a standard of 1,100 mg/kg for lead in non-residential scenarios and for residential soil ten feet or greater in depth. In lieu of the 1,100 mg/kg value, the IDNR allows the calculation of alternate standards using the USEPA's Exposure Model for Assessing Risk Associated with Adult Exposures to Lead in Soil. Instead of calculating an alternate value, Terracon conservatively used the 1,100 mg/kg standard.

7.2.2 Statewide Groundwater Standards

Statewide groundwater standards are determined as being the:

- MCL established by the USEPA, if one exists.
- If no enforceable MCL exists, the lifetime HAL.
- If no MCL or HAL exists, the standard is calculated using Equation (1) with input variables specified in the rule.

The statewide groundwater standard for a Nonprotected Groundwater Source is based on a series of tests and iterations of the formula used for soil standards, with input values that are dependent on the properties of the specific compound being evaluated.

A Protected Groundwater Source is defined as "...a saturated bed, formation, or group of formations which has a hydraulic conductivity of at least 0.44 m/day and a TDS concentration of less than 2,500 mg/L." A Nonprotected Groundwater Source is, by definition, a saturated bed, formation, or group of formations that has a hydraulic conductivity of less than 0.44 m/day or a TDS concentration in excess of 2,500 mg/L. The aquifer at the site is considered a Protected Groundwater Source; however, Terracon compared the site chemistry in groundwater to Statewide Standards for both Protected and Nonprotected Groundwater.

The LRP requires multiple sampling and testing events before making the comparisons of groundwater chemistry to standards for final determination of compliance. The period of monitoring may vary dependent on IDNR approvals if enrolled in the LRP. A "favorable" comparison is not necessarily sufficient for enrollment and closure in the LRP. Later sections discuss potential remedy and include possible activities that might be required to take a project to formal closure.

7.3 Iowa Site-Specific Comparison

The statewide standards assume that the property will be restored to unrestricted land use. They are protective of the most sensitive member of the population for the public exposures defined in the LRP rules. In general, this is sufficient for redevelopment or restoration for residential land use and residential occupancy by children.

The Project does not require restoration of all properties to levels of chemical risk so that future residence by families can occur. Land use for commercial/industrial use must also be considered, and is in fact often the primary consideration for reuse. The LRP rules recognize these considerations and include processes whereby site-specific standards can be determined for property-specific conditions of residential or non-residential land use. This is done by using site-specific values for the input variables in Equation (1). The values depend on specific land use and the depth below surface where impact is found.

Alternate site-specific variables can be substituted into the formula to calculate site-specific risk-based concentrations for different property use scenarios. Variables can be adjusted to evaluate risk from chemical impact at different depths in soil.

7.4 Application of the Standards

The user of this document must understand the limited applicability of the standards adopted under the authority of the LRP. The standards were developed within the narrow focus and constraints of the LRP. While the standards are based on a consideration of risk, they are different from other "risk-based" approaches.

The LRP does not contain standards that are established based on the migration of contaminants from one medium to another, which then becomes the basis for subsequent exposure. This does not mean the IDNR has no concern for these cross-media transfers. IDNR chooses to address them through direct measurement of the medium in which the exposure takes place or through the calculation of such cross-media transfer standards only when it is determined that such an approach is appropriate in a site-specific context. The intent is to avoid the application of needlessly restrictive standards to situations where they are not a relevant concern. Implicit in the final application of the standards is IDNR concurrence that the standards applied in any given situation address all exposure pathways that are deemed to be of concern. This can only take place when the IDNR is adequately informed of the particulars of a situation. Without IDNR concurrence there should be no presumption that a standard is sufficiently protective or that it will meet the requirements of the LRP.

Most of the standards entail very specific exposure assumptions. Site-specific standards assume that institutional controls will be put in place in order to preserve those exposure assumptions (e.g., a prohibition of residential use or well installation). Implicit in the use of such standards is the assumption that the IDNR has evaluated the exposure assumptions, along with necessary institutional controls, and determined that they are appropriate to the situation.

As a result of the integral role of IDNR in determining and approving the appropriate use of the standards, they should not routinely be used for purposes outside of the LRP, including screening to determine whether a situation is a significant problem or whether it is reportable. Exceptions to this are the Statewide Standards for Protected Groundwater. These standards may be used in lieu of action levels set by IAC Chapter 133: *Rules for Determining Cleanup Actions and Responsible Parties*. This does not prevent IDNR from making use of the standards outside of the LRP when applicable and appropriate to projects under their supervision.

For the Project, IDNR participation is limited in property transactions by Department resources and role until real issues of environmental impairment are identified. However, within its limited resources, the IDNR's Land Quality Bureau and Contaminated Sites Section can provide assistance and general direction.

8.0 PRIMARY PROJECT DECISIONS

The SEIRPC intends to determine whether properties identified as having RECs can be considered as feasible for "normal" redevelopment without need for remedy of environmental impairment. The measurement and method of the determination is for redevelopment planning. The method must be cost-effective yet produce defensible data. The determination must be relevant to issues of redevelopment beyond the life of the grants, particularly with regard to possible changes in land use.

The decision is to determine whether this property is or is not impacted relative to Iowa environmental standards. Based on the outcome of the decision, there are two Project actions. They are as follows.

- The property is "clean" and poses, due to measured conditions of environmental impairment, no reasonable impediment to consideration for redevelopment than would normally be exercised.

or,

- The property is impacted and poses, based on measured conditions of environmental impairment, a need for additional evaluation above that normally exercised in considering a property as feasible for redevelopment.

8.1 Selected Approach

The LRP allows a direct comparison of analytical results to the standards. Alternatively, the rules also allow the calculation of a 95UCL for comparison to the standards. Terracon experience shows the second approach requires a reasonably large data set in order to be effective.

The sampling size for this Phase II ESA was considered to be marginal for the latter approach. Terracon compared the maximum concentration of each chemical to the LRP standards.

8.2 Primary Project Decision - Soils

Arsenic, lead, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, and dibenz(a,h)anthracene were measured above the Statewide Standards in the soil samples collected from the site.

This property is impacted by metals and PAHs in soils. These areas constitute affected areas for unrestricted use if the property is enrolled in the LRP. These areas are shown on Figure 4A in Appendix A. Based on measured conditions of environmental impairment relative to unrestricted land use, there is a need for additional evaluation above that normally exercised in considering this property as feasible for redevelopment.

8.3 Primary Project Decision - Groundwater

Cadmium, lead, and pentachlorophenol were measured above the Statewide Standards in the groundwater samples collected from the site.

The locations that exhibited concentrations of chemicals above the statewide standards constitute affected areas if the property is enrolled in the LRP. These areas are shown on Figure 5 in Appendix A. Based on measured conditions of environmental impairment relative to unrestricted land use, there is a need for additional evaluation above that normally exercised in considering this property as feasible for redevelopment.

Groundwater, if pumped from excavations, will also have to be considered in future construction.

9.0 SECONDARY PROJECT DECISIONS

The primary project decision was made relative to unrestricted land use represented by Iowa statewide standards, including residential occupancy. The City must also consider restoration for alternative land uses. The QAPP set forth a process of secondary, site-specific consideration for restoration to other than unrestricted use.

9.1 Selected Approach

Analytical results were compared to depth-dependent standards for the following conditions.

- Impacts in soil at greater than ten feet depth on property in residential land use
- Impacts in soil at less than two feet depth on property in non-residential land use
- Impacts in soil at greater than two feet depth on property in non-residential land use

The comparisons were made understanding the following.

- The property is not enrolled in the LRP and this comparison is for planning purposes only.

- The property at the time of assessment does not have restricted access to control exposures; there are not existing significant security structures, engineered barriers, institutional controls, or remoteness of location pursuant to the LRP rules.

9.2 Secondary Project Decisions - Soils

The tables in Appendix B depict comparisons of laboratory data for the site to the site-specific standards. Lead was detected above the site-specific standards. Based on this comparison, soil on this property is impacted for nonresidential use if the property is enrolled in the LRP.

9.3 Secondary Project Decision - Groundwater

Tables in Appendix B depict comparisons of laboratory data for the site to the Statewide Standard. Groundwater at the site is classified as a Protected Groundwater Source. The groundwater might be considered non-used water in a Protected Groundwater Source under certain restrictions, such as a groundwater ordinance requiring municipal water for potable use or environmental easement.

According to Burlington Code of Ordinances, Chapter 91.02, "No person shall construct a well to be used as a potable water supply ("drinking wells") within the corporate City limits. For the purposes of this chapter, "person" means private citizen, corporation or any other entity excluding the City of Burlington and Burlington Municipal Waterworks. Wells constructed for purposes other than potable water supply (non-drinking wells) shall not be connected directly or indirectly to City water supply."

According to Burlington Code of Ordinances, Chapter 91.03, "Burlington Municipal Waterworks may, upon written application to the Director of Burlington Municipal Waterworks, grant a special exception to the prohibition set forth in Section 91.02 upon such conditions and limitations as the Waterworks, in its sole discretion, may prescribe. The Waterworks is under no obligation to grant any special exceptions whatsoever, and the authority to grant such special exceptions includes the authority to set appropriate fees for administration, oversight and monitoring as the Waterworks Board of Trustees shall deem appropriate."

9.4 Other Issues

The term of monitoring and level of assessment for LRP closure of an affected area may be adjusted by IDNR. Other factors of occurrence are considered by IDNR and warrant brief discussion.

Compliance demonstration for soils in an affected area having undergone remedy requires that 75% of all samples for a specific chemical collected during a single event shall be less than or equal to its statewide standard. The LRP rules also require that any individual sample does not exceed ten times its statewide standard.

Demonstration of compliance for groundwater in an affected area having undergone remedy allows that 75% of all groundwater samples for a specific chemical collected in each monitoring well over time shall be less than or equal to its statewide standard. The LRP rules also require that any individual sample does not exceed ten times its statewide standard. Two sampling events were conducted for this Phase II ESA. An expanded program of groundwater assessment or post-remedy monitoring could be requested by the IDNR if the property is enrolled in the LRP.

10.0 EXPOSURE ASSESSMENT

To develop appropriate remedial options for a site, it is necessary to understand the site's interaction of soil, groundwater, contaminant transport, receptors, and potential for contaminant exposure during and after redevelopment.

The numerical comparison is limited to the pathways of direct ingestion/dermal contact of soils and groundwater ingestion addressed by the statewide and site-specific standards. The concept of Statewide Standards is to define concentrations of contaminants that if met are protective of human health and safety, aquatic life, and the environment, where the point of compliance is any location on the site. Iowa decided that rather than require participants to evaluate a "laundry list" of exposure pathways in every case, it would mandate evaluation of only groundwater and soil ingestion/dermal contact pathways in all cases. The assumption by Iowa was that for the vast majority of sites characteristic to Iowa, meeting these pathway conditions would be protective of other exposure pathways as well. The IDNR reserves the authority to identify and require further evaluation of other pathways on a case-by-case basis.

Future enrollment in the LRP could require assessment of additional pathways or determine different site-specific standards as corrective action objectives. An exhaustive evaluation is not possible at this time. However, the following is presented to give the public and user a qualitative feel for the other pathways Iowa felt are generally protected by the LRP standards.

In order for possible target compounds to do harm to public health or the environment, they must occupy a point of exposure accessible to the population at risk. Compounds to which populations are not currently, or in the immediate future, exposed via complete exposure pathways do not constitute a probable condition of elevated risk.

The first step of the exposure assessment is to establish a CSM to identify target populations and receptors. This approach attempts to map the physical and demographic conditions of the site, determine what pathways appear reasonably complete, and graphically present the information. Terracon developed the CSM using ASTM E1689-95: *Standard Guide for Developing Conceptual Site Models for Contaminated Sites.*

The CSM represents potential chemical risk from current conditions on the impacted property to first-order receptors, as if no corrective action were completed. First-order receptors are considered those on the property, those on property immediately contiguous to the property and second-order receptors beyond contiguous properties required for evaluation and protection (e.g., a private drinking water well remote from the property). Residences and businesses directly adjacent to the site are generally assumed to incur greater potential risk from the site. For example, a residence directly adjacent to the site is expected to be at greater potential risk than a residence one-half mile from the site.

Determining site-specific project action limits for immediate and contiguous populations-at-risk is expected to provide a protective condition for second-order, more remote receptors.

The following three human receptor populations were considered for at-chemical-risk conditions if the site were to be occupied without remedy.

- The residential exposure, or persons who reside on the property
- The industrial/commercial exposure, or persons who occupy the property under conditions of full-time employment
- The construction worker exposure, or persons who construct, repair, or maintain development on the property

The completion of a pathway allowing contaminants to be conveyed to a receptor is necessary to produce exposure resulting in added risk.

The assessor can speculate and extrapolate probability upon probability attempting to account for all scenarios of exposure. An overly conservative, "what if, what if ... and then what if?" syndrome results in a cumulative estimate of hazard higher than the realistic exposure and practical risk posed. In keeping with the CERCLA emphasis and support for realistic development of exposure scenarios, the CSM evaluated the completion of exposure pathways as practical and reasonable to conditions of the property. A potential exposure pathway was considered conceptually complete if it satisfied the following.

- The condition could reasonably present a contaminant to the soil, groundwater, or air without extraordinary circumstance.
- The pathway reasonably sustains transport through the media to the closest receptors.
- The pathway provides a regular and sustainable condition of transport for exposure of significant duration.

In order to visualize exposure pathways and potential receptors, Terracon developed a graphical presentation based on current site conditions. The development was consistent with the concept and methodology of ASTM. The project model assumes that populations are exposed to residual soil or groundwater impact through exposure routes. The LRP pathways considered directly by the CSM include the following.

- Primary ingestion/dermal contact of contaminants in soil/fills by residential populations
- Primary ingestion/dermal contact of contaminants in soil/fills by industrial/commercial populations
- Primary ingestion of contaminants in groundwater by residential populations

Indirect pathways considered likely protected by the LRP standards, but for which IDNR could ask consideration if enrolled in the LRP include the following.

- Primary ingestion/dermal contact of contaminants in soil/fills by construction worker populations
- Incidental ingestion/dermal contact of contaminants in soil/fills by residential populations
- Incidental ingestion/dermal contact of contaminants in soil/fills by industrial/commercial populations
- Incidental ingestion/dermal contact of contaminants in soil/fills by construction worker populations
- Inhalation of contaminants from soil/fills by residential populations
- Inhalation of contaminants from soil/fills by industrial/commercial populations
- Primary ingestion of contaminants in groundwater by industrial/commercial populations
- Incidental ingestion of contaminants leaching to groundwater with off-site transport to residential populations
- Indirect ingestion of contaminants in contaminated groundwater transporting off-site
- Indirect ingestion of contaminants in groundwater by soil impact leaching to groundwater and be transported off-site to actual and potential groundwater receptors

The CSM represents a global presentation of exposure pathways available at the site. The mechanics of exposure for the property are developed as if current conditions were not abated.

Primary Sources	Primary Release Mechanism	Primary Media of Exposure	Exposure Route	Receptors: On-Site Residential	Adjacent Residential	On-Site Industrial/ Commercial	On-Site Construction Worker	River Aquatic
Impacted Soil/Fill	Direct Contact	Soil <=2 Feet	Ingestion	YES	NO	YES	YES	NO
			Inhalation	NO	NO	NO	NO	NO
			Dermal Contact	YES	NO	YES	YES	NO
	Direct Contact	Soil >2 Feet	Ingestion	NO	NO	NO	YES	NO
			Inhalation	NO	NO	NO	NO	NO
			Dermal Contact	NO	NO	NO	YES	NO
	Surface Runoff	Surface Water	Ingestion	YES	YES	YES	YES	NO
			Inhalation	NO	NO	NO	NO	NO
			Dermal Contact	YES	YES	YES	YES	NO
	Leaching to Groundwater	Groundwater	Ingestion	YES	YES	YES	YES	YES
			Inhalation	NO	NO	NO	NO	NO
			Dermal Contact	YES	YES	YES	YES	YES
	Airborne Particulates	Ambient Air	Ingestion	YES	YES	YES	YES	NO
			Inhalation	YES	YES	YES	YES	NO
			Dermal Contact	YES	YES	YES	YES	NO
	Volatilization (Vapors)	Ambient Air	Ingestion	NO	NO	NO	NO	NO
			Inhalation	YES	YES	YES	YES	NO
			Dermal Contact	NO	NO	NO	NO	NO
Impacted Groundwater	Potable Wells	Groundwater	Ingestion	YES	YES	YES	YES	NO
			Inhalation	NO	NO	NO	NO	NO
			Dermal Contact	YES	YES	YES	YES	NO
	Migration to River	Surface Water	Ingestion	NO	NO	NO	NO	YES
			Inhalation	NO	NO	NO	NO	NO
			Dermal Contact	NO	NO	NO	NO	YES

"YES" indicates that the pathway is complete
"NO" indicates that the pathway is not complete

Figure 1 Conceptual Site Model

11.0 SUMMARY OF PROJECT DECISIONS RELATIVE TO REMEDY

The data collection and analysis have been conducted to levels sufficient to support the primary and secondary decisions.

The primary decision has determined this property is environmentally impaired above Statewide Standards representing protection of the public health and environment if the property is considered for unrestricted land use or if the impairment does not undergo corrective action or control of potential chemical risk.

The SEIRPC can further consider feasibility for redevelopment with a need for corrective action of impacted soils and groundwater to statewide standards. This comparison moves beyond the data quality process and into the planning and sustainability portions of the grants. For the SEIRPC, feasibility for redevelopment must further address the magnitude and type of possible remedies, potential restrictions of remedies on redevelopment construction and the associated range of possible financial impacts to feasibility for redevelopment planning.

Within the context of developing the property for any possible future land use, remedy must be considered.

12.0 CONSIDERATION OF REMEDIES

The Phase II ESA must answer these elements to further address feasibility.

- What is the chemical impairment to undergo corrective action?
- What is the media to undergo corrective action?
- How much of the chemical impairment must undergo corrective action?
- What is the best method of corrective action?
- What is the potential cost of corrective action?

12.1 Type of Chemical Impairment

This report previously discussed those compounds and sample locations where exceedance of project decision limits were observed. Based on these exceedances, arsenic, lead, and PAHs were selected for further evaluation relative to possible remedy. These chemicals were those compounds for which one or more exceedances of a project action limit were measured in soil or groundwater.

Some of the compounds are listed on the 1999 CERCLA List of Priority Hazardous Substances. The CERCLA section 104 (i), as amended by the SARA, requires the ATSDR and the USEPA to prepare a list, in order of priority, of substances that are most commonly found at facilities on the NPL. These are chemicals determined to pose significant potential threat to human health due to their known or suspected toxicity or potential for human exposure at these NPL sites. CERCLA also requires this list to be revised periodically to reflect additional information on hazardous substances.

Inclusion on this priority list is not a determinant as a "most toxic" substance. It is a prioritization of substances based on a combination of their frequency, toxicity, and potential for human exposure at NPL sites. Thus, it is possible for substances with low toxicity but high NPL frequency of occurrence and exposure to be on this priority list. The objective of this priority list is to rank substances across all NPL sites to provide guidance in selecting which substances will be the subject of toxicological profiles prepared by ATSDR.

ATSDR ToxFAQs,™ which are brief one to two page summaries of the toxicological profiles, are attached in Appendix H for the following compounds.

- Arsenic
- Cadmium
- Lead

- Pentachlorophenol
- PAHs

12.2 Media of Environmental Impairment

The Phase II ESA identified chemical impact to soils/fills and groundwater on the site. Arsenic, lead, and PAHs were detected in soil above Statewide Standards for unrestricted land use. Cadmium, lead, and PAHs were detected in groundwater above Statewide Standards.

The soil impact was detected in the sandy clay fill materials that compose the subsurface at the site. Groundwater impact was detected in water collected from each of the monitoring wells. The shallow water-bearing unit was located within the fill materials. Movement of groundwater is readily apparent based on the lithology of the unit and measured hydraulic conductivity.

12.3 Magnitude of Remedy

In the LRP, an affected area is any real property affected, suspected of being affected, or modeled to be affected, by a release occurring at an enrolled site. Within the limited scope of the Phase II ESA, the affected area is considered to be conditions of chemical impact in excess of statewide or site-specific standards. Affected areas are within property boundaries for soil and an estimated radius of influence from the source for groundwater.

This property, as identified by the work to date, is environmentally impaired by residual contaminants. In general, affected areas involve the following primary conditions.

12.3.1 Affected Area #1

The Affected Area consists of an area of soils impacted at non-hazardous waste concentrations by arsenic, lead and PAHs. The Affected Area consists of non-interconnected areas located across the site and comprises an estimated 1.36 acres. Arsenic is observed to a depth of two feet, PAH impact is observed to depths of approximately 10 feet, and lead is observed to depths of approximately 12 feet. The following is an estimate of the units of materials used to conduct cost analysis for corrective action.

Table 12-1 Affected Area s

Media	Statewide Standard	Site-Specific >10 Feet, Residential	Site-Specific <=2 Feet, Nonresidential	Site-Specific >2 Feet, Nonresidential
Soil	8,160 CY	4,710 CY	628 CY	0 CY

12.3.2 Affected Area #2

Affected Area #2 consists of groundwater that is impacted above the Statewide Standards for pentachlorophenol and metals dissolved in groundwater. Groundwater at the site is classified as a Protected Groundwater source based on measured hydraulic conductivities. Estimated volume uses a saturated thickness of 10 feet and porosity of 30%, plus a 25% contingency for water extraction, rounding up. The amount of groundwater for treatment will likely vary substantially from the base estimates derived from this preliminary Phase II ESA study.

12.4 Industry Methods of Remedy

The feasibility study requires the evaluator to speculate as to possible corrective actions and their respective costs to remedy affected areas. Not all remedies are physical or chemical. Excess public risk requires four elements, all of which must be present to produce excess chemical risk.

- A chemical of sufficient toxicity to do harm
- A sufficient amount of the chemical to be toxic and do harm
- A receptor on which to do harm
- A pathway by which sufficient toxic material can actually reach the receptor

12.4.1 Acceptable Risk

Corrective actions rarely "clean up" all chemicals. It is generally the intent to remove, treat, or immobilize the concentrations of chemicals producing unacceptable risk. The degree of acceptable risk is determined by the public through legislative and regulated processes. As seen in the comparisons between restoration to unrestricted residential use or to non-residential commercial use, the degree to which corrective action must occur varies significantly depending on the types of exposure. The level of protection dictated by rule generally does not change.

12.4.2 Institutional Controls

Some corrective actions can be institutional rather than technical or mechanical. For example, contaminated groundwater must reach a receptor in sufficient volume and be ingested for a long enough period to do harm. If the pathway providing the exposure, in this case a well delivering water to the tap, is made incomplete, the exposure is removed and the chemical risk is mitigated. The well could simply be physically removed and the tap connected to municipal water. However, this might not address the possibility of someone else drilling a well in the future. A legal restriction attached to the deed prohibiting groundwater use on the property or an ordinance restricting wells or requiring connection to municipal water would provide that future protection. This is known as an institutional control. Iowa allows the use of institutional controls, such as a city ordinance, to address chemical impact.

A common concern over use of institutional controls is that the remedy may be overly dependent on the property owner to maintain the common law legal prohibition (i.e., the deed restriction in the previous example). Iowa has developed an Environmental Covenant to better bind the institutional control of a property to the public. The Environmental Covenant must be approved by the IDNR and can only be terminated with approval of the IDNR. The Environmental Covenant is effective in perpetuity until properly terminated. The Environmental Covenant is currently considered by the LRP as the primary control required to establish institutional controls for effective closure.

12.4.3 General Treatment Technologies

When contaminants require physical or chemical action to mitigate conditions of unacceptable chemical risk, numerous methods are available. The types of contaminants, the affected media, and physical conditions of the property determine a variable range of technical effectiveness and implementation costs. Many technologies have only been tried in the laboratory or in small field pilot tests. Their actual effectiveness in large-scale application is unknown.

Industry experience shows that the following three general physical strategies are used separately or in conjunction to remedy most sites.

- Destruction or alteration of the chemical of concern
- Extraction or separation of contaminants from environmental media
- Immobilization of chemicals so they are not available for exposure

Treatment technologies capable of contaminant destruction by altering their chemical structure are thermal, biological, and chemical treatment methods. These destruction technologies can be applied in-situ (in place) or ex-situ (by removing the media).

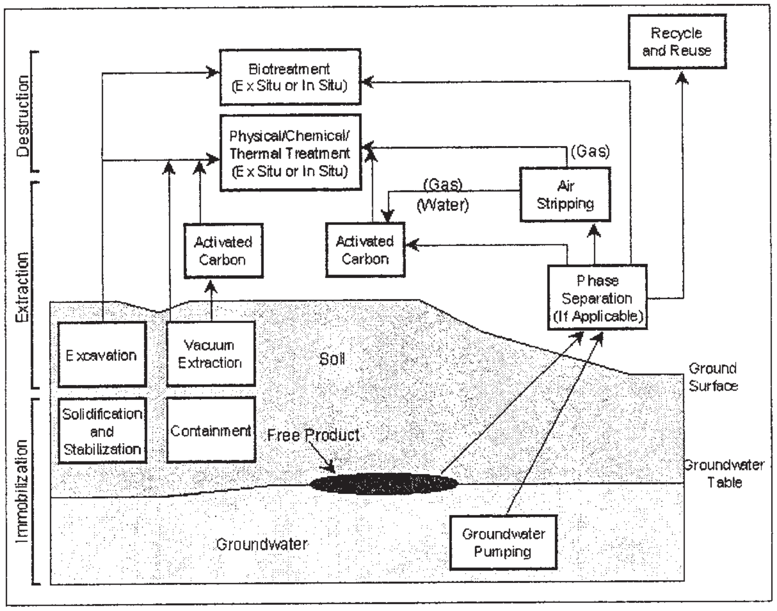

Figure 2 Typical Treatment Scenarios

Some soil treatment technologies commonly used for extraction and separation of contaminants from environmental media include soil treatment by thermal desorption, soil washing, solvent extraction, and SVE. Groundwater treatment often occurs by phase separation, carbon adsorption, air stripping, ion exchange, or some combination of these technologies. Selection and integration of technologies should use the most effective contaminant transport mechanisms to arrive at the most effective treatment scheme. For example, if more air than water can be moved through soil and a volatile contaminant in soil is relatively insoluble in water, SVE would be a more efficient separation technology than soil flushing or washing.

On-site immobilization technologies include stabilization, solidification, and containment technologies, such as construction of slurry walls. No immobilization technology is permanently effective, so some type of maintenance is desired. Stabilization technologies are often proposed to remedy sites contaminated by metals or other inorganic compounds.

12.4.4 Approach

This scope of evaluation under the limited strictures and funding of the grants cannot evaluate all possible technological remedies nor can it do so on some to the level of a definitive cost estimate. The preliminary nature of the feasibility study and the unknown future land uses of redevelopment preclude doing so.

Terracon made use of guidance and a research base compiled by a group of federal regulatory and military agencies. This group is known as the Federal Remediation

Technologies Roundtable and the guidance is known as the Remediation Technologies Screening Matrix, Version 4.0.

The remediation technologies screening matrix allows screening of in-situ and ex-situ technologies for soil and/or groundwater remediation. Variables used in screening include contaminants, development status, overall cost, and cleanup time. In-depth information on each technology is incorporated in the matrix, including hundreds of cost and performance reports written by members of the Federal Remediation Technologies Roundtable. The unique approach used to prepare this guide was to review and compile the collective efforts of several government agencies into one compendium document. For several types of sites, the guide enables the reader to conduct the following.

- Screen for possible treatment technologies common to the industry
- Distinguish between emerging and mature technologies
- Look at relative probability of success based on available performance data, field use, and engineering judgment from federal projects

The goal of remedial investigation is to obtain enough information to consider and select practicable remedial alternatives. Gathering this information can require considerable time, effort, and finances. In some cases, it is possible to focus very early on specific remedies that have been proven under similar conditions.

The matrix provides a "yellow pages" of remediation technologies. It is intended to be used to screen and evaluate candidate cleanup technologies for contaminated installations and waste sites in order to assist federal remedial project managers in selecting a remedial alternative. To reduce data collection efforts and to focus the remedial evaluation steps, information on widely used and presumptive remedies is provided.

Presumptive remedies are preferred technologies for common categories of sites, based on historical patterns of remedy selection and EPA's scientific and engineering evaluation of performance data on technology implementation. Use of presumptive remedies will allow a federal remedial project manager to focus on one or two alternatives; decreasing the site characterization data needs and focusing the remedial evaluation steps, resulting in less time and effort.

The reference guide allows the reader to gather essential descriptive information on the respective technologies. It incorporates cost and performance data to the maximum extent available and focuses primarily on demonstrated technologies. However, emerging technologies may be more appropriate in some cases, based upon site conditions and requirements.

The matrix is not designed to be used as the sole basis for remedy selection. The matrix and supporting information are only guidance, and the exclusion or omission of a specific treatment technology does not necessarily mean that a technology is not applicable to a site. However, the matrix emphasis on proven presumptive remedies while discussing emerging technologies is appropriate to the scale of evaluation and the available resources to evaluate restoration of affected areas for this property.

12.5 Methods

This evaluation made use of screening of presumptive remedies. A presumptive remedy is a technology that the USEPA believes, based upon its experience, generally will be the most appropriate remedy for a specified type of site. The USEPA is establishing presumptive remedies to accelerate site-specific analysis of remedies by focusing the feasibility study efforts. The USEPA expects that a presumptive remedy, when available, will be used for all CERCLA sites except under unusual circumstances.

The USEPA has determined that, when using presumptive remedies, the site characterization data collection effort can be limited, and the detailed analysis can be limited to the presumptive remedies. This streamlines that portion of the feasibility study. This approach is appropriate to the scale and size of the Phase II ESA data set.

There are circumstances where a presumptive remedy may not be used. These can include unusual site soil characteristics, mixtures of contaminants not treated by the remedy, or demonstration of significant advantages of alternate (or innovative) technologies over the presumptive remedies. They can include conditions of extraordinary community and state concerns. The final use of other than presumptive remedy technologies, or the absence of a presumptive remedy entirely, does not render the selected treatment technology less effective. The presumptive remedy is simply an expedited approval process, not the only technically feasible alternative. This is consistent with the level of secondary project evaluation required in considering redevelopment feasibility.

The remedial cost estimation was limited to selection and preliminary costing of presumptive remedies that appear most probable for application. These will be applied to each level of remedy required to bring the affected areas to closure.

12.5.1 Iowa Considerations

The comparison of Phase II ESA data and definition of affected areas has been generally done parallel to LRP guidance. The property is not enrolled in the LRP. The Phase II ESA may be used to enroll this property for IDNR review or to seek formal closure (NFA Certificate). In considering the IDNR process, certain base costs specific to Iowa should be considered in developing estimates of potential remedial costs. Where seemingly appropriate, these have been appended to base industry costs of the matrix information. Final costs to implement may vary and may include all or some of the items considered.

12.5.2 Appropriate Technology Selection

The technology screening matrix identified groupings of treatment appropriate to types of media. These media included the following groupings appropriate to remedy of impairment to soils and groundwater.

- Soil
- Groundwater

The matrix evaluates and groups presumptive remedies appropriate to types of chemicals relative to treatment. The matrix and related documentation identified numerous presumptive remedies. The technologies were presented and relatively ranked in descending order of probable applicability as better, average, worse, or special definition reflecting a limited or specialized application within the following criteria.

- Development status, or has the method undergone full scale project implementation or only pilot study phase
- Availability, the method's ready availability through sufficient industry resources to be amenable to the competitive bid process for cost control
- Residuals produced, the identification of secondary materials produced by the process and requiring additional handling or treatment
- Typical treatment train, the identification and requisite use of more than this treatment technology to achieve the remedy
- Contaminants treated, the identification of which specific contaminants may be treated by the method and which may cause interference with the process
- System reliability/maintainability, the identification of relative performance of the mechanical or chemical procedure to bring about a definitive solution
- Cleanup time
- Overall cost
- Capital or Operation & Maintenance intensive, the identification of costs and efforts to support the treatment process that might offset the low cost-to-unit-treated

12.5.3 Specific Technology Selection

Terracon exercised professional judgment in selecting presumptive remedies appropriate to industry corrective action of arsenic, lead, and PAHs in soils, and metals and pentachlorophenol in groundwater. Terracon biased selection toward the "better" ratings of treatment that have undergone full scale project implementation(s), required less operation and maintenance, were overall cost effective, and produced less secondary residuals or secondary treatment.

Time for cleanup was not given a primary consideration in the bias as the value of time cannot be determined in the redevelopment process unless a more specific redevelopment project is known. For example, a low-cost, effective, and reliable method of cleanup that requires no maintenance but requires a future owner not to construct on the property for 10 years may not be optimal nor appropriate relative to the redevelopment schedule.

The following were selected as appropriate for the affected areas.

Metals and PAHs in Soil

- Containment
- Excavation and off-site disposal

Metals and Pentachlorophenol Groundwater

- Institutional Controls
- Discharge to POTW

12.5.4 Remedies of Metals and PAHs in Soil

The most commonly used treatment technologies for metals in soil/fill include containment and excavation with off-site disposal. These treatment technologies are described as follows.

Containment treatments are often performed to prevent, or significantly reduce, the migration of contaminants in soils or groundwater. Containment is necessary whenever contaminated materials are to be buried or left in place at a site. In general, containment is performed when extensive subsurface contamination at a site precludes excavation and removal of wastes because of potential hazards, unrealistic cost, or lack of adequate treatment technologies.

Containment treatments offer quick installation times and are typically a low to moderate cost treatment group. Unlike ex-situ treatment groups, containment does not require excavation of soils that leads to increased costs from engineering design of equipment, possible permitting, and material handling. However, these treatments require periodic inspections for settlement, ponding of liquids, erosion, and naturally occurring invasion by deep-rooted vegetation. Additionally, groundwater monitoring wells associated with the treatments need to be periodically sampled and maintained. Even with these long-term requirements, containment treatments usually are considerably more economical than excavation and removal of the wastes.

Excavation with off-site disposal of contaminated soil, with and without solidification/stabilization pretreatment, to a landfill has been performed extensively at many sites. Landfilling of hazardous materials, especially hazardous wastes, is becoming increasingly difficult and expensive because of growing regulatory control, and may be cost-prohibitive for sites with large volumes, greater depths, or complex hydrogeologic environments. In addition, disposal capacity for radioactive and mixed waste is extremely limited. Determining the feasibility of off-site disposal requires knowledge of land disposal restrictions and other regulations developed by state governments.

12.6 Methods of Estimating Cost of Corrective Action

Feasibility to acquire and/or redevelop a property with environmental impairment is directly related to the potential cost to remedy the environmental impairment and restore the property to a specific land use.

The three types of cost estimating for remediation are order of magnitude estimate, budget estimate, and definitive estimate. The type of estimate developed generally depends on the amount of information available to the evaluator.

An order of magnitude estimate typically has the largest margin of error because it is performed in the initial stages of a project when relatively little information is known. Conversely, a definitive estimate typically has a smaller margin of error because it is performed at a later stage of a project when presumably most of the needed information is known. The following figure plots the three types of estimates against the expected accuracy of the estimate, based on the amount of information available.

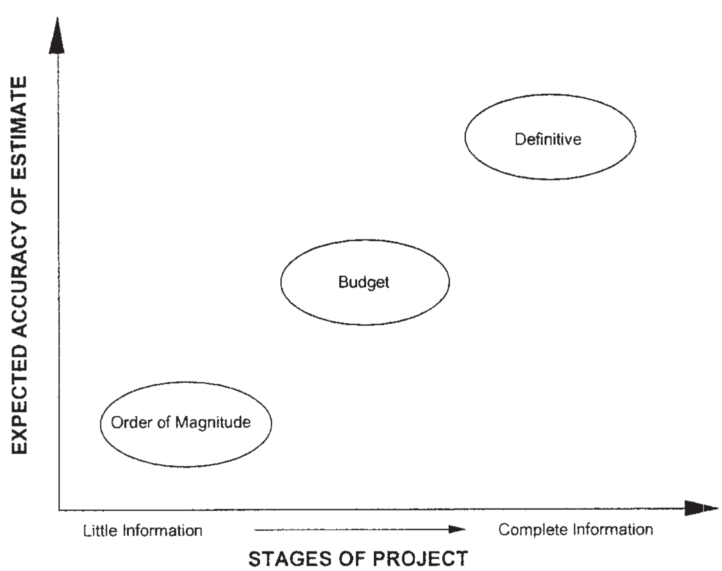

Figure 3 Remedial Estimation for Planning

For an order of magnitude estimate, historical costs for similar types of projects are often used to calculate a "ballpark" figure for the project. An order of magnitude estimate is completed at the initial stages of a cleanup, when minimal information is available. The cost of a project at this stage is frequently estimated by multiplying the number of "units" of a particular type of contamination (e.g., the number of cubic feet of contaminated sludge) by a pre-established cost for cleanup per unit (e.g., dollars per cubic foot) using a particular technology. USEPA guidance indicates an order of magnitude estimate might be expected to be between 70% and 150% of the future cost of remedy for the project. These ranges are not definitive and final costs can vary greatly depending on the complexity of project and regulatory requirements which may be required as the project moves forward during redevelopment. These types of estimates are used when considering the potential magnitude of restoration as it might relate to a potential project's value or feasibility of acquisition.

The budget estimate is prepared during the intermediate stages of the remedial design process. A higher level of accuracy is expected than that achieved with the order of magnitude estimate because more project-specific information is known. A budget estimate assesses the cost of each project component to compute an estimated total project cost. Several activities and cost items are grouped into a "system" that relates to the phase of cleanup. These systems are generally listed in the order in which they are employed in the cleanup. Budget estimates are sometimes referred to as assemblies or systems estimates. USEPA guidance indicates a budget estimate might be expected to be between 85% and 130% of the actual cost of the project. These ranges too are not definitive and final costs may vary significantly depending on the complexity of project and regulatory requirements which may be required as the project moves forward or land use changes during redevelopment. These types of estimates may be used to support requests for funding, preliminary budgeting, or planning as part of overall redevelopment.

A detailed cleanup plan design is required to produce a definitive estimate. This type of estimate is typically conducted once site characterization and/or a substantial portion of the remedial and redevelopment reconstruction design is completed. A definitive estimate is normally prepared by multiplying the quantity of each item needed by its unit price, and summing the line item totals. A competitive bid process is typically used to determine definitive estimates for reconstruction. Developing a definitive estimate is time consuming, but it is generally more accurate than other estimates because more is known about the site. Definitive estimates are sometimes referred to as unit price, quantity take-off, or bottom-up estimates. USEPA guidance indicates a definitive estimate might be expected to be between 95% and 115% of the actual cost of the project. Typically developed through engineering estimates from the remedial design plans and specifications, final costs may still vary.

The scope and budget structures of the grants limit the remedial cost estimation effort. Regardless of format or level of detail, discussions of cost and remedy must be considered similar to order of magnitude costs.

12.7 Feasibility Cost Estimates for Correction Action

The following present a compilation of the information and assumptions previously discussed or referenced relative to the potential financial effects of corrective action on this property. Theses values are presented as part of preliminary planning, and are intended to support the project decisions. Use by others must recognize and understand the limitations and focused use of this discussion and presentation.

The estimates presume the property may be enrolled in the LRP for final closure. Although the actual levels of effort required under the LRP vary, they have been considered equivalent for purposes of preliminary estimation. Common base costs of the approach are summarized as follows.

Table 12-2 Cost Considerations Common to All Remedies

Baseline Elements	Units	Unit Cost	Extended Cost
1. LRP Fees – Maximum	1 per project	$7,500	$7,500
2. LRP-Specific Evaluations (e.g., cumulative risk)	1 per project	$10,000	$10,000
3. Reports and Design Approved by the IDNR	1 per project	$15,000	$15,000
4. Meetings with the IDNR	5 per project	$1,000	$5,000
5. Construction Monitoring, Testing, and As-Built Documentation	1 per project	$10,000	$10,000
6. Develop and File Institutional Control Documents	1 per project	$2,500	$2,500
7. Eight Quarters of IDNR Monitoring/Testing and Reports for IDNR Closure	2 years	$4,000	$8,000
8. Supplemental Study by the IDNR	1 per project	$5,000	$5,000

For purposes considering feasibility of redevelopment, the final remedy assumes that all affected areas could be addressed within the LRP simultaneously. The costs consider potential activity for all affected areas defined by the Phase II ESA and are based on professional judgment. Some or all of the contingent activities could be required to obtain closure.

Some components of the evaluation (e.g., cumulative risk, cross-media transfers, etc.) require concurrence by the IDNR that can only be obtained once an affected area or property is enrolled in the LRP. Since these components require enrollment in the LRP, they are not evaluated in detail in this Phase II ESA. Depending on the chemicals detected at a site, proximity to surface water or other water supplies, and/or other factors, the costs for these components could vary significantly upward or downward. The actual costs may be more or less, depending on the requirements for final remedy and closure.

For clarity of presentation for future discussions, tables for affected areas include an individual allocation of potential "stand alone" baseline costs based on professional judgment and knowledge of the industry. Actual costs may vary higher or lower depending on site-specific requirements.

12.7.1 Affected Area-Soil Scenarios #1

Impacts to soils by arsenic, lead and PAHs above the Statewide Standards were measured. Concentrations of arsenic above the Statewide Standards appeared to be limited to the 0-2 foot soil depth interval. Concentrations PAHs and were measured above the Statewide Standards in the 0-2 and 2-10, and greater than 10 foot soil depth intervals.

The following summaries present a range of scenarios and their cost analyses to restore property for unrestricted redevelopment. The remedies presented allow for residential reuse supported by institutional controls or environmental easements and post-closure site management.

Table 12-3 Affected Area-Soil, Potential Remedy 1A

Excavation with Off-Site Disposal			
Final Regulatory Closure Allowing Residential Development			
Assumptions: Excavation with off-site disposal of the impacted area to a maximum depth of 12 feet totaling 9,312 CY. Assumes soil is not covered by structures or other barriers (asphalt). Estimated 110 pounds per cubic foot soil density, and a bulking factor of 1.2. Level D safety attire for removal and subcontractor trained in 40-Hour OSHA 1910.120. Some units rounded for presentation.			
Remediation Activity	**Units**	**Unit Cost**	**Extended Cost**
Specifications, Bid Package, and Contractor Selection	1 per project	$5,000	$5,000
Landfill Permits and Soil Characterization	1 per project	$1,000	$1,000
Excavate and Load Impacted Soil	9,312 CY	$40	$372,480
Transport Excavated Material to Landfill	931 loads	$120	$111,720
Confirmation Sampling (12 samples per 3,000 CY)	38 samples	$100	$3,800
Backfill with Imported Material	9,312CY	$15	$139,680
Disposal at Landfill	14,000 tons	$50	$700,000
Estimated Remedy Contingency:	~10% of Above		$133,300
Rounded Estimate for Planning:			$1,467,000

Table 12-4 Affected Area-Soil, Potential Remedy 1B

Containment			
Final Regulatory Closure Allowing Residential Development			
Assumptions: Affected areas under structures or other in-place barriers will not be disturbed. Areas located on the west portion of the site not under containment (approximately 34,250 square feet) will be addressed with a two-foot cap as 8-inch (nominal final depth) compacted lifts of imported cohesive fill, in conjunction with Soil and Storm Water Management Plans for construction and post-closure management. Level D safety attire. Some units rounded for presentation.			
Remediation Activity	**Units**	**Unit Cost**	**Extended Cost**
Specifications, Bid Package, and Contractor Selection	1 per project	$5,000	$5,000
Storm Water Management Plan (Construction) and Inspections	1 per project	$5,000	$5,000
Cap Affected Area With 24-inch Imported Clay Fill	2,500 CY	$15	$37,500
Hydroseed as Interim Stability until Redevelopment	0.75 acres	$1,000	$750
Storm water Management Plan (Post-Closure)	1 per project	$3,000	$3,000
Soil Management Plan for Owners/Developers (Post-Closure)	1 per project	$5,000	$5,000
Estimated Remedy Contingency:	~10% of Above		$5,650
Rounded Estimate for Planning:			$61,900

Table 12-5 Affected Area-Soil, Potential Remedy 1C

Excavation with Off-Site Disposal			
Final Regulatory Closure Allowing Non-Residential Development			
Assumptions: Excavation with off-site disposal of the impacted area to a maximum depth of 2 feet totaling 157 CY. Assumes soil is not covered by structures or other barriers (asphalt). Estimated 110 pounds per cubic foot soil density, and a bulking factor of 1.2. Level D safety attire for removal and subcontractor trained in 40-Hour OSHA 1910.120. Some units rounded for presentation.			
Remediation Activity	**Units**	**Unit Cost**	**Extended Cost**
Specifications, Bid Package, and Contractor Selection	1 per project	$5,000	$5,000
Landfill Permits and Soil Characterization	1 per project	$1,000	$1,000
Excavate and Load Impacted Soil	157 CY	$40	$6,280
Transport Excavated Material to Landfill	16 loads	$120	$1,920
Confirmation Sampling (12 samples per 3,000 CY)	12 samples	$100	$1,200
Backfill with Imported Material	157CY	$15	$2,355
Disposal at Landfill	234 tons	$50	$11,700
Estimated Remedy Contingency:	~10% of Above		$2,950
Rounded Estimate for Planning:			$32,400

Table 12-6 Affected Area-Soil, Potential Remedy 1D

Containment			
Final Regulatory Closure Allowing Non-Residential Development			
Assumptions: The affected areas are located beneath existing floor slab or asphalt. Assuming the existing barriers will not be removed, no further remediation action is required.			
Remediation Activity	**Units**	**Unit Cost**	**Extended Cost**
Soil Management Plan for Owners/Developers (Post-Closure)	1 per project	$5,000	$5,000
Estimated Remedy Contingency:	~20% of Above		$1,000
Rounded Estimate for Planning:			$5,500

12.7.2 Affected Area-Groundwater Scenario #2

Groundwater at the site has inorganic metals and a SVOC impact above preliminary and secondary statewide comparisons. The extent of groundwater impacted by metals is nominally defined, and could vary significantly from what was indicated by the preliminary groundwater investigation performed. The project decisions consist of comparisons to Statewide Standards for Protected and Nonprotected Groundwater. No comparisons have been drawn to background or site-specific standards.

The Statewide Standard for Protected Groundwater considers physical factors of groundwater and actual or potential use of the groundwater source to provide drinking water supplies to residential users. Unrestricted future land use would require remedy of the shallow groundwater to below statewide standards for a Protected Groundwater Source.

The remedial effort and associated costs to restore conditions for a groundwater source providing drinking water may require additional assessment or studies. Additional assessment could be required to refine impact boundaries beyond the current assessment or as the IDNR requires of participation in the LRP. Restoration of groundwater for unrestricted land use would likely require chemical or physical treatment.

Exclusion of the groundwater ingestion pathway would not require treatment. Implementation of an institutional control prohibiting groundwater use, such as an environmental easement or municipal ordinance, could provide conditions that do not require treatment or restoration.

Table 12-7 Affected Area-Groundwater#1, Potential Remedy 2A

Remediation Activity	Units	Unit Cost	Extended Cost
Environmental Covenant			
Final Regulatory Closure Prohibiting Potable Use of Groundwater			
Assumptions: Incorporating institutional control prohibiting drinking water wells at the site			
Deed Restriction	1 per project	$10,000	$10,000
Estimated Remedy Contingency:	~20% of Above		$2,000
Rounded Estimate for Planning:			$12,000

The following potential remedy allows for unrestricted land-use; however, Burlington Code of Ordinances, Chapter 91.02, prohibits potable wells within the city limits. Costs associated to petitioning the Burlington Water Works for permission to install water wells was not included in the potential remedy estimate.

Table 12-8 Affected Area-Groundwater#1, Potential Remedy 2B

Remediation Activity	Units	Unit Cost	Extended Cost
Discharge to POTW			
Final Regulatory Closure Allowing On-site Potable Use of Groundwater			
Assumptions: Preliminary hydraulic properties estimate using the shallow groundwater in-situ testing from Brownfields Pilot Phase II assessment. Disposal of water to Burlington sanitary sewer under permit, including operating costs. Estimated approximately 10 years of remedial operation. Some units rounded for presentation.			
Remedial design Plume Definitions: 6 wells and Pump Test	1 per project	$20,000	$20,000
Construction Specifications, Bid Package, and Contractor Selection	1 per project	$10,000	$10,000
Installation of Recovery Wells and Subsurface Piping	1 per project	$150,000	$150,000
Operating Costs	3.6 MG	$100,000	$360,000
Estimated Remedy Contingency:	~20% of Above		$108,000
Rounded Estimate for Planning:			$648,000

12.7.3 Select Detailed Scenarios

In response to the nature and extent of observed impacts, Terracon evaluated several remedial alternatives based on professional judgment and experience, technical and economical feasibility, practical application results, and common regulatory requirements and objectives. In addition, Terracon applied RACER™ Version 10.0.2 planning software to further evaluate appropriate cleanup alternatives and associated costs. RACER™ software has been jointly developed by the USEPA the U.S. Department of Defense to provide a computer-based planning mechanism that objectively evaluates relevant cleanup strategies and associated costs, based on the specific site conditions inputted by the user.

The following sections provide cost estimate ranges and brief discussions for several remedial alternatives based on the criteria referenced above. These estimates are based on RACER™-calculated average costs for the State of Iowa and for calendar year 2008, unless otherwise indicated. It should be noted than several assumptions were necessary to calculate RACER™ estimates. These assumptions were generally based on previous Brownfield assessment findings. The assumptions made; however, are based on a limited evaluation of site conditions and may not reflect actual conditions or associated cleanup costs. The cost estimates provided below are therefore intended for general planning purposes, and to provide general order of magnitude costs associated with each option. These estimates do not represent actual Terracon cost proposals or labor rates.

Terracon selected one potential remedy scenario from an affected area in each affected media for secondary RACER™ comparison relative to restoration. The selection was biased to scenarios having significant construction or mechanical components (i.e., overexcavation of soils). The detailed model printouts are attached in Appendix G.

12.7.3.1 Scenario 1C (Soil)

The scenario, involving excavation and off-site disposal of approximately 9,312 cubic yards of soil impacted by PAHs, lead and arsenic (at non-hazardous concentrations) was considered relative to RACER™ estimation. The approaches vary and assumptions differ to varying degrees. The software does not include reporting and efforts required by local regulatory agencies as set forth in base matrix estimates previously. The software incorporates some elements of construction monitoring and support that are generally equivalent to base estimate elements. This comparison gives a general overview of specific items within the discussed remedy as an indicator of possible regional industry influence on construction-related elements to mitigate environmental impairment.

Table 12-9 Potential Remedy #1A Comparison of Construction Elements

Excavation and Off-Site Disposal of PAH-Impacted Soils Closed Under LRP to Statewide Standard (Residential)				
Comparative Environmental Construction or Mechanical Treatment Elements	**Brownfields Matrix Order-Of-Magnitude[1] Estimate**			**RACER™ Comparative Estimate**
	Base Estimate	**Lower Limit of 70%**	**Upper Limit of 150%**	
Specifications, Bid Package, and Contractor Selection	$5,000			Appendix G
Landfill Permits and Soil Characterization	$1,000			Appendix G
Excavate and Load Impacted Soil	$372,480			Appendix G
Transport Excavated Material to Landfill	$111,720			Appendix G
Confirmation Sampling	$3,800			Appendix G
Backfill with Imported Material	$139,680			Appendix G
Disposal at Landfill	$700,000			Appendix G
Rounded Comparison RACER™-to-Brownfields-Estimate Variance	$1,333,680	$933,576	$2,000,500	**$1,770,100 (128%)**

In considering possible regional effects on construction-related elements of this remedy, the base matrix estimates relative to RACER™ appear to be within the limits associated with order of magnitude estimates discussed in USEPA guidance documents for Brownfields.

12.7.4 Summary Cost Ranges of Land Use Remedies

The Phase II ESA has been completed consistent with project plans. The primary and secondary project decisions have been made. The project decisions indicate that the potential magnitudes and costs of remedy for restoration to multiple future land uses must be considered. The Phase II ESA data has been used to derive those order of magnitude estimates. The following table presents a summary range of potential remedy costs that should be considered. These are relative to final feasibility of this property for redevelopment.

[1] *See discussion in Section 12.6.*

Table 12-10 Summary Range of Potential Remedy Cost to Land Use (Rounded)

Affected Area	Remedy Scenario	Allowable Land/Groundwater Use				Order of Magnitude Estimate	Minimum for Scenario	Maximum for Scenario
		Land		Groundwater				
		R	I/C	Yes	No			
1	1A	X	X	N/A	N/A	$1,467,000		$1,467,000
	1B*	X	X	N/A	N/A	$61,900		
	1C*		X	N/A	N/A	$6,000	$6,000	
	1D*		X	N/A	N/A	$32,400		
2	2A	N/A	N/A		X	$15,000	$15,000	
	2B	N/A	N/A	X		$648,000		$640,000
LRP Baseline Costs[2]							$63,000	$63,000
Summary of Combined Remedies							**$84,000**	**$2,170,000**

*Assumes existing barriers will remain in place
R = Residential, I/C = Industrial/Commercial
Yes = Potable Groundwater Use Allowed, No = Potable Groundwater Use Not Allowed

The demonstration of cost analyses and models demonstrate the following if the property is enrolled in the LRP for formal closure of potential affected areas.

- Restoration of soil to allow residential land use without containment can be accomplished for approximately $1,530,000.
- Restoration of soil to allow industrial/commercial land use can be accomplished for approximately $69,000.
- If the groundwater ingestion pathway can be excluded, physical treatment may not be necessary. An estimate of the level of effort and associated costs to exclude the pathway requires enrollment in the LRP and negotiations with the IDNR. As such, estimating the costs for pathway exclusion are beyond the scope of this Phase II ESA.
- If the groundwater ingestion pathway cannot be technically or feasibly excluded, restoration of groundwater to levels allowing potable use can be accomplished for approximately $703,000.

Terracon acknowledges that the some overlap of affected areas in soil and groundwater exists at the site. In practice, remedy of these overlapped areas would result in a lowering of the estimates previously listed. The actual reduction is highly variable and based on a number of factors, but based on the levels of impact encountered at the site, a reduction of approximately 50% or more could be realized.

Extensive physical soil and/or groundwater remediation is not required to bring the site to conditions acceptable for industrial/commercial property use with groundwater use restrictions. If the groundwater ingestion pathway can be excluded through negotiations with

[2] *From Table 12-2.*

the IDNR after enrollment in the LRP, the estimated costs to remedy the affected areas in groundwater could be significantly reduced. Engineering evaluations and modeled demonstrations of contaminant control will likely be required by the IDNR if enrolled in the LRP. Post-closure controls for risk management would be necessary. To the extent possible within this effort, costs for control-related issues have been included in the remedy scenarios (e.g., groundwater modeling, filing of an Environmental Covenant, or soil/water management plans).

Should the property be considered feasible for redevelopment without soil remediation, the property would likely be used for commercial or industrial redevelopment. The use of a nonresidential land use classification must be supported by an Environmental Covenant that prevents a change in land use to residential, if enrolled in the LRP.

An Environmental Covenant is a legal document filed with the local county courthouse that gives control over portions of the property to the receiving party. The Environmental Covenant must be approved by the IDNR and can only be terminated with approval of the IDNR. The Environmental Covenant is effective in perpetuity until properly terminated. The Environmental Covenant is currently considered by the LRP as the primary control required to establish institutional controls for effective closure.

Should the property be considered feasible for redevelopment with limited groundwater remediation, restrictions on groundwater use would be required. In order to use Nonprotected Groundwater standards at this site, it must be demonstrated to the IDNR's satisfaction that site conditions will not have an impact on existing water supplies and that the aquifer is not a locally significant water resource. A local ordinance prohibiting the potable use of groundwater will likely be required if the property is enrolled in the LRP.

13.0 OTHER REDEVELOPMENT CONSIDERATIONS

Consideration must be given during planning to environmental issues not related directly to negotiated or technical remedy of site conditions. Just as actual or perceived environmental impairment often keeps a Brownfield property from consideration of redevelopment, the stigma and associated perceptions of impairment can extend beyond re-establishing the property's marketability.

Consistent with this evaluation in determining feasibility for redevelopment, Terracon presents additional issues as reference in planning. Except for soil and/or storm water management plans for risk-managed remedies, these issues and associated discussions of potential costs have not been included in remedy cost analyses.

These discussions presume that the property is found to be feasible for redevelopment within the limits discussed herein and that a future party moves to ownership or direct management of the redevelopment project.

13.1 Sustainable Redevelopment and Green Design

In recent years, there has been an emphasis and desire on the part of communities to pursue "green," or sustainable, redevelopment. According to the USGBC, green design consists of, "design and construction practices that significantly reduce or eliminate the negative impact of buildings on the environment and occupants in five broad areas: sustainable site planning, safeguarding water and water efficiency, energy efficiency and renewable energy, conservation of materials and resources, and indoor environmental quality."

The desire for green design typically manifests itself via the LEED® Green Building Rating System, which is a voluntary, consensus-based national standard for developing high-performance, sustainable buildings. Among other reasons, the LEED® system was created to define "green" by providing a standard for measurement, to recognize green building leaders, and to stimulate green competition. Under the LEED® rating system, a development project can receive certification as (in order of increasing "greenness") Certified, Silver, Gold, and Platinum. The level of certification is based on points that are awarded to the project for elements that fall into the five green design areas.

Sometimes, the emphasis on green design can conflict with the environmental aspects of brownfields redevelopment. For example, a brownfields redevelopment project may incorporate an impermeable barrier at the ground surface to reduce or eliminate surface water infiltration. This type of barrier is typically used to reduce the potential for groundwater contamination when shallow soil contamination remains on-site. In this sense, the barrier is good because it reduces the potential for groundwater contamination. However, the barrier is not good when pursuing LEED® Certification, because it goes against the green design concept of allowing surface water to infiltrate naturally into the ground. Alternatively, physical remediation of residual contamination can be more costly, but is more "green-friendly." An important concept to remember is that, done properly, both risk-based remediation (e.g., barriers, etc.) and physical remediation are equally protective of human health and the environment.

Faced with a contaminated site and the desire for green design, a community must answer the question, "How important is green design and LEED® Certification of our project?" In order to answer this question, each community must assign a value to green design in terms of dollars that can be compared to the cost of remediation alternatives. The Brownfields Phase II ESA report, with its order of magnitude cost estimates for remediation, answers the latter half of the question. The answer to the former rests solely with each community and the values of its citizens. For example, if a certain level of LEED® Certification requires a physical remediation method that is $500,000 more expensive than its risk-based alternative, is the level of LEED® Certification worth the extra cost? In Terracon's experience, it is vitally important to engage the community and put a value on green design at the initial planning stages of a redevelopment project.

13.2 Subcontractor Education Regarding Chemical Risk

The directing party should consider an educational package for inclusion with bid documents to educate subcontractors and provide sufficient information to perform Employee-Right-To-Know Training for any redevelopment projects on the property. This effort can take a variety of forms, however, it should convey to subcontractors the following issues.

- The directing party does not want to infer there is no chemical risk. Rather it wishes to convey that, after evaluating impacts, conditions pose acceptable risk on a par with physical and chemical exposures.
- Although conditions identify manageable chemical risk, the directing party acknowledges the potential for unknown discovery and is prudently providing for such contingencies.

The approach can be as simple as attaching this report or the management plans developed during remedies discussed above directly to bid documents and allowing individual interpretation by the contractor. Another effort that is more advanced could have the directing party develop a site-specific educational summary relative to risk-based redevelopment for attachment to bid documents.

Either approach should involve a pre-bid or pre-construction presentation of risk-based findings by the directing party or their representatives to bidders. Either effort should include development of a site-specific safety plan as a template for contractor use and at least one initial "tool box" presentation to rank-and-file workers on the job site. The safety plan should include site-specific hazard recognition and response. The upper-end effort could include development of the program and materials in conjunction with management or technical support groups of organized labor (i.e., laborers, and operators) in contact with soils.

Terracon experience has shown the complexity of this activity determines final cost. For planning purposes, the directing party could estimate costs for conditions of the magnitude discussed herein to range on the order of $5,000 to $10,000. These costs can be integrated into construction budgets.

13.3 On-site Construction Worker Exposure

Iowa rules do not specifically address construction worker exposure to impacted soils. During development of Iowa's LUST rules, it was determined that construction worker exposures were protected by levels set for commercial/industrial exposures.[3] Regionally, Illinois has developed tiered risk-based soil values for construction worker protection on commercial/industrial sites.[4]

Often the perception of exposure of environmental impact to the construction worker can impair on-site construction activity as effectively as actual chemical risk. Workers are protected under law from excess chemical risk from exposures to hazardous substances. A loss of confidence in personal protection can result in work stoppage[5] until workers feel adequate characterization of the work environment has occurred. Worker concern can also prompt out-of-project calls to public agencies by workers seeking satisfaction on health issues. In addition to developing the educational component for bidding, consideration should be given to developing a contingency program to respond to concerns of on-site workers during actual construction. Experience shows the program can be preemptive or reactive in nature.

13.3.1 Preemptive Planning

An example of a preemptive approach might begin immediately after the preliminary types and locations of site work are determined. During final geotechnical drilling and sampling for foundation design, additional samples could be obtained in locations requiring soil removal. Risk information for specific areas could be included in the safety plan.

This approach attempts to provide for "no surprises" and typically has the least potential to disrupt construction schedules. Preemptive approaches have the value of instilling in on-site parties that environmental impacts are merely another component of the construction process to be managed, not significantly different than traditional safety issues.

Similarly, during actual on-site construction, the directing party could also perform third-party observation and testing through field screening of spoils to monitor consistency with drilling and sampling. This field screening can take the forms used in the preliminary assessment or other field methods appropriate to findings (e.g., bioimmunoassay screening, colorimetric reagent testing of lead in soils, on-site portable gas chromatography).

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[3] *Technical Advisory Committee and IDNR rulemaking in open committee and technical subcommittees, June 1996.*

[4] *35 Illinois Administrative Code, Part 742: Tiered Approach to Corrective Action Objectives using ASTM RBCA and USEPA CERCLA risk assessment calculations.*

[5] *Public works redevelopment for John Deere Plow & Planter Works/The Mark of the Quad Cities, Moline, Illinois 1993-1994. Considered a USEPA Region 5 Brownfields Success Story, organized labor recognized a non-strike agreement for economic redevelopment contracts unless hazardous waste materials were encountered. Historical fills contained non-hazardous levels of staining and oils, prompting caisson worker concerns, stoppage, and a potential strike. The implementation of an educational subcontractor program in conjunction with a reactive sampling plan allowed construction on schedule.*

Cost becomes dependent on sampling locations and number of field days, full- or part-time, for monitoring services. Terracon experience has shown this type of approach for conditions of the magnitude discussed could result in costs on the order of $20,000 to $30,000 with an estimated 50% of fees expended in sampling and analytical chemistry. These costs can be integrated into construction budgets, often overlapping with traditional construction testing for QC and monitoring.

13.3.2 Reactive Planning

A reactive approach could be considered. For example, a program could be designed and implemented to quickly sample, chemically analyze, and report to workers on suspect materials that are discovered during construction. This approach needs to be integrated into the initial educational segment and hazard recognition portion of the safety plan as pre-construction presentations to contractors.

This type program must carefully integrate with contractor planning, since some laboratory tests can require a week turnaround even with "RUSH" analysis. This requires isolation/storage of the spoil materials and possible movement of the contractor to another area of the site until chemistry is received and verified. This approach has the highest variability and is reflected in the range of costs for planning.

Reactive monitoring requires expedited response by testing personnel and "RUSH" chemistry, thereby escalating costs when needed but having the advantage of being only needed "on call." This approach leaves itself open to the determination of need by the contractor. Failure to respond promptly and with similar effort every time can result in loss of confidence by workers in the program. The concern can prompt worker/contractor requests for personnel monitoring in addition to testing and analyses of soil/fills.

Terracon and industry experience has shown these costs to be highly variable and solely dependent on actual incidents of reaction, planning should consider variable costs on the order of $50,000 to $150,000. These costs can and often are integrated into construction budget contingencies, but do not readily overlap with traditional construction testing for QC and monitoring.

13.4 Consideration of On- and Off-site Soil Disposal

Risk-based corrective action or risk-managed sites using institutional controls can be very cost-effective with regard to corrective action. However, these approaches often carry with them non-traditional restrictions regarding construction. Site-specific comparisons to LRP standards are directly related to spatial relationships of depth. The protectiveness of the remedy requires that the impacted material at depths and locations remain reasonably unchanged from the time of assessment. Contractors and construction crews cannot freely move soils through grading or minor cut-and-fill as is routinely done on construction projects. A variance of less than 12 inches can affect the relative protectiveness of the remedy in the eyes of the regulating agency.

For example, consider a compound with a site-specific standard of 400 ppm for soil within two feet of the surface and a site-specific standard of 1,100 ppm below two feet from the surface. A soil sample at a depth of three feet with a concentration of 1,000 meets the site-specific standard. If the site grading contractor strips and stockpiles two feet of topsoil in preparation of construction, the material is now less than two feet from surface and far exceeds the site-specific standard. However, if a parking lot contractor cuts to the same depth and then replaces the cut with sub-base and pavement as an engineered barrier constituting restricted access, the level of protection is maintained.

Such detailed tracking of soil movement on large sites becomes almost impossible. The solution lies in effective communication to planners, architects, and contractors on the limits and intent to control soil handling.

The construction design should consider a bias toward minimal disturbance of soil/fills during construction (i.e., a slightly more expensive foundation option rather than a less expensive method generating large amounts of spoil). The lowest generation of soil/fills as spoils is preferred to minimize environmental exposures and possible issues of disposal. Impacted materials cannot enter the cut-and-fill balance for site construction.

In the event soils impacted above the risk-based levels are removed as part of construction, the directing party will need to consider appropriate characterization and disposal. Following removal, impacted soils would need to be protected from weather and accidental dispersal while the landfill or other receiver conducts new acceptance characterization (routinely one to two weeks). If the material tests out as hazardous waste (RCRA Subtitle C), special transport and disposal criteria become necessary. The cost per contaminated cubic yard of bulked soil removed from depth, separate from a planned remediation effort, can result in higher per unit costs. These can be on the order of $50 to $100 per ton for local Subtitle D landfill disposal and $300 to $500 per ton for hazardous waste Subtitle C disposal.

The communications on handling soil and groundwater should be formalized in a project Soil and Groundwater Management Plan at the construction planning stage.

13.5 Routine Maintenance/Construction to Control Exposures

The placement of engineered fills over residual soils would further provide protection against exposure to potentially impacted fills and soils, for both secondary construction workers and future occupants/workers. Routinely engineered barriers placed as part of corrective action require extended future inspection/testing services and financial instruments/funds to assure future maintenance.

Mechanical barriers strengthen a condition of limited exposure or by removing potential receptors from the exposure pathway. A simple chain-link perimeter fence, signature-only access, or other security procedures can be used to control receptor availability within the definitions of exposure under Iowa rule. This is referred to as restricted access and allows depth-specific thresholds of material to remain in place.

13.6 Dust Control Measures

On-site structures and/or demolition debris, if present, may be removed from the site before redevelopment. The directing party should consider a dust management plan or other control measures to limit exposure to airborne particulates generated during particulate removal or demolition activities. Some measure of exposure control for these materials will be required during redevelopment activities.

The directing party may consider establishing a no visible emissions criteria during structure demolition and handling of material capable of generating dust emissions. Such criteria may require that if visible dust emissions are observed during material handling activities, work will be curtailed until the material is lightly sprayed with potable water. Slow movement of equipment and low bucket dump heights can reduce the potential for dust generation.

Perimeter air monitoring may be conducted during particulate handling activities to determine the effectiveness of dust control measures. Perimeter air monitoring can be conducted downwind of the work area. Air monitoring equipment, such as aerosol meters, is available to measure the content of particulate matter in the ambient air. Total particulate matter concentration could be used as a surrogate measure to demonstrate that ambient metals concentrations do not exceed applicable thresholds for worker and off-site receptor health and safety. If downwind perimeter air monitoring results exceed project-specific levels protective of worker and public health, dust control mitigation procedures should be enhanced.

In addition to dust monitoring, worker exposure concerns can be addressed through worker education, use of appropriate personal protective equipment, and good construction practices. In addition, work activities will be designed to minimize releases of soil and debris during handling. Workers managing non-hazardous but impacted soil at the site should preferentially be trained in Hazardous Waster Operations and Emergency Response as designated by Occupational Safety and Health Administration regulations at 29 Code of Federal Regulations 1910.210 (e)(8).

13.7 Risk Management Practice

In considering Brownfield property for redevelopment, solutions of remedy are greatly strengthened by other than technical or engineered means. The following are a few issues for consideration. They are discussed briefly and only to establish a preliminary awareness for the reader. Some items are mentioned in previous discussion for emphasis. The directing party may wish to explore further these issues as part of risk management practice.

13.7.1 Institutional Controls

Restriction of property land use to industrial or commercial activity controls the future exposure types and duration as defined by risk calculations under Iowa programs. Where appropriate to the remedy, restricting groundwater from potable use on the property is necessary. This is done through institutional control, such as a municipal ordinance or an Environmental Covenant. These instruments control future exposure pathways and duration as defined by risk calculations under Iowa programs. Costs for these items were estimated in the remedy scenarios discussed.

13.7.2 Environmental Insurance Products

Actual remedial costs to restore properties cannot usually be precisely determined during the feasibility stage. The best Phase II assessments do not test everywhere and everything. It is a directed process that relies on generalizing the site from adequate data. The quantity and quality of data is dictated by the project plans and appropriate sampling designs derived from them. It does not purport to be a guarantee of identification of all risk. Insurance products have recently entered the market to control open-ended risk of unanticipated cleanup, protect lenders reluctant to loan on environmentally impaired property, and protect against new discoveries during redevelopment construction. The directing party should contact their commercial insurance broker to identify appropriate insurance products that might assist them in risk management of the property.

13.7.3 Environmental Indemnification

A party considering acquisition or redevelopment of a Brownfield property with measured environmental impairment, either above or below LRP standards, should consider engaging environmental counsel to structure the formal documents of negotiation. Environmental counsel will be able to address contractual arrangements and issues of liability and indemnification specific to environmental impairment and Iowa code.

13.7.4 Iowa Voluntary Program Closure

This report is fixed in time unless modified by future work described in several of the scenarios of possible remedy. Zoning laws change and regulatory programs are not static. Both can be modified and can affect the property if not formally closed. This report and current conditions of environmental impairment should be routinely revisited at new phases of future redevelopment for consistency with current Iowa rules.

This can be preempted by enrollment and closure in the LRP. The LRP is not intended to "sanitize" all commercial property transfers. The property must have identified conditions of chemical risk above statewide standards as affected areas through adequate Phase II ESA and make the IDNR an active participant in the evaluation process.

The formal closure under the program, an NFA certificate, applies only to affected areas entered into the program. By statute, the NFA certificate confers liability protection from further regulatory action to protected parties. Protected parties include participants and any affiliate or successor in interest, subsequent property owners, persons with possessory interests such as leasees and mortgagees, trusts, and many other descriptions of future interest. It does not include prior owners or operators of the property or facilities who might otherwise be liable under Iowa law unless they are participants to the closure.

The NFA certificate and the liability protection apply only to the affected area as evidenced by the actual or modeled contaminant data and the specific environmental condition for which a regulatory standard is met. The NFA certificate applies only to the contaminants actually identified and evaluated in the site assessment and risk evaluation process. The NFA certificate applies only to the exposure pathways that are actually evaluated by the participant and reviewed by the IDNR. The NFA certificate does not apply to releases, sources, of contamination, hazardous substances, or other environmental conditions not expressly addressed by the site assessment.

The liability protection against regulatory enforcement is conditioned by the following.

- If a protected party were considered a statutorily liable party under Iowa law as a "person in control of a hazardous substance during its release," a further response action could be required. The action would only be to address "an imminent and substantial threat to public health, safety, and welfare." In essence, a protected party found to have contributed to an unknown condition or new discovery of the property cannot "hide" behind the NFA certificate.

- The NFA certificate can be rescinded if shown it was obtained by fraud or material misrepresentation, knowing failure to disclose material information, or false certification to the IDNR.

- The NFA certificate can be rescinded if failure of a technological or institutional control to achieve its intended purpose occurs.

- The NFA certificate does not protect parties involved in new releases on the property.

14.0 FINDINGS AND CONCLUSIONS

Terracon has conducted fieldwork and evaluation for the Phase II ESA portion of the Project for this property. Terracon makes the following conclusions.

- This Phase II ESA has been completed consistent with the intent and strictures of the grants.

- This Phase II ESA has been conducted consistent with the QAPP and the Checklist, both approved by USEPA 7, except as modified to assess apparent lead impacts in groundwater.

- This Phase II ESA has produced data of a quality sufficient to make the project decisions set forth in the QAPP.

- This Phase II ESA has determined that the potential for RECs identified in the Phase I ESA is realized as measurable environmental impact on the property.

- This Phase II ESA has not identified conditions of imminent threat or public hazard consistent with the findings of the Phase I ESA.

- One or more Affected Areas were identified. The IDNR "recommends reporting of contamination that is greater than statewide standards for soil and groundwater." Users of this document may wish to consult with legal counsel as to reporting obligations.

- The primary project decision determined that the property is environmentally impaired. It is not feasible to consider for redevelopment for unrestricted land use without considering environmental remedy of conditions.

- Failure of the primary project action limits identified affected areas of soil and groundwater impacted by metals, PAHs, and pentachlorophenol, relative to LRP Statewide Standards.

- The secondary project decision determined that the property is environmentally impaired. It is not feasible to consider the property for redevelopment for restricted land use without considering environmental remedy of conditions.

- Failure of the secondary project action limits identified affected areas of soil impacted by metals relative to site-specific standards.

- Consideration of compliance demonstration criteria indicates the property could be considered feasible for restricted use redevelopment in conjunction with environmental remedy.

- The Phase II ESA developed and identified potential order of magnitude cost estimates of remedy for a range of scenarios relative to restoration to statewide and site-specific standards.

- Phase II ESA cost models and analyses calculated order of magnitude cost estimates for combinations of remedies for restoration of affected areas to land use from restricted commercial to unrestricted residential in a range of $84,000 to $2,170,000, respectively.

- Phase II ESA cost models and analyses indicate that if arsenic in near surface soils cannot be demonstrated as attributable to natural background levels to the IDNR's satisfaction, restoration to unrestricted land use including residential occupancy, may not be practical. Terracon regional experience shows this has a high probability for concurrence by the IDNR, although some additional comparative sampling could be required.

- Major financial and technical investment appear to make restoration of property soils and groundwater to statewide standards for residential use infeasible, without evaluation or special studies outside the scope of the Brownfield study.

- The affected areas defined by the Phase II ESA appear eligible for enrollment in the LRP to seek closure and a NFA certificate transferable to future successors to title.

15.0 GENERAL COMMENTS

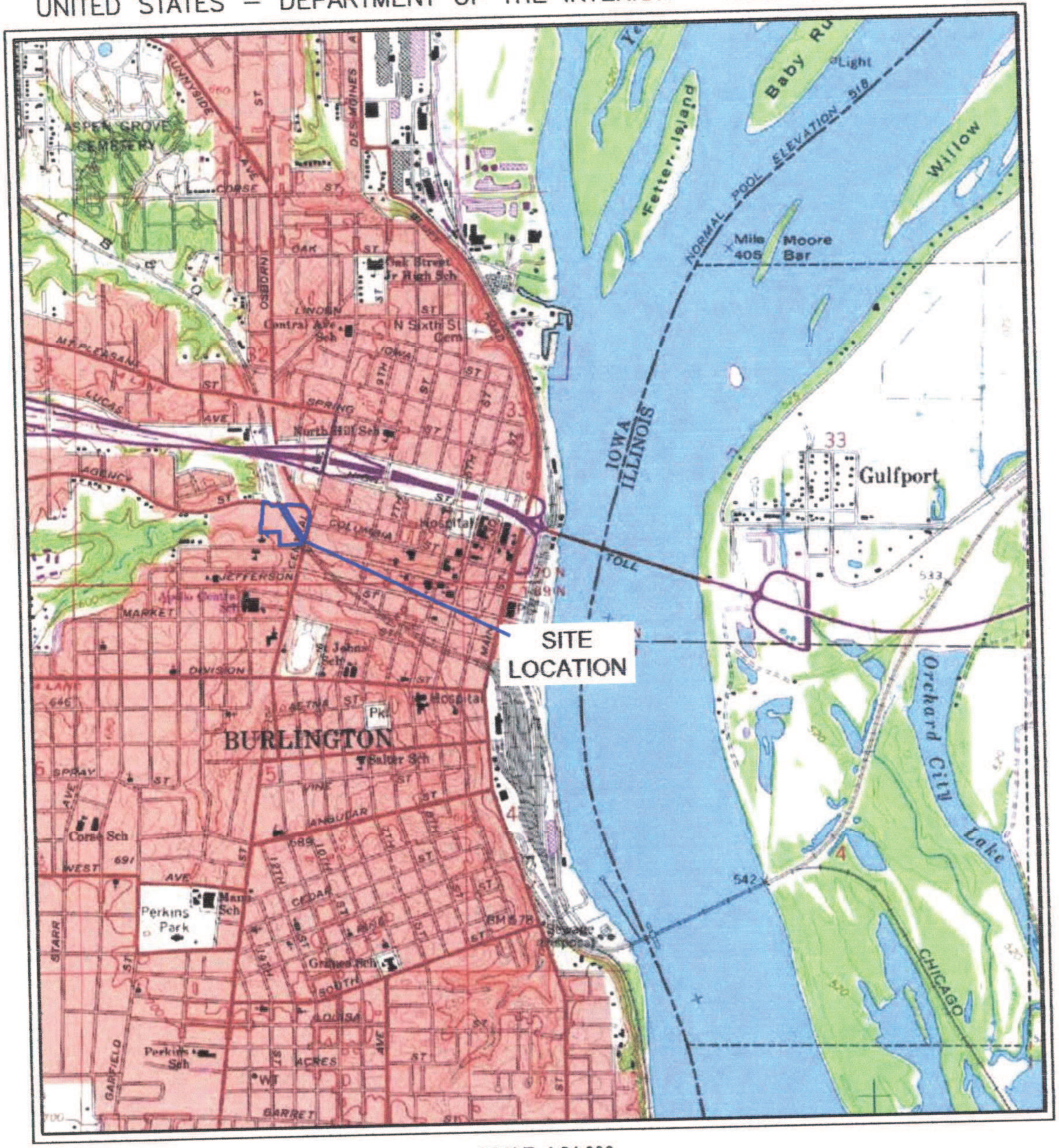
Terracon has performed a Phase II ESA in general compliance with the scope and limitations of the Agreement for Services between Terracon and the Southeast Iowa Regional Planning Commission dated February 17, 2005.

The analysis presented in this report is based upon data obtained from field activities and from other information discussed in this report. This report does not reflect any variations in subsurface stratigraphy that may occur between borings or across the site. Actual subsurface conditions may vary. The extent of such variations may not become evident without additional exploration. The limitations of this assessment should be recognized as the SEIRPC formulates conclusions on the environmental risks associated with this property.

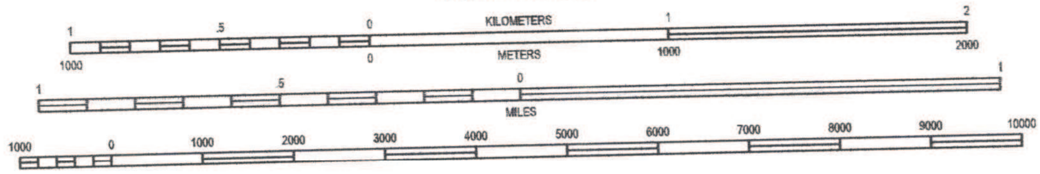
This report is prepared for the exclusive use of our client for the specific application to the project discussed and has been prepared in accordance with generally accepted environmental engineering practices. No warranties, express or implied, are intended or made. In the event any changes in nature or location of subsurface conditions as outlined in this report are observed, the conclusions contained in this report cannot be considered valid unless the changes are reviewed and the conclusions of this report are modified or verified in writing by the environmental engineer.

Appendix A

UNITED STATES – DEPARTMENT OF THE INTERIOR – GEOLOGICAL SURVEY



SCALE 1:24 000

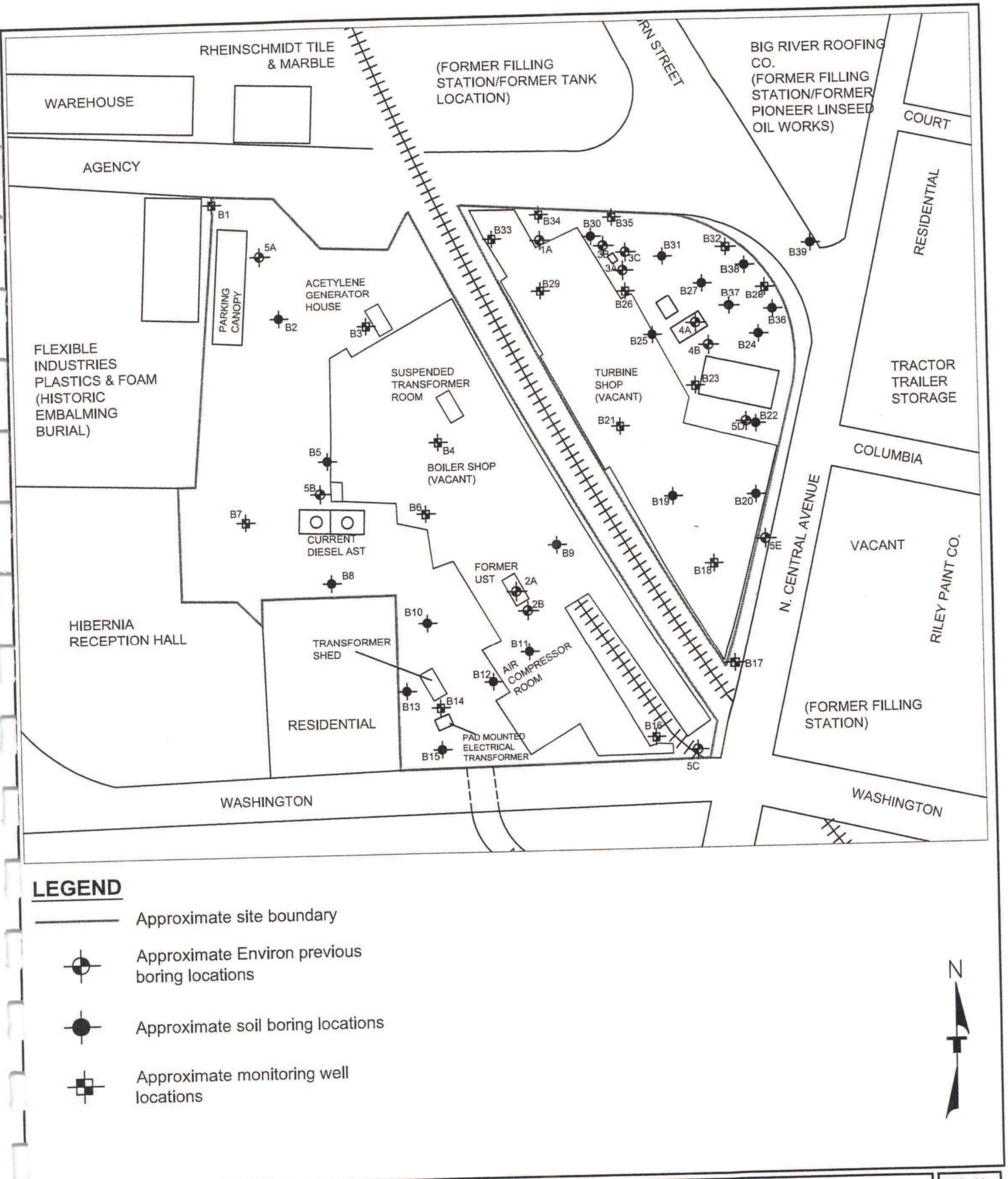


CONTOUR INTERVAL 10 FEET

NATIONAL GEODETIC VERTICAL DATUM OF 1929

BURLINGTON
IOWA
1976
7.5 MINUTE SERIES (TOPOGRAPHIC)

Project Mngr: JFB Drawn By: AAH Checked By: BMN Approved By: BMN	Project No. 07087052 Scale: AS-SHOWN File No. TOPO Date: 12/18/2008	Terracon Consulting Engineers and Scientists 870 40th Avenue Bettendorf, Iowa PH. (563) 355-0702 FAX. (563) 355-4789	TOPOGRAPHIC MAP PHASE II ENVIRONMENTAL SITE ASSESSMENT DRESSER-RAND COMPANY 1106 WASHINGTON STREET BURLINGTON, IOWA	FIG. No. 1

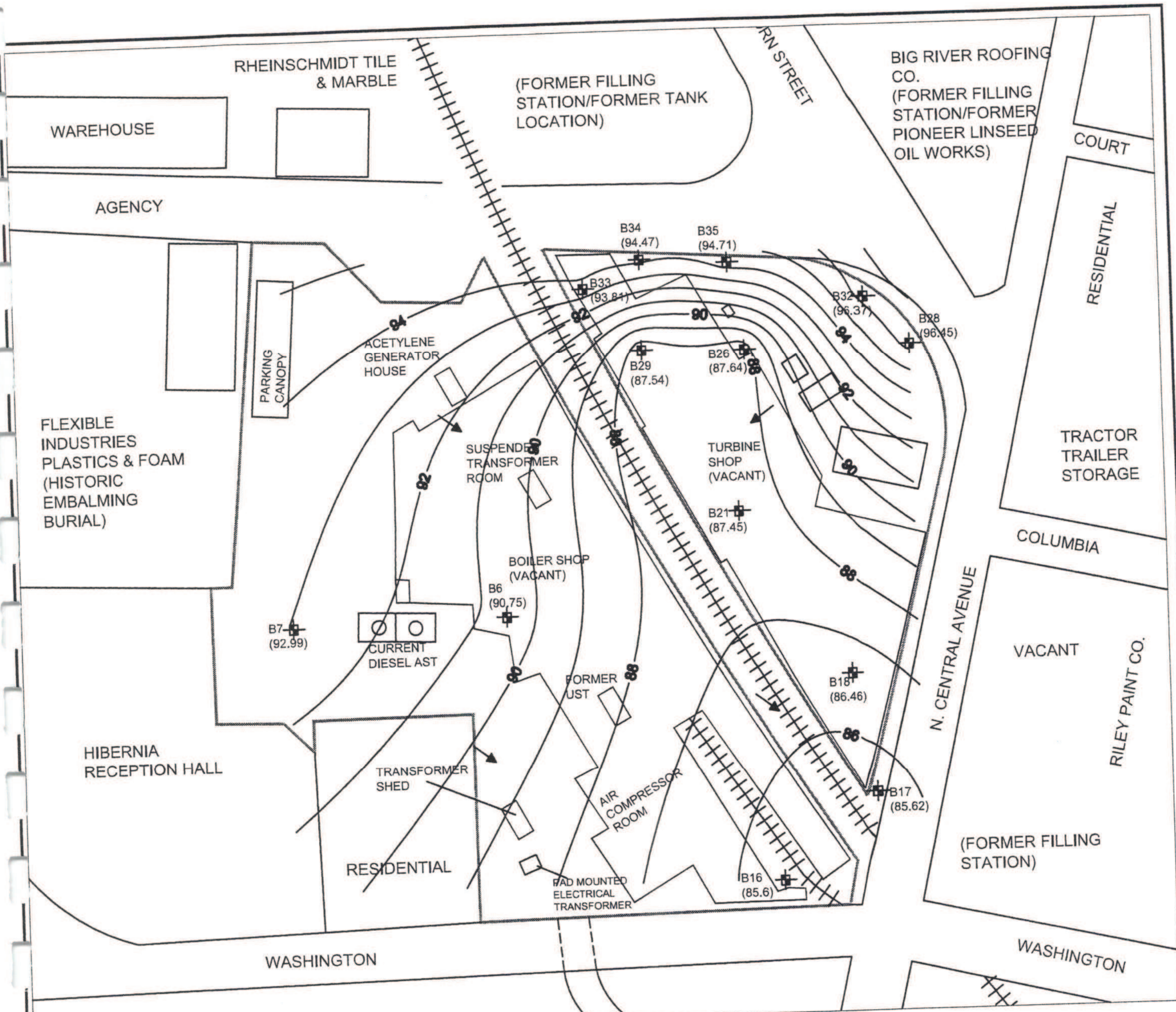


Project Mngr: SAK	Project No. 07087052
Drawn By: AAH	Scale: 1"=120'
Checked By: SAK	File No. D2
Approved By: SAK	Date: 07/21/2009

Terracon
Consulting Engineers and Scientists
11600 LILBURN PARK ROAD ST. LOUIS, MO
PH. (314) 692-8811 FAX. (314) 692-8810

SITE DIAGRAM
PHASE II ENVIRONMENTAL SITE ASSESSMENT
DRESSER-RAND COMPANY
1106 WASHINGTON STREET
BURLINGTON IOWA

FIG. No. 2



LEGEND

Approximate site boundary

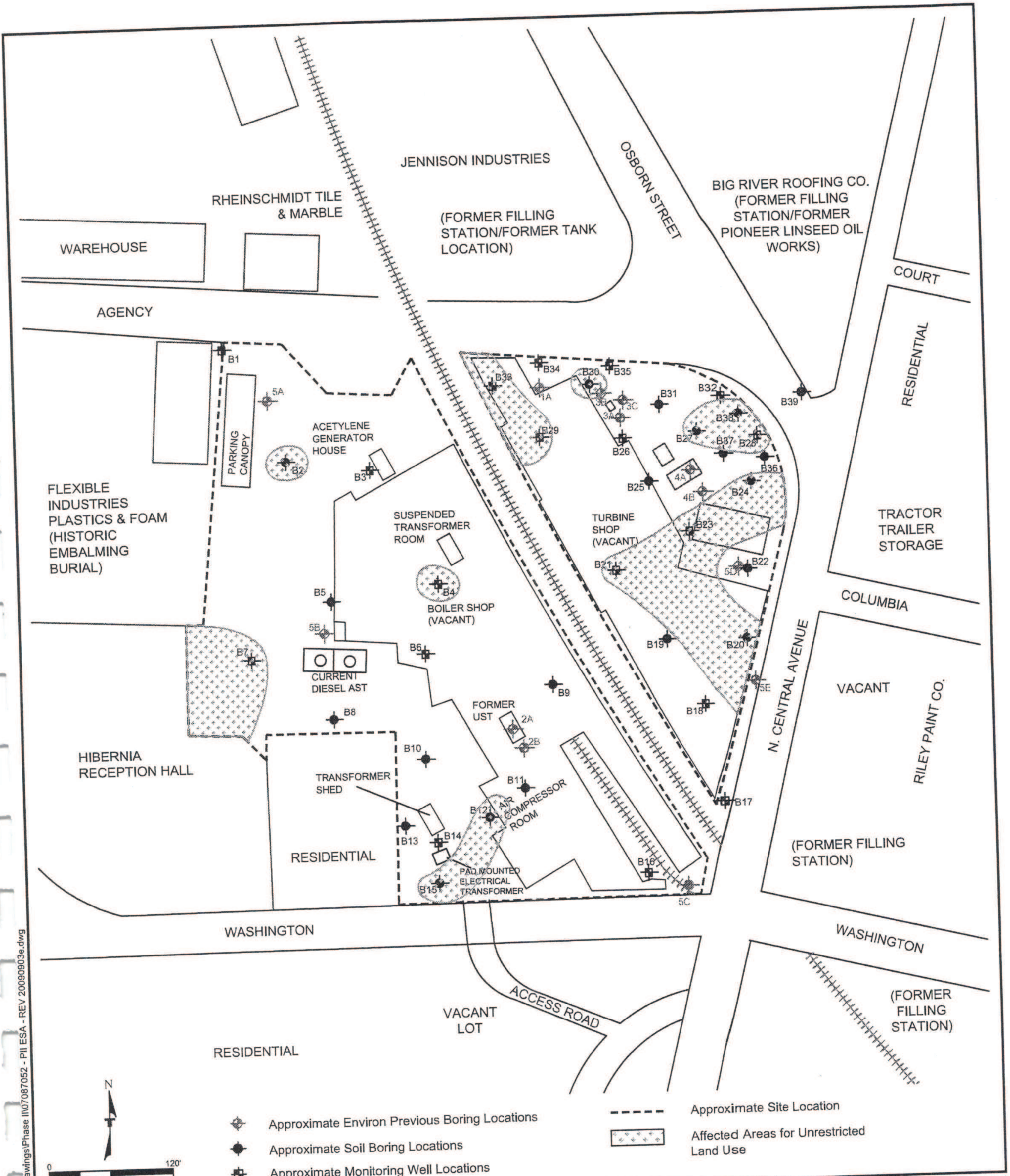
Approximate monitoring well locations

Approximate groundwater contour intervals

B7
(92.99) Approximate groundwater level

N

Project Mngr: SAK	Project No. 07087052	Terracon Consulting Engineers and Scientists	GROUNDWATER FLOW DIAGRAM	FIG. No.
Drawn By: AAH	Scale: 1"=120'	11600 LILBURN PARK ROAD, ST. LOUIS, MO	PHASE II ENVIRONMENTAL SITE ASSESSMENT DRESSER-RAND COMPANY	3
Checked By: SAK	File No. D3	PH. (314) 692-8811, FAX. (314) 692-8810	1106 WASHINGTON STREET	
Approved By: SAK	Date: 07/21/2009		BURLINGTON IOWA	



Project Mngr: SAK	Project No. 07087052	
Drawn By: DAC	Scale: AS-SHOWN	
Checked By: SAK	Revised By: ~	
Approved By: SAK	Date: September 17, 2009	

Terracon
Consulting Engineers and Scientists
870 40TH AVENUE BETTENDORF, IOWA 52722
PH. (563) 355-0702 FAX. (563) 355-4789

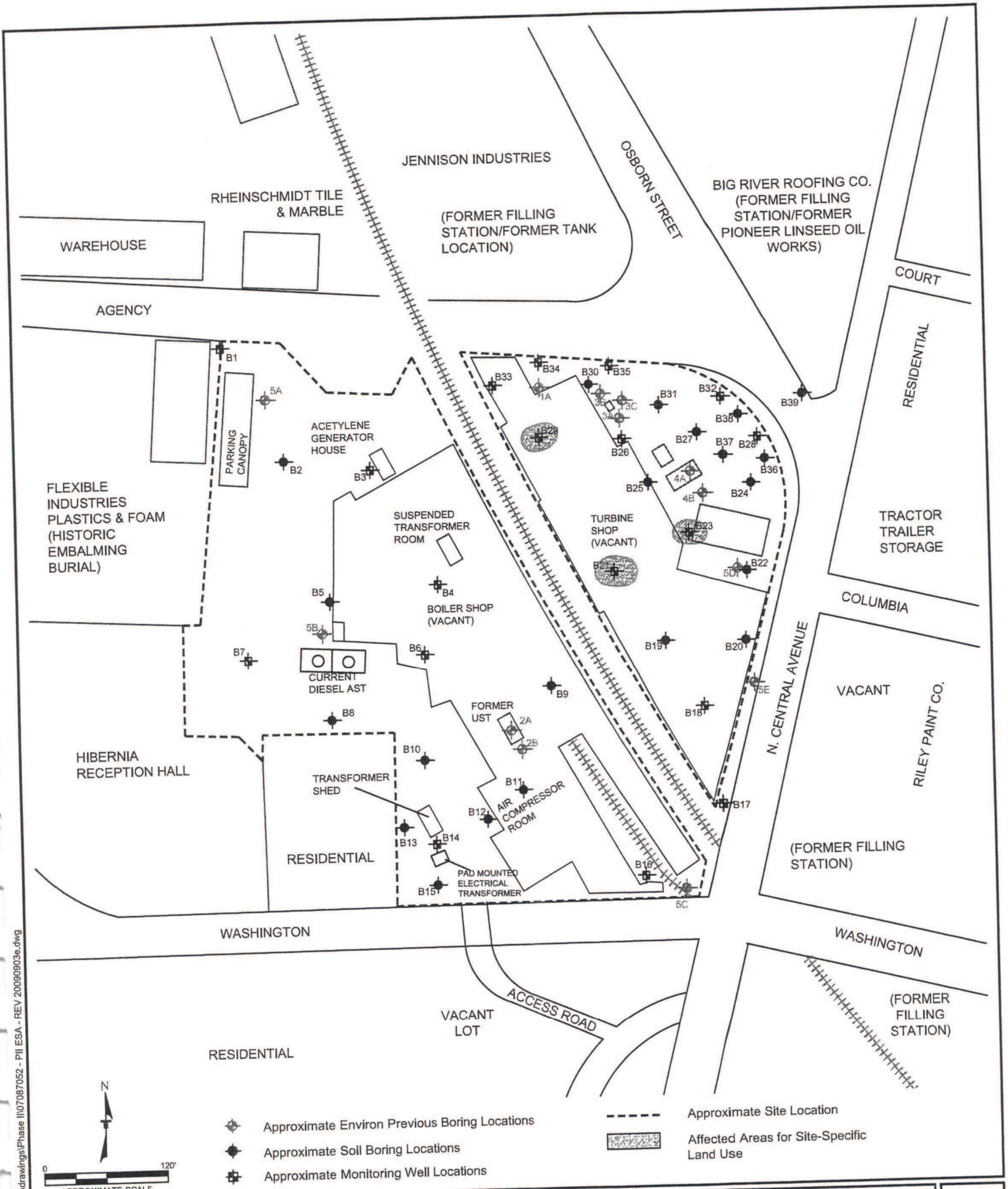
AFFECTED AREAS-SOIL

PHASE II ENVIRONMENTAL SITE ASSESSMENT
DRESSER-RAND COMPANY
1106 WASHINGTON STREET
BURLINGTON, DES MOINES COUNTY, IOWA

FIG. No. 4A

N:\Projects\2008\0708\052\drawings\Phase II\07087052 - PII ESA - REV 20090903e.dwg

DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES.



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Project Mngr: SAK	Project No. 07087052		
Drawn By: DAC	Scale: AS-SHOWN		
Checked By: SAK	Revised By: -		
Approved By: SAK	Date: September 17, 2009		

Terracon
Consulting Engineers and Scientists
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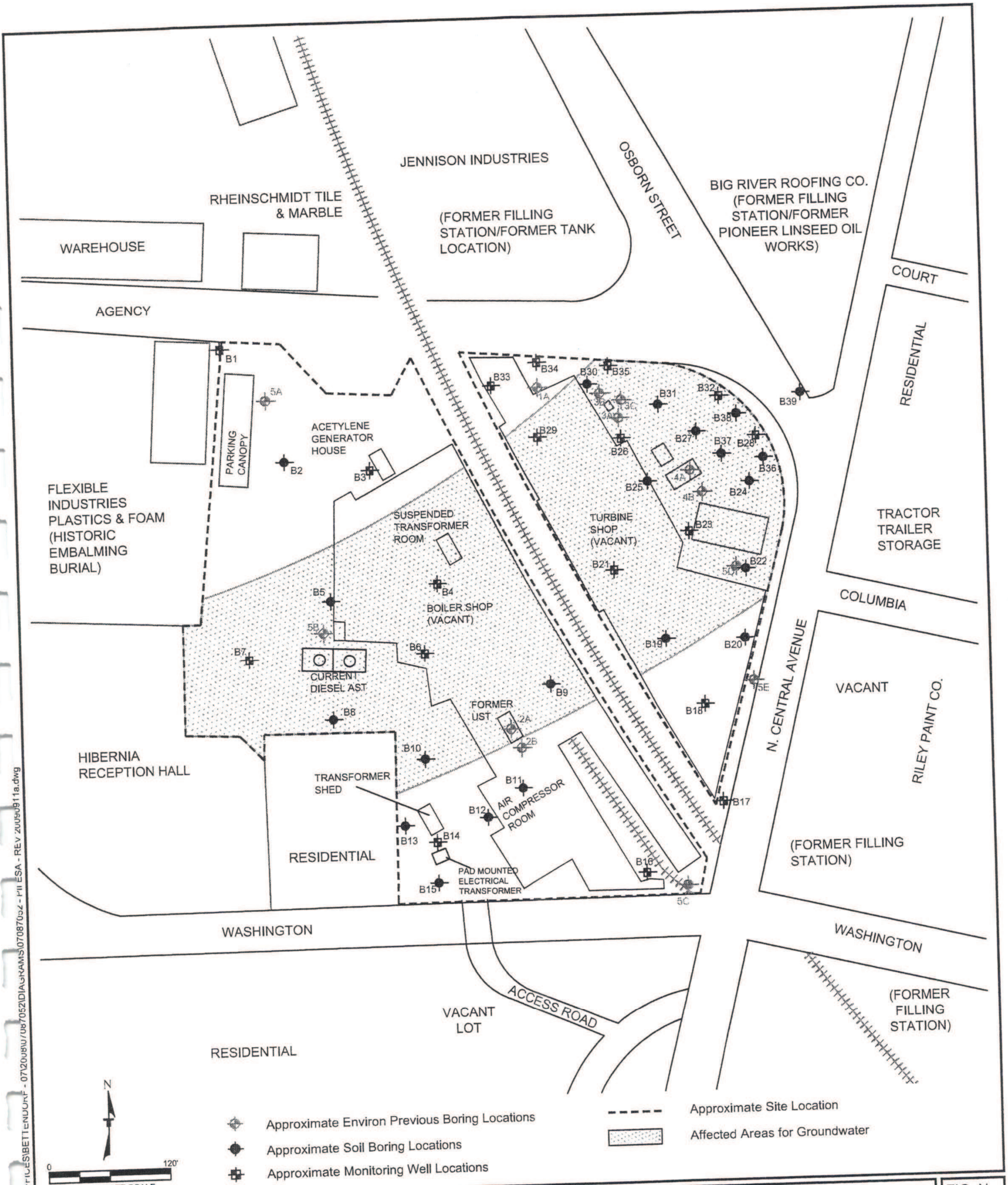
PH. (563) 355-0702 FAX. (563) 355-4789

AFFECTED AREAS-SOIL

PHASE II ENVIRONMENTAL SITE ASSESSMENT
DRESSER-RAND COMPANY
1106 WASHINGTON STREET
BURLINGTON, DES MOINES COUNTY, IOWA

FIG. No. 4B

DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES.



Project Mngr: SAK	Project No. 07087052	Terracon Consulting Engineers and Scientists	AFFECTED AREAS - GROUNDWATER	FIG. No.
Drawn By: DAC	Scale: AS-SHOWN	870 40TH AVENUE, BETTENDORF, IOWA 52722	PHASE II ENVIRONMENTAL SITE ASSESSMENT	5
Checked By: SAK	Revised By: ~	PH. (563) 355-0702, FAX. (563) 355-4789	DRESSER-RAND COMPANY 1106 WASHINGTON STREET BURLINGTON, DES MOINES COUNTY, IOWA	
Approved By: SAK	Date: September 11, 2009			

DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES.

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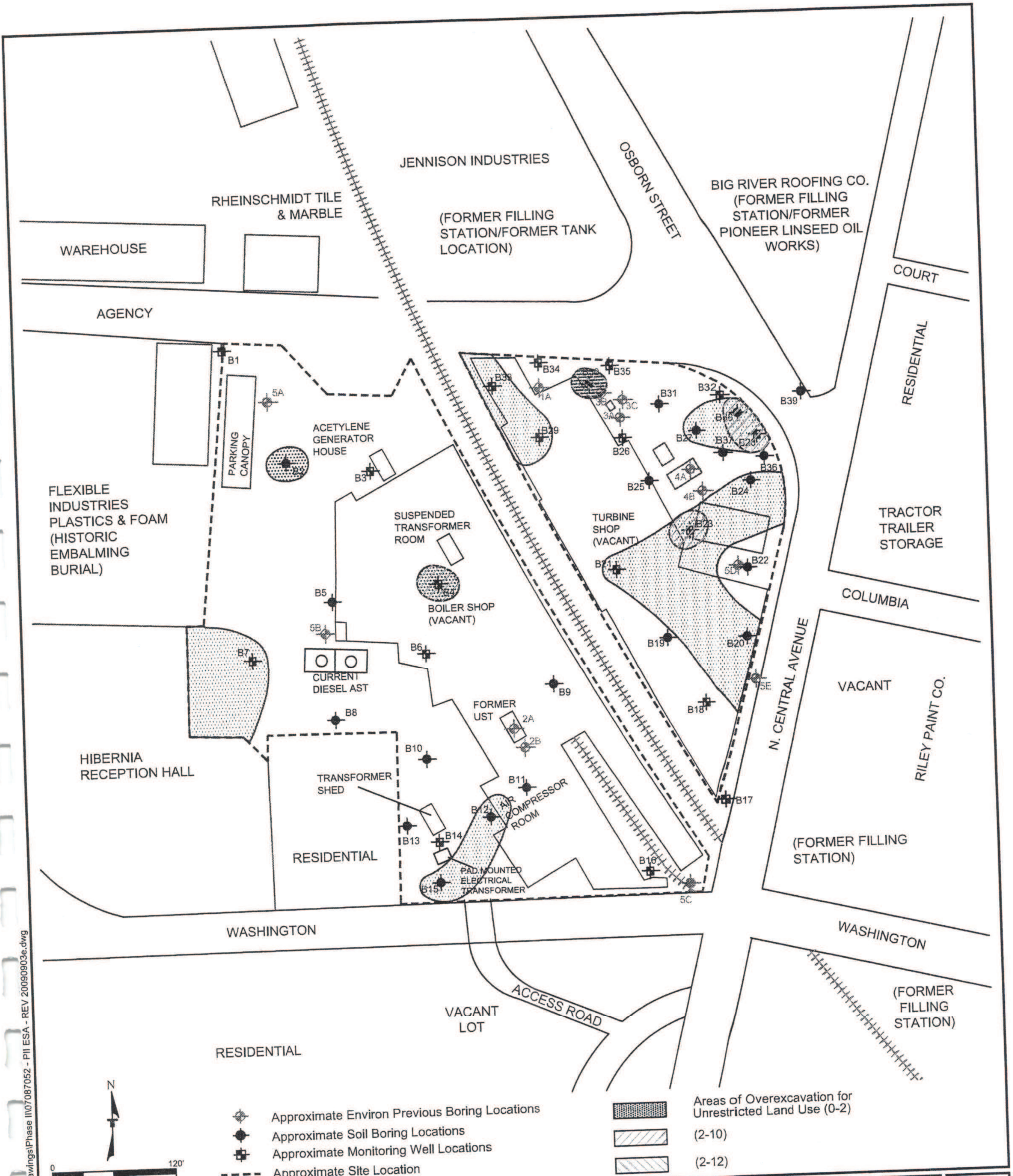
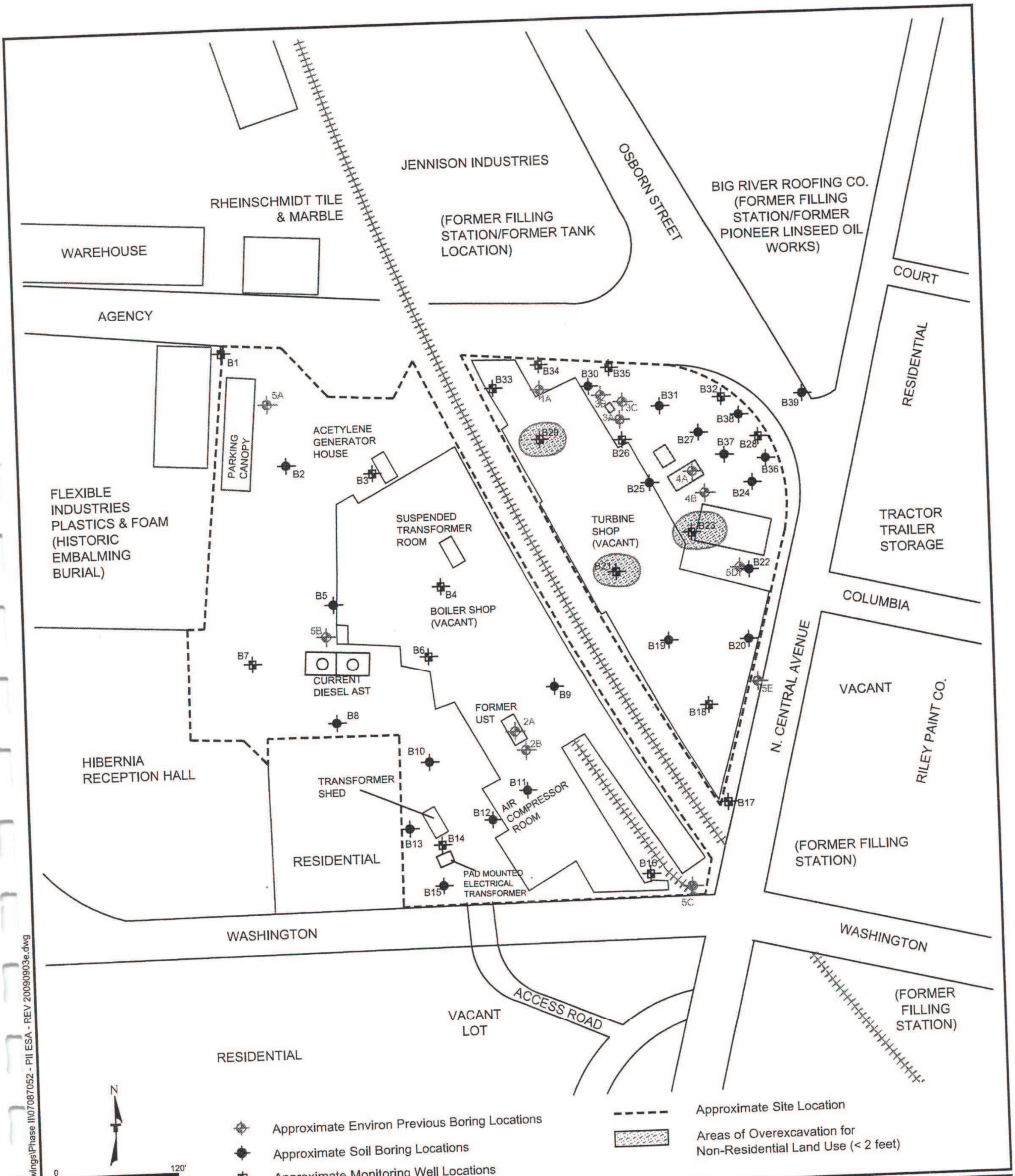


Project Mngr: SAK	Project No. 07087052	Terracon Consulting Engineers and Scientists	POTENTIAL REMEDY UNRESTRICTED USE
Drawn By: DAC	Scale: AS-SHOWN	870 40TH AVENUE / BETTENDORF, IOWA 52722	PHASE II ENVIRONMENTAL SITE ASSESSMENT DRESSER-RAND COMPANY 1106 WASHINGTON STREET BURLINGTON, DES MOINES COUNTY, IOWA
Checked By: SAK	Revised By: -	PH. (563) 355-0702 / FAX. (563) 355-4789	FIG. No. 6A
Approved By: SAK	Date: September 17, 2009		

N:\Projects\2008\07087052\drawings\Phase II\07087052 - PII ESA - REV 20090903e.dwg

DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES.



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Project Mngr: SAK	Project No. 07087052
Drawn By: DAC	Scale: AS-SHOWN
Checked By: SAK	Revised By: -
Approved By: SAK	Date: September 17, 2009

Terracon
Consulting Engineers and Scientists
870 40TH AVENUE BETTENDORF, IOWA 52722
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POTENTIAL REMEDY RESTRICTED USE

PHASE II ENVIRONMENTAL SITE ASSESSMENT
DRESSER-RAND COMPANY
1106 WASHINGTON STREET
BURLINGTON, DES MOINES COUNTY, IOWA

FIG. No.
6B

DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES.

Appendix B

Table Notes

Statewide Standards from http://programs.iowadnr.com/riskcalc/pages/standards.aspx (July 24, 2006).

Site-Specific Standards calculated using chemical-specific information downloaded from http://programs.iowadnr.com/riskcalc/pages/standards.aspx (July 24, 2006).

mg/L = milligrams per liter, generally equivalent to parts per million (ppm)

mg/kg = milligrams per kilogram, generally equivalent to ppm

TCLP = Toxicity Characteristic Leaching Procedure

SPLP = Synthetic Precipitation Leaching Procedure

87-61-6	1,2,3-Trichlorobenzene	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050			<0.00
96-18-4	1,2,3-Trichloropropane	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050			<0.00
526-73-8	1,2,3-Trimethylbenzene	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050			<0.00
120-82-1	1,2,4-Trichlorobenzene	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050			<0.00
95-63-6	1,2,4-Trimethylbenzene	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050			<0.00
96-12-8	1,2-Dibromo-3-Chloropropane	mg/kg	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025			<0.02
106-93-4	1,2-Dibromoethane	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050			<0.00
95-50-1	1,2-Dichlorobenzene	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050			<0.00
107-06-2	1,2-Dichloroethane	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050			<0.00
78-87-5	1,2-Dichloropropane	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050			<0.00
108-67-8	1,3,5-Trimethylbenzene	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050			<0.00
541-73-1	1,3-Dichlorobenzene	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050			<0.00
142-28-9	1,3-Dichloropropane	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050			<0.00
106-46-7	1,4-Dichlorobenzene	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050			<0.00
594-20-7	2,2-Dichloropropane	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050			<0.00
78-93-3	2-Butanone (MEK)	mg/kg	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050			<0.05
110-75-8	2-Chloroethyl vinyl ether	mg/kg	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25			<0.2
95-49-8	2-Chlorotoluene	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050			<0.00
106-43-4	4-Chlorotoluene	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050			<0.00
108-10-1	4-Methyl-2-pentanone (MIBK)	mg/kg	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050			<0.05
67-64-1	Acetone	mg/kg	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25			<0.2
107-13-1	Acrylonitrile	mg/kg	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050			<0.05
71-43-2	Benzene	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050			<0.00
108-86-1	Bromobenzene	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050			<0.00
75-27-4	Bromodichloromethane	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050			<0.00
75-25-2	Bromoform	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050			<0.00
74-83-9	Bromomethane	mg/kg	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025			<0.02
56-23-5	Carbon tetrachloride	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050			<0.00
108-90-7	Chlorobenzene	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050			<0.00
124-48-1	Chlorodibromomethane	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050			<0.00
75-00-3	Chloroethane	mg/kg	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025			<0.02
67-66-3	Chloroform	mg/kg	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025			<0.02
74-87-3	Chloromethane	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050			<0.00
156-59-2	cis-1,2-Dichloroethene	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050			<0.00
10061-01-5	cis-1,3-Dichloropropene	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050			<0.00
74-95-3	Dibromomethane	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050			<0.00
75-71-8	Dichlorodifluoromethane	mg/kg	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025			<0.02
108-20-3	Di-isopropyl ether	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050			<0.00
100-41-4	Ethylbenzene	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050			<0.00
87-68-3	Hexachloro-1,3-butadiene	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050			<0.00
98-82-8	Isopropylbenzene	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050			<0.00
1634-04-4	Methyl tert-butyl ether	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050			<0.00
75-09-2	Methylene Chloride	mg/kg	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025			<0.02
91-20-3	Naphthalene	mg/kg	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025			<0.02
104-51-8	n-Butylbenzene	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050			<0.00
103-65-1	n-Propylbenzene	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050			<0.00
99-87-6	p-Isopropyltoluene	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050			<0.00
135-98-8	sec-Butylbenzene	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050			<0.00
100-42-5	Styrene	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050			<0.00
98-06-6	tert-Butylbenzene	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050			<0.00
127-18-4	Tetrachloroethene	mg/kg	<0.0050	<0.0050	<0.0050	0.0057	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050			<0.00
108-88-3	Toluene	mg/kg	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025			<0.02
156-60-5	trans-1,2-Dichloroethene	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050			<0.00
10061-02-6	trans-1,3-Dichloropropene	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050			<0.00
79-01-6	Trichloroethene	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050			<0.00
75-69-4	Trichlorofluoromethane	mg/kg	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025			<0.02
75-01-4	Vinyl chloride	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050			<0.00
1330-20-7	Xylenes, Total	mg/kg	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015			<0.01

87-61-6	1,2,3-Trichlorobenzene	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050		<0.0050	<0.0050	<0.0050		<0.0
96-18-4	1,2,3-Trichloropropane	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050		<0.0050	<0.0050	<0.0050		<0.0
526-73-8	1,2,3-Trimethylbenzene	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050		<0.0050	<0.0050	<0.0050		<0.0
120-82-1	1,2,4-Trichlorobenzene	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050		<0.0050	<0.0050	<0.0050		<0.0
95-63-6	1,2,4-Trimethylbenzene	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050		<0.0050	<0.0050	<0.0050		<0.0
96-12-8	1,2-Dibromo-3-Chloropropane	mg/kg	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025		<0.025	<0.025	<0.025		<0.
106-93-4	1,2-Dibromoethane	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050		<0.0050	<0.0050	<0.0050		<0.0
95-50-1	1,2-Dichlorobenzene	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050		<0.0050	<0.0050	<0.0050		<0.0
107-06-2	1,2-Dichloroethane	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050		<0.0050	<0.0050	<0.0050		<0.0
78-87-5	1,2-Dichloropropane	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050		<0.0050	<0.0050	<0.0050		<0.0
108-67-8	1,3,5-Trimethylbenzene	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050		<0.0050	<0.0050	<0.0050		<0.0
541-73-1	1,3-Dichlorobenzene	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050		<0.0050	<0.0050	<0.0050		<0.0
142-28-9	1,3-Dichloropropane	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050		<0.0050	<0.0050	<0.0050		<0.0
106-46-7	1,4-Dichlorobenzene	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050		<0.0050	<0.0050	<0.0050		<0.0
594-20-7	2,2-Dichloropropane	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050		<0.0050	<0.0050	<0.0050		<0.0
78-93-3	2-Butanone (MEK)	mg/kg	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050		<0.050	<0.050	<0.050		<0.
110-75-8	2-Chloroethyl vinyl ether	mg/kg	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25		<0.25	<0.25	<0.25		<0
95-49-8	2-Chlorotoluene	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050		<0.0050	<0.0050	<0.0050		<0.0
106-43-4	4-Chlorotoluene	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050		<0.0050	<0.0050	<0.0050		<0.0
108-10-1	4-Methyl-2-pentanone (MIBK)	mg/kg	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050		<0.050	<0.050	<0.050		<0.
67-64-1	Acetone	mg/kg	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25		<0.25	<0.25	<0.25		<0
107-13-1	Acrylonitrile	mg/kg	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050		<0.050	<0.050	<0.050		<0.
71-43-2	Benzene	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0
108-86-1	Bromobenzene	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050		<0.0050	<0.0050	<0.0050		<0.0
75-27-4	Bromodichloromethane	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050		<0.0050	<0.0050	<0.0050		<0.0
75-25-2	Bromoform	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050		<0.0050	<0.0050	<0.0050		<0.0
74-83-9	Bromomethane	mg/kg	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025		<0.025	<0.025	<0.025		<0.
56-23-5	Carbon tetrachloride	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050		<0.0050	<0.0050	<0.0050		<0.0
108-90-7	Chlorobenzene	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050		<0.0050	<0.0050	<0.0050		<0.0
124-48-1	Chlorodibromomethane	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050		<0.0050	<0.0050	<0.0050		<0.0
75-00-3	Chloroethane	mg/kg	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025		<0.025	<0.025	<0.025		<0.
67-66-3	Chloroform	mg/kg	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025		<0.025	<0.025	<0.025		<0.
74-87-3	Chloromethane	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050		<0.0050	<0.0050	<0.0050		<0.0
156-59-2	cis-1,2-Dichloroethene	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050		<0.0050	<0.0050	<0.0050		<0.0
10061-01-5	cis-1,3-Dichloropropene	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050		<0.0050	<0.0050	<0.0050		<0.0
74-95-3	Dibromomethane	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050		<0.0050	<0.0050	<0.0050		<0.0
75-71-8	Dichlorodifluoromethane	mg/kg	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025		<0.025	<0.025	<0.025		<0.
108-20-3	Di-isopropyl ether	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050		<0.0050	<0.0050	<0.0050		<0.0
100-41-4	Ethylbenzene	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0
87-68-3	Hexachloro-1,3-butadiene	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050		<0.0050	<0.0050	<0.0050		<0.0
98-82-8	Isopropylbenzene	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050		<0.0050	<0.0050	<0.0050		<0.0
1634-04-4	Methyl tert-butyl ether	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050		<0.0050	<0.0050	<0.0050		<0.0
75-09-2	Methylene Chloride	mg/kg	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025		<0.025	<0.025	<0.025		<0.
91-20-3	Naphthalene	mg/kg	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025		<0.025	<0.025	<0.025		<0.
104-51-8	n-Butylbenzene	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050		<0.0050	<0.0050	<0.0050		<0.0
103-65-1	n-Propylbenzene	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050		<0.0050	<0.0050	<0.0050		<0.0
99-87-6	p-Isopropyltoluene	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050		<0.0050	<0.0050	<0.0050		<0.0
135-98-8	sec-Butylbenzene	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050		<0.0050	<0.0050	<0.0050		<0.0
100-42-5	Styrene	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050		<0.0050	<0.0050	<0.0050		<0.0
98-06-6	tert-Butylbenzene	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050		<0.0050	<0.0050	<0.0050		<0.0
127-18-4	Tetrachloroethene	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050		<0.0050	<0.0050	<0.0050		<0.0
108-88-3	Toluene	mg/kg	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.0
156-60-5	trans-1,2-Dichloroethene	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050		<0.0050	<0.0050	<0.0050		<0.0
10061-02-6	trans-1,3-Dichloropropene	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050		<0.0050	<0.0050	<0.0050		<0.0
79-01-6	Trichloroethene	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050		<0.0050	<0.0050	<0.0050		<0.0
75-69-4	Trichlorofluoromethane	mg/kg	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025		<0.025	<0.025	<0.025		<0.0
75-01-4	Vinyl chloride	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050		<0.0050	<0.0050	<0.0050		<0.0
1330-20-7	Xylenes, Total	mg/kg	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.0

87-61-6	1,2,3-Trichlorobenzene	mg/kg	<0.0050		<0.0050		<0.0050			<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.00
96-18-4	1,2,3-Trichloropropane	mg/kg	<0.0050		<0.0050		<0.0050			<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.00
526-73-8	1,2,3-Trimethylbenzene	mg/kg	<0.0050		<0.0050		<0.0050			<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.00
120-82-1	1,2,4-Trichlorobenzene	mg/kg	<0.0050		<0.0050		<0.0050			<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.00
95-63-6	1,2,4-Trimethylbenzene	mg/kg	<0.0050		<0.0050		<0.0050			<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.00
96-12-8	1,2-Dibromo-3-Chloropropane	mg/kg	<0.025		<0.025		<0.025			<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.02
106-93-4	1,2-Dibromoethane	mg/kg	<0.0050		<0.0050		<0.0050			<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.00
95-50-1	1,2-Dichlorobenzene	mg/kg	<0.0050		<0.0050		<0.0050			<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.00
107-06-2	1,2-Dichloroethane	mg/kg	<0.0050		<0.0050		<0.0050			<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.00
78-87-5	1,2-Dichloropropane	mg/kg	<0.0050		<0.0050		<0.0050			<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.00
108-67-8	1,3,5-Trimethylbenzene	mg/kg	<0.0050		<0.0050		<0.0050			<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.00
541-73-1	1,3-Dichlorobenzene	mg/kg	<0.0050		<0.0050		<0.0050			<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.00
142-28-9	1,3-Dichloropropane	mg/kg	<0.0050		<0.0050		<0.0050			<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.00
106-46-7	1,4-Dichlorobenzene	mg/kg	<0.0050		<0.0050		<0.0050			<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.00
594-20-7	2,2-Dichloropropane	mg/kg	<0.0050		<0.0050		<0.0050			<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.00
78-93-3	2-Butanone (MEK)	mg/kg	<0.050		<0.050		<0.050			<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.05
110-75-8	2-Chloroethyl vinyl ether	mg/kg	<0.25		<0.25		<0.25			<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.2
95-49-8	2-Chlorotoluene	mg/kg	<0.0050		<0.0050		<0.0050			<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.00
106-43-4	4-Chlorotoluene	mg/kg	<0.0050		<0.0050		<0.0050			<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.00
108-10-1	4-Methyl-2-pentanone (MIBK)	mg/kg	<0.050		<0.050		<0.050			<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.05
67-64-1	Acetone	mg/kg	<0.25		<0.25		<0.25			<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.2
107-13-1	Acrylonitrile	mg/kg	<0.050		<0.050		<0.050			<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.05
71-43-2	Benzene	mg/kg	<0.0050		<0.0050		<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.00
108-86-1	Bromobenzene	mg/kg	<0.0050		<0.0050		<0.0050			<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.00
75-27-4	Bromodichloromethane	mg/kg	<0.0050		<0.0050		<0.0050			<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.00
75-25-2	Bromoform	mg/kg	<0.0050		<0.0050		<0.0050			<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.00
74-83-9	Bromomethane	mg/kg	<0.025		<0.025		<0.025			<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.02
56-23-5	Carbon tetrachloride	mg/kg	<0.0050		<0.0050		<0.0050			<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.00
108-90-7	Chlorobenzene	mg/kg	<0.0050		<0.0050		<0.0050			<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.00
124-48-1	Chlorodibromomethane	mg/kg	<0.0050		<0.0050		<0.0050			<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.00
75-00-3	Chloroethane	mg/kg	<0.025		<0.025		<0.025			<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.02
67-66-3	Chloroform	mg/kg	<0.025		<0.025		<0.025			<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.02
74-87-3	Chloromethane	mg/kg	<0.0050		<0.0050		<0.0050			<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.00
156-59-2	cis-1,2-Dichloroethene	mg/kg	<0.0050		<0.0050		<0.0050			<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.00
10061-01-5	cis-1,3-Dichloropropene	mg/kg	<0.0050		<0.0050		<0.0050			<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.00
74-95-3	Dibromomethane	mg/kg	<0.0050		<0.0050		<0.0050			<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.00
75-71-8	Dichlorodifluoromethane	mg/kg	<0.025		<0.025		<0.025			<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.02
108-20-3	Di-isopropyl ether	mg/kg	<0.0050		<0.0050		<0.0050			<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.00
100-41-4	Ethylbenzene	mg/kg	<0.0050		<0.0050		<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.00
87-68-3	Hexachloro-1,3-butadiene	mg/kg	<0.0050		<0.0050		<0.0050			<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.00
98-82-8	Isopropylbenzene	mg/kg	<0.0050		<0.0050		<0.0050			<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.00
1634-04-4	Methyl tert-butyl ether	mg/kg	<0.0050		<0.0050		<0.0050			<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.00
75-09-2	Methylene Chloride	mg/kg	<0.025		<0.025		<0.025			<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.02
91-20-3	Naphthalene	mg/kg	<0.025		<0.025		<0.025			<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.02
104-51-8	n-Butylbenzene	mg/kg	<0.0050		<0.0050		<0.0050			<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.00
103-65-1	n-Propylbenzene	mg/kg	<0.0050		<0.0050		<0.0050			<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.00
99-87-6	p-Isopropyltoluene	mg/kg	<0.0050		<0.0050		<0.0050			<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.00
135-98-8	sec-Butylbenzene	mg/kg	<0.0050		<0.0050		<0.0050			<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.00
100-42-5	Styrene	mg/kg	<0.0050		<0.0050		<0.0050			<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.00
98-06-6	tert-Butylbenzene	mg/kg	<0.0050		<0.0050		<0.0050			<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.00
127-18-4	Tetrachloroethene	mg/kg	<0.0050		<0.0050		<0.0050			<0.0050	<0.0050	<0.0050	0.006	<0.0050	<0.0050	<0.00
108-88-3	Toluene	mg/kg	<0.025		<0.025		<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.02
156-60-5	trans-1,2-Dichloroethene	mg/kg	<0.0050		<0.0050		<0.0050			<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.00
10061-02-6	trans-1,3-Dichloropropene	mg/kg	<0.0050		<0.0050		<0.0050			<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.00
79-01-6	Trichloroethene	mg/kg	<0.0050		<0.0050		<0.0050			<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.00
75-69-4	Trichlorofluoromethane	mg/kg	<0.025		<0.025		<0.025			<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.02
75-01-4	Vinyl chloride	mg/kg	<0.0050		<0.0050		<0.0050			<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.00
1330-20-7	Xylenes, Total	mg/kg	<0.015		<0.015		<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.01

87-61-6	1,2,3-Trichlorobenzene	mg/kg		<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050		<0.0050	
96-18-4	1,2,3-Trichloropropane	mg/kg		<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050		<0.0050	
526-73-8	1,2,3-Trimethylbenzene	mg/kg		<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050		<0.0050	
120-82-1	1,2,4-Trichlorobenzene	mg/kg		<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050		<0.0050	
95-63-6	1,2,4-Trimethylbenzene	mg/kg		<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050		<0.0050	
96-12-8	1,2-Dibromo-3-Chloropropane	mg/kg		<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025		<0.025	
106-93-4	1,2-Dibromoethane	mg/kg		<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050		<0.0050	
95-50-1	1,2-Dichlorobenzene	mg/kg		<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050		<0.0050	
107-06-2	1,2-Dichloroethane	mg/kg		<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050		<0.0050	
78-87-5	1,2-Dichloropropane	mg/kg		<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050		<0.0050	
108-67-8	1,3,5-Trimethylbenzene	mg/kg		<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050		<0.0050	
541-73-1	1,3-Dichlorobenzene	mg/kg		<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050		<0.0050	
142-28-9	1,3-Dichloropropane	mg/kg		<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050		<0.0050	
106-46-7	1,4-Dichlorobenzene	mg/kg		<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050		<0.0050	
594-20-7	2,2-Dichloropropane	mg/kg		<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050		<0.0050	
78-93-3	2-Butanone (MEK)	mg/kg		<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050		<0.050	
110-75-8	2-Chloroethyl vinyl ether	mg/kg		<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25		<0.25	
95-49-8	2-Chlorotoluene	mg/kg		<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050		<0.0050	
106-43-4	4-Chlorotoluene	mg/kg		<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050		<0.0050	
108-10-1	4-Methyl-2-pentanone (MIBK)	mg/kg		<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050		<0.050	
67-64-1	Acetone	mg/kg		<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	0.29	<0.25		<0.25	
107-13-1	Acrylonitrile	mg/kg		<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050		<0.050	
71-43-2	Benzene	mg/kg		<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
108-86-1	Bromobenzene	mg/kg		<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050		<0.0050	
75-27-4	Bromodichloromethane	mg/kg		<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050		<0.0050	
75-25-2	Bromoform	mg/kg		<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050		<0.0050	
74-83-9	Bromomethane	mg/kg		<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025		<0.025	
56-23-5	Carbon tetrachloride	mg/kg		<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050		<0.0050	
108-90-7	Chlorobenzene	mg/kg		<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050		<0.0050	
124-48-1	Chlorodibromomethane	mg/kg		<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050		<0.0050	
75-00-3	Chloroethane	mg/kg		<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025		<0.025	
67-66-3	Chloroform	mg/kg		<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025		<0.025	
74-87-3	Chloromethane	mg/kg		<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050		<0.0050	
156-59-2	cis-1,2-Dichloroethene	mg/kg		<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050		<0.0050	
10061-01-5	cis-1,3-Dichloropropene	mg/kg		<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050		<0.0050	
74-95-3	Dibromomethane	mg/kg		<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050		<0.0050	
75-71-8	Dichlorodifluoromethane	mg/kg		<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025		<0.025	
108-20-3	Di-isopropyl ether	mg/kg		<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050		<0.0050	
100-41-4	Ethylbenzene	mg/kg		<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
87-68-3	Hexachloro-1,3-butadiene	mg/kg		<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050		<0.0050	
98-82-8	Isopropylbenzene	mg/kg		<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050		<0.0050	
1634-04-4	Methyl tert-butyl ether	mg/kg		<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050		<0.0050	
75-09-2	Methylene Chloride	mg/kg		<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025		<0.025	
91-20-3	Naphthalene	mg/kg		<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025		<0.025	
104-51-8	n-Butylbenzene	mg/kg		<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050		<0.0050	
103-65-1	n-Propylbenzene	mg/kg		<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050		<0.0050	
99-87-6	p-Isopropyltoluene	mg/kg		<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050		<0.0050	
135-98-8	sec-Butylbenzene	mg/kg		<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050		<0.0050	
100-42-5	Styrene	mg/kg		<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050		<0.0050	
98-06-6	tert-Butylbenzene	mg/kg		<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050		<0.0050	
127-18-4	Tetrachloroethene	mg/kg		<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.016	<0.0050		<0.0050	
108-88-3	Toluene	mg/kg		<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
156-60-5	trans-1,2-Dichloroethene	mg/kg		<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050		<0.0050	
10061-02-6	trans-1,3-Dichloropropene	mg/kg		<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050		<0.0050	
79-01-6	Trichloroethene	mg/kg		<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050		<0.0050	
75-69-4	Trichlorofluoromethane	mg/kg		<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025		<0.025	
75-01-4	Vinyl chloride	mg/kg		<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050		<0.0050	
1330-20-7	Xylenes, Total	mg/kg		<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015

95-57-8	2-Chlorophenol	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33		<0.
88-75-5	2-Nitrophenol	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33		<0.
91-94-1	3,3-Dichlorobenzidine	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33		<0.
534-52-1	4,6-Dinitro-2-methylphenol	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33		<0.
101-55-3	4-Bromophenyl-phenylether	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33		<0.
59-50-7	4-Chloro-3-methylphenol	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33		<0.
7005-72-3	4-Chlorophenyl-phenylether	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33		<0.
100-02-7	4-Nitrophenol	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33		<0.
83-32-9	Acenaphthene	mg/kg	<0.033	0.053	<0.033	<0.033	<0.033	<0.033	<0.033	<0.033	<0.033	<0.033	<0.033	<0.033	<0.033	0.0
208-96-8	Acenaphthylene	mg/kg	<0.033	0.075	<0.033	<0.033	<0.033	<0.033	<0.033	<0.033	<0.033	<0.033	<0.033	<0.033	<0.033	0.0
120-12-7	Anthracene	mg/kg	<0.033	0.23	<0.033	<0.033	<0.033	<0.033	<0.033	<0.033	<0.033	<0.033	<0.033	<0.033	<0.033	0.2
92-87-5	Benzidine	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33		<0.
56-55-3	Benzo(a)anthracene	mg/kg	<0.033	0.82	0.041	0.28	<0.033	<0.033	<0.033	0.2	<0.033	<0.033	<0.033	0.061	<0.033	2.
50-32-8	Benzo(a)pyrene	mg/kg	<0.033	**0.72**	0.041	**0.51**	<0.033	<0.033	<0.033	0.15	<0.033	<0.033	<0.033	0.07	<0.033	**2.**
205-99-2	Benzo(b)fluoranthene	mg/kg	<0.033	1	0.044	0.58	<0.033	<0.033	<0.033	0.29	<0.033	<0.033	<0.033	0.057	<0.033	2.
191-24-2	Benzo(g,h,i)perylene	mg/kg	<0.033	0.18	<0.033	0.21	<0.033	<0.033	<0.033	0.048	<0.033	<0.033	<0.033	<0.033	<0.033	0.
207-08-9	Benzo(k)fluoranthene	mg/kg	<0.033	0.39	<0.033	0.36	<0.033	<0.033	<0.033	0.15	<0.033	<0.033	<0.033	0.045	<0.033	1.
85-68-7	Benzylbutyl phthalate	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33		<0.
111-91-1	Bis(2-chlorethoxy)methane	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33		<0.
111-44-4	Bis(2-chloroethyl)ether	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33		<0.
108-60-1	Bis(2-chloroisopropyl)ether	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33		<0.
117-81-7	Bis(2-ethylhexyl)phthalate	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33		<0.
218-01-9	Chrysene	mg/kg	<0.033	0.7	0.063	0.25	<0.033	<0.033	<0.033	0.15	<0.033	<0.033	<0.033	0.066	<0.033	2.
53-70-3	Dibenz(a,h)anthracene	mg/kg	<0.033	0.11	<0.033	0.066	<0.033	<0.033	<0.033	<0.033	<0.033	<0.033	<0.033	<0.033	<0.033	0.2
84-66-2	Diethyl phthalate	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33		<0.
131-11-3	Dimethyl phthalate	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33		<0.
84-74-2	Di-n-butyl phthalate	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33		<0.
117-84-0	Di-n-octyl phthalate	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33		<0.
206-44-0	Fluoranthene	mg/kg	<0.033	1.7	0.063	0.18	<0.033	<0.033	<0.033	0.4	<0.033	<0.033	<0.033	0.082	<0.033	3.
86-73-7	Fluorene	mg/kg	<0.033	0.079	<0.033	<0.033	<0.033	<0.033	<0.033	<0.033	<0.033	<0.033	<0.033	<0.033	<0.033	0.0
87-68-3	Hexachloro-1,3-butadiene	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33		<0.
118-74-1	Hexachlorobenzene	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33		<0.
77-47-4	Hexachlorocyclopentadiene	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33		<0.
67-72-1	Hexachloroethane	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33		<0.
193-39-5	Indeno(1,2,3-cd)pyrene	mg/kg	<0.033	0.2	<0.033	0.22	<0.033	<0.033	<0.033	0.05	<0.033	<0.033	<0.033	<0.033	<0.033	0.5
78-59-1	Isophorone	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33		<0.
91-20-3	Naphthalene	mg/kg	<0.033	0.08	<0.033	<0.033	<0.033	<0.033	<0.033	<0.033	<0.033	<0.033	<0.033	<0.033		0.0
98-95-3	Nitrobenzene	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33		<0.
62-75-9	n-Nitrosodimethylamine	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33		<0.
621-64-7	n-Nitrosodi-n-propylamine	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33		<0.
86-30-6	n-Nitrosodiphenylamine	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33		<0.
87-86-5	Pentachlorophenol	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33		<0.
85-01-8	Phenanthrene	mg/kg	<0.033	1.2	0.062	0.044	<0.033	<0.033	<0.033	0.21	<0.033	<0.033	<0.033	<0.033	<0.033	1.
108-95-2	Phenol	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33		<0.
129-00-0	Pyrene	mg/kg	<0.033	1.9	0.052	0.26	<0.033	<0.033	<0.033	0.32	<0.033	<0.033	<0.033	0.16	<0.033	7.
12674-11-2	PCB 1016	mg/kg	<0.017	<0.017	<0.017	<0.017	<0.017	<0.017	<0.017	<0.017	<0.017	<0.017	<0.017	<0.017		<0.0
11104-28-2	PCB 1221	mg/kg	<0.017	<0.017	<0.017	<0.017	<0.017	<0.017	<0.017	<0.017	<0.017	<0.017	<0.017	<0.017		<0.0
11141-16-5	PCB 1232	mg/kg	<0.017	<0.017	<0.017	<0.017	<0.017	<0.017	<0.017	<0.017	<0.017	<0.017	<0.017	<0.017		<0.0
53469-21-9	PCB 1242	mg/kg	<0.017	<0.017	<0.017	<0.017	<0.017	<0.017	<0.017	<0.017	<0.017	<0.017	<0.017	<0.017		<0.0
12672-29-6	PCB 1248	mg/kg	<0.017	<0.017	<0.017	<0.017	<0.017	<0.017	<0.017	<0.017	<0.017	<0.017	<0.017	<0.017		<0.0
11097-69-1	PCB 1254	mg/kg	<0.017	<0.017	<0.017	<0.017	<0.017	<0.017	<0.017	<0.017	<0.017	<0.017	<0.017	<0.017		<0.0
11096-82-5	PCB 1260	mg/kg	<0.017	<0.017	<0.017	<0.017	<0.017	<0.017	<0.017	0.05	<0.017	<0.017	<0.017	<0.017		<0.0
7440-38-2	Arsenic	mg/kg	3.5	<50	3	6.1	3.4	4.1	3.4	**18**	<1.0	2	<5.0			**18**
7440-39-3	Barium	mg/kg	72	100	74	70	14	71	66	170	69	61	21			31
7440-43-9	Cadmium	mg/kg	1.2	9.6	1.8	2.8	0.34	0.41	0.29	3.9	1.7	1.5	<1.2			0.6
7440-47-3	Chromium	mg/kg	8.4	33	11	15	4.8	11	11	49	17	14	25			9.1
7439-92-1	Lead	mg/kg	91	290	130	300	9	130	76	**580**	30	22	21			71

95-57-8	2-Chlorophenol	mg/kg	<0.33	<0.33	<1.6	<0.33	<0.33	<0.33	<0.33	<0.33		<0.33	<0.33	<0.33		<0
88-75-5	2-Nitrophenol	mg/kg	<0.33	<0.33	<1.6	<0.33	<0.33	<0.33	<0.33	<0.33		<0.33	<0.33	<0.33		<0
91-94-1	3,3-Dichlorobenzidine	mg/kg	<0.33	<0.33	<1.6	<0.33	<0.33	<0.33	<0.33	<0.33		<0.33	<0.33	<0.33		<0
534-52-1	4,6-Dinitro-2-methylphenol	mg/kg	<0.33	<0.33	<1.6	<0.33	<0.33	<0.33	<0.33	<0.33		<0.33	<0.33	<0.33		<0
101-55-3	4-Bromophenyl-phenylether	mg/kg	<0.33	<0.33	<1.6	<0.33	<0.33	<0.33	<0.33	<0.33		<0.33	<0.33	<0.33		<0
59-50-7	4-Chloro-3-methylphenol	mg/kg	<0.33	<0.33	<1.6	<0.33	<0.33	<0.33	<0.33	<0.33		<0.33	<0.33	<0.33		<0
7005-72-3	4-Chlorophenyl-phenylether	mg/kg	<0.33	<0.33	<1.6	<0.33	<0.33	<0.33	<0.33	<0.33		<0.33	<0.33	<0.33		<0
100-02-7	4-Nitrophenol	mg/kg	<0.33	<0.33	<1.6	<0.33	<0.33	<0.33	<0.33	<0.33		<0.33	<0.33	<0.33		<0
83-32-9	Acenaphthene	mg/kg	<0.033	0.38	<0.16	<0.033	<0.033	<0.033	<0.033	<0.033	<0.033	<0.033	<0.033	<0.033	<0.033	<0.
208-96-8	Acenaphthylene	mg/kg	<0.033	0.098	0.47	<0.033	<0.033	0.082	<0.033	<0.033	<0.033	<0.033	<0.033	0.051	<0.033	<0.
120-12-7	Anthracene	mg/kg	0.033	0.41	0.27	<0.033	<0.033	0.11	<0.033	<0.033	<0.033	<0.033	<0.033	0.053	<0.033	<0.
92-87-5	Benzidine	mg/kg	<0.33	<0.33	<1.6	<0.33	<0.33	<0.33	<0.33	<0.33		<0.33	<0.33	<0.33		<0
56-55-3	Benzo(a)anthracene	mg/kg	0.2	2.4	2.6	0.059	<0.033	0.63	<0.033	0.2	<0.033	<0.033	0.18	0.32	0.19	<0.
50-32-8	Benzo(a)pyrene	mg/kg	0.22	**2.4**	**4.8**	<0.033	<0.033	**0.8**	<0.033	0.13	<0.033	<0.033	0.19	**0.45**	0.21	<0.
205-99-2	Benzo(b)fluoranthene	mg/kg	0.26	3.1	**5.9**	<0.033	<0.033	0.96	<0.033	0.2	<0.033	<0.033	0.23	0.63	0.29	<0.
191-24-2	Benzo(g,h,i)perylene	mg/kg	0.16	0.99	2.6	<0.033	<0.033	0.64	<0.033	0.054	<0.033	<0.033	0.051	0.26	0.14	<0.
207-08-9	Benzo(k)fluoranthene	mg/kg	0.14	1.2	2.5	<0.033	<0.033	0.52	<0.033	0.1	<0.033	<0.033	0.1	0.24	0.13	<0.
85-68-7	Benzylbutyl phthalate	mg/kg	<0.33	<0.33	<1.6	<0.33	<0.33	<0.33	<0.33	<0.33		<0.33	<0.33	<0.33		<0
111-91-1	Bis(2-chlorethoxy)methane	mg/kg	<0.33	<0.33	<1.6	<0.33	<0.33	<0.33	<0.33	<0.33		<0.33	<0.33	<0.33		<0
111-44-4	Bis(2-chloroethyl)ether	mg/kg	<0.33	<0.33	<1.6	<0.33	<0.33	<0.33	<0.33	<0.33		<0.33	<0.33	<0.33		<0
108-60-1	Bis(2-chloroisopropyl)ether	mg/kg	<0.33	<0.33	<1.6	<0.33	<0.33	<0.33	<0.33	<0.33		<0.33	<0.33	<0.33		<0
117-81-7	Bis(2-ethylhexyl)phthalate	mg/kg	<0.33	<0.33	<1.6	<0.33	<0.33	<0.33	<0.33	<0.33		<0.33	<0.33	<0.33		<0
218-01-9	Chrysene	mg/kg	0.22	2.6	2.7	0.059	<0.033	0.74	<0.033	0.25	<0.033	<0.033	0.2	0.5	0.23	<0.
53-70-3	Dibenz(a,h)anthracene	mg/kg	0.041	0.28	**0.72**	<0.033	<0.033	0.13	<0.033	<0.033	<0.033	<0.033	<0.033	0.051	0.061	<0.
84-66-2	Diethyl phthalate	mg/kg	<0.33	<0.33	<1.6	<0.33	<0.33	<0.33	<0.33	<0.33		<0.33	<0.33	<0.33		<0
131-11-3	Dimethyl phthalate	mg/kg	<0.33	<0.33	<1.6	<0.33	<0.33	<0.33	<0.33	<0.33		<0.33	<0.33	<0.33		<0
84-74-2	Di-n-butyl phthalate	mg/kg	<0.33	<0.33	<1.6	<0.33	<0.33	<0.33	<0.33	<0.33		<0.33	<0.33	<0.33		<0
117-84-0	Di-n-octyl phthalate	mg/kg	<0.33	<0.33	<1.6	<0.33	<0.33	<0.33	<0.33	<0.33		<0.33	<0.33	<0.33		<0
206-44-0	Fluoranthene	mg/kg	0.5	9.1	3.5	0.072	<0.033	1.7	<0.033	0.32	0.05	0.05	0.34	1.4	0.38	<0.
86-73-7	Fluorene	mg/kg	<0.033	0.38	<0.16	<0.033	<0.033	<0.033	<0.033	<0.033	<0.033	<0.033	<0.033	<0.033	<0.033	<0.
87-68-3	Hexachloro-1,3-butadiene	mg/kg	<0.33	<0.33	<1.6	<0.33	<0.33	<0.33	<0.33	<0.33		<0.33	<0.33	<0.33		<0.
118-74-1	Hexachlorobenzene	mg/kg	<0.33	<0.33	<1.6	<0.33	<0.33	<0.33	<0.33	<0.33		<0.33	<0.33	<0.33		<0.
77-47-4	Hexachlorocyclopentadiene	mg/kg	<0.33	<0.33	<1.6	<0.33	<0.33	<0.33	<0.33	<0.33		<0.33	<0.33	<0.33		<0.
67-72-1	Hexachloroethane	mg/kg	<0.33	<0.33	<1.6	<0.33	<0.33	<0.33	<0.33	<0.33		<0.33	<0.33	<0.33		<0.
193-39-5	Indeno(1,2,3-cd)pyrene	mg/kg	0.16	0.91	2.8	<0.033	<0.033	0.57	<0.033	0.045	<0.033	<0.033	0.052	0.28	0.12	<0.
78-59-1	Isophorone	mg/kg	<0.33	<0.33	<1.6	<0.33	<0.33	<0.33	<0.33	<0.33		<0.33	<0.33	<0.33		<0.
91-20-3	Naphthalene	mg/kg	0.035	0.64	0.28	0.16	<0.033	0.072	<0.033	0.13	<0.033	<0.033	<0.033	0.05	<0.033	<0.
98-95-3	Nitrobenzene	mg/kg	<0.33	<0.33	<1.6	<0.33	<0.33	<0.33	<0.33	<0.33		<0.33	<0.33	<0.33		<0.
62-75-9	n-Nitrosodimethylamine	mg/kg	<0.33	<0.33	<1.6	<0.33	<0.33	<0.33	<0.33	<0.33		<0.33	<0.33	<0.33		<0.
621-64-7	n-Nitrosodi-n-propylamine	mg/kg	<0.33	<0.33	<1.6	<0.33	<0.33	<0.33	<0.33	<0.33		<0.33	<0.33	<0.33		<0.
86-30-6	n-Nitrosodiphenylamine	mg/kg	<0.33	<0.33	<1.6	<0.33	<0.33	<0.33	<0.33	<0.33		<0.33	<0.33	<0.33		<0.
87-86-5	Pentachlorophenol	mg/kg	<0.33	<0.33	<1.6	<0.33	<0.33	<0.33	<0.33	<0.33		<0.33	<0.33	<0.33		<0.
85-01-8	Phenanthrene	mg/kg	0.41	7.6	1.4	0.6	0.058	0.72	<0.033	0.35	0.07	0.037	0.17	0.78	0.13	<0.
108-95-2	Phenol	mg/kg	<0.33	<0.33	<1.6	<0.33	<0.33	<0.33	<0.33	<0.33		<0.33	<0.33	<0.33		<0.
129-00-0	Pyrene	mg/kg	0.44	9.5	5.8	0.078	0.048	1.2	<0.033	0.33	0.046	0.052	0.32	1.1	0.32	<0.
12674-11-2	PCB 1016	mg/kg	<0.017	<0.017	<0.017	<0.017	<0.017	<0.017	<0.017	<0.017		<0.017	<0.017	<0.017		<0.
11104-28-2	PCB 1221	mg/kg	<0.017	<0.017	<0.017	<0.017	<0.017	<0.017	<0.017	<0.017		<0.017	<0.017	<0.017		<0.
11141-16-5	PCB 1232	mg/kg	<0.017	<0.017	<0.017	<0.017	<0.017	<0.017	<0.017	<0.017		<0.017	<0.017	<0.017		<0.
53469-21-9	PCB 1242	mg/kg	<0.017	<0.017	<0.017	<0.017	<0.017	<0.017	<0.017	<0.017		<0.017	<0.017	<0.017		<0.
12672-29-6	PCB 1248	mg/kg	<0.017	<0.017	<0.017	<0.017	<0.017	<0.017	<0.017	<0.017		<0.017	<0.017	<0.017		<0.
11097-69-1	PCB 1254	mg/kg	<0.017	<0.017	<0.017	<0.017	<0.017	<0.017	<0.017	<0.017		<0.017	<0.017	<0.017		<0.
11096-82-5	PCB 1260	mg/kg	<0.017	<0.017	<0.017	<0.017	<0.017	<0.017	<0.017	<0.017		<0.017	<0.017	<0.017		<0.
7440-38-2	Arsenic	mg/kg	<5.0	6.8	2.8	<5.0	<50	**110**	5.9	**23**		1.7	2.1	2.4	<5.0	7.
7440-39-3	Barium	mg/kg	120	160	160	70	46	94	170	120		40	81	120	92	9
7440-43-9	Cadmium	mg/kg	5.5	4.4	1.3	0.64	<12	1.6	0.28	<1.2		0.28	<0.25	1.3	1.4	3.
7440-47-3	Chromium	mg/kg	28	<25	33	22	52	35	17	30		22	13	9.2	14	17
7439-92-1	Lead	mg/kg	74	**13000**	170	40	290	260	11	**13000**		37	35	180	90	34

95-57-8	2-Chlorophenol	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33			<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.
88-75-5	2-Nitrophenol	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33			<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.
91-94-1	3,3-Dichlorobenzidine	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33			<0.33	<0.33	<0.33	<3.3	<0.33	<0.33	<0.
534-52-1	4,6-Dinitro-2-methylphenol	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33			<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.
101-55-3	4-Bromophenyl-phenylether	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33			<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.
59-50-7	4-Chloro-3-methylphenol	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33			<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.
7005-72-3	4-Chlorophenyl-phenylether	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33			<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.
100-02-7	4-Nitrophenol	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33			<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.
83-32-9	Acenaphthene	mg/kg	<0.033	<0.033	<0.033	<0.033	<0.033	<0.033	<0.033	<0.033	<0.033	<0.033	0.16	<0.033	<0.033	<0.0
208-96-8	Acenaphthylene	mg/kg	<0.033	<0.033	<0.033	<0.033	<0.033	<0.033	<0.033	<0.033	<0.033	<0.033	0.18	<0.033	<0.033	<0.0
120-12-7	Anthracene	mg/kg	<0.033	<0.033	<0.033	<0.033	<0.033	<0.033	<0.033	0.16	<0.033	<0.033	1.1	<0.033	<0.033	<0.0
92-87-5	Benzidine	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33			<0.33	<0.33	<0.33	<3.3	<0.33	<0.33	<0.
56-55-3	Benzo(a)anthracene	mg/kg	<0.033	<0.033	<0.033	<0.033	<0.033	<0.033	<0.033	0.074	<0.033	<0.033	**3.5**	0.15	0.058	<0.0
50-32-8	Benzo(a)pyrene	mg/kg	<0.033	<0.033	<0.033	<0.033	<0.033	<0.033	<0.033	0.039	<0.033	<0.033	3	0.17	0.048	<0.0
205-99-2	Benzo(b)fluoranthene	mg/kg	<0.033	<0.033	<0.033	<0.033	<0.033	<0.033	<0.033	0.073	0.037	0.046	3.1	0.28	0.051	<0.0
191-24-2	Benzo(g,h,i)perylene	mg/kg	<0.033	<0.033	<0.033	<0.033	<0.033	<0.033	<0.033	<0.033	<0.033	<0.033	0.9	0.045	<0.033	<0.0
207-08-9	Benzo(k)fluoranthene	mg/kg	<0.033	<0.033	<0.033	<0.033	<0.033	<0.033	<0.033	<0.033	<0.033	<0.033	1.8	0.08	0.035	<0.0
85-68-7	Benzylbutyl phthalate	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33			<0.33	<0.33	<0.33	<3.3	<0.33	<0.33	<0.
111-91-1	Bis(2-chlorethoxy)methane	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33			<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.
111-44-4	Bis(2-chloroethyl)ether	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33			<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.
108-60-1	Bis(2-chloroisopropyl)ether	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33			<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.
117-81-7	Bis(2-ethylhexyl)phthalate	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33			<0.33	<0.33	<0.33	<3.3	<0.33	<0.33	<0.
218-01-9	Chrysene	mg/kg	<0.033	<0.033	<0.033	<0.033	<0.033	<0.033	<0.033	0.068	<0.033	0.039	3.1	0.15	0.046	<0.0
53-70-3	Dibenz(a,h)anthracene	mg/kg	<0.033	<0.033	<0.033	<0.033	<0.033	<0.033	<0.033	<0.033	<0.033	<0.033	0.26	<0.033	<0.033	<0.0
84-66-2	Diethyl phthalate	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33			<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.
131-11-3	Dimethyl phthalate	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33			<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.
84-74-2	Di-n-butyl phthalate	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33			<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.
117-84-0	Di-n-octyl phthalate	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33			<0.33	<0.33	<0.33	<3.3	<0.33	<0.33	<0.
206-44-0	Fluoranthene	mg/kg	<0.033	<0.033	<0.033	<0.033	<0.033	<0.033	<0.033	0.36	0.04	0.04	8.5	0.28	0.081	<0.0
86-73-7	Fluorene	mg/kg	<0.033	<0.033	<0.033	<0.033	<0.033	<0.033	<0.033	<0.033	<0.033	<0.033	0.21	<0.033	<0.033	<0.0
87-68-3	Hexachloro-1,3-butadiene	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33			<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.3
118-74-1	Hexachlorobenzene	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33			<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.3
77-47-4	Hexachlorocyclopentadiene	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33			<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.3
67-72-1	Hexachloroethane	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33			<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.3
193-39-5	Indeno(1,2,3-cd)pyrene	mg/kg	<0.033	<0.033	<0.033	<0.033	<0.033	<0.033	<0.033	<0.033	<0.033	<0.033	1.1	0.046	<0.033	<0.0
78-59-1	Isophorone	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33			<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.3
91-20-3	Naphthalene	mg/kg	<0.033	<0.033	<0.033	<0.033	<0.033			<0.033	<0.033	<0.033	0.2	<0.033	<0.033	<0.0
98-95-3	Nitrobenzene	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33			<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.3
62-75-9	n-Nitrosodimethylamine	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33			<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.3
621-64-7	n-Nitrosodi-n-propylamine	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33			<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.3
86-30-6	n-Nitrosodiphenylamine	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33			<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.3
87-86-5	Pentachlorophenol	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33			<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.3
85-01-8	Phenanthrene	mg/kg	<0.033	<0.033	<0.033	<0.033	<0.033	<0.033	<0.033	0.48	0.04	0.037	4.2	0.13	0.047	<0.0
108-95-2	Phenol	mg/kg	<0.33	<0.33	<0.33	<0.33	<0.33			<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.3
129-00-0	Pyrene	mg/kg	<0.033	<0.033	<0.033	<0.033	<0.033	<0.033	<0.033	0.34	0.041	0.046	6.2	0.26	0.12	<0.0
12674-11-2	PCB 1016	mg/kg	<0.017	<0.017	<0.017	<0.017	<0.017			<0.017	<0.017	<0.017	<0.017	<0.017	<0.017	<0.0
11104-28-2	PCB 1221	mg/kg	<0.017	<0.017	<0.017	<0.017	<0.017			<0.017	<0.017	<0.017	<0.017	<0.017	<0.017	<0.0
11141-16-5	PCB 1232	mg/kg	<0.017	<0.017	<0.017	<0.017	<0.017			<0.017	<0.017	<0.017	<0.017	<0.017	<0.017	<0.0
53469-21-9	PCB 1242	mg/kg	<0.017	<0.017	<0.017	<0.017	<0.017			<0.017	<0.017	<0.017	<0.017	<0.017	<0.017	<0.0
12672-29-6	PCB 1248	mg/kg	<0.017	<0.017	<0.017	<0.017	<0.017			<0.017	<0.017	<0.017	<0.017	<0.017	<0.017	<0.0
11097-69-1	PCB 1254	mg/kg	<0.017	<0.017	<0.017	<0.017	<0.017			<0.017	<0.017	<0.017	<0.017	<0.017	<0.017	<0.0
11096-82-5	PCB 1260	mg/kg	<0.017	<0.017	<0.017	<0.017	<0.017			<0.017	<0.017	<0.017	<0.017	0.069	<0.017	<0.0
7440-38-2	Arsenic	mg/kg	7.5				2.1			<10	<50	<20	5.1	<5.0	<1.0	6.8
7440-39-3	Barium	mg/kg	42				86			40	51	43	46	110	100	59
7440-43-9	Cadmium	mg/kg	1.6				0.46			<2.5	8.6	3.2	2.3	3	4.4	0.3
7440-47-3	Chromium	mg/kg	12				12			19	12	12	7.4	31	9.3	20
7439-92-1	Lead	mg/kg	7.7				12			44	350	46	320	17	230	**430**

95-57-8	2-Chlorophenol	mg/kg		<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33		<0.33	
88-75-5	2-Nitrophenol	mg/kg		<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33		<0.33	
91-94-1	3,3-Dichlorobenzidine	mg/kg		<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33		<0.33	
534-52-1	4,6-Dinitro-2-methylphenol	mg/kg		<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33		<0.33	
101-55-3	4-Bromophenyl-phenylether	mg/kg		<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33		<0.33	
59-50-7	4-Chloro-3-methylphenol	mg/kg		<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33		<0.33	
7005-72-3	4-Chlorophenyl-phenylether	mg/kg		<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33		<0.33	
100-02-7	4-Nitrophenol	mg/kg		<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33		<0.33	
83-32-9	Acenaphthene	mg/kg		<0.033	<0.033	<0.033	<0.033	<0.033	<0.033	<0.033	<0.033	<0.033	0.037	<0.033	<0.033
208-96-8	Acenaphthylene	mg/kg		<0.033	<0.033	<0.033	<0.033	<0.033	<0.033	<0.033	<0.033	<0.033	0.27	<0.033	<0.033
120-12-7	Anthracene	mg/kg		<0.033	<0.033	<0.033	<0.033	<0.033	<0.033	<0.033	<0.033	<0.033	0.37	<0.033	<0.033
92-87-5	Benzidine	mg/kg		<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33		<0.33	
56-55-3	Benzo(a)anthracene	mg/kg		<0.033	<0.033	<0.033	<0.033	<0.033	<0.033	0.15	<0.033	<0.033	1.4	<0.033	<0.033
50-32-8	Benzo(a)pyrene	mg/kg		<0.033	<0.033	<0.033	<0.033	<0.033	<0.033	0.17	<0.033	<0.033	**1.3**	<0.033	<0.033
205-99-2	Benzo(b)fluoranthene	mg/kg		<0.033	<0.033	<0.033	<0.033	<0.033	<0.033	0.28	<0.033	<0.033	1.5	<0.033	<0.033
191-24-2	Benzo(g,h,i)perylene	mg/kg		<0.033	<0.033	<0.033	<0.033	<0.033	<0.033	0.045	<0.033	<0.033	0.72	<0.033	<0.033
207-08-9	Benzo(k)fluoranthene	mg/kg		<0.033	<0.033	<0.033	<0.033	<0.033	<0.033	0.08	<0.033	<0.033	0.77	<0.033	<0.033
85-68-7	Benzylbutyl phthalate	mg/kg		<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33		<0.33	
111-91-1	Bis(2-chlorethoxy)methane	mg/kg		<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33		<0.33	
111-44-4	Bis(2-chloroethyl)ether	mg/kg		<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33		<0.33	
108-60-1	Bis(2-chloroisopropyl)ether	mg/kg		<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33		<0.33	
117-81-7	Bis(2-ethylhexyl)phthalate	mg/kg		<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33		<0.33	
218-01-9	Chrysene	mg/kg		<0.033	<0.033	<0.033	<0.033	<0.033	<0.033	0.15	<0.033	<0.033	1.6	<0.033	<0.033
53-70-3	Dibenz(a,h)anthracene	mg/kg		<0.033	<0.033	<0.033	<0.033	<0.033	<0.033	<0.033	<0.033	<0.033	**0.4**	<0.033	<0.033
84-66-2	Diethyl phthalate	mg/kg		<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33		<0.33	
131-11-3	Dimethyl phthalate	mg/kg		<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33		<0.33	
84-74-2	Di-n-butyl phthalate	mg/kg		<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33		<0.33	
117-84-0	Di-n-octyl phthalate	mg/kg		<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33		<0.33	
206-44-0	Fluoranthene	mg/kg		<0.033	<0.033	<0.033	<0.033	<0.033	<0.033	0.28	<0.033	<0.033	3.3	<0.033	<0.033
86-73-7	Fluorene	mg/kg		<0.033	<0.033	<0.033	<0.033	<0.033	<0.033	<0.033	<0.033	<0.033	<0.033	<0.033	<0.033
87-68-3	Hexachloro-1,3-butadiene	mg/kg		<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33		<0.33	
118-74-1	Hexachlorobenzene	mg/kg		<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33		<0.33	
77-47-4	Hexachlorocyclopentadiene	mg/kg		<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33		<0.33	
67-72-1	Hexachloroethane	mg/kg		<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33		<0.33	
193-39-5	Indeno(1,2,3-cd)pyrene	mg/kg		<0.033	<0.033	<0.033	<0.033	<0.033	<0.033	0.046	<0.033	<0.033	0.73	<0.033	<0.033
78-59-1	Isophorone	mg/kg		<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33		<0.33	
91-20-3	Naphthalene	mg/kg		<0.033	<0.033	<0.033	<0.033	<0.033	<0.033	<0.033	<0.033	<0.033	0.24	<0.033	<0.033
98-95-3	Nitrobenzene	mg/kg		<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33		<0.33	
62-75-9	n-Nitrosodimethylamine	mg/kg		<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33		<0.33	
621-64-7	n-Nitrosodi-n-propylamine	mg/kg		<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33		<0.33	
86-30-6	n-Nitrosodiphenylamine	mg/kg		<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33		<0.33	
87-86-5	Pentachlorophenol	mg/kg		<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33		<0.33	
85-01-8	Phenanthrene	mg/kg		<0.033	<0.033	<0.033	<0.033	<0.033	<0.033	0.13	<0.033	<0.033	1.7	<0.033	<0.033
108-95-2	Phenol	mg/kg		<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33		<0.33	
129-00-0	Pyrene	mg/kg		<0.033	<0.033	<0.033	<0.033	<0.033	<0.033	0.26	<0.033	<0.033	2.4	<0.033	<0.033
12674-11-2	PCB 1016	mg/kg		<0.017	<0.017	<0.017	<0.017	<0.017	<0.017	<0.017	<0.017	<0.017		<0.017	
11104-28-2	PCB 1221	mg/kg		<0.017	<0.017	<0.017	<0.017	<0.017	<0.017	<0.017	<0.017	<0.017		<0.017	
11141-16-5	PCB 1232	mg/kg		<0.017	<0.017	<0.017	<0.017	<0.017	<0.017	<0.017	<0.017	<0.017		<0.017	
53469-21-9	PCB 1242	mg/kg		<0.017	<0.017	<0.017	<0.017	<0.017	<0.017	<0.017	<0.017	<0.017		<0.017	
12672-29-6	PCB 1248	mg/kg		<0.017	<0.017	<0.017	<0.017	<0.017	<0.017	<0.017	<0.017	<0.017		<0.017	
11097-69-1	PCB 1254	mg/kg		<0.017	<0.017	<0.017	<0.017	<0.017	<0.017	<0.017	<0.017	<0.017		<0.017	
11096-82-5	PCB 1260	mg/kg		<0.017	<0.017	<0.017	<0.017	<0.017	<0.017	0.069	<0.017	<0.017		<0.017	
7440-38-2	Arsenic	mg/kg		2.9	<1.0	2.1	<5.0	1.8	<1.0	<5.0	<1.0	<1.0		3.9	1.7
7440-39-3	Barium	mg/kg		44	59	39	50	140	170	110	35	22		130	52
7440-43-9	Cadmium	mg/kg		0.47	1.4	1.2	2.8	<0.25	<0.25	3	<0.25	0.49		<0.25	0.31
7440-47-3	Chromium	mg/kg		10	14	16	9.1	26	28	31	12	5.8		30	6.4
7439-92-1	Lead	mg/kg	28	9.1	10	12	33	11	12	17	5.7	5.2		14	8.8

87-61-6	1,2,3-Trichlorobenzene	mg/L		<0.0010	<0.0010		<0.0010	<0.0010			<0.0010	<0.0010		
96-18-4	1,2,3-Trichloropropane	mg/L		<0.0010	<0.0010		<0.0010	<0.0010			<0.0010	<0.0010		
526-73-8	1,2,3-Trimethylbenzene	mg/L		<0.0010	<0.0010		<0.0010	<0.0010			<0.0010	<0.0010		
120-82-1	1,2,4-Trichlorobenzene	mg/L		<0.0010	<0.0010		<0.0010	<0.0010			<0.0010	<0.0010		
95-63-6	1,2,4-Trimethylbenzene	mg/L		<0.0010	<0.0010		<0.0010	<0.0010			<0.0010	<0.0010		
96-12-8	1,2-Dibromo-3-Chloropropane	mg/L		<0.0050	<0.0050		<0.0050	<0.0050			<0.0050	<0.0050		
106-93-4	1,2-Dibromoethane	mg/L		<0.0010	<0.0010		<0.0010	<0.0010			<0.0010	<0.0010		
95-50-1	1,2-Dichlorobenzene	mg/L		<0.0010	<0.0010		<0.0010	<0.0010			<0.0010	<0.0010		
107-06-2	1,2-Dichloroethane	mg/L		<0.0010	<0.0010		<0.0010	<0.0010			<0.0010	<0.0010		
78-87-5	1,2-Dichloropropane	mg/L		<0.0010	<0.0010		<0.0010	<0.0010			<0.0010	<0.0010		
108-67-8	1,3,5-Trimethylbenzene	mg/L		<0.0010	<0.0010		<0.0010	<0.0010			<0.0010	<0.0010		
541-73-1	1,3-Dichlorobenzene	mg/L		<0.0010	<0.0010		<0.0010	<0.0010			<0.0010	<0.0010		
142-28-9	1,3-Dichloropropane	mg/L		<0.0010	<0.0010		<0.0010	<0.0010			<0.0010	<0.0010		
106-46-7	1,4-Dichlorobenzene	mg/L		<0.0010	<0.0010		<0.0010	<0.0010			<0.0010	<0.0010		
594-20-7	2,2-Dichloropropane	mg/L		<0.0010	<0.0010		<0.0010	<0.0010			<0.0010	<0.0010		
78-93-3	2-Butanone (MEK)	mg/L		<0.010	<0.010		<0.010	<0.010			<0.010	<0.010		
110-75-8	2-Chloroethyl vinyl ether	mg/L		<0.050	<0.050		<0.050	<0.050			<0.050	<0.050		
95-49-8	2-Chlorotoluene	mg/L		<0.0010	<0.0010		<0.0010	<0.0010			<0.0010	<0.0010		
106-43-4	4-Chlorotoluene	mg/L		<0.0010	<0.0010		<0.0010	<0.0010			<0.0010	<0.0010		
108-10-1	4-Methyl-2-pentanone (MIBK)	mg/L		<0.010	<0.010		<0.010	<0.010			<0.010	<0.010		
67-64-1	Acetone	mg/L		<0.050	<0.050		<0.050	<0.050			<0.050	<0.050		
107-02-8	Acrolein	mg/L		<0.050	<0.050		<0.050	<0.050			<0.050	<0.050		
107-13-1	Acrylonitrile	mg/L		<0.010	<0.010		<0.010	<0.010			<0.010	<0.010		
71-43-2	Benzene	mg/L		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010			<0.0010	<0.0010		
108-86-1	Bromobenzene	mg/L		<0.0010	<0.0010		<0.0010	<0.0010			<0.0010	<0.0010		
75-27-4	Bromodichloromethane	mg/L		<0.0010	0.0012		<0.0010	<0.0010			<0.0010	<0.0010		
75-25-2	Bromoform	mg/L		<0.0010	<0.0010		<0.0010	<0.0010			<0.0010	<0.0010		
74-83-9	Bromomethane	mg/L		<0.0050	<0.0050		<0.0050	<0.0050			<0.0050	<0.0050		
56-23-5	Carbon tetrachloride	mg/L		<0.0010	<0.0010		<0.0010	<0.0010			<0.0010	<0.0010		
108-90-7	Chlorobenzene	mg/L		<0.0010	<0.0010		<0.0010	<0.0010			<0.0010	<0.0010		
124-48-1	Chlorodibromomethane	mg/L		<0.0010	<0.0010		<0.0010	<0.0010			<0.0010	<0.0010		
75-00-3	Chloroethane	mg/L		<0.0050	<0.0050		<0.0050	<0.0050			<0.0050	<0.0050		
67-66-3	Chloroform	mg/L		<0.0050	0.0062		<0.0050	<0.0050			<0.0050	<0.0050		
74-87-3	Chloromethane	mg/L		<0.0025	<0.0025		<0.0025	<0.0025			<0.0025	<0.0025		
156-59-2	cis-1,2-Dichloroethene	mg/L		<0.0010	<0.0010		<0.0010	<0.0010			<0.0010	<0.0010		
10061-01-5	cis-1,3-Dichloropropene	mg/L		<0.0010	<0.0010		<0.0010	<0.0010			<0.0010	<0.0010		
74-95-3	Dibromomethane	mg/L		<0.0010	<0.0010		<0.0010	<0.0010			<0.0010	<0.0010		
75-71-8	Dichlorodifluoromethane	mg/L		<0.0050	<0.0050		<0.0050	<0.0050			<0.0050	<0.0050		
108-20-3	Di-isopropyl ether	mg/L	-	<0.0010	<0.0010		<0.0010	<0.0010			<0.0010	<0.0010		
100-41-4	Ethylbenzene	mg/L		<0.0010	<0.0010	<0.0010	0.0014	<0.0010			<0.0010	<0.0010		
87-68-3	Hexachloro-1,3-butadiene	mg/L		<0.0010	<0.0010		<0.0010	<0.0010			<0.0010	<0.0010		
98-82-8	Isopropylbenzene	mg/L		<0.0010	<0.0010		<0.0010	<0.0010			<0.0010	<0.0010		
1634-04-4	Methyl tert-butyl ether	mg/L		<0.0010	<0.0010		<0.0010	<0.0010			<0.0010	<0.0010		
75-09-2	Methylene Chloride	mg/L		<0.0050	<0.0050		<0.0050	<0.0050			<0.0050	<0.0050		
91-20-3	Naphthalene	mg/L		<0.0050	<0.0050		<0.0050	<0.0050			<0.0050	<0.0050		
104-51-8	n-Butylbenzene	mg/L		<0.0010	<0.0010		<0.0010	<0.0010			<0.0010	<0.0010		
103-65-1	n-Propylbenzene	mg/L		<0.0010	<0.0010		<0.0010	<0.0010			<0.0010	<0.0010		
99-87-6	p-Isopropyltoluene	mg/L		<0.0010	<0.0010		<0.0010	<0.0010			<0.0010	<0.0010		
135-98-8	sec-Butylbenzene	mg/L		<0.0010	<0.0010		<0.0010	<0.0010			<0.0010	<0.0010		
100-42-5	Styrene	mg/L		<0.0010	<0.0010		<0.0010	<0.0010			<0.0010	<0.0010		
98-06-6	tert-Butylbenzene	mg/L		<0.0010	<0.0010		<0.0010	<0.0010			<0.0010	<0.0010		
127-18-4	Tetrachloroethene	mg/L		<0.0010	<0.0010		<0.0010	<0.0010			<0.0010	<0.0010		
108-88-3	Toluene	mg/L		<0.0050	<0.0050	<0.0050	<0.0050	<0.0050			<0.0050	<0.0050		
156-60-5	trans-1,2-Dichloroethene	mg/L		<0.0010	<0.0010		<0.0010	<0.0010			<0.0010	<0.0010		
10061-02-6	trans-1,3-Dichloropropene	mg/L		<0.0010	<0.0010		<0.0010	<0.0010			<0.0010	<0.0010		
79-01-6	Trichloroethene	mg/L		<0.0010	<0.0010		<0.0010	<0.0010			<0.0010	<0.0010		
75-69-4	Trichlorofluoromethane	mg/L		<0.0050	<0.0050		<0.0050	<0.0050			<0.0050	<0.0050		
75-01-4	Vinyl chloride	mg/L		<0.0010	<0.0010		<0.0010	<0.0010			<0.0010	<0.0010		

87-61-6	1,2,3-Trichlorobenzene	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
96-18-4	1,2,3-Trichloropropane	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
526-73-8	1,2,3-Trimethylbenzene	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
120-82-1	1,2,4-Trichlorobenzene	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
95-63-6	1,2,4-Trimethylbenzene	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
96-12-8	1,2-Dibromo-3-Chloropropane	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
106-93-4	1,2-Dibromoethane	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
95-50-1	1,2-Dichlorobenzene	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
107-06-2	1,2-Dichloroethane	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
78-87-5	1,2-Dichloropropane	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
108-67-8	1,3,5-Trimethylbenzene	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
541-73-1	1,3-Dichlorobenzene	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
142-28-9	1,3-Dichloropropane	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
106-46-7	1,4-Dichlorobenzene	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
594-20-7	2,2-Dichloropropane	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
78-93-3	2-Butanone (MEK)	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
110-75-8	2-Chloroethyl vinyl ether	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
95-49-8	2-Chlorotoluene	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
106-43-4	4-Chlorotoluene	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
108-10-1	4-Methyl-2-pentanone (MIBK)	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
67-64-1	Acetone	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
107-02-8	Acrolein	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
107-13-1	Acrylonitrile	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
71-43-2	Benzene	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
108-86-1	Bromobenzene	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
75-27-4	Bromodichloromethane	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
75-25-2	Bromoform	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
74-83-9	Bromomethane	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
56-23-5	Carbon tetrachloride	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
108-90-7	Chlorobenzene	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
124-48-1	Chlorodibromomethane	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
75-00-3	Chloroethane	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
67-66-3	Chloroform	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
74-87-3	Chloromethane	mg/L	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025
156-59-2	cis-1,2-Dichloroethene	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
10061-01-5	cis-1,3-Dichloropropene	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
74-95-3	Dibromomethane	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
75-71-8	Dichlorodifluoromethane	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
108-20-3	Di-isopropyl ether	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
100-41-4	Ethylbenzene	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
87-68-3	Hexachloro-1,3-butadiene	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
98-82-8	Isopropylbenzene	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
1634-04-4	Methyl tert-butyl ether	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
75-09-2	Methylene Chloride	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
91-20-3	Naphthalene	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
104-51-8	n-Butylbenzene	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
103-65-1	n-Propylbenzene	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
99-87-6	p-Isopropyltoluene	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
135-98-8	sec-Butylbenzene	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
100-42-5	Styrene	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
98-06-6	tert-Butylbenzene	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
127-18-4	Tetrachloroethene	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
108-88-3	Toluene	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
156-60-5	trans-1,2-Dichloroethene	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
10061-02-6	trans-1,3-Dichloropropene	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
79-01-6	Trichloroethene	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
75-69-4	Trichlorofluoromethane	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
75-01-4	Vinyl chloride	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010

105-67-9	2,4-Dimethylphenol	mg/L		<0.010	<0.010		<0.010	<0.010			<0.010	<0.010		
51-28-5	2,4-Dinitrophenol	mg/L		<0.010	<0.010		<0.010	<0.010			<0.010	<0.010		
121-14-2	2,4-Dinitrotoluene	mg/L		<0.010	<0.010		<0.010	<0.010			<0.010	<0.010		
606-20-2	2,6-Dinitrotoluene	mg/L		<0.010	<0.010		<0.010	<0.010			<0.010	<0.010		
91-58-7	2-Chloronaphthalene	mg/L		<0.010	<0.010		<0.010	<0.010			<0.010	<0.010		
95-57-8	2-Chlorophenol	mg/L		<0.010	<0.010		<0.010	<0.010			<0.010	<0.010		
91-57-6	2-methylnaphthalene	mg/L		<0.010	<0.010		<0.010	<0.010			<0.010	<0.010		
95-48-7	2-Methylphenol	mg/L		<0.010	<0.010		<0.010	<0.010			<0.010	<0.010		
88-74-4	2-Nitroaniline	mg/L		<0.010	<0.010		<0.010	<0.010			<0.010	<0.010		
88-75-5	2-Nitrophenol	mg/L		<0.010	<0.010		<0.010	<0.010			<0.010	<0.010		
	3&4-Methyl Phenol	mg/L									<0.010	<0.010		
91-94-1	3,3-Dichlorobenzidine	mg/L		<0.010	<0.010		<0.010	<0.010			<0.010	<0.010		
99-09-2	3-Nitroaniline	mg/L		<0.010	<0.010		<0.010	<0.010			<0.010	<0.010		
534-52-1	4,6-Dinitro-2-methylphenol	mg/L		<0.010	<0.010		<0.010	<0.010			<0.010	<0.010		
101-55-3	4-Bromophenyl-phenylether	mg/L		<0.010	<0.010		<0.010	<0.010			<0.010	<0.010		
59-50-7	4-Chloro-3-methylphenol	mg/L		<0.010	<0.010		<0.010	<0.010			<0.010	<0.010		
106-47-8	4-Chloroaniline	mg/L		<0.010	<0.010		<0.010	<0.010			<0.010	<0.010		
7005-72-3	4-Chlorophenyl-phenylether	mg/L		<0.010	<0.010		<0.010	<0.010			<0.010	<0.010		
100-01-6	4-Nitroaniline	mg/L		<0.010	<0.010		<0.010	<0.010			<0.010	<0.010		
100-02-7	4-Nitrophenol	mg/L	<0.0010	<0.010	<0.010	<0.0010	<0.010	<0.010	<0.0010	<0.0010	<0.010	<0.010		0.0025
83-32-9	Acenaphthene	mg/L	<0.0010	<0.010	<0.010	<0.0010	<0.010	<0.010	<0.0010	<0.0010	<0.010	<0.010		<0.0010
208-96-8	Acenaphthylene	mg/L	<0.0010	<0.010	<0.010	<0.0010	<0.010	<0.010	<0.0010	<0.0010	<0.010	<0.010		<0.0010
120-12-7	Anthracene	mg/L	<0.0010	<0.010	<0.010	<0.0010	<0.010	<0.010	<0.0010	<0.0010	<0.010	<0.010		<0.0010
56-55-3	Benzo(a)anthracene	mg/L	<0.0010	<0.010	<0.010	<0.0010	<0.010	<0.010	<0.0010	<0.0010	<0.010	<0.010		<0.0010
50-32-8	Benzo(a)pyrene	mg/L	<0.0010	<0.010	<0.010	<0.0010	<0.010	<0.010	<0.0010	<0.0010	<0.010	<0.010		<0.0010
205-99-2	Benzo(b)fluoranthene	mg/L	<0.0010	<0.010	<0.010	<0.0010	<0.010	<0.010	<0.0010	<0.0010	<0.010	<0.010		<0.0010
191-24-2	Benzo(g,h,i)perylene	mg/L	<0.0010	<0.010	<0.010	<0.0010	<0.010	<0.010	<0.0010	<0.0010	<0.010	<0.010		<0.0010
207-08-9	Benzo(k)fluoranthene	mg/L		<0.010	<0.010		<0.010	<0.010			<0.010	<0.010		
85-68-7	Benzylbutyl phthalate	mg/L		<0.010	<0.010		<0.010	<0.010			<0.010	<0.010		
111-91-1	Bis(2-chlorethoxy)methane	mg/L		<0.010	<0.010		<0.010	<0.010			<0.010	<0.010		
111-44-4	Bis(2-chloroethyl)ether	mg/L		<0.010	<0.010		<0.010	<0.010			<0.010	<0.010		
108-60-1	Bis(2-chloroisopropyl)ether	mg/L		<0.010	<0.010		<0.010	<0.010			<0.010	<0.010		
117-81-7	Bis(2-ethylhexyl)phthalate	mg/L	<0.0010	<0.010	<0.010	<0.0010	<0.010	<0.010	<0.0010	<0.0010	<0.010	<0.010		<0.0010
218-01-9	Chrysene	mg/L	<0.0010	<0.010	<0.010	<0.0010	<0.010	<0.010	<0.0010	<0.0010	<0.010	<0.010		<0.0010
53-70-3	Dibenz(a,h)anthracene	mg/L		<0.010	<0.010		<0.010	<0.010			<0.010	<0.010		
132-64-9	Dibenzofuran	mg/L		<0.010	<0.010		<0.010	<0.010			<0.010	<0.010		
84-66-2	Diethyl phthalate	mg/L		<0.010	<0.010		<0.010	<0.010			<0.010	<0.010		
131-11-3	Dimethyl phthalate	mg/L		<0.010	<0.010		<0.010	<0.010			<0.010	<0.010		
84-74-2	Di-n-butyl phthalate	mg/L		<0.010	<0.010		<0.010	<0.010			<0.010	<0.010		
117-84-0	Di-n-octyl phthalate	mg/L	<0.0010	<0.010	<0.010	<0.0010	<0.010	<0.010	0.0016	<0.0010	<0.010	<0.010		<0.0010
206-44-0	Fluoranthene	mg/L	<0.0010	<0.010	<0.010	<0.0010	<0.010	<0.010	<0.0010	<0.0010	<0.010	<0.010		<0.0010
86-73-7	Fluorene	mg/L		<0.010	<0.010		<0.010	<0.010			<0.010	<0.010		
87-68-3	Hexachloro-1,3-butadiene	mg/L		<0.010	<0.010		<0.010	<0.010			<0.010	<0.010		
118-74-1	Hexachlorobenzene	mg/L		<0.010	<0.010		<0.010	<0.010			<0.010	<0.010		
77-47-4	Hexachlorocyclopentadiene	mg/L		<0.010	<0.010		<0.010	<0.010			<0.010	<0.010		
67-72-1	Hexachloroethane	mg/L	<0.0010	<0.010	<0.010	<0.0010	<0.010	<0.010	<0.0010	<0.0010	<0.010	<0.010		<0.0010
193-39-5	Indeno(1,2,3-cd)pyrene	mg/L		<0.010	<0.010		<0.010	<0.010			<0.010	<0.010		
78-59-1	Isophorone	mg/L	<0.0010	<0.010	<0.010	<0.0010	<0.010	<0.010	<0.0010	<0.0010	<0.010	<0.010		<0.0010
91-20-3	Naphthalene	mg/L		<0.010	<0.010		<0.010	<0.010			<0.010	<0.010		
98-95-3	Nitrobenzene	mg/L		<0.010	<0.010		<0.010	<0.010			<0.010	<0.010		
621-64-7	n-Nitrosodi-n-propylamine	mg/L		<0.010	<0.010		<0.010	<0.010			<0.010	<0.010		
86-30-6	n-Nitrosodiphenylamine	mg/L		<0.010	<0.010		<0.010	<0.010			<0.010	<0.010		
87-86-5	Pentachlorophenol	mg/L	<0.0010	<0.010	<0.010	<0.0010	<0.010	<0.010	**0.0011**	<0.0010	<0.010	<0.010		<0.0010
85-01-8	Phenanthrene	mg/L		<0.010	<0.010		<0.010	<0.010			<0.010	<0.010		
108-95-2	Phenol	mg/L	<0.0010	<0.010	<0.010	<0.0010	<0.010	<0.010	0.002	<0.0010	<0.010	<0.010		<0.0010
129-00-0	Pyrene	mg/L		<0.010	<0.010		<0.010	<0.010			<0.010	<0.010		
12674-11-2	PCB 1016	mg/L		<0.00050	<0.00050		<0.00050	<0.00050			<0.00050	<0.00050		

105-67-9	2,4-Dimethylphenol	mg/L							<0.010	<0.010
51-28-5	2,4-Dinitrophenol	mg/L							<0.010	<0.010
121-14-2	2,4-Dinitrotoluene	mg/L							<0.010	<0.010
606-20-2	2,6-Dinitrotoluene	mg/L							<0.010	<0.010
91-58-7	2-Chloronaphthalene	mg/L							<0.010	<0.010
95-57-8	2-Chlorophenol	mg/L							<0.010	<0.010
91-57-6	2-methylnaphthalene	mg/L							<0.010	<0.010
95-48-7	2-Methylphenol	mg/L							<0.010	<0.010
88-74-4	2-Nitroaniline	mg/L							<0.010	<0.010
88-75-5	2-Nitrophenol	mg/L							<0.010	<0.010
	3&4-Methyl Phenol	mg/L								
91-94-1	3,3-Dichlorobenzidine	mg/L							<0.010	<0.010
99-09-2	3-Nitroaniline	mg/L							<0.010	<0.010
534-52-1	4,6-Dinitro-2-methylphenol	mg/L							<0.010	<0.010
101-55-3	4-Bromophenyl-phenylether	mg/L							<0.010	<0.010
59-50-7	4-Chloro-3-methylphenol	mg/L							<0.010	<0.010
106-47-8	4-Chloroaniline	mg/L							<0.010	<0.010
7005-72-3	4-Chlorophenyl-phenylether	mg/L							<0.010	<0.010
100-01-6	4-Nitroaniline	mg/L							<0.010	<0.010
100-02-7	4-Nitrophenol	mg/L							<0.010	<0.010
83-32-9	Acenaphthene	mg/L							<0.010	<0.010
208-96-8	Acenaphthylene	mg/L							<0.010	<0.010
120-12-7	Anthracene	mg/L							<0.010	<0.010
56-55-3	Benzo(a)anthracene	mg/L							<0.010	<0.010
50-32-8	Benzo(a)pyrene	mg/L							<0.010	<0.010
205-99-2	Benzo(b)fluoranthene	mg/L							<0.010	<0.010
191-24-2	Benzo(g,h,i)perylene	mg/L							<0.010	<0.010
207-08-9	Benzo(k)fluoranthene	mg/L							<0.010	<0.010
85-68-7	Benzylbutyl phthalate	mg/L							<0.010	<0.010
111-91-1	Bis(2-chlorethoxy)methane	mg/L							<0.010	<0.010
111-44-4	Bis(2-chloroethyl)ether	mg/L							<0.010	<0.010
108-60-1	Bis(2-chloroisopropyl)ether	mg/L							<0.010	<0.010
117-81-7	Bis(2-ethylhexyl)phthalate	mg/L							<0.010	<0.010
218-01-9	Chrysene	mg/L							<0.010	<0.010
53-70-3	Dibenz(a,h)anthracene	mg/L							<0.010	<0.010
132-64-9	Dibenzofuran	mg/L							<0.010	<0.010
84-66-2	Diethyl phthalate	mg/L							<0.010	<0.010
131-11-3	Dimethyl phthalate	mg/L							<0.010	<0.010
84-74-2	Di-n-butyl phthalate	mg/L							<0.010	<0.010
117-84-0	Di-n-octyl phthalate	mg/L							<0.010	<0.010
206-44-0	Fluoranthene	mg/L							<0.010	<0.010
86-73-7	Fluorene	mg/L							<0.010	<0.010
87-68-3	Hexachloro-1,3-butadiene	mg/L							<0.010	<0.010
118-74-1	Hexachlorobenzene	mg/L							<0.010	<0.010
77-47-4	Hexachlorocyclopentadiene	mg/L							<0.010	<0.010
67-72-1	Hexachloroethane	mg/L							<0.010	<0.010
193-39-5	Indeno(1,2,3-cd)pyrene	mg/L							<0.010	<0.010
78-59-1	Isophorone	mg/L							<0.010	<0.010
91-20-3	Naphthalene	mg/L							<0.010	<0.010
98-95-3	Nitrobenzene	mg/L							<0.010	<0.010
621-64-7	n-Nitrosodi-n-propylamine	mg/L							<0.010	<0.010
86-30-6	n-Nitrosodiphenylamine	mg/L							<0.010	<0.010
87-86-5	Pentachlorophenol	mg/L							<0.010	<0.010
85-01-8	Phenanthrene	mg/L							<0.010	<0.010
108-95-2	Phenol	mg/L							<0.010	<0.010
129-00-0	Pyrene	mg/L							<0.010	<0.010
12674-11-2	PCB 1016	mg/L							<0.00050	<0.00050

7440-43-9	Cadmium	mg/L	<0.0050	<0.0050	<0.0050		<0.0050	<0.0050	<0.0050	<0.0050	**0.037**	**0.051**		<0.0050
7440-47-3	Chromium	mg/L	0.049	0.011	<0.010		<0.010	<0.010	<0.010	<0.010	0.039	0.048		<0.010
7439-92-1	Lead	mg/L	**0.095**	**0.041**	<0.0050		0.0078	**0.032**	**0.21**	**0.018**	**3**	**4.1**	<0.005	**0.016**
7439-97-6	Mercury	mg/L	<0.00020	<0.00020	<0.00020		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020		<0.00020
7782-49-2	Selenium	mg/L	<0.020	<0.020	<0.020		<0.020	<0.020	<0.020	<0.020	<0.10	<0.10		<0.020
7440-22-4	Silver	mg/L	<0.010	<0.010	<0.010		<0.010	<0.010	<0.010	<0.010	<0.010	<0.010		<0.010

7440-43-9	Cadmium	mg/L							<0.0050	<0.0050	
7440-47-3	Chromium	mg/L							<0.010	<0.010	
7439-92-1	Lead	mg/L							<0.0050	<0.0050	
7439-97-6	Mercury	mg/L							<0.00020	<0.00020	
7782-49-2	Selenium	mg/L							<0.020	<0.020	
7440-22-4	Silver	mg/L							<0.010	<0.010	

Appendix C

GENERAL NOTES

DRILLING & SAMPLING SYMBOLS:

SS:	Split Spoon - 1-^{3}/8" I.D., 2" O.D., unless otherwise noted	HS:	Hollow Stem Auger
ST:	Thin-Walled Tube - 2" O.D., unless otherwise noted	PA:	Power Auger
RS:	Ring Sampler - 2.42" I.D., 3" O.D., unless otherwise noted	HA:	Hand Auger
DB:	Diamond Bit Coring - 4", N, B	RB:	Rock Bit
BS:	Bulk Sample or Auger Sample	WB:	Wash Boring or Mud Rotary

The number of blows required to advance a standard 2-inch O.D. split-spoon sampler (SS) the last 12 inches of the total 18-inch penetration with a 140-pound hammer falling 30 inches is considered the "Standard Penetration" or "N-value".

WATER LEVEL MEASUREMENT SYMBOLS:

WL:	Water Level	WS:	While Sampling	N/E:	Not Encountered
WCI:	Wet Cave in	WD:	While Drilling		
DCI:	Dry Cave in	BCR:	Before Casing Removal		
AB:	After Boring	ACR:	After Casing Removal		

Water levels indicated on the boring logs are the levels measured in the borings at the times indicated. Groundwater levels at other times and other locations across the site could vary. In pervious soils, the indicated levels may reflect the location of groundwater. In low permeability soils, the accurate determination of groundwater levels may not be possible with only short-term observations.

DESCRIPTIVE SOIL CLASSIFICATION: Soil classification is based on the Unified Classification System. Coarse Grained Soils have more than 50% of their dry weight retained on a #200 sieve; their principal descriptors are: boulders, cobbles, gravel or sand. Fine Grained Soils have less than 50% of their dry weight retained on a #200 sieve; they are principally described as clays if they are plastic, and silts if they are slightly plastic or non-plastic. Major constituents may be added as modifiers and minor constituents may be added according to the relative proportions based on grain size. In addition to gradation, coarse-grained soils are defined on the basis of their in-place relative density and fine-grained soils on the basis of their consistency.

CONSISTENCY OF FINE-GRAINED SOILS

Unconfined Compressive Strength, Qu, psf	Standard Penetration or N-value (SS) Blows/Ft.	Consistency
< 500	0 - 1	Very Soft
500 – 1,000	2 - 4	Soft
1,000 – 2,000	4 - 8	Medium Stiff
2,000 – 4,000	8 - 15	Stiff
4,000 – 8,000	15 - 30	Very Stiff
8,000+	> 30	Hard

RELATIVE DENSITY OF COARSE-GRAINED SOILS

Standard Penetration or N-value (SS) Blows/Ft.	Relative Density
0 – 3	Very Loose
4 – 9	Loose
10 – 29	Medium Dense
30 – 49	Dense
> 50	Very Dense

RELATIVE PROPORTIONS OF SAND AND GRAVEL

Descriptive Term(s) of other constituents	Percent of Dry Weight
Trace	< 15
With	15 – 29
Modifier	> 30

RELATIVE PROPORTIONS OF FINES

Descriptive Term(s) of other constituents	Percent of Dry Weight
Trace	< 5
With	5 – 12
Modifiers	> 12

GRAIN SIZE TERMINOLOGY

Major Component of Sample	Particle Size
Boulders	Over 12 in. (300mm)
Cobbles	12 in. to 3 in. (300mm to 75 mm)
Gravel	3 in. to #4 sieve (75mm to 4.75 mm)
Sand	#4 to #200 sieve (4.75mm to 0.075mm)
Silt or Clay	Passing #200 Sieve (0.075mm)

PLASTICITY DESCRIPTION

Term	Plasticity Index
Non-plastic	0
Low	1-10
Medium	11-30
High	> 30

Terracon

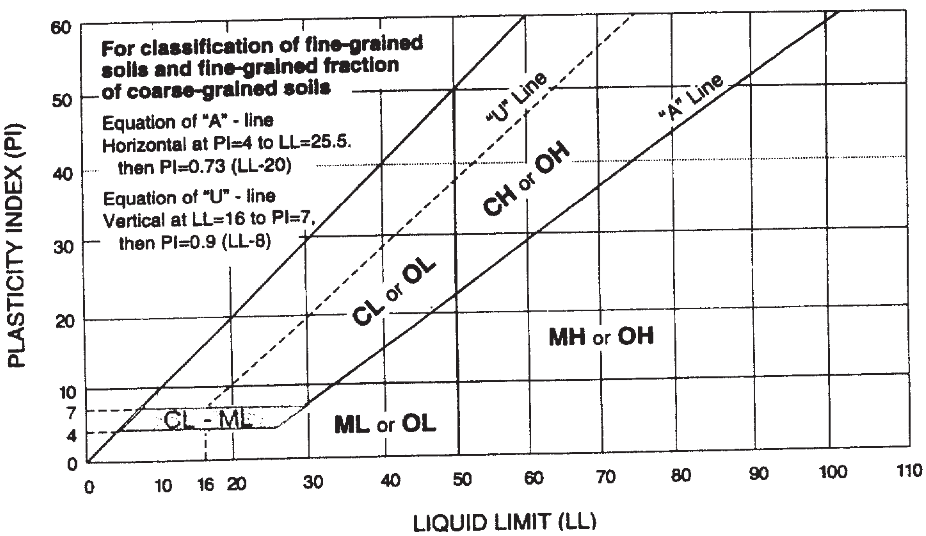
UNIFIED SOIL CLASSIFICATION SYSTEM

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests[A]					Soil Classification	
					Group Symbol	Group Name[B]
Coarse Grained Soils More than 50% retained on No. 200 sieve	Gravels More than 50% of coarse fraction retained on No. 4 sieve	Clean Gravels Less than 5% fines[C]	$Cu \geq 4$ and $1 \leq Cc \leq 3$[E]		GW	Well-graded gravel[F]
			$Cu < 4$ and/or $1 > Cc > 3$[E]		GP	Poorly graded gravel[F]
		Gravels with Fines More than 12% fines[C]	Fines classify as ML or MH		GM	Silty gravel[F,G,H]
			Fines classify as CL or CH		GC	Clayey gravel[F,G,H]
	Sands 50% or more of coarse fraction passes No. 4 sieve	Clean Sands Less than 5% fines[D]	$Cu \geq 6$ and $1 \leq Cc \leq 3$[E]		SW	Well-graded sand[I]
			$Cu < 6$ and/or $1 > Cc > 3$[E]		SP	Poorly graded sand[I]
		Sands with Fines More than 12% fines[D]	Fines classify as ML or MH		SM	Silty sand[G,H,I]
			Fines Classify as CL or CH		SC	Clayey sand[G,H,I]
Fine-Grained Soils 50% or more passes the No. 200 sieve	Silts and Clays Liquid limit less than 50	inorganic	PI > 7 and plots on or above "A" line[J]		CL	Lean clay[K,L,M]
			PI < 4 or plots below "A" line[J]		ML	Silt[K,L,M]
		organic	Liquid limit - oven dried	< 0.75	OL	Organic clay[K,L,M,N]
			Liquid limit - not dried			Organic silt[K,L,M,O]
	Silts and Clays Liquid limit 50 or more	inorganic	PI plots on or above "A" line		CH	Fat clay[K,L,M]
			PI lots below "A" line		MH	Elastic Silt[K,L,M]
		organic	Liquid limit - oven dried	< 0.75	OH	Organic clay[K,L,M,P]
			Liquid limit - not dried			Organic silt[K,L,M,Q]
Highly organic soils		Primarily organic matter, dark in color, and organic odor			PT	Peat

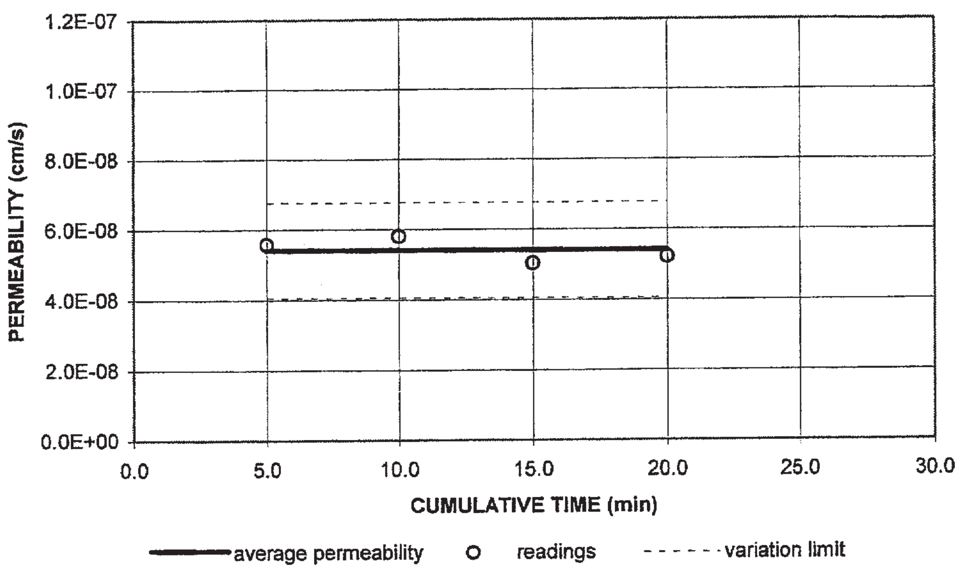
[A]Based on the material passing the 3-in. (75-mm) sieve
[B]If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.
[C]Gravels with 5 to 12% fines require dual symbols: GW-GM well-graded gravel with silt, GW-GC well-graded gravel with clay, GP-GM poorly graded gravel with silt, GP-GC poorly graded gravel with clay.
[D]Sands with 5 to 12% fines require dual symbols: SW-SM well-graded sand with silt, SW-SC well-graded sand with clay, SP-SM poorly graded sand with silt, SP-SC poorly graded sand with clay

[E] $Cu = D_{60}/D_{10}$ $Cc = \frac{(D_{30})^2}{D_{10} \times D_{60}}$

[F] If soil contains ≥ 15% sand, add "with sand" to group name.
[G]If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.
[H]If fines are organic, add "with organic fines" to group name.
[I] If soil contains ≥ 15% gravel, add "with gravel" to group name.
[J] If Atterberg limits plot in shaded area, soil is a CL-ML, silty clay.
[K]If soil contains 15 to 29% plus No. 200, add "with sand" or "with gravel," whichever is predominant.
[L] If soil contains ≥ 30% plus No. 200 predominantly sand, add "sandy" to group name.
[M] If soil contains ≥ 30% plus No. 200, predominantly gravel, add "gravelly" to group name.
[N]PI ≥ 4 and plots on or above "A" line.
[O] PI < 4 or plots below "A" line.
[P]PI plots on or above "A" line.
[Q] PI plots below "A" line.



FLEXIBLE WALL PERMEABILITY TEST



Test Specification: ASTM D 5084

Fluid Temp. (°C)	Elapsed Time (min.)	Cumulative Time (min.)	Gradient (cm-Hg)	Calculated Permeability (cm/sec)	Average Permeability (cm/sec)
21.00	5.00	5.00	14.43	5.58E-08	**5.4E-08**
21.00	5.00	10.00	13.84	5.81E-08	
21.00	5.00	15.00	13.36	5.03E-08	
21.00	5.00	20.00	12.87	5.22E-08	

Compaction Data		Sample Data	Initial	Final
Proctor (pcf)		Specimen Height, (inches)	2.85	2.80
Opti. M.C., (%)		Specimen Diameter, (inches)	2.83	2.83
Comp. Method		Moisture Content, (%)	16.25	16.09
% Recompct.		Percent Saturation (%)	96.98	100.00
Test Pressures (psi)		Wet Mass Density (pcf)	134.85	137.07
Backpressure	90.00	Dry Mass Density (pcf)	116.00	118.07
Cell pressure	93.00	Void Ratio	0.45	0.43
Eff. Stress	3.00	Calculated Porosity, %	31.15	30.29

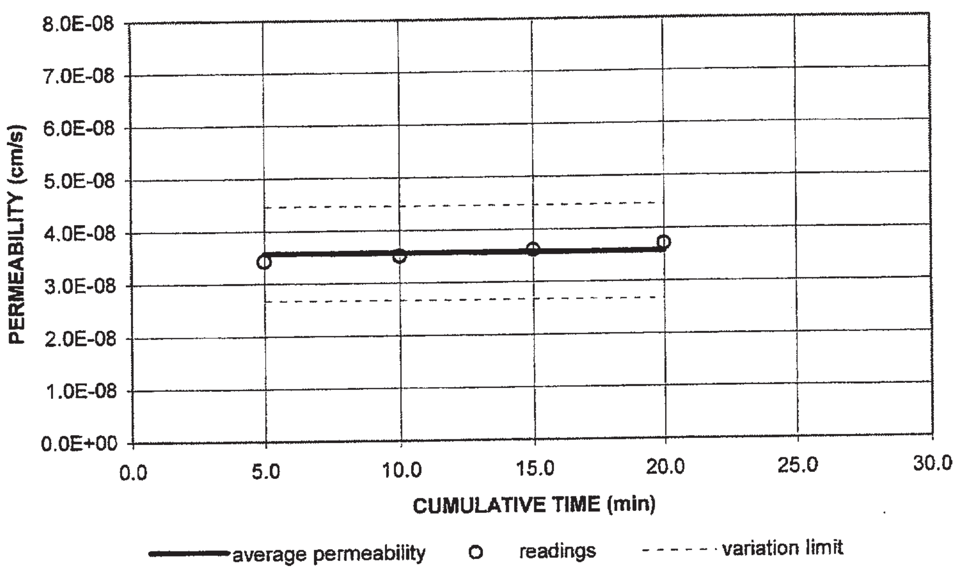
USCS LL PI

Permeant Used: WATER Remarks GRAY SANDY LEAN CLAY W/ FINE GRAVEL

Project Name	2008 SE IOWA BROWNFIELD		Tested by FCE Reviewed by TGG
Client	Terracon W.O.#	07087052	
Sample Number	S-2168		FLEXIBLE WALL PERMEABILITY TEST
Sample Location	B3 (TASK 5)	19-21'	Terracon
Date	4/6/2009 Lab No.	2168	

4/6/2009

FLEXIBLE WALL PERMEABILITY TEST



Test Specification: ASTM D 5084

Fluid Temp. (°C)	Elapsed Time (min.)	Cumulative Time (min.)	Gradient (cm-Hg)	Calculated Permeability (cm/sec)	Average Permeability (cm/sec)
21.00	5.00	5.00	16.06	3.43E-08	**3.6E-08**
21.00	5.00	10.00	15.64	3.52E-08	
21.00	5.00	15.00	15.23	3.61E-08	
21.00	5.00	20.00	14.81	3.71E-08	

Compaction Data		Sample Data	Initial	Final
Proctor (pcf)		Specimen Height, (inches)	2.66	2.64
Opti. M.C., (%)		Specimen Diameter, (inches)	2.80	2.80
Comp. Method		Moisture Content, (%)	15.73	15.57
% Recompct.		Percent Saturation (%)	99.66	100.00
Test Pressures (psi)		Wet Mass Density (pcf)	136.72	137.67
Backpressure	90.00	Dry Mass Density (pcf)	118.14	119.13
Cell pressure	93.00	Void Ratio	0.43	0.42
Eff. Stress	3.00	Calculated Porosity, %	29.88	29.59

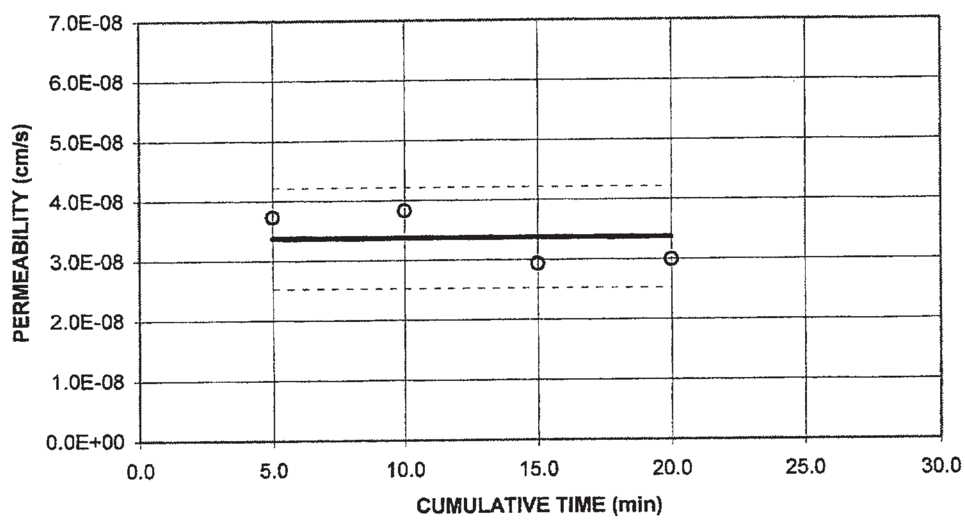
USCS LL PI

Permeant Used: WATER Remarks GRAY SANDY LEAN CLAY W/ FINE GRAVEL

Project Name	2008 SE IOWA BROWNFIELD		Tested by FCE Reviewed by TGG
Client	Terracon W.O.#	07087052	FLEXIBLE WALL PERMEABILITY TEST
Sample Number	S-2169		Terracon
Sample Location	B4 (TASK 5)	24-31'	
Date	4/6/2009 Lab No.	2169	

4/6/2009

FLEXIBLE WALL PERMEABILITY TEST



Test Specification: ASTM D 5084

Fluid Temp. (°C)	Elapsed Time (min.)	Cumulative Time (min.)	Gradient (cm-Hg)	Calculated Permeability (cm/sec)	Average Permeability (cm/sec)
21.00	5.00	5.00	14.67	3.73E-08	
21.00	5.00	10.00	14.29	3.82E-08	
21.00	5.00	15.00	14.01	2.93E-08	**3.4E-08**
21.00	5.00	20.00	13.73	2.99E-08	

Compaction Data		Sample Data	Initial	Final
Proctor (pcf)		Specimen Height, (inches)	2.96	2.93
Opti. M.C., (%)		Specimen Diameter, (inches)	2.81	2.80
Comp. Method		Moisture Content, (%)	15.79	16.17
% Recompct.		Percent Saturation (%)	97.72	100.00
Test Pressures (psi)		Wet Mass Density (pcf)	135.83	138.63
Backpressure	90.00	Dry Mass Density (pcf)	117.31	119.33
Cell pressure	93.00	Void Ratio	0.44	0.44
Eff. Stress	3.00	Calculated Porosity, %	30.37	30.40

USCS LL PI

Permeant Used: WATER Remarks GRAY SANDY LEAN CLAY W/ FINE GRAVEL

Project Name	2008 SE IOWA BROWNFIELD	Tested by FCE	Reviewed by TGG
Client	Terracon W.O.# 07087052	FLEXIBLE WALL PERMEABILITY TEST	
Sample Number	S-2170	Terracon	
Sample Location	B14 (TASK 5) 18-20'		
Date	4/6/2009 Lab No. 2170		

BORING NO. 1

CLIENT: **Southeast Iowa Regional Planning Commission**	
SITE: **Former Dresser Rand, Burlington, Iowa**	PROJECT: **Phase II ESA**

Depth (ft)	Description
0 – 1	**SILTY CLAY WITH LIMESTONE GRAVEL** Brown
1 – 4.5	**SILTY CLAY WITH SOME SAND** Brown
4.5 – 8	**CLAY WITH LIMESTONE** Brown, Tan
8 – 14	**CLAY WITH SOME GRAVEL** Brown
14 –	**SILTY CLAY WITH SOME GRAVEL (GLACIAL TILL)** Gray

Continued Next Page

USCS SYMBOL	SAMPLES: NUMBER	TYPE	RECOVERY, in.	SPT - N BLOWS / ft.	TESTS: WATER CONTENT, %	FIELD VAPOR TEST (PPM)*	SOIL SAMPLE SENT TO LABORATORY
							X
	1	SS	18			ND	
	2	SS	18			ND	X
	3	SS	18			ND	
	4	SS	18			ND	
	5	SS	18			ND	
	6	SS	18			ND	
	7	SS	18			ND	
	8	SS	18			ND	
	9	SS	18			ND	
	10	SS	18			ND	
	11	SS	18			ND	
	12	SS	18			ND	

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

* ND indicates a reading of less than the field detection limit (FDL) of one (1) part per million isobutylene equivalents (ppmi).

WATER LEVEL OBSERVATIONS, ft		
WL	▽	▼
WL	▼	▽
WL		

Terracon

BORING STARTED	3-23-09
BORING COMPLETED	3-23-09
RIG	FOREMAN
APPROVED SAK	JOB # 07087052

BORING NO. 1

CLIENT Southeast Iowa Regional Planning Commission	
SITE Former Dresser Rand Burlington, Iowa	PROJECT Phase II ESA

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: RECOVERY, in.	SAMPLES: SPT - N BLOWS / ft.	TESTS: WATER CONTENT, %	TESTS: FIELD VAPOR TEST (PPM)*	TESTS: SOIL SAMPLE SENT TO LABORATORY
	SILTY CLAY WITH SOME GRAVEL (GLACIAL TILL) Gray									
		35		13	SS	18			ND	
		40		14	SS	18			ND	
		45		15	SS	18			ND	
		50		16	SS	18			ND	
52	BOTTOM OF BORING									

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

* ND indicates a reading of less than the field detection limit (FDL) of one (1) part per million isobutylene equivalents (ppmi).

WATER LEVEL OBSERVATIONS, ft		
WL	▽	▼
WL	▼	▽
WL		

Terracon

BORING STARTED	3-23-09
BORING COMPLETED	3-23-09
RIG	FOREMAN
APPROVED SAK	JOB # 07087052

BORING NO. 2

CLIENT
Southeast Iowa Regional Planning Commission

SITE **Former Dresser Rand Burlington, Iowa**

PROJECT **Phase II ESA**

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: RECOVERY, in.	SAMPLES: SPT - N BLOWS / ft.	TESTS: WATER CONTENT, %	TESTS: FIELD VAPOR TEST (PPM)*	TESTS: SOIL SAMPLE SENT TO LABORATORY
2	**GRAVEL WITH CINDERS AND SAND** Black			1	SS	24			ND	X
6	**SANDY LEAN CLAY** Brown	5		2	SS	30			ND	
10	**FAT TO LEAN SANDY CLAY** Brown			3	SS	30			ND	X
14	**SANDY SILTY CLAY (GLACIAL TILL)** Brown to Gray	10		4	SS	48			ND	
	BOTTOM OF BORING									

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

* ND indicates a reading of less than the field detection limit (FDL) of one (1) part per million isobutylene equivalents (ppmi).

WATER LEVEL OBSERVATIONS, ft		
WL	∇	▼
WL	▼	∇
WL		

Terracon

BORING STARTED	3-26-09
BORING COMPLETED	3-26-09
RIG	FOREMAN
APPROVED SAK	JOB # 07087052

BORING NO. 3

CLIENT
Southeast Iowa Regional Planning Commission

SITE **Former Dresser Rand Burlington, Iowa**

PROJECT **Phase II ESA**

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: RECOVERY, in.	SAMPLES: SPT - N BLOWS / ft.	TESTS: WATER CONTENT, %	TESTS: FIELD VAPOR TEST (PPM)*	TESTS: SOIL SAMPLE SENT TO LABORATORY
	SANDY CLAY WITH BRICK AND GRAVEL Brown			1	SS	12			ND	X
				2	SS	12			ND	
4	**CLAY (GLACIAL TILL)** Tan			3	SS	18			ND	
		5								
6.5	**LIMESTONE**			4	SS	18			ND	
7	**CLAY (GLACIAL TILL)** Tan			5	SS	18			ND	
		10		6	SS	18			ND	
12	**CLAY (GLACIAL TILL)** Tan			7	SS	18			ND	X
		15		8	SS	18			ND	
				9	SS	18			ND	
18	BOTTOM OF BORING									

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

* ND indicates a reading of less than the field detection limit (FDL) of one (1) part per million isobutylene equivalents (ppmi).

WATER LEVEL OBSERVATIONS, ft		
WL	∇	▼
WL	▼	∇
WL		

Terracon

BORING STARTED	3-24-09
BORING COMPLETED	3-24-09
RIG	FOREMAN
APPROVED SAK	JOB # 07087052

BORING NO. 4

CLIENT
Southeast Iowa Regional Planning Commission

SITE **Former Dresser Rand**
Burlington, Iowa

PROJECT
Phase II ESA

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: RECOVERY, in.	SAMPLES: SPT - N BLOWS / ft.	TESTS: WATER CONTENT, %	TESTS: FIELD VAPOR TEST (PPM)*	TESTS: SOIL SAMPLE SENT TO LABORATORY
	SAND WITH RUBBLE AND SLAG Dark Gray			1	SS	12			ND	X
				2	SS	12			15	X
4	**SILTY CLAY (GLACIAL TILL)** Gray			3	SS	18			ND	
		5		4	SS	18			ND	
				5	SS	18			ND	
		10		6	SS	18			ND	
		15		7	SS	15			ND	
		20		8	SS	18			ND	
		25		9	SS	18			ND	
		30		10	SS	18			ND	
31	BOTTOM OF BORING									

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

* ND indicates a reading of less than the field detection limit (FDL) of one (1) part per million isobutylene equivalents (ppmi).

WATER LEVEL OBSERVATIONS, ft		
WL	▽	▼
WL	▼	▽
WL		

Terracon

BORING STARTED	3-26-09
BORING COMPLETED	3-26-09
RIG	FOREMAN
APPROVED SAK	JOB # 07087052

BORING NO. 5

CLIENT
Southeast Iowa Regional Planning Commission

SITE **Former Dresser Rand**
Burlington, Iowa

PROJECT
Phase II ESA

GRAPHIC LOG (depth)	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: RECOVERY, in.	SAMPLES: SPT - N BLOWS / ft.	TESTS: WATER CONTENT, %	TESTS: FIELD VAPOR TEST (PPM)*	TESTS: SOIL SAMPLE SENT TO LABORATORY
2	**FINE SAND, TRACE SAND AND GRAVEL** Brown			1	SS	24			ND	X
4	**FINE TO COARSE LIMESTONE, GRAVEL** Gray			2	SS	10			ND	
5	**SANDY CLAY, FINE TO COARSE SAND** Brown	5		3	SS	28			ND	
8	**SANDY LEAN CLAY** Brown									
12	**SANDY LEAN CLAY (GLACIAL TILL)** Gray	10		4	SS	30			ND	X
	BOTTOM OF BORING									

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

* ND indicates a reading of less than the field detection limit (FDL) of one (1) part per million isobutylene equivalents (ppmi).

WATER LEVEL OBSERVATIONS, ft		
WL	▽	▼
WL	▼	▼
WL		

Terracon

BORING STARTED			3-26-09
BORING COMPLETED			3-26-09
RIG		FOREMAN	
APPROVED	SAK	JOB #	07087052

BORING NO. 6

CLIENT
Southeast Iowa Regional Planning Commission

SITE **Former Dresser Rand**
Burlington, Iowa

PROJECT
Phase II ESA

WELL DIA.: 2 in
APPROX. SURFACE ELEV.: ft

Depth (ft)	Description	Sample Number	Type	Recovery, in.	SPT-N Blows / ft.	Water Content, %	Field Vapor Test (PPM)*	Soil Sample Sent to Laboratory
0.5	**CONCRETE**	1	SS	18			ND	X
6	**SILTY CLAY WITH BRICK AND SAND, WOOD** Tan	2	SS	18			ND	
		3	SS	18			ND	
9	**SILTY CLAY WITH SAND** Tan	4	SS	18			ND	X
		5	SS	18			ND	
14	**CLAY** Tan	6	SS	18			ND	
		7	SS	18			ND	

BOTTOM OF BORING

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

* ND indicates a reading of less than the field detection limit (FDL) of one (1) part per million isobutylene equivalents (ppmi).

WATER LEVEL OBSERVATIONS, ft		
WL ∇ 9	WD ▼	
WL ▼	▼	
WL		

Terracon

BORING STARTED	3-26-09
BORING COMPLETED	3-26-09
RIG	FOREMAN
APPROVED SAK	JOB # 07087052

BORING NO. 7

CLIENT
Southeast Iowa Regional Planning Commission

SITE **Former Dresser Rand**
Burlington, Iowa

PROJECT
Phase II ESA

WELL DIA.: in
2 in
APPROX. SURFACE ELEV.: ft

Depth (ft)	Description	Samples: Number	Type	Recovery, in.	SPT - N Blows / ft.	Water Content, %	Field Vapor Test (PPM)*	Soil Sample Sent to Laboratory
0–6	**SILTY SANDY CLAY WITH RUBBLE AND WOOD** Brown	1	SS	18			ND	X
		2	SS	18			ND	
		3	SS	6			ND	
6–8	**SILTY CLAY WITH SOME SAND** Brown	4	SS	12			ND	X
8–14	**LIMESTONE** (water level ∇ 9)	5	SS	6			ND	
		6	SS	6			ND	
		7	SS	0			ND	

BOTTOM OF BORING

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

* ND indicates a reading of less than the field detection limit (FDL) of one (1) part per million isobutylene equivalents (ppmi).

WATER LEVEL OBSERVATIONS, ft		
WL	∇ 9	WD ▼
WL	▼	▼
WL		

Terracon

BORING STARTED	3-24-09
BORING COMPLETED	3-24-09
RIG	FOREMAN
APPROVED SAK	JOB # 07087052

BORING NO. 8

CLIENT
Southeast Iowa Regional Planning Commission

SITE **Former Dresser Rand**
Burlington, Iowa

PROJECT
Phase II ESA

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: RECOVERY, in.	SAMPLES: SPT - N BLOWS / ft.	TESTS: WATER CONTENT, %	TESTS: FIELD VAPOR TEST (PPM)*	TESTS: SOIL SAMPLE SENT TO LABORATORY
	SILTY CLAY WITH RUBBLE Brown			1	SS	12			ND	X
				2	SS	18			ND	
		5		3	SS	18			ND	
	6 **SILTY CLAY WITH SOME SAND** Tan			4	SS	12			ND	
				5	SS	12			ND	
		10		6	SS	18			ND	
				7	SS	18			ND	
		15		8	SS	12			ND	X
	16 BOTTOM OF BORING									

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

* ND indicates a reading of less than the field detection limit (FDL) of one (1) part per million isobutylene equivalents (ppmi).

WATER LEVEL OBSERVATIONS, ft		
WL	▽	▼
WL	▽	▽
WL		

Terracon

BORING STARTED	3-27-09
BORING COMPLETED	3-27-09
RIG	FOREMAN
APPROVED SAK	JOB # 07087052

BORING NO. 9

CLIENT	
Southeast Iowa Regional Planning Commission	
SITE: Former Dresser Rand, Burlington, Iowa	PROJECT: Phase II ESA

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: RECOVERY, in.	SAMPLES: SPT - N BLOWS / ft.	TESTS: WATER CONTENT, %	TESTS: FIELD VAPOR TEST (PPM)*	TESTS: SOIL SAMPLE SENT TO LABORATORY
0.6	Approx. 6" Concrete			1	SS	18			ND	X
	SILTY CLAY WITH BRICK AND SAND Brown			2	SS	18			ND	
5				3	SS	18			ND	
	SILTY CLAY Brown	5								
7				4	SS	18			ND	
	SILTY CLAY Brown to Gray			5	SS	18			ND	X
10	BOTTOM OF BORING	10								

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

* ND indicates a reading of less than the field detection limit (FDL) of one (1) part per million isobutylene equivalents (ppmi).

WATER LEVEL OBSERVATIONS, ft		
WL ▽		▼
WL ▼		▼
WL		

Terracon

BORING STARTED	3-26-09
BORING COMPLETED	3-26-09
RIG	FOREMAN
APPROVED SAK	JOB # 07087052

BOREHOLE 99 BORING LOGS.GPJ TERRACON.GDT 8/12/09

BORING NO. 10

CLIENT
Southeast Iowa Regional Planning Commission

SITE **Former Dresser Rand**
Burlington, Iowa

PROJECT
Phase II ESA

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: RECOVERY, in.	SAMPLES: SPT - N BLOWS / ft.	TESTS: WATER CONTENT, %	TESTS: FIELD VAPOR TEST (PPM)*	TESTS: SOIL SAMPLE SENT TO LABORATORY
0.5	**SANDY CLAY, HIGH ORGANICS** Dark Brown			1	HA				ND	X
	SANDY LEAN CLAY WITH SAND AND GRAVEL SEAMS Light Brown			2	HA				ND	
		5		3	HA				ND	
8				4	HA				ND	
10	**SANDY LEAN CLAY, TRACE GRAVEL** Gray, Brown	10		5	HA				ND	X
	BOTTOM OF BORING									

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

* ND indicates a reading of less than the field detection limit (FDL) of one (1) part per million isobutylene equivalents (ppmi).

WATER LEVEL OBSERVATIONS, ft		
WL	∇	▼
WL	▼	▼
WL		

Terracon

BORING STARTED	3-27-09		
BORING COMPLETED	3-27-09		
RIG		FOREMAN	
APPROVED	SAK	JOB #	07087052

BOREHOLE 99 BORING LOGS.GPJ TERRACON.GDT 8/12/09

BORING NO. 11

CLIENT
Southeast Iowa Regional Planning Commission

SITE **Former Dresser Rand**
Burlington, Iowa

PROJECT
Phase II ESA

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: RECOVERY, in.	SAMPLES: SPT - N BLOWS / ft.	TESTS: WATER CONTENT, %	TESTS: FIELD VAPOR TEST (PPM)*	TESTS: SOIL SAMPLE SENT TO LABORATORY	
	SILTY CLAY Brown			1	SS				ND	X	
				2	SS				ND		
				3	SS				ND		
		5		4	SS				ND		
				5	SS				ND	X	
	10 BOTTOM OF BORING	10									

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

* ND indicates a reading of less than the field detection limit (FDL) of one (1) part per million isobutylene equivalents (ppmi).

WATER LEVEL OBSERVATIONS, ft		
WL	▽	▼
WL	▼	▽
WL		

Terracon

BORING STARTED	3-27-09
BORING COMPLETED	3-27-09
RIG	FOREMAN
APPROVED SAK	JOB # 07087052

BOREHOLE 99 BORING LOGS.GPJ TERRACON.GDT 8/12/09

BORING NO. 12

CLIENT
Southeast Iowa Regional Planning Commission

SITE
Former Dresser Rand
Burlington, Iowa

PROJECT
Phase II ESA

Graphic Log (depth, ft)	Description	Depth, ft.	USCS Symbol	Samples: Number	Samples: Type	Samples: Recovery, in.	Samples: SPT - N Blows / ft.	Tests: Water Content, %	Tests: Field Vapor Test (PPM)*	Tests: Soil Sample Sent to Laboratory
	SAND WITH RUBBLE Dark Gray			1	SS	18			ND	X
3				2	SS	18			ND	
	CLAY Tan	5		3	SS	20			ND	
				4	SS	18			ND	
8				5	SS	18			ND	
9	**SAND**									
	SILTY CLAY Tan	10		6	SS	18			ND	X
12	BOTTOM OF BORING									

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

* ND indicates a reading of less than the field detection limit (FDL) of one (1) part per million isobutylene equivalents (ppmi).

WATER LEVEL OBSERVATIONS, ft		
WL	∇	▼
WL	▼	▼
WL		

Terracon

BORING STARTED	3-27-09
BORING COMPLETED	3-27-09
RIG	FOREMAN
APPROVED SAK	JOB # 07087052

BORING NO. 13

CLIENT
Southeast Iowa Regional Planning Commission

SITE **Former Dresser Rand Burlington, Iowa**

PROJECT **Phase II ESA**

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: RECOVERY, in.	SAMPLES: SPT - N BLOWS / ft.	TESTS: WATER CONTENT, %	TESTS: FIELD VAPOR TEST (PPM)*	TESTS: SOIL SAMPLE SENT TO LABORATORY
	SAND WITH SLAG Dark Gray			1	SS	12			ND	X
				2	SS	20			ND	
3	**SILTY CLAY** Tan	5								
				3	SS	20			ND	X
10	BOTTOM OF BORING	10								

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

* ND indicates a reading of less than the field detection limit (FDL) of one (1) part per million isobutylene equivalents (ppmi).

WATER LEVEL OBSERVATIONS, ft		
WL	∇	▼
WL	▼	▼
WL		

Terracon

BORING STARTED	
BORING COMPLETED	
RIG	FOREMAN
APPROVED SAK	JOB # 07087052

BOREHOLE 99 BORING LOGS.GPJ TERRACON.GDT 8/12/09

BORING NO. 14

CLIENT
Southeast Iowa Regional Planning Commission

SITE **Former Dresser Rand**
Burlington, Iowa

PROJECT
Phase II ESA

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: RECOVERY, in.	SAMPLES: SPT - N BLOWS / ft.	TESTS: WATER CONTENT, %	TESTS: FIELD VAPOR TEST (PPM)*	TESTS: SOIL SAMPLE SENT TO LABORATORY
	SILTY GRAVEL Brown			1	SS	18			ND	X
2	**SANDY LEAN CLAY** Brown			2	SS	18			ND	
4	**SANDY SILTY CLAY** Brown	5		3	SS	20			ND	
6	**SANDY SILTY CLAY (GLACIAL TILL)** Gray			4	SS	10			ND	
				5	SS	12			ND	X
		10		6	SS	18			ND	
				7	SS	18			ND	
		15		8	SS	18			ND	
				9	SS	18			ND	
20	BOTTOM OF BORING	20								

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

* ND indicates a reading of less than the field detection limit (FDL) of one (1) part per million isobutylene equivalents (ppmi).

WATER LEVEL OBSERVATIONS, ft		
WL	▽	▼
WL	▼	▼
WL		

Terracon

BORING STARTED	3-25-09
BORING COMPLETED	3-25-09
RIG	FOREMAN
APPROVED SAK	JOB # 07087052

BOREHOLE_99 BORING LOGS.GPJ TERRACON.GDT 8/12/09

BORING NO. 15

CLIENT
Southeast Iowa Regional Planning Commission

SITE **Former Dresser Rand**
Burlington, Iowa

PROJECT
Phase II ESA

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: RECOVERY, in.	SAMPLES: SPT - N BLOWS / ft.	TESTS: WATER CONTENT, %	TESTS: FIELD VAPOR TEST (PPM)*	TESTS: SOIL SAMPLE SENT TO LABORATORY
	SILTY SAND WITH RUBBLE Dark Gray			1	SS	12			ND	X
3				2	SS	18			ND	
	CLAY Tan	5		3	SS	18			ND	
6	**CLAY WITH LIMESTONE** Tan									
				4	SS	18			ND	X
10	BOTTOM OF BORING	10								

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

* ND indicates a reading of less than the field detection limit (FDL) of one (1) part per million isobutylene equivalents (ppmi).

WATER LEVEL OBSERVATIONS, ft		
WL	∇	▼
WL	▼	∇
WL		

Terracon

BORING STARTED			3-27-09
BORING COMPLETED			3-27-09
RIG		FOREMAN	
APPROVED	SAK	JOB #	07087052

BOREHOLE 99 BORING LOGS.GPJ TERRACON.GDT 8/12/09

BORING NO. 16

CLIENT
Southeast Iowa Regional Planning Commission

SITE
Former Dresser Rand
Burlington, Iowa

PROJECT
Phase II ESA

WELL DIA.: 2 in
APPROX. SURFACE ELEV.: ft

Depth (ft)	Description
0.6	6" Concrete
3	**SILTY CLAY WITH BRICK AND SLUG** Dark Gray
6	**SILTY CLAY** Tan
10	**SILTY CLAY (TILL)** Gray
11	**SILTY CLAY WITH SAND SEAMS** Gray
17	**SILTY CLAY (GLACIAL TILL)** Gray
	BOTTOM OF BORING

SAMPLES: NUMBER	TYPE	RECOVERY, in.	SPT - N BLOWS / ft.	TESTS: WATER CONTENT, %	FIELD VAPOR TEST (PPM)*	SOIL SAMPLE SENT TO LABORATORY
1	SS	18			ND	X
2	SS	18			ND	
3	SS	18			ND	
4	SS	12			ND	X
5	SS	18			ND	
6	SS	18			ND	
7	SS	10			ND	
8	SS	12			ND	
9	SS	10			ND	
10	SS	12			ND	

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

* ND indicates a reading of less than the field detection limit (FDL) of one (1) part per million isobutylene equivalents (ppmi).

WATER LEVEL OBSERVATIONS, ft
WL
WL
WL

Terracon

BORING STARTED	3-26-09
BORING COMPLETED	3-26-09
RIG	FOREMAN
APPROVED SAK	JOB # 07087052

BORING NO. 17

CLIENT
Southeast Iowa Regional Planning Commission

SITE: Former Dresser Rand, Burlington, Iowa

PROJECT: Phase II ESA

WELL DIA.: 2 in

APPROX. SURFACE ELEV.: ft

Depth (ft)	Description	Number	Type	Recovery, in.	SPT - N Blows / ft.	Water Content, %	Field Vapor Test (PPM)*	Soil Sample Sent to Laboratory
0–1	**CRUSHED LIMESTONE WITH GRAVEL**	1	SS	18			ND	X
1–3	**SAND WITH SLAG** Dark Brown	2	SS	18			ND	
3–7	**SILTY CLAY** Tan	3	SS	18			ND	
		4	SS	18			20	X
7–9	**SILTY WITH SAND** Tan	5	SS	18			ND	
9–12	**SILTY CLAY** Tan	6	SS	10			ND	

BOTTOM OF BORING

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

* ND indicates a reading of less than the field detection limit (FDL) of one (1) part per million isobutylene equivalents (ppmi).

WATER LEVEL OBSERVATIONS, ft

WL

WL

WL

Terracon

BORING STARTED

BORING COMPLETED

RIG | FOREMAN

APPROVED SAK | JOB # 07087052

BORING NO. 18

CLIENT
Southeast Iowa Regional Planning Commission

SITE **Former Dresser Rand Burlington, Iowa**

PROJECT **Phase II ESA**

WELL DIA.: 2 in
APPROX. SURFACE ELEV.: ft

Depth (ft)	Description
0.6	Approx. 6" Concrete
7	**SILTY SAND WITH RUBBLE** Brown (water level symbol at approx. 5.5 ft)
10	**SITLY CLAY WITH BRICK** Brown
14	**SILTY CLAY** Gray
	BOTTOM OF BORING

NUMBER	TYPE	RECOVERY, in.	SPT - N BLOWS / ft.	WATER CONTENT, %	FIELD VAPOR TEST (PPM)*	SOIL SAMPLE SENT TO LABORATORY
1	SS	12			ND	X
2	SS	18			60	
3	SS	18			165	
4	SS	18			170	X
5	SS	18			60	
6	SS	18			40	
7	SS	18			ND	

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

* ND indicates a reading of less than the field detection limit (FDL) of one (1) part per million isobutylene equivalents (ppmi).

WATER LEVEL OBSERVATIONS, ft

WL	∇ 5.5	WD	▼
WL	▼		▼
WL			

Terracon

BORING STARTED	
BORING COMPLETED	
RIG	FOREMAN
APPROVED SAK	JOB # 07087052

BORING NO. 19

CLIENT
Southeast Iowa Regional Planning Commission

SITE Former Dresser Rand
Burlington, Iowa

PROJECT
Phase II ESA

Depth	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES: NUMBER	TYPE	RECOVERY, in.	SPT - N BLOWS / ft.	TESTS: WATER CONTENT, %	FIELD VAPOR TEST (PPM)*	SOIL SAMPLE SENT TO LABORATORY
0.4	4" Concrete			1	SS	18			ND	X
3	**FINE SAND** Brown			2	SS	18			1	
10.5	**FINE SAND** Brown	5		3	SS	25			3	X
		10		4	SS	12			ND	
13	**SILTY CLAYEY SAND** Brown			5	SS	40			ND	
16	**SANDY SILTY CLAY** Gray Brown	15								
	BOTTOM OF BORING									

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

* ND indicates a reading of less than the field detection limit (FDL) of one (1) part per million isobutylene equivalents (ppmi).

WATER LEVEL OBSERVATIONS, ft		
WL	▽	▼
WL	▼	▼
WL		

Terracon

BORING STARTED	3-26-09
BORING COMPLETED	3-26-09
RIG	FOREMAN
APPROVED SAK	JOB # 07087052

BOREHOLE 99 BORING LOGS.GPJ TERRACON.GDT 8/12/09

BORING NO. 20

CLIENT
Southeast Iowa Regional Planning Commission

SITE
Former Dresser Rand
Burlington, Iowa

PROJECT
Phase II ESA

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: RECOVERY, in.	SAMPLES: SPT - N BLOWS / ft.	TESTS: WATER CONTENT, %	TESTS: FIELD VAPOR TEST (PPM)*	TESTS: SOIL SAMPLE SENT TO LABORATORY
0.5	Approx. 5" Concrete									
	CLAYEY SILTY CLAY, TRACE CINDERS AND GRAVEL Dark Brown			1	SS	24			3	X
				2	SS	17			6	
		5		3	SS	24			15	X
8	**SANDY SILTY CLAY (GLACIAL TILL)** Brown Gray			4	SS	36			ND	
12	BOTTOM OF BORING	10								

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

* ND indicates a reading of less than the field detection limit (FDL) of one (1) part per million isobutylene equivalents (ppmi).

WATER LEVEL OBSERVATIONS, ft		
WL	▽	▼
WL	▽	▽
WL		

Terracon

BORING STARTED	3-26-09
BORING COMPLETED	3-26-09
RIG	FOREMAN
APPROVED SAK	JOB # 07087052

BORING NO. 21

CLIENT
Southeast Iowa Regional Planning Commission

SITE **Former Dresser Rand**
Burlington, Iowa

PROJECT
Phase II ESA

WELL DIA.: 2 in

APPROX. SURFACE ELEV.: ft

Depth (ft)	Description	Number	Type	Recovery, in.	SPT-N Blows / ft.	Water Content, %	Field Vapor Test (PPM)*	Soil Sample Sent to Laboratory
0–1.5	Approx. 1½' Concrete	1	SS	18			ND	X
1.5–4	**SILTY SAND WITH BRICK** Brown	2	SS	12			ND	
4–14	**LIMESTONE WITH SILTY SANDY CLAY** Brown, Gray	3	SS	12			ND	
		4	SS	10			ND	
		5	SS	18			ND	
		6	SS	0			ND	
		7	SS	18			ND	X
14	BOTTOM OF BORING							

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

* ND indicates a reading of less than the field detection limit (FDL) of one (1) part per million isobutylene equivalents (ppmi).

WATER LEVEL OBSERVATIONS, ft	
WL ∇ 8	WD ▼
WL ▼	▼
WL	

Terracon

BORING STARTED	3-27-09
BORING COMPLETED	3-27-09
RIG	FOREMAN
APPROVED SAK	JOB # 07087052

BORING NO. 22

CLIENT
Southeast Iowa Regional Planning Commission

SITE
Former Dresser Rand
Burlington, Iowa

PROJECT
Phase II ESA

Depth (ft)	Description	USCS Symbol	Sample Number	Type	Recovery, in.	SPT - N Blows / ft.	Water Content, %	Field Vapor Test (PPM)*	Soil Sample Sent to Laboratory
0.6	Approx. 6" Concrete		1	SS	24			ND	X
2.5	**SILTY FINE TO COARSE SAND, TRACE GRAVEL**, Black								
4	**SANDY LEAN CLAY WITH SAND LAYERS**, Gray, Brown		2	SS	9			ND	
12	**SANDY SILTY CLAY WITH TRACE SAND SEAMS** Brown, Moist		3	SS	12			ND	
			4	SS	6			ND	
16	**SANDY SILTY FINE TO MEDIUM SAND** Gray, Brown		5	SS	30			ND	X
	BOTTOM OF BORING								

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

* ND indicates a reading of less than the field detection limit (FDL) of one (1) part per million isobutylene equivalents (ppmi).

WATER LEVEL OBSERVATIONS, ft		
WL	▽	▼
WL	▼	▽
WL		

Terracon

BORING STARTED	3-26-09
BORING COMPLETED	3-26-09
RIG	FOREMAN
APPROVED SAK	JOB # 07087052

BORING NO. 23

CLIENT
Southeast Iowa Regional Planning Commission

SITE
Former Dresser Rand
Burlington, Iowa

PROJECT
Phase II ESA

WELL DIA.: 2 in
APPROX. SURFACE ELEV.: ft

Depth, ft.	Description	Sample Number	Type	Recovery, in.	SPT-N Blows/ft.	Water Content, %	Field Vapor Test (PPM)*	Soil Sample Sent to Laboratory
0.6	Approx. 6" Concrete	1	SS	12			ND	X
	SILTY SAND WITH BRICK AND SLAG Brown	2	SS	12			ND	
		3	SS	12			ND	
		4	SS	12			ND	
9.5		5	SS	12			ND	X
	SILTY CLAY Gray	6	SS	18			ND	
15		7	SS				ND	
	BOTTOM OF BORING							

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

* ND indicates a reading of less than the field detection limit (FDL) of one (1) part per million isobutylene equivalents (ppmi).

WATER LEVEL OBSERVATIONS, ft
WL
WL
WL

Terracon

BORING STARTED	3-25-09
BORING COMPLETED	3-25-09
RIG	FOREMAN
APPROVED SAK	JOB # 07087052

WELL 99 BORING LOGS.GPJ TERRACON.GDT 8/19/09

BORING NO. 24

CLIENT
Southeast Iowa Regional Planning Commission

SITE **Former Dresser Rand**
Burlington, Iowa

PROJECT
Phase II ESA

Depth boundary	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: RECOVERY, in.	SAMPLES: SPT - N BLOWS / ft.	TESTS: WATER CONTENT, %	TESTS: FIELD VAPOR TEST (PPM)*	TESTS: SOIL SAMPLE SENT TO LABORATORY
0.5	Approx. 5" Concrete									
4	**SANDY LEAN CLAY WITH FLYASH, BRICK AND GRAVEL** Dark Brown			1	SS	6			ND	X
				2	SS	6			ND	
8	**SANDY SILTY CLAY** Brown	5		3	SS	30			ND	
12	**SANDY LEAN CLAY WITH TREE ROOTS AND SAND SEAMS** Gray	10		4	SS	36			ND	X

BOTTOM OF BORING

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

* ND indicates a reading of less than the field detection limit (FDL) of one (1) part per million isobutylene equivalents (ppmi).

WATER LEVEL OBSERVATIONS, ft		
WL	∇	▼
WL	▼	∇
WL		

Terracon

BORING STARTED	3-26-09
BORING COMPLETED	3-26-09
RIG	FOREMAN
APPROVED SAK	JOB # 07087052

BORING NO. 25

CLIENT
Southeast Iowa Regional Planning Commission

SITE **Former Dresser Rand, Burlington, Iowa**

PROJECT **Phase II ESA**

Depth (ft)	Description	Depth, ft.	USCS Symbol	Sample Number	Type	Recovery, in.	SPT - N Blows / ft.	Water Content, %	Field Vapor Test (PPM)*	Soil Sample Sent to Laboratory
0.5	Approx. Concrete 6"									
	SAND AND CINDERS AND FLYASH Dark Brown			1	SS	24			ND	X
				2	SS	9			ND	
		5		3	SS	16			ND	
11		10		4	SS	24			ND	X
14	**LIMESTONE** Gray			5	SS	20			ND	
16	**SANDY SILT (GLACIAL TILL)** Gray	15								
	BOTTOM OF BORING									

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

* ND indicates a reading of less than the field detection limit (FDL) of one (1) part per million isobutylene equivalents (ppmi).

WATER LEVEL OBSERVATIONS, ft		
WL	▽	▼
WL	▼	▽
WL		

Terracon

BORING STARTED	3-26-09
BORING COMPLETED	3-26-09
RIG	FOREMAN
APPROVED SAK	JOB # 07087052

BOREHOLE 99 BORING LOGS.GPJ TERRACON.GDT 8/12/09

BORING NO. 26

CLIENT
Southeast Iowa Regional Planning Commission

SITE **Former Dresser Rand Burlington, Iowa**

PROJECT **Phase II ESA**

WELL DIA.: 2 in
APPROX. SURFACE ELEV.: ft

Depth (ft)	Description	Sample Number	Type	Recovery, in.	SPT - N Blows / ft.	Water Content, %	Field Vapor Test (PPM)*	Soil Sample Sent to Laboratory
0.4	Approx. 4" Concrete	1	SS	12			ND	
6	**SILTY SAND WITH SLUG AND BRICK** Brown	2	SS	12			ND	X
		3	SS	12			ND	
9	**SILTY CLAY WITH SOME GRAVEL** Brown (water level ∇)	4	SS	4			ND	
		5	SS	12			ND	X
11	**SILTY SAND**	6	SS	12			ND	
12	**SILTY CLAY** Gray							

BOTTOM OF BORING

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

* ND indicates a reading of less than the field detection limit (FDL) of one (1) part per million isobutylene equivalents (ppmi).

WATER LEVEL OBSERVATIONS, ft		
WL	∇ 7	WD ▼
WL	▼	▼
WL		

Terracon

BORING STARTED	3-27-09
BORING COMPLETED	3-27-09
RIG	FOREMAN
APPROVED SAK	JOB # 07087052

WELL 99 BORING LOGS.GPJ TERRACON.GDT 8/19/09

BORING NO. 27

CLIENT
Southeast Iowa Regional Planning Commission

SITE **Former Dresser Rand**
Burlington, Iowa

PROJECT
Phase II ESA

Depth	Description	Depth, ft.	USCS Symbol	Samples: Number	Samples: Type	Samples: Recovery, in.	Samples: SPT - N Blows / ft.	Tests: Water Content, %	Tests: Field Vapor Test (PPM)*	Tests: Soil Sample Sent to Laboratory
0.4	Approx. 4" Concrete			1	SS	6			ND	X
	SANDY LEAN CLAY WITH FLYASH AND GRAVEL Dark Brown			2	SS	6			ND	
4.5				3	SS	24			ND	
	SANDY LEAN CLAY Brown and Gray	5								
7	**SANDY LEAN CLAY, TRACE BRICK** Gray			4	SS	8			ND	
		10								
				5	SS	30			ND	X
		15								
16	BOTTOM OF BORING									

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

* ND indicates a reading of less than the field detection limit (FDL) of one (1) part per million isobutylene equivalents (ppmi).

WATER LEVEL OBSERVATIONS, ft		
WL	▽	▼
WL	▼	▽
WL		

Terracon

BORING STARTED	3-26-09
BORING COMPLETED	3-26-09
RIG	FOREMAN
APPROVED SAK	JOB # 07087052

BORING NO. 28

CLIENT
Southeast Iowa Regional Planning Commission

SITE **Former Dresser Rand**
Burlington, Iowa

PROJECT
Phase II ESA

WELL DIA.: 2 in
APPROX. SURFACE ELEV.: ft

Depth to (ft)	Description	Depth, ft.	USCS Symbol	Sample Number	Type	Recovery, in.	SPT - N Blows / ft.	Water Content, %	Field Vapor Test (PPM)*	Soil Sample Sent to Laboratory
4	**SILTY CLAY WITH BRICK** Brown			1	SS	10			ND	X
				2	SS	18			ND	
18	**SILTY CLAY WITH SOME SAND** Brown	5		3	SS	18			ND	
				4	SS	10			ND	X
				5	SS	0				
		10		6	SS	12			ND	
	(water level ∇ ~13)			7	SS	12			ND	
		15		8	SS	12			ND	
				9	SS	8			ND	
	BOTTOM OF BORING									

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

* ND indicates a reading of less than the field detection limit (FDL) of one (1) part per million isobutylene equivalents (ppmi).

WATER LEVEL OBSERVATIONS, ft		
WL	∇ 13	WD ▼
WL	∇	▼
WL		

Terracon

BORING STARTED	3-25-09
BORING COMPLETED	3-25-09
RIG	FOREMAN
APPROVED SAK	JOB # 07087052

BORING NO. 29

CLIENT
Southeast Iowa Regional Planning Commission

SITE **Former Dresser Rand**
Burlington, Iowa

PROJECT
Phase II ESA

WELL DIA.: 2 in
APPROX. SURFACE ELEV.: ft

Depth (ft)	DESCRIPTION
0.833	Approx. 10" Concrete
6	**GRAVEL WITH SILTY SAND AND BRICK** Dark Brown
9	**SILTY CLAY WITH SOME SAND** Tan
16	**SAND WITH SOME CLAY AND GRAVEL** Dark Gray
17	**SILTY CLAY (GLACIAL TILL)** Gray

BOTTOM OF BORING

NUMBER	TYPE	RECOVERY, in.	SPT - N BLOWS / ft.	WATER CONTENT, %	FIELD VAPOR TEST (PPM)*	SOIL SAMPLE SENT TO LABORATORY
1	SS	6			ND	X
2	SS	12			ND	
3	SS	18			ND	
4	SS	0			ND	
5	SS	18			ND	
6	SS	18			50	
7	SS	18			75	X
8	SS				10	

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

* ND indicates a reading of less than the field detection limit (FDL) of one (1) part per million isobutylene equivalents (ppmi).

WATER LEVEL OBSERVATIONS, ft
WL
WL
WL

Terracon

BORING STARTED	3-27-09
BORING COMPLETED	3-27-09
RIG	FOREMAN
APPROVED SAK	JOB # 07087052

WELL 99 BORING LOGS.GPJ TERRACON.GDT 8/19/09

BORING NO. 30

CLIENT
Southeast Iowa Regional Planning Commission

SITE **Former Dresser Rand**
Burlington, Iowa

PROJECT
Phase II ESA

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: RECOVERY, in.	SAMPLES: SPT - N BLOWS / ft.	TESTS: WATER CONTENT, %	TESTS: FIELD VAPOR TEST (PPM)*	TESTS: SOIL SAMPLE SENT TO LABORATORY
1	Approx. 1' Concrete									
	FLY ASH CINDERS AND RUBBLE Dark Brown			1	SS	24			ND	X
				2	SS	7			ND	
8		5		3	SS	26			ND	
12	**SANDY SILTY CLAY** Gray	10		4	SS	40			ND	X
16	**SANDY LEAN CLAY, TRACE GRAVEL** Black	15		5	SS	40			ND	

BOTTOM OF BORING

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

* ND indicates a reading of less than the field detection limit (FDL) of one (1) part per million isobutylene equivalents (ppmi).

WATER LEVEL OBSERVATIONS, ft		
WL	∇	▼
WL	▼	∇
WL		

Terracon

BORING STARTED	3-26-09
BORING COMPLETED	3-26-09
RIG	FOREMAN
APPROVED SAK	JOB # 07087052

BORING NO. 31

CLIENT
Southeast Iowa Regional Planning Commission

SITE **Former Dresser Rand Burlington, Iowa**

PROJECT **Phase II ESA**

Depth (strata)	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY, in.	SAMPLES SPT - N BLOWS / ft.	TESTS WATER CONTENT, %	TESTS FIELD VAPOR TEST (PPM)*	TESTS SOIL SAMPLE SENT TO LABORATORY
0.4	Approx. 4" Concrete									
	LEAN CLAY WITH SOME LIMESTONE SAND Black, Brown			1	SS	12			ND	X
				2	SS	24			ND	
4	**FINE TO COARSE SAND, LEAN CLAY, GRAVEL** Brown	5		3	SS	24			ND	
8	**LEAN CLAY, ORGANICS** Gray, Dark Gray	10		4	SS	30			ND	
		15		5	SS	40			ND	X
16	BOTTOM OF BORING									

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

* ND indicates a reading of less than the field detection limit (FDL) of one (1) part per million isobutylene equivalents (ppmi).

WATER LEVEL OBSERVATIONS, ft		
WL	▽	▼
WL	▼	▽
WL		

Terracon

BORING STARTED	3-26-09
BORING COMPLETED	3-26-09
RIG	FOREMAN
APPROVED SAK	JOB # 07087052

BORING NO. 32

CLIENT
Southeast Iowa Regional Planning Commission

SITE
Former Dresser Rand
Burlington, Iowa

PROJECT
Phase II ESA

WELL DIA.: 2 in
APPROX. SURFACE ELEV.: ft

Depth (ft)	Description	Sample Number	Type	Recovery, in.	SPT - N Blows / ft.	Water Content, %	Field Vapor Test (PPM)*	
0.5	Approx. 5" Concrete	1	SS	12			ND	X
4	**SANDY LEAN CLAY, TRACE SAND SEAMS** Brown	2	SS	12			ND	
8	**SANDY LEAN CLAY, TRACE GRAVEL** Brown	3	SS	9			ND	
		4	SS	12			ND	
10	**SANDY LEAN CLAY, TRACE SAND SEAMS** Brown	5	SS	24			ND	X
12	**LEAN CLAY** Brown	6	SS	24			ND	
15	**SILTY FINE TO MEDIUM SAND** Brown	7	SS	20			ND	
19	**SILTY CLAY** Gray	8	SS	20			ND	
		9	SS	12			ND	

BOTTOM OF BORING

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

* ND indicates a reading of less than the field detection limit (FDL) of one (1) part per million isobutylene equivalents (ppmi).

WATER LEVEL OBSERVATIONS, ft		
WL	12.5	WD
WL		
WL		

Terracon

BORING STARTED	3-25-09
BORING COMPLETED	3-25-09
RIG	FOREMAN
APPROVED SAK	JOB # 07087052

WELL 99 BORING LOGS.GPJ TERRACON.GDT 8/19/09

BORING NO. 33

CLIENT
Southeast Iowa Regional Planning Commission

SITE **Former Dresser Rand**
Burlington, Iowa

PROJECT
Phase II ESA

WELL DIA.: 2 in
APPROX. SURFACE ELEV.: ft

Depth (ft)	Description	Sample Number	Type	Recovery, in.	SPT - N Blows / ft.	Water Content, %	Field Vapor Test (PPM)*	Soil Sample Sent to Laboratory
0.6	Approx. 6" Concrete	1	PA SS	17			ND	X
1.5	CLEAN SAND, FLYASH Brown	2	SS	18			ND	
6.5	FLYASH AND SAND, TRACE LIMESTONE GRAVEL Brown, Black	3	SS	20			ND	
8	LEAN CLAY Brown	4	SS	20			ND	
14	SANDY LEAN CLAY Brown ∇	5	SS	18			ND	X
		6	SS	12			ND	
		7	SS	12			ND	

BOTTOM OF BORING

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

* ND indicates a reading of less than the field detection limit (FDL) of one (1) part per million isobutylene equivalents (ppmi).

WATER LEVEL OBSERVATIONS, ft		
WL	∇ 9	WD ▼
WL	▼	▼
WL		

Terracon

BORING STARTED	3-25-09
BORING COMPLETED	3-25-09
RIG	FOREMAN
APPROVED SAK	JOB # 07087052

BORING NO. 34

CLIENT: **Southeast Iowa Regional Planning Commission**

SITE: **Former Dresser Rand, Burlington, Iowa**

PROJECT: **Phase II ESA**

WELL DIA.: 2 in

APPROX. SURFACE ELEV.: ft

Depth, ft	Description	Sample Number	Type	Recovery, in.	SPT - N Blows / ft.	Water Content, %	Field Vapor Test (PPM)*	Soil Sample Sent to Laboratory
0.8	Approx. 8" Concrete	1	SS	8			ND	X
4	**SANDY LEAN CLAY, TRACE GRAVEL AND FLYASH** Dark Brown	2	SS	10			ND	
12	**WEAHTERED LIMESTONE** Reddish Brown	3	SS	15			ND	
		4	SS	18			ND	
		5	SS	6			ND	
		6	SS	8			ND	
13	**LEAN CLAY** Dark Brown	7	SS	2			ND	X
18	**FINE TO COARSE SAND, SOME SILT** Brown	8	SS	18			ND	
		9	SS	12			ND	

BOTTOM OF BORING

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

* ND indicates a reading of less than the field detection limit (FDL) of one (1) part per million isobutylene equivalents (ppmi).

WATER LEVEL OBSERVATIONS, ft		
WL	▽ 12.5	WD ▼
WL	▼	▼
WL		

Terracon

BORING STARTED	3-25-09
BORING COMPLETED	3-25-09
RIG	FOREMAN
APPROVED SAK	JOB # 07087052

WELL 99 BORING LOGS.GPJ TERRACON.GDT 8/19/09

BORING NO. 35

CLIENT
Southeast Iowa Regional Planning Commission

SITE **Former Dresser Rand**
Burlington, Iowa

PROJECT
Phase II ESA

WELL DIA.: 2 in
APPROX. SURFACE ELEV.: ft

Depth to base of layer (ft)	Description
0.5	Approx. 6" Concrete
2	**LEAN CLAY WITH BROWN FINE TO MEDIUM SAND** Black
4	**LEAN CLAY WITH FLYASH** Brown
6	**SANDY LEAN CLAY** Brown
9.5	**FINE TO COARSE SANDY LEAN CLAY** Brown
11	**SANDY LEAN CLAY** Dark Brown
18	**FINE TO MEDIUM SAND** Dark Brown
	BOTTOM OF BORING

Water level symbol (▽) shown at 11 ft.

Number	Type	Recovery, in.	SPT - N Blows / ft.	Water Content, %	Field Vapor Test (PPM)*	
1	PA SS	8			ND	X
2	SS	9			ND	
3	SS	18			ND	
4	SS	17			ND	
5	SS	20			ND	X
6	SS	12			ND	
7	SS	10			ND	
8	SS	12			ND	
9	SS	12			ND	

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

* ND indicates a reading of less than the field detection limit (FDL) of one (1) part per million isobutylene equivalents (ppmi).

WATER LEVEL OBSERVATIONS, ft		
WL	▽ 11.5	WD ▼
WL	▼	▼
WL		

Terracon

BORING STARTED	3-25-09
BORING COMPLETED	3-25-09
RIG	FOREMAN
APPROVED SAK	JOB # 07087052

BORING NO. 36

CLIENT
Southeast Iowa Regional Planning Commission

SITE **Former Dresser Rand**
Burlington, Iowa

PROJECT
Phase II ESA

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: RECOVERY, in.	SAMPLES: SPT - N BLOWS / ft.	TESTS: WATER CONTENT, %	TESTS: FIELD VAPOR TEST (PPM)*	TESTS: SOIL SAMPLE SENT TO LABORATORY
0.8	Approx. 6" Concrete				PA					
1.5	LIMESTONE WITH GRAVEL,			1	SS	19			ND	
	SANDY CLAY Light Brown	5		2	SS	22			ND	X
8	SILTY CLAY, TRACE GRAVEL, TREE ROOTS, WOOD Brown to Gray	10		3	SS	19			ND	
11	BOTTOM OF BORING									

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

* ND indicates a reading of less than the field detection limit (FDL) of one (1) part per million isobutylene equivalents (ppmi).

WATER LEVEL OBSERVATIONS, ft		
WL	▽	▼
WL	▼	▽
WL		

Terracon

BORING STARTED	5-6-09
BORING COMPLETED	5-6-09
RIG	FOREMAN
APPROVED SAK	JOB # 07087052

BORING NO. 37

CLIENT
Southeast Iowa Regional Planning Commission

SITE **Former Dresser Rand**
Burlington, Iowa

PROJECT
Phase II ESA

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: RECOVERY, in.	SAMPLES: SPT - N BLOWS / ft.	TESTS: WATER CONTENT, %	TESTS: FIELD VAPOR TEST (PPM)*	TESTS: SOIL SAMPLE SENT TO LABORATORY
0.8	Approx. 8" Concrete				PA					
1	**SAND AND FLYASH** Black			1	SS	18			ND	
	SILTY CLAY Brown	5		2	SS	23			ND	
8	**SILTY CLAY, SOME TREE ROOTS** Brown	10		3	SS	24			ND	X
11	BOTTOM OF BORING									

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

* ND indicates a reading of less than the field detection limit (FDL) of one (1) part per million isobutylene equivalents (ppmi).

WATER LEVEL OBSERVATIONS, ft		
WL	∇	▼
WL	▼	▼
WL		

Terracon

BORING STARTED	5-6-09
BORING COMPLETED	5-6-09
RIG	FOREMAN
APPROVED SAK	JOB # 07087052

BORING NO. 38

CLIENT
Southeast Iowa Regional Planning Commission

SITE
Former Dresser Rand
Burlington, Iowa

PROJECT
Phase II ESA

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: RECOVERY, in.	SAMPLES: SPT - N BLOWS / ft.	TESTS: WATER CONTENT, %	TESTS: FIELD VAPOR TEST (PPM)*	TESTS: SOIL SAMPLE SENT TO LABORATORY
0.7	Approx. 7" Concrete				PA					
1.5	**GRAVEL** Brown			1	SS	27			ND	
	SANDY CLAY Brown			2	SS	28			ND	X
8	**SILTY CLAY WITH FLYASH** Brown			3	SS	27			ND	
12	BOTTOM OF BORING									

Depth scale: 5, 10

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

* ND indicates a reading of less than the field detection limit (FDL) of one (1) part per million isobutylene equivalents (ppmi).

WATER LEVEL OBSERVATIONS, ft		
WL	▽	▼
WL	▼	▼
WL		

Terracon

BORING STARTED	5-6-09
BORING COMPLETED	5-6-09
RIG	FOREMAN
APPROVED SAK	JOB # 07087052

BORING NO. 39

CLIENT
Southeast Iowa Regional Planning Commission

SITE **Former Dresser Rand**
Burlington, Iowa

PROJECT
Phase II ESA

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: RECOVERY, in.	SAMPLES: SPT - N BLOWS / ft.	TESTS: WATER CONTENT, %	TESTS: FIELD VAPOR TEST (PPM)*	TESTS: SOIL SAMPLE SENT TO LABORATORY
	CONCRETE				PA					
3.8	**LIMESTONE, GRAVEL**			1	SS	27			ND	X
		5								
6.5	**LEAN CLAY** Dark Brown to Gray			2	SS	27			ND	
		10								
12	BOTTOM OF BORING									

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

* ND indicates a reading of less than the field detection limit (FDL) of one (1) part per million isobutylene equivalents (ppmi).

WATER LEVEL OBSERVATIONS, ft		
WL	∇	▼
WL	▼	▼
WL		

Terracon

BORING STARTED	5-6-09
BORING COMPLETED	5-6-09
RIG	FOREMAN
APPROVED SAK	JOB # 07087052

Appendix D

MEASUREMENT CONVERSIONS

"Rite in the Rain"®

ALL-WEATHER WRITING PAPER

ALL-WEATHER

HORIZONTAL LINE

NO. 390-4F with Fabrikoid Cover

Name Scott Kerr

Address 1106 Washington Street
Burlington, IA

Phone 563-355-0702

Project Dresser Rand

"Rite in the Rain" - A unique All-Weather Writing surface created to shed water and to enhance the written image. Makes it possible to write sharp legible field data in any kind of weather. For best results use a pencil or an all weather pen.

a product of

J. L. DARLING CORPORATION
Tacoma, WA 98424-1017 USA
(253) 922-5000 • FAX (253) 922-5300
www.RiteintheRain.com

3/23
SAK
- 1215 Arrived ~~at~~ site
met Jeff Carr - Gas/Power
locator. Cleared Borings
Ryan & Josh
1245 - Drill rig on site
unloaded materials,
signed H&S plan, obtained
ice, water. Sent Ryan
to get air compressor.
Calibrate PID
Set up on B1 @ 1530
Advanced boring to
52 ft without encountering
water. Removed augers
and left hole open.
Cleaned up site
off site @ 1800.

[signature]

3-24 SAK, Ryan, Josh

On site @ 700
Forcast is for heavy rains
Checked B-1 - no water
hole remained open over nght
Calibrate PID
Decommed augers and
set up on B 6.

@ 830 John Brimeyer
called and recommended
pushing a shelby tube (in till) if
water is not encountered
prior to encountering gw.

Material in tube will
be tested for hydraulic
conductivity.

Heavy rain and lightning
@ 1230 Waited until
1345. rain & lightening continues.
off site @ 1400.

3/25 ; AK, Josh, Ryan
on site @ 700
Calibrate PID
@ 700 met
[illegible] Dresser Rand
Matt Yeiter City of Burlington
and reps from Alliant Energy
Discussed options for [illegible]
~~[illegible]~~ interior utilities.
Matt [illegible] to shut down
all [illegible] to buildings.
Rep from Alliant indicated
utilities would be shut off
[illegible] end of day. Utilities
will be turned on the following
Monday after [illegible] they check
w/ Terracon.

[illegible] ~~[illegible]~~ Fegley on site @
930

3/25

Ryan left site @ 1030
~~[illegible]~~ for personal time. may
return late today

Ryan returned to
site @ 1600

Coordinated w/ John
Cameron to stop in
@ office to pick
up supplies

off site @ 1745

3/26 ~~Abby~~ Ryan ~~Josh~~ Jay John

Arrived @ ~~site~~ @ 645
Calibrate PID
Cameron & Jay will run Geoprobe
Ryan & Josh to run Drill rig

SAK left site @ 1500 to ship samples and pick up supplies
Ryan & Josh left site to fix tire and get concrete

offsite @ 1800

3/27 SAK, Ryan Josh, John

Arrive @ site @ 600
SAK & John - Geoprobe
Ryan / Josh - ~~&~~ Drill & Core floor
calibrate PID
John off site @ 1430

off site @ 1730

3/28 SAK, Ryan, Josh
Arrive @ site @ 730
calibrate PID
Completed borings.

developed wells - 3 well volumes
Survey - BM - manhole - Agency/@storm
Main overhead door stuck.
unable to fix - need power

Josh / Ryan . cleanup site
and left ~ 1400
SAK off site @ 1500
to [illegible]
sampled wells
B-6, B-7, B-23, B-28, (Dup-28)
B-32,
metal samples were
Field filtered.
~~QA~~

Conductivity . slug out
B-3, B-4, B-14

3/30
~~SAK~~ Ryan, Josh
Arrive @ site from Bettendorf @ 900
Coordinated w/ Power Company
to restore power to
open main over-head
door.
Ryan & Josh off site @
1300

Sampled ~~[illegible]~~ wells
B-16, 17, 18, 21, 26, 25
23, 33, 34, 35 (duplicate)
metal samples were
field filtered
SAK
offsite @ 1720
shipped samples

3/6/09

Jay to site to meet
Geoprobe & operator

Advanced borings
B-36, 37, 38, 39 sample 6-10
see logs
Resampled groundwater B-28 using
low-flow pump

backfilled borings w/ bentonite

	DTW	DTB	
B-7	9.90	15.49	830
B-6	7.69	14.80	900
B-23	10.52	16.25	1000
B-28	12.3	20.31	1030
GW Dup 1			
D 32	10.54		1130
~~B-35~~			1200
B-1	Dry		
B-14	Dry		
B-3	Dry		
B-4	Dry	Dup-2	
B-35	10.53	2032	1200
B-34	9.55	19.2	1230
B-33	10.24		1300
B-29	10.55		1410
B-26	10.92		1430
B-21	13.66	15.95	1500
B-18	8.90	16.36	1530
B-17	6.8		1600
B-16	4.9		1630

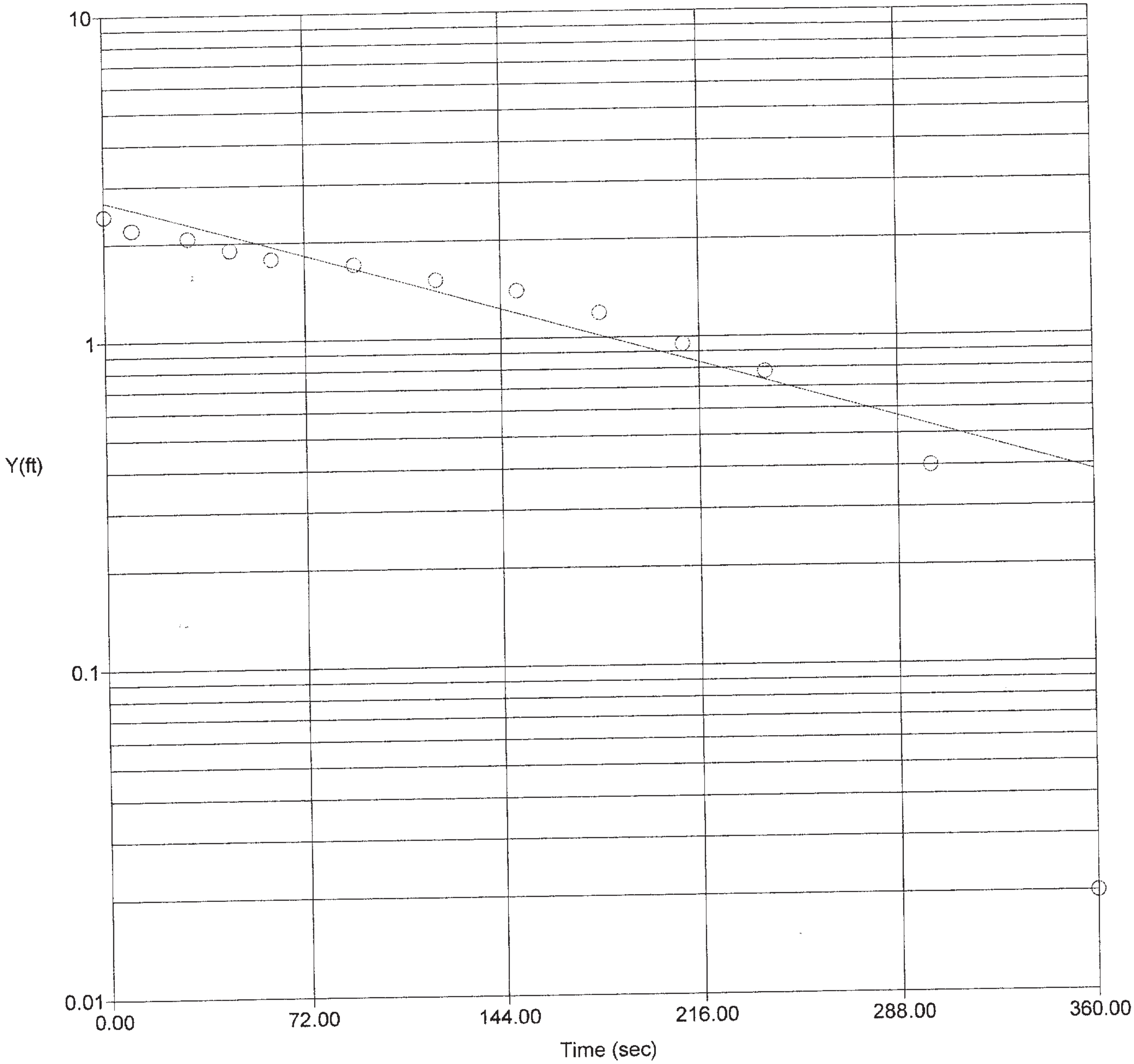
Appendix E

Lab Data

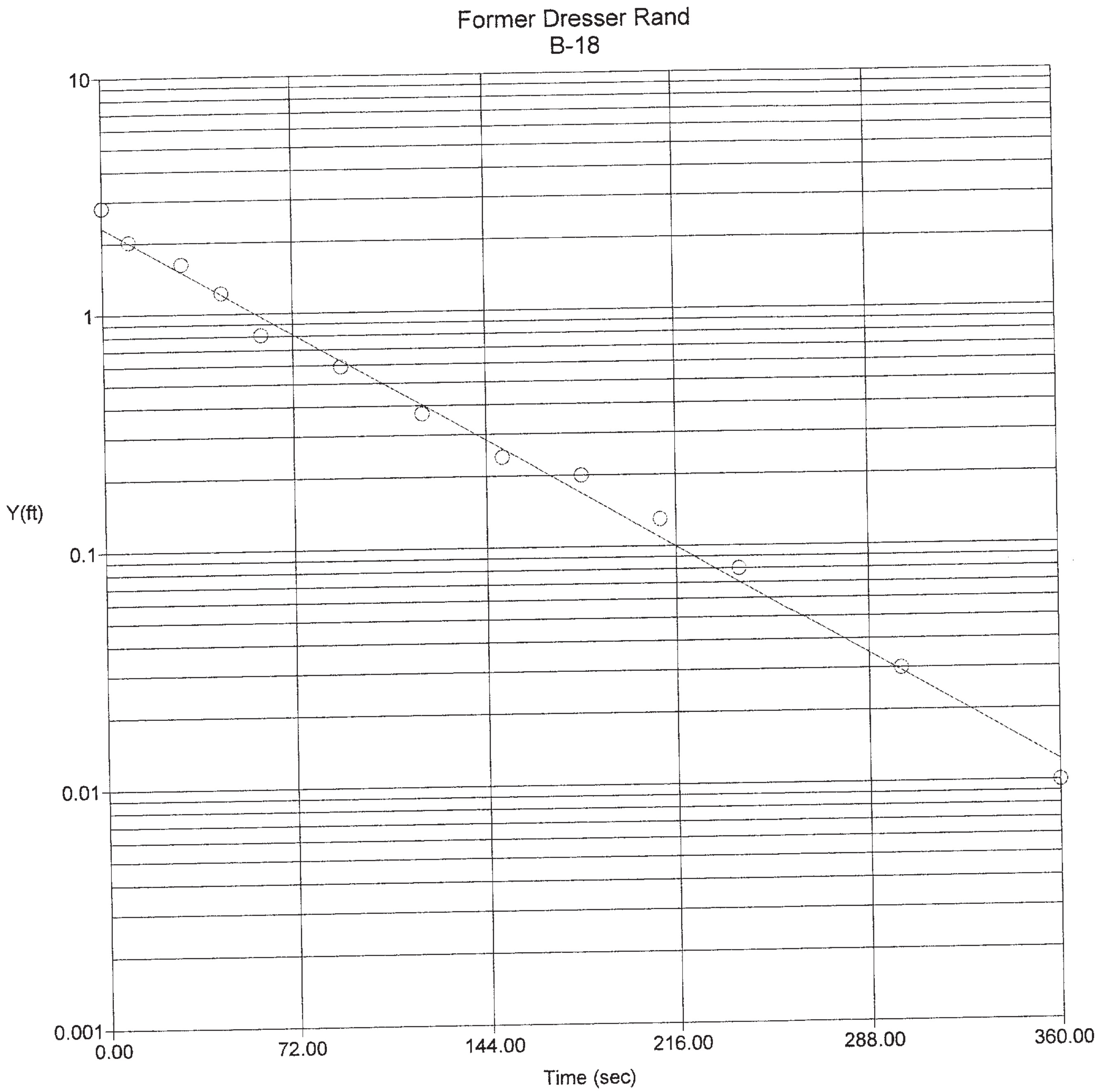
on DISC

Appendix F

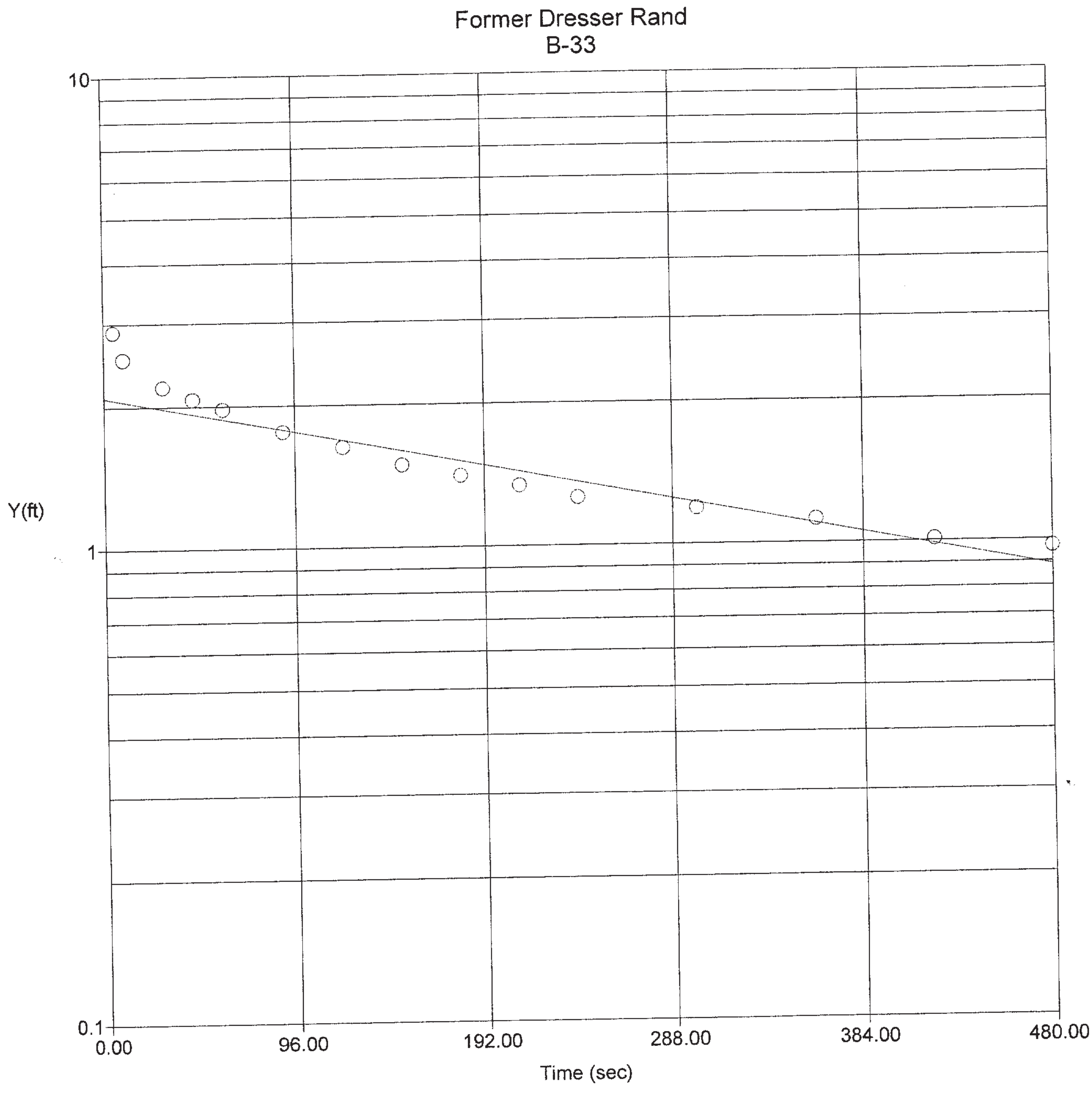
Former Dresser Rand
B-6



LUST No.:	Site Name:	
Hydraulic Conductivity: 0.785 m/day	Well: B-6	Slug Test Date:
Terracon	CGWP: N/A, N/A	



LUST No.:	Site Name:	
Hydraulic Conductivity: 1.57 m/day	Well: B-18	Slug Test Date:
Terracon	CGWP: N/A, N/A	



LUST No.:	Site Name:	
Hydraulic Conductivity: 0.219 m/day	Well: B-33	Slug Test Date:
Terracon	CGWP: N/A, N/A	

Appendix 4

Estimate Documentation Report

System:

RACER Version: 10.0.2
Database Location: N:\RACER 10.0\RACER.mdb

Folder:

Folder Name: 07087052

Project:

Project ID: 07087052
Project Name: Dresser-Rand Remedial Cost Estimates
Project Category: None

Location
State / Country: IOWA
City: BURLINGTON

Location Modifier	Default	User
	0.894	0.894

Options
Database: System Costs
Cost Database Date: 2008
Report Option: Calendar

Description Remedial cost estimates for redevelopment.

Estimate Documentation Report

Site Documentation:

Site ID: Area 1
Site Name: PAHs, Lead, and Arsenic in Soil (0-2)
Site Type: None

Media/Waste Type
Primary: Soil
Secondary: N/A

Contaminant
Primary: Metals
Secondary: Other

Phase Names
Pre-Study: ☐
Study: ☐
Design: ☐
Removal/Interim Action: ☐
Remedial Action: ☑
Operations & Maintenance: ☐
Long Term Monitoring: ☐
Site Closeout: ☐

Documentation
Description: Non-hazardous disposal of 4,392 cubic yards soil contaminated with PAHs, lead, and arsenic. Level D Safety, Landfill is no more than 30 miles away (one-way). In accordance with 567 IAC Chapter 137, 24 confirmation samples will be required. The source of the backfill material assumed to be within 10 miles.
Support Team: Documentation of personnel used to provide support for estimator and preparation of the estimate.
References: Documentation of reference sources used in the preparation of the estimate.

Estimator Information
Estimator Name: Brian Porter, PE
Estimator Title: Environmental Manager
Agency/Org./Office: Terracon
Business Address: 11600 Lilburn Park Road
St. Louis, Missouri 63146
Telephone Number: [314] 692 8811
Email Address: brporter@terracon.com
Estimate Prepared Date: 09/09/2009

Estimator Signature: ______________________ **Date:** ____________

Reviewer Information

Estimate Documentation Report

Reviewer Name: John F. Brimeyer, PE
Reviewer Title: Environmental Manager
Agency/Org./Office: Terracon
Business Address: 870 40th Avenue
Bettendorf, Iowa 52722
Telephone Number: [563] 355 0702
Email Address: jfbrimeyer@terracon.com
Date Reviewed:

Reviewer Signature: ______________________ **Date:** ____________

Estimated Costs:

Phase Names	Direct Cost	Marked-up Cost
Excavation and Off-Site Disposal	$607,371	$734,109
Total Cost:	$607,371	$734,109
Escalation:	$13,970	$16,885
Total Site Cost:	$621,341	$750,994

Estimate Documentation Report

Phase Documentation:

Phase Type: Remedial Action
Phase Name: Excavation and Off-Site Disposal
Description: Non-hazardous excavation and off-site disposal of contaminated soil.

Approach: Ex Situ
Start Date: September, 2009
Labor Rate Group: System Labor Rate
Analysis Rate Group: System Analysis Rate

Phase Markups: System Defaults

Technology Markups	Markup	% Prime	% Sub.
Excavation	Yes	100	0
Off-site Transportation and Waste Disposal	Yes	100	0
Professional Labor Management	Yes	100	0

Total Marked-up Cost: $734,109

Technologies:

Estimate Documentation Report

Technology Name: **Excavation (# 1)**

Description	Default	Value	UOM
System Definition			
Required Parameters			
Estimating Method		Area / Depth	n/a
Area		1.3612	AC
Depth		2	FT
Soil Type		Sand-Silt/Sand-Clay Mixture	n/a
Safety Level		D	n/a
Excavation			
Secondary Parameters			
Existing Cover	Soil/Gravel	Soil/Gravel	n/a
Replacement Cover	Soil/Seeding	Soil/Seeding	n/a
Sidewall Protection	None	None	n/a
% of Excavated Material To Be Used as Backfill	0	0	%
Source of Additional Fill	Off Site	Off Site	n/a
Backfill Hauling Distance (one way)	10	10	MI
Dewatering Required	No	No	n/a
Analytical			
Secondary Parameters			
Primary Analytical Template	System Soil - Metals	System Soil - Metals	n/a
Secondary Analytical Template	None	System Soil - Fuels	n/a
Number of Sampling Points/Locations	99	24	EA
Number of Composites Submitted to Lab	25	24	EA
Turnaround Time	Standard (21 Days)	Standard (21 Days)	n/a
Submit Data Electronically	Yes	Yes	n/a
Data Package / QC	Stage 1	Stage 1	n/a
Lab Data Review	Stage 1	Stage 1	n/a
Sampling Reports	Abbreviated	Abbreviated	n/a

Comments:

Estimate Documentation Report

Technology Name: Off-site Transportation and Waste Disposal (# 1)

Description	*Default*	*Value*	*UOM*
System Definition			
Required Parameters			
Waste Type		Non-Hazardous	n/a
Waste Form		Solid	n/a
Condition of Waste		Bulk to remain as bulk	n/a
Volume of Bulk Solid Waste		4,392	CY
Stabilization		None	n/a
Transportation Type		Truck	n/a
Truck Distance (One-way)		30	MI
Safety Level		D	n/a

Comments:

Technology Name: Professional Labor Management (# 1)

Description	*Default*	*Value*	*UOM*
System Definition			
Required Parameters			
Markedup Construction Cost ($)		617,417	$
Percentage	18.9	18.9	%
Dollar Amount		116,692	$

Comments:

Phase Technology Cost Detail Report
(with Markups)

System:

RACER Version: 10.0.2
Database Location: N:\RACER 10.0\RACER.mdb

Folder:

Folder Name: 07087052

Project:

Project ID: 07087052
Project Name: Dresser-Rand Remedial Cost Estimates
Project Category: None

Location
State / Country: IOWA
City: BURLINGTON

Location Modifier	Default	User
	0.894	0.894

Options
Database: System Costs
Cost Database Date: 2008
Report Option: Calendar

Description Remedial cost estimates for redevelopment.

Phase Technology Cost Detail Report
(with Markups)

Site:

Site ID: Area 1
Site Name: PAHs, Lead, and Arsenic in Soil (0-2)
Site Type: None

Media/Waste Type
Primary: Soil
Secondary: N/A

Contaminant
Primary: Metals
Secondary: Other

Phase Names
- **Pre-Study:** ☐
- **Study:** ☐
- **Design:** ☐
- **Removal/Interim Action:** ☐
- **Remedial Action:** ☑
- **Operations & Maintenance:** ☐
- **Long Term Monitoring:** ☐
- **Site Closeout:** ☐

Documentation

Description: Non-hazardous disposal of 4,392 cubic yards soil contaminated with PAHs, lead, and arsenic. Level D Safety, Landfill is no more than 30 miles away (one-way). In accordance with 567 IAC Chapter 137, 24 confirmation samples will be required. The source of the backfill material assumed to be within 10 miles.

Support Team: Documentation of personnel used to provide support for estimator and preparation of the estimate.

References: Documentation of reference sources used in the preparation of the estimate.

Estimator Information

Phase Technology Cost Detail Report
(with Markups)

Estimator Name: Brian Porter, PE
Estimator Title: Environmental Manager
Agency/Org./Office: Terracon
Business Address: 11600 Lilburn Park Road
St. Louis, Missouri 63146
Telephone Number: [314] 692 8811
Email Address: brporter@terracon.com
Estimate Prepared Date: 09/09/2009

Estimator Signature: ______________________ **Date:** __________

Reviewer Information

Reviewer Name: John F. Brimeyer, PE
Reviewer Title: Environmental Manager
Agency/Org./Office: Terracon
Business Address: 870 40th Avenue
Bettendorf, Iowa 52722
Telephone Number: [563] 355 0702
Email Address: jfbrimeyer@terracon.com
Date Reviewed:

Reviewer Signature: ______________________ **Date:** __________

Phase Technology Cost Detail Report
(with Markups)

Phase:

Phase Type: Remedial Action
Phase Name: Excavation and Off-Site Disposal
Description: Non-hazardous excavation and off-site disposal of contaminated soil.

Approach: Ex Situ
Start Date: September, 2009
Labor Rate Group: System Labor Rate
Analysis Rate Group: System Analysis Rate

Phase Markups: System Defaults

Technology Markups	Markup	% Prime	% Sub.
Excavation	Yes	100	0
Off-site Transportation and Waste Disposal	Yes	100	0
Professional Labor Management	Yes	100	0

Phase Technology Cost Detail Report
(with Markups)

Technology: Excavation

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Unit Cost	Extended Cost	Cost Override	Markups Applied
17020416	12 CY Dump Truck Haul/Hour	272.00	HR	0.00	73.08	53.15	0.00	$34,335.18	☐	☑
17030278	Excavate and load, bank measure, medium material, 3-1/2 C.Y. bucket, hydraulic excavator	4,393.00	BCY	0.00	0.94	1.06	0.00	$8,781.42	☐	☑
17030423	Unclassified Fill, 6" Lifts, Off-Site, Includes Delivery, Spreading, and Compaction	5,709.78	CY	8.44	1.21	1.11	0.02	$61,571.80	☐	☑
18050402	Seeding, Vegetative Cover	1.63	ACR	920.20	658.39	239.51	0.00	$2,963.50	☐	☑
33020303	Organic Vapor Analyzer Rental, per Day	4.00	DAY	0.00	0.00	0.00	37.77	$151.06	☐	☑
33020401	Disposable Materials per Sample	24.00	EA	11.41	0.00	0.00	0.00	$273.83	☐	☑
33021710	Testing, soil & sediment analysis, metals (1 cp) (6010)	48.00	EA	0.00	0.00	0.00	12.97	$622.46	☐	☑
33021722	Polynuclear Aromatic Hydrocarbons(PAH) (SW 8310),w/prep, Soil Analysis	24.00	EA	0.00	0.00	0.00	222.02	$5,328.53	☐	☑
33220102	Project Manager	7.00	HR	0.00	160.12	0.00	0.00	$1,120.82	☐	☑
33220108	Project Scientist	18.00	HR	0.00	145.41	0.00	0.00	$2,617.45	☐	☑
33220110	QA/QC Officer	3.00	HR	0.00	131.00	0.00	0.00	$393.00	☐	☑
33220112	Field Technician	3.00	HR	0.00	76.74	0.00	0.00	$230.21	☐	☑
33220114	Word Processing/Clerical	3.00	HR	0.00	69.36	0.00	0.00	$208.09	☐	☑
33220115	Draftsman/CADD	3.00	HR	0.00	83.09	0.00	0.00	$249.28	☐	☑

Phase Technology Cost Detail Report
(with Markups)

Total Element Cost	$118,846.64
Total 1st Year Technology Cost	$118,846.64

Phase Technology Cost Detail Report
(with Markups)

Technology: Off-site Transportation and Waste Disposal

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Unit Cost	Extended Cost	Cost Override	Markups Applied
33190102	Bulk Solid Waste Loading Into Disposal Vehicle or Bulk Disposal Container	4,392.00	BCY	1.27	1.38	0.49	0.00	$13,800.66	☐	☑
33190205	Transport Bulk Solid Hazardous Waste, Maximum 20 CY (per Mile)	6,600.00	MI	0.00	0.00	0.00	1.88	$12,378.45	☐	☑
33190317	Waste Stream Evaluation Fee, Not Including 50% Rebate on 1st Shipment	1.00	EA	0.00	0.00	0.00	492.99	$492.99	☐	☑
33190807	32 Ft. Dump Truck, 6 Mil Liner, disposable	220.00	EA	48.23	0.00	0.00	0.00	$10,610.10	☐	☑
33197270	Landfill Nonhazardous Solid Bulk Waste by CY	4,392.00	CY	0.00	0.00	0.00	105.03	$461,288.53	☐	☑

Total Element Cost	**$498,570.73**
Total 1st Year Technology Cost	**$498,570.73**

Phase Technology Cost Detail Report
(with Markups)

Technology: Professional Labor Management

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Unit Cost	Extended Cost	Cost Override	Markups Applied
33220149	Lump Sum Percentage Labor Cost	1.00	LS	0.00	116,692.00	0.00	0.00	$116,692.00	☑	☐

Total Element Cost	**$116,692.00**
Total 1st Year Technology Cost	**$116,692.00**
Total Phase Cost	**$734,109.37**

Estimate Documentation Report

System:

RACER Version: 10.0.2
Database Location: N:\RACER 10.0\RACER.mdb

Folder:

Folder Name: 07087052

Project:

Project ID: 07087052
Project Name: Dresser-Rand Remedial Cost Estimates
Project Category: None

Location
State / Country: IOWA
City: BURLINGTON

Location Modifier	Default	User
	0.894	0.894

Options
Database: System Costs
Cost Database Date: 2008
Report Option: Calendar

Description Remedial cost estimates for redevelopment.

Estimate Documentation Report

Site Documentation:

Site ID: Area 2
Site Name: PAHs and Lead in Soil (0-10)
Site Type: None

Media/Waste Type
Primary: Soil
Secondary: N/A

Contaminant
Primary: Metals
Secondary: Other

Phase Names
Pre-Study: ☐
Study: ☐
Design: ☐
Removal/Interim Action: ☐
Remedial Action: ☑
Operations & Maintenance: ☐
Long Term Monitoring: ☐
Site Closeout: ☐

Documentation
Description: Non-hazardous disposal of 4,187 cubic yards of soil contaminated with PAHs and lead. Level D Safety, Landfill is no more than 30 miles away (one-way). In accordance with 567 IAC Chapter 137, 24 confirmation samples will be required. The source of the backfill material assumed to be within 10 miles.
Support Team: Documentation of personnel used to provide support for estimator and preparation of the estimate.
References: Documentation of reference sources used in the preparation of the estimate.

Estimator Information
Estimator Name: Brian Porter, PE
Estimator Title: Environmental Manager
Agency/Org./Office: Terracon
Business Address: 11600 Lilburn Park Road
St. Louis, Missouri 63146
Telephone Number: [314] 692 8811
Email Address: brporter@terracon.com
Estimate Prepared Date: 09/09/2009

Estimator Signature: ______________________ **Date:** ____________

Reviewer Information

Estimate Documentation Report

Reviewer Name: John F. Brimeyer, PE
Reviewer Title: Environmental Manager
Agency/Org./Office: Terracon
Business Address: 870 40th Avenue
Bettendorf, Iowa 52722
Telephone Number: [563] 355 0702
Email Address: jfbrimeyer@terracon.com
Date Reviewed:

Reviewer Signature: ______________________ **Date:** ____________

Estimated Costs:

Phase Names	Direct Cost	Marked-up Cost
Excavation and Off-Site Disposal	$825,132	$991,249
Total Cost:	$825,132	$991,249
Escalation:	$18,978	$22,799
Total Site Cost:	$844,110	$1,014,048

Estimate Documentation Report

Phase Documentation:

Phase Type: Remedial Action
Phase Name: Excavation and Off-Site Disposal
Description: Non-hazardous excavation and off-site disposal of contaminated soil.

Approach: Ex Situ
Start Date: September, 2009
Labor Rate Group: System Labor Rate
Analysis Rate Group: System Analysis Rate

Phase Markups: System Defaults

Technology Markups	Markup	% Prime	% Sub.
Excavation	Yes	100	0
Off-site Transportation and Waste Disposal	Yes	100	0
Professional Labor Management	Yes	100	0

Total Marked-up Cost: $991,249

Technologies:

Estimate Documentation Report

Technology Name: **Excavation (# 1)**

Description	*Default*	*Value*	*UOM*
System Definition			
Required Parameters			
Estimating Method		Area / Depth	n/a
Area		0.2595	AC
Depth		10	FT
Soil Type		Sand-Silt/Sand-Clay Mixture	n/a
Safety Level		D	n/a
Excavation			
Secondary Parameters			
Existing Cover	Soil/Gravel	Soil/Gravel	n/a
Replacement Cover	Soil/Seeding	Soil/Seeding	n/a
Sidewall Protection	Side Sloping	Side Sloping	n/a
Rise : Run	1	1	n/a
% of Excavated Material To Be Used as Backfill	17	0	%
Source of Additional Fill	Off Site	Off Site	n/a
Backfill Hauling Distance (one way)	10	10	MI
Dewatering Required	No	No	n/a
Analytical			
Secondary Parameters			
Primary Analytical Template	System Soil - Metals	System Soil - Metals	n/a
Secondary Analytical Template	None	System Soil - Fuels	n/a
Number of Sampling Points/Locations	26	24	EA
Number of Composites Submitted to Lab	7	24	EA
Turnaround Time	Standard (21 Days)	Standard (21 Days)	n/a
Submit Data Electronically	Yes	Yes	n/a
Data Package / QC	Stage 1	Stage 1	n/a
Lab Data Review	Stage 1	Stage 1	n/a
Sampling Reports	Abbreviated	Abbreviated	n/a

Comments:

Estimate Documentation Report

Technology Name: Off-site Transportation and Waste Disposal (# 1)

Description	Default	Value	UOM
System Definition			
Required Parameters			
Waste Type		Non-Hazardous	n/a
Waste Form		Solid	n/a
Condition of Waste		Bulk to remain as bulk	n/a
Volume of Bulk Solid Waste		6,257	CY
Stabilization		None	n/a
Transportation Type		Truck	n/a
Truck Distance (One-way)		30	MI
Safety Level		D	n/a

Comments:

Technology Name: Professional Labor Management (# 1)

Description	Default	Value	UOM
System Definition			
Required Parameters			
Markedup Construction Cost ($)		836,497	$
Percentage	18.5	18.5	%
Dollar Amount		154,752	$

Comments:

Phase Technology Cost Detail Report
(with Markups)

System:

RACER Version: 10.0.2
Database Location: N:\RACER 10.0\RACER.mdb

Folder:

Folder Name: 07087052

Project:

Project ID: 07087052
Project Name: Dresser-Rand Remedial Cost Estimates
Project Category: None

Location
State / Country: IOWA
City: BURLINGTON

Location Modifier	Default	User
	0.894	0.894

Options
Database: System Costs
Cost Database Date: 2008
Report Option: Calendar

Description Remedial cost estimates for redevelopment.

Phase Technology Cost Detail Report
(with Markups)

Site:

Site ID: Area 2
Site Name: PAHs and Lead in Soil (0-10)
Site Type: None

Media/Waste Type
Primary: Soil
Secondary: N/A

Contaminant
Primary: Metals
Secondary: Other

Phase Names
- **Pre-Study:** ☐
- **Study:** ☐
- **Design:** ☐
- **Removal/Interim Action:** ☐
- **Remedial Action:** ☑
- **Operations & Maintenance:** ☐
- **Long Term Monitoring:** ☐
- **Site Closeout:** ☐

Documentation
Description: Non-hazardous disposal of 4,187 cubic yards of soil contaminated with PAHs and lead. Level D Safety, Landfill is no more than 30 miles away (one-way). In accordance with 567 IAC Chapter 137, 24 confirmation samples will be required. The source of the backfill material assumed to be within 10 miles.
Support Team: Documentation of personnel used to provide support for estimator and preparation of the estimate.
References: Documentation of reference sources used in the preparation of the estimate.

Estimator Information

Phase Technology Cost Detail Report
(with Markups)

Estimator Name: Brian Porter, PE
Estimator Title: Environmental Manager
Agency/Org./Office: Terracon
Business Address: 11600 Lilburn Park Road
St. Louis, Missouri 63146
Telephone Number: [314] 692 8811
Email Address: brporter@terracon.com
Estimate Prepared Date: 09/09/2009

Estimator Signature: ______________________ **Date:** __________

Reviewer Information

Reviewer Name: John F. Brimeyer, PE
Reviewer Title: Environmental Manager
Agency/Org./Office: Terracon
Business Address: 870 40th Avenue
Bettendorf, Iowa 52722
Telephone Number: [563] 355 0702
Email Address: jfbrimeyer@terracon.com
Date Reviewed:

Reviewer Signature: ______________________ **Date:** __________

Phase Technology Cost Detail Report
(with Markups)

Phase:

Phase Type: Remedial Action
Phase Name: Excavation and Off-Site Disposal
Description: Non-hazardous excavation and off-site disposal of contaminated soil.

Approach: Ex Situ
Start Date: September, 2009
Labor Rate Group: System Labor Rate
Analysis Rate Group: System Analysis Rate

Phase Markups: System Defaults

Technology Markups	Markup	% Prime	% Sub.
Excavation	Yes	100	0
Off-site Transportation and Waste Disposal	Yes	100	0
Professional Labor Management	Yes	100	0

Phase Technology Cost Detail Report
(with Markups)

Technology: Excavation

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Unit Cost	Extended Cost	Cost Override	Markups Applied
17020416	12 CY Dump Truck Haul/Hour	299.00	HR	0.00	73.08	53.15	0.00	$37,743.46	☐	☑
17030278	Excavate and load, bank measure, medium material, 3-1/2 C.Y. bucket, hydraulic excavator	4,814.00	BCY	0.00	0.94	1.06	0.00	$9,622.98	☐	☑
17030423	Unclassified Fill, 6" Lifts, Off-Site, Includes Delivery, Spreading, and Compaction	6,257.02	CY	8.44	1.21	1.11	0.02	$67,473.00	☐	☑
18050402	Seeding, Vegetative Cover	0.41	ACR	920.20	658.39	239.51	0.00	$745.42	☐	☑
33020303	Organic Vapor Analyzer Rental, per Day	4.00	DAY	0.00	0.00	0.00	37.77	$151.06	☐	☑
33020401	Disposable Materials per Sample	24.00	EA	11.41	0.00	0.00	0.00	$273.83	☐	☑
33021710	Testing, soil & sediment analysis, metals (1 cp) (6010)	24.00	EA	0.00	0.00	0.00	12.97	$311.23	☐	☑
33021722	Polynuclear Aromatic Hydrocarbons(PAH) (SW 8310),w/prep, Soil Analysis	24.00	EA	0.00	0.00	0.00	222.02	$5,328.53	☐	☑
33220102	Project Manager	7.00	HR	0.00	160.12	0.00	0.00	$1,120.82	☐	☑
33220108	Project Scientist	18.00	HR	0.00	145.41	0.00	0.00	$2,617.45	☐	☑
33220110	QA/QC Officer	3.00	HR	0.00	131.00	0.00	0.00	$393.00	☐	☑
33220112	Field Technician	3.00	HR	0.00	76.74	0.00	0.00	$230.21	☐	☑
33220114	Word Processing/Clerical	3.00	HR	0.00	69.36	0.00	0.00	$208.09	☐	☑
33220115	Draftsman/CADD	3.00	HR	0.00	83.09	0.00	0.00	$249.28	☐	☑

Phase Technology Cost Detail Report
(with Markups)

Total Element Cost	$126,468.37
Total 1st Year Technology Cost	$126,468.37

Phase Technology Cost Detail Report
(with Markups)

Technology: Off-site Transportation and Waste Disposal

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Unit Cost	Extended Cost	Cost Override	Markups Applied
33190102	Bulk Solid Waste Loading Into Disposal Vehicle or Bulk Disposal Container	6,257.00	BCY	1.27	1.38	0.49	0.00	$19,660.91	☐	☑
33190205	Transport Bulk Solid Hazardous Waste, Maximum 20 CY (per Mile)	9,390.00	MI	0.00	0.00	0.00	1.88	$17,611.16	☐	☑
33190317	Waste Stream Evaluation Fee, Not Including 50% Rebate on 1st Shipment	1.00	EA	0.00	0.00	0.00	492.99	$492.99	☐	☑
33190807	32 Ft. Dump Truck, 6 Mil Liner, disposable	313.00	EA	48.23	0.00	0.00	0.00	$15,095.28	☐	☑
33197270	Landfill Nonhazardous Solid Bulk Waste by CY	6,257.00	CY	0.00	0.00	0.00	105.03	$657,168.11	☐	☑

Total Element Cost	**$710,028.45**
Total 1st Year Technology Cost	**$710,028.45**

Phase Technology Cost Detail Report
(with Markups)

Technology: Professional Labor Management

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Unit Cost	Extended Cost	Cost Override	Markups Applied
33220149	Lump Sum Percentage Labor Cost	1.00	LS	0.00	154,752.00	0.00	0.00	$154,752.00	☑	☐

Total Element Cost	**$154,752.00**
Total 1st Year Technology Cost	**$154,752.00**
Total Phase Cost	**$991,248.82**

Estimate Documentation Report

System:

RACER Version: 10.0.2
Database Location: N:\RACER 10.0\RACER.mdb

Folder:

Folder Name: 07087052

Project:

Project ID: 07087052
Project Name: Dresser-Rand Remedial Cost Estimates
Project Category: None

Location
State / Country: IOWA
City: BURLINGTON

Location Modifier	**Default**	**User**
	0.894	0.894

Options
Database: System Costs
Cost Database Date: 2008
Report Option: Calendar

Description Remedial cost estimates for redevelopment.

Estimate Documentation Report

Site Documentation:

Site ID: Area 3
Site Name: PAHs in Soil (0-12)
Site Type: None

Media/Waste Type
Primary: Soil
Secondary: N/A

Contaminant
Primary: Other
Secondary: None

Phase Names
Pre-Study: ☐
Study: ☐
Design: ☐
Removal/Interim Action: ☐
Remedial Action: ☑
Operations & Maintenance: ☐
Long Term Monitoring: ☐
Site Closeout: ☐

Documentation
Description: Non-hazardous disposal of 1,256 cubic yards of soil contaminated with PAHs. Level D Safety, Landfill is no more than 30 miles away (one-way). In accordance with 567 IAC Chapter 137, 12 confirmation samples will be required. The source of the backfill material assumed to be within 10 miles.
Support Team: Documentation of personnel used to provide support for estimator and preparation of the estimate.
References: Documentation of reference sources used in the preparation of the estimate.

Estimator Information
Estimator Name: Brian Porter, PE
Estimator Title: Environmental Manager
Agency/Org./Office: Terracon
Business Address: 11600 Lilburn Park Road
St. Louis, Missouri 63146
Telephone Number: [314] 692 8811
Email Address: brporter@terracon.com
Estimate Prepared Date: 09/09/2009

Estimator Signature: ______________________ **Date:** ____________

Reviewer Information

Estimate Documentation Report

Reviewer Name:	John F. Brimeyer, PE
Reviewer Title:	Environmental Manager
Agency/Org./Office:	Terracon
Business Address:	870 40th Avenue Bettendorf, Iowa 52722
Telephone Number:	[563] 355 0702
Email Address:	jfbrimeyer@terracon.com
Date Reviewed:	

Reviewer Signature: ______________________ **Date:** ____________

Estimated Costs:

Phase Names	Direct Cost	Marked-up Cost
Excavation and Off-Site Disposal	$297,813	$357,756
Total Cost:	$297,813	$357,756
Escalation:	$6,850	$8,228
Total Site Cost:	$304,663	$365,984

Estimate Documentation Report

Phase Documentation:

Phase Type: Remedial Action
Phase Name: Excavation and Off-Site Disposal
Description: Non-hazardous excavation and off-site disposal of contaminated soil.

Approach: Ex Situ
Start Date: September, 2009
Labor Rate Group: System Labor Rate
Analysis Rate Group: System Analysis Rate

Phase Markups: System Defaults

Technology Markups	Markup	% Prime	% Sub.
Excavation	Yes	100	0
Off-site Transportation and Waste Disposal	Yes	100	0
Professional Labor Management	Yes	100	0

Total Marked-up Cost: $357,756

Technologies:

Estimate Documentation Report

Technology Name: **Excavation (# 1)**

Description	Default	Value	UOM
System Definition			
Required Parameters			
Estimating Method		Area / Depth	n/a
Area		0.0649	AC
Depth		12	FT
Soil Type		Sand-Silt/Sand-Clay Mixture	n/a
Safety Level		D	n/a
Excavation			
Secondary Parameters			
Existing Cover	Soil/Gravel	Soil/Gravel	n/a
Replacement Cover	Soil/Seeding	Soil/Seeding	n/a
Sidewall Protection	Side Sloping	Side Sloping	n/a
Rise : Run	1	1	n/a
% of Excavated Material To Be Used as Backfill	33	0	%
Source of Additional Fill	Off Site	Off Site	n/a
Backfill Hauling Distance (one way)	10	10	MI
Dewatering Required	No	No	n/a
Analytical			
Secondary Parameters			
Primary Analytical Template	None	System Soil - Fuels	n/a
Secondary Analytical Template	None	None	n/a
Number of Sampling Points/Locations	9	12	EA
Number of Composites Submitted to Lab	5	12	EA
Turnaround Time	Standard (21 Days)	Standard (21 Days)	n/a
Submit Data Electronically	Yes	Yes	n/a
Data Package / QC	Stage 1	Stage 1	n/a
Lab Data Review	Stage 1	Stage 1	n/a
Sampling Reports	Abbreviated	Abbreviated	n/a

Comments:

Estimate Documentation Report

Technology Name: **Off-site Transportation and Waste Disposal (# 1)**

Description	*Default*	*Value*	*UOM*
System Definition			
Required Parameters			
Waste Type		Non-Hazardous	n/a
Waste Form		Solid	n/a
Condition of Waste		Bulk to remain as bulk	n/a
Volume of Bulk Solid Waste		2,220	CY
Stabilization		None	n/a
Transportation Type		Truck	n/a
Truck Distance (One-way)		30	MI
Safety Level		D	n/a

Comments:

Technology Name: **Professional Labor Management (# 1)**

Description	*Default*	*Value*	*UOM*
System Definition			
Required Parameters			
Markedup Construction Cost ($)		299,127	$
Percentage	19.6	19.6	%
Dollar Amount		58,629	$

Comments:

Phase Technology Cost Detail Report
(with Markups)

System:

RACER Version: 10.0.2
Database Location: N:\RACER 10.0\RACER.mdb

Folder:

Folder Name: 07087052

Project:

Project ID: 07087052
Project Name: Dresser-Rand Remedial Cost Estimates
Project Category: None

Location
State / Country: IOWA
City: BURLINGTON

Location Modifier	Default	User
	0.894	0.894

Options
Database: System Costs
Cost Database Date: 2008
Report Option: Calendar

Description Remedial cost estimates for redevelopment.

Phase Technology Cost Detail Report
(with Markups)

Site:

Site ID: Area 3
Site Name: PAHs in Soil (0-12)
Site Type: None

Media/Waste Type
Primary: Soil
Secondary: N/A

Contaminant
Primary: Other
Secondary: None

Phase Names
- **Pre-Study:** ☐
- **Study:** ☐
- **Design:** ☐
- **Removal/Interim Action:** ☐
- **Remedial Action:** ☑
- **Operations & Maintenance:** ☐
- **Long Term Monitoring:** ☐
- **Site Closeout:** ☐

Documentation

Description: Non-hazardous disposal of 1,256 cubic yards of soil contaminated with PAHs. Level D Safety, Landfill is no more than 30 miles away (one-way). In accordance with 567 IAC Chapter 137, 12 confirmation samples will be required. The source of the backfill material assumed to be within 10 miles.

Support Team: Documentation of personnel used to provide support for estimator and preparation of the estimate.

References: Documentation of reference sources used in the preparation of the estimate.

Estimator Information

Phase Technology Cost Detail Report
(with Markups)

Estimator Name: Brian Porter, PE
Estimator Title: Environmental Manager
Agency/Org./Office: Terracon
Business Address: 11600 Lilburn Park Road
St. Louis, Missouri 63146
Telephone Number: [314] 692 8811
Email Address: brporter@terracon.com
Estimate Prepared Date: 09/09/2009

Estimator Signature: ______________________ **Date:** ____________

Reviewer Information
Reviewer Name: John F. Brimeyer, PE
Reviewer Title: Environmental Manager
Agency/Org./Office: Terracon
Business Address: 870 40th Avenue
Bettendorf, Iowa 52722
Telephone Number: [563] 355 0702
Email Address: jfbrimeyer@terracon.com
Date Reviewed:

Reviewer Signature: ______________________ **Date:** ____________

Phase Technology Cost Detail Report
(with Markups)

Phase:

Phase Type: Remedial Action
Phase Name: Excavation and Off-Site Disposal
Description: Non-hazardous excavation and off-site disposal of contaminated soil.

Approach: Ex Situ
Start Date: September, 2009
Labor Rate Group: System Labor Rate
Analysis Rate Group: System Analysis Rate

Phase Markups: System Defaults

Technology Markups	Markup	% Prime	% Sub.
Excavation	Yes	100	0
Off-site Transportation and Waste Disposal	Yes	100	0
Professional Labor Management	Yes	100	0

Phase Technology Cost Detail Report
(with Markups)

Technology: Excavation

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Unit Cost	Extended Cost	Cost Override	Markups Applied
17020416	12 CY Dump Truck Haul/Hour	106.00	HR	0.00	73.08	53.15	0.00	$13,380.62	☐	☑
17030277	Excavate and load, bank measure, medium material, 2 C.Y. bucket, hydraulic excavator	1,708.00	BCY	0.00	1.18	0.85	0.00	$3,454.28	☐	☑
17030423	Unclassified Fill, 6" Lifts, Off-Site, Includes Delivery, Spreading, and Compaction	2,219.91	CY	8.44	1.21	1.11	0.02	$23,938.55	☐	☑
18050402	Seeding, Vegetative Cover	0.14	ACR	920.20	658.39	239.51	0.00	$254.53	☐	☑
33020303	Organic Vapor Analyzer Rental, per Day	2.00	DAY	0.00	0.00	0.00	37.77	$75.53	☐	☑
33020401	Disposable Materials per Sample	12.00	EA	11.41	0.00	0.00	0.00	$136.92	☐	☑
33021722	Polynuclear Aromatic Hydrocarbons(PAH) (SW 8310),w/prep, Soil Analysis	12.00	EA	0.00	0.00	0.00	222.02	$2,664.27	☐	☑
33220102	Project Manager	6.00	HR	0.00	160.12	0.00	0.00	$960.71	☐	☑
33220108	Project Scientist	9.00	HR	0.00	145.41	0.00	0.00	$1,308.72	☐	☑
33220110	QA/QC Officer	2.00	HR	0.00	131.00	0.00	0.00	$262.00	☐	☑
33220112	Field Technician	2.00	HR	0.00	76.74	0.00	0.00	$153.47	☐	☑
33220114	Word Processing/Clerical	2.00	HR	0.00	69.36	0.00	0.00	$138.73	☐	☑
33220115	Draftsman/CADD	2.00	HR	0.00	83.09	0.00	0.00	$166.19	☐	☑

Total Element Cost **$46,894.52**

Total 1st Year Technology Cost **$46,894.52**

Phase Technology Cost Detail Report
(with Markups)

Technology: Off-site Transportation and Waste Disposal

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Unit Cost	Extended Cost	Cost Override	Markups Applied
33190102	Bulk Solid Waste Loading Into Disposal Vehicle or Bulk Disposal Container	2,220.00	BCY	1.27	1.38	0.49	0.00	$6,975.74	☐	☑
33190205	Transport Bulk Solid Hazardous Waste, Maximum 20 CY (per Mile)	3,330.00	MI	0.00	0.00	0.00	1.88	$6,245.49	☐	☑
33190317	Waste Stream Evaluation Fee, Not Including 50% Rebate on 1st Shipment	1.00	EA	0.00	0.00	0.00	492.99	$492.99	☐	☑
33190807	32 Ft. Dump Truck, 6 Mil Liner, disposable	111.00	EA	48.23	0.00	0.00	0.00	$5,353.28	☐	☑
33197270	Landfill Nonhazardous Solid Bulk Waste by CY	2,220.00	CY	0.00	0.00	0.00	105.03	$233,164.97	☐	☑

Total Element Cost **$252,232.47**

Total 1st Year Technology Cost **$252,232.47**

Phase Technology Cost Detail Report
(with Markups)

Technology: Professional Labor Management

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Unit Cost	Extended Cost	Cost Override	Markups Applied
33220149	Lump Sum Percentage Labor Cost	1.00	LS	0.00	58,629.00	0.00	0.00	$58,629.00	☑	☐

Total Element Cost	**$58,629.00**
Total 1st Year Technology Cost	**$58,629.00**
Total Phase Cost	**$357,755.99**

Appendix H

ATSDR

AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY

ARSENIC

CAS # 7440-38-2

Division of Toxicology and Environmental Medicine ToxFAQs™ **August 2007**

This fact sheet answers the most frequently asked health questions (FAQs) about arsenic. For more information, call the ATSDR Information Center at 1-800-232-4636. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It is important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Exposure to higher than average levels of arsenic occur mostly in the workplace, near hazardous waste sites, or in areas with high natural levels. At high levels, inorganic arsenic can cause death. Exposure to lower levels for a long time can cause a discoloration of the skin and the appearance of small corns or warts. Arsenic has been found in at least 1,149 of the 1,684 National Priority List sites identified by the Environmental Protection Agency (EPA).

What is arsenic?

Arsenic is a naturally occurring element widely distributed in the earth's crust. In the environment, arsenic is combined with oxygen, chlorine, and sulfur to form inorganic arsenic compounds. Arsenic in animals and plants combines with carbon and hydrogen to form organic arsenic compounds.

Inorganic arsenic compounds are mainly used to preserve wood. Copper chromated arsenate (CCA) is used to make "pressure-treated" lumber. CCA is no longer used in the U.S. for residential uses; it is still used in industrial applications. Organic arsenic compounds are used as pesticides, primarily on cotton fields and orchards.

What happens to arsenic when it enters the environment?

- Arsenic occurs naturally in soil and minerals and may enter the air, water, and land from wind-blown dust and may get into water from runoff and leaching.
- Arsenic cannot be destroyed in the environment. It can only change its form.
- Rain and snow remove arsenic dust particles from the air.
- Many common arsenic compounds can dissolve in water. Most of the arsenic in water will ultimately end up in soil or sediment.
- Fish and shellfish can accumulate arsenic; most of this arsenic is in an organic form called arsenobetaine that is much less harmful.

How might I be exposed to arsenic?

- Ingesting small amounts present in your food and water or breathing air containing arsenic.
- Breathing sawdust or burning smoke from wood treated with arsenic.
- Living in areas with unusually high natural levels of arsenic in rock.
- Working in a job that involves arsenic production or use, such as copper or lead smelting, wood treating, or pesticide application.

How can arsenic affect my health?

Breathing high levels of inorganic arsenic can give you a sore throat or irritated lungs.

Ingesting very high levels of arsenic can result in death. Exposure to lower levels can cause nausea and vomiting, decreased production of red and white blood cells, abnormal heart rhythm, damage to blood vessels, and a sensation of "pins and needles" in hands and feet.

Ingesting or breathing low levels of inorganic arsenic for a long time can cause a darkening of the skin and the appearance of small "corns" or "warts" on the palms, soles, and torso.

Skin contact with inorganic arsenic may cause redness and swelling.

ATSDR

AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY

CADMIUM

CAS # 7440-43-9

Division of Toxicology and Environmental Medicine ToxFAQs™ September 2008

This fact sheet answers the most frequently asked health questions (FAQs) about cadmium. For more information, call the ATSDR Information Center at 1-800-232-4636. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It is important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Exposure to cadmium happens mostly in the workplace where cadmium products are made. The general population is exposed from breathing cigarette smoke or eating cadmium contaminated foods. Cadmium damages the kidneys, lungs, and bones. Cadmium has been found in at least 1,014 of the 1,669 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What is cadmium?

Cadmium is a natural element in the earth's crust. It is usually found as a mineral combined with other elements such as oxygen (cadmium oxide), chlorine (cadmium chloride), or sulfur (cadmium sulfate, cadmium sulfide).

All soils and rocks, including coal and mineral fertilizers, contain some cadmium. Most cadmium used in the United States is extracted during the production of other metals like zinc, lead, and copper. Cadmium does not corrode easily and has many uses, including batteries, pigments, metal coatings, and plastics.

What happens to cadmium when it enters the environment?

- ❑ Cadmium enters soil, water, and air from mining, industry, and burning coal and household wastes.
- ❑ Cadmium does not break down in the environment, but can change forms.
- ❑ Cadmium particles in air can travel long distances before falling to the ground or water.
- ❑ Some forms of cadmium dissolve in water.
- ❑ Cadmium binds strongly to soil particles.
- ❑ Fish, plants, and animals take up cadmium from the environment.

How might I be exposed to cadmium?

- ❑ Eating foods containing cadmium; low levels are found in all foods (highest levels are found in shellfish, liver, and kidney meats).
- ❑ Smoking cigarettes or breathing cigarette smoke.
- ❑ Breathing contaminated workplace air.
- ❑ Drinking contaminated water.
- ❑ Living near industrial facilities which release cadmium into the air.

How can cadmium affect my health?

Breathing high levels of cadmium can severely damage the lungs. Eating food or drinking water with very high levels severely irritates the stomach, leading to vomiting and diarrhea.

Long-term exposure to lower levels of cadmium in air, food, or water leads to a buildup of cadmium in the kidneys and possible kidney disease. Other long-term effects are lung damage and fragile bones.

How likely is cadmium to cause cancer?

The Department of Health and Human Services (DHHS) has determined that cadmium and cadmium compounds are known human carcinogens.

(DHHS) has determined that lead and lead compounds are reasonably anticipated to be human carcinogens and the EPA has determined that lead is a probable human carcinogen. The International Agency for Research on Cancer (IARC) has determined that inorganic lead is probably carcinogenic to humans and that there is insufficient information to determine whether organic lead compounds will cause cancer in humans.

How can lead affect children?

Small children can be exposed by eating lead-based paint chips, chewing on objects painted with lead-based paint, or swallowing house dust or soil that contains lead.

Children are more vulnerable to lead poisoning than adults. A child who swallows large amounts of lead may develop blood anemia, severe stomachache, muscle weakness, and brain damage. If a child swallows smaller amounts of lead, much less severe effects on blood and brain function may occur. Even at much lower levels of exposure, lead can affect a child's mental and physical growth.

Exposure to lead is more dangerous for young and unborn children. Unborn children can be exposed to lead through their mothers. Harmful effects include premature births, smaller babies, decreased mental ability in the infant, learning difficulties, and reduced growth in young children. These effects are more common if the mother or baby was exposed to high levels of lead. Some of these effects may persist beyond childhood.

How can families reduce the risks of exposure to lead?

- ❑ Avoid exposure to sources of lead.
- ❑ Do not allow children to chew or mouth surfaces that may have been painted with lead-based paint.
- ❑ If you have a water lead problem, run or flush water that has been standing overnight before drinking or cooking with it.
- ❑ Some types of paints and pigments that are used as make-up or hair coloring contain lead. Keep these kinds of products away from children
- ❑ If your home contains lead-based paint or you live in an area contaminated with lead, wash children's hands and faces often to remove lead dusts and soil, and regularly clean the house of dust and tracked in soil.

Is there a medical test to determine whether I've been exposed to lead?

A blood test is available to measure the amount of lead in your blood and to estimate the amount of your recent exposure to lead. Blood tests are commonly used to screen children for lead poisoning. Lead in teeth or bones can be measured by X-ray techniques, but these methods are not widely available. Exposure to lead also can be evaluated by measuring erythrocyte protoporphyrin (EP) in blood samples. EP is a part of red blood cells known to increase when the amount of lead in the blood is high. However, the EP level is not sensitive enough to identify children with elevated blood lead levels below about 25 micrograms per deciliter (µg/dL). These tests usually require special analytical equipment that is not available in a doctor's office. However, your doctor can draw blood samples and send them to appropriate laboratories for analysis.

Has the federal government made recommendations to protect human health?

The Centers for Disease Control and Prevention (CDC) recommends that states test children at ages 1 and 2 years. Children should be tested at ages 3–6 years if they have never been tested for lead, if they receive services from public assistance programs for the poor such as Medicaid or the Supplemental Food Program for Women, Infants, and Children, if they live in a building or frequently visit a house built before 1950; if they visit a home (house or apartment) built before 1978 that has been recently remodeled; and/or if they have a brother, sister, or playmate who has had lead poisoning. CDC considers a blood lead level of 10 µg/dL to be a level of concern for children.

EPA limits lead in drinking water to 15 µg per liter.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 2007. Toxicological Profile for lead (Update). Atlanta, GA: U.S. Department of Public Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology and Environmental Medicine, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-800-232-4636, FAX: 770-488-4178. ToxFAQs Internet address via WWW is http://www.atsdr.cdc.gov/toxfaq.html. ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

ATSDR
AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY

PENTACHLOROPHENOL

CAS #87-86-5

Division of Toxicology ToxFAQs™ **September 2001**

This fact sheet answers the most frequently asked health questions (FAQs) about pentachlorophenol. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It is important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Pentachlorophenol is a manufactured chemical which is a restricted use pesticide and is used industrially as a wood preservative for utility poles, railroad ties, and wharf pilings. Exposure to high levels of pentachlorophenol can cause increases in body temperature, liver effects, damage to the immune system, reproductive effects, and developmental effects. This substance has been found in at least 313 of the 1,585 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What is pentachlorophenol?

Pentachlorophenol is a manufactured chemical that does not occur naturally. Pure pentachlorophenol exists as colorless crystals. Impure pentachlorophenol (the form usually found at hazardous waste sites) is dark gray to brown and exists as dust, beads, or flakes. Humans are usually exposed to impure pentachlorophenol (also called technical grade pentachlorophenol).

Pentachlorophenol was widely used as a pesticide and wood preservative. Since 1984, the purchase and use of pentachlorophenol has been restricted to certified applicators. It is no longer available to the general public. It is still used industrially as a wood preservative for utility poles, railroad ties, and wharf pilings.

What happens to pentachlorophenol when it enters the environment?

❑ Pentachlorophenol can be found in the air, water, and soil. It enters the environment through evaporation from treated wood surfaces, industrial spills, and disposal at uncontrolled hazardous waste sites.

❑ Pentachlorophenol is broken down by sunlight, other chemicals, and microorganisms to other chemicals within a couple of days to months.

❑ Pentachlorophenol is found in fish and other foods, but tissue levels are usually low.

How might I be exposed to pentachlorophenol?

❑ The general populations can be exposed to very low levels of pentachlorophenol in contaminated indoor and outdoor air, food, drinking water and soil.

❑ People who work or live near a wood treatment facility or in the production of utility poles, railroad ties, or wharf pilings may be exposed to pentachlorophenol in the air or by coming in contact with the treated wood.

❑ People living near hazardous waste sites may also be exposed to higher than usual levels of pentachlorophenol.

How can pentachlorophenol affect my health?

Studies in workers show that exposure to high levels of pentachlorophenol can cause the cells in the body to produce excess heat. When this occurs, a person may experience a very high fever, profuse sweating, and difficulty breathing. The body temperature can increase to dangerous levels, causing injury to various organs and tissues, and even death. Liver effects and damage to the immune system have also been observed in humans exposed to high levels of pentachlorophenol for a long time. Damage to the thyroid and reproductive system has been observed in laboratory animals exposed to high doses of pentachlorophenol. Some of the harmful effects of pentachlorophenol are caused by the other chemicals present in technical grade pentachlorophenol.

- Nursing infants of mothers living near hazardous waste sites may be exposed to PAHs through their mother's milk.

How can PAHs affect my health?

Mice that were fed high levels of one PAH during pregnancy had difficulty reproducing and so did their offspring. These offspring also had higher rates of birth defects and lower body weights. It is not known whether these effects occur in people.

Animal studies have also shown that PAHs can cause harmful effects on the skin, body fluids, and ability to fight disease after both short- and long-term exposure. But these effects have not been seen in people.

How likely are PAHs to cause cancer?

The Department of Health and Human Services (DHHS) has determined that some PAHs may reasonably be expected to be carcinogens.

Some people who have breathed or touched mixtures of PAHs and other chemicals for long periods of time have developed cancer. Some PAHs have caused cancer in laboratory animals when they breathed air containing them (lung cancer), ingested them in food (stomach cancer), or had them applied to their skin (skin cancer).

Is there a medical test to show whether I've been exposed to PAHs?

In the body, PAHs are changed into chemicals that can attach to substances within the body. There are special tests that can detect PAHs attached to these substances in body tissues or blood. However, these tests cannot tell whether any health effects will occur or find out the extent or source of your exposure to the PAHs. The tests aren't usually available in your doctor's office because special equipment is needed to conduct them.

Has the federal government made recommendations to protect human health?

The Occupational Safety and Health Administration (OSHA) has set a limit of 0.2 milligrams of PAHs per cubic meter of air (0.2 mg/m^3). The OSHA Permissible Exposure Limit (PEL) for mineral oil mist that contains PAHs is 5 mg/m^3 averaged over an 8-hour exposure period.

The National Institute for Occupational Safety and Health (NIOSH) recommends that the average workplace air levels for coal tar products not exceed 0.1 mg/m^3 for a 10-hour workday, within a 40-hour workweek. There are other limits for workplace exposure for things that contain PAHs, such as coal, coal tar, and mineral oil.

Glossary

Carcinogen: A substance that can cause cancer.

Ingest: Take food or drink into your body.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 1995. Toxicological profile for polycyclic aromatic hydrocarbons. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 770-488-4178. ToxFAQs Internet address via WWW is http://www.atsdr.cdc.gov/toxfaq.html ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.