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ENVIRONMENTAL MANAGEMENT

BECHTEL JACOBS COMPANY LLC
ACCELERATED CLEANUP CONTRACT
WITH THE UNITED STATES
U.S. DEPARTMENT OF ENERGY

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BJC/OR-2889

RCRA Summary Document for the David Witherspoon 1630 Site Knoxville, Tennessee

This document is approved for public release per review by:	
Arthur McBride Signature on File	6/13/08
BJC ETTP Classification & Information Office	Date

BECHTEL JACOBS
Bechtel Jacobs Company LLC

DOE Contract No. DE-AC05-98OR22700
Job No. 23900
DWI-2008-0003
June 19, 2008

Mr. Jason D. Darby
Project Manager
U.S. Department of Energy
Oak Ridge Operations
Post Office Box 2001
Oak Ridge, Tennessee 37831

Dear Mr. Darby:

DE-AC05-98OR22700: Transmittal of the *RCRA Summary Document for the David Witherspoon 1630 Site, Knoxville, Tennessee,* (BJC/OR-2889)

Enclosed is one copy of the *RCRA Summary Document for the David Witherspoon 1630 Site, Knoxville, Tennessee,* (BJC/OR-2889) report for your information.

If you have any questions, please contact me at (865) 573-2312.

Sincerely,

Julie Pfeffer
Manager of Projects
DWI / DD Projects

JLP:mll

Enclosure: As stated

c/enc: C. A. Dirnbauer
T. Poole
File–DWI PDCC
File–EMEF DMC–RC

BJC/OR-2889

RCRA Summary Document for the David Witherspoon 1630 Site Knoxville, Tennessee

Date Issued—June 2008

Prepared for the
U.S. Department of Energy
Office of Environmental Management

BECHTEL JACOBS COMPANY LLC
managing the
Environmental Management Activities at the
East Tennessee Technology Park
Y-12 National Security Complex Oak Ridge National Laboratory
under contract DE-AC05-98OR22700
for the
U.S. DEPARTMENT OF ENERGY

APPROVALS

RCRA Summary Document
for the
David Witherspoon 1630 Site Knoxville, Tennessee

BJC/OR-2889

June 2008

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USQD Review Determination: ☐ USQD ☐ UCD ☐ CAT X ☒ N/A USQD/UCD/CAT X No: _____

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CONTENTS

ACRONYMS

BJC	Bechtel Jacobs Company LLC
DOE	U.S. Department of Energy
DWI	David Witherspoon Inc.
EMWMF	Environmental Management Waste Management Facility
FS	feasibility study
LDR	Land Disposal Restrictions
MOU	Memorandum of Understanding
MT2	Metals Treatment Technologies
PCB	polychlorinated biphenyls
PPE	personal protective equipment
RCRA	Resource Conservation and Recovery Act of 1976
RI	remedial investigation
SAP	Sampling and Analysis Plan
SVOC	semi-volatile organic compound
TCLP	Toxicity Characteristic Leaching Procedure
TDEC	Tennessee Department of Environment and Conservation
TDSF	Tennessee Division of Superfund
UCL	upper confidence level
VOC	volatile organic compound
WAC	Waste Acceptance Criteria
WL	waste lot

FIGURE

TABLES

1. INTRODUCTION

The 48-acre David Witherspoon, Inc. (DWI) 1630 Site operated as an unregulated industrial landfill and scrap yard. The Tennessee Division of Superfund (TDSF) closed the landfill in 1974. During the period of operation, the site received solid and liquid wastes from salvage and industrial operations. The site consists of five separate tracts of land including a small portion located across the Norfolk Southern Railroad track. The landfill occupies approximately 5 acres of the site, and roughly 20 acres of the 48 acres contains surface and buried debris associated with the DWI dismantling business operation. Beginning in 1968, the state of Tennessee licensed DWI to receive scrap metal at the DWI 1630 Site, contaminated with natural uranium and enriched uranium (235U) not exceeding 0.1 percent by weight (TDSF 1990). The U.S. Department of Energy (DOE) has agreed to undertake remedial actions at the DWI 1630 Site as specified under a Consent Order with the Tennessee Department of Environment and Conservation (TDEC) (Consent Order No. 90-3443, April 4, 1991), and as further delineated by a Memorandum of Understanding (MOU) between DOE and the State of Tennessee (MOU Regarding Implementation of Consent Orders, October 6, 1994). The soil and debris removal at the DWI 1630 Site is being performed by Bechtel Jacobs Company LLC (BJC) on behalf of the DOE. Remediation consists of removing contaminated soil and debris from the DWI 1630 site except for the landfill area and repairing the landfill cap.

The DWI 1630 remediation waste that is being disposed at the Environmental Management Waste Management Facility (EMWMF) as defined as waste lot (WL) 146.1 and consists primarily of soils and soil like material, incidental debris and secondary waste generated from the excavation of debris and soil from the DWI 1630 site. The WL 146.1 includes soil, soil like material (e.g., shredded or chipped vegetation, ash), discrete debris items (e.g., equipment, drums, large scrap metal, cylinders, and cable) and populations of debris type items (e.g., piles of bricks, small scrap metal, roofing material, scaffolding, and shelving) that are located throughout the DWI 1630 site. The project also generates an additional small volume of secondary waste [e.g., personal protective equipments (PPE), and miscellaneous construction waste] that is bagged and included in bulk soil shipments to the EMWMF. The Waste Acceptance Criteria (WAC) for the EMWMF does not allow for material that does not meet the Resource Conservation and Recovery Act (RCRA) Land Disposal Restrictions (LDRs). The waste being excavated in certain areas of the DWI 1630 site contained soil that did not meet RCRA LDR criteria; therefore this waste had to be segregated for treatment or alternate disposal offsite.

2. PURPOSE

This document identifies the approach taken by the DWI 1630 project to further characterize the areas identified during the Phase II Remedial Investigation (RI) as potentially containing RCRA-characteristic waste. This document also describes the methodology used to determine excavation limits for areas determined to be RCRA waste, post excavation sampling, and the treatment and disposal of this material.

3. SITE RCRA CHARACTERIZATION AND EXCAVATION

3.1 REMEDIAL INVESTIGATION APPROACH AND RESULTS

A draft Phase II RI/feasibility study (FS) report (DOE 1999) was prepared for the DWI 1630 Site to describe the nature and extent of contamination and evaluate remediation options. During the field work to support the RI, numerous samples of debris piles, surface and subsurface soils, groundwater, and surface water were collected and analyzed for a full spectrum of analytical parameters that included radioactive contaminants, polychlorinated biphenyls (PCBs), volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), metals, Toxicity Characteristics Leaching Procedure (TCLP) metals and organics, and dioxins/furans in an effort to characterize the site wastes and explore treatment and disposal options for these materials.

The RI TCLP samples were collected from biased locations. Known areas of surface contamination on the DWI 1630 site (i.e., the debris piles) were sampled based on visual contamination indicators (e.g., visually stained soil, under waste piles, other suspect areas, etc.). Consequently, the TCLP data obtained can be considered representative of the areas most likely to contain RCRA-characteristic waste. This data indicated RCRA contaminants were generally below RCRA regulatory limits across the site (see WL 146.1 profile), with the exception of elevated lead and/or cadmium levels at 15 locations. Figure 1 shows the hotspot areas in relation to the rest of the DWI 1630 Site. Table 1 shows the RCRA TCLP results for areas where the regulatory limits were exceeded and the coordinates for each of the fifteen (15) locations. The regulatory limits are 5 mg/L for lead and 1 mg/L for cadmium. These 15 locations were identified in the field by a licensed land surveyor and the areas roped off or otherwise identified as suspect RCRA areas. The remaining soils were considered suitable for excavation and subsequent disposal at EMWMF. A complete listing of results from all TCLP samples obtained during the Phase II RI (DOE 1999) can be found in Volume 2 of the subject report, Table J-49.

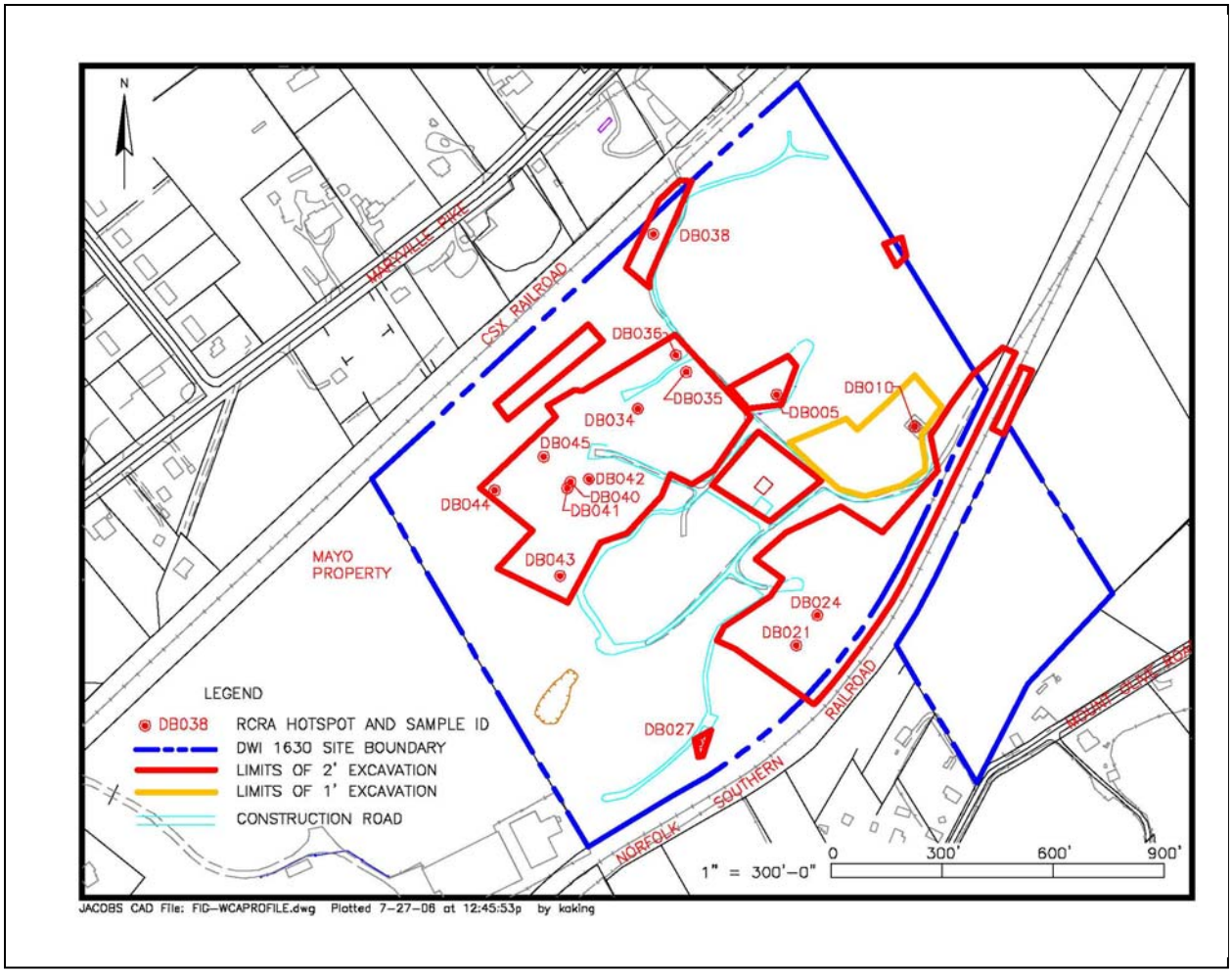


Figure 1. Relation of 15 Hotspots to DWI 1630

Table 1. DWI 1630 RI RCRA TCLP Exceedances

Hotspot	Location ID	Sample ID	Trench No.	Northing	Easting	TCLP Results (exceedances only)
1	DB-05	D1630DB005	1	582201.64	2581434.41	Lead 7.67 mg/L
2	DB-09	D1630DB010	1	582115.12	2581807.22	Lead 19.1 mg/L
3	DB-019	D1630DB021	21	581524.47	2581487.56	Lead 12.0 mg/L, Cadmium 4.88 mg/L
4	DB-019	D1630DB024	20	581605.47	2581544.25	Lead 9.17 mg/L
5	DB-020	D1630DB027	4	581260.99	2581224.19	Cadmium 1.52 mg/L
6	DB-026	D1630DB034	3	582162.87	2581059.92	Lead 11.2 mg/L
7	DB-027	D1630DB035	1	582262.33	2581190.61	Lead 22.4 mg/L
8	DB-028	D1630DB036	1	582307.76	2581163.17	Lead 56.6 mg/L, Cadmium 6.81 mg/L
9	DB-029	D1630DB038	10	582635.11	2581101.23	Lead 8.97 mg/L,
10	DB-031	D1630DB040	8	581965.52	2580878.27	Lead 10.4 mg/L, Cadmium 14.3 mg/L
11	DB-031	D1630DB041	11	581948.29	2580868.86	Lead 13.9 mg/L, Cadmium 12.8 mg/L
12	DB-031	D1630DB042	4	581973.35	2580927.66	Lead 6.77 mg/L, Cadmium 18.4 mg/L
13	DB-032	D1630DB043	2	581712.56	2580850.04	Lead 12.7 mg/L Cadmium 11.5 mg/L
14	DB-033	D1630DB044	3	581942.81	2580673.1	Lead 668.0 mg/L Cadmium 1.48 mg/L
15	DB-033	D1630DB045	8	582034.44	2580805.59	Lead 7.22 mg/L Cadmium 13.6 mg/L

ID = Identification
RCRA = Resource Conservation and Recovery Act of 1976
RI = Remedial Investigation
TCLP = Toxicity Characteristics Leaching Procedure

3.2 VERIFICATION OF RI RESULTS

A sampling and analysis plan (SAP) was prepared to support collection of additional analytical data from the 15 hotspots. The materials sampled included soil and/or soil-like material. Because of the biased nature of the original RI sampling effort, additional samples were necessary to bound the hotspot areas. The analytical data generated from the SAP was used to either confirm that:

- RCRA regulated soils or soil-like materials were not present;
- the lateral extent of RCRA contaminated soils or soil-like materials was adequately bounded; or
- RCRA regulated soils or soil-like materials were present, were not been bounded in all areas, and that the collection of additional data was required.

Nine additional samples were initially collected at each hotspot location. A co-located core sample was collected at the coordinates of the original RI sample, and the remaining eight samples were located in a 2-tiered pattern around the original sample location. Individual core samples were obtained down to 2-feet (i.e., the expected final excavation depth).

A total of 143 TCLP lead and/or cadmium samples were obtained for the initial confirmation and bounding sampling event of the 15 hotspot areas. Only TCLP lead and/or cadmium were analyzed due to previous characterization which determined the absence of other TCLP metals and organics above RCRA characteristic limits at these 15 locations. For complete SAP details and information, refer to Appendix A.

Three locations (HS-03, HS-05 and HS-09) were determined to not contain RCRA-characteristic waste. Three other locations (HS-01, HS-02 and HS-07) were determined to be sufficiently bounded by the initial sampling event to allow excavation boundaries to be established. The remaining nine locations required additional bounding samples to define the limits of RCRA-characteristic material. The additional sampling locations were selected based on a number of factors including a visual examination of the soils, and the use of a hand-held X-Ray Fluorescence Spectrometer in an attempt to establish trends in total metal concentrations in the surface soils. An additional 61 TCLP lead and/or cadmium samples were collected at the remaining nine locations before excavation boundaries could be determined. All of the TCLP sample results that were obtained to confirm and/or bound the 15 RCRA hotspot locations can be found in Appendix A, Table A-1.

3.3 RIMMER PROPERTY CHARACTERIZATION

Part way through the remediation project at 1630, an additional area of radiological contamination was found off the 1630 property on the adjacent Rimmer property. To provide waste characteristic information, 14 surface soil (0-6 in) samples and three composite soil samples taken during installation of three test pits were collected and analyzed for a variety of analytes including TCLP for metals and organics (samples D1630RIM01-17).

Table A-2 contains TCLP lead results. All other TCLP results were below regulatory limits. Three sample results exceeded RCRA levels for lead, D1630RIM07, 11, and 06. The TCLP lead result at location 6 was 48.7 mg/L. This result was so unusual and there was no evidence of different material at the location that the location was resampled (D1630RIM18) using a 2-ft core which is more representative of the material to be excavated. At the same time, four 2-ft core samples were taken 5 feet from location 6/18 to bound any RCRA waste in case it was present. Table A-2 presents the results from the 5 additional samples (D1630RIM18-22). Sample 18 had a TCLP lead result of 0.057 mg/L. This result replaced the result from location 6 in all statistical analysis. One of the new samples, location 22, had a RCRA level exceedance at 9.2 mg/L.

All original Rimmer results (except location 6) and the five new results were evaluated for compliance with RCRA. The UCL-90 was calculated to be 3.97 mg/L using the most conservative distribution assumption, pert Beta. The UCL-90 of the mean is below the RCRA TCLP level of 5 mg/L. Therefore, the Rimmer waste was determined to not be RCRA-characteristic waste. Appendix C presents the statistical evaluation details.

3.4 EXCAVATION BOUNDARY DETERMINATION

The initial excavation boundary approach was to:

1. use the analytical characterization data to bound the hotspot where all additional data points were in compliance [i.e., upper confidence level (UCL)-90<5 mg/L for lead and <1 mg/L for cadmium],

2. to collect additional bounding data where the sample results were increasing, and

3. to use over-excavation techniques of high analytical results (i.e., >5 mg/L for lead and >1 mg/L for cadmium) in certain areas to render the remaining soils compliant as defined by the UCL-90.

The data results for hotspots HS-01 and HS-07 were straightforward and the excavation areas for these hotspots defined considering the highest TCLP failures, and then evaluating the remaining data points and comparing the UCL-90 to the regulatory limit. Although data points over 5.0 mg/L lead or 1.0 mg/L cadmium remained in these areas, the UCL-90 for soil that remained in HS-01 and HS-07 after the highest data failures were excavated were in compliance with RCRA regulatory requirements and could be disposed in the EMWMF.

The remaining hotspots were not as amenable to selective removal of TCLP failures and subsequent hand drawing of boundaries. As a result, a contouring method was determined to be the most technically feasible option to determine excavation boundaries within the hotspots areas. The approach involved determining the average concentration of the fifteen hotspot areas so that the UCL-90 for TCLP lead for the whole site was approximately the same as the conservative UCL reported in the profile (approximately 2.1 mg/L). Based on recalculation of the UCL-90 with the original sample results and 15 additional bounding sample values inserted for the hotspots, a value of 2.7 mg/L produced a UCL-90 of 2.1 mg/L [using nonparametric distribution and a 90% Chebyshev (Mean, Sd) UCL]. For example, the resampled results for HS-02 (not including the original RI TCLP sample failure) were plotted and surface contours of concentration with 1 mg/L contours generated up to 10 mg/L for lead. These contours were then imported into ArcGIS and overlaid on the original base map showing HS-02. The area of each contour up to 10 mg/L was then determined using toolsets in ArcGIS. For the 1 mg/L contour, an approximate area was defined since the original contour was exceedingly large; reducing the contour size would result in a more conservative calculation of the weighted average concentration. Once areas for each contour were determined, the average concentration in the contour (e.g., 1.5 mg/L as the average between the 1 mg/L and 2 mg/L contour lines) was multiplied by the contour area (e.g, 1.5 mg/L x 1 mg/L contour area, 2.5 mg/L x 2 mg/L contour area, etc.). The resulting area times concentrations were then summed and divided by the sum of the contour area (1 through 10 mg/L) to get the weighted average for the area. The resulting weighted average, up to the 10 mg/L contour line, was 2.1 mg/L, meeting the UCL-90 represented in the WL 146.1 profile. HS-02, -04, -06, and -08 were evaluated using this methodology.

Due to the potential large volumes of RCRA soils associated with the above contouring method for HS-10 through 15, an alternate contouring approach for these hotspots was used. This approach consisted of:

1. The area calculations and hotspot contours would be conducted using all the excavation site data. The original 27 site samples plus the results from HS-01 through 04 and HS-06 through 15 would be used in calculating the UCL-90 demonstrating compliance with RCRA limits for lead and cadmium.

2. The acceptable UCL-90 for lead would be at a maximum value of slightly over 3.0 mg/L for lead. However, the actual excavation contours would also be impacted by additional criteria to ensure sufficient excavation of RCRA material, as follows:

    - The maximum allowable weighted average-concentration for HS-10 through 15 would be the TCLP RCRA lead limit of 5 mg/L.

    - The maximum allowable concentration contour that could remain for HS-10 through 15 would be at 2.5 times the TCLP RCRA limit for lead, or the 12.5 mg/L contour.

3. The same criteria was used to determine cadmium areas (i.e., 2.5 mg/L TCLP limit on excavation contour and 1 mg/L upper limit on the weighted average-concentration left at the hotspot).

Excavation contours for HS-10 through 15 are provided in Appendix B. It should be noted that for HS-01 through 09, lead was the contributor for final contour excavation limits while for HS-10 through 15 cadmium was the main contributor to the contour excavation limits. All final hotspot excavation area packages are contained in Appendix C.

3.5 EXCAVATION

After each excavation boundary was established, a minimum of 2-feet of contaminated soil within the hotspot area boundaries was excavated. After the 2-foot of excavation, a visual indicator was used and if a natural soil composition (e.g., clay, etc.) with no evidence of visual staining was visible, the excavation continued for an additional 3-6 inches and then stopped. At this point, the remaining soil under the

excavation (and outside the hotspot borders) could be considered non-RCRA material. However, for hotspot areas that after the initial 2-feet of contaminated soil had been excavated the remaining soil still appeared contaminated due to staining, unchanged soil composition, etc., the excavation continued until a natural soil composition was discovered.

Across the site, all potential RCRA-characteristic items such as circuit boards, lead items, etc., were removed per the DWI 1630 Anomaly Detection Plan.

3.6 POST-EXCAVATION SAMPLING

The excavated potentially RCRA characteristic soil was staged in windrows or piles pending further sampling to confirm that treatment was needed. The excavation spoils from HS-01, HS-02, HS-04, HS-06, HS-07 and HS-08 were initially staged in windrows and sampled. The results are shown in Appendix A, Table A-2 and indicate that the waste exceeded RCRA regulatory limits. The remaining hotspots were excavated and all excavation spoils were subsequently commingled and mixed thoroughly to prepare for treatment. Large debris was removed from the pile by raking. Residual soil was shaken/cleaned off the debris back into the soil pile. The debris was shipped to the EMWMF with other non-RCRA soils. The pile was reconfigured into a flat pile approximately 90 ft by 90 ft and 2 ft deep. A round of sampling for TCLP analysis was then performed. Eleven composite samples consisting of four grab samples each were collected and analyzed for TCLP and total lead and cadmium. Gamma spec analyses were conducted on the samples with U-238 results varying from not detected to 9.2 pCi/g. The laboratory results are shown in Appendix A, Table A-3. The TCLP and gamma spec results illustrate that the pile was well mixed as the results were similar between samples.

4. TREATMENT

Because the soils excavated did not meet LDRs, some form of treatment would be needed prior to disposal, either at a location onsite or at the Energy Solutions disposal cell. Treatment goals were established to meet the regulatory levels of 5 mg/L lead and 1 mg/L of cadmium from TCLP tests. Considering that metals are easily treated by stabilization, an EPA-recognized treatment technology, it was determined to be considerably more cost effective to treat the material at the site and dispose of it at EMWMF. BJC first procured the services of a technical advisor from Metals Treatment Technologies (MT2). MT2 then performed a treatability study to determine the material to add to the soil to prevent the leaching of lead and cadmium. The study was followed by the development of a work plan and then implementation of the remedy. The soils were sampled after treatment and a small portion of the soils had to be retreated to meet the required regulatory levels. The soils were then sampled again. Once all regulatory levels had been met, the soils were disposed in the EMWMF.

4.1 TREATABILITY STUDY

In August of 2007, BJC and Restoration Services Inc. personnel collected a representative composite sample of soil from the soil stockpile in a five-gallon plastic bucket. Before testing, the sample was transferred to a plastic bag and blended to ensure a homogeneous mixture. At the MT2 laboratory, the sample was analyzed and treated with ECOBOND® to determine the appropriate mixture of produce to soil to meet the treatment goals. Two mixtures were tested. Table 2 illustrates the treatability study results which led to the concluding mixture. Lead and cadmium TCLP concentrations dropped by at least 90% after treatment during the study with ECOBOND® Pb/Cd. The selected concentration was 3 % by weight of each ECOBOND® Pb and Cd (total of 6% by weight).

Table 2. Treatability Study Results

ECOBOND® Pb/Cd Formulation (weight %)	Untreated TCLP Pb (mg/L)	Treated TCLP Pb (mg/L)	Untreated TCLP Cd (mg/L)	Treated TCLP Cd (mg/L)
3.0	79.8	1.3	2.95	0.81
6.0	79.8	0.4	2.95	0.04

TCLP = Toxicity Characteristic Leaching Procedure

4.2 SOIL TREATMENT WITH ECOBOND®

Lead and cadmium contaminated soil stabilization treatment was performed at the site on October 25 and 26, 2007. About 600 cy of soil was treated with 25 tons of ECOBOND® Cd and 23 tons of ECOBOND® Pb using a CAT 330 excavator to mix the soil. A small portion (3 to 5 tons) of the ECOBOND® Pb was withheld for retreatment, if needed. Due to the reactivity of the ECOBOND® Cd with water, none of that material was withheld. To determine if treatment goals were met, 11 composite samples made of four grab samples, were collected on a grid pattern and analyzed for TCLP Pb and Cd. The initial post-treatment results are presented in Table 3. The shaded values show samples results that are above the regulatory levels. A small part of the pile was not sufficiently treated to meet the Cd goals so BJC retreated only that portion of the pile with 900 pounds of hydrated lime, under the advice of MT2, on November 13, 2007. The reason for not reaching the treatment goal was likely to be incomplete mixing. The remaining ECOBOND® Pb was added to the soil that was sufficiently treated only for disposal.

Table 3. Initial Post-Treatment Sampling Results

Sample ID	TCLP Pb (mg/L)	TCLP Cd (mg/L)
D1630RCRAPL5-12	0.04U	0.31
D1630RCRAPL5-13	4.4	1.3
D1630RCRAPL5-14	2.8	1.1
D1630RCRAPL5-15	0.52	0.39
D1630RCRAPL5-16	0.04U	0.01U
D1630RCRAPL5-17	0.04U	0.01U
D1630RCRAPL5-18	0.04U	0.01U
D1630RCRAPL5-19	0.04U	0.01U
D1630RCRAPL5-20	0.04U	0.02B
D1630RCRAPL5-21	0.04U	0.01U
D1630RCRAPL5-22	0.04U	0.01U

ID = Identification
TCLP = Toxicity Characteristic Leaching Procedure
U = Below detection limits

4.3 CONFIRMATION OF PROJECT CLEANUP GOALS

After retreatment, the residual pile was again spread out to a depth of approximately 2 ft and sampled in a grid pattern. Initially 8 grab samples were collected on November 15, 2007 and again, 10 grab samples were collected on January 25. All sample results were below regulatory levels. The results are presented in Appendix D. The TCLP Pb results varied from non-detect to 0.72 mg/L and the TCLP Cd results varied from non-detect to 0.44 mg/L. The vendor provided a final treatment report (Appendix E). Environmental compliance certified, based on these results and an evaluation of underlying constituents, that the soil did not exhibit a characteristic of hazardous waste and complied with the soil treatment standards as provided by part Rule 1200—1-11-.10(3)(j)3. The WAC profile, Rev. 5 presents the information and certification necessary to demonstrate that the soil was no longer RCRA-characteristic.

5. DISPOSAL

On March 10-12, 2008, the treated soils were loaded into dump trucks and sent to the EMWMF for placement and final disposal. A total of 61 truck loads were used to dispose of the treated soil.

6. REFERENCES

BJC, (Bechtel Jacobs Company LLC), *Waste Profile for the DWI 1630 Site, Soil and Incidental Debris, Waste Lot 146.1, Revision 5.*

DOE (U.S. Department of Energy) 1999 *Phase II Remedial Investigation/Feasibility Study for the David Witherspoon Inc. 1630 Site, Knoxville, Tennessee,* DOE/OR/01-1802/V1&D1, U.S. Department of Energy, Office of Environmental Management, Oak Ridge, TN.

APPENDIX A

Analytical Data

Table A-1. RCRA Hotspot TCLP results

Hotspot	Sample ID	Lead (mg/L)	Cadmium (mg/L)
HS01	DW1630-HS01-01	3.5	N/A
HS01	DW1630-HS01-02	1.1	N/A
HS01	DW1630-HS01-03	13.0	N/A
HS01	DW1630-HS01-04	3.7	N/A
HS01	DW1630-HS01-05	1.9	N/A
HS01	DW1630-HS01-06	0.70	N/A
HS01	DW1630-HS01-07	6.4	N/A
HS01	DW1630-HS01-08	0.34	N/A
HS01	DW1630-HS01-09	5.8	N/A
HS02	DW1630-HS02-01	7.7	N/A
HS02	DW1630-HS02-02	0.29	N/A
HS02	DW1630-HS02-03	22.4	N/A
HS02	DW1630-HS02-04	20.3	N/A
HS02	DW1630-HS02-05	3.2	N/A
HS02	DW1630-HS02-06	ND	N/A
HS02	DW1630-HS02-06D	ND	N/A
HS02	DW1630-HS02-07	ND	N/A
HS02	DW1630-HS02-08	ND	N/A
HS02	DW1630-HS02-09	5.90	N/A
HS03	DW1630-HS03-01	ND	0.30
HS03	DW1630-HS03-02	0.073	0.48
HS03	DW1630-HS03-03	ND	0.30
HS03	DW1630-HS03-04	ND	0.059
HS03	DW1630-HS03-05	ND	0.31
HS03	DW1630-HS03-06	0.058	0.26
HS03	DW1630-HS03-07	ND	0.31
HS03	DW1630-HS03-08	ND	0.22
HS03	DW1630-HS03-09	ND	0.16
HS04	DW1630-HS04-01	3.0	N/A
HS04	DW1630-HS04-02	2.5	N/A
HS04	DW1630-HS04-03	6.8	N/A
HS04	DW1630-HS04-04	6.4	N/A
HS04	DW1630-HS04-05	0.51	N/A
HS04	DW1630-HS04-06	0.40	N/A
HS04	DW1630-HS04-07	1.2	N/A
HS04	DW1630-HS04-08	19.7	N/A
HS04	DW1630-HS04-08D	16.1	N/A
HS04	DW1630-HS04-09	0.73	N/A
HS04	DW1630-HS04-10	5.13	N/A
HS04	DW1630-HS04-11	6.94	N/A

Table A-1. RCRA Hotspot TCLP results (Continued)

Hotspot	Sample ID	Lead (mg/L)	Cadmium (mg/L)
HS05	DW1630-HS05-01	N/A	0.096
HS05	DW1630-HS05-02	N/A	0.018
HS05	DW1630-HS05-03	N/A	ND
HS05	DW1630-HS05-04	N/A	0.021
HS05	DW1630-HS05-05	N/A	1.1
HS05	DW1630-HS05-06	N/A	0.62
HS05	DW1630-HS05-07	N/A	0.048
HS05	DW1630-HS05-08	N/A	0.049
HS05	DW1630-HS05-09	N/A	0.016
HS06	DW1630-HS06-01	3.1	N/A
HS06	DW1630-HS06-02	3.6	N/A
HS06	DW1630-HS06-03	12.1	N/A
HS06	DW1630-HS06-04	1.4	N/A
HS06	DW1630-HS06-05	0.38	N/A
HS06	DW1630-HS06-06	2.8	N/A
HS06	DW1630-HS06-07	16.0	N/A
HS06	DW1630-HS06-08	1.3	N/A
HS06	DW1630-HS06-09	0.074	N/A
HS06	DW1630-HS06-09D	0.10	N/A
HS06	DW1630-HS06-10	14.9	N/A
HS06	DW1630-HS06-10D	16.1	N/A
HS06	DW1630-HS06-11	6.6	N/A
HS06	DW1630-HS06-12	1.15	N/A
HS07	DW1630-HS07-01	8.7	N/A
HS07	DW1630-HS07-02	0.90	N/A
HS07	DW1630-HS07-03	0.43	N/A
HS07	DW1630-HS07-04	10.3	N/A
HS07	DW1630-HS07-05	23.0	N/A
HS07	DW1630-HS07-06	1.9	N/A
HS07	DW1630-HS07-07	0.11	N/A
HS07	DW1630-HS07-08	2.7	N/A
HS07	DW1630-HS07-09	2.0	N/A
HS08	DW1630-HS08-01	3.9	0.65
HS08	DW1630-HS08-02	0.089	0.032
HS08	DW1630-HS08-03	42.3	3.6
HS08	DW1630-HS08-04	36.3	3.8
HS08	DW1630-HS08-05	5.5	0.49
HS08	DW1630-HS08-06	18.0	2.1
HS08	DW1630-HS08-07	0.58	0.080
HS08	DW1630-HS08-08	0.35	0.14
HS08	DW1630-HS08-09	0.14	0.045
HS08	DW1630-HS08-10	2.69	0.637
HS08	DW1630-HS08-11	0.936	0.305

Table A-1. RCRA Hotspot TCLP results (Continued)

Hotspot	Sample ID	Lead (mg/L)	Cadmium (mg/L)
HS09	DW1630-HS09-01	0.18	0.052
HS09	DW1630-HS09-01D	0.12	0.051
HS09	DW1630-HS09-02	ND	0.015
HS09	DW1630-HS09-03	0.075	ND
HS09	DW1630-HS09-04	ND	0.0034
HS09	DW1630-HS09-05	0.081	0.010
HS09	DW1630-HS09-06	ND	ND
HS09	DW1630-HS09-07	0.36	0.026
HS09	DW1630-HS09-08	0.30	0.0066
HS09	DW1630-HS09-09	ND	0.0050
HS10	DW1630-HS10-01	ND	0.021
HS10	DW1630-HS10-02	0.057	0.021
HS10	DW1630-HS10-03	0.093	0.017
HS10	DW1630-HS10-04	12.4	0.89
HS10	DW1630-HS10-05	15.2	1.6
HS10	DW1630-HS10-06	10.4	0.97
HS10	DW1630-HS10-07	9.6	7.6
HS10	DW1630-HS10-08	4.1	12.0
HS10	DW1630-HS10-09	26.8	5.5
HS10	DW1630-HS10-10	0.688	0.079
HS10	DW1630-HS10-11	14.000	2.86
HS10	DW1630-HS10-12	N/A	0.144
HS10	DW1630-HS10-13	3.33	10.70
HS10	DW1630-HS10-13D	3.10	10.70
HS10	DW1630-HS10-14	1.1	0.161
HS10	DW1630-HS10-15	N/A	0.002
HS11	DW1630-HS11-01	6.6	12.8
HS11	DW1630-HS11-01D	7.9	10.3
HS11	DW1630-HS11-02	67.0	1.6
HS11	DW1630-HS11-03	5.2	11.5
HS11	DW1630-HS11-04	8.0	12.3
HS11	DW1630-HS11-05	13.0	1.2
HS11	DW1630-HS11-06	5.0	0.031
HS11	DW1630-HS11-07	4.7	9.3
HS11	DW1630-HS11-08	18.7	1.6
HS11	DW1630-HS11-09	12.2	0.68
HS11	DW1630-HS11-10	9.14	N/A
HS11	DW1630-HS11-11	19.8	1.47
HS11	DW1630-HS11-12	3.92	12.8
HS11	DW1630-HS11-13	6.88	N/A
HS11	DW1630-HS11-14	0.0406	N/A
HS11	DW1630-HS11-15	2.82	N/A
HS11	DW1630-HS11-16	N/A	0.0714

Table A-1. RCRA Hotspot TCLP results (Continued)

Hotspot	Sample ID	Lead (mg/L)	Cadmium (mg/L)
HS12	DW1630-HS12-01	3.2	0.26
HS12	DW1630-HS12-02	0.81	0.20
HS12	DW1630-HS12-03	4.7	0.35
HS12	DW1630-HS12-04	48.5	3.6
HS12	DW1630-HS12-05	41.5	3.8
HS12	DW1630-HS12-06	9.3	0.70
HS12	DW1630-HS12-07	3.3	0.30
HS12	DW1630-HS12-08	5.9	0.31
HS12	DW1630-HS12-09	ND	0.018
HS12	DW1630-HS12-10	0.028	0.017
HS12	DW1630-HS12-11	0.102	0.034
HS13	DW1630-HS13-01	15.9	3.4
HS13	DW1630-HS13-02	5.6	8.7
HS13	DW1630-HS13-02D	5.7	8.6
HS13	DW1630-HS13-03	16.6	4.0
HS13	DW1630-HS13-04	21.4	6.5
HS13	DW1630-HS13-05	16.1	9.0
HS13	DW1630-HS13-06	12.2	9.5
HS13	DW1630-HS13-07	8.0	8.1
HS13	DW1630-HS13-08	31.0	5.3
HS13	DW1630-HS13-09	26.2	6.6
HS13	DW1630-HS13-10	33.7	4.49
HS13	DW1630-HS13-11	54.5	3.95
HS13	DW1630-HS13-12	0.299	0.15
HS13	DW1630-HS13-13	0.055	0.021
HS13	DW1630-HS13-14	0.0119	0.0018
HS13	DW1630-HS13-15	0.0252	0.001
HS13	DW1630HS-13-16	0.0129	0.002
HS13	DW1630HS-13-17	0.0102	0.001
HS14	DW1630-HS14-01	17.7	3.0
HS14	DW1630-HS14-02	0.92	0.085
HS14	DW1630-HS14-03	0.63	0.15
HS14	DW1630-HS14-04	7.6	11.8
HS14	DW1630-HS14-05	40.7	10.1
HS14	DW1630-HS14-05D	58.0	6.5
HS14	DW1630-HS14-06	1.4	0.066
HS14	DW1630-HS14-07	0.033	0.010
HS14	DW1630-HS14-08	2.7	14.0
HS14	DW1630-HS14-09	65.6	8.0
HS14	DW1630-HS14-10A	6.08	12.4
HS14	DW1630-HS14-11A	1650.0	5.02

Table A-1. RCRA Hotspot TCLP results (Continued)

Hotspot	Sample ID	TCLP Lead (mg/L)	TCLP Cadmium (mg/L)
HS14	DW1630-HS14-12	1710.0	4.74
HS14	DW1630-HS14-13	1570.0	3.46
HS14	DW1630-HS14-14	1690.0	1.35
HS14	DW1630-HS14-15	0.644	0.0233
HS14	DW1630-HS14-16	25.8	3.11
HS14	DW1630-HS14-17	70.2	8.03
HS14	DW1630-HS14-18	N/A	15.1
HS14	DW1630-HS14-19	19.6	1.37
HS14	DW1630-HS14-19D	20.1	1.51
HS14	DW1630-HS14-20	7.62	0.845
HS14	DW1630-HS14-21	0.0161	N/A
HS14	DW1630-HS14-22	0.0484	N/A
HS15	DW1630-HS15-01	0.13	0.031
HS15	DW1630-HS15-02	0.18	0.047
HS15	DW1630-HS15-03	3.2	0.24
HS15	DW1630-HS15-04	19.1	3.9
HS15	DW1630-HS15-05	5.9	5.3
HS15	DW1630-HS15-06	54.4	5.5
HS15	DW1630-HS15-07	4.0	0.52
HS15	DW1630-HS15-08	18.9	3.4
HS15	DW1630-HS15-09	63.6	5.0
HS15	DW1630-HS15-09D	55.9	4.1
HS15	DW1630-HS15-10A	6.61	0.751
HS15	DW1630-HS15-11A	19.5	9.31
HS15	DW1630-HS15-12A	34.4	8.1
HS15	DW1630-HS15-13	5.74	0.766
HS15	DW1630-HS15-13D	5.83	0.567
HS15	DW1630-HS15-14	6.44	0.82
HS15	DW1630-HS15-15	40.2	3.33
HS15	DW1630-HS15-16	39.3	1.94
HS15	DW1630-HS15-17	11.6	1.53
HS15	DW1630-HS15-18	2.69	N/A
HS15	DW1630-HS15-19	10.9	N/A
HS15	DW1630-HS15-20	0.0178	0.0035
HS15	DW1630-HS15-21	0.0092	0.0011
HS15	DW1630-HS15-22	0.0194	0.0043
HS15	DW1630-HS15-23	2.81	N/A

ID = Identification
N/A = not analyzed
RCRA = Resource Conservation and Recovery Act of 1976
TCLP = Toxicity Characteristic Leaching Procedure

Table A-2. Rimmer Property TCLP results

Sample ID	Units	Lead
D1630RIM01	mg/l	ND
D1630RIM02	mg/l	0.063
D1630RIM03	mg/l	ND
D1630RIM04	mg/l	ND
D1630RIM05	mg/l	ND
D1630RIM06	mg/l	48.7
D1630RIM07	mg/l	7.0
D1630RIM08	mg/l	ND
D1630RIM09	mg/l	ND
D1630RIM10	mg/l	0.180
D1630RIM11	mg/l	10.7
D1630RIM12D	mg/l	ND
D1630RIM12	mg/l	ND
D1630RIM13	mg/l	ND
D1630RIM14	mg/l	ND
D1630RIM15	mg/l	1.5
D1630RIM16	mg/l	0.150
D1630RIM17	mg/l	ND
D1630RIM18	mg/l	0.057
D1630RIM19	mg/l	0.310
D1630RIM20	mg/l	0.20
D1630RIM21	mg/l	ND
D1630RIM22	mg/l	9.2

ID=Identification
TCLP=Toxicity Characteristic Leaching Procedure

Table A-3. Initial RCRA Pile Sampling

Pile	Sample ID	TCLP Lead (mg/L)	TCLP Cadmium (mg/L)
Pile 1 and 2	D1630-PILE-01	3.63	N/A
Pile 1 and 2	D1630-PILE-02	2.65	N/A
Pile 1 and 2	D1630-PILE-03	18.60	N/A
Pile 1 and 2	D1630-PILE-04	4.95	N/A
Pile 1 and 2	D1630-PILE-05	5.45	N/A
Pile 1 and 2	D1630-PILE-06	11.30	N/A
Pile 1 and 2	D1630-PILE-07	33.40	N/A
Pile 1 and 2	D1630-PILE-08	1.97	N/A
Pile 1 and 2	D1630-PILE-09	10.20	N/A
Pile 1 and 2	D1630-PILE-10	10.20	N/A
Pile 1 and 2	D1630-PILE-11	14.50	N/A
Pile 1 and 2	D1630-PILE-12	17.70	N/A
Pile 1 and 2	D1630-PILE-12D	15.80	N/A
Pile 1 and 2	D1630-PILE-13	14.30	N/A
Pile 1 and 2	D1630-PILE-14	18.70	N/A
Pile 1 and 2	D1630-PILE-15	54.30	N/A
Pile 3	D1630-RCRA3-16	2.90	0.172
Pile 3	D1630-RCRA3-17	12.50	0.136
Pile 3	D1630-RCRA3-18	11.80	0.345
Pile 3	D1630-RCRA3-18D	18.40	0.344
Pile 3	D1630-RCRA3-19	19.70	0.165
Pile 3	D1630-RCRA3-20	16.00	0.106
Pile 3	D1630-RCRA3-21	5.93	0.093
Pile 3	D1630-RCRA3-22	16.30	0.304
Pile 4	D1630-RCRA4-23	2.36	0.381
Pile 4	D1630-RCRA4-24	33.00	7.790
Pile 4	D1630-RCRA4-25	5.07	0.541
Pile 4	D1630-RCRA4-26	8.78	0.976
Pile 4	D1630-RCRA4-27	15.50	1.270
Pile 4	D1630-RCRA4-27D	15.00	1.290
Pile 4	D1630-RCRA4-28	6.52	0.120
Pile 4	D1630-RCRA4-29	24.10	0.502
Pile 4	D1630-RCRA4-30	13.40	0.589

ID = Identification
RCRA = Resource Conservation and Recovery Act of 1976
TCLP = Toxicity Characteristic Leaching Procedure

Table A-4. Final RCRA Pile Sampling

Sample ID	Total Lead (mg/kg)	TCLP Lead (mg/L)	Total Cadmium (mg/kg)	TCLP Cadmium (mg/L)
D1630RCRAPL5-1	5580	74.4	109	3.1
D1630RCRAPL5-2	7140	79.2	146	3.9
D1630RCRAPL5-3	6940	44.5	140	3.9
D1630RCRAPL5-4	4200	82.5	93.9	3.8
D1630RCRAPL5-5	7840	103.0	118	3.6
D1630RCRAPL5-6	6030	54.1	114	4.8
D1630RCRAPL5-7	11400	79.4	153	3.5
D1630RCRAPL5-8	21400	87.9	496	4.6
D1630RCRAPL5-9	4850	60.0	105	4.8
D1630RCRAPL5-10	6420	119.0	155	3.4
D1630RCRAPL5-11	4420	100.0	105	3.5

ID = Identification
RCRA = Resource Conservation and Recovery Act of 1976
TCLP = Toxicity Characteristic Leaching Procedure

APPENDIX B

RCRA Hotspot Sampling and Analysis Plan

Sampling and Analysis Plan for the Lead and Cadmium Hot Spots at the David Witherspoon (DWI 1630) Site, Knoxville, Tennessee

Prepared: _____ Date: 9/7/06
Carl Dirnbauer

Approved: _____ Date: 9/7/06
Julie Pfeffer

CONTENTS

ACRONYMS

BJC	Bechtel Jacobs Company LLC
DWI	David Witherspoon Inc. 1630 Site
RCRA	Resource Conservation and Recovery Act of 1976
RI/FS	remedial investigation//feasibility study
SAP	sampling and analysis plan
TCLP	Toxicity Characteristic Leaching Procedure

1. INTRODUCTION AND OBJECTIVES

This sampling and analysis plan (SAP) has been prepared to support collection of additional analytical data from the David Witherspoon Inc. 1630 Site (DWI 1630 Site). Biased samples that were collected during the Phase II remedial investigation (DOE 1999), identified fifteen (15) locations with sample results that exceeded the RCRA Toxicity Characteristics Leaching Procedure (TCLP) regulatory levels for lead (D008) and/or cadmium (D006). The materials sampled included soil and/or soil like debris. Because of the biased nature of the original sampling effort, additional samples will be collected to further characterize these areas. The collected samples will be un-biased and representative of the soils and/or soil-like debris that will be excavated from these areas during remedial action at this site. The analytical data generated from this SAP will be used to either confirm that RCRA regulated soils or soil-like debris are not present, or if they are, that the lateral extent has been bounded. Alternatively, the data may indicate that RCRA regulated soils or soil-like debris are present, have not been bounded in all areas, and that the collection of additional data is required. This SAP will be revised to address the collection of any additional data for any RCRA hotspots not bounded during the initial sampling event.

2. SCOPE

The scope of this plan is limited to obtaining samples from the 15 suspect RCRA hotspots identified in Table 1. General site background, data quality objectives, analytical methods, sampling documentation, data management, waste management approach, etc., are provided in *BJC/OR-2338, Sampling and Analysis Plan for the Soil and Debris Removal at the David Witherspoon (DWI 1630) Site, Knoxville, Tennessee*, which should be adhered to when sampling these areas.

3. SAMPLING AREAS BACKGROUND

Extensive data were collected from the DWI 1630 site during the Remedial Investigation/Feasibility Study (DOE 1999). This characterization data indicated RCRA contaminants were generally below RCRA regulatory limits, with the exception of elevated lead and/or cadmium levels at 15 locations on the site. Biased sampling techniques were used to collect these samples. Figure 1 shows the hotspot areas in relation to the rest of the DWI 1630 Site. Table 1 shows the RCRA TCLP results for areas where the regulatory limits were exceeded and the coordinates for each of the 15 locations. These locations will be identified in the field by the civil survey subcontractor and the areas roped off or otherwise identified as suspect RCRA areas. If sample results indicate that the soils are not RCRA hazardous, these areas will be released for remedial action. If sample results indicate the presence of RCRA hazardous material, additional sampling may be required to bound the lateral extent of this material. Once these areas are bounded by clean sample results, they will be excavated and the excavated material will be managed separately from the remaining soils on the site. This SAP covers sampling of the 15 hotspots to ensure that hazardous material is either not present, or if it is, that it is properly bounded.

Figure 1. Relation of 15 Hotspots to Rest of DWI Site.

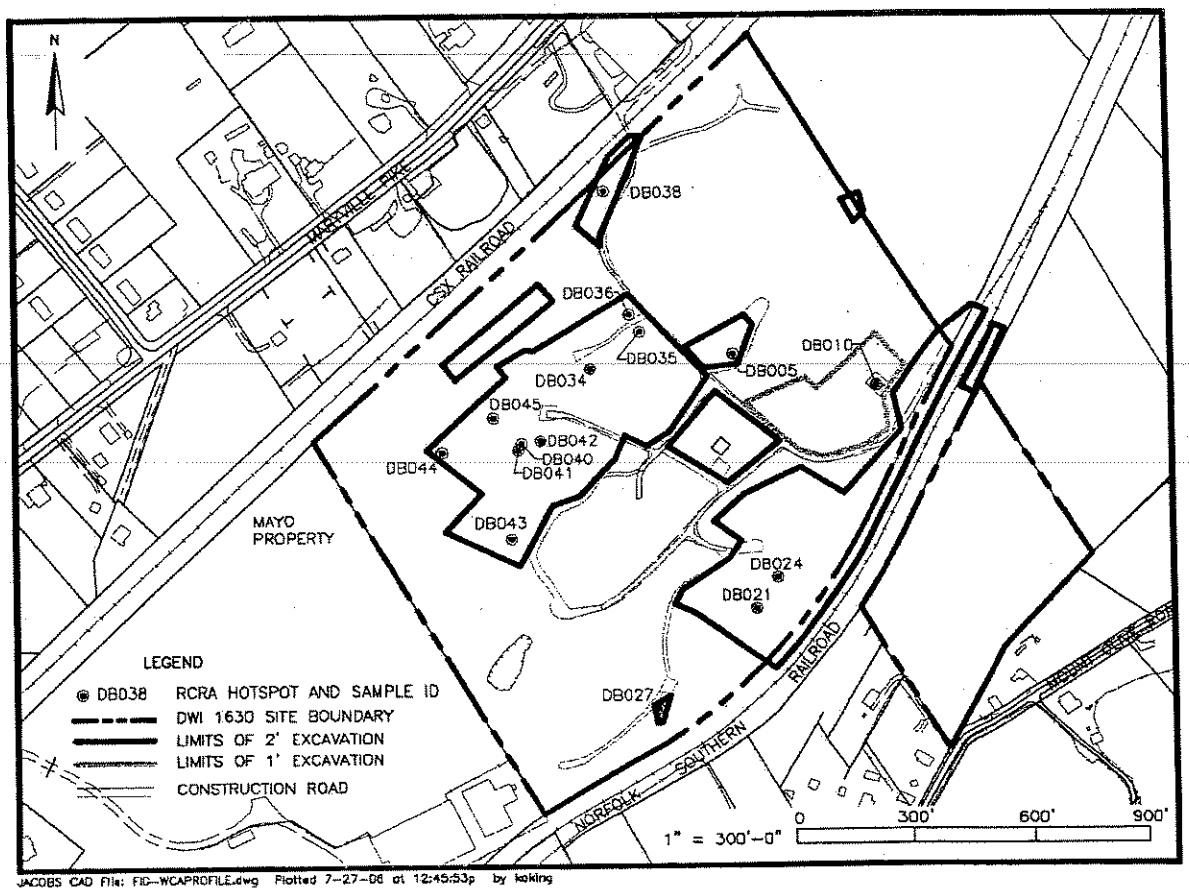


Table 1. DWI 1630 RCRA Exceedances

Hotspot	Location ID	Sample ID	Trench No.	Northing	Easting	Comments
1	DB-05	D1630DB005	1	582201.64	2581434.41	TCLP Lead 7.67 mg/L
2	DB-09	D1630DB010	1	582115.12	2581807.22	TCLP Lead 19.1 mg/L
3	DB-019	D1630DB021	21	581524.47	2581487.56	TCLP Lead 12.0 mg/L, Cadmium 4.88 mg/L
4	DB-019	D1630DB024	20	581605.47	2581544.25	TCLP Lead 9.17 mg/L
5	DB-020	D1630DB027	4	581260.99	2581224.19	TCLP Cadmium 1.52 mg/L
6	DB-026	D1630DB034	3	582162.87	2581059.92	TCLP Lead 11.2 mg/L
7	DB-027	D1630DB035	1	582262.33	2581190.61	TCLP Lead 22.4 mg/L
8	DB-028	D1630DB036	1	582307.76	2581163.17	TCLP Lead 56.6 mg/L, Cadmium 6.81 mg/L
9	DB-029	D1630DB038	10	582635.11	2581101.23	TCLP Lead 8.97 mg/L,
10	DB-031	D1630DB040	8	581965.52	2580878.27	TCLP Lead 10.4 mg/L, Cadmium 14.3 mg/L
11	DB-031	D1630DB041	11	581948.29	2580868.86	TCLP Lead 13.9 mg/L, Cadmium 12.8 mg/L
12	DB-031	D1630DB042	4	581973.35	2580927.66	TCLP Lead 6.77 mg/L, Cadmium 18.4 mg/L
13	DB-032	D1630DB043	2	581712.56	2580850.04	TCLP Lead 12.7 mg/L Cadmium 11.5 mg/L
14	DB-033	D1630DB044	3	581942.81	2580673.1	TCLP Lead 668.0 mg/L Cadmium 1.48 mg/L
15	DB-033	D1630DB045	8	582034.44	2580805.59	TCLP Lead 7.22 mg/L Cadmium 13.6 mg/L

Note: RCRA TCLP regulatory limits for lead = 5.0 mg/L and for cadmium = 1.0 mg/L

4. SAMPLING AND ANALYSIS

The soil sampling proposed in this SAP is intended to further characterize suspect RCRA areas at the DWI 1630 site. Previous biased sampling at this site identified 15 locations which contained sample results that exceeded RCRA limits for lead and/or cadmium.

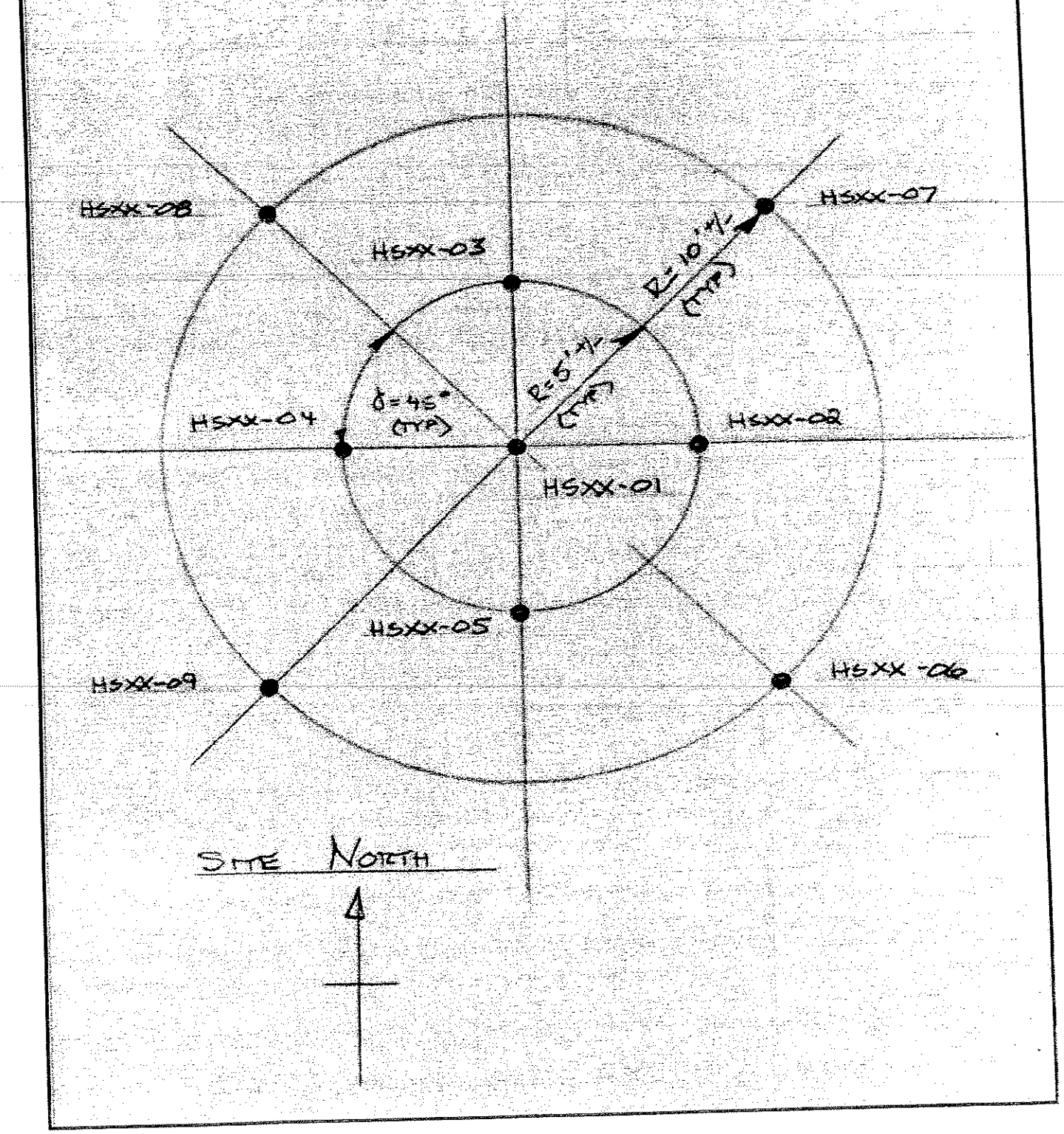
Initially, nine samples will be collected at each hotspot location. The nine samples will be located in a circular pattern around the civil surveyed location of the hotspot as shown in Figure 2. Samples will be obtained as cores down to 2 ft since this represents the expected final excavation depth. The extracted soil core from each sampling location will be mixed thoroughly and a representative subsample obtained for submittal to the laboratory. Pin flags will be placed by BJC at required sampling locations prior to beginning of sample extraction. Sample numbers will be recorded on the pin flags and maintained in the field until removed by the resident engineer or designee. If cores down to 2 ft are not possible, the sample location will be re-located to another point on the perimeter as directed by BJC. If refusal due to bedrock is met after relocation, a core of the available depth will be taken and noted in the logbook. Sample locations may be modified in the field to avoid debris and/or trees, or if the material to be sampled is distinctly different from material at the known hotspot location. As-built sample locations will be noted in the logbook along with any explanatory notes.

In total, one hundred and thirty-five (135) TCLP lead and/or cadmium samples are planned for the initial sampling event. Additional bounding samples may be required based on analytical results. Any additional sampling required to bound RCRA areas will be addressed in a revision to this SAP. **Only TCLP lead and/or cadmium**, as opposed to all TCLP metals, will be requested for analysis at all hotspot locations (see Table 2). Previous characterization has determined the absence of other metals above RCRA characteristic limits at these locations. In addition, total metals shall be requested for analysis at hotspot location number 14. Analytical methods, preservation, duplicate and equipment rinsate blank frequency, and other requirements are detailed in *BJC/OR-2338*.

Table 2. DWI 1630 Sample Numbers and Analysis

Hotspot Number	Sample Number	Analysis		
		Lead	Cadmium	Total Metals
1	D1630-HS01-01 through 09	x		
2	D1630-HS02-01 through 09	x		
3	D1630-HS03-01 through 09	x	x	
4	D1630-HS04-01 through 09	x		
5	D1630-HS05-01 through 09		x	
6	D1630-HS06-01 through 09	x		
7	D1630-HS07-01 through 09	x		
8	D1630-HS08-01 through 09	x	x	
9	D1630-HS09-01 through 09	x	x	
10	D1630-HS010-01 through 09	x	x	
11	D1630-HS011-01 through 09	x	x	
12	D1630-HS012-01 through 09	x	x	
13	D1630-HS013-01 through 09	x	x	
14	D1630-HS014-01 through 09	x	x	x
15	D1630-HS015-01 through 09	x	x	

FIGURE 2: DWI 1630 TYPICAL HOTSPOT SAMPLE GRID



5. REFERENCES

DOE 1999, *Phase II Remedial Investigation/Feasibility Study for the David Witherspoon Inc. 1630 site, Knoxville, Tennessee,* DOE/OR/01-1802/V1&D1, Oak Ridge, TN.

APPENDIX C

Final RCRA Hotspot Packages

Hotspot No.	Sample No.	Analysis	Units	Result	Ordered Results	RCRA?	UCL90 with original data point	UCL90 w/o original data point	UCL 90 Calculated using Distribution
HS01	DW1630-HS01-01	lead	mg/L	3.5	0.34	yes	6.131160541	5.907114778	Normal
HS01	DW1630-HS01-02	lead	mg/L	1.1	0.7				
HS01	DW1630-HS01-03	lead	mg/L	13	1.1				
HS01	DW1630-HS01-04	lead	mg/L	3.7	1.9				
HS01	DW1630-HS01-05	lead	mg/L	1.9	3.5				
HS01	DW1630-HS01-06	lead	mg/L	0.7	3.7				
HS01	DW1630-HS01-07	lead	mg/L	6.4	5.8				
HS01	DW1630-HS01-08	lead	mg/L	0.34	6.4				
HS01	DW1630-HS01-09	lead	mg/L	5.8	7.67				
HS01	D1630DB005	lead	mg/L	7.67	13				
HS02	DW1630-HS02-01	lead	mg/L	7.7	0.06	yes	22.23640814	21.9035983	Adjusted Gamma
HS02	DW1630-HS02-02	lead	mg/L	0.29	0.06				
HS02	DW1630-HS02-03	lead	mg/L	22.4	0.06				
HS02	DW1630-HS02-04	lead	mg/L	20.3	0.29				
HS02	DW1630-HS02-05	lead	mg/L	3.2	3.2				
HS02	DW1630-HS02-06	lead	mg/L	0.06	5.9				
HS02	DW1630-HS02-07	lead	mg/L	0.06	7.7				
HS02	DW1630-HS02-08	lead	mg/L	0.06	19.1				
HS02	DW1630-HS02-09	lead	mg/L	5.9	20.3				
HS02	D1630DB010	lead	mg/L	19.1	22.4				
HS03	DW1630-HS03-01	cadmium	mg/L	0.3	0.059	no	2.115837207	0.320707606	90% Chebyshev (Mean, Sd), Normal
HS03	DW1630-HS03-02	cadmium	mg/L	0.48	0.16				
HS03	DW1630-HS03-03	cadmium	mg/L	0.3	0.22				
HS03	DW1630-HS03-04	cadmium	mg/L	0.059	0.26				
HS03	DW1630-HS03-05	cadmium	mg/L	0.31	0.3				
HS03	DW1630-HS03-06	cadmium	mg/L	0.26	0.3				
HS03	DW1630-HS03-07	cadmium	mg/L	0.31	0.31				
HS03	DW1630-HS03-08	cadmium	mg/L	0.22	0.31				
HS03	DW1630-HS03-09	cadmium	mg/L	0.16	0.48				
HS03	D1630DB021	cadmium	mg/L	4.88	4.88				
HS03	DW1630-HS03-01	lead	mg/L	0.06	0.058	no	4.836735561	0.063301578	90% Chebyshev (Mean, Sd), Normal
HS03	DW1630-HS03-02	lead	mg/L	0.073	0.06				
HS03	DW1630-HS03-03	lead	mg/L	0.06	0.06				
HS03	DW1630-HS03-04	lead	mg/L	0.06	0.06				
HS03	DW1630-HS03-05	lead	mg/L	0.06	0.06				
HS03	DW1630-HS03-06	lead	mg/L	0.058	0.06				
HS03	DW1630-HS03-07	lead	mg/L	0.06	0.06				
HS03	DW1630-HS03-08	lead	mg/L	0.06	0.06				
HS03	DW1630-HS03-09	lead	mg/L	0.06	0.073				
HS03	D1630DB021	lead	mg/L	12	12				
HS04	DW1630-HS04-01	lead	mg/L	3	0.4	yes	9.24058642	9.049312971	Adjusted Gamma
HS04	DW1630-HS04-02	lead	mg/L	2.5	0.51				
HS04	DW1630-HS04-03	lead	mg/L	6.8	0.73				
HS04	DW1630-HS04-04	lead	mg/L	6.4	1.2				
HS04	DW1630-HS04-05	lead	mg/L	0.51	2.5				
HS04	DW1630-HS04-06	lead	mg/L	0.4	3				
HS04	DW1630-HS04-07	lead	mg/L	1.2	6.4				

ORIGINAL BOUNDARY SAMPLES ALL IS RCRA HOTSPOTS

Hotspot No.	Sample No.	Analysis	Units	Result	Ordered Results	RCRA?	UCL90 with original data point	UCL90 w/o original data point	UCL 90 Calculated using Distribution
HS04	DW1630-HS04-08	lead	mg/L	19.7	6.8				
HS04	DW1630-HS04-09	lead	mg/L	0.73	9.17				
HS04	D1630DB024	lead	mg/L	9.17	19.7				
HS05	DW1630-HS05-01	cadmium	mg/L	0.096	0.016	no	0.869407327	0.603415831	90% Chebyshev (Mean, Sd)
HS05	DW1630-HS05-02	cadmium	mg/L	0.018	0.018				
HS05	DW1630-HS05-03	cadmium	mg/L	0.02	0.02				
HS05	DW1630-HS05-04	cadmium	mg/L	0.021	0.021				
HS05	DW1630-HS05-05	cadmium	mg/L	1.1	0.048				
HS05	DW1630-HS05-06	cadmium	mg/L	0.62	0.049				
HS05	DW1630-HS05-07	cadmium	mg/L	0.048	0.096				
HS05	DW1630-HS05-08	cadmium	mg/L	0.049	0.62				
HS05	DW1630-HS05-09	cadmium	mg/L	0.016	1.1				
HS05	D1630DB027	cadmium	mg/L	1.52	1.52				
HS06	DW1630-HS06-01	lead	mg/L	3.1	0.1	yes	9.969007371	9.340315378	Adjusted Gamma
HS06	DW1630-HS06-02	lead	mg/L	3.6	0.38				
HS06	DW1630-HS06-03	lead	mg/L	12.1	1.3				
HS06	DW1630-HS06-04	lead	mg/L	1.4	1.4				
HS06	DW1630-HS06-05	lead	mg/L	0.38	2.8				
HS06	DW1630-HS06-06	lead	mg/L	2.8	3.1				
HS06	DW1630-HS06-07	lead	mg/L	16	3.6				
HS06	DW1630-HS06-08	lead	mg/L	1.3	11.2				
HS06	DW1630-HS06-09D	lead	mg/L	0.1	12.1				
HS06	D1630DB034	lead	mg/L	11.2	16				
HS07	DW1630-HS07-01	lead	mg/L	8.7	0.11	yes	14.86621108	12.01123592	Approximate Gamma
HS07	DW1630-HS07-02	lead	mg/L	0.9	0.43				
HS07	DW1630-HS07-03	lead	mg/L	0.43	0.9				
HS07	DW1630-HS07-04	lead	mg/L	10.3	1.9				
HS07	DW1630-HS07-05	lead	mg/L	23	2				
HS07	DW1630-HS07-06	lead	mg/L	1.9	2.7				
HS07	DW1630-HS07-07	lead	mg/L	0.11	8.7				
HS07	DW1630-HS07-08	lead	mg/L	2.7	10.3				
HS07	DW1630-HS07-09	lead	mg/L	2	22.4				
HS07	D1630DB035	lead	mg/L	22.4	23				
HS08	DW1630-HS08-01	cadmium	mg/L	0.65	0.032	yes	3.974531161	2.832951081	Adjusted Gamma
HS08	DW1630-HS08-02	cadmium	mg/L	0.032	0.045				
HS08	DW1630-HS08-03	cadmium	mg/L	3.6	0.08				
HS08	DW1630-HS08-04	cadmium	mg/L	3.8	0.14				
HS08	DW1630-HS08-05	cadmium	mg/L	0.49	0.49				
HS08	DW1630-HS08-06	cadmium	mg/L	2.1	0.65				
HS08	DW1630-HS08-07	cadmium	mg/L	0.08	2.1				
HS08	DW1630-HS08-08	cadmium	mg/L	0.14	3.6				
HS08	DW1630-HS08-09	cadmium	mg/L	0.045	3.8				
HS08	D1630DB036	cadmium	mg/L	6.81	6.81				
HS08	DW1630-HS08-01	lead	mg/L	3.9	0.089	yes	46.45460535	38.24992526	Adjusted Gamma
HS08	DW1630-HS08-02	lead	mg/L	0.089	0.14				
HS08	DW1630-HS08-03	lead	mg/L	42.3	0.35				
HS08	DW1630-HS08-04	lead	mg/L	36.3	0.58				

Hotspot No.	Sample No.	Analysis	Units	Result	Ordered Results	RCRA?	UCL90 with original data point	UCL90 w/o original data point	UCL 90 Calculated using Distribution
HS08	DW1630-HS08-05	lead	mg/L	5.5	3.9				
HS08	DW1630-HS08-06	lead	mg/L	18	5.5				
HS08	DW1630-HS08-07	lead	mg/L	0.58	18				
HS08	DW1630-HS08-08	lead	mg/L	0.35	36.3				
HS08	DW1630-HS08-09	lead	mg/L	0.14	42.3				
HS08	D1630DB036	lead	mg/L	56.6	56.6				
HS09	DW1630-HS09-01	cadmium	mg/L	0.052	0.0034	no	0.026185072		Normal
HS09	DW1630-HS09-02	cadmium	mg/L	0.015	0.005				
HS09	DW1630-HS09-03	cadmium	mg/L	0.02	0.0066				
HS09	DW1630-HS09-04	cadmium	mg/L	0.0034	0.01				
HS09	DW1630-HS09-05	cadmium	mg/L	0.01	0.015				
HS09	DW1630-HS09-06	cadmium	mg/L	0.02	0.02				
HS09	DW1630-HS09-07	cadmium	mg/L	0.026	0.02				
HS09	DW1630-HS09-08	cadmium	mg/L	0.0066	0.026				
HS09	DW1630-HS09-09	cadmium	mg/L	0.005	0.0365				
HS09	D1630DB038	cadmium	mg/L	0.0365	0.052				
HS09	DW1630-HS09-01	lead	mg/L	0.18	0.06	no	3.672452982	0.253974878	90% Chebyshev (Mean, Sd)
HS09	DW1630-HS09-02	lead	mg/L	0.06	0.06				
HS09	DW1630-HS09-03	lead	mg/L	0.075	0.06				
HS09	DW1630-HS09-04	lead	mg/L	0.06	0.06				
HS09	DW1630-HS09-05	lead	mg/L	0.081	0.075				
HS09	DW1630-HS09-06	lead	mg/L	0.06	0.081				
HS09	DW1630-HS09-07	lead	mg/L	0.36	0.18				
HS09	DW1630-HS09-08	lead	mg/L	0.3	0.3				
HS09	DW1630-HS09-09	lead	mg/L	0.06	0.36				
HS09	D1630DB038	lead	mg/L	8.97	8.97				
HS10	DW1630-HS10-01	cadmium	mg/L	0.021	0.017	yes	12.36862813	10.46107628	Adjusted Gamma
HS10	DW1630-HS10-02	cadmium	mg/L	0.021	0.021				
HS10	DW1630-HS10-03	cadmium	mg/L	0.017	0.021				
HS10	DW1630-HS10-04	cadmium	mg/L	0.89	0.89				
HS10	DW1630-HS10-05	cadmium	mg/L	1.6	0.97				
HS10	DW1630-HS10-06	cadmium	mg/L	0.97	1.6				
HS10	DW1630-HS10-07	cadmium	mg/L	7.6	5.5				
HS10	DW1630-HS10-08	cadmium	mg/L	12	7.6				
HS10	DW1630-HS10-09	cadmium	mg/L	5.5	12				
HS10	D1630DB040	cadmium	mg/L	14.3	14.3				
HS10	DW1630-HS10-01	lead	mg/L	0.06	0.057	yes	12.58257646	12.8833641	Normal
HS10	DW1630-HS10-02	lead	mg/L	0.057	0.06				
HS10	DW1630-HS10-03	lead	mg/L	0.093	0.093				
HS10	DW1630-HS10-04	lead	mg/L	12.4	4.1				
HS10	DW1630-HS10-05	lead	mg/L	15.2	9.6				
HS10	DW1630-HS10-06	lead	mg/L	10.4	10.4				
HS10	DW1630-HS10-07	lead	mg/L	9.6	10.4				
HS10	DW1630-HS10-08	lead	mg/L	4.1	12.4				
HS10	DW1630-HS10-09	lead	mg/L	26.8	15.2				
HS10	D1630DB040	lead	mg/L	10.4	26.8				
HS11	DW1630-HS11-01	cadmium	mg/L	12.8	0.031	yes	12.68615543	12.23470063	Approximate Gamma

Hotspot No.	Sample No.	Analysis	Units	Result	Ordered Results	RCRA?	UCL90 with original data point	UCL90 w/o original data point	UCL 90 Calculated using Distribution
HS11	DW1630-HS11-02	cadmium	mg/L	1.6	0.68				
HS11	DW1630-HS11-03	cadmium	mg/L	11.5	1.2				
HS11	DW1630-HS11-04	cadmium	mg/L	12.3	1.6				
HS11	DW1630-HS11-05	cadmium	mg/L	1.2	1.6				
HS11	DW1630-HS11-06	cadmium	mg/L	0.031	9.3				
HS11	DW1630-HS11-07	cadmium	mg/L	9.3	11.5				
HS11	DW1630-HS11-08	cadmium	mg/L	1.6	12.3				
HS11	DW1630-HS11-09	cadmium	mg/L	0.68	12.8				
HS11	D1630DB041	cadmium	mg/L	12.8	12.8				
HS11	DW1630-HS11-01D	lead	mg/L	7.9	4.7	yes	24.247519	26.16639329	Approximate Gamma
HS11	DW1630-HS11-02	lead	mg/L	67	5				
HS11	DW1630-HS11-03	lead	mg/L	5.2	5.2				
HS11	DW1630-HS11-04	lead	mg/L	8	7.9				
HS11	DW1630-HS11-05	lead	mg/L	13	8				
HS11	DW1630-HS11-06	lead	mg/L	5	12.2				
HS11	DW1630-HS11-07	lead	mg/L	4.7	13				
HS11	DW1630-HS11-08	lead	mg/L	18.7	13.9				
HS11	DW1630-HS11-09	lead	mg/L	12.2	18.7				
HS11	D1630DB041	lead	mg/L	13.9	67				
HS12	DW1630-HS12-01	cadmium	mg/L	0.26	0.018	yes	7.673233276	2.291767989	Approximate Gamma
HS12	DW1630-HS12-02	cadmium	mg/L	0.2	0.2				
HS12	DW1630-HS12-03	cadmium	mg/L	0.35	0.26				
HS12	DW1630-HS12-04	cadmium	mg/L	3.6	0.3				
HS12	DW1630-HS12-05	cadmium	mg/L	3.8	0.31				
HS12	DW1630-HS12-06	cadmium	mg/L	0.7	0.35				
HS12	DW1630-HS12-07	cadmium	mg/L	0.3	0.7				
HS12	DW1630-HS12-08	cadmium	mg/L	0.31	3.6				
HS12	DW1630-HS12-09	cadmium	mg/L	0.018	3.8				
HS12	D1630DB042	cadmium	mg/L	18.4	18.4				
HS12	DW1630-HS12-01	lead	mg/L	3.2	0.06	yes	26.2193352	30.41732759	Approximate Gamma
HS12	DW1630-HS12-02	lead	mg/L	0.81	0.81				
HS12	DW1630-HS12-03	lead	mg/L	4.7	3.2				
HS12	DW1630-HS12-04	lead	mg/L	48.5	3.3				
HS12	DW1630-HS12-05	lead	mg/L	41.5	4.7				
HS12	DW1630-HS12-06	lead	mg/L	9.3	5.9				
HS12	DW1630-HS12-07	lead	mg/L	3.3	6.77				
HS12	DW1630-HS12-08	lead	mg/L	5.9	9.3				
HS12	DW1630-HS12-09	lead	mg/L	0.06	41.5				
HS12	D1630DB042	lead	mg/L	6.77	48.5				
HS13	DW1630-HS13-01	cadmium	mg/L	3.4	3.4	yes	8.381533041	7.819666568	Normal
HS13	DW1630-HS13-02	cadmium	mg/L	8.7	4				
HS13	DW1630-HS13-03	cadmium	mg/L	4	5.3				
HS13	DW1630-HS13-04	cadmium	mg/L	6.5	6.5				
HS13	DW1630-HS13-05	cadmium	mg/L	9	6.6				
HS13	DW1630-HS13-06	cadmium	mg/L	9.5	8.1				
HS13	DW1630-HS13-07	cadmium	mg/L	8.1	8.7				
HS13	DW1630-HS13-08	cadmium	mg/L	5.3	9				

Hotspot No.	Sample No.	Analysis	Units	Result	Ordered Results	RCRA?	UCL90 with original data point	UCL90 w/o original data point	UCL 90 Calculated using Distribution
HS13	DW1630-HS13-09	cadmium	mg/L	6.6	9.5				
HS13	D1630DB043	cadmium	mg/L	11.5	11.5				
HS13	DW1630-HS13-01	lead	mg/L	15.9	5.7	yes	20.00091447	20.81481161	Normal
HS13	DW1630-HS13-02D	lead	mg/L	5.7	8				
HS13	DW1630-HS13-03	lead	mg/L	16.6	12.2				
HS13	DW1630-HS13-04	lead	mg/L	21.4	12.7				
HS13	DW1630-HS13-05	lead	mg/L	16.1	15.9				
HS13	DW1630-HS13-06	lead	mg/L	12.2	16.1				
HS13	DW1630-HS13-07	lead	mg/L	8	16.6				
HS13	DW1630-HS13-08	lead	mg/L	31	21.4				
HS13	DW1630-HS13-09	lead	mg/L	26.2	26.2				
HS13	D1630DB043	lead	mg/L	12.7	31				
HS14	DW1630-HS14-01	cadmium	mg/L	3	0.01		13.77920367	7.913420432	Adjusted Gamma, Normal
HS14	DW1630-HS14-02	cadmium	mg/L	0.085	0.066				
HS14	DW1630-HS14-03	cadmium	mg/L	0.15	0.085				
HS14	DW1630-HS14-04	cadmium	mg/L	11.8	0.15				
HS14	DW1630-HS14-05	cadmium	mg/L	10.1	1.48				
HS14	DW1630-HS14-06	cadmium	mg/L	0.066	3				
HS14	DW1630-HS14-07	cadmium	mg/L	0.01	8				
HS14	DW1630-HS14-08	cadmium	mg/L	14	10.1				
HS14	DW1630-HS14-09	cadmium	mg/L	8	11.8				
HS14	D1630DB044	cadmium	mg/L	1.48	14				
HS14	DW1630-HS14-01	lead	mg/L	17.7	0.033		300.3408951	55.3546641	Adjusted Gamma
HS14	DW1630-HS14-02	lead	mg/L	0.92	0.63				
HS14	DW1630-HS14-03	lead	mg/L	0.63	0.92				
HS14	DW1630-HS14-04	lead	mg/L	7.6	1.4				
HS14	DW1630-HS14-05D	lead	mg/L	58	2.7				
HS14	DW1630-HS14-06	lead	mg/L	1.4	7.6				
HS14	DW1630-HS14-07	lead	mg/L	0.033	17.7				
HS14	DW1630-HS14-08	lead	mg/L	2.7	58				
HS14	DW1630-HS14-09	lead	mg/L	65.6	65.6				
HS14	D1630DB044	lead	mg/L	668	668				

Hotspot 01 and 07 Bounding

Estimates of weighted average lead concentrations based on HS01 and HS07 samples were prepared using the previously described methodology on soils remaining at the hotspots after excavation of defined center areas of the hotspots:

-Determine the average concentration of the 15 hotspots so that the UCL90 for TCLP lead for the whole site is approximately the same as reported in the profile (~2.1 ppm Pb). Based on recalculation of the UCL90 with the original sample results and 15 additional values inserted for the hotspots, a value of 2.7 ppm produces a UCL90 of ~2.1 ppm for lead(using nonparametric distribution, 90% Chebyshev (Mean, Sd) UCL for lead).

-The resampling results for the hotspot (not including the original sample and not including the excavated area) were plotted and surface contours of concentration created by Kriging (software package Surfer, using default settings), with graduated contours generated. These contours were then imported into ArcGIS and overlayed on the original base map showing the hotspot. The area of each contour (minus the excavated area) was then determined using toolsets in ArcGIS. For some contours, approximate area was defined since the original contour was exceedingly large; reducing the contour size would result in a more conservative calculation of the weighted average concentration.

-Once areas for each contour were determined, the average concentration in the contour (e.g., 1.5 ppm as the average between the 1 ppm and 2 ppm contour lines) was multiplied by the contour area (e.g, 1.5 ppm x 1 ppm contour area, 2.5 ppm as 2 ppm contour area, etc.). The resulting area times concentrations were then summed and divided by the sum of the contour area (0 through upper limit of concentration) to get the weight average for the area. The resulting weighted average could be compared to the value (2.7 ppm) necessary for meeting the UCL90 requirement in the original profile.

Samples HS01-10 through HS01-09 and HS07-01 through HS07-09 with associated contours are shown in Figures 1 and 2, respectively, along with approximate excavated areas (see black box in each figure). Estimated areas for some contours are shown in Figures 3 through 5. The calculation of weighted averages is shown in the spreadsheets HS1 Areas.xls and HS7 Areas.xls. The weighted averages were slightly over 2.7 ppm in each case, but as discussed with HS04, these should still allow the overall UCL90 for lead to meet the result reported in the profile if the lead values for the other hotspots do not substantially exceed 2.7 ppm.

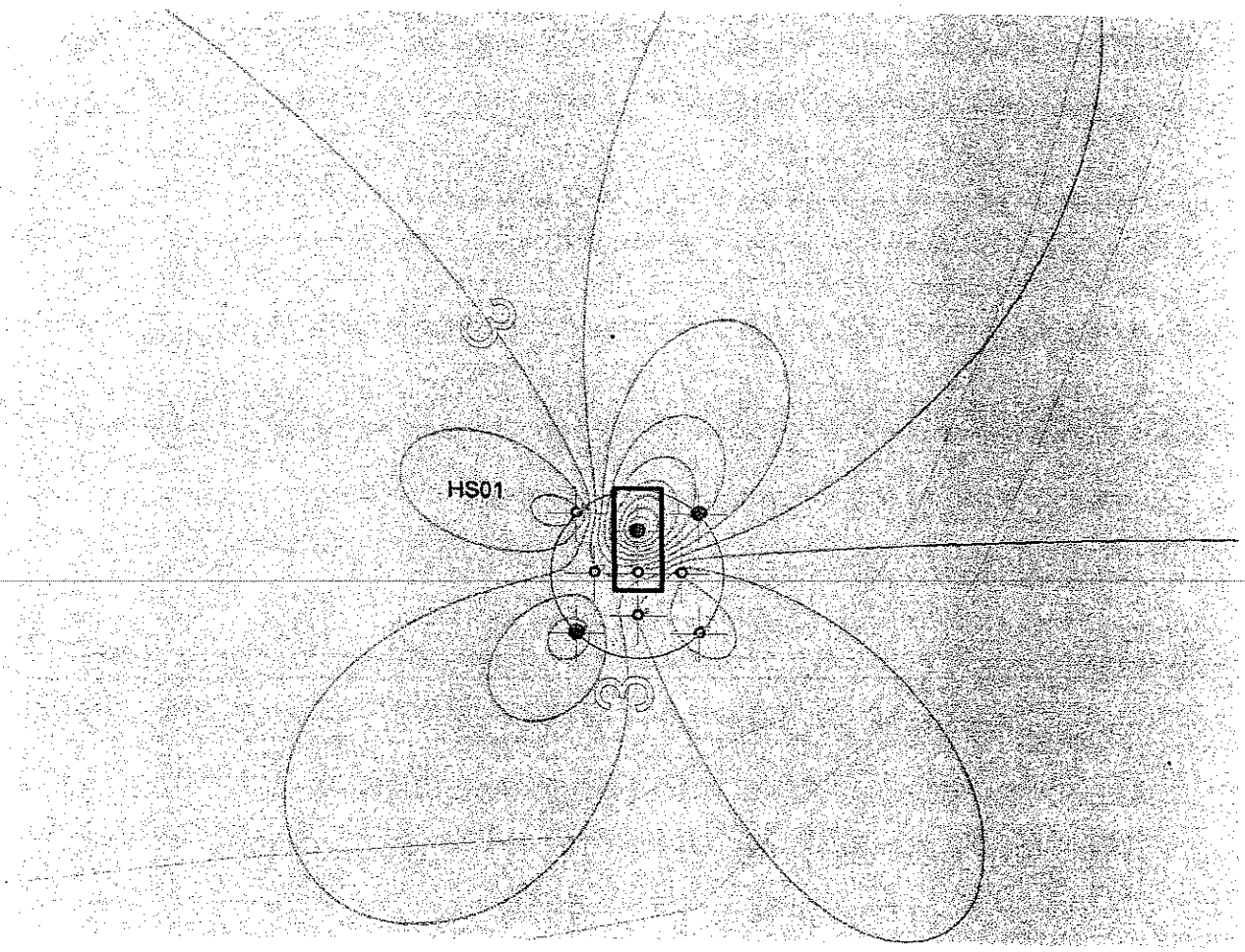


Figure 1. Contours for HS01 Generated by Kriging

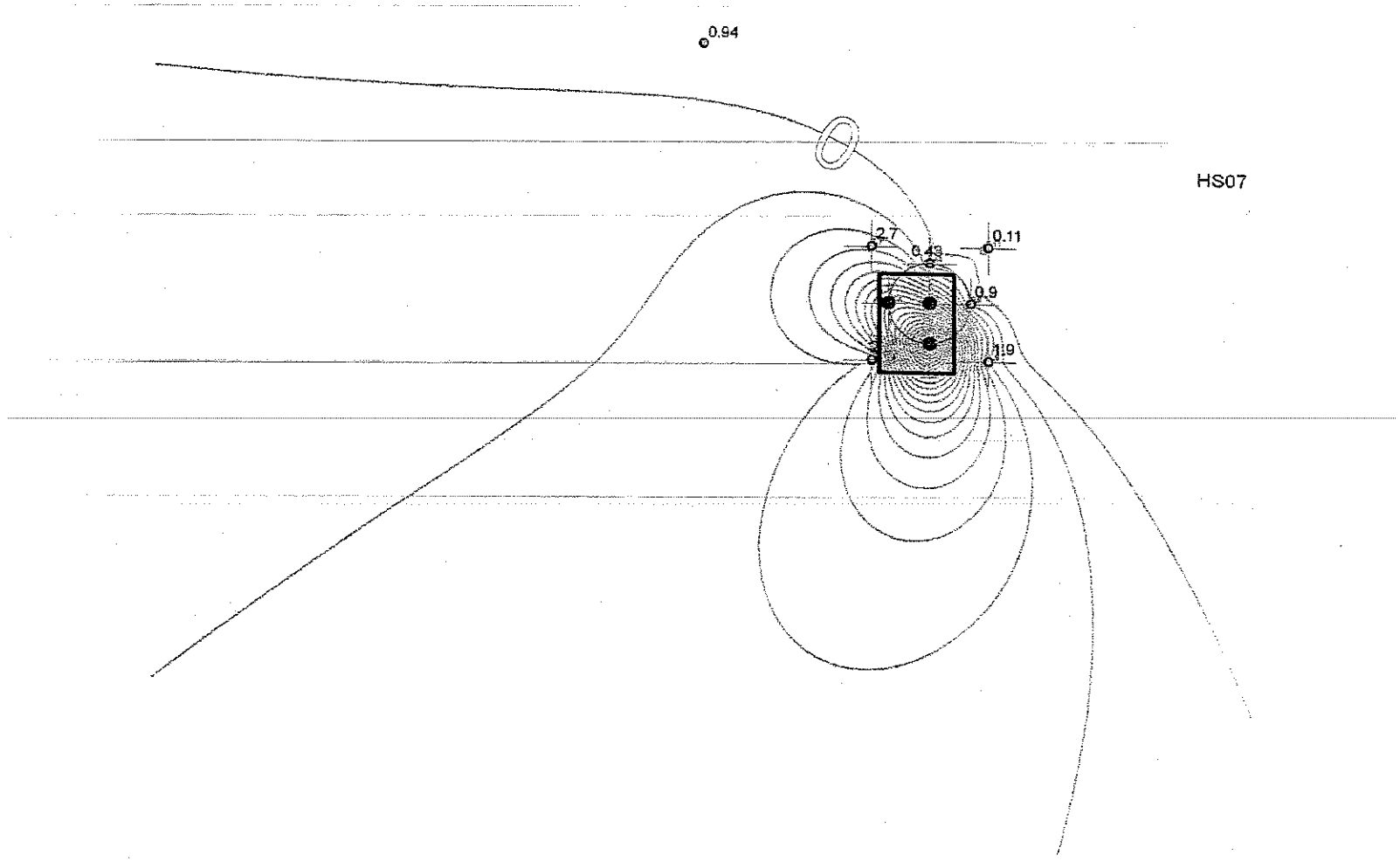


Figure 2. Contours for HS07 Generated by Kriging

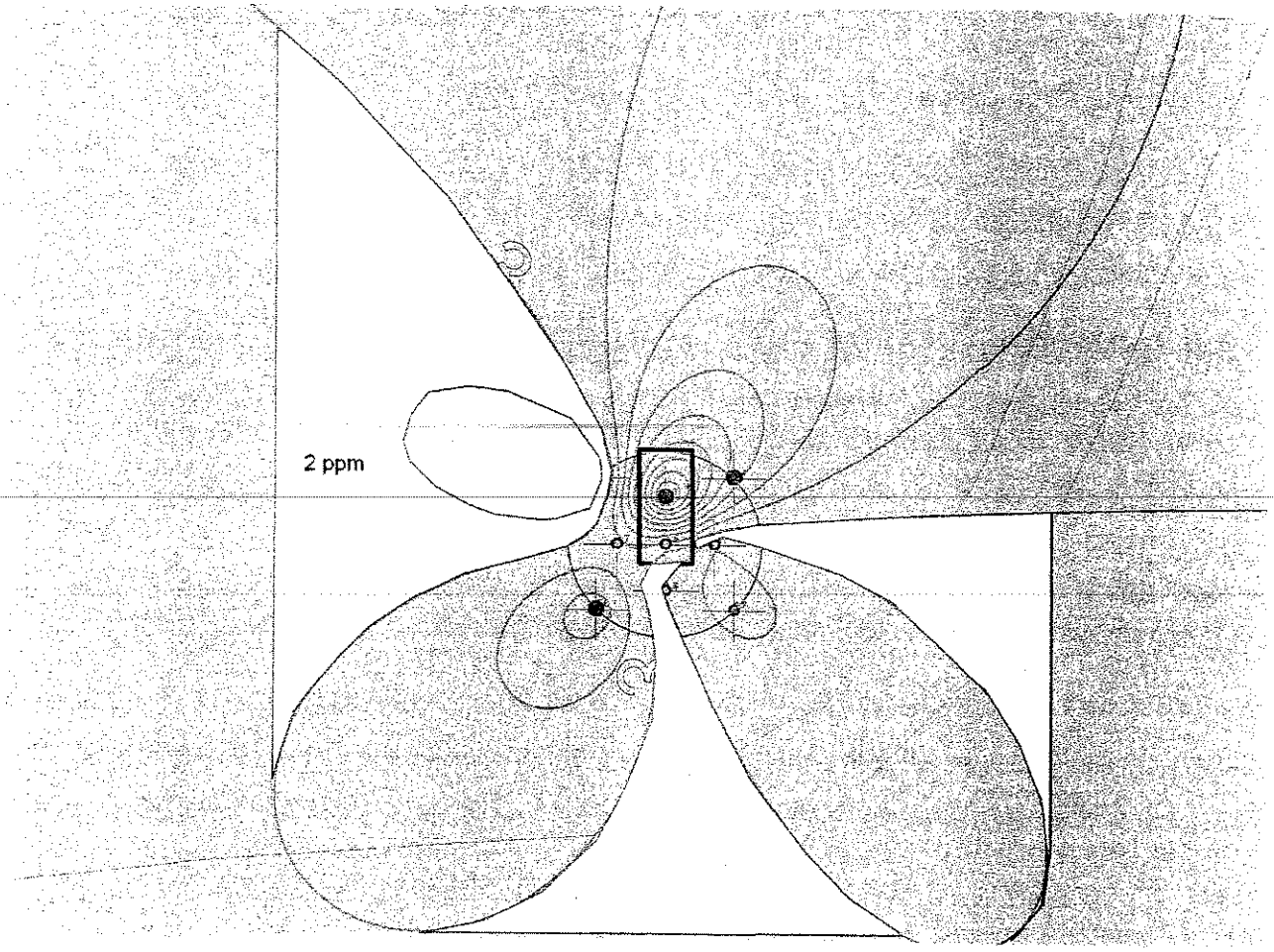


Figure 3. Conservative Contour Area Estimates for 2 ppm for HS01

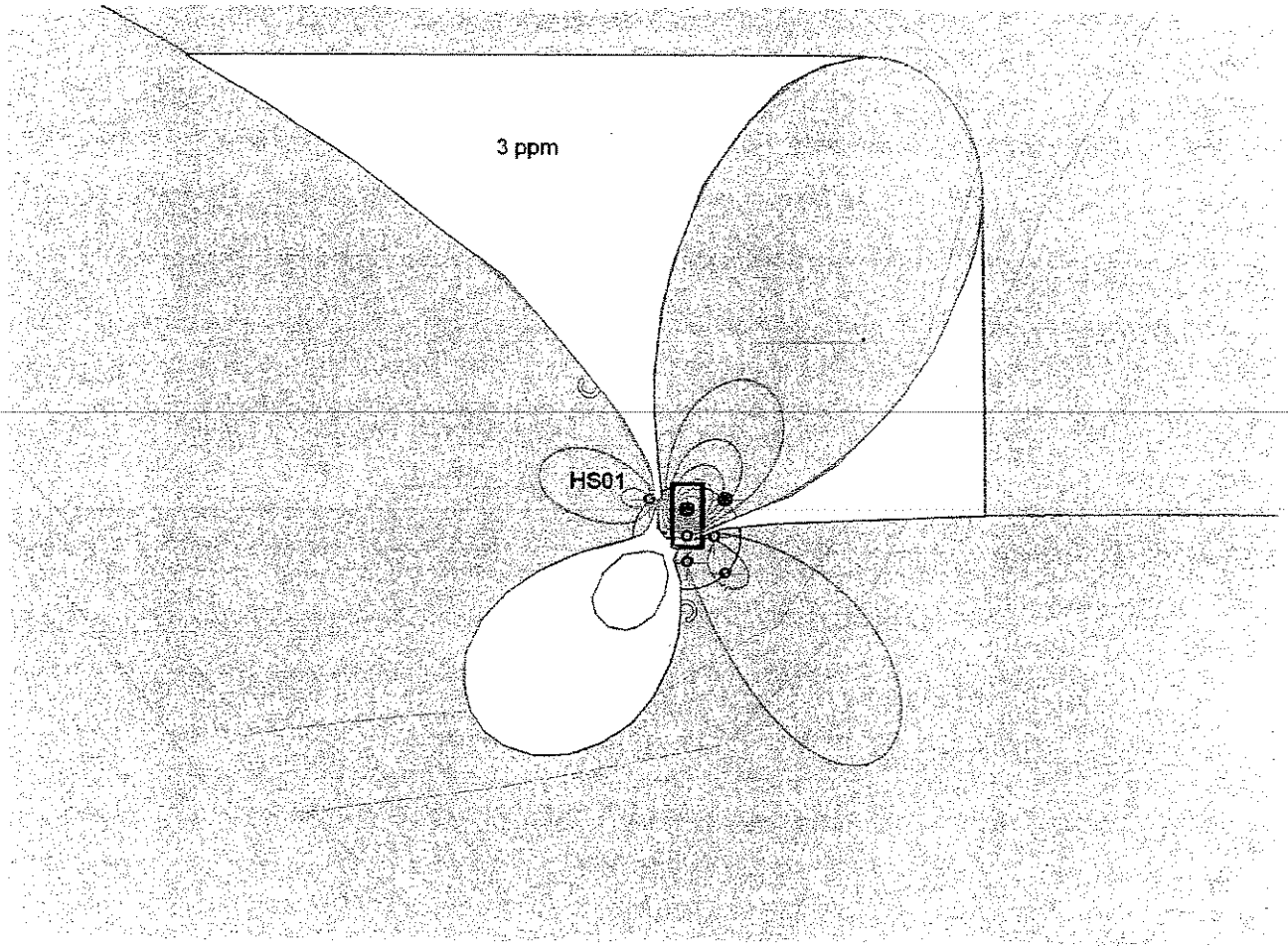


Figure 4. Conservative Contour Area Estimates for 3 ppm for HS01

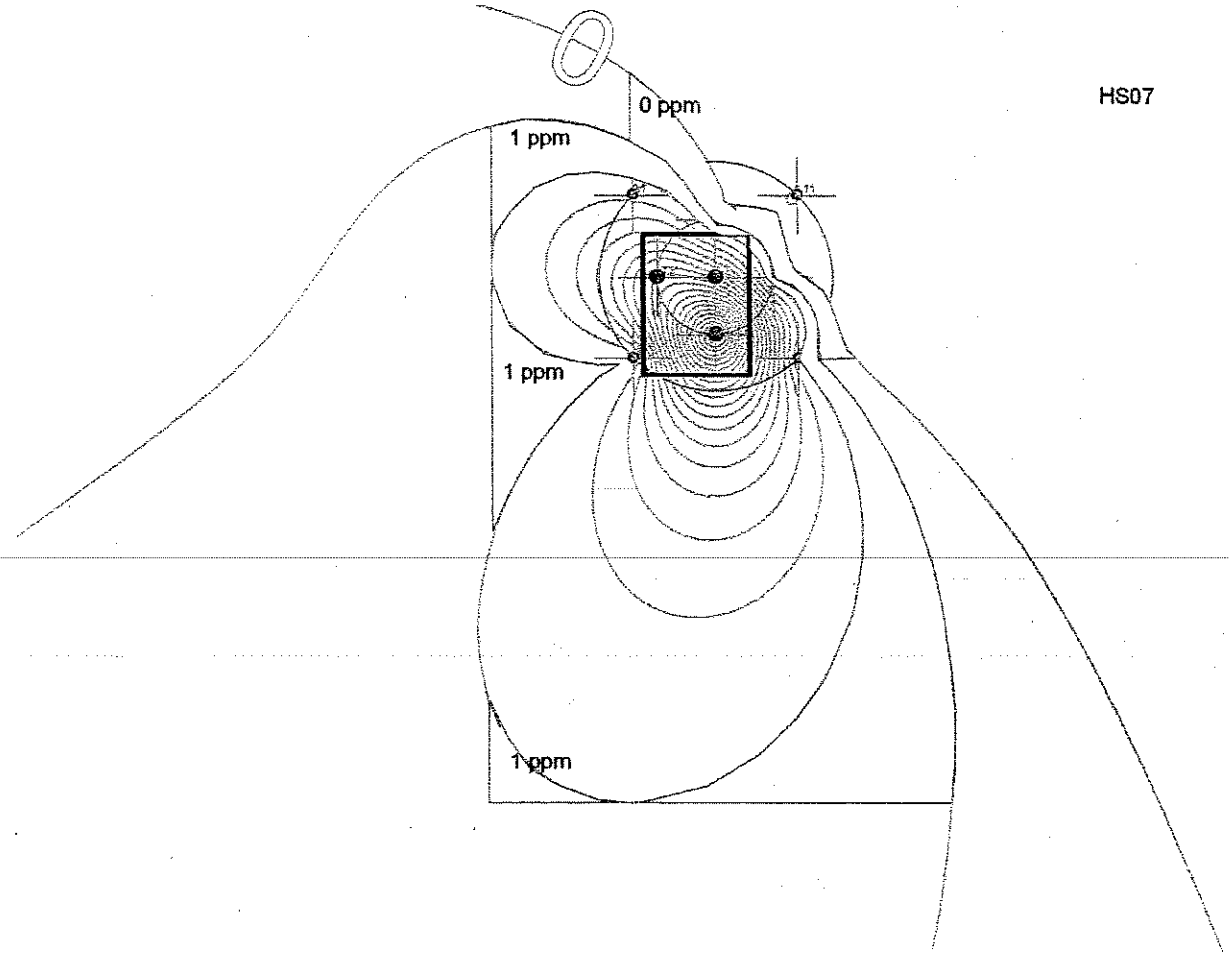


Figure 5. Conservative Contour Area Estimates for HS07

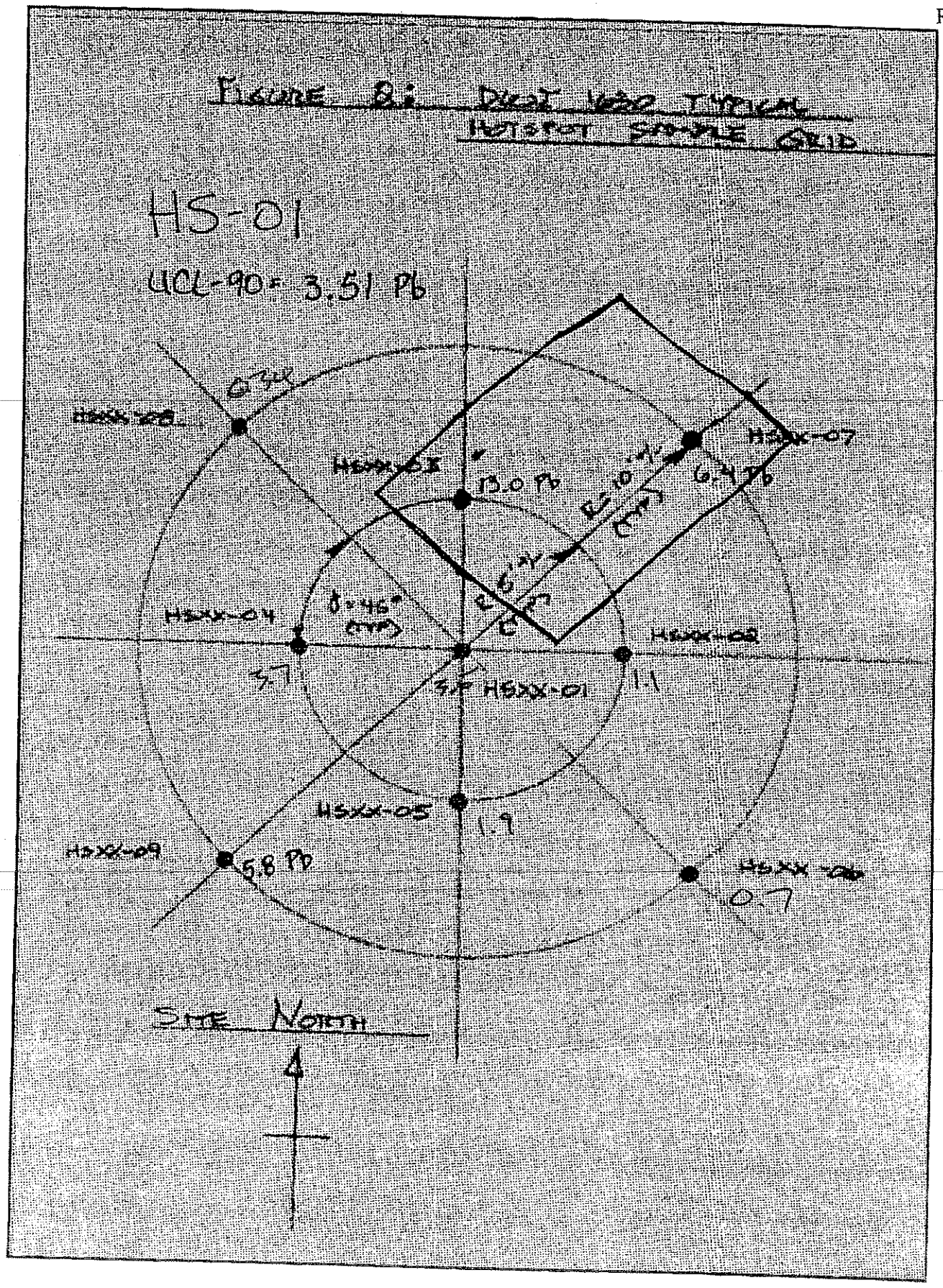
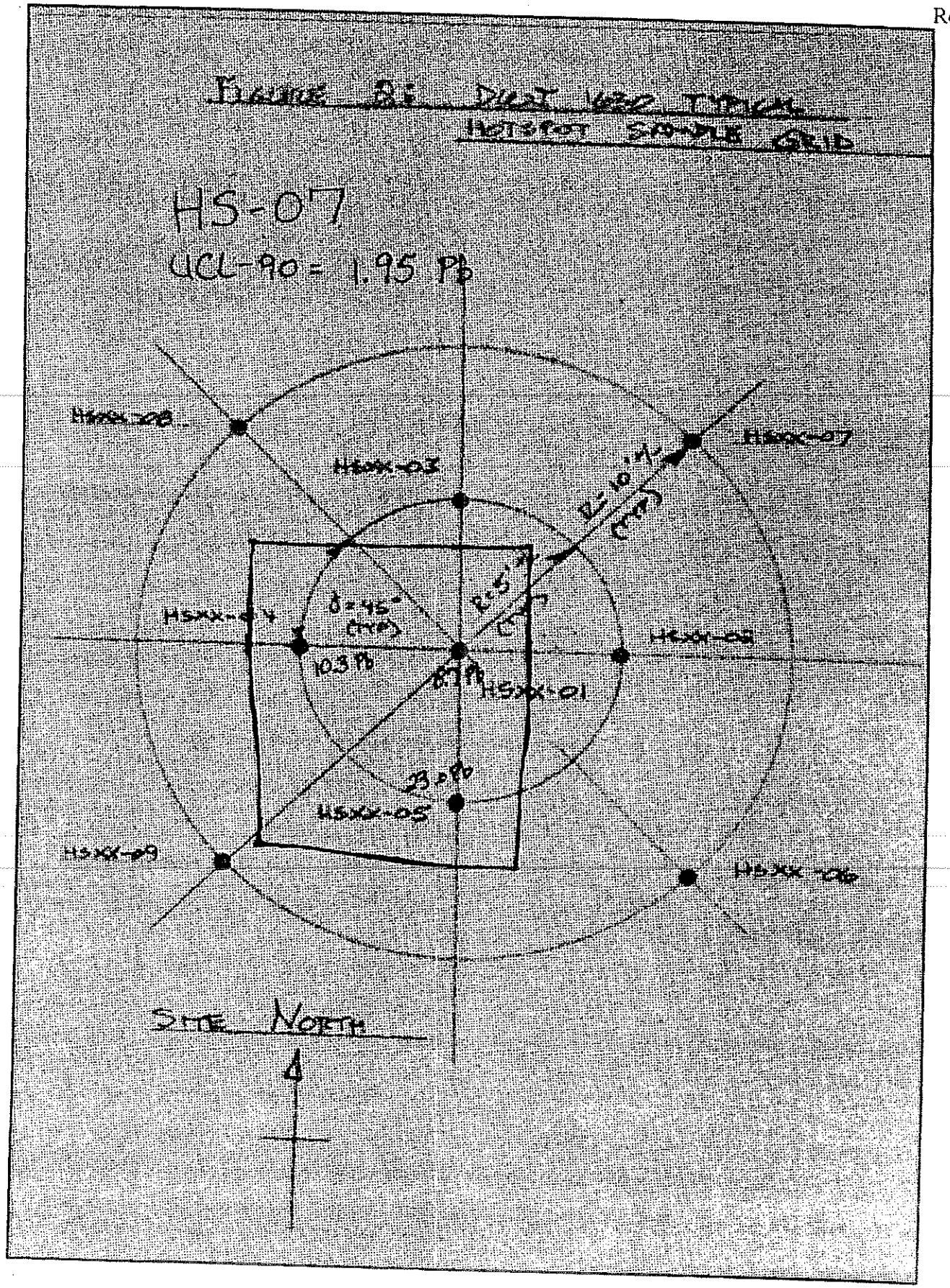


FIGURE 8i DEQ 1630 TYPICAL
INTERIOR SAMPLE GRID
HS-01
UCL-90 = 3.51 Pb
HSXX-08
HSXX-07
HSXX-04
HSXX-02
HSXX-01
HSXX-05
HSXX-09
HSXX-06
13.0 Pb
6.4 Pb
5.8 Pb
4.7
5.7
1.1
1.9
0.7
SITE NORTH
4


HS-07
UCL-90 = 1.95 Pb
HSXX-08
HSXX-03
HSXX-07
HSXX-04
HSXX-02
HSXX-01
HSXX-05
HSXX-09
HSXX-06
10.3 Pb
23.0 Pb
δ = 45° (TYP)
SITE NORTH

DWI-1630 Hot Spot 1 and 7 Bouniding Areas

Hotspot No.	Sample No.	Analysis	Units	Result	Option 1	Option 2	RCRA (Y/N) Option 1	UCL90 Option 1	Distrib. Option 1	RCRA (Y/N) Option 2	UCL90 Option 2	Distrib. Option 2
HS01	DW1630-HS01-01	lead	mg/L	3.5			No	4.084554052	Normal	No	3.511823281	Normal
HS01	DW1630-HS01-02	lead	mg/L	1.1								
HS01	DW1630-HS01-03	lead	mg/L	13	remove	remove						
HS01	DW1630-HS01-04	lead	mg/L	3.7								
HS01	DW1630-HS01-05	lead	mg/L	1.9								
HS01	DW1630-HS01-06	lead	mg/L	0.7								
HS01	DW1630-HS01-07	lead	mg/L	6.4		remove						
HS01	DW1630-HS01-08	lead	mg/L	0.34								
HS01	DW1630-HS01-09	lead	mg/L	5.8								
HS07	DW1630-HS07-01	lead	mg/L	8.7		remove	Yes	5.398737338	Approximate Gamma	No	1.950511893	Normal
HS07	DW1630-HS07-02	lead	mg/L	0.9								
HS07	DW1630-HS07-03	lead	mg/L	0.43								
HS07	DW1630-HS07-04	lead	mg/L	10.3	remove	remove						
HS07	DW1630-HS07-05	lead	mg/L	23	remove	remove						
HS07	DW1630-HS07-06	lead	mg/L	1.9								
HS07	DW1630-HS07-07	lead	mg/L	0.11								
HS07	DW1630-HS07-08	lead	mg/L	2.7								
HS07	DW1630-HS07-09	lead	mg/L	2								

HOTSPOT #2

Dirnbauer, Carl A (DBM)

From: Mike Williams [mewilliams@wescinc.com]
Sent: Tuesday, November 28, 2006 7:19 AM
To: Dirnbauer, Carl A (DBM); 'Jamie Raymer'
Subject: Draft of Excavation Area for HS2

Attachments: Revised Stats Lead.xls; HS2krig.pdf; hs2krig.emf; Hs2 1ppm area.jpg; HS2excav krig.jpg; Areas.xls

Carl,

Attached are files related to the methodology we discussed Tuesday with Tony Poole and Sam Thomas. In the methodology, the approach is to:

-Determine the average concentration of the 15 hotspots so that the UCL90 for TCLP lead for the whole site is approximately the same as reported in the profile (~2.1 ppm). Based on recalculation of the UCL90 with the original sample results and 15 additional values inserted for the hotspots, a value of 2.7 ppm produces a UCL90 of ~2.1 ppm (using nonparametric distribution, 90% Chebyshev (Mean, Sd) UCL). See attached spreadsheet Revised Stats Lead.xls.

-The resampling results for Hotspot 2 (not including the original sample) were plotted and surface contours of concentration created by Kriging (software package Surfer, using default settings) - see HS2Krig.pdf - with 1 ppm contours generated up to 10 ppm for lead. These contours were then imported into ArcGIS and overlayed on the original base map showing HS2 (see e.g., HS2 1ppm area.jpg). The area of each contour up to 10 ppm was then determined using toolsets in ArcGIS. For the 1ppm contour (see HS2 1ppm area.jpg), an approximate area was defined since the original contour was exceedingly large; reducing the contour size would result in a more conservative calculation of the weighted average concentration.

-Once areas for each contour were determined, the average concentration in the contour (e.g., 1.5 ppm as the average between the 1 ppm and 2 ppm contour lines) was multiplied by the contour area (e.g, 1.5 ppm x 1 ppm contour area, 2.5 ppm as 2 ppm contour area, etc.). The resulting area times concentrations were then summed and divided by the sum of the contour area (1 through 10 ppm) to get the weight average for the area. The resulting weighted average, up to the 10 ppm contour line, was ~2.1 ppm (see Areas.xls), meeting the UCL90 requirement in the original profile and <2.7 ppm calculated above. The excavation area inside the 10 ppm contour line is shown in HS2escav krig.jpg and represents approximately 115 ft2.

Let's discuss the assumptions behind this before passing this on.

Mike


Revised Stats Lead.xls (40 KB)...


HS2krig.pdf (197 KB)


hs2krig.emf (219 KB)


Hs2 1ppm area.jpg (475 KB)


HS2excav krig.jpg (931 KB)


Areas.xls (19 KB)

Mike Williams
mewilliams@wescinc.com
Phone: (865) 207-0571
Fax: (877) 608-5508

Include	HotSpot	Level 0-2	plicateH	PROJ_SAMPLE_ID	STA_NAME	ANA_TYPE	ANA_METHOD_Cd	MICAL_NA	UNITS	RSLTQUAL	ALIDATIO	RESULTS	TEQT_LIN
Y		Y		D1630DB037	DB-29-TRENCH 6	TCLPMET	EPA-ILM04.0	Lead	mg/L		=	2.21	0.14
Y		Y		D1630DB022	DB-19-TRENCH3	TCLPMET	EPA-ILM04.0	Lead	mg/L		J	0.137	0.003
Y		Y		D1630DB012	DB-11-1	TCLPMET	EPA-ILM04.0	Lead	mg/L	U	U	0.01395	0.0279
Y		Y		D1630DB017	DB-14	TCLPMET	EPA-ILM04.0	Lead	mg/L		J	0.0797	0.003
Y		Y		D1630DB011	DB-10	TCLPMET	EPA-ILM04.0	Lead	mg/L		U	0.0279	0.003
Y		Y		D1630DB008	DB-07-TRENCH 5	TCLPMET	EPA-ILM04.0	Lead	mg/L		=	3.7	0.003
Y		Y		D1630DB023	DB-19-TRENCH20	TCLPMET	EPA-ILM04.0	Lead	mg/L	U	U	0.0279	0.003
Y		Y		D1630DB018	DB-17	TCLPMET	EPA-ILM04.0	Lead	mg/L		J	0.266	0.003
Y		Y		D1630DB030	DB-23-MS/D-T2	TCLPMET	EPA-ILM04.0	Lead	mg/L	U	U	0.07	0.14
Y		Y		D1630DB019	DB-18-CENTER	TCLPMET	EPA-ILM04.0	Lead	mg/L	U	UJ	0.01395	0.0279
Y		Y		D1630DB033	DB-25-TRENCH 2	TCLPMET	EPA-ILM04.0	Lead	mg/L		=	0.874	0.14
Y		Y		D1630DB039	DB-30-TRENCH 3	TCLPMET	EPA-ILM04.0	Lead	mg/L	U	U	0.07	0.14
Y		Y		D1630DB046	DB-34-TRENCH 1	TCLPMET	SW846-6010	Lead	mg/L		J	3.91	0.0279
Y		Y		D1630DB003	DB-04-TRENCH 3	TCLPMET	EPA-ILM04.0	Lead	mg/L		=	0.47	0.003
Y		Y		D1630DB004	DB-04-TRENCH 2	TCLPMET	EPA-ILM04.0	Lead	mg/L		=	0.488	0.003
Y		Y		D1630DB009	DB-08	TCLPMET	EPA-ILM04.0	Lead	mg/L		U	0.0279	0.003
Y		Y		D1630DB026	DB-19-TRENCH28	TCLPMET	EPA-ILM04.0	Lead	mg/L		J	0.817	0.003
Y		Y		D1630DB007	DB-13-TRENCH 1	TCLPMET	EPA-ILM04.0	Lead	mg/L		J	0.197	0.003
Y		Y		D1630DB032	DB-24-TRENCH 2	TCLPMET	EPA-ILM04.0	Lead	mg/L		=	1.79	0.14
Y		Y		D1630DB014	DB-12	TCLPMET	EPA-ILM04.0	Lead	mg/L		J	0.578	0.003
Y		Y		D1630DB020	DB-19-TRENCH4	TCLPMET	EPA-ILM04.0	Lead	mg/L		J	1.74	0.003
Y		Y		D1630DB047	DB-35-TRENCH 6	TCLPMET	SW846-6010	Lead	mg/L		J	0.403	0.0279
Y		Y		D1630DB031	DB-24-TRENCH 1	TCLPMET	EPA-ILM04.0	Lead	mg/L	U	U	0.07	0.14
Y		Y		D1630DB025	DB-19-TRENCH22	TCLPMET	EPA-ILM04.0	Lead	mg/L		J	1.87	0.003
Y		Y		D1630DB006	DB-06-TRENCH 1	TCLPMET	EPA-ILM04.0	Lead	mg/L		J	0.327	0.003
Y		Y		D1630DB013	DB-11-2	TCLPMET	EPA-ILM04.0	Lead	mg/L		=	0.249	0.003
Y	YL	Y		D1630DB010	DB-09	TCLPMET	EPA-ILM04.0	Lead	mg/L		=	19.1	0.003
Y	YL	Y		D1630DB005	DB-05	TCLPMET	EPA-ILM04.0	Lead	mg/L		J	7.67	0.003
Y	YL	Y		D1630DB034	DB-26-TRENCH 1	TCLPMET	EPA-ILM04.0	Lead	mg/L		=	11.2	0.14
Y	YL	Y		D1630DB024	DB-19-TRENCH23	TCLPMET	EPA-ILM04.0	Lead	mg/L		=	9.17	0.003
Y	YL	Y		D1630DB042	DB-31-TRENCH 12	TCLPMET	SW846-6010	Lead	mg/L		J	6.77	0.0279
Y	YL	Y	Y	D1630DB043	DB-32-TRENCH 2	TCLPMET	SW846-6010	Lead	mg/L		J	12.7	0.0279
Y	YL	Y		D1630DB045	DB-33-TRENCH 8	TCLPMET	SW846-6010	Lead	mg/L		J	7.22	0.0279
YLate	YL	Y		D1630DB027	DB-20-TRENCH 4	TCLPMET	EPA-ILM04.0	Lead	mg/L		J	2.36	0.003
Y	YL	Y		D1630DB036	DB-28-TRENCH 1	TCLPMET	EPA-ILM04.0	Lead	mg/L		=	56.6	0.14
Y	YL	Y		D1630DB040	DB-31-TRENCH 8	TCLPMET	SW846-6010	Lead	mg/L		J	10.4	0.0279
Y	YL	Y		D1630DB035	DB-27	TCLPMET	EPA-ILM04.0	Lead	mg/L		=	22.4	0.14
Y	YL	Y		D1630DB021	DB-19-TRENCH11	TCLPMET	EPA-ILM04.0	Lead	mg/L		J	12	0.003
Y	YL	Y		D1630DB038	DB-29-TRENCH 10	TCLPMET	EPA-ILM04.0	Lead	mg/L		=	8.97	0.14
Y	YL	Y		D1630DB041	DB-31-TRENCH 10	TCLPMET	SW846-6010	Lead	mg/L		J	13.9	0.0279
Y	YL	Y		D1630DB044	DB-33-TRENCH 3	TCLPMET	SW846-6010	Lead	mg/L		J	668	0.279

Raw Statistics		Normal Distribution Test	
Number of Valid Samples	41	Shapiro-Wilk Test Statisitic	0.812086
Number of Unique Samples	22	Shapiro-Wilk 5% Critical Value	0.941

Minimum	0.014
Maximum	3.91
Mean	1.486
Median	1.74
Standard Deviation	1.2758
Variance	1.6277
Coefficient of Variation	0.8585
Skewness	0.1389

Gamma Statistics

k hat	0.6795
k star (bias corrected)	0.6461
Theta hat	2.1868
Theta star	2.3001
nu hat	55.723
nu star	52.979
Approx.Chi Square Value(.1	40.287
Adjusted Level of Significan	0.0936
Adjusted Chi Square Value	39.966

Log-transformed Statistics

Minimum of log data	-4.272
Maximum of log data	1.3635
Mean of log data	-0.497
Standard Deviation of log da	1.7766
Variance of log data	3.1564

NO RECOMMENDATION AVAIL/

Select 95% Confidence Coefficier

Data not normal at 5% significance level

90% UCL (Assuming Normal Distribution)

Student's-t UCL	1.74567

Gamma Distribution Test

A-D Test Statistic	2.528291
A-D 5% Critical Value	0.795972
K-S Test Statistic	0.24031
K-S 5% Critical Value	0.144077

Data do not follow gamma distribution
at 5% significance level

90% UCLs (Assuming Gamma Distribution)

Approximate Gamma UCL	1.954156
Adjusted Gamma UCL	1.969868

Lognormal Distribution Test

Shapiro-Wilk Test Statisitic	0.824739
Shapiro-Wilk 5% Critical Value	0.941

Data not lognormal at 5% significance level

90% UCLs (Assuming Lognormal Distribution)

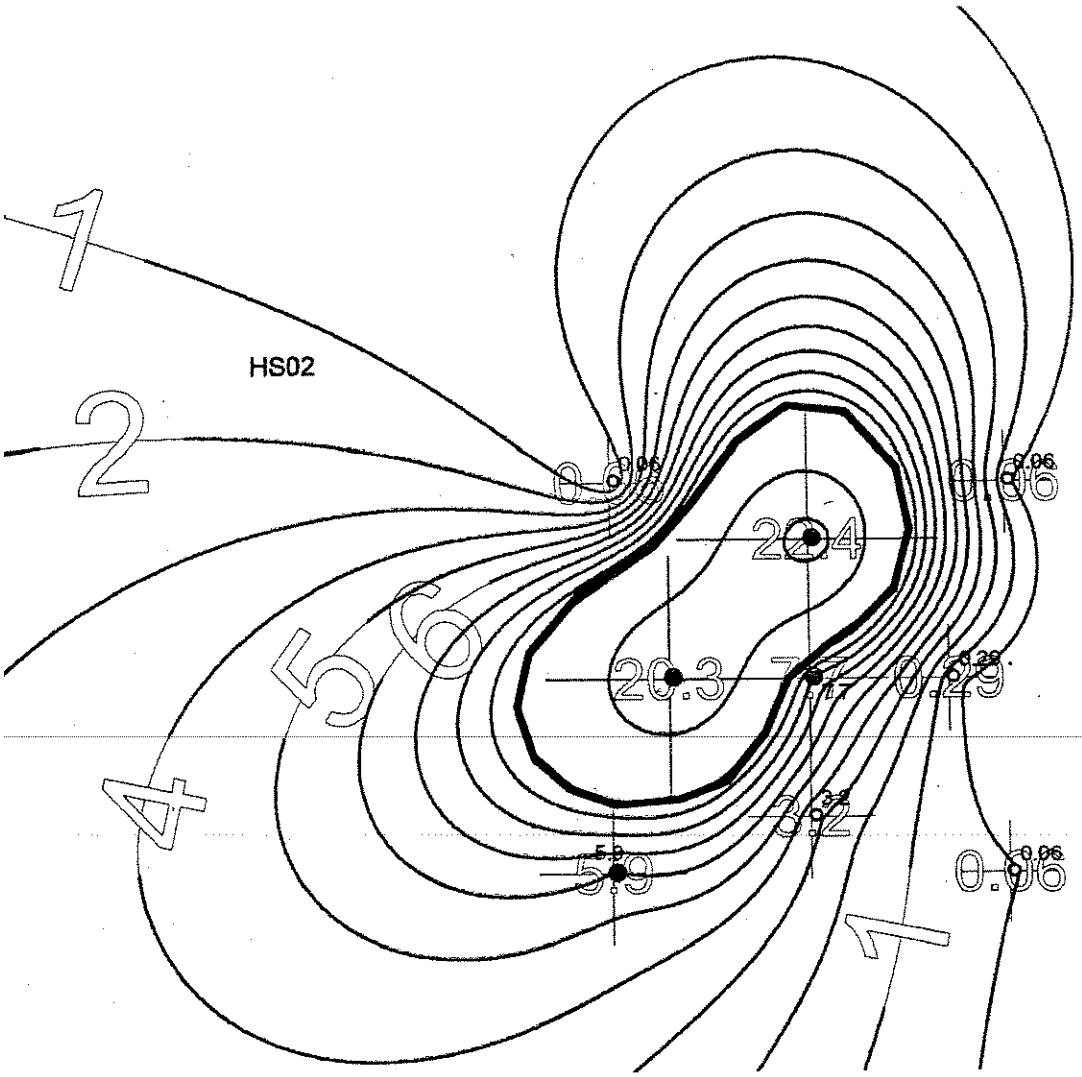
90% H-UCL	5.950104
90% Chebyshev (MVUE) UCL	5.770703
95% Chebyshev (MVUE) UCL	7.16437
97.5% Chebyshev (MVUE) UCL	9.098725
99% Chebyshev (MVUE) UCL	12.89839

90% Non-parametric UCLs

CLT UCL	1.741381
Adj-CLT UCL (Adjusted for skewness)	1.744468
Mod-t UCL (Adjusted for skewness)	1.74639
Jackknife UCL	1.74567
Standard Bootstrap UCL	1.738386
Bootstrap-t UCL	1.747272
Hall's Bootstrap UCL	1.722203
Percentile Bootstrap UCL	1.723
BCA Bootstrap UCL	1.759071
90% Chebyshev (Mean, Sd) UCL	**2.083781**
95% Chebyshev (Mean, Sd) UCL	2.354542
97.5% Chebyshev (Mean, Sd) UCL	2.730347
99% Chebyshev (Mean, Sd) UCL	3.468543

detect	RAD ERR	TPU	STRT LEG	END LEG	SPLANE EAST FT	SPLANE NORTH FT	RESULTS
Y	0		1	2	2581097.015	582571.8092	2.21
Y	0		0	2	2581520.014	581750.812	0.137
N	0		1	2	2581731.005	581959.8015	0.01395
Y	0		0	2	2581765.027	582582.8	0.0797
N	0		1	2.5	2581712.009	582055.7988	0.0279
Y	0		0	1	2581689.01	582107.8001	3.7
N	0		0	6	2581551.018	581640.8055	0.0279
Y	0		0	2	2581785.007	581819.8081	0.266
N	0		0	3	2581180.02	582005.7989	0.07
N	0		0	2	2581771.031	581797.8265	0.01395
Y	0		0	1	2581075.034	582161.8027	0.874
N	0		0	2	2581000.034	581987.8199	0.07
Y	0		0	1	2580877.002	582127.8132	3.91
Y	0		0	2	2581377.002	582183.8172	0.47
Y	0		0	2	2581358.006	582201.7962	0.488
N	0		0	1	2581822.015	582179.8145	0.0279
Y	0		0	2	2581328.019	581538.8042	0.817
Y	0		0	2	2581655.02	582078.7975	0.197
Y	0		0	2	2581253.019	582058.8172	1.79
Y	0		1	3	2581640.027	582002.8133	0.578
Y	0		0	2	2581527.002	581846.8094	1.74
Y	0		0	2	2580833.006	582257.8001	0.403
N	0		0	2	2581209.023	582031.8159	0.07
Y	0		0	2	2581433.006	581575.8121	1.87
Y	0		0	2	2581565.027	582000.812	0.327
Y	0		1	2	2581715.027	581986.8028	0.249
Y	0		0	1	2581807.022	582114.8211	2.7
Y	0		0	0.5	2581434.023	582201.7962	2.7
Y	0		0	3	2581060.007	582162.8198	2.7
Y	0		0	2	2581544.03	581604.8147	2.7
Y	0		0	2	2580928.019	581972.8264	2.7
Y	0		0	2	2580850.034	581712.8199	2.7
Y	0		0	2	2580806.005	582033.8172	2.7
Y	0		0	2	2581224.016	581260.8188	2.7
Y	0		1	2	2581163.026	582307.8001	2.7
Y	0		0	2	2580878.019	581965.8054	2.7
Y	0		0	2	2581191.011	582261.8027	2.7
Y	0		0	2	2581488.026	581523.8108	2.7
Y	0		1	2	2581101.018	582634.8013	2.7
Y	0		0	2	2580869.03	581947.8264	2.7
Y	0		0	2	2580673.032	581942.8067	2.7

Concentration (ppm)	Area Inside (ft2)	Avg Conc. in area (ppm)	Area of Conc (ft2)	Area * Avg. Conc (ft2-ppm)	Total Area (ft2)	Sum (ft2-ppm)	Wt Avg Conc. (ppm)
1	6730	1.5	4211	6316.5			
2	2519	2.5	1644	4110			
3	875	3.5	378	1323			
4	497	4.5	162	729			
5	335	5.5	83	456.5			
6	252	6.5	51	331.5			
7	201	7.5	37	277.5			
8	164	8.8	28	246.4			
9	136	9.5	22	209	6616	13999.4	2.115991536
10	114						


HS02
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2
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5
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0.06
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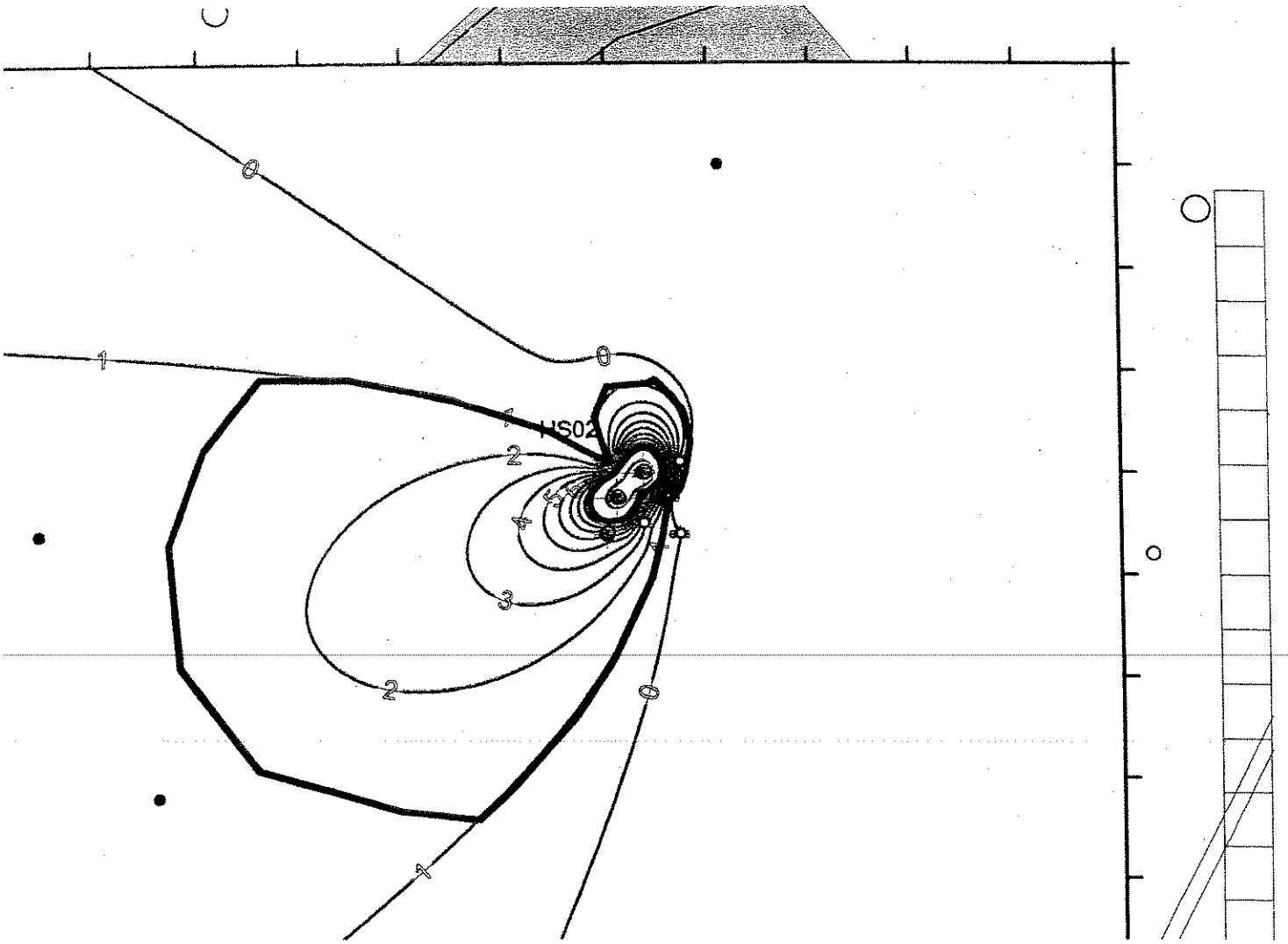
0.06
1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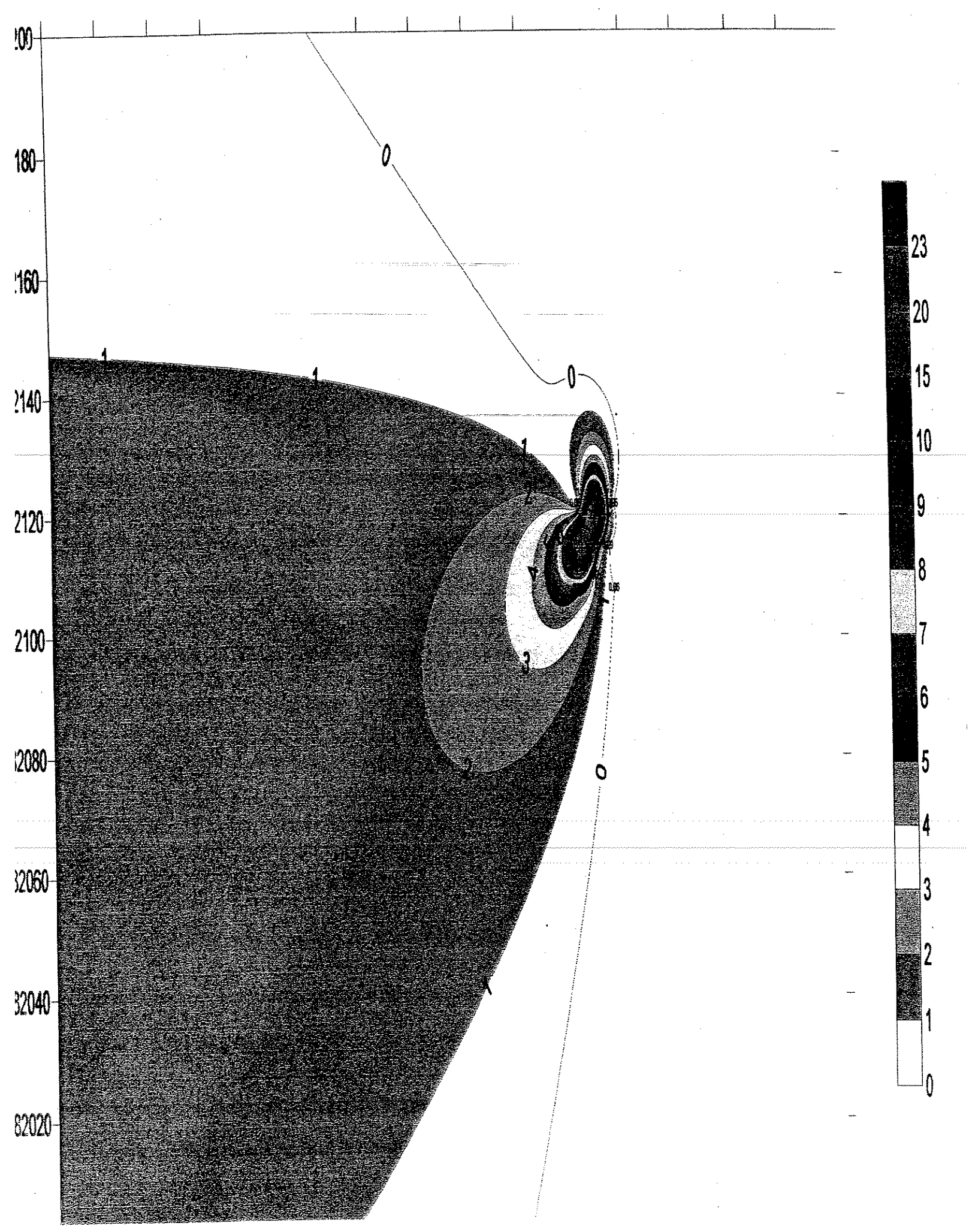
HS02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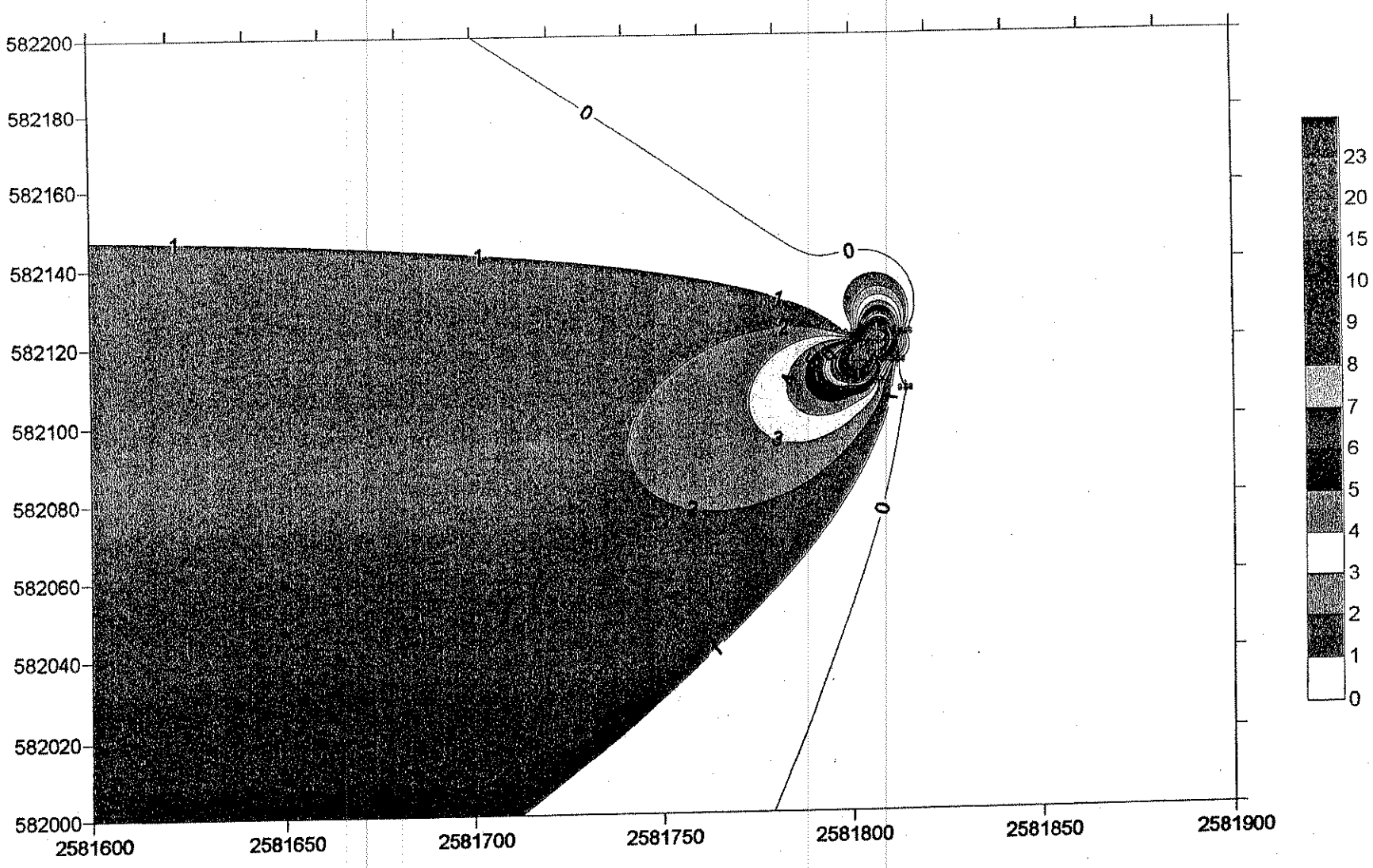
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582000
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2581750
2581800
2581850
2581900
0
1
23
20
15
10
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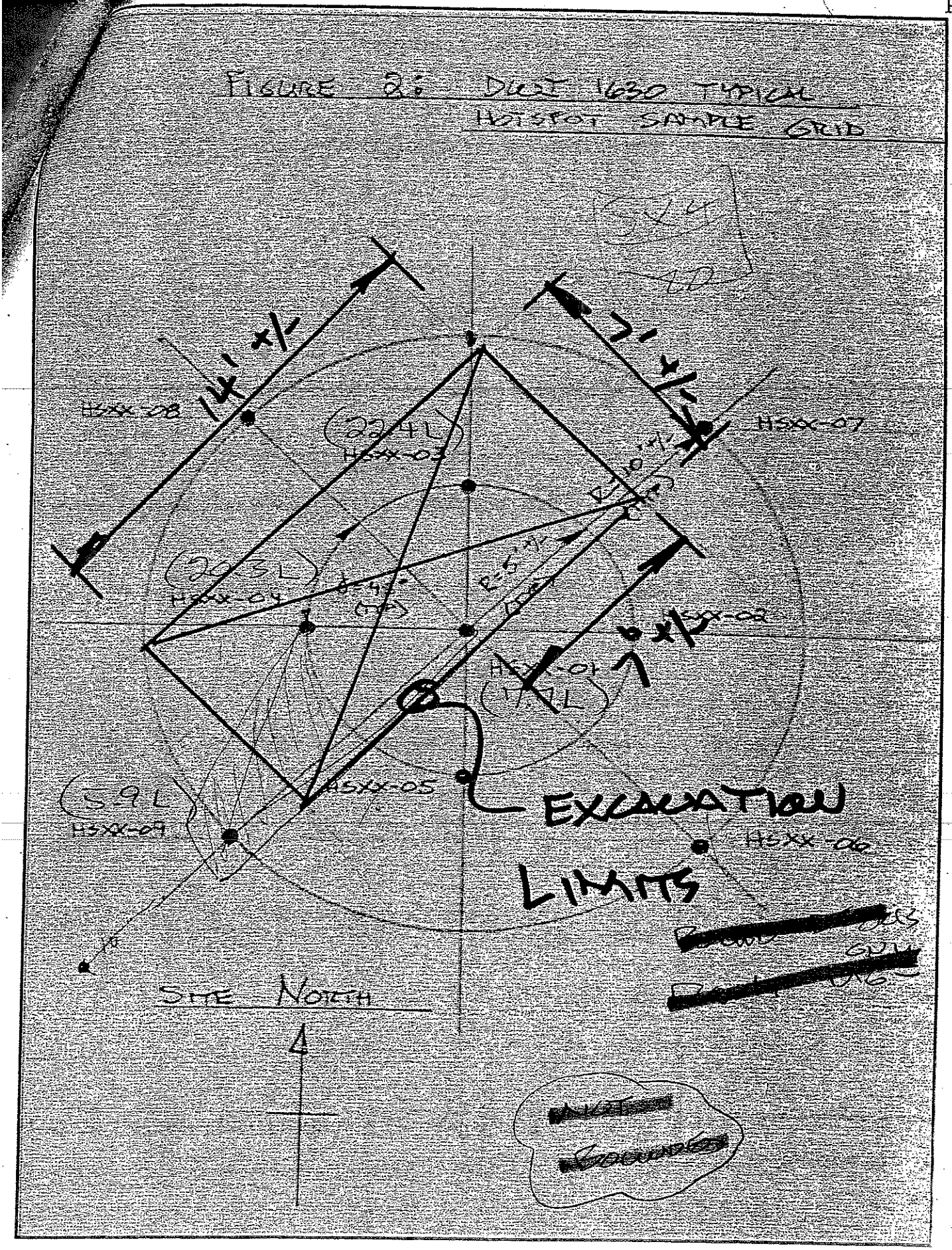
8
7
6
5
4
3
2
1
0

FIGURE 2: DWI 1630 TYPICAL HOTSPOT SAMPLE GRID



Hotspot 04 Bounding

Estimates of weighted average lead concentrations based on HS04 samples were prepared using the previously described methodology:

-Determine the average concentration of the 15 hotspots so that the UCL90 for TCLP lead for the whole site is approximately the same as reported in the profile (~2.1 ppm). Based on recalculation of the UCL90 with the original sample results and 15 additional values inserted for the hotspots, a value of 2.7 ppm produces a UCL90 of ~2.1 ppm (using nonparametric distribution, 90% Chebyshev (Mean, Sd) UCL).

-The resampling results for the hotspot (not including the original sample) were plotted and surface contours of concentration created by Kriging (software package Surfer, using default settings), with 1 ppm contours generated. These contours were then imported into ArcGIS and overlayed on the original base map showing the hotspot. The area of each contour was then determined using toolsets in ArcGIS. For the some, approximate area was defined since the original contour was exceedingly large; reducing the contour size would result in a more conservative calculation of the weighted average concentration.

-Once areas for each contour were determined, the average concentration in the contour (e.g., 1.5 ppm as the average between the 1 ppm and 2 ppm contour lines) was multiplied by the contour area (e.g, 1.5 ppm x 1 ppm contour area, 2.5 ppm as 2 ppm contour area, etc.). The resulting area times concentrations were then summed and divided by the sum of the contour area (1 through 10 ppm) to get the weight average for the area. The resulting weighted average could be compared to the value (2.7 ppm) necessary for meeting the UCL90 requirement in the original profile.

Samples HS04-10 and HS04-11 combined with the previous HS04 samples resulted in well-defined lead contours generated by Kriging for 4 ppm through 19 ppm (see Figures 1 and 2). While 0 ppm through 3 ppm contours were less well-defined, conservative estimates of the contour area were possible; these are shown in Figure 3. The resulting calculation of weighted average, shown in the spreadsheet HS4 Areas.xls, indicates a weighted average of 2.7 ppm would be difficult to achieve without excavating a substantial area. However, the spreadsheet also shows that the weighted area result is below 5 ppm for excavation areas up to the 17 ppm contour. The UCL90 lead statistics for the site were re-run substituting an actual weighted average for HS04 while keeping the remaining hotspot values as 2.7 ppm. The recalculations showed that as long as the HS04 value was 4.2 ppm or below (meaning, the excavation area defined as the 12 ppm contour) and the remaining hotspot areas had weighted averages of 2.7 ppm or below, the lead UCL90 would not change. If this is feasible (i.e., other hotspots will have 2.7 ppm or below weighted averages), the recommended excavation area is shown in Figure 4 as inside the 12 ppm contour. This represents an approximate circle with 4 ft diameter centered around sample location HS04-08.

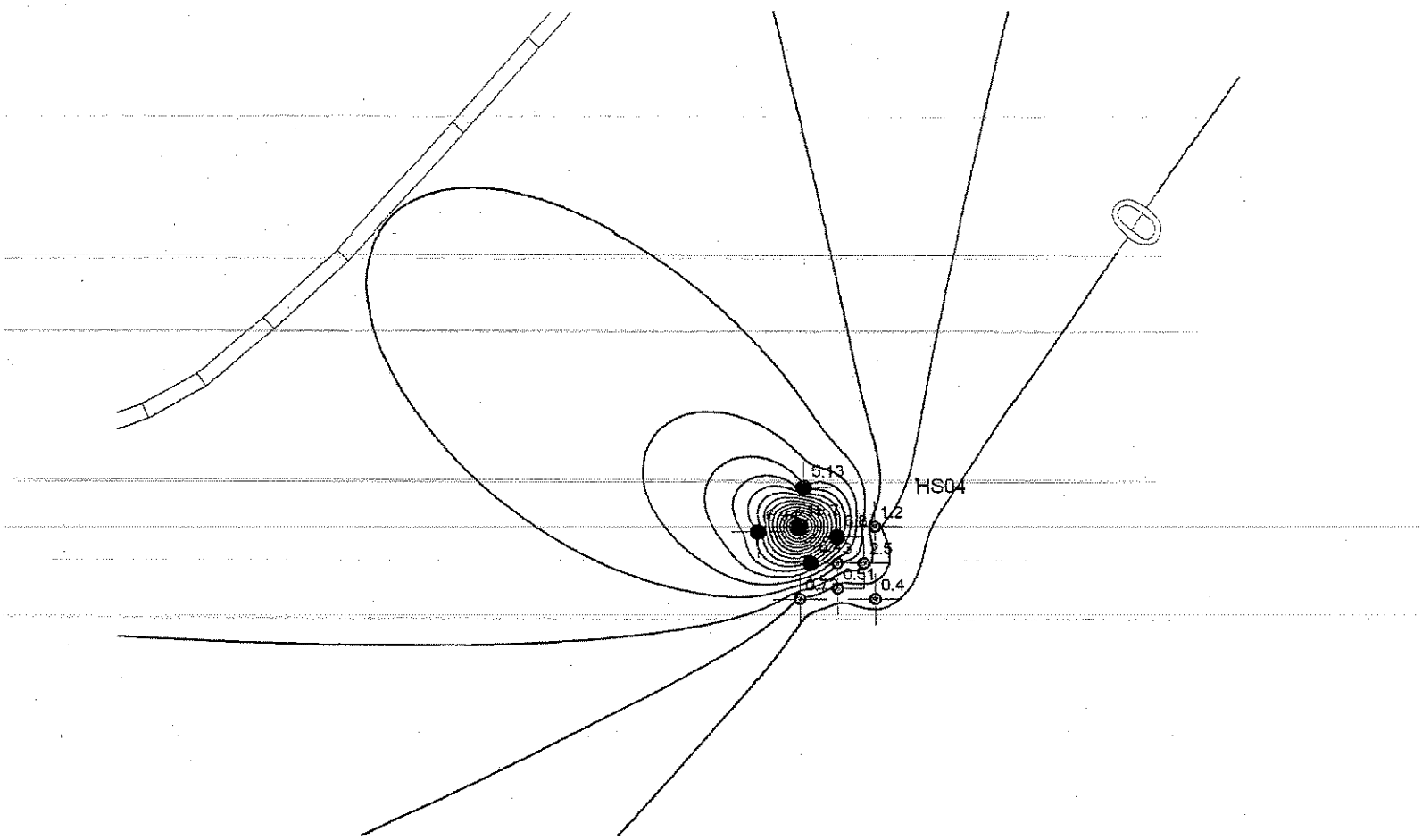


Figure 1. Contours for HS04 Generated by Kriging using Samples HS04-01 through HS04-11

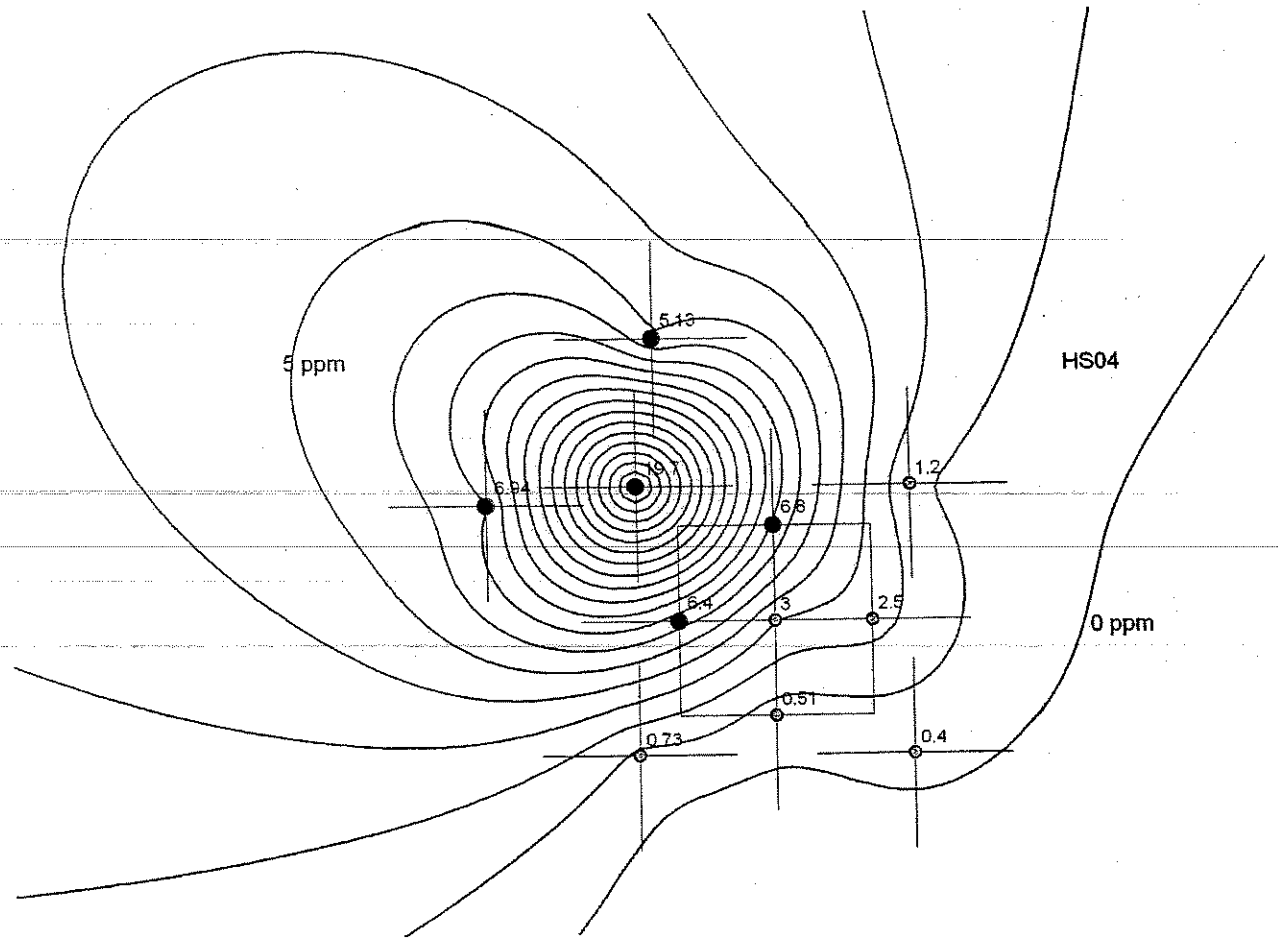


Figure 2. Contours for HS04 Generated by Kriging using Samples HS04-01 through HS04-11 – Expanded View

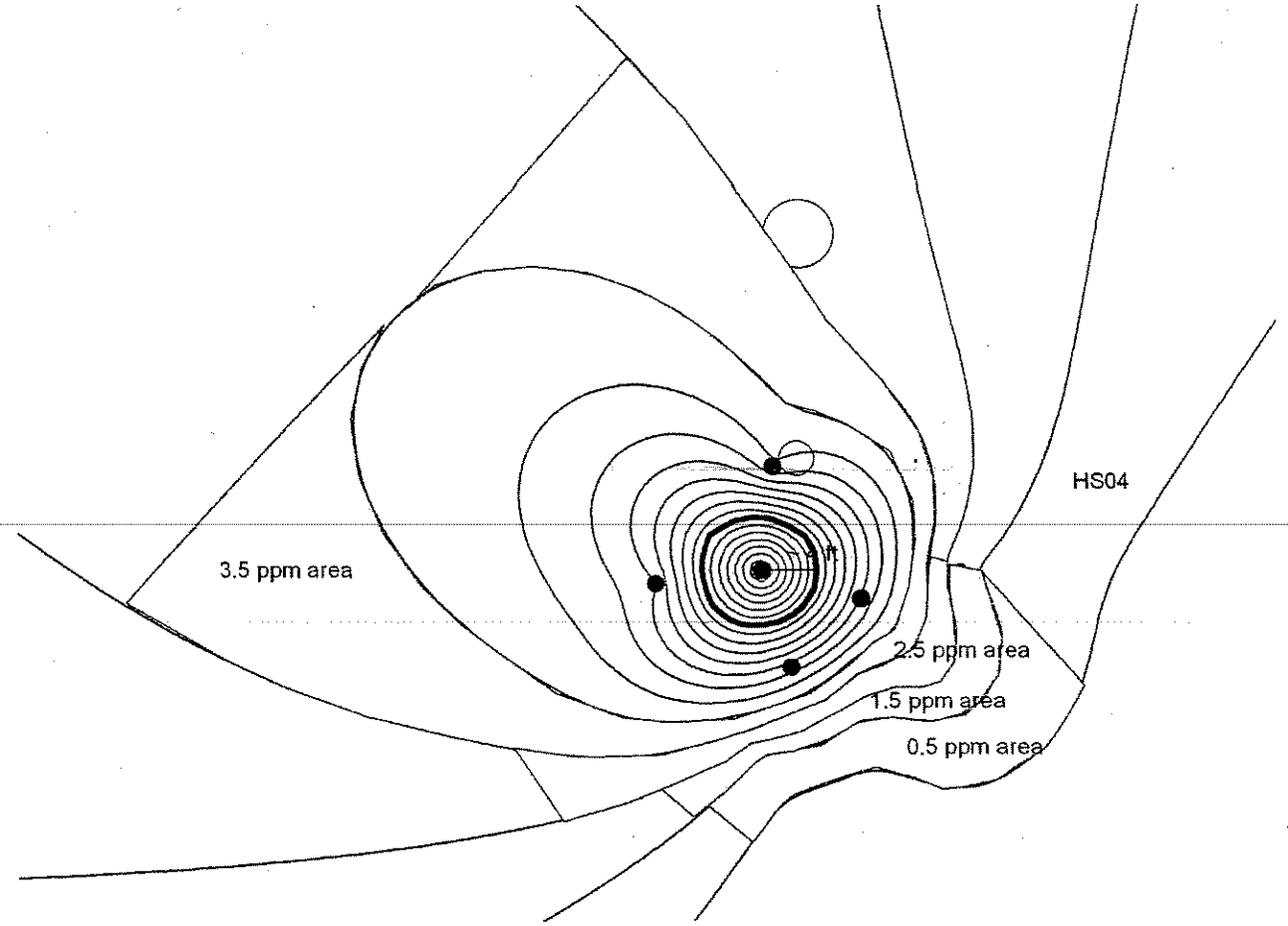


Figure 3. Conservative Contour Area Estimates for 0 ppm through 3 ppm

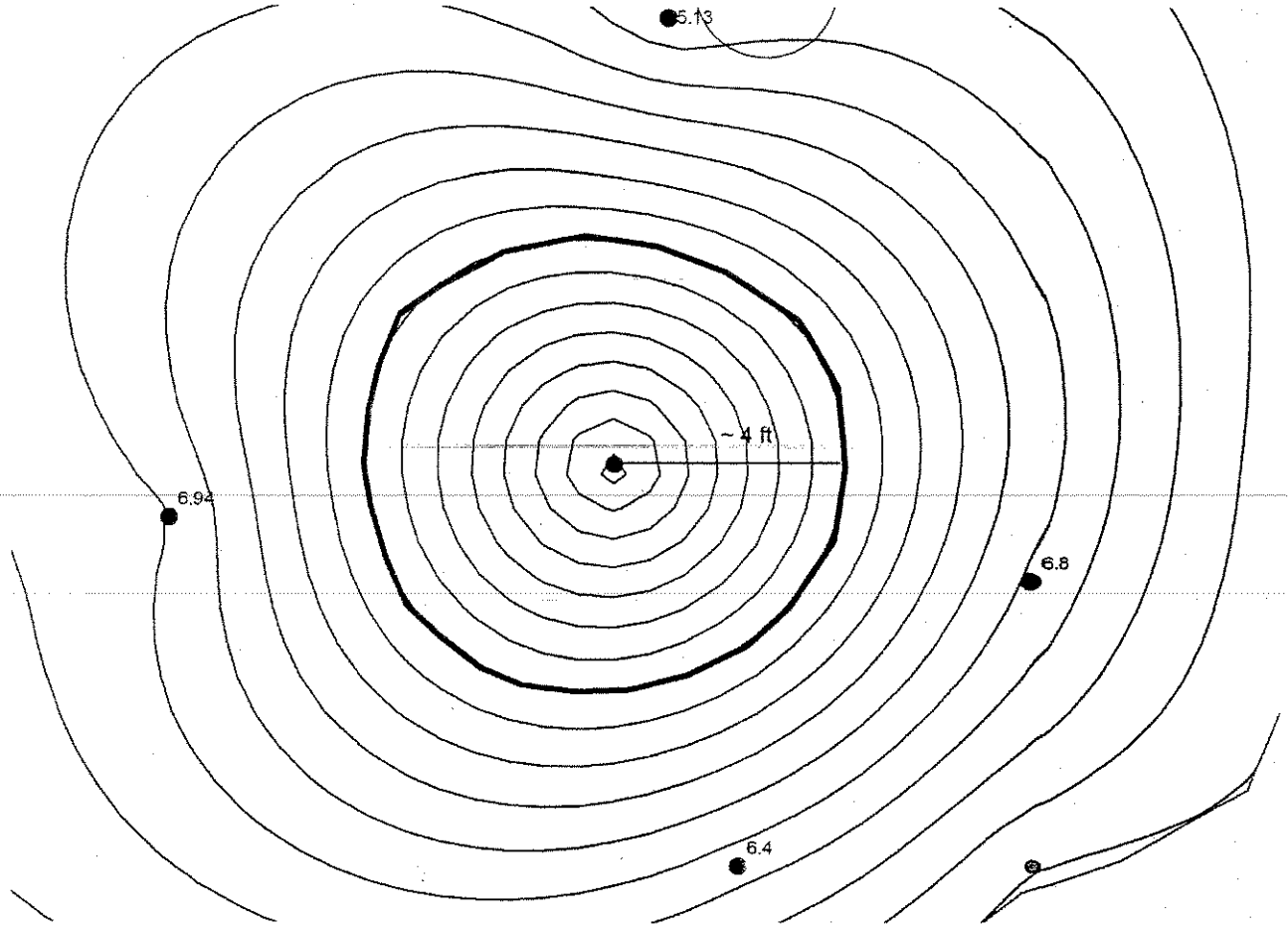
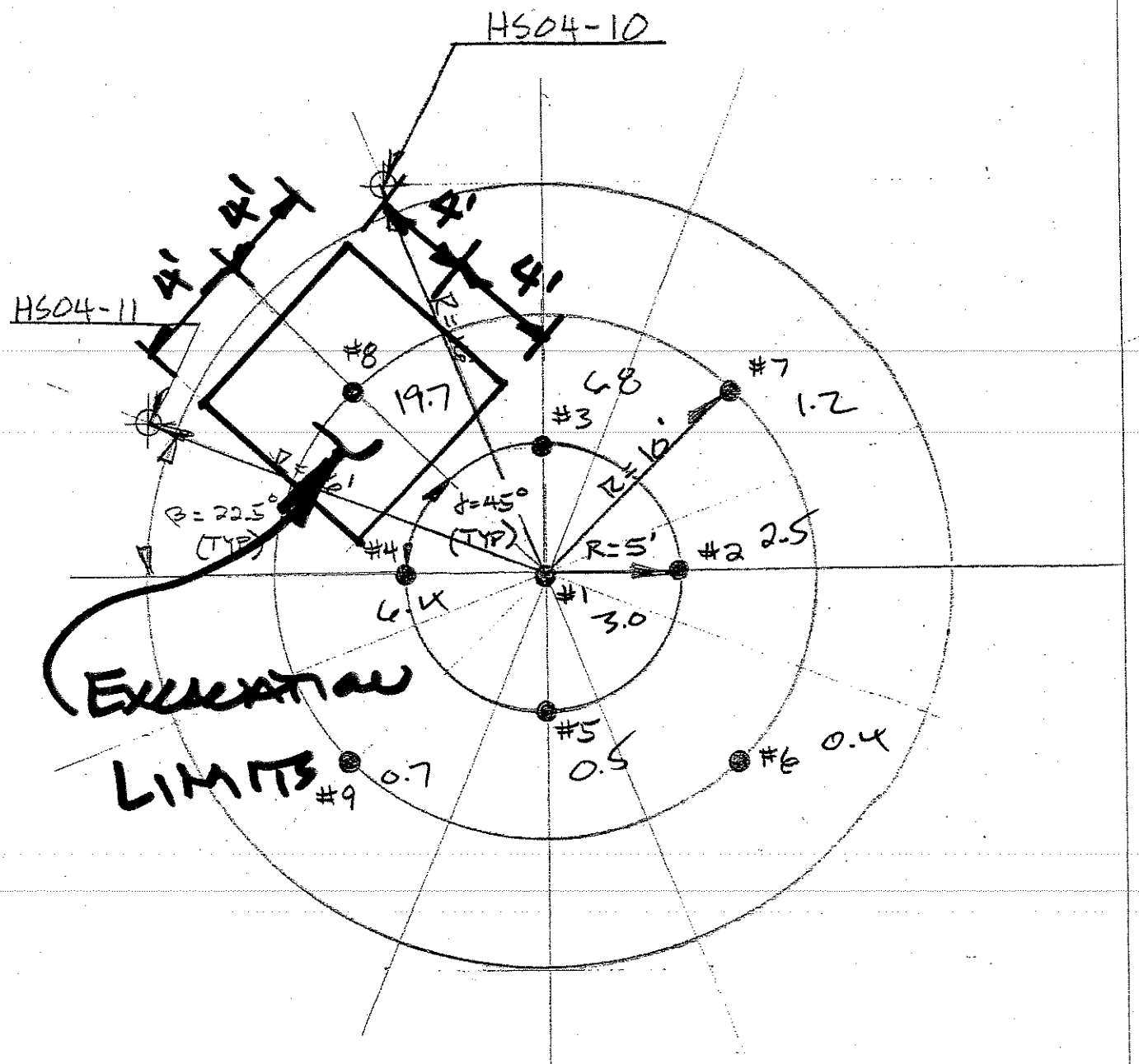


Figure 4. Excavation Area using 4.2 ppm Weighted Average to Represent HS04 in Site Lead UCL90 Calculation

Concentration (ppm)	Area Inside (ft2)	Avg Conc. in area (ppm)	Area of Conc (ft2)	Area * Avg. Conc (ft2-ppm)	Total Area (ft2)	Sum (ft2-ppm)	Wt Avg Conc. (ppm)
0	133	0.5	133	66.5			
1	75	1.5	75	112.5			
2	87	2.5	87	217.5			
3	1736	3.5	758	2653	1053	3049.5	2.896011396
4	978	4.5	510	2295	1563	5344.5	3.419385797
5	468	5.5	175	962.5	1738	6307	3.628883774
6	293	6.5	85	552.5	1823	6859.5	3.762753703
7	208	7.5	53	397.5	1876	7257	3.868336887
8	155	8.5	36	306	1912	7563	3.955543933
9	119	9.5	27	256.5	1939	7819.5	4.03274884
10	92	10.5	22	231	1961	8050.5	4.105303417
11	70	11.5	18	207	1979	8257.5	4.1725619
12	52	12.5	14	175	1993	8432.5	4.231058705
13	38	13.5	12	162	2005	8594.5	4.286533666
14	26	14.5	9	130.5	2014	8725	4.332174777
15	17	15.5	7	108.5	2021	8833.5	4.370856012
16	10	16.5	5	82.5	2026	8916	4.400789733
17	5						

UCL90 in Profile:	2.1 mg/L						
Data File					Variable:	Lead w/ 4.2 ppm value for HS04 and 2.7 or below for remaining hotspots	
Raw Statistics			Normal Distribution Test				
Number of Valid Samples		41	Shapiro-Wilk Test Statisitic				0.831049091
Number of Unique Samples		23	Shapiro-Wilk 5% Critical Value				0.941
Minimum		0.01395	Data not normal at 5% significance level				
Maximum		4.2					
Mean		1.522617073	90% UCL (Assuming Normal Distribution)				
Median		1.74	Student's-t UCL				1.793643555
Standard Deviation		1.331783294					
Variance		1.773646743	Gamma Distribution Test				
Coefficient of Variation		0.874667254	A-D Test Statistic				2.283092272
Skewness		0.237986888	A-D 5% Critical Value				0.796825644
			K-S Test Statistic				0.233920852
Gamma Statistics			K-S 5% Critical Value				0.144168084
k hat		0.670642278	Data do not follow gamma distribution				
k star (bias corrected)		0.637831055	at 5% significance level				
Theta hat		2.270386348					
Theta star		2.387179272	90% UCLs (Assuming Gamma Distribution)				
nu hat		54.99266683	Approximate Gamma UCL				2.006154847
nu star		52.30214649	Adjusted Gamma UCL				2.022399727
Approx.Chi Square Value(.10)		39.69590947					
Adjusted Level of Significance		0.093560976	Lognormal Distribution Test				
Adjusted Chi Square Value		39.377053	Shapiro-Wilk Test Statisitic				0.833880508
			Shapiro-Wilk 5% Critical Value				0.941
Log-transformed Statistics			Data not lognormal at 5% significance level				
Minimum of log data		-4.272275771					
Maximum of log data		1.435084525	90% UCLs (Assuming Lognormal Distribution)				
Mean of log data		-0.486161657	90% H-UCL				6.173401514
Standard Deviation of log data		1.78719895	90% Chebyshev (MVUE) UCL				5.958693248
Variance of log data		3.194080086	95% Chebyshev (MVUE) UCL				7.402905788
			97.5% Chebyshev (MVUE) UCL				9.407416808
			99% Chebyshev (MVUE) UCL				13.34489056
			90% Non-parametric UCLs				
			CLT UCL				1.789166479
			Adj-CLT UCL (Adjusted for skewness)				1.794686959
			Mod-t UCL (Adjusted for skewness)				1.794931957
			Jackknife UCL				1.793643555
			Standard Bootstrap UCL				1.7877962
			Bootstrap-t UCL				1.791684617
			Hall's Bootstrap UCL				1.803613463
			Percentile Bootstrap UCL				1.790095122
			BCA Bootstrap UCL				1.802407317
NO RECOMMENDATION AVAILABLE			90% Chebyshev (Mean, Sd) UCL				2.146585894
			95% Chebyshev (Mean, Sd) UCL				2.429222752
Select 95% Confidence Coefficient			97.5% Chebyshev (Mean, Sd) UCL				2.821511753
			99% Chebyshev (Mean, Sd) UCL				3.592087534

ADDITIONAL BOUNDING SAMPLES
HOT SPOT # 4 (TCLP LEAD ONLY)



SITE NORTH

LEGEND:

● ——→ EXISTING SAMPLE

⊕ ——→ NEW SAMPLE

Hotspot 06 Bounding Rev. 1

Estimates of weighted average lead concentrations based on HS06 samples were prepared using the previously described methodology:

-Determine the average concentration of the 15 hotspots so that the UCL90 for TCLP lead for the whole site is approximately the same as reported in the profile (~2.1 ppm). Based on recalculation of the UCL90 with the original sample results and 15 additional values inserted for the hotspots, a value of 2.7 ppm produces a UCL90 of ~2.1 ppm (using nonparametric distribution, 90% Chebyshev (Mean, Sd) UCL).

-The resampling results for the hotspot (not including the original sample) were plotted and surface contours of concentration created by Kriging (software package Surfer, using default settings, linear calculation of contours), with 1 ppm contours generated. These contours were then imported into ArcGIS and overlaid on the original base map showing the hotspot. The area of each contour was then determined using toolsets in ArcGIS. For some contours, approximate area was defined since the original contour was exceedingly large; reducing the contour size would result in a more conservative calculation of the weighted average concentration.

-Once areas for each contour were determined, the average concentration in the contour (e.g., 1.5 ppm as the average between the 1 ppm and 2 ppm contour lines) was multiplied by the contour area (e.g, 1.5 ppm x 1 ppm contour area, 2.5 ppm as 2 ppm contour area, etc.). The resulting area times concentrations were then summed and divided by the sum of the contour area (1 through 10 ppm) to get the weighted average for the area. The resulting weighted average could be compared to the value (2.7 ppm) necessary for meeting the UCL90 requirement in the original profile.

Samples HS06-10, -11, and -12 combined with the previous HS06 samples resulted in well-defined lead contours generated by Kriging for 1 ppm through 15 ppm (see Figure 1). The 0 ppm contour was not well defined and so it was not included in the weighted average calculation. In addition, the 1 ppm contour was only partially selected since it too was large compared to the other contours; the area selected for the 1 ppm contour is shown in Figure 2. The resulting calculation of weighted average is shown in the spreadsheet HS6Pb Areas2.xls, indicating a weighted average of 2.7 ppm can be achieved by excavating the area inside the 9 ppm contour. The proposed excavation area is shown in Figure 3, consisting of approximately 119 ft^2.

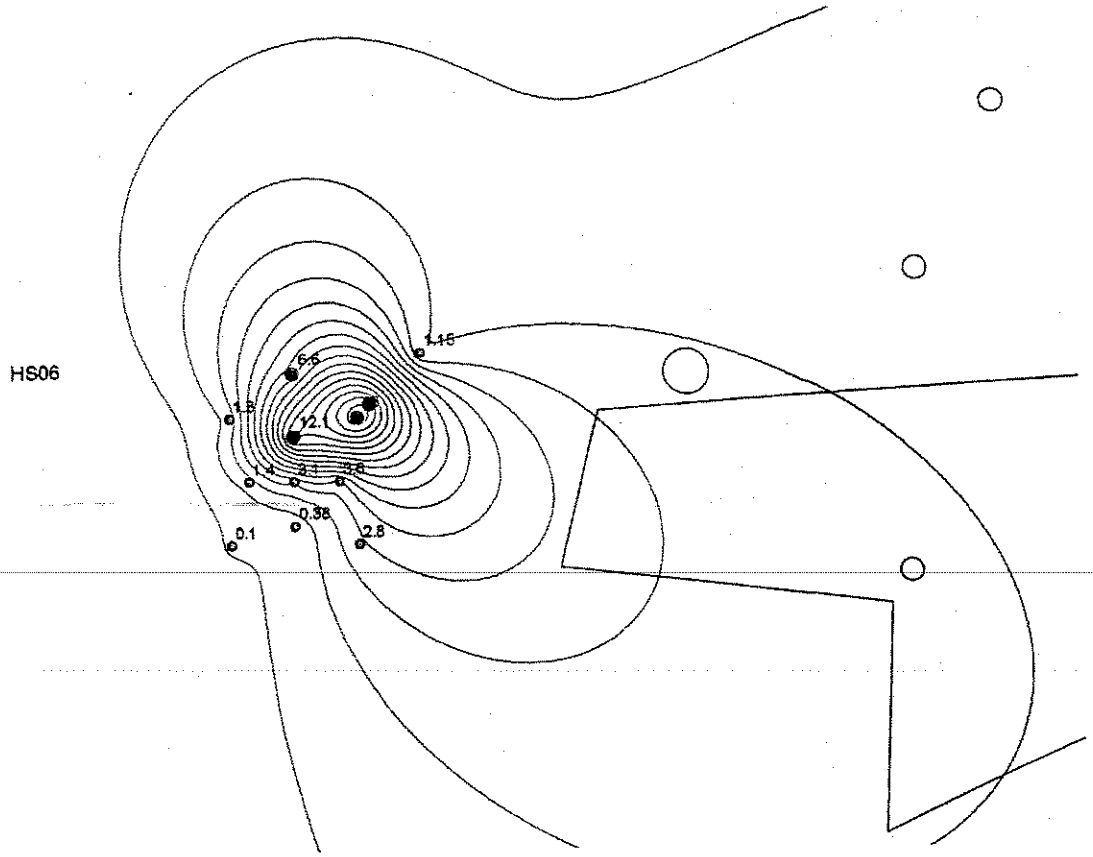


Figure 1. Contours for HS06 Generated by Kriging using Samples HS06-01 through HS06-12

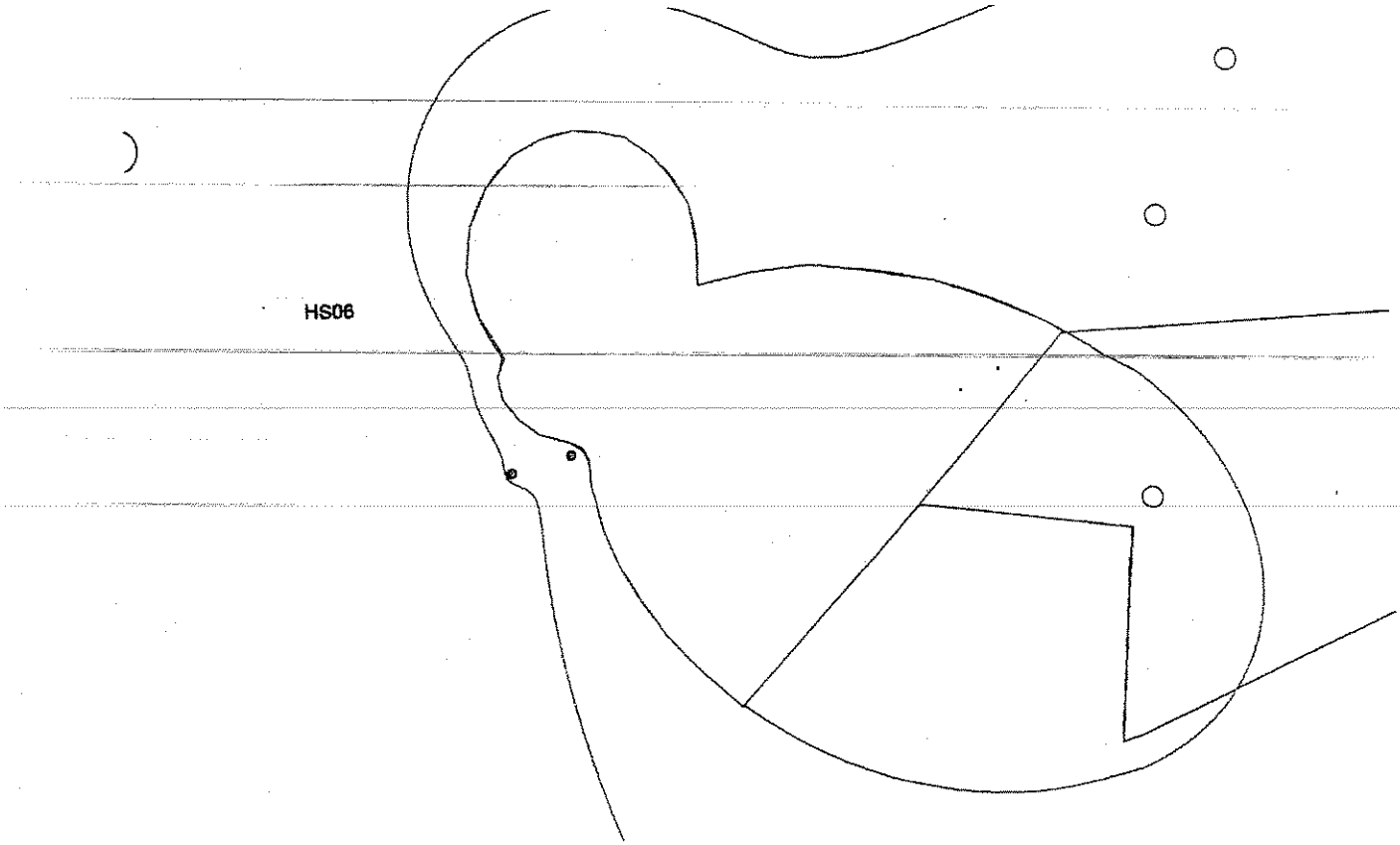


Figure 2. Conservative Contour Area Estimate for 1 ppm

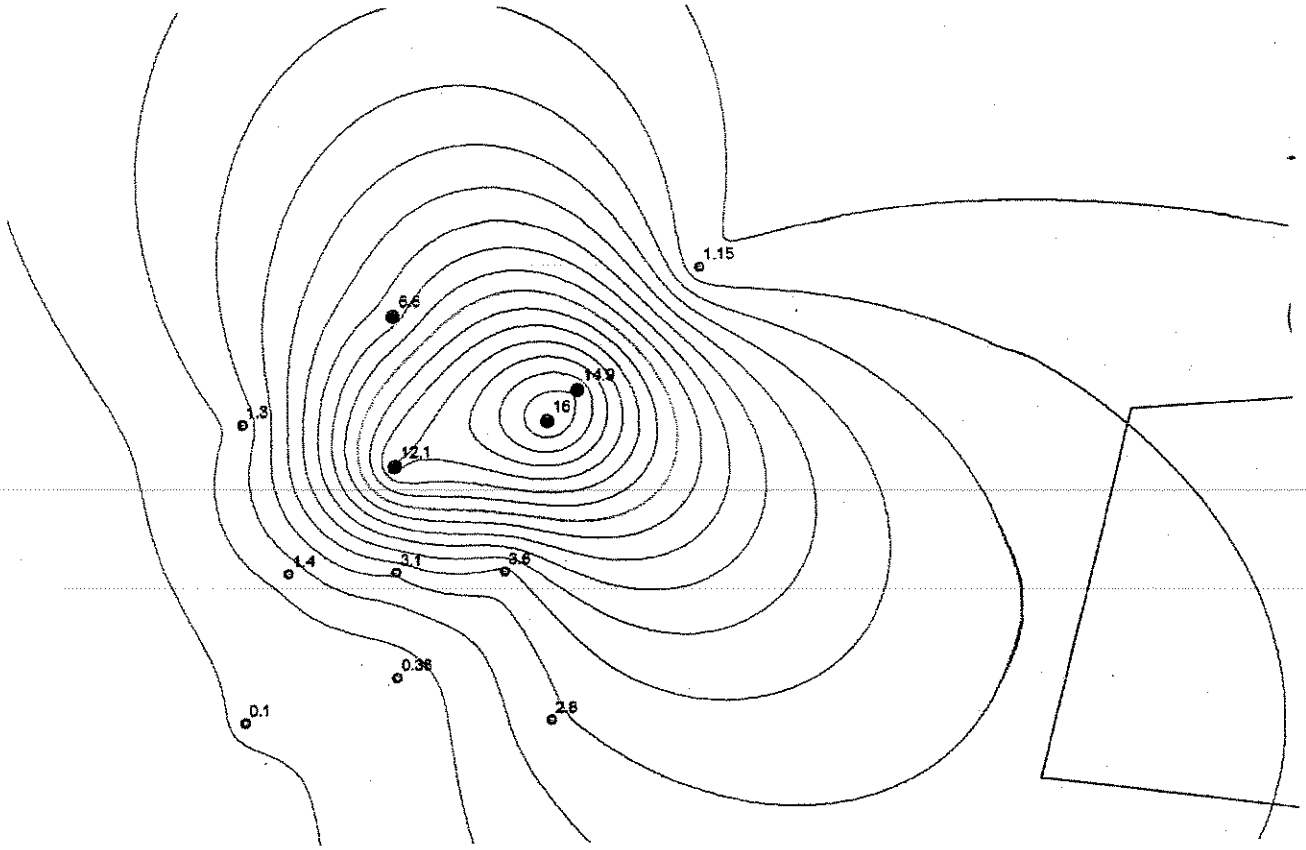


Figure 3. Excavation Area using 2.7 ppm Weighted Average to Represent HS06 in Site Lead UCL90 Calculation

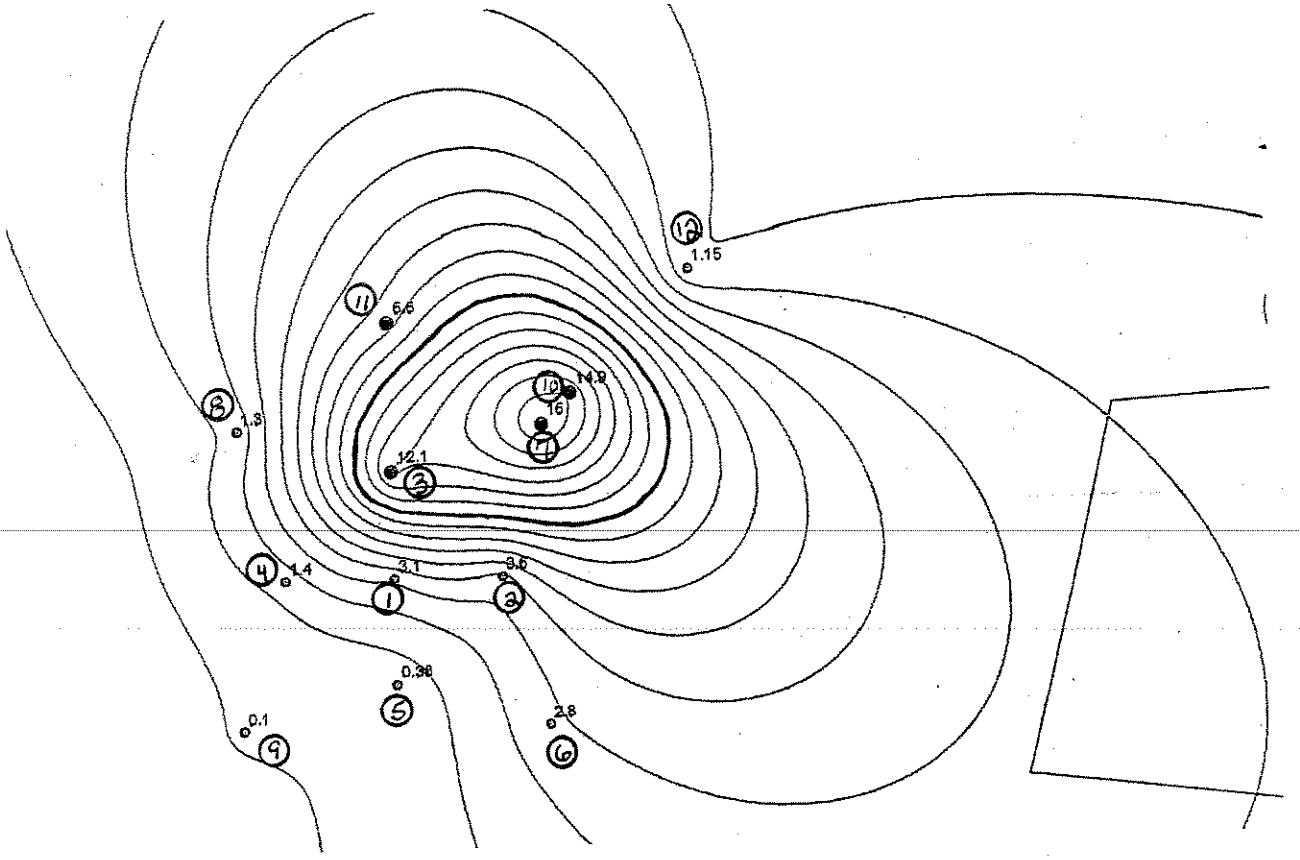


Figure 3. Excavation Area using 2.7 ppm Weighted Average to Represent HS06 in Site Lead UCL90 Calculation

01/16/07

HS06 Weighted Average Results

Concentration (ppm)	Area Inside (ft2)	Avg Conc. in area (ppm)	Area of Conc (ft2)	Area * Avg. Conc (ft2-ppm)	Total Area (ft2	Sum (ft2-ppm)	Wt Avg Conc. (ppm)
1	2416.439171	1.5	1050.43	1575.641783			
2	1366.011316	2.5	636.12	1590.302133			
3	729.890463	3.5	260.10	910.358344			
4	469.788079	4.5	133.89	602.5095495	2080.54	4678.811809	2.248842646
5	335.897068	5.5	84.12	462.665709	2164.66	5141.477518	2.375185968
6	251.77603	6.5	56.25	365.6502395	2220.92	5507.127757	2.479663894
7	195.522147	7.5	42.08	315.578895	2262.99	5822.706652	2.573009965
8	153.444961	8.5	34.19	290.6505385	2297.19	6113.357191	2.661234583
9	119.25078	9.5	27.13	257.7130645	2324.32	6371.070255	2.741051574
10	92.123089	10.5	24.33	255.471258	2348.65	6626.541513	2.821429709
11	67.792493	11.5	23.12	265.9294385	2371.77	6892.470952	2.906044057
12	44.668194	12.5	19.94	249.2226125	2391.71	7141.693564	2.986021378
13	24.730385	13.5	12.29	165.918186	2404.00	7307.61175	3.039773179
14	12.440149	14.5	8.40	121.786312	2412.40	7429.398062	3.079673347
15	4.041093	15.5	4.04	62.6369415	2416.44	7492.035004	3.100444279
UCL90 in Profile:	2.1 mg/L						
Target Level:	2.7 mg/L						

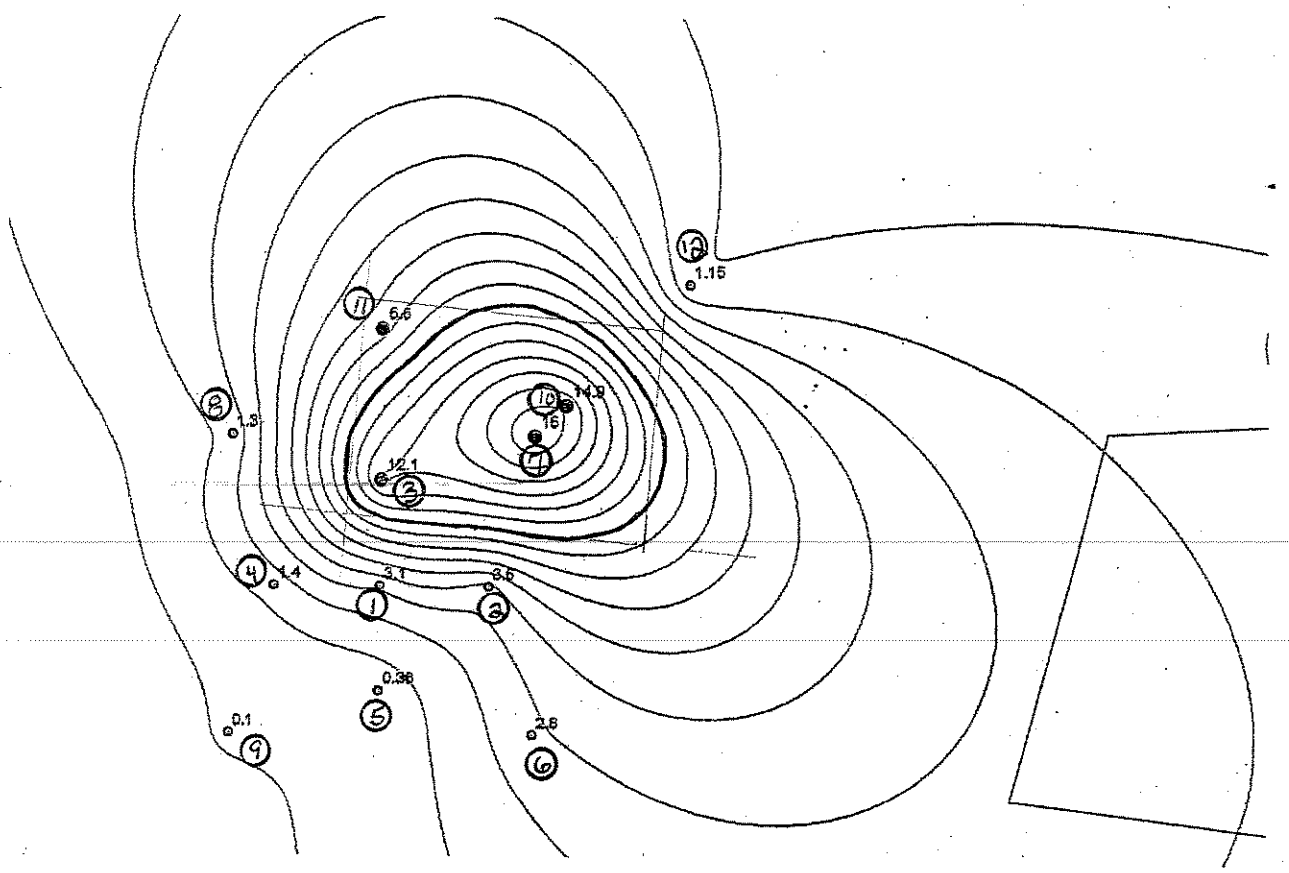


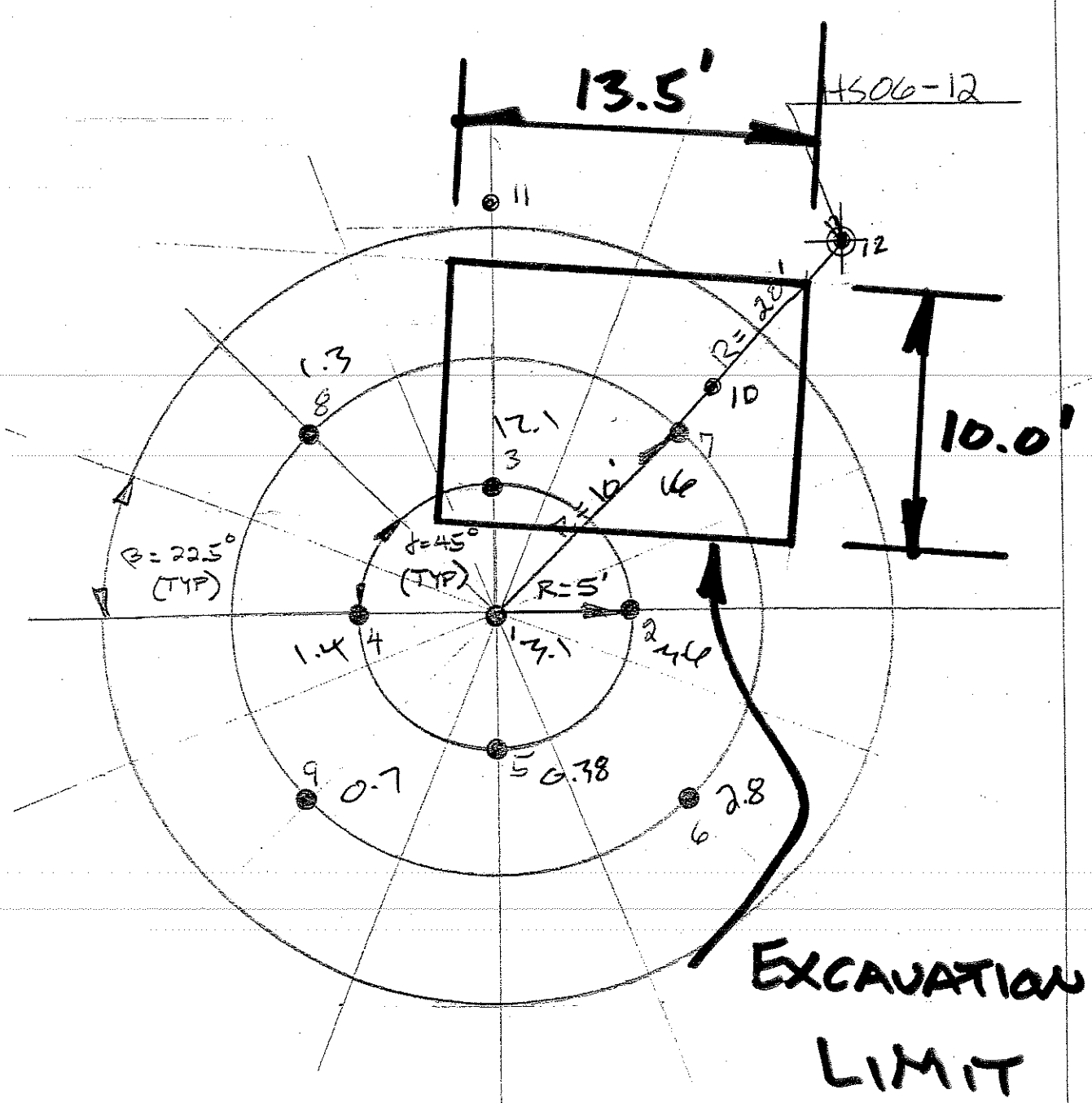
Figure 3. Excavation Area using 2.7 ppm Weighted Average to Represent HS06 in Site Lead UCL90 Calculation

USD

NO CHANGE IN EXCAVATION LIMITS. SEE ORIGINAL SUBMITTAL DATED 1/18/07

ADDITIONAL BOUNDING SAMPLES

HOT SPOT # 6



EXCAVATION LIMIT

SITE NORTH

LEGEND

- EXISTING SAMPLE
- NEW SAMPLE

Hotspot 08 Bounding

Estimates of weighted average lead concentrations based on HS08 samples were prepared using the previously described methodology:

-Determine the average concentration of the 15 hotspots so that the UCL90 for TCLP lead and TCLP cadmium for the whole site is approximately the same as reported in the profile (~2.1 ppm Pb, ~0.38 ppm cadmium). Based on recalculation of the UCL90 with the original sample results and 15 additional values inserted for the hotspots, a value of 2.7 ppm produces a UCL90 of ~2.1 ppm for lead and 0.60 ppm produces a UCL90 of ~0.38 ppm for cadmium (using nonparametric distribution, 90% Chebyshev (Mean, Sd) UCL for lead, approximate gamma UCL for cadmium).

-The resampling results for the hotspot (not including the original sample) were plotted and surface contours of concentration created by Kriging (software package Surfer, using default settings), with graduated contours generated. These contours were then imported into ArcGIS and overlaid on the original base map showing the hotspot. The area of each contour was then determined using toolsets in ArcGIS. For some contours, approximate area was defined since the original contour was exceedingly large; reducing the contour size would result in a more conservative calculation of the weighted average concentration.

-Once areas for each contour were determined, the average concentration in the contour (e.g., 1.5 ppm as the average between the 1 ppm and 2 ppm contour lines) was multiplied by the contour area (e.g, 1.5 ppm x 1 ppm contour area, 2.5 ppm as 2 ppm contour area, etc.). The resulting area times concentrations were then summed and divided by the sum of the contour area (0 through upper limit of concentration) to get the weighted average for the area. The resulting weighted average could be compared to the value (2.7 ppm or 0.60 ppm) necessary for meeting the UCL90 requirement in the original profile.

Samples HS08-10 and HS08-11 combined with the previous HS08 samples resulted in well-defined lead and cadmium contours generated by Kriging (see Figures 1 and 2). No estimates of the contour areas were necessary. The resulting calculation of weighted averages, shown in the spreadsheets HS8Pb Areas2.xls and HS8Cd Areas.xls, indicate a weighted average of 5.76 ppm for lead is possible if material inside the 20 ppm lead contours is excavated (see Figure 3); this would also satisfy the weighted average for cadmium (see Figures 4 and 5). The resulting UCL90 for lead for the site would be 2.2 ppm. Total excavation area would be 98.2 sq. ft.

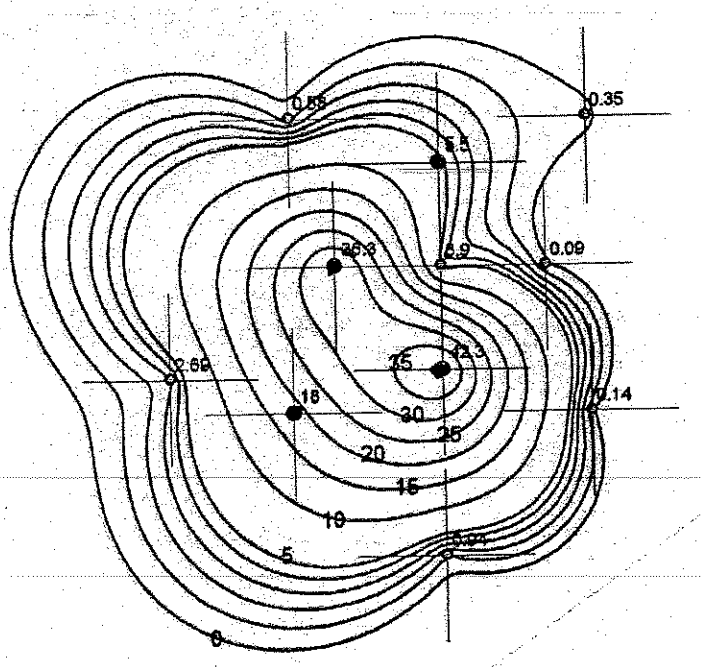


Figure 1. Contours for HS08 Generated by Kriging using Samples HS08-01 through HS08-11 for Lead

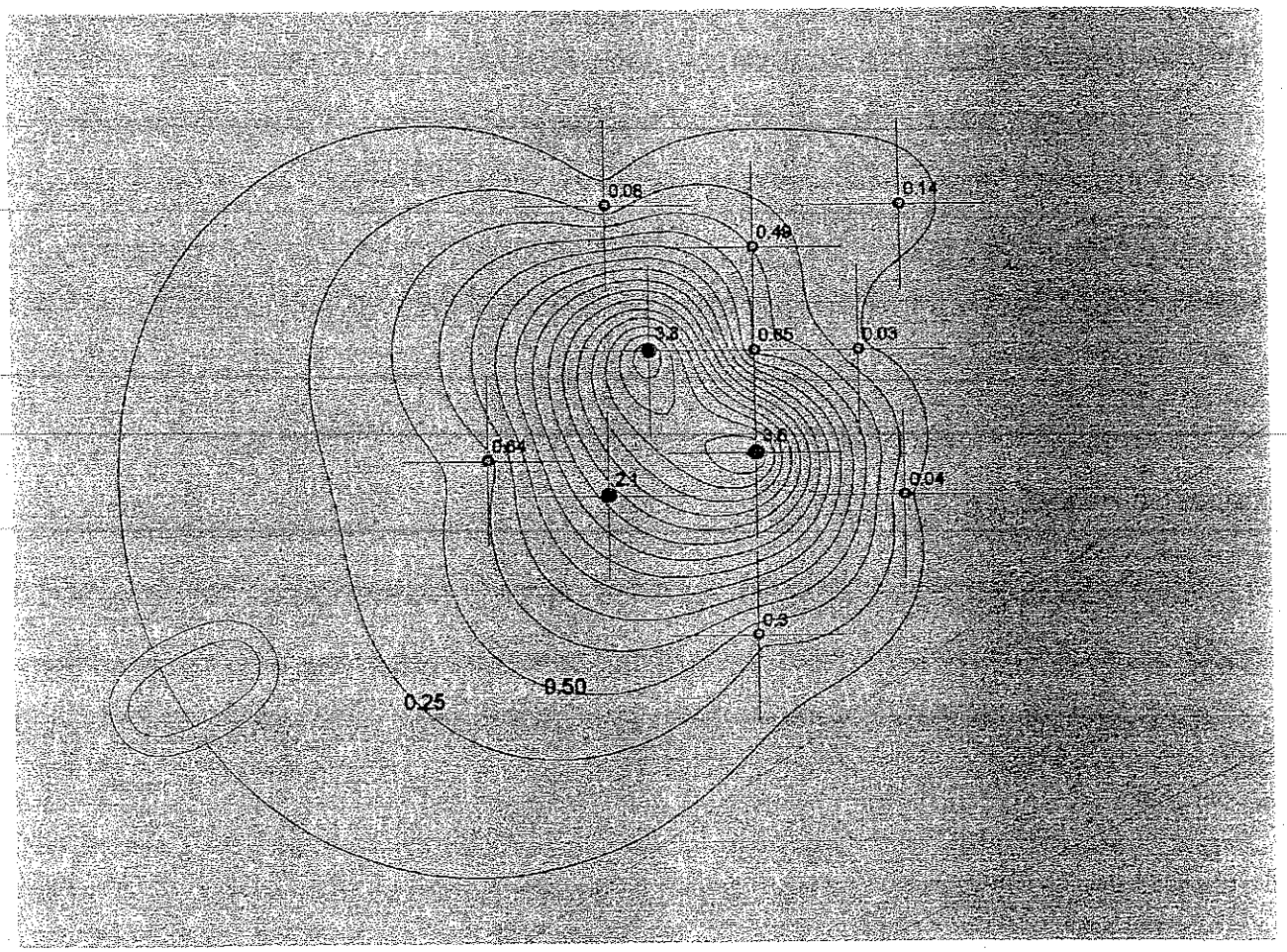


Figure 2. Contours for HS08 Generated by Kriging using Samples HS08-01 through HS08-11 for Cadmium

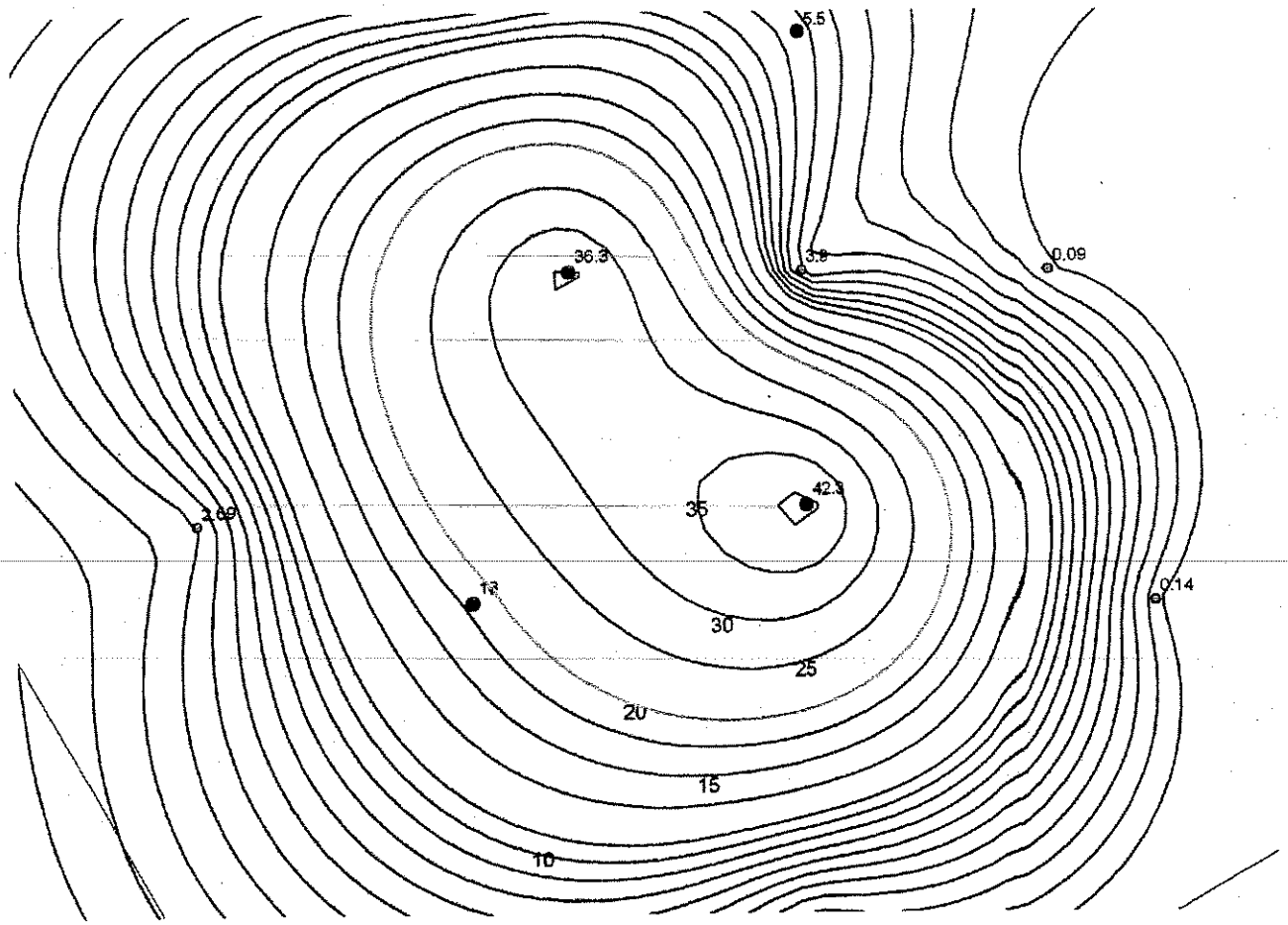


Figure 3. Excavation Area Resulting in Lead Weighted Average for 20 ppm Contour (5.76 ppm wt average)

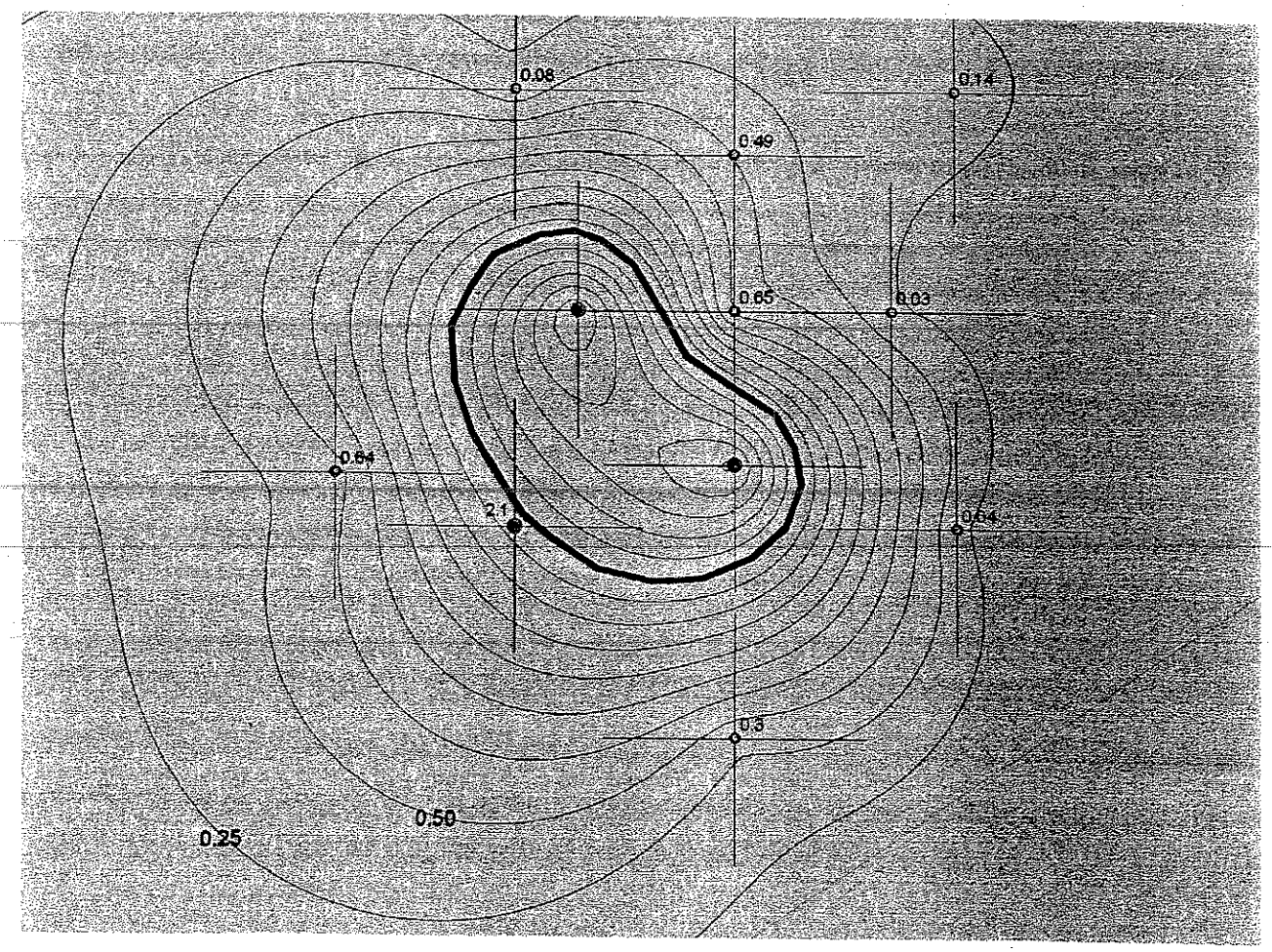


Figure 4. Excavation Area Resulting in Cadmium Weighted Average of <0.38 ppm

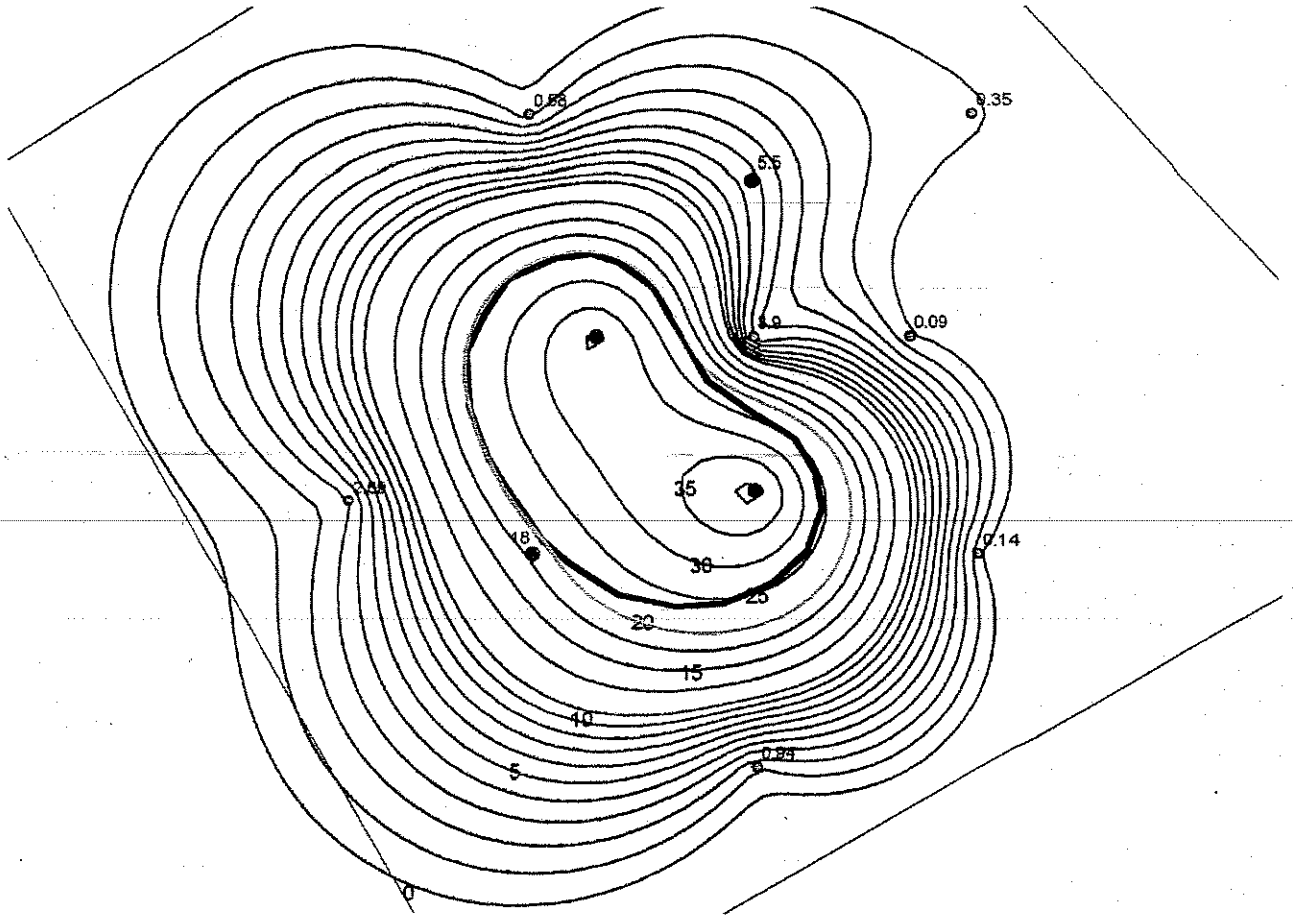


Figure 5. Excavation Area (outer line) Resulting in Lead Weighted Average 5.76 ppm Overlaid with Cadmium Excavation Area (inner line)

HS08 Weighted Average Results

Concentration (ppm)	Area Inside (ft2)	Avg Conc. in area (ppm)	Area of Conc (ft2)	Area * Avg. Conc (ft2-ppm)	Total Area (ft2)	Sum (ft2-ppm)	Wt Avg Conc. (ppm)
0	636.887792	0.5	107.14	53.567547			
1	529.752698	1.5	74.86	112.2932745			
2	454.890515	2.5	53.95	134.87943			
3	400.938743	3.5	43.42	151.9560035	279.37	452.696255	1.620446992
4	357.522742	4.5	34.90	157.033674	314.26	609.729929	1.940199739
5	322.62637	5.5	27.59	151.748168	341.85	761.478097	2.227508107
6	295.035794	6.5	24.72	160.661696	366.57	922.139793	2.515595523
7	270.31861	7.5	21.93	164.4790575	388.50	1086.618851	2.796961712
8	248.388069	8.5	19.11	162.452187	407.61	1249.071038	3.064364687
9	229.276047	9.5	18.54	176.158557	426.15	1425.229595	3.344394474
10	210.733041	12.5	35.09	438.6462875	461.25	1863.875882	4.040954387
12.5	175.641338	13.75	30.66	421.5528763	491.90	2285.428758	4.646078975
15	144.982947	16.25	24.52	398.4643325	516.43	2683.893091	5.197055357
17.5	120.462065	18.75	22.25	417.09975	538.67	3100.992841	5.756746827
20	98.216745	22.5	34.58	778.05432	573.25	3879.047161	6.766746847
25	63.636553	27.5	29.19	802.802	602.44	4681.849161	7.771425822
30	34.443753	32.5	27.80	903.48518	630.24	5585.334341	8.862183593
35	6.644209	37.5	6.31	236.760225	636.56	5822.094566	9.146223884
40	0.330603	41.25	0.33	13.63737375	636.89	5835.73194	9.16288868
42.5							
UCL90 in Profile:	2.1 mg/L	Pb					
Target Conc.	2.7 mg/L						

Include	HotSpot	evel_0_2	plicateH	PROJ_SAMPLE_ID	STA_NAME	ANA_TYPE	ANA_METHOD_ORI	MICAL_N	UNITS	RSLTQUAL	ALIDAT_Q	RESULTSET	FOT_LIM	detect
Y		Y		D1630DB037	DB-29-TRENCH 6	TCLPMET	EPA-ILM04.0	Lead	mg/L		=	2.21	0.14	Y
Y		Y		D1630DB022	DB-19-TRENCH3	TCLPMET	EPA-ILM04.0	Lead	mg/L		J	0.137	0.003	Y
Y		Y		D1630DB012	DB-11-1	TCLPMET	EPA-ILM04.0	Lead	mg/L	U	U	0.01395	0.0279	N
Y		Y		D1630DB017	DB-14	TCLPMET	EPA-ILM04.0	Lead	mg/L		J	0.0797	0.003	Y
Y		Y		D1630DB011	DB-10	TCLPMET	EPA-ILM04.0	Lead	mg/L		U	0.0279	0.003	N
Y		Y		D1630DB008	DB-07-TRENCH 5	TCLPMET	EPA-ILM04.0	Lead	mg/L		=	3.7	0.003	Y
Y		Y		D1630DB023	DB-19-TRENCH20	TCLPMET	EPA-ILM04.0	Lead	mg/L	U	U	0.0279	0.003	N
Y		Y		D1630DB018	DB-17	TCLPMET	EPA-ILM04.0	Lead	mg/L		J	0.266	0.003	Y
Y		Y		D1630DB030	DB-23-MS/D-T2	TCLPMET	EPA-ILM04.0	Lead	mg/L	U	U	0.07	0.14	N
Y		Y		D1630DB019	DB-18-CENTER	TCLPMET	EPA-ILM04.0	Lead	mg/L	U	UJ	0.01395	0.0279	N
Y		Y		D1630DB033	DB-25-TRENCH 2	TCLPMET	EPA-ILM04.0	Lead	mg/L		=	0.874	0.14	Y
Y		Y		D1630DB039	DB-30-TRENCH 3	TCLPMET	EPA-ILM04.0	Lead	mg/L	U	U	0.07	0.14	N
Y		Y		D1630DB046	DB-34-TRENCH 1	TCLPMET	SW846-6010	Lead	mg/L		J	3.91	0.0279	Y
Y		Y		D1630DB003	DB-04-TRENCH 3	TCLPMET	EPA-ILM04.0	Lead	mg/L		=	0.47	0.003	Y
Y		Y		D1630DB004	DB-04-TRENCH 2	TCLPMET	EPA-ILM04.0	Lead	mg/L		=	0.488	0.003	Y
Y		Y		D1630DB009	DB-08	TCLPMET	EPA-ILM04.0	Lead	mg/L		U	0.0279	0.003	N
Y		Y		D1630DB026	DB-19-TRENCH28	TCLPMET	EPA-ILM04.0	Lead	mg/L		J	0.817	0.003	Y
Y		Y		D1630DB007	DB-13-TRENCH 1	TCLPMET	EPA-ILM04.0	Lead	mg/L		J	0.197	0.003	Y
Y		Y		D1630DB032	DB-24-TRENCH 2	TCLPMET	EPA-ILM04.0	Lead	mg/L		=	1.79	0.14	Y
Y		Y		D1630DB014	DB-12	TCLPMET	EPA-ILM04.0	Lead	mg/L		J	0.578	0.003	Y
Y		Y		D1630DB020	DB-19-TRENCH4	TCLPMET	EPA-ILM04.0	Lead	mg/L		J	1.74	0.003	Y
Y		Y		D1630DB047	DB-35-TRENCH 6	TCLPMET	SW846-6010	Lead	mg/L		J	0.403	0.0279	Y
Y		Y		D1630DB031	DB-24-TRENCH 1	TCLPMET	EPA-ILM04.0	Lead	mg/L	U	U	0.07	0.14	N
Y		Y		D1630DB025	DB-19-TRENCH22	TCLPMET	EPA-ILM04.0	Lead	mg/L		J	1.87	0.003	Y
Y		Y		D1630DB006	DB-06-TRENCH 1	TCLPMET	EPA-ILM04.0	Lead	mg/L		J	0.327	0.003	Y
Y		Y		D1630DB013	DB-11-2	TCLPMET	EPA-ILM04.0	Lead	mg/L		=	0.249	0.003	Y
Y	YL	Y		D1630DB010	DB-09	TCLPMET	EPA-ILM04.0	Lead	mg/L		=	19.1	0.003	Y
Y	YL	Y		D1630DB005	DB-05	TCLPMET	EPA-ILM04.0	Lead	mg/L		J	7.67	0.003	Y
Y	YL	Y		D1630DB034	DB-26-TRENCH 1	TCLPMET	EPA-ILM04.0	Lead	mg/L		=	11.2	0.14	Y
Y	YL	Y		D1630DB024	DB-19-TRENCH23	TCLPMET	EPA-ILM04.0	Lead	mg/L		=	9.17	0.003	Y
Y	YL	Y		D1630DB042	DB-31-TRENCH 12	TCLPMET	SW846-6010	Lead	mg/L		J	6.77	0.0279	Y
Y	YL	Y	Y	D1630DB043	DB-32-TRENCH 2	TCLPMET	SW846-6010	Lead	mg/L		J	12.7	0.0279	Y
Y	YL	Y		D1630DB045	DB-33-TRENCH 8	TCLPMET	SW846-6010	Lead	mg/L		J	7.22	0.0279	Y
YLate	YL	Y		D1630DB027	DB-20-TRENCH 4	TCLPMET	EPA-ILM04.0	Lead	mg/L		J	2.36	0.003	Y
Y	YL	Y		D1630DB036	DB-28-TRENCH 1	TCLPMET	EPA-ILM04.0	Lead	mg/L		=	56.6	0.14	Y
Y	YL	Y		D1630DB040	DB-31-TRENCH 8	TCLPMET	SW846-6010	Lead	mg/L		J	10.4	0.0279	Y
Y	YL	Y		D1630DB035	DB-27	TCLPMET	EPA-ILM04.0	Lead	mg/L		=	22.4	0.14	Y
Y	YL	Y		D1630DB021	DB-19-TRENCH11	TCLPMET	EPA-ILM04.0	Lead	mg/L		J	12	0.003	Y
Y	YL	Y		D1630DB038	DB-29-TRENCH 10	TCLPMET	EPA-ILM04.0	Lead	mg/L		=	8.97	0.14	Y
Y	YL	Y		D1630DB041	DB-31-TRENCH 10	TCLPMET	SW846-6010	Lead	mg/L		J	13.9	0.0279	Y
Y	YL	Y		D1630DB044	DB-33-TRENCH 3	TCLPMET	SW846-6010	Lead	mg/L		J	668	0.279	Y

UCL90 in Profile 2.0336

Raw Statistics	
Number of Valid Samples	41
Number of Unique Sample	30
Minimum	0.014
Maximum	5.76

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.848236
Shapiro-Wilk 5% Critical Value	0.941
Data not normal at 5% significance level	

Mean	1.4784
Median	0.817
Standard Deviation	1.4992
Variance	2.2477
Coefficient of Variation	1.0141
Skewness	0.8131

Gamma Statistics

k hat	0.6115
k star (bias corrected)	0.5831
Theta hat	2.4175
Theta star	2.5356
nu hat	50.147
nu star	47.811
Approx.Chi Square Value(	35.783
Adjusted Level of Significa	0.0936
Adjusted Chi Square Valu	35.482

Log-transformed Statistics

Minimum of log data	-4.272
Maximum of log data	1.7509
Mean of log data	-0.617
Standard Deviation of log	1.814
Variance of log data	3.2905

NO RECOMMENDATION AVAI

Select 95% Confidence Coeffici

90% UCL (Assuming Normal Distribution)

Student's-t UCL	1.783509

Gamma Distribution Test

A-D Test Statistic	1.340112
A-D 5% Critical Value	0.802489
K-S Test Statistic	0.174734
K-S 5% Critical Value	0.144771

Data do not follow gamma distribution
at 5% significance level

90% UCLs (Assuming Gamma Distribution)

Approximate Gamma UCL	1.975319
Adjusted Gamma UCL	1.992129

Lognormal Distribution Test

Shapiro-Wilk Test Statisitic	0.883841
Shapiro-Wilk 5% Critical Value	0.941

Data not lognormal at 5% significance level

90% UCLs (Assuming Lognormal Distribution)

90% H-UCL	5.792509
90% Chebyshev (MVUE) UCL	5.521805
95% Chebyshev (MVUE) UCL	6.872052
97.5% Chebyshev (MVUE) UCL	8.746143
99% Chebyshev (MVUE) UCL	12.42743

90% Non-parametric UCLs

CLT UCL	1.778469
Adj-CLT UCL (Adjusted for skewness)	1.799701
Mod-t UCL (Adjusted for skewness)	1.788464
Jackknife UCL	1.783509
Standard Bootstrap UCL	1.77678
Bootstrap-t UCL	1.816209
Hall's Bootstrap UCL	1.812584
Percentile Bootstrap UCL	1.784182
BCA Bootstrap UCL	1.778506
90% Chebyshev (Mean, Sd) UCL	**2.180828**
95% Chebyshev (Mean, Sd) UCL	2.499002
97.5% Chebyshev (Mean, Sd) UCL	2.940615
99% Chebyshev (Mean, Sd) UCL	3.808078

STRT_LE	END_LE	SPLANE_EAST_FT	SPLANE_NORTH_FT	RESULTS
1	2	2581097.015	582571.8092	2.21
0	2	2581520.014	581750.812	0.137
1	2	2581731.005	581959.8015	0.01395
0	2	2581765.027	582582.8	0.0797
1	2.5	2581712.009	582055.7988	0.0279
0	1	2581689.01	582107.8001	3.7
0	6	2581551.018	581640.8055	0.0279
0	2	2581785.007	581819.8081	0.266
0	3	2581180.02	582005.7989	0.07
0	2	2581771.031	581797.8265	0.01395
0	1	2581075.034	582161.8027	0.874
0	2	2581000.034	581987.8199	0.07
0	1	2580877.002	582127.8132	3.91
0	2	2581377.002	582183.8172	0.47
0	2	2581358.006	582201.7962	0.488
0	1	2581822.015	582179.8145	0.0279
0	2	2581328.019	581538.8042	0.817
0	2	2581655.02	582078.7975	0.197
0	2	2581253.019	582058.8172	1.79
1	3	2581640.027	582002.8133	0.578
0	2	2581527.002	581846.8094	1.74
0	2	2580833.006	582257.8001	0.403
0	2	2581209.023	582031.8159	0.07
0	2	2581433.006	581575.8121	1.87
0	2	2581565.027	582000.812	0.327
1	2	2581715.027	581986.8028	0.249
0	1	2581807.022	582114.8211	4.23
0	0.5	2581434.023	582201.7962	0.0633
0	3	2581060.007	582162.8198	0.254
0	2	2581544.03	581604.8147	2.12
0	2	2580928.019	581972.8264	3.46
0	2	2580850.034	581712.8199	2.76
0	2	2580806.005	582033.8172	5.76
0	2	2581224.016	581260.8188	2.64
1	2	2581163.026	582307.8001	2.7
0	2	2580878.019	581965.8054	2.7
0	2	2581191.011	582261.8027	2.7
0	2	2581488.026	581523.8108	2.7
1	2	2581101.018	582634.8013	2.7
0	2	2580869.03	581947.8264	2.7
0	2	2580673.032	581942.8067	2.7

HS04	wt avg
HS03	UCL90
HS09	UCL90
HS02	wt avg
HS01	wt avg
HS07	wt avg
HS08	wt avg
HS06	wt avg

other HS
5
10
11
12
13
14

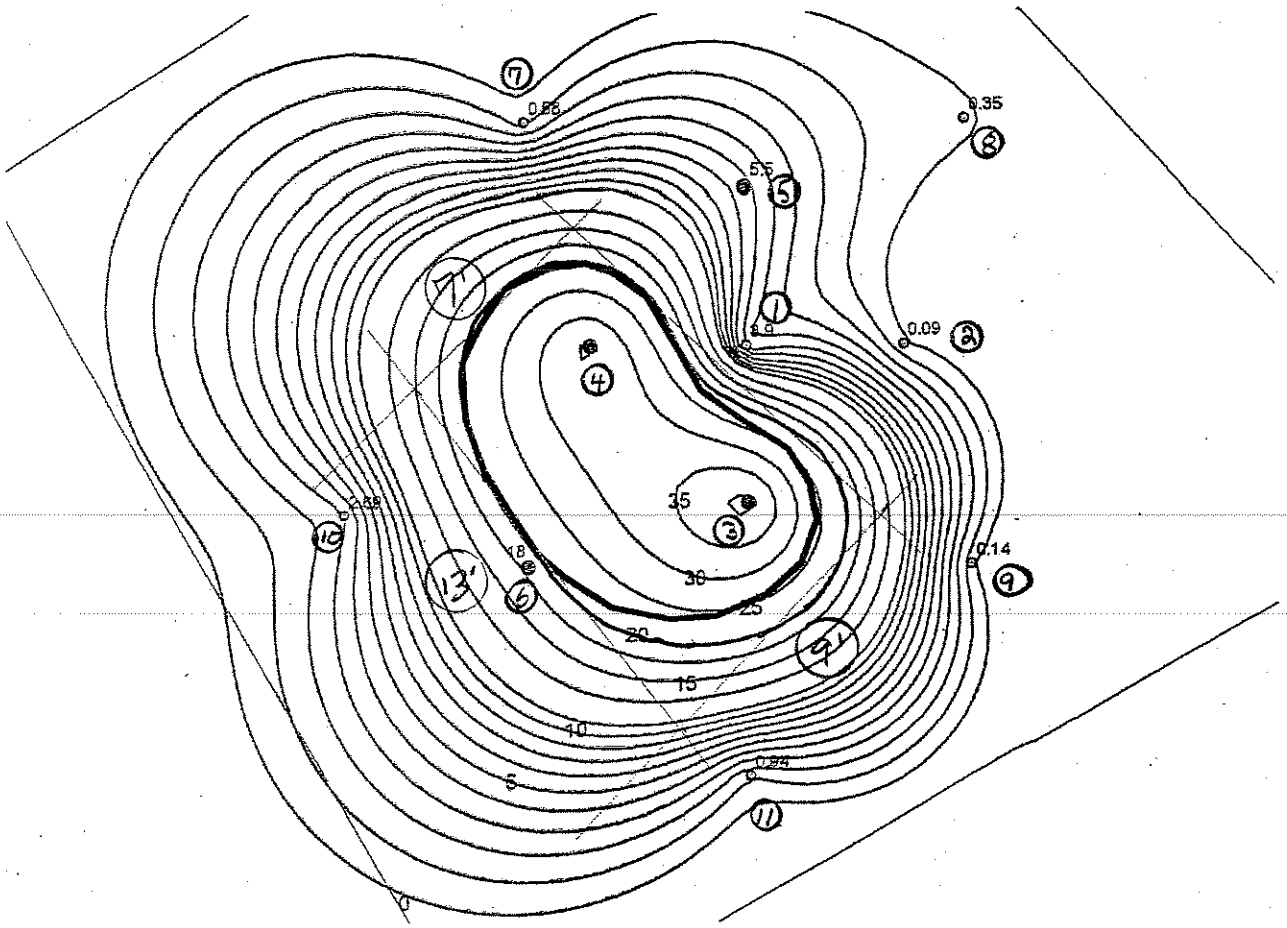


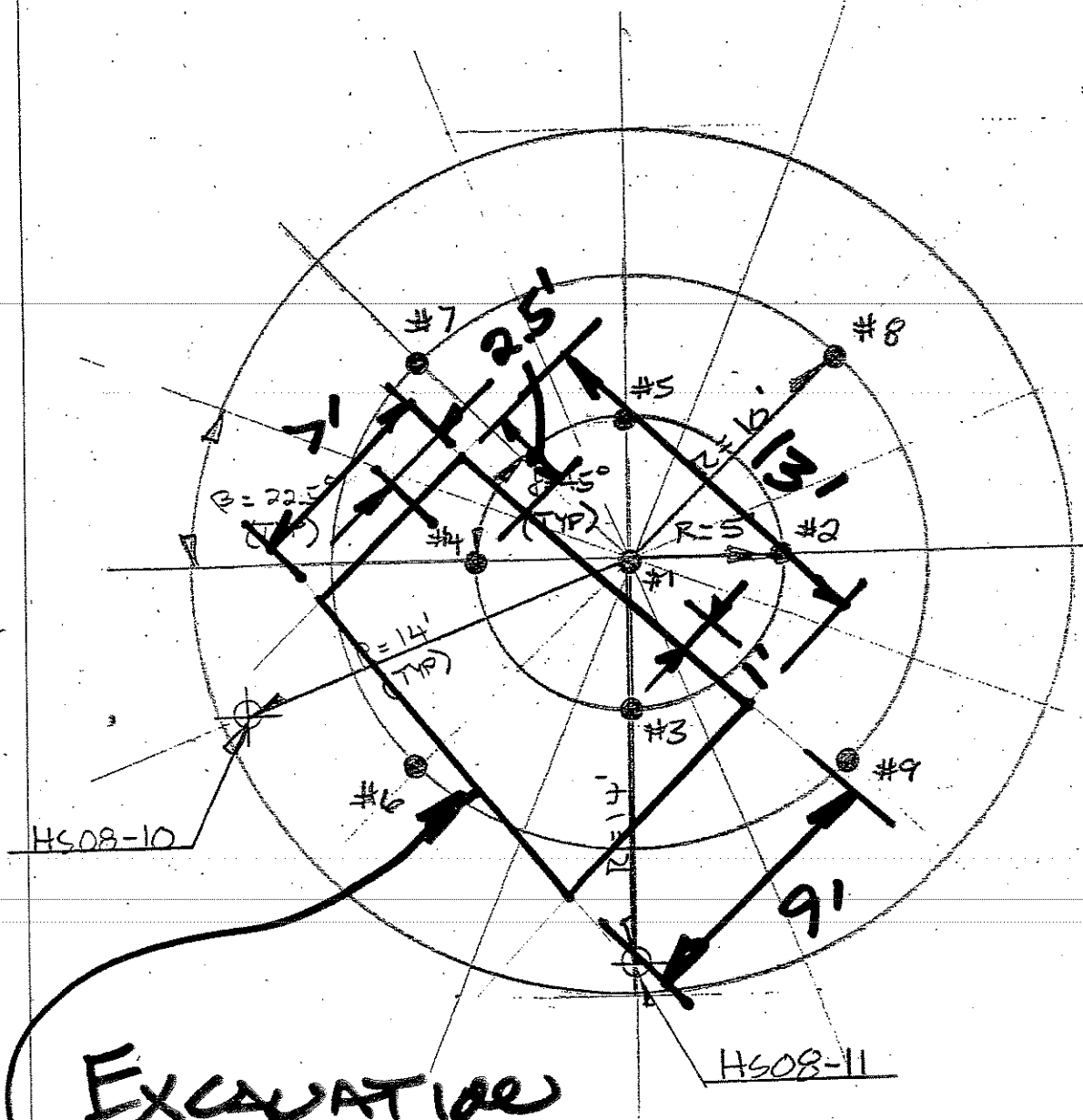
Figure 5. Excavation Area (outer line) Resulting in Lead Weighted Average 5.76 ppm Overlaid with Cadmium Excavation Area (inner line)

$A \approx (7')(13') + (1/2)(2')(13') = 91 FT^2 + 13 FT^2$

$\approx 104 FT^2$

ADDITIONAL BOREHOLE SAMPLES

HOT SPOT # 8 (TCLP LEAD/CADMIUM ONLY)



EXCAVATION LIMITS

SITE NORTH

LEGEND:

- EXISTING SAMPLE
- NEW SAMPLE

Hotspots 10 and 11 Bounding for Excavation

Estimates of lead and cadmium (as applicable) concentration distributions have been prepared for DWI1630 site hotspots HS-01, HS-02, HS-04, HS06, HS-07, and HS-08 based on a previously described methodology (see earlier reports for each hotspot).

Since hotspots HS-10 and HS-11 were located closely together at the site, single excavation bounding limits for these have been established. The following methodology was used for bounding:

-Sampling results for the hotspots (not including the original sample failure from RI/FS sampling) were plotted and surface contours of concentration created by Kriging (software package Surfer, using default settings, linear calculation of contours). The area of each concentration contour was then determined using toolsets in Surfer and ArcGIS, and the concentration contours overlaid onto the site map showing sampling points using ArcGIS.

-Once areas for each contour were determined, the average concentration in the contour (e.g., 1.5 ppm as the average between the 1 ppm and 2 ppm contour lines) was multiplied by the contour area (e.g, 1.5 ppm x 1 ppm contour area, 2.5 ppm as 2 ppm contour area, etc.). The resulting areas multiplied by concentrations were then summed and divided by the sum of the contour areas up to that particular contour to get the weighted average concentration up to and including that contour.

-The excavation limits were determined as the most restrictive of:

- -the contour that allowed a maximum weighted concentration left at the hotspot after excavation equal to the TCLP characteristic limit (5 mg/L for lead or 1 mg/L for cadmium); or,
- -the contour that was 2.5 times the characteristic limit (12.5 mg/L for lead, 2.5 mg/L for cadmium).

-The separate excavation limits for lead and cadmium using the above criteria were plotted using ArcGIS. An overall excavation boundary encompassing the individual lead and cadmium excavation limit areas was then drawn.

Samples for HS-10 and HS-11 resulted in well-defined lead and cadmium contours generated by Kriging (see Figures 1 and 2). The resulting calculation of weighted averages are shown in the spreadsheets HS10-11Pb AreasF.xls and HS10-11Cd AreasF.xls, indicating excavating the 12.5 mg/L contour for lead and the 2.5 mg/L contour for cadmium are needed to satisfy the above criteria. Figures 3 and 4 show the individual excavation limits and overall excavation boundary necessary, along with sampling results for lead and cadmium, respectively. The proposed excavation boundary area consists of approximately 1,664 ft^2.

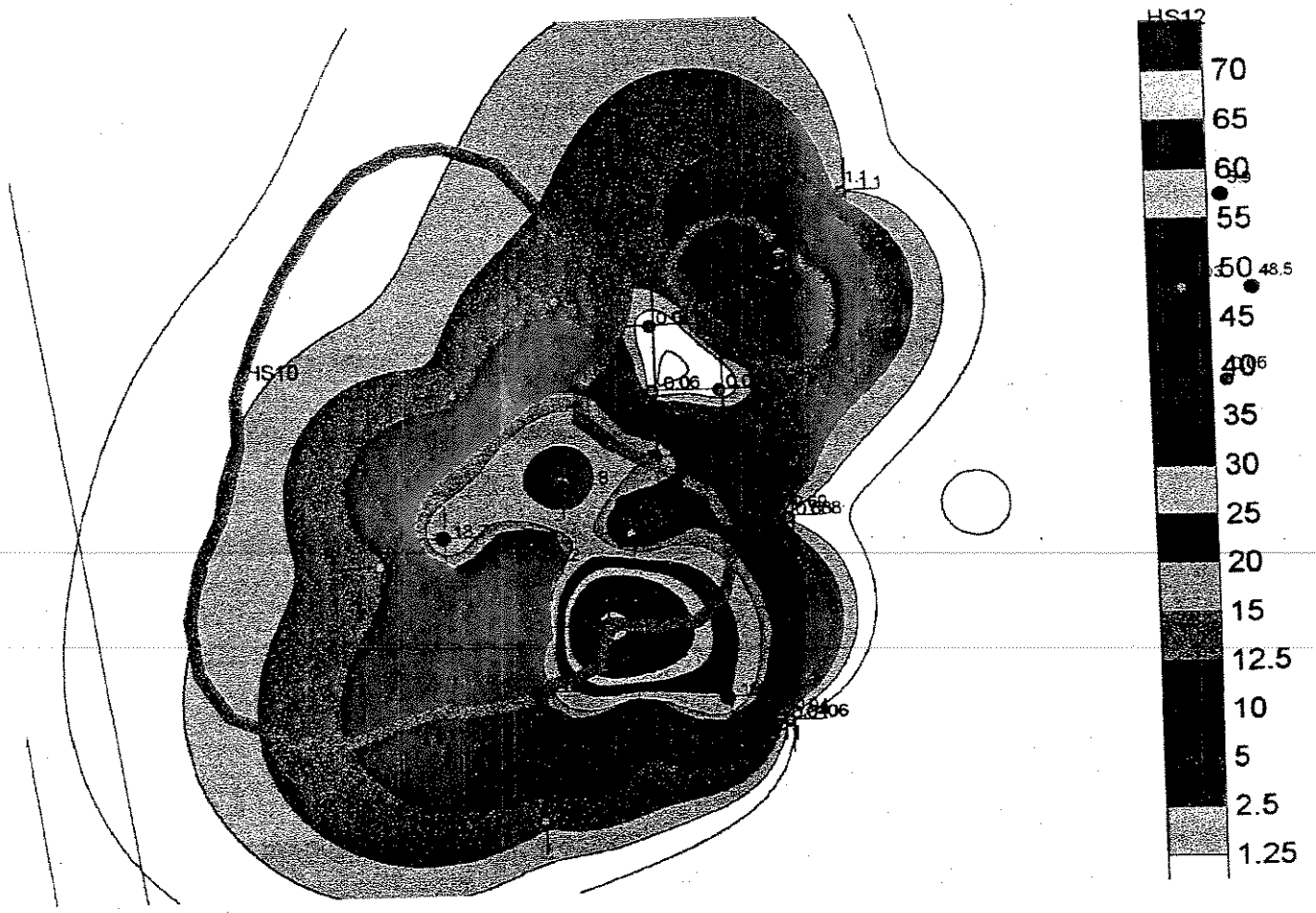


Figure 1. HS10-11 Lead Concentration Contours

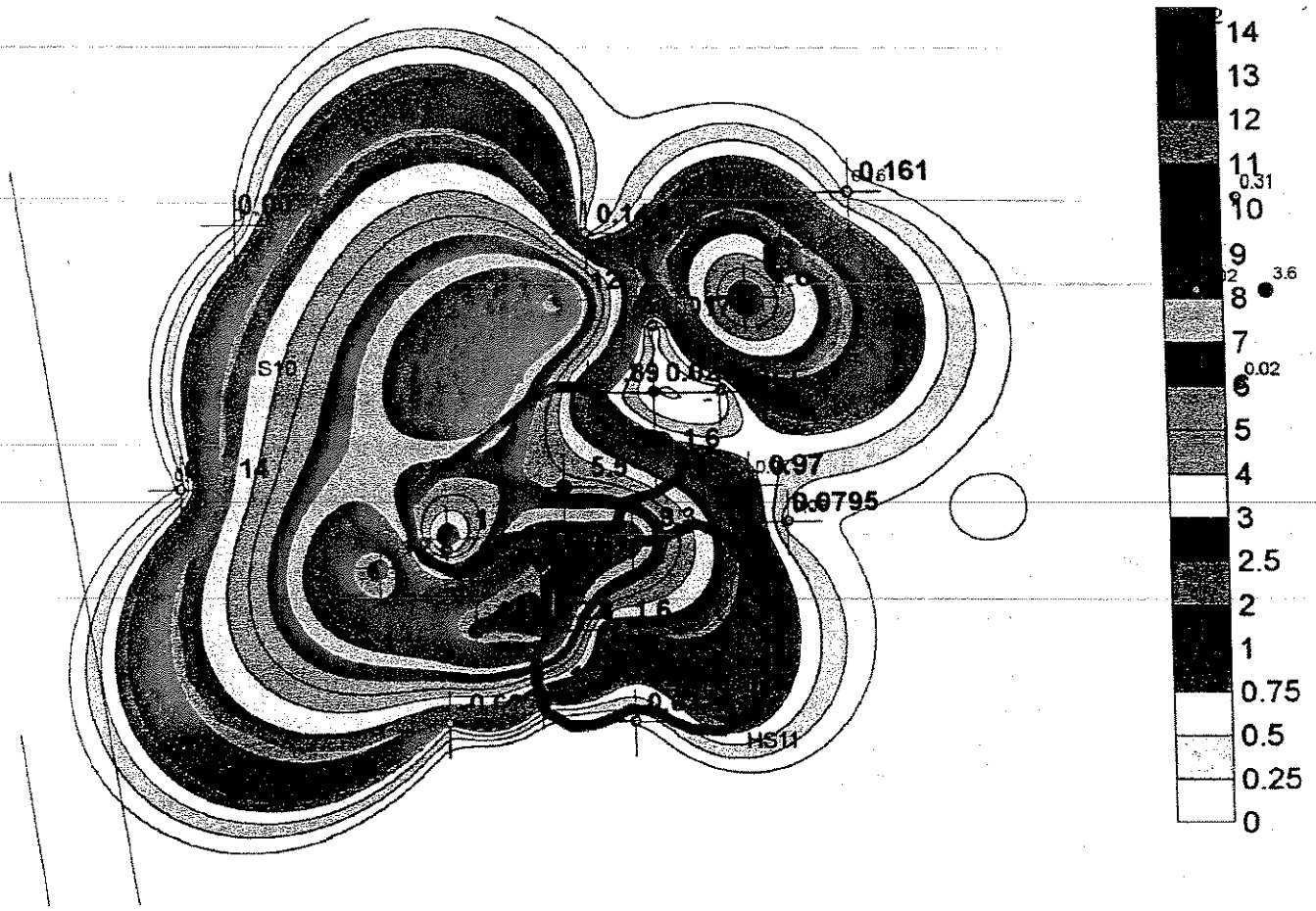


Figure 2. HS10-11 Cadmium Concentration Contours

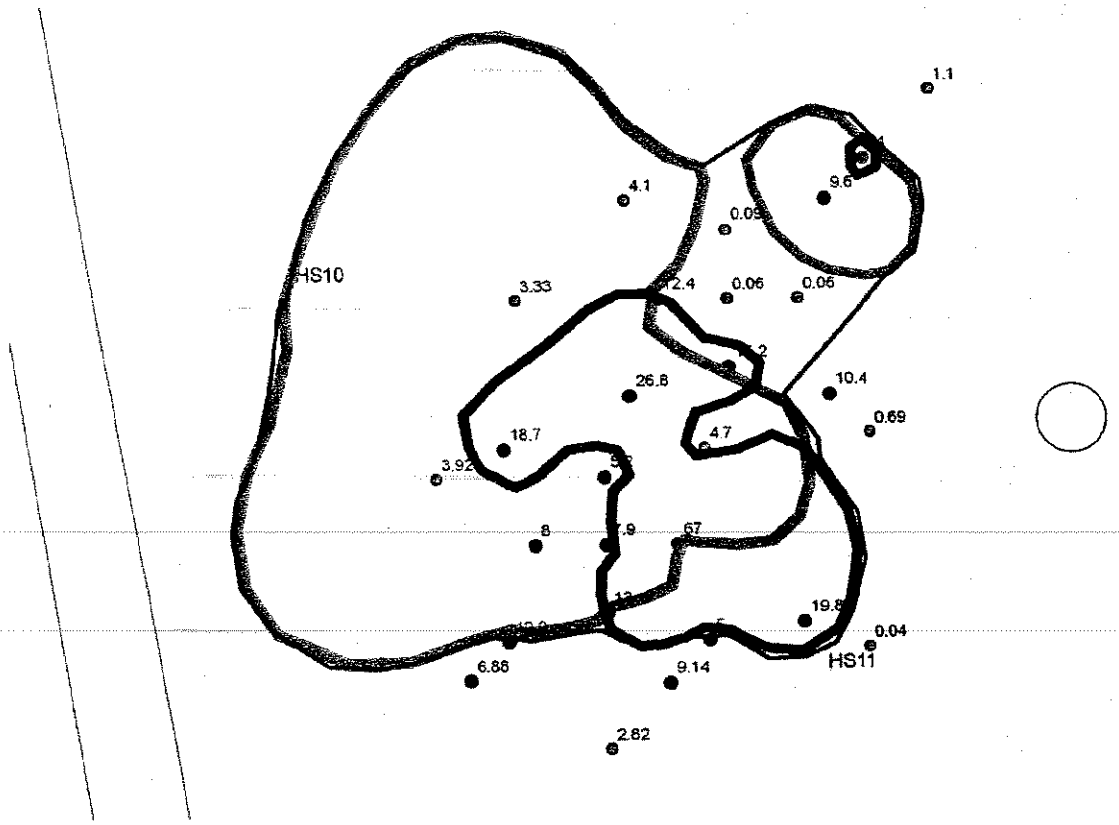


Figure 3. HS10-11 Lead (black outline) Bounding Limits, Cadmium (green outline) Limits, and Overall Excavation Bounding Limits (red outline) with Hotspot Lead Data

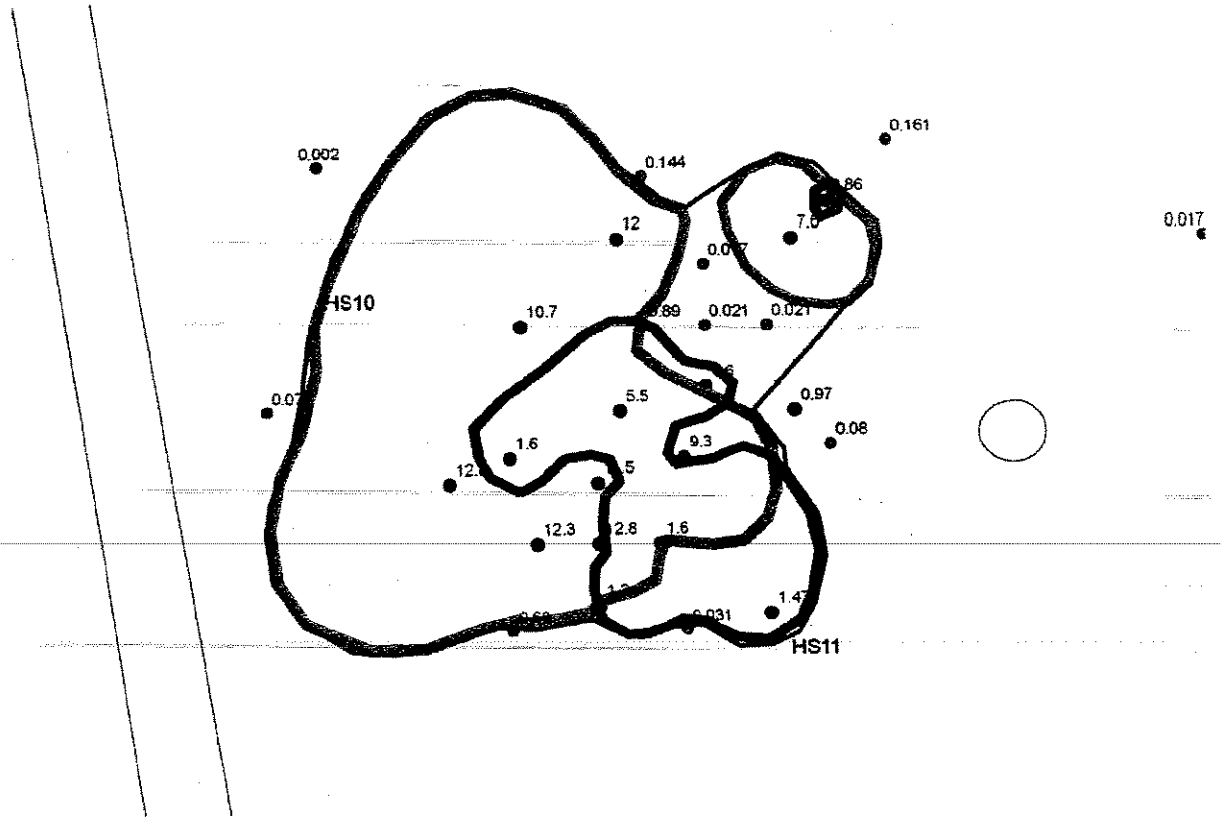
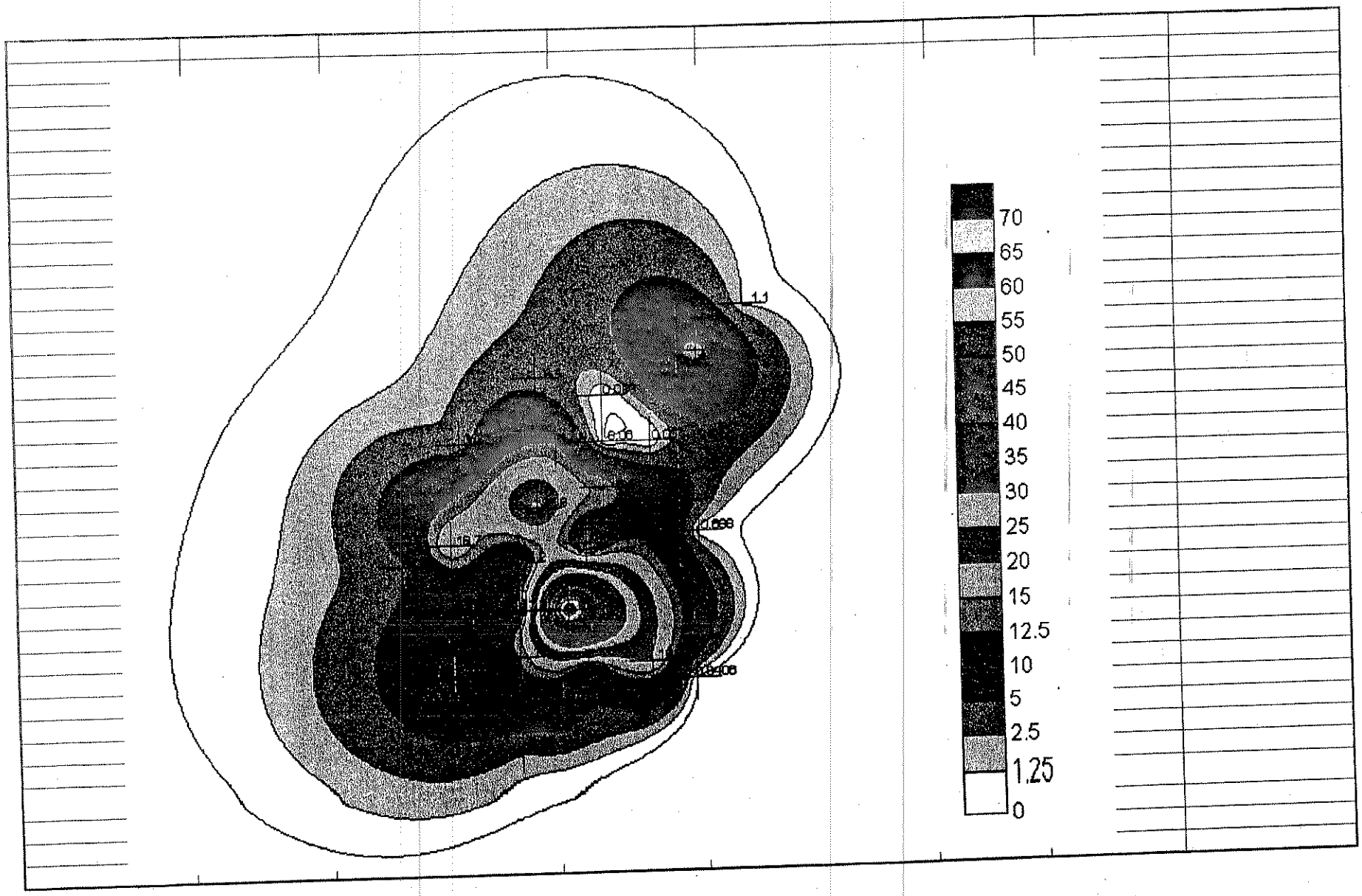


Figure 4. HS10-11 Lead (black outline) Bounding Limits, Cadmium (green outline) Limits, and Overall Excavation Bounding Limits (red outline) with Hotspot Cadmium Data

HS10-11 Weighted Average Results

Concentration (ppm)	Area Inside (ft2)	Avg Conc. in area (ppm)	Area of Conc (ft2)	Area * Avg. Conc (ft2-ppm)	Total Area (ft2)	Sum (ft2-ppm)	Wt Avg Conc. (ppm)
0	4030.16	0.625	1390.14	868.8382014	1390.14	868.8382014	0.625
1.25	2640.02	1.875	726.56	1362.293492	2116.70	2231.13	1.054062536
2.5	1913.46	3.75	762.32	2858.705002	2879.02	5089.84	1.76790661
5	1151.14	7.5	593.71	4452.822258	3472.73	9542.658954	2.74788502
10	557.43	11.25	182.89	2057.496645	3655.62	11600.1556	3.173241325
12.5	374.54	13.75	99.26	1364.860809	3754.88	12965.02	3.452844578
15	275.28	17.5	133.00	2327.465655	3887.88	15292.48206	3.933375133
20	142.28	22.5	57.91	1302.881117	3945.78	16595.36318	4.205847185
25	84.37	27.5	27.31	750.9044029	3973.09	17346.26758	4.365939524
30	57.07	32.5	18.39	597.6881241	3991.48	17943.95571	4.495564819
35	38.68	37.5	13.30	498.5959944	4004.78	18442.5517	4.605139859
40	25.38	42.5	9.68	411.2268303	4014.45	18853.77853	4.69647683
45	15.70	47.5	6.90	327.866566	4021.35	19181.65	4.769946948
50	8.80	52.5	4.68	245.5507324	4026.03	19427.20	4.825396331
55	4.13	57.5	2.82	162.3801753	4028.86	19589.58	4.862318294
60	1.30	62.5	1.28	79.8400519	4030.13	19669.42	4.880587849
65	0.02	67.5	0.02	1.596016184	4030.16	19671.01	4.880955233
70							

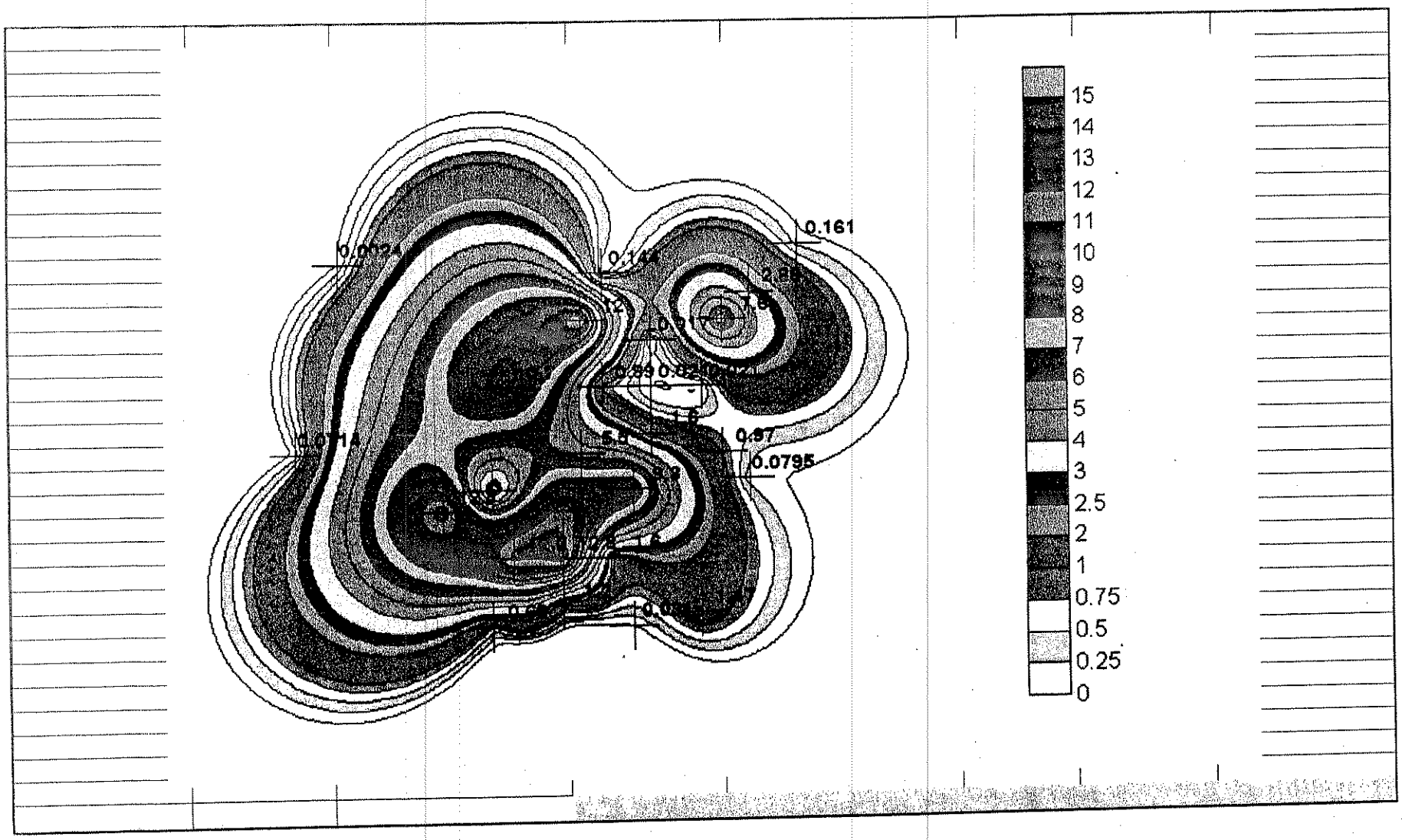
HS10-11 Weighted Average Results



HS10-11 Weighted Average Results

Concentration (ppm)	Area Inside (ft2)	Avg Conc. in area (ppm)	Area of Conc (ft2)	Area * Avg. Conc (ft2-ppm)	Total Area (ft	Sum (ft2-ppm)	Wt Avg Conc. (ppm)
0	3041.101121	0.125	363.55	45.44399304			
0.25	2677.549176	0.375	270.90	101.5858058			
0.5	2406.653694	0.625	227.47	142.1690578			
0.75	2179.183201	0.875	183.44	160.5059914	1045.35	449.7048481	0.430194109
1	1995.747783	1.5	513.82	770.724612	1559.17	1220.42946	0.782743164
2	1481.931375	2.25	168.77	379.7417165	1727.94	1600.171177	0.926055082
2.5	1313.157279	2.75	134.96	371.1371273	1862.90	1971.308304	1.058191714
3	1178.198323	3.5	213.35	746.7365796	2076.26	2718.044884	1.309108677
4	964.8450147	4.5	174.30	784.3370689	2250.55	3502.381952	1.556231553
5	790.5478883	5.5	160.78	884.3048583	2411.34	4386.686811	1.819193564
6	629.7651868	6.5	157.83	1025.874621	2569.16	5412.561431	2.106741322
7	471.938322	7.5	148.26	1111.949193	2717.42	6524.510624	2.400992178
8	323.6784297	8.5	116.48	990.0554422	2833.90	7514.566066	2.65166964
9	207.2013188	9.5	105.75	1004.617615	2939.65	8519.183681	2.898027489
10	101.4520962	10.5	58.97	619.1838526	2998.62	9138.367534	3.047525475
11	42.48220546	11.5	29.60	340.4260021	3028.22	9478.793536	3.130152319
12	12.87994441	12.5	12.88	160.9993052	3041.10	9639.792841	3.169836339
13							

HS10-11 Weighted Average Results



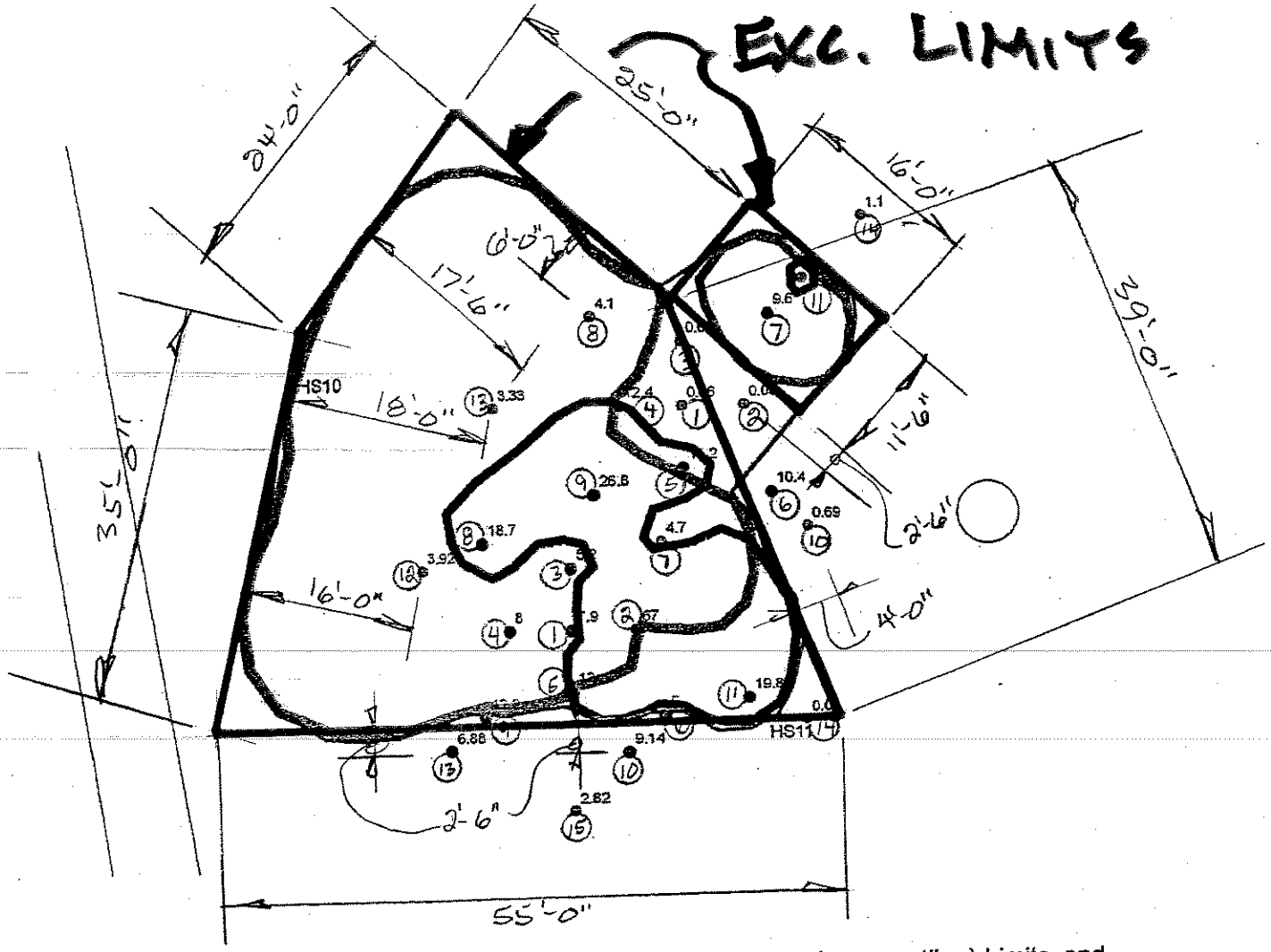


Figure 3. HS10-11 Lead (black outline) Bounding Limits, Cadmium (green outline) Limits, and Overall Excavation Bounding Limits (red outline) with Hotspot Lead Data

Hotspot 12 Bounding for Excavation

Estimates of lead and cadmium (as applicable) concentration distributions have been prepared for DWI1630 site hotspots HS-01, HS-02, HS-04, HS06, HS-07, and HS-08 based on a previously described methodology (see earlier reports for each hotspot).

The following methodology was used for bounding HS-12:

-Sampling results for the hotspot (not including the original sample failure from RI/FS sampling) were plotted and surface contours of concentration created by Kriging (software package Surfer, using default settings, linear calculation of contours). The area of each concentration contour was then determined using toolsets in Surfer and ArcGIS, and the concentration contours overlaid onto the site map showing sampling points using ArcGIS.

-Once areas for each contour were determined, the average concentration in the contour (e.g., 1.5 ppm as the average between the 1 ppm and 2 ppm contour lines) was multiplied by the contour area (e.g, 1.5 ppm x 1 ppm contour area, 2.5 ppm as 2 ppm contour area, etc.). The resulting areas multiplied by concentrations were then summed and divided by the sum of the contour areas up to that particular contour to get the weighted average concentration up to and including that contour.

-The excavation limits were determined as the most restrictive of:
  -the contour that allowed a maximum weighted concentration left at the hotspot after excavation equal to the TCLP characteristic limit (5 mg/L for lead or 1 mg/L for cadmium); or,
  -the contour that was 2.5 times the characteristic limit (12.5 mg/L for lead, 2.5 mg/L for cadmium).

-The separate excavation limits for lead and cadmium using the above criteria were plotted using ArcGIS. An overall excavation boundary encompassing the individual lead and cadmium excavation limit areas was then drawn.

Samples for HS-12 resulted in well-defined lead and cadmium contours generated by Kriging (see Figures 1 and 2). The resulting calculation of weighted averages are shown in the spreadsheets HS12cPb Areas.xls and HS12cCd Areas.xls, indicating excavating the 12.5 mg/L contour for lead and the 2.5 mg/L contour for cadmium are needed to satisfy the above criteria. Figures 3 and 4 show the individual excavation limits and overall excavation boundary necessary, along with sampling results for lead and cadmium, respectively. The proposed excavation boundary area consists of approximately 123 ft^2.

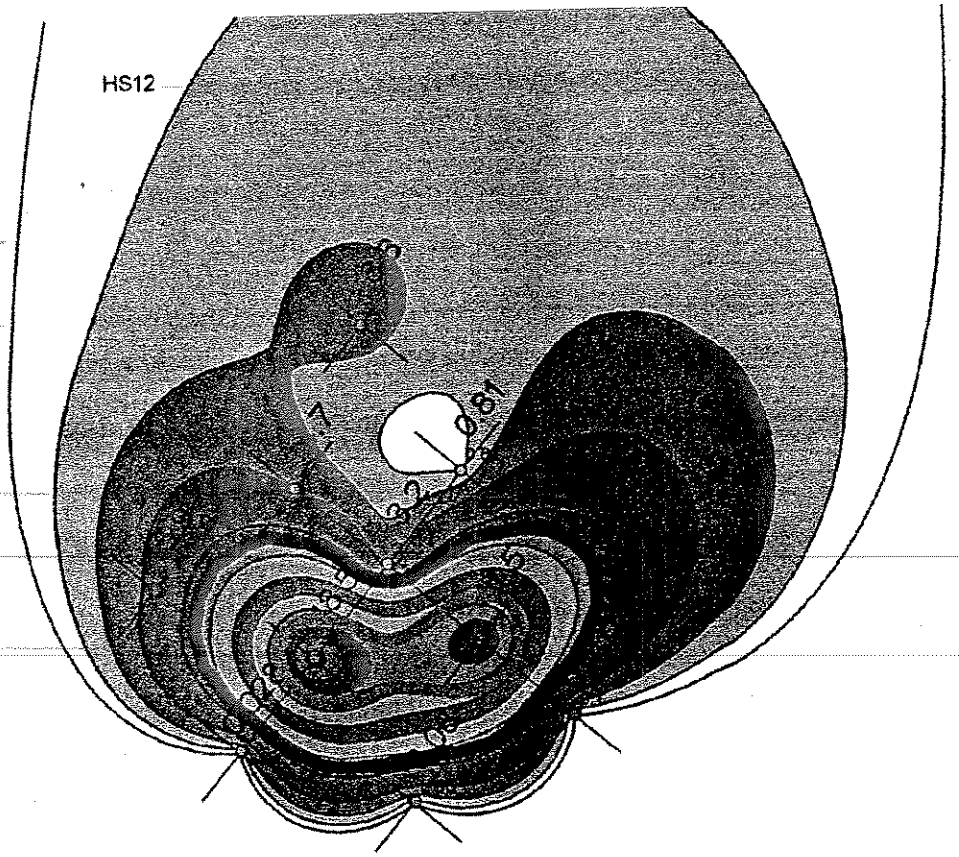


Figure 1. HS12 Lead Concentration Contours

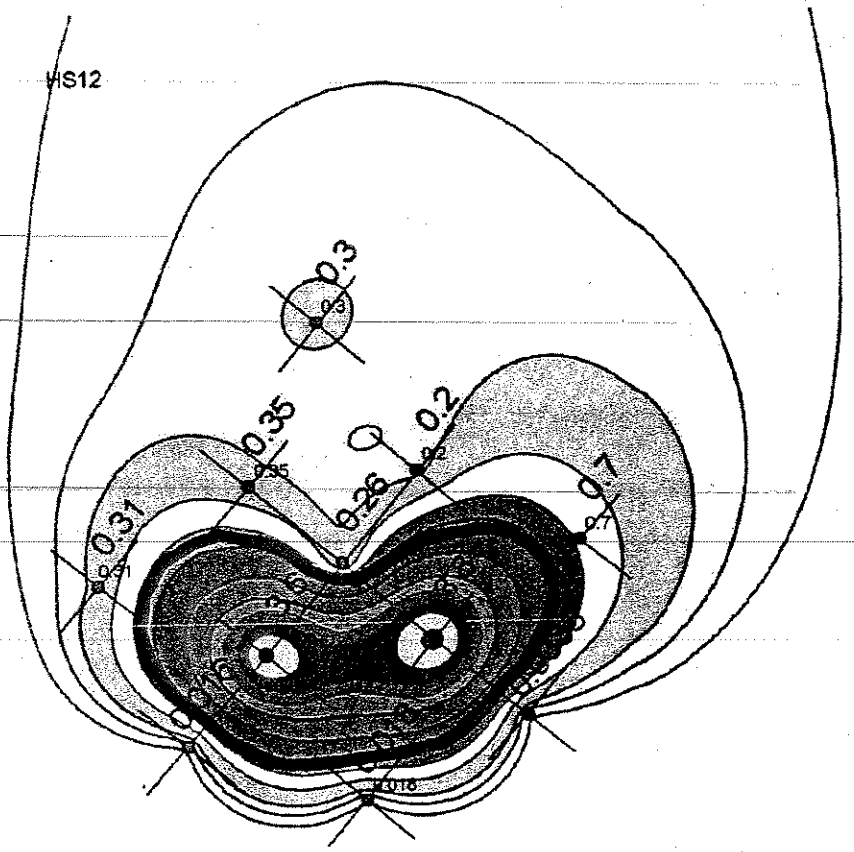


Figure 2. HS12 Cadmium Concentration Contours

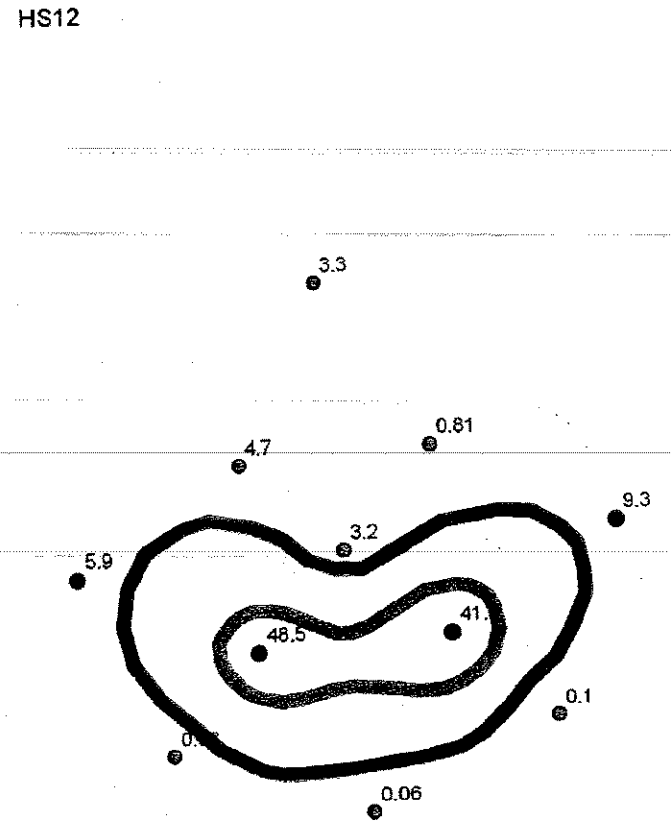


Figure 3. HS12 Lead (black outline) Bounding Limits, Cadmium (green outline) Limits, and Overall Excavation Bounding Limits (red outline) with Hotspot Lead Data

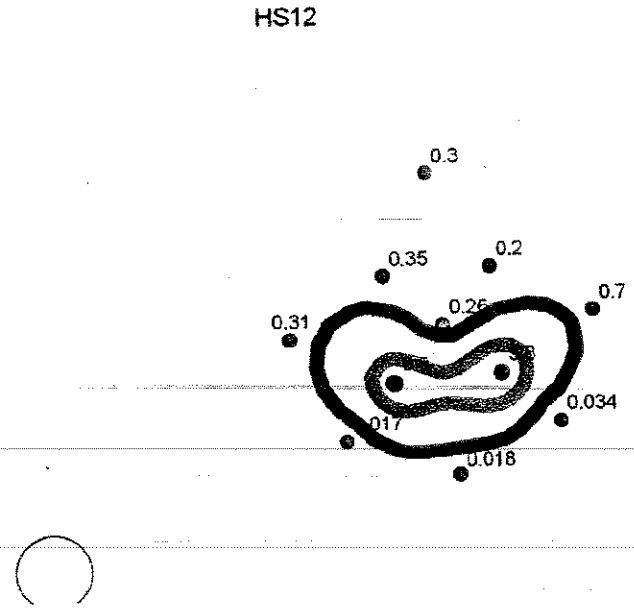
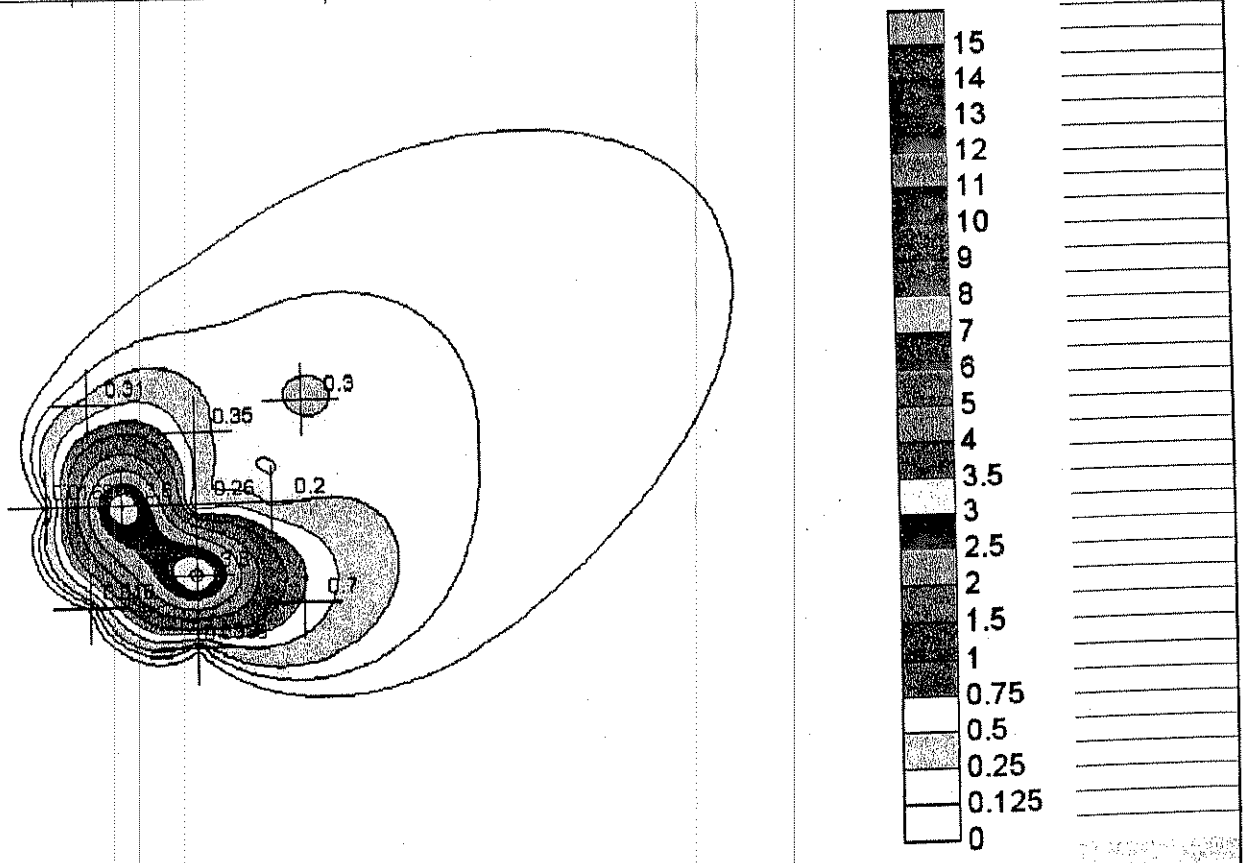


Figure 4. HS12 Lead (black outline) Bounding Limits, Cadmium (green outline) Limits, and Overall Excavation Bounding Limits (red outline) with Hotspot Cadmium Data

HS12 Weighted Average Results

Concentration (ppm)	Area Inside (ft2)	Avg Conc. in area (ppm)	Area of Conc (ft2)	Area * Avg. Conc (ft2-ppm)	Total Area (ft2)	Sum (ft2-ppm)	Wt Avg Conc. (ppm)
0	1331.195895	0.0625	1331.20	83.19974344			
0.125	619.714651	0.1875	619.71	116.1964971			
0.25	316.856266	0.375	316.86	118.8210998			
0.5	203.111567	0.625	47.49	29.68382438	2315.26	347.9011646	0.150264344
0.75	155.617448	0.875	31.84	27.86339325	2347.10	375.7645579	0.160097051
1	123.77357	1.25	42.04	52.55150375	2389.15	428.3160616	0.1792758
1.5	81.732367	1.75	28.69	50.200864	2417.83	478.5169256	0.197911551
2	53.046159	2.25	23.58	53.04845925	2441.41	531.5653849	0.217726908
2.5	29.468086	2.75	21.92	60.28740575	2463.33	591.8527906	0.240265132
3	7.546373	3.25	7.00	22.73923275	2470.33	614.5920234	0.248789574
3.5	0.549686	3.75	0.55	2.0613225	2470.88	616.6533459	0.249568474
4							

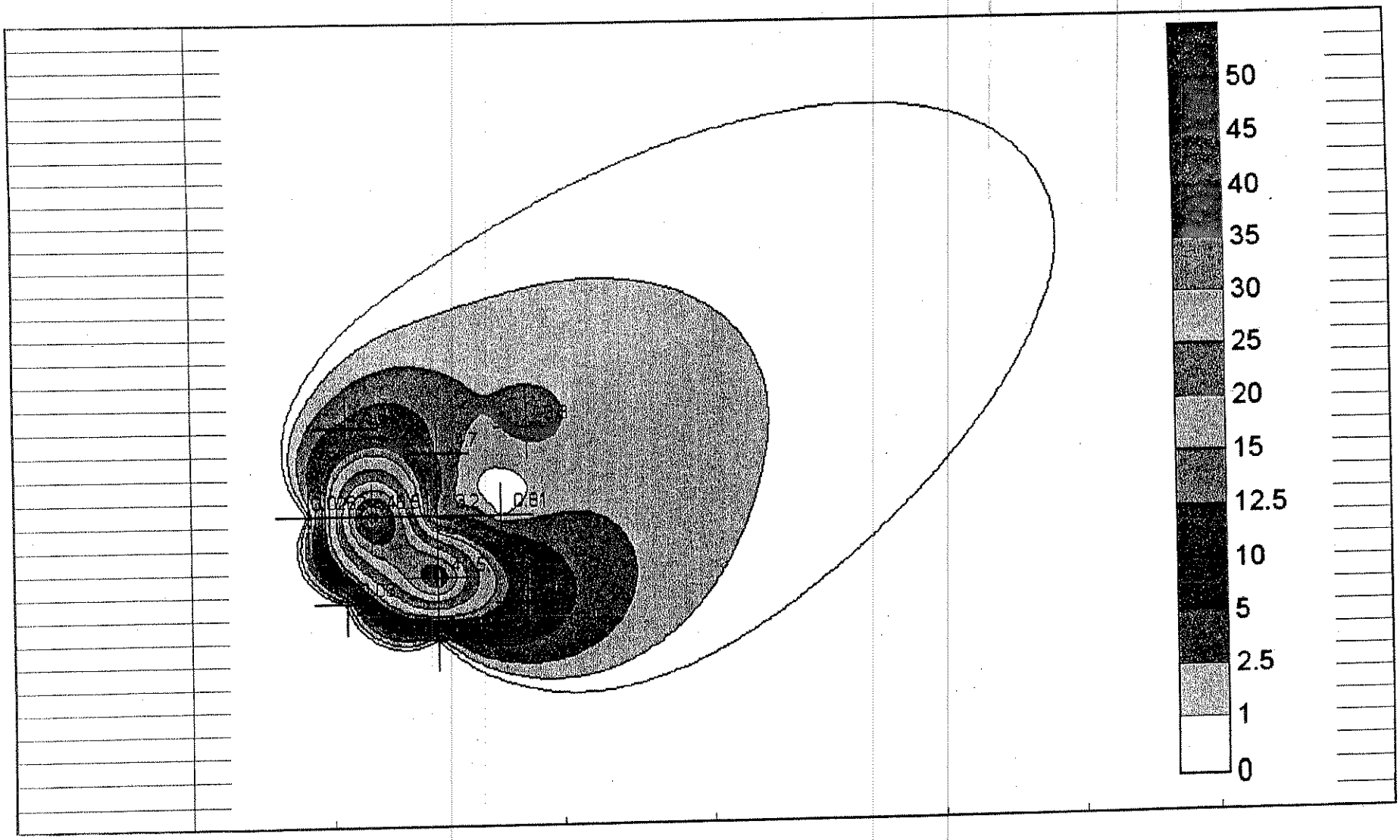


4/20/07

HS12 Weighted Average Results

Concentration (ppm)	Area Inside (ft2)	Avg Conc. in area (ppm)	Area of Conc (ft2)	Area * Avg. Conc (ft2-ppm)	Total Area (ft2)	Sum (ft2-ppm)	Wt Avg Conc. (ppm)
0	1312.359982	0.5	370.65	185.3235205			
1	941.7129407	1.75	534.73	935.7812314			
2.5	406.9808085	3.75	164.18	615.6567094			
5	242.805686	7.5	93.68	702.5767803	1163.23	2439.338242	2.097036464
10	149.128782	11.25	25.96	292.0914078	1189.19	2731.429649	2.296873031
12.5	123.1651013	13.75	20.00	275.0013397	1209.19	3006.43	2.486307869
15	103.1650038	17.5	30.08	526.4838452	1239.28	3532.914834	2.850780689
20	73.08021268	22.5	22.75	511.8910745	1262.03	4044.805909	3.204998581
25	50.32949826	27.5	19.45	534.8970561	1281.48	4579.702965	3.573757196
30	30.87869622	32.5	19.42	631.2631159	1300.90	5210.97	4.005647621
35	11.45521573	37.5	8.35	313.3042128	1309.26	5524.270294	4.219385159
40	3.100436719	42.5	2.66	113.2485744	1311.92	5637.518868	4.297137589
45	0.43576438	47.5	0.44	20.69880805	1312.36	5658.217676	4.311482943
50							

HS12 Weighted Average Results



HS12

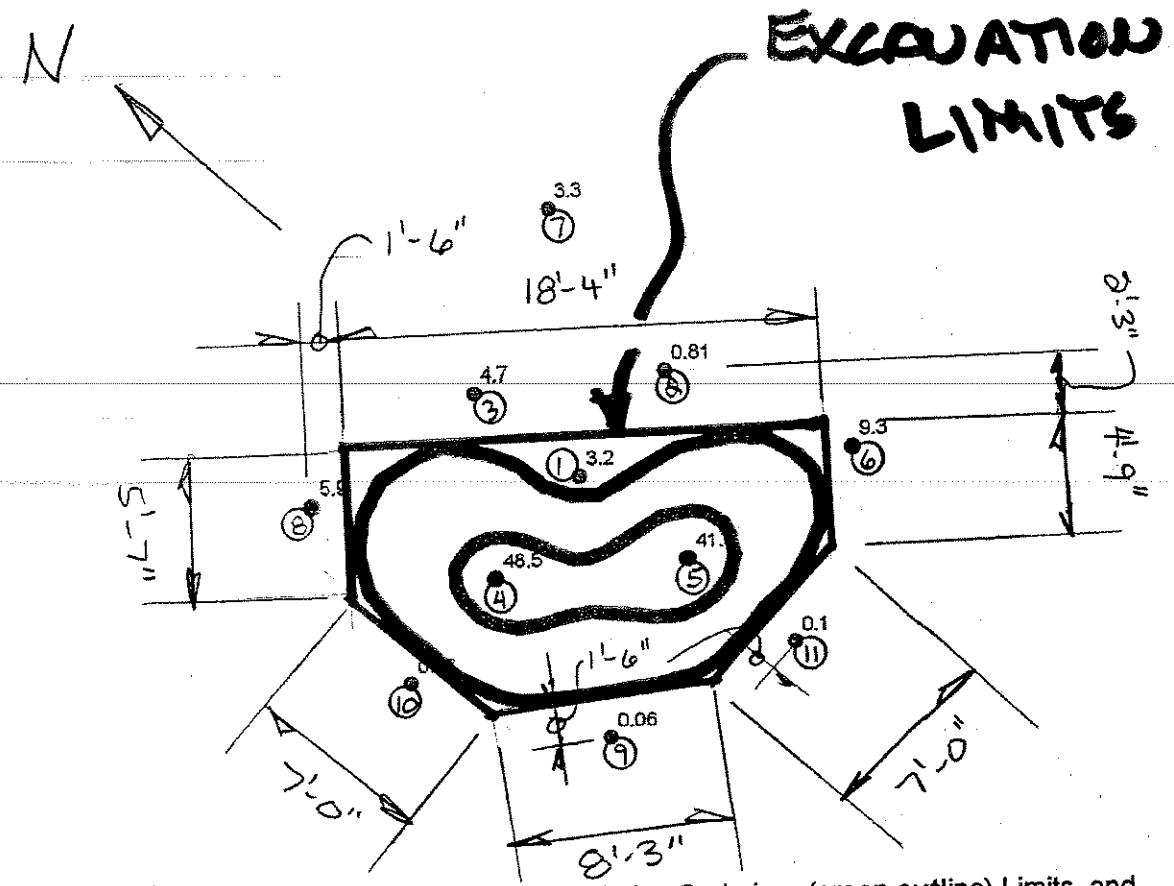


Figure 3. HS12 Lead (black outline) Bounding Limits, Cadmium (green outline) Limits, and Overall Excavation Bounding Limits (red outline) with Hotspot Lead Data

Hotspot 13 Bounding for Excavation

Estimates of lead and cadmium (as applicable) concentration distributions have been prepared for DWI1630 site hotspots HS-01, HS-02, HS-04, HS06, HS-07, and HS-08 based on a previously described methodology (see earlier reports for each hotspot).

The following methodology was used for bounding HS-13:

-Sampling results for the hotspot (not including the original sample failure from RI/FS sampling) were plotted and surface contours of concentration created by Kriging (software package Surfer, using default settings, linear calculation of contours). The area of each concentration contour was then determined using toolsets in Surfer and ArcGIS, and the concentration contours overlaid onto the site map showing sampling points using ArcGIS.

-Once areas for each contour were determined, the average concentration in the contour (e.g., 1.5 ppm as the average between the 1 ppm and 2 ppm contour lines) was multiplied by the contour area (e.g, 1.5 ppm x 1 ppm contour area, 2.5 ppm as 2 ppm contour area, etc.). The resulting areas multiplied by concentrations were then summed and divided by the sum of the contour areas up to that particular contour to get the weighted average concentration up to and including that contour.

-The excavation limits were determined as the most restrictive of:
  -the contour that allowed a maximum weighted concentration left at the hotspot after excavation equal to the TCLP characteristic limit (5 mg/L for lead or 1 mg/L for cadmium); or,
  -the contour that was 2.5 times the characteristic limit (12.5 mg/L for lead, 2.5 mg/L for cadmium).

-The separate excavation limits for lead and cadmium using the above criteria were plotted using ArcGIS. An overall excavation boundary encompassing the individual lead and cadmium excavation limit areas was then drawn.

Samples for HS-13 resulted in well-defined lead and cadmium contours generated by Kriging (see Figures 1 and 2). The resulting calculation of weighted averages are shown in the spreadsheets HS13 Pb AreasF.xls and HS13 Cd AreasF.xls, indicating excavating the 12.25 mg/L contour for lead and the 2.5 mg/L contour for cadmium are needed to satisfy the above criteria. Figures 3 and 4 show the individual excavation limits and overall excavation boundary necessary, along with sampling results for lead and cadmium, respectively. The proposed excavation boundary area consists of approximately 1,378 ft^2.

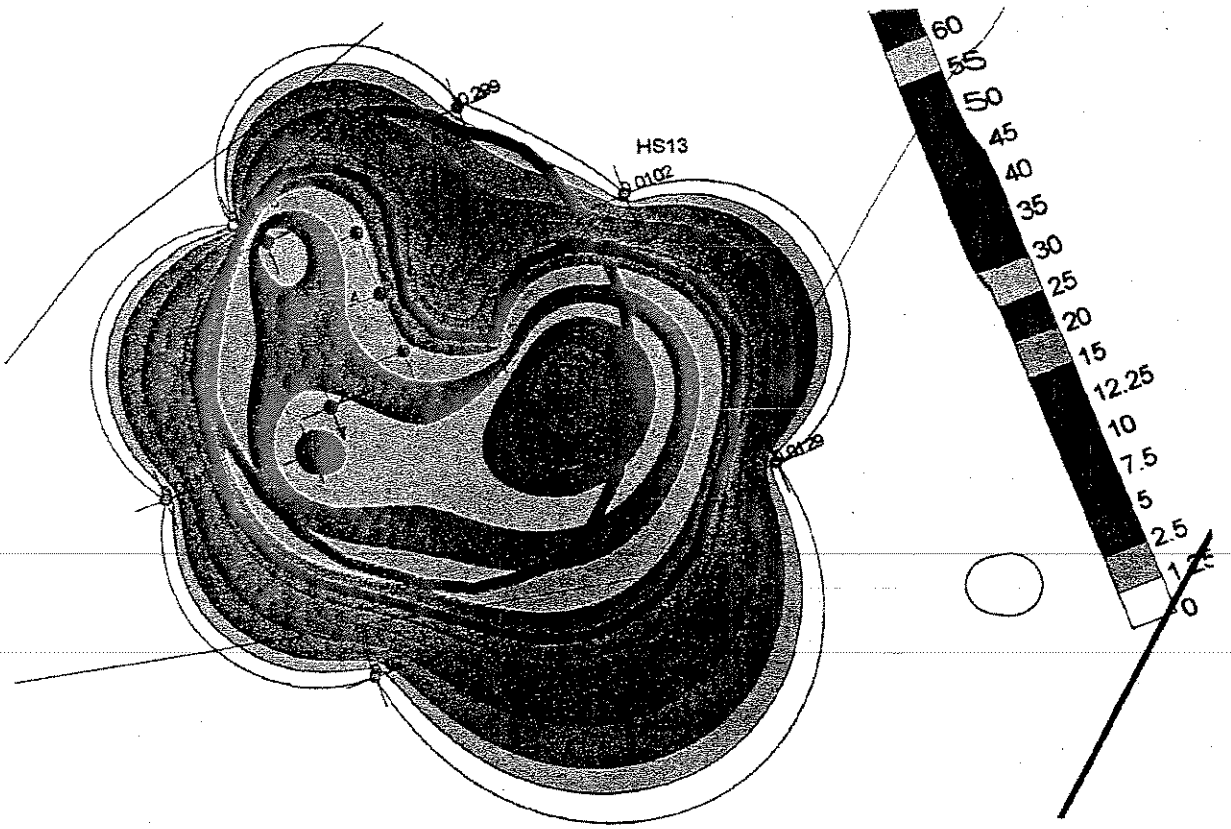


Figure 1. HS13 Lead Concentration Contours

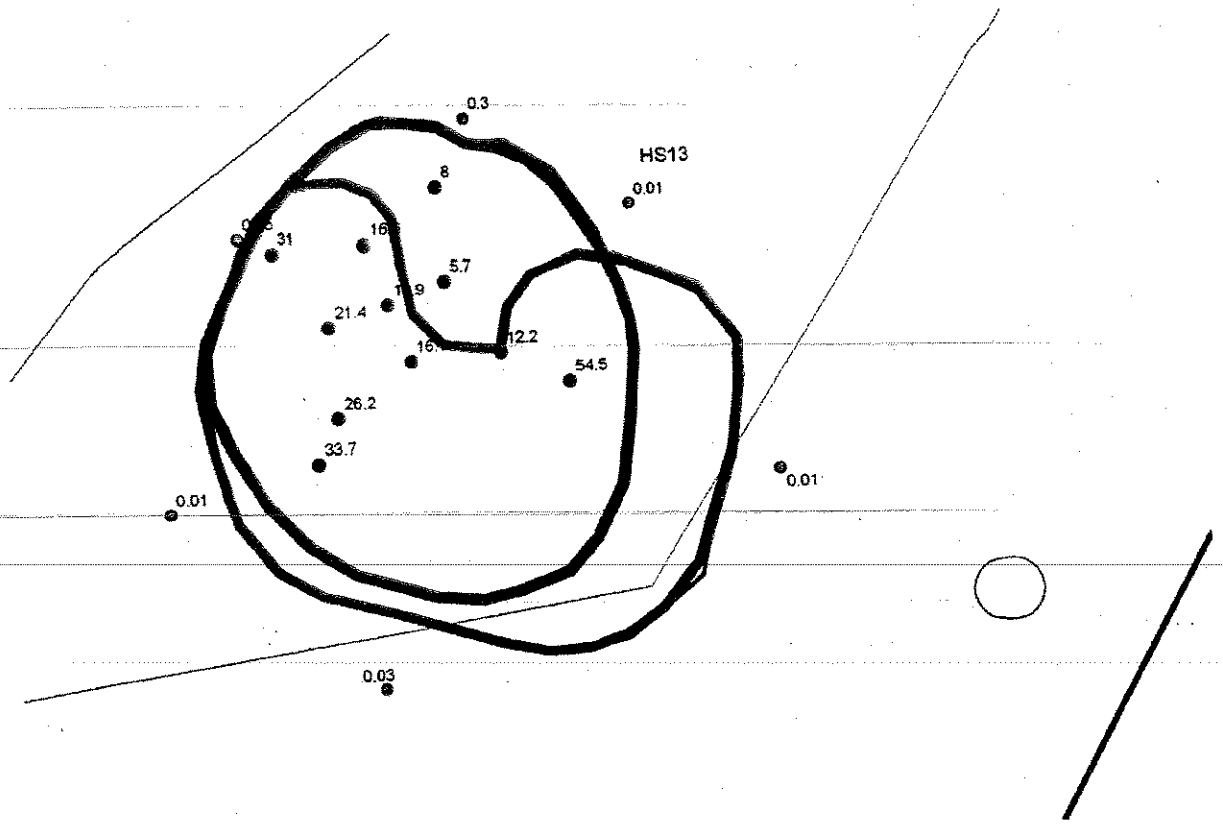


Figure 3. HS13 Lead (black outline) Bounding Limits, Cadmium (green outline) Limits, and Overall Excavation Bounding Limits (red outline) with Hotspot Lead Data

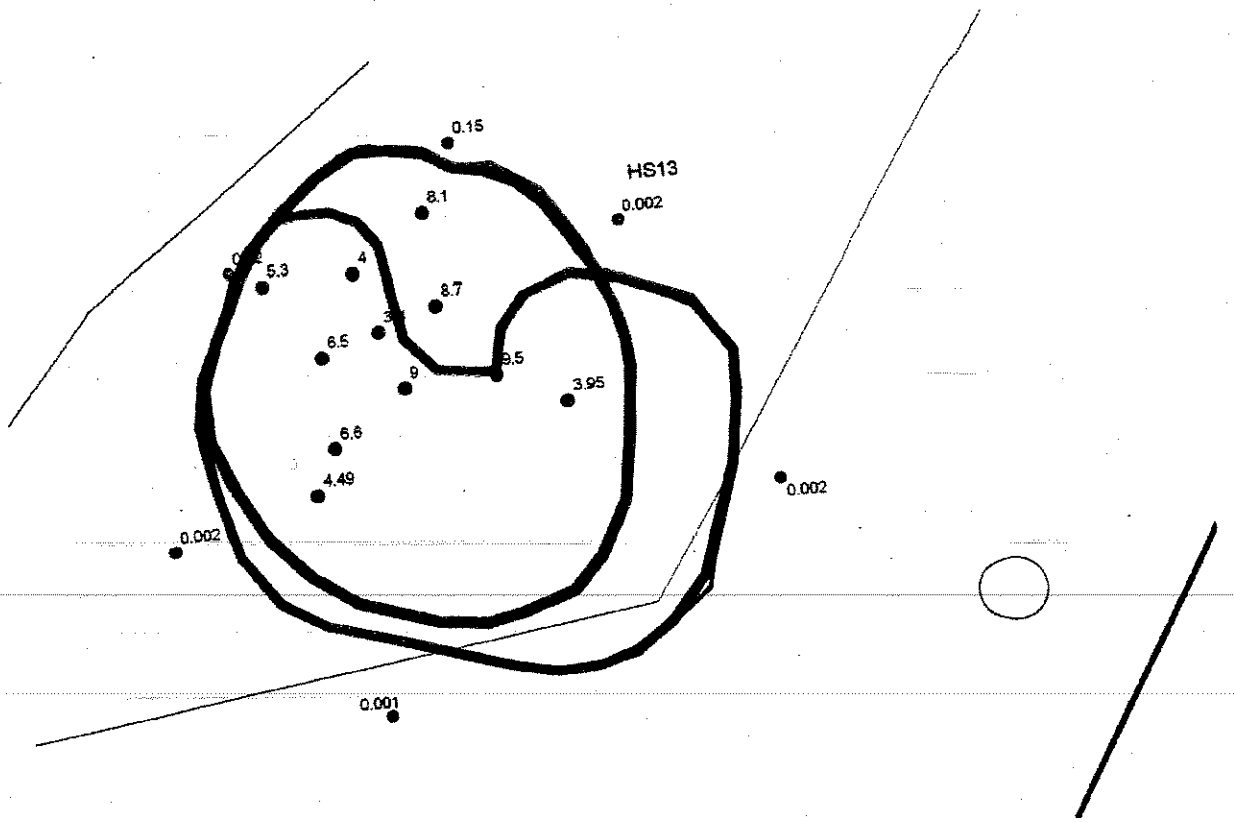
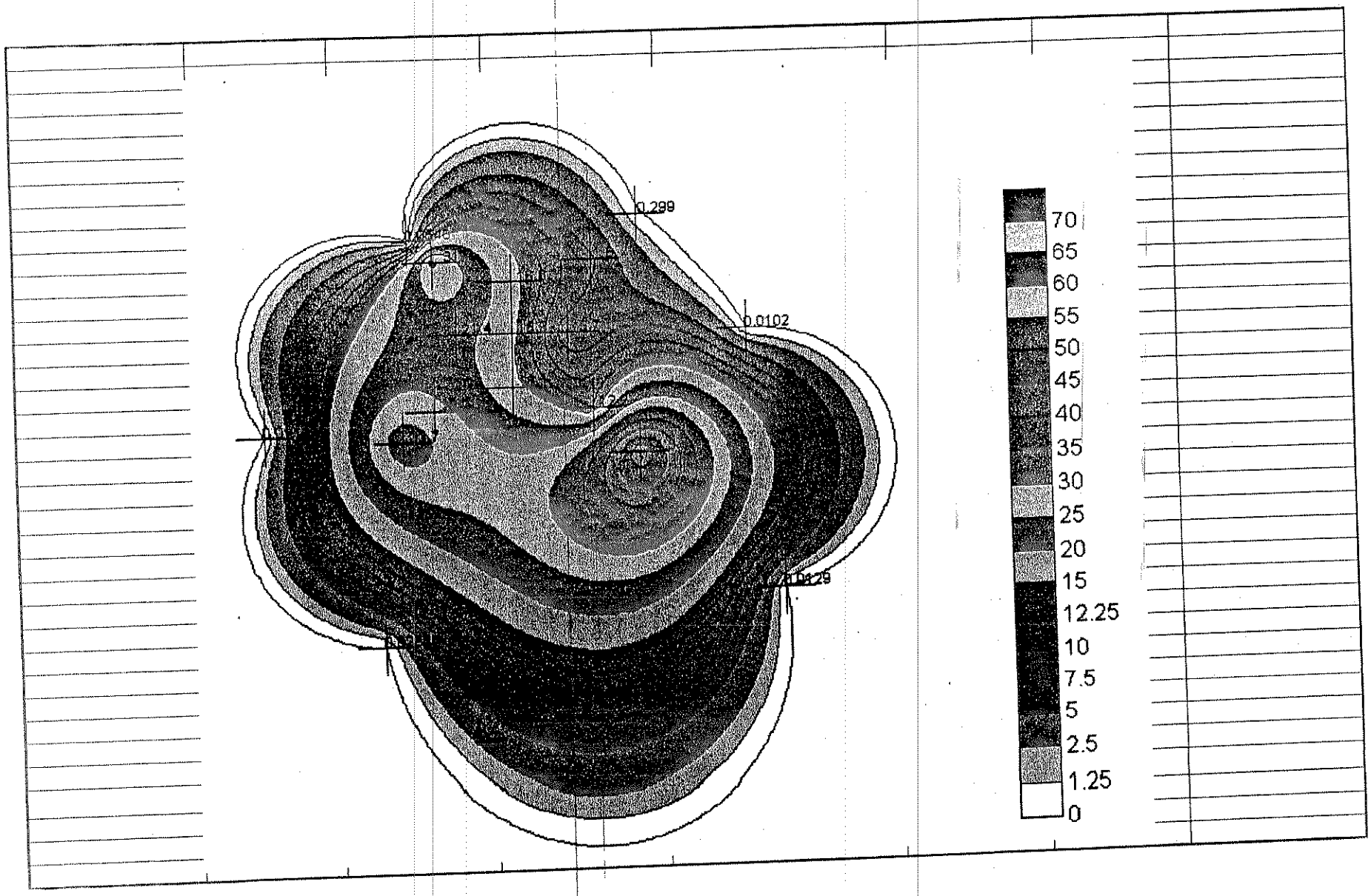


Figure 4. HS13 Lead (black outline) Bounding Limits, Cadmium (green outline) Limits, and Overall Excavation Bounding Limits (red outline) with Hotspot Cadmium Data

HS13 Weighted Average Results

Concentration (ppm)	Area Inside (ft2)	Avg Conc. in area	Area of Conc (ft2)	Area * Avg. Conc (ft2-ppm)	Total Area (ft2)	Sum (ft2-ppm)	Wt Avg Conc. (ppm)
0	2615.94	0.625	272.58	170.3623241			
1.25	2343.37	1.875	215.66	404.355775	488.24	574.72	1.177131436
2.5	2127.71	3.75	333.79	1251.708583	822.03	1826.43	2.221862459
5	1793.92	6.25	281.92	1762.015496	1103.95	3588.44	3.250554905
7.5	1512.00	8.75	227.64	1991.842032	1331.59	5580.28	4.190703012
10	1284.36	10.5	79.43	833.9875117	1411.01	6414.27	4.545859608
11	1204.93	11.5	74.23	853.5912816	1485.24	7267.86	4.893395075
12	1130.71	12.125	17.72	214.828612	1502.96	7482.69	4.978645873
12.25	1112.99	12.375	17.37	214.942128	1520.33	7697.63	5.063145976
12.5	1095.62	12.75	33.87	431.8949976	1554.20	8129.53	5.230682545
13	1061.74	14	126.56	1771.80361	1680.76	9901.33	5.890993057
15	935.19	17.5	281.28	4922.396681	1962.04	14823.73	7.555272734
20	653.91	22.5	285.99	6434.771913	2248.03	21258.50	9.456513092
25	367.92	27.5	213.49	5870.849601	2461.51	27129.35	11.02141319
30	154.43	32.5	76.90	2499.090255	2538.41	29628.44	11.67205634
35	77.54	37.5	39.58	1484.260408	2577.99	31112.70	12.068597
40	37.96	42.5	23.27	989.0633702	2601.26	32101.76	12.34085042
45	14.68	47.5	11.71	556.373298	2612.97	32658.14	12.49845762
50	2.97	52.5	2.97	156.0029906	2615.94	32814.14	12.54389588
55							

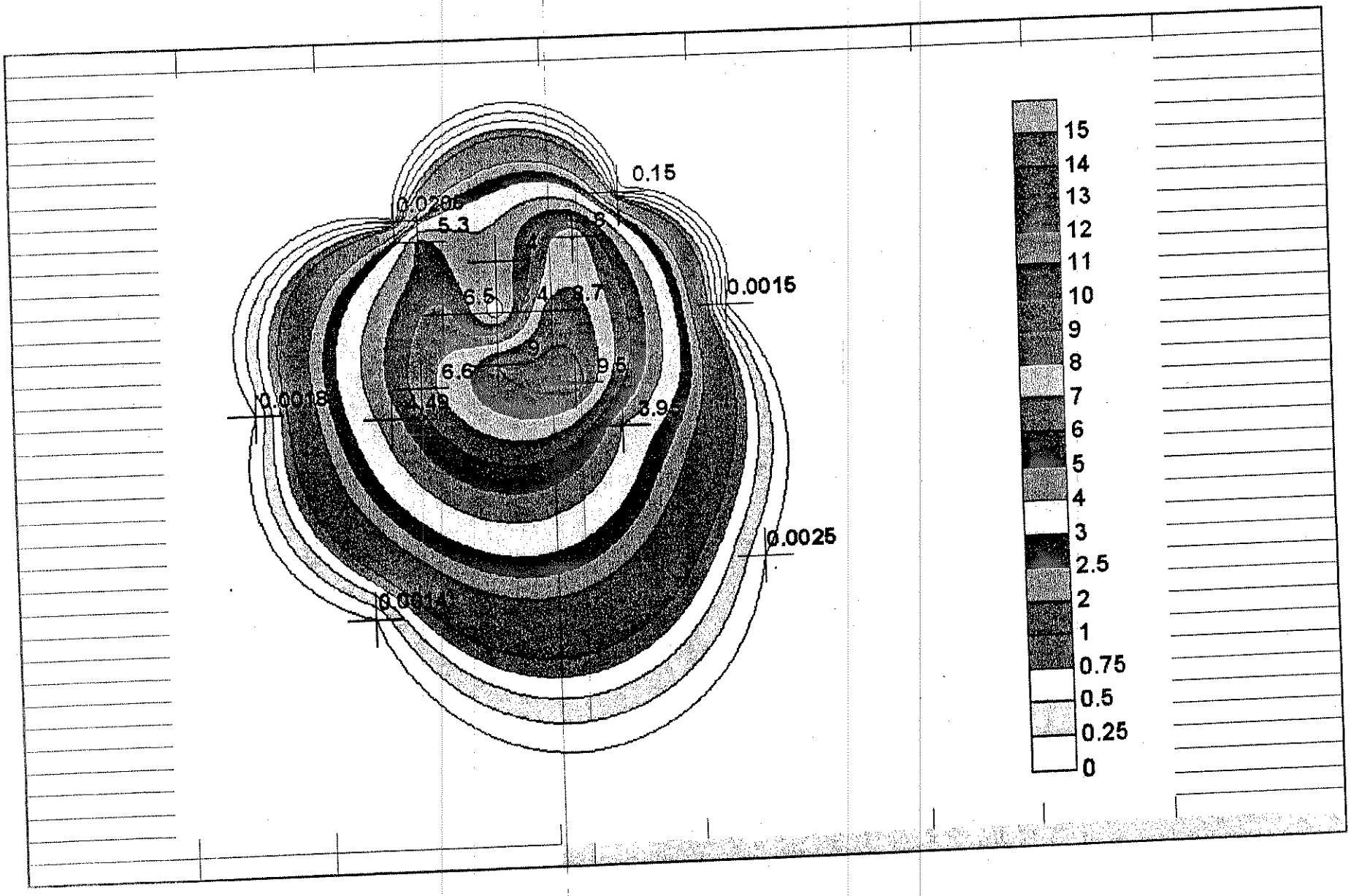
HS13 Weighted Average Results



HS13 Weighted Average Results

Concentration (ppm)	Area Inside (ft2)	Avg Conc. in area (ppm)	Area of Conc (ft2)	Area * Avg. Conc (ft2-ppm)	Total Area (ft	Sum (ft2-ppm)	Wt Avg Conc. (ppm)
0	2259.104161	0.125	236.39	29.54894348			
0.25	2022.712613	0.375	189.84	71.18969095			
0.5	1832.873437	0.625	158.72	99.1987765			
0.75	1674.155395	0.875	136.16	119.1406953	721.11	319.0781062	0.442482146
1	1537.9946	1.5	405.05	607.5733901	1126.16	926.6514963	0.822842883
2	1132.945673	2.25	149.97	337.4281984	1276.13	1264.079695	0.990559807
2.5	982.9775852	2.75	127.64	351.0004352	1403.76	1615.08013	1.150536107
3	855.3410634	3.5	210.95	738.3146622	1614.71	2353.394792	1.457471981
4	644.394017	4.5	194.53	875.3711565	1809.24	3228.765949	1.784600817
5	449.8670934	5.5	147.30	810.1326799	1956.53	4038.898628	2.064313115
6	302.5702425	6.5	115.14	748.407289	2071.67	4787.305917	2.310839963
7	187.4306595	7.5	96.52	723.9210169	2168.20	5511.226934	2.54184869
8	90.90785729	8.5	68.83	585.0740208	2237.03	6096.300955	2.725177995
9	22.07561955	9.5	22.08	209.7183857	2259.10	6306.019341	2.791380517
10							

HS13 Weighted Average Results



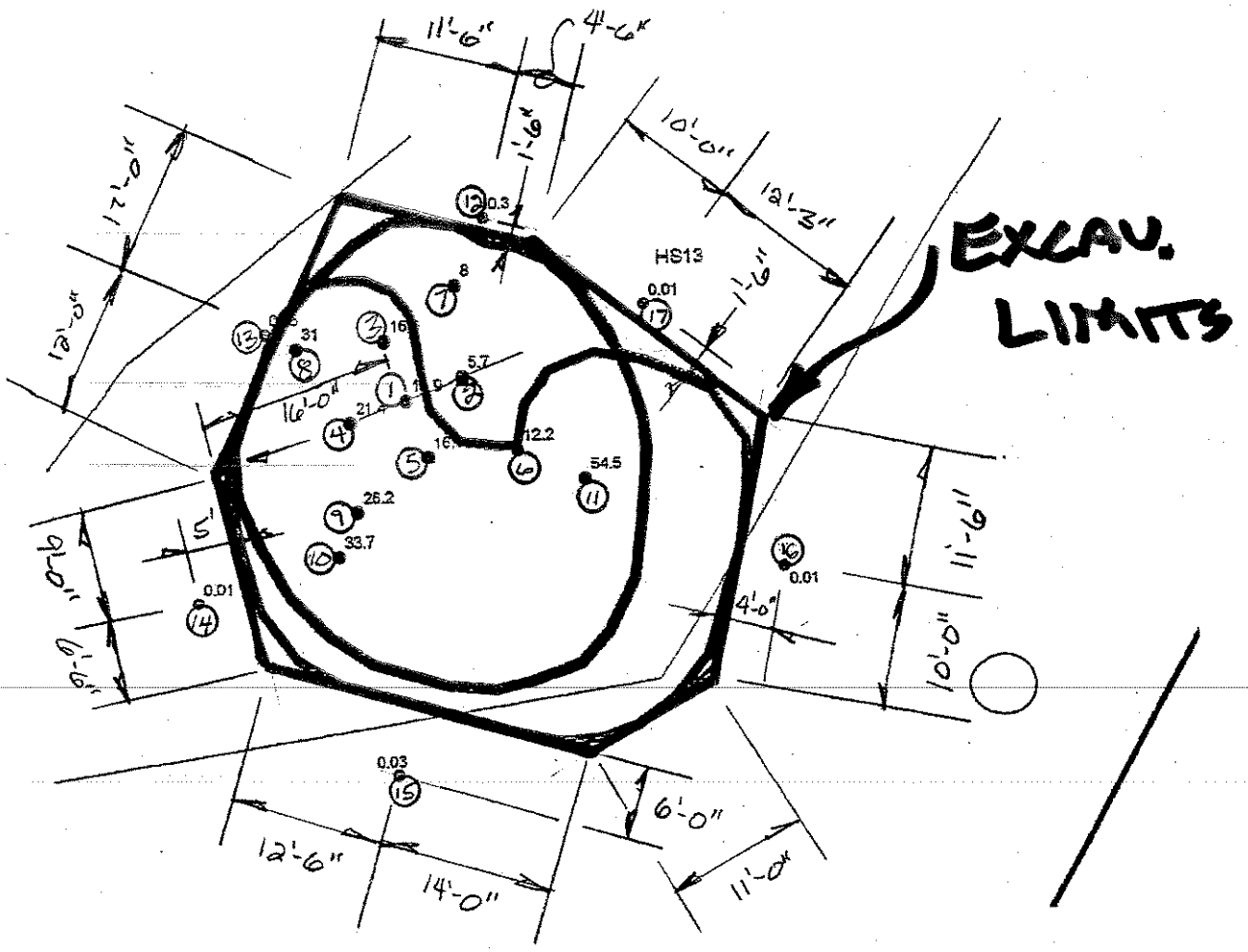


Figure 3. HS13 Lead (black outline) Bounding Limits, Cadmium (green outline) Limits, and Overall Excavation Bounding Limits (red outline) with Hotspot Lead Data

Hotspot 14 Bounding for Excavation

Estimates of lead and cadmium (as applicable) concentration distributions have been prepared for DWI1630 site hotspots HS-01, HS-02, HS-04, HS06, HS-07, and HS-08 based on a previously described methodology (see earlier reports for each hotspot).

The following methodology was used for bounding HS-14:

-Sampling results for the hotspot (not including the original sample failure from RI/FS sampling) were plotted and surface contours of concentration created by Kriging (software package Surfer, using default settings, linear calculation of contours). The area of each concentration contour was then determined using toolsets in Surfer and ArcGIS, and the concentration contours overlaid onto the site map showing sampling points using ArcGIS.

-Once areas for each contour were determined, the average concentration in the contour (e.g., 1.5 ppm as the average between the 1 ppm and 2 ppm contour lines) was multiplied by the contour area (e.g, 1.5 ppm x 1 ppm contour area, 2.5 ppm as 2 ppm contour area, etc.). The resulting areas multiplied by concentrations were then summed and divided by the sum of the contour areas up to that particular contour to get the weighted average concentration up to and including that contour.

-The excavation limits were determined as the most restrictive of:
  -the contour that allowed a maximum weighted concentration left at the hotspot after excavation equal to the TCLP characteristic limit (5 mg/L for lead or 1 mg/L for cadmium); or,
  -the contour that was 2.5 times the characteristic limit (12.5 mg/L for lead, 2.5 mg/L for cadmium).

-The separate excavation limits for lead and cadmium using the above criteria were plotted using ArcGIS. An overall excavation boundary encompassing the individual lead and cadmium excavation limit areas was then drawn.

Samples for HS-14 resulted in well-defined lead and cadmium contours generated by Kriging (see Figures 1 and 2). The resulting calculation of weighted averages are shown in the spreadsheets HS14 Pb AreasF.xls and HS14 Cd AreasF.xls, indicating excavating the 10 mg/L contour for lead and the 2.5 mg/L contour for cadmium are needed to satisfy the above criteria. Figures 3 and 4 show the individual excavation limits and overall excavation boundary necessary, along with sampling results for lead and cadmium, respectively. The proposed excavation boundary area consists of approximately 1,777 ft^2.

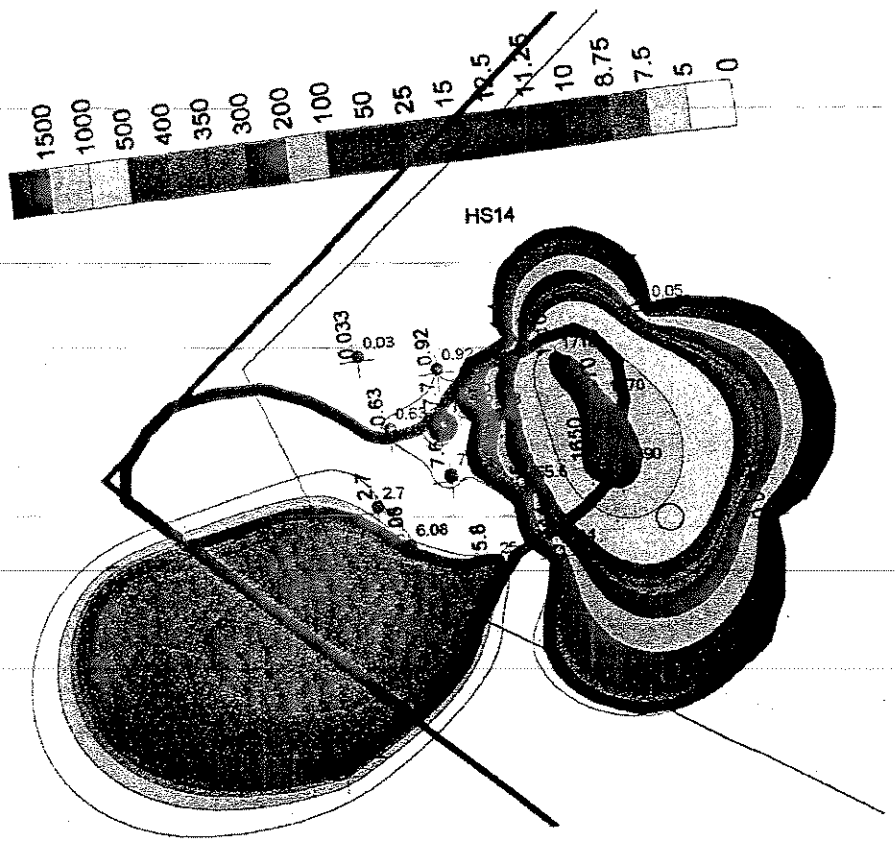


Figure 1. HS14 Lead Concentration Contours

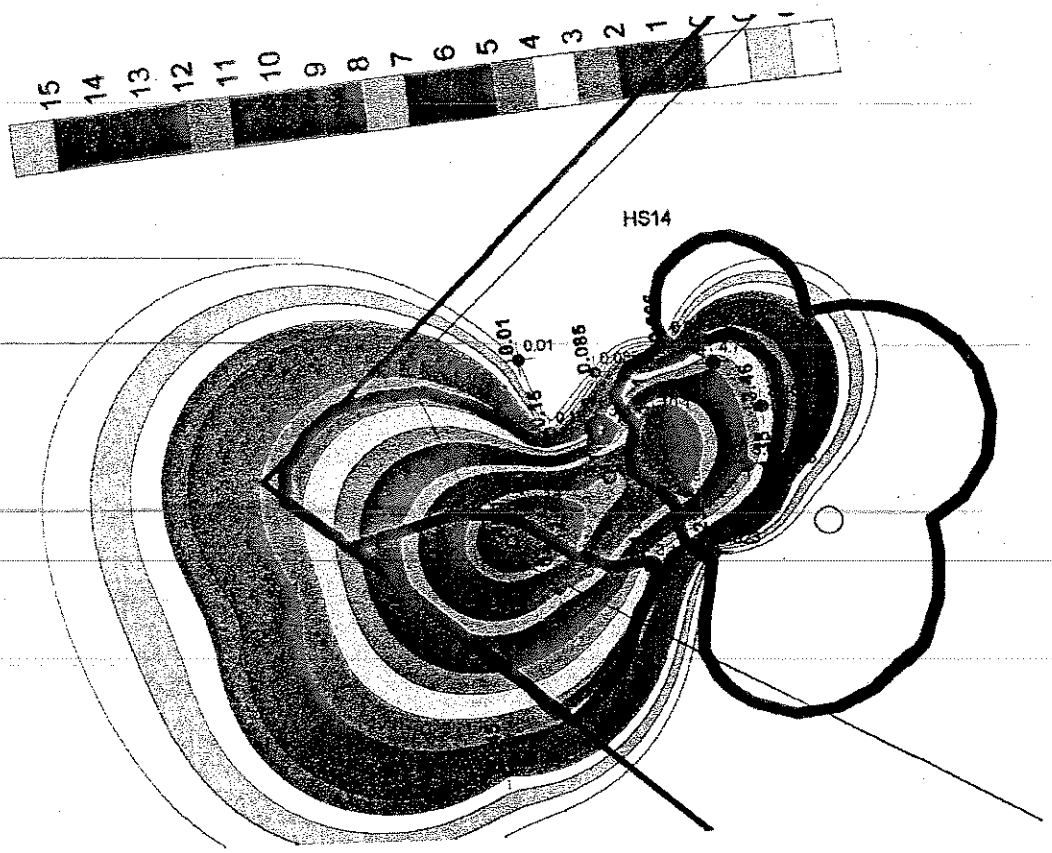


Figure 2. HS14 Cadmium Concentration Contours

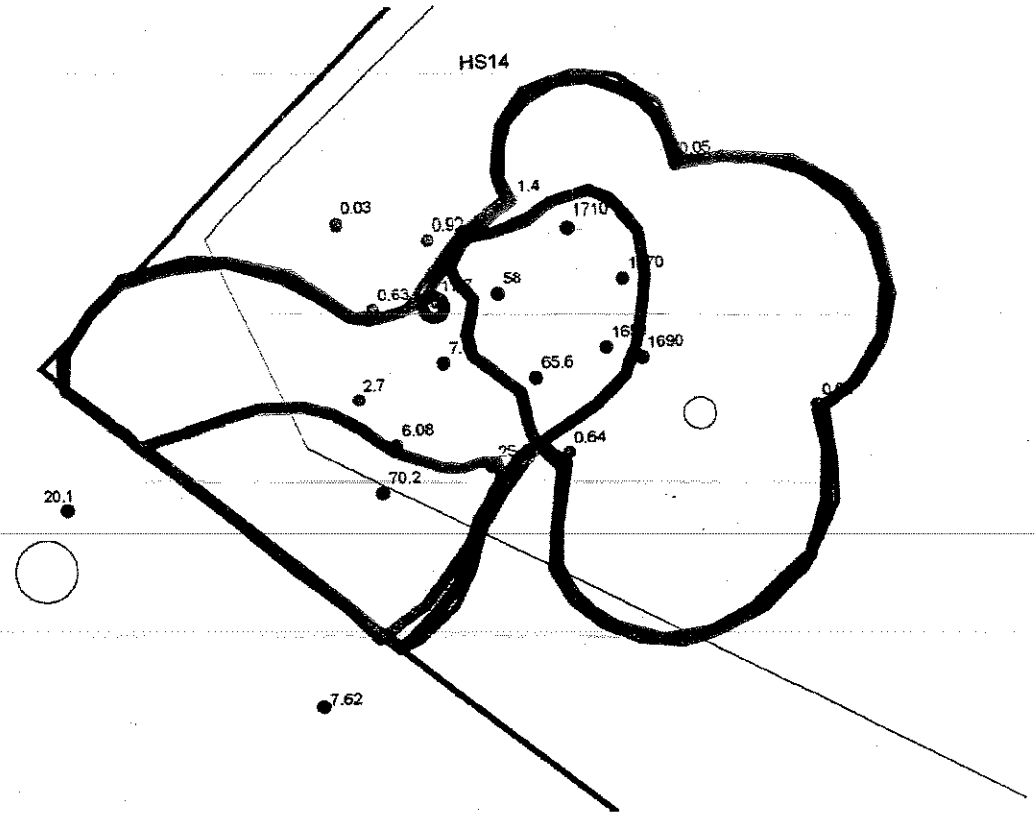


Figure 3. HS14 Lead (black outline) Bounding Limits, Cadmium (green outline) Limits, and Overall Excavation Bounding Limits (red outline) with Hotspot Lead Data

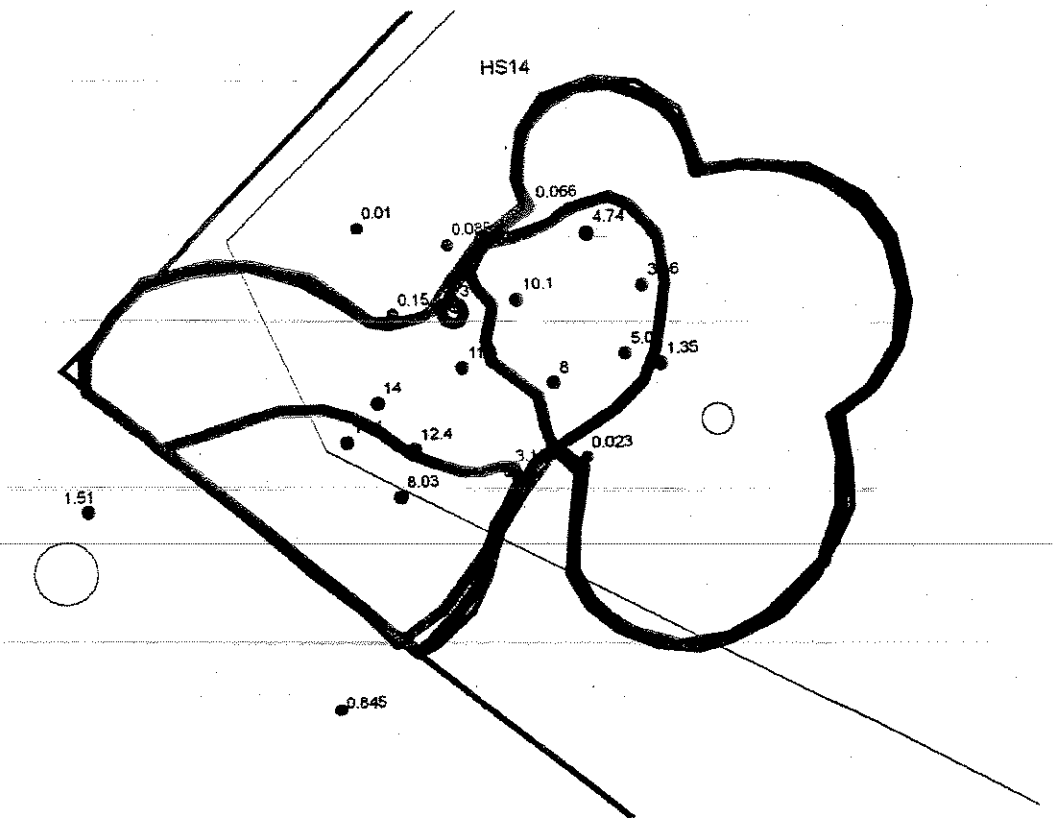
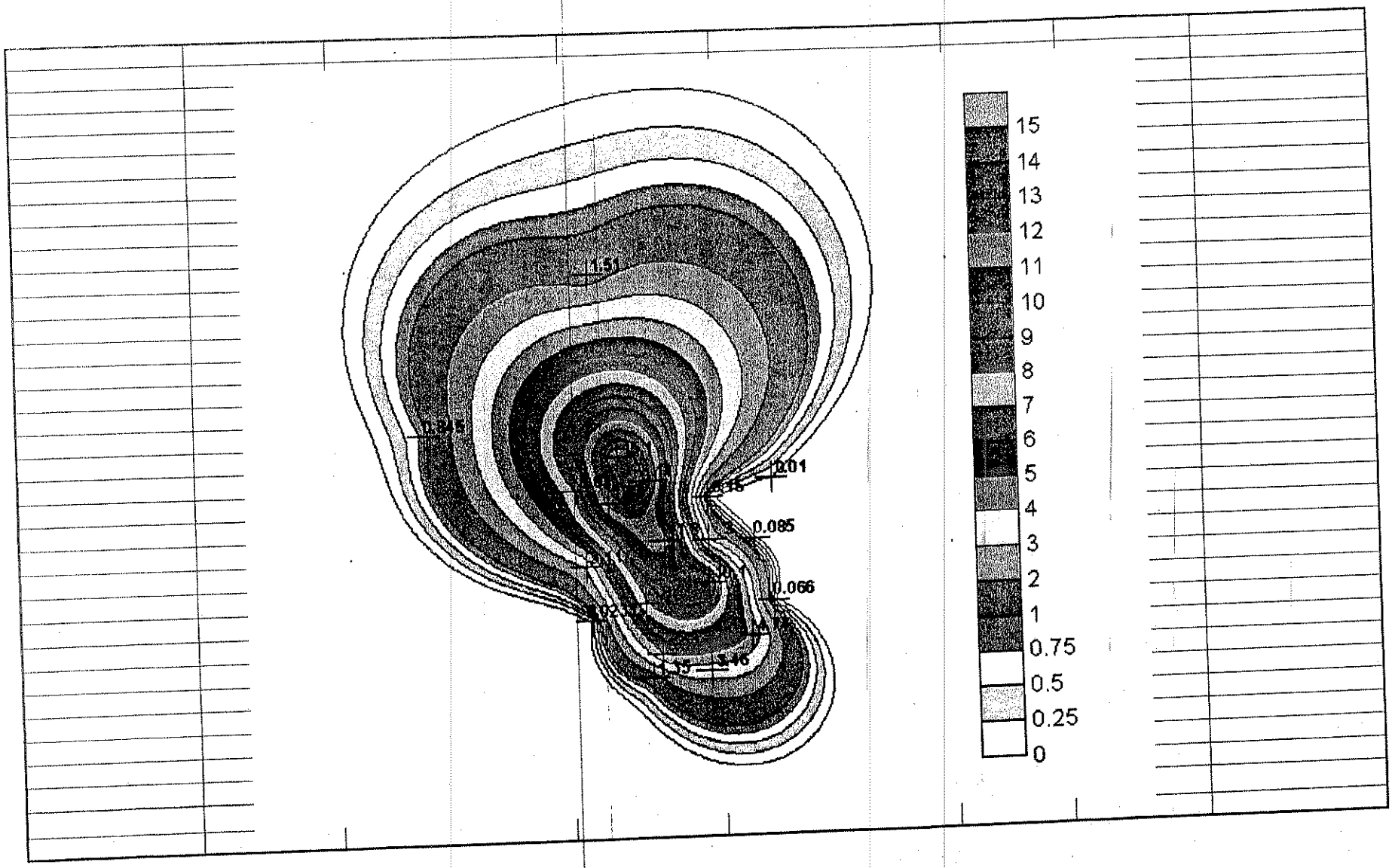


Figure 4. HS14 Lead (black outline) Bounding Limits, Cadmium (green outline) Limits, and Overall Excavation Bounding Limits (red outline) with Hotspot Cadmium Data

HS14 Weighted Average Results

Concentration (ppm)	Area Inside (ft2)	Avg Conc. in area (ppm)	Area of Conc (ft2)	Area * Avg. Conc (ft2-ppm)	Total Area (ft	Sum (ft2-ppm)	Wt Avg Conc. (ppm)
0	3154.497122	0.125	462.95	57.86848973			
0.25	2691.549205	0.375	355.03	133.1373834			
0.5	2336.516182	0.625	278.83	174.2668592			
0.75	2057.689207	0.875	222.43	194.6235078	1319.23	559.8962401	0.424409853
1	1835.262341	1.5	554.46	831.6912112	1873.70	1391.587451	0.742696658
2	1280.801534	2.25	171.36	385.5704941	2045.06	1777.157945	0.869000287
2.5	1109.43687	2.75	137.67	378.6056849	2182.74	2155.76363	0.987643293
3	971.7620754	3.5	210.83	737.9084062	2393.57	2893.672036	1.208937632
4	760.9311022	4.5	159.81	719.1249707	2553.37	3612.797007	1.414912366
5	601.1255532	5.5	128.19	705.0432603	2681.56	4317.840267	1.610196397
6	472.9358695	6.5	103.22	670.941036	2784.78	4988.781304	1.791443496
7	369.7141716	7.5	84.97	637.2683365	2869.75	5626.04964	1.960465405
8	284.7450601	8.5	72.16	613.3734788	2941.91	6239.423119	2.120872284
9	212.5834744	9.5	71.02	674.7363841	3012.94	6914.159503	2.294822623
10	141.5585918	10.5	46.48	487.9985375	3059.41	7402.15804	2.419468772
11	95.08254064	11.5	39.59	455.3241534	3099.01	7857.482194	2.535483041
12	55.48913599	12.5	24.53	306.6098899	3123.54	8164.092084	2.613733298
13	30.9603448	13.5	18.82	254.1228747	3142.36	8418.214958	2.67894611
14	12.13642816	14.5	12.07	174.9482346	3154.43	8593.163193	2.724160576
15	0.071032665	15.5	0.07	1.101006304	3154.50	8594.264199	2.724448261
16							

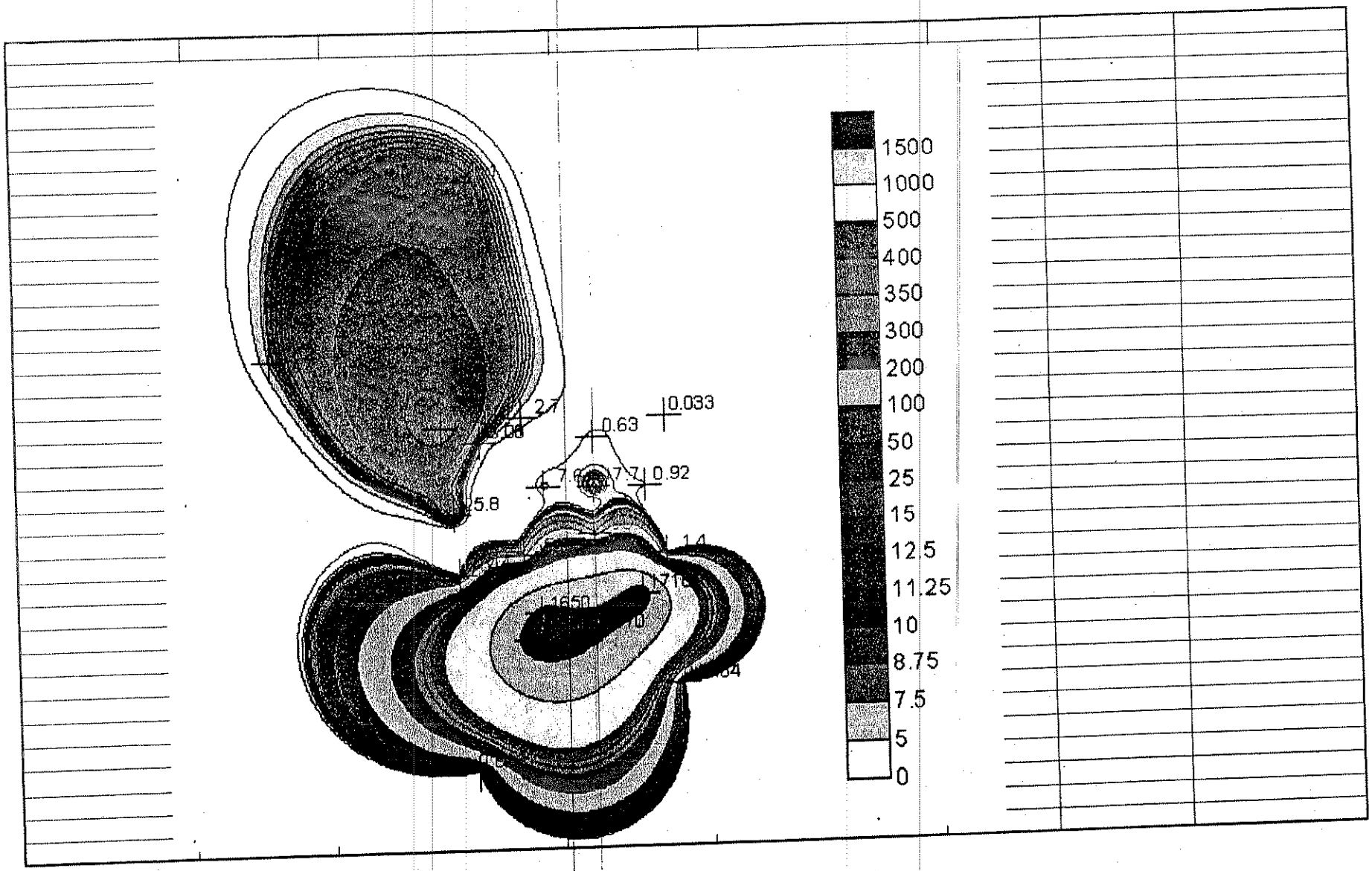
HS14 Weighted Average Results



HS14 Weighted Average Results

Concentration (ppm)	Area Inside (ft2)	Avg Conc. in area (ppm)	Area of Conc (ft2)	Area * Avg. Conc (ft2-ppm)	Total Area (ft	Sum (ft2-ppm)	Wt Avg Conc. (ppm)
0	2174.46	0.625	73.78	46.11106721			
1.25	2100.69	1.875	69.85	130.9773296	143.63	177.09	1.232928926
2.5	2030.83	3.125	66.16	206.7569111	209.79	383.85	1.829625263
3.75	1964.67	4.375	60.30	263.823785	270.10	647.67	2.397912286
5	1904.37	5.625	57.41	322.9272494	327.51	970.60	2.963595373
6.25	1846.96	6.875	54.43	374.2239108	381.94	1344.82	3.521034754
7.5	1792.52	8.125	51.81	420.9912045	433.75	1765.81	4.071004707
8.75	1740.71	9.375	49.89	467.717978	483.64	2233.53	4.618135143
10	1690.82	10.625	48.26	512.7814913	531.90	2746.31	5.163161169
11.25	1642.56	11.875	46.87	556.6337255	578.78	3302.94	5.706742312
12.5	1595.68	13.75	90.44	1243.547691	669.22	4546.49	6.793726794
15	1505.24	17.5	175.94	3079.021237	845.16	7625.51	9.0225332
20	1329.30	22.5	168.71	3796.074903	1013.88	11421.59	11.26525268
25	1160.59	27.5	112.74	3100.382325	1126.62	14521.97	12.88986996
30	1047.84	32.5	74.76	2429.600321	1201.38	16951.57	14.1101319
35	973.09	37.5	52.90	1983.716459	1254.27	18935.29	15.09660072
40	920.19	42.5	39.38	1673.685434	1293.66	20608.97	15.93080156
45	880.81	47.5	30.38	1442.953983	1324.03	22051.93	16.65510972
50	850.43	55	43.42	2388.222068	1367.46	24440.15	17.87271402
60	807.01	65	28.66	1862.980403	1396.12	26303.13	18.8402018
70	778.35	75	22.32	1674.343681	1418.44	27977.47	19.72409007
80	756.02	85	20.66	1756.031198	1439.10	29733.50	20.66116642
90	735.36	95	19.24	1827.568876	1458.34	31561.07	21.64180176
100	716.12	150	142.66	21398.45693	1600.99	52959.53	33.07913726
200	573.47	212.5	26.64	5660.458114	1627.63	58619.99	36.01549708
225	546.83	237.5	24.32	5775.219866	1651.95	64395.21	38.98135201
250	522.51	262.5	22.38	5873.978941	1674.33	70269.19	41.96863787
275	500.14	287.5	20.73	5960.02267	1695.06	76229.21	44.97148221
300	479.41	325	37.39	12151.78476	1732.45	88380.99	51.01512899
350	442.02	375	33.05	12394.1478	1765.50	100775.14	57.0802986
400	408.97	450	56.53	25436.72106	1822.02	126211.86	69.27014854
500	352.44						

HS14 Weighted Average Results



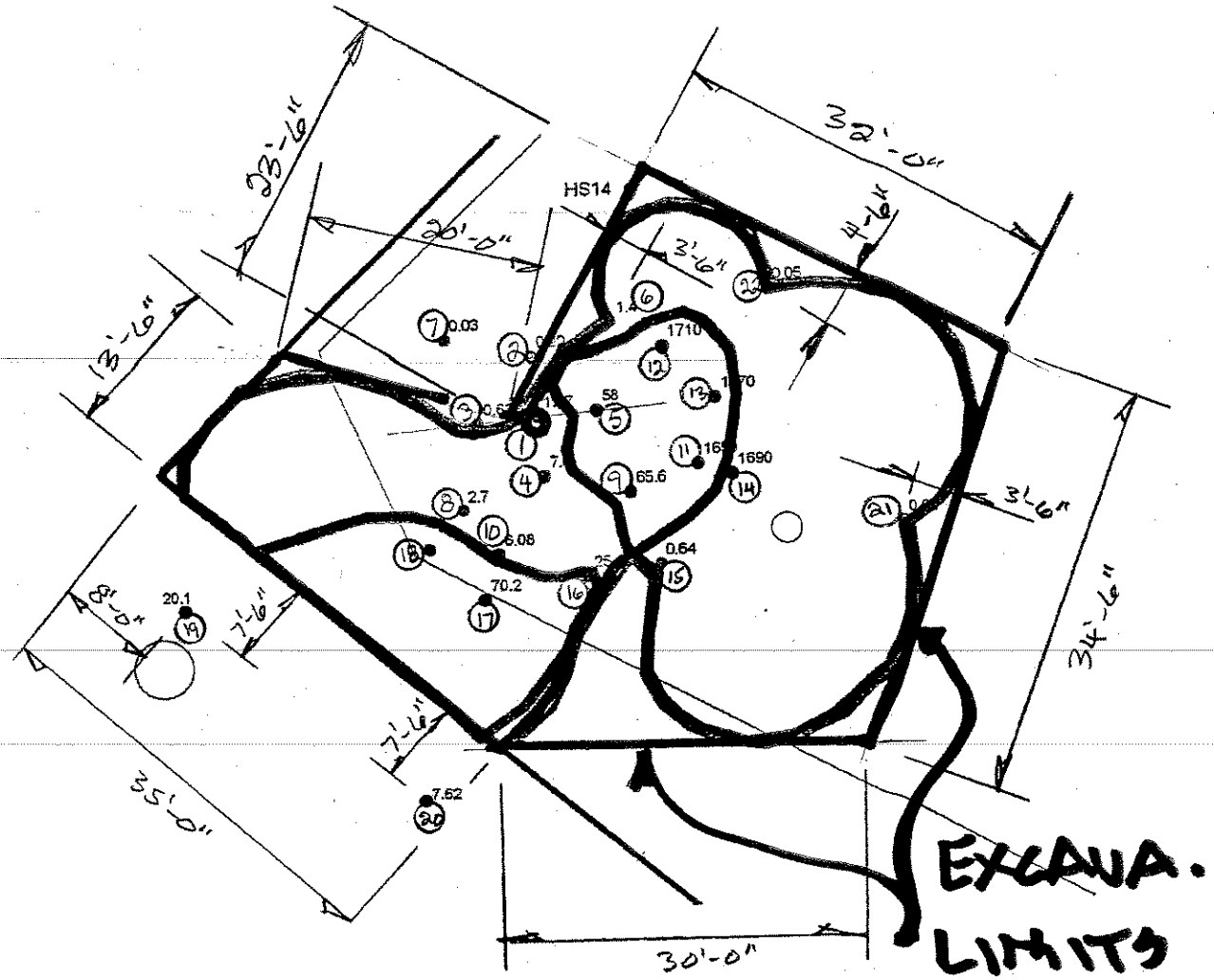


Figure 3. HS14 Lead (black outline) Bounding Limits, Cadmium (green outline) Limits, and Overall Excavation Bounding Limits (red outline) with Hotspot Lead Data

Hotspot 15 Bounding for Excavation

Estimates of lead and cadmium (as applicable) concentration distributions have been prepared for DWI1630 site hotspots HS-01, HS-02, HS-04, HS06, HS-07, and HS-08 based on a previously described methodology (see earlier reports for each hotspot).

The following methodology was used for bounding HS-15:

-Sampling results for the hotspot (not including the original sample failure from RI/FS sampling) were plotted and surface contours of concentration created by Kriging (software package Surfer, using default settings, linear calculation of contours). The area of each concentration contour was then determined using toolsets in Surfer and ArcGIS, and the concentration contours overlaid onto the site map showing sampling points using ArcGIS.

-Once areas for each contour were determined, the average concentration in the contour (e.g., 1.5 ppm as the average between the 1 ppm and 2 ppm contour lines) was multiplied by the contour area (e.g, 1.5 ppm x 1 ppm contour area, 2.5 ppm as 2 ppm contour area, etc.). The resulting areas multiplied by concentrations were then summed and divided by the sum of the contour areas up to that particular contour to get the weighted average concentration up to and including that contour.

-The excavation limits were determined as the most restrictive of:
  -the contour that allowed a maximum weighted concentration left at the hotspot after excavation equal to the TCLP characteristic limit (5 mg/L for lead or 1 mg/L for cadmium); or,
  -the contour that was 2.5 times the characteristic limit (12.5 mg/L for lead, 2.5 mg/L for cadmium).

-The separate excavation limits for lead and cadmium using the above criteria were plotted using ArcGIS. An overall excavation boundary encompassing the individual lead and cadmium excavation limit areas was then drawn.

Samples for HS-15 resulted in well-defined lead and cadmium contours generated by Kriging (see Figures 1 and 2). The resulting calculation of weighted averages are shown in the spreadsheets HS15 Pb AreasF.xls and HS15 Cd AreasF.xls, indicating excavating the 12.5 mg/L contour for lead and the 2.5 mg/L contour for cadmium are needed to satisfy the above criteria. Figures 3 and 4 show the individual excavation limits and overall excavation boundary necessary, along with sampling results for lead and cadmium, respectively. The proposed excavation boundary area consists of approximately 933 ft^2.

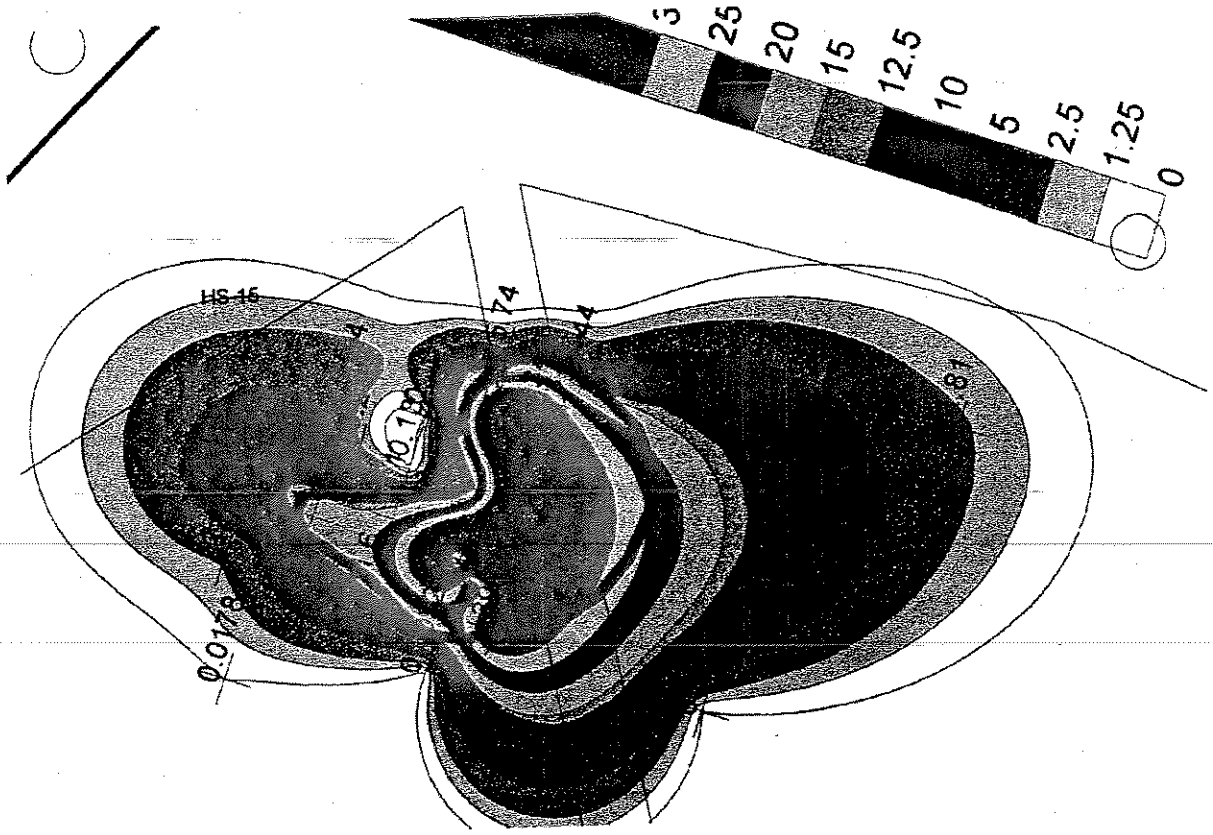


Figure 1. HS15 Lead Concentration Contours

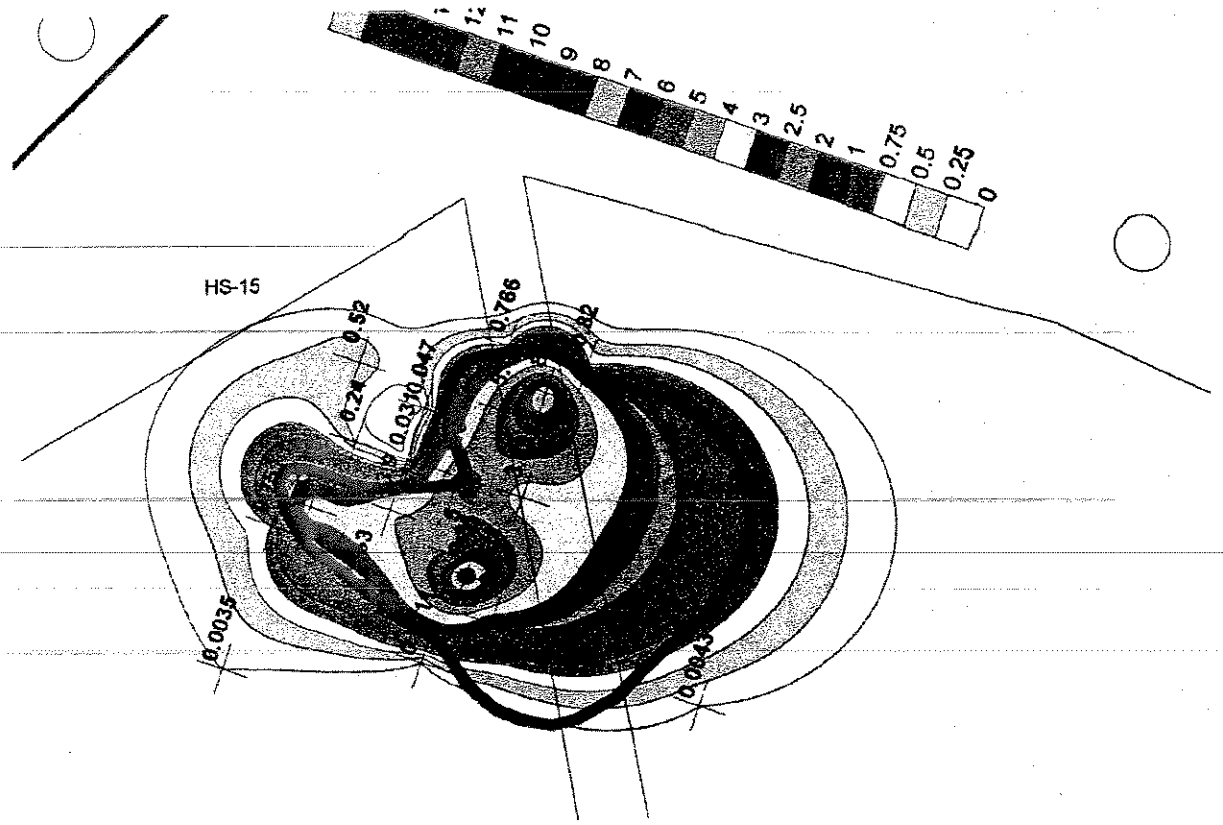


Figure 2. HS15 Cadmium Concentration Contours

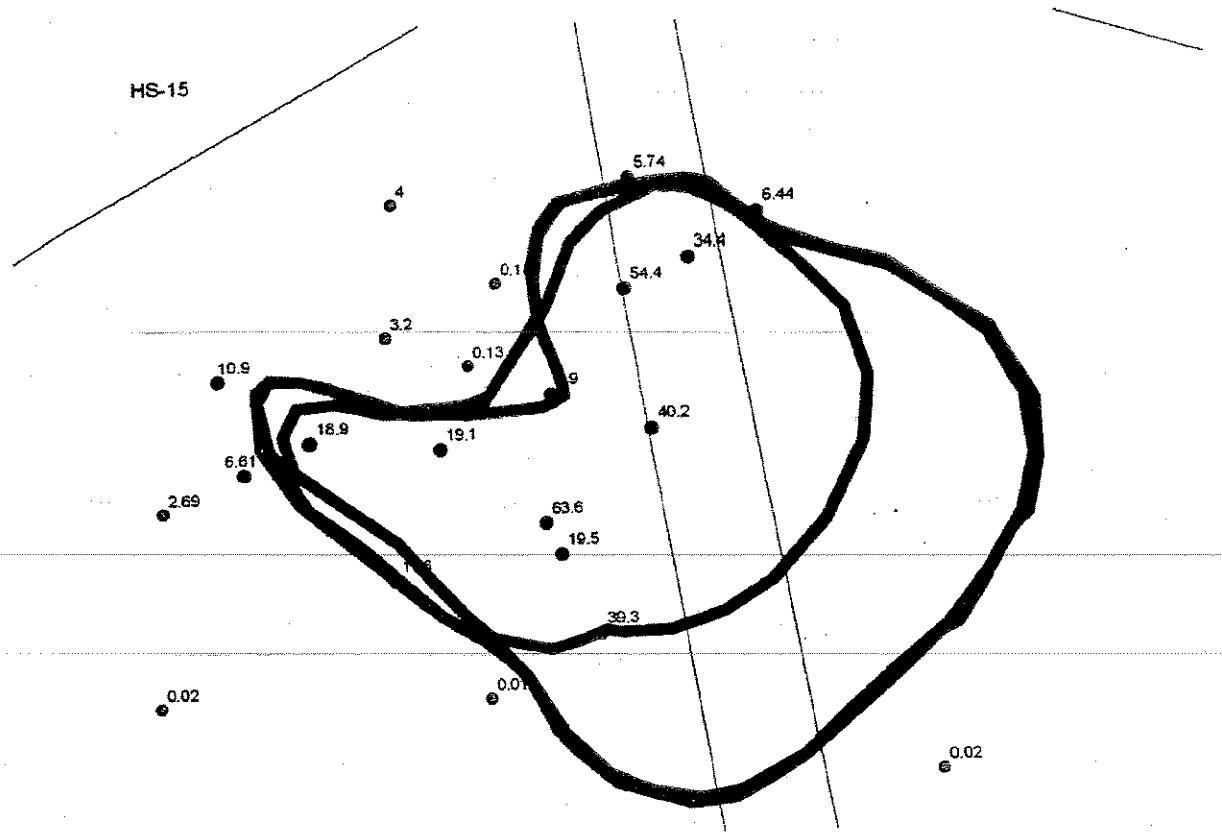


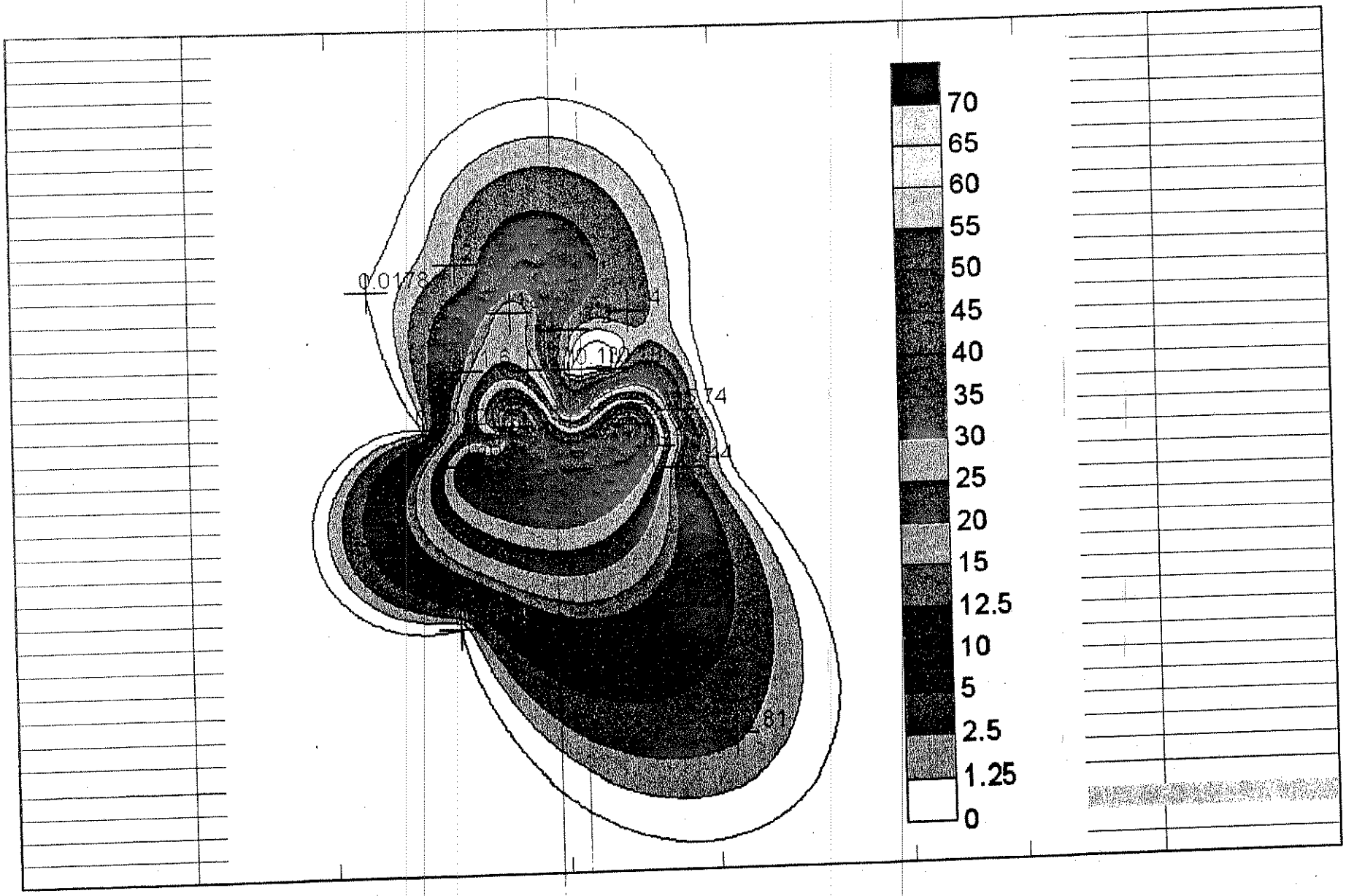
Figure 3. HS15 Lead (black outline) Bounding Limits, Cadmium (green outline) Limits, and Overall Excavation Bounding Limits (red outline) with Hotspot Lead Data

Figure 4. HS15 Lead (black outline) Bounding Limits, Cadmium (green outline) Limits, and Overall Excavation Bounding Limits (red outline) with Hotspot Cadmium Data

HS15 Weighted Average Results

Concentration (ppm)	Area Inside (ft2)	Avg Conc. in area (ppm)	Area of Conc (ft2)	Area * Avg. Conc (ft2-p	Total Area (ft2	Sum (ft2-ppm)	Wt Avg Conc. (ppm)
0	3613.79	0.625	756.09	472.5566939			
1.25	2857.70	1.875	544.13	1020.2461	1300.22	1492.80	1.148113811
2.5	2313.57	3.75	685.06	2568.977686	1985.28	4061.78	2.045945658
5	1628.51	7.5	597.54	4481.536371	2582.82	8543.32	3.30774657
10	1030.97	11.25	168.43	1894.791613	2751.25	10438.11	3.793955717
12.5	862.55	13.75	128.84	1771.543566	2880.09	12209.65	4.239335454
15	733.71	17.5	202.09	3536.658774	3082.18	15746.31	5.10882076
20	531.61	22.5	141.02	3172.968549	3223.20	18919.28	5.869715823
25	390.59	27.5	113.33	3116.571604	3336.53	22035.85	6.604418076
30	277.26	32.5	104.34	3390.978416	3440.87	25426.83	7.389652128
35	172.92	37.5	111.64	4186.369771	3552.51	29613.20	8.335861522
40	61.29	42.5	41.46	1762.09961	3593.97	31375.30	8.729990056
45	19.83	47.5	13.32	632.7870584	3607.29	32008.09	8.873168928
50	6.51	52.5	4.82	253.002921	3612.11	32261.09	8.931373775
55	1.69	57.5	1.48	84.89043651	3613.58	32345.98	8.951216829
60	0.21						

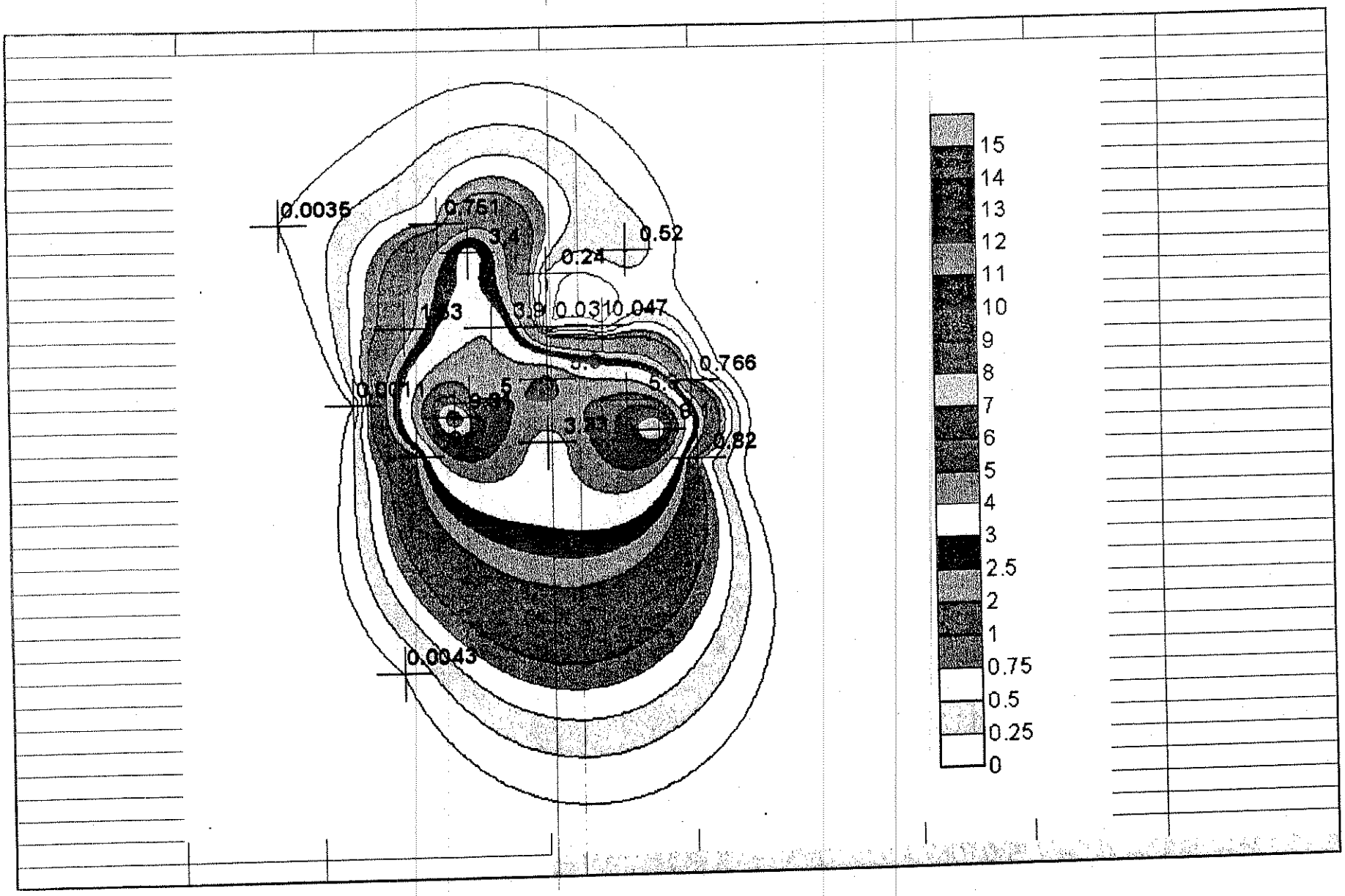
HS15 Weighted Average Results



HS15 Weighted Average Results

Concentration (ppm)	Area Inside (ft2)	Avg Conc. in area (ppm)	Area of Conc (ft2)	Area * Avg. Conc (ft2-ppm)	Total Area (ft	Sum (ft2-ppm)	Wt Avg Conc. (ppm)
0	2135.741442	0.125	503.47	62.93351493			
0.25	1632.273323	0.375	335.02	125.6330195			
0.5	1297.251937	0.625	206.69	129.1791408			
0.75	1090.565312	0.875	147.56	129.1115461	1192.73	446.8572213	0.374650091
1	943.0092592	1.5	348.92	523.3822098	1541.65	970.2394311	0.629349807
2	594.087786	2.25	108.76	244.7153409	1650.42	1214.954772	0.736150613
2.5	485.3254123	2.75	93.69	257.6422137	1744.10	1472.596986	0.844328604
3	391.6373346	3.5	166.52	582.8232408	1910.63	2055.420226	1.075784202
4	225.1164086	4.5	129.90	584.5299443	2040.52	2639.950171	1.293763073
5	95.22086546	5.5	60.75	334.1354217	2101.27	2974.085593	1.415373605
6	34.4689706	6.5	23.86	155.0705365	2125.13	3129.156129	1.472454344
7	10.61196499	7.5	8.80	66.01351739	2133.93	3195.169646	1.497316093
8	1.810162672	8.5	1.78	15.16836323	2135.72	3210.33801	1.503167238
9	0.025649351	9.5	0.03	0.243668832	2135.74	3210.581678	1.503263277
10		5					

HS15 Weighted Average Results



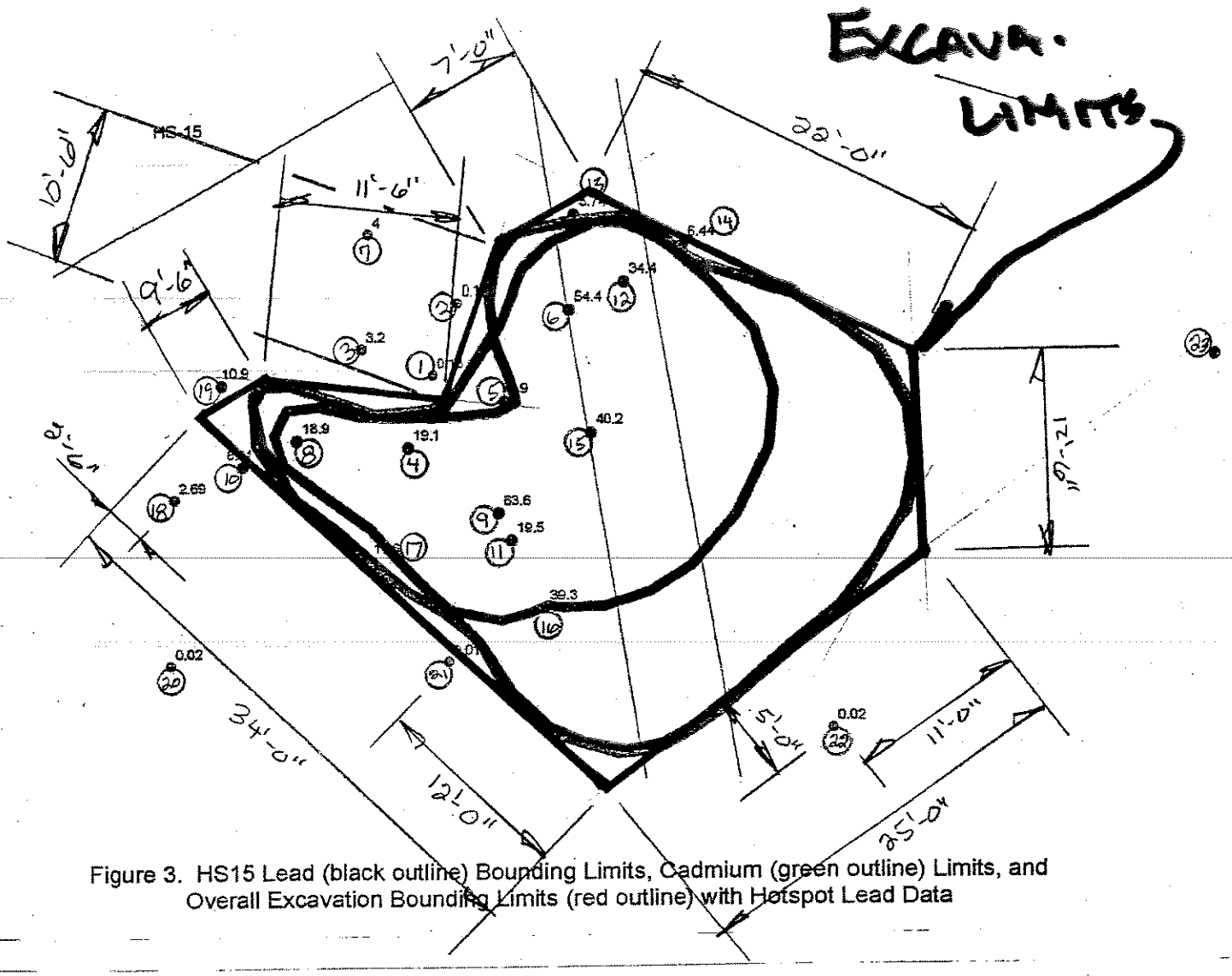


Figure 3. HS15 Lead (black outline) Bounding Limits, Cadmium (green outline) Limits, and Overall Excavation Bounding Limits (red outline) with Hotspot Lead Data

"Rimmer Statistical Evaluation"

Location ID	Chemical Name	Units	Result	Lab Qualifier	Detection Limit	Sample Id
D1630RIM01	Lead	mg/kg	11.3		0.49	D1630RIM01-A
D1630RIM01	Lead	mg/L	0.04	U	0.04	D1630RIM01-A
D1630RIM02	Lead	mg/kg	47.2		0.49	D1630RIM02-A
D1630RIM02	Lead	mg/L	0.063	B	0.04	D1630RIM02-A
D1630RIM03	Lead	mg/L	0.04	U	0.04	D1630RIM03-A
D1630RIM03	Lead	mg/kg	136		2.3	D1630RIM03-A
D1630RIM04	Lead	mg/L	0.04	U	0.04	D1630RIM04-A
D1630RIM04	Lead	mg/kg	21.4		0.46	D1630RIM04-A
D1630RIM05	Lead	mg/kg	101		0.5	D1630RIM05-A
D1630RIM05	Lead	mg/L	0.04	U	0.04	D1630RIM05-A
D1630RIM06	Lead	mg/kg	27600		9.1	D1630RIM06-A
D1630RIM06	Lead	mg/L	48.7		0.04	D1630RIM06-A
D1630RIM07	Lead	mg/kg	510		0.5	D1630RIM07-A
D1630RIM07	Lead	mg/L	7		0.04	D1630RIM07-A
D1630RIM08	Lead	mg/L	0.04	U	0.04	D1630RIM08-A
D1630RIM08	Lead	mg/kg	26.1		0.46	D1630RIM08-A
D1630RIM09	Lead	mg/L	0.04	U	0.04	D1630RIM09-A
D1630RIM09	Lead	mg/kg	73.1		0.49	D1630RIM09-A
D1630RIM10	Lead	mg/L	0.18		0.04	D1630RIM10-A
D1630RIM10	Lead	mg/kg	147		0.5	D1630RIM10-A
D1630RIM11	Lead	mg/L	10.7		0.04	D1630RIM11-A
D1630RIM11	Lead	mg/kg	4120		2.3	D1630RIM11-A
D1630RIM12	Lead	mg/kg	21.3		0.46	D1630RIM12-A
D1630RIM12	Lead	mg/L	0.04	U	0.04	D1630RIM12-A
D1630RIM12D	Lead	mg/kg	35.9		0.46	D1630RIM12-E
D1630RIM12D	Lead	mg/L	0.04	U	0.04	D1630RIM12-E
D1630RIM13	Lead	mg/L	0.04	U	0.04	D1630RIM13-A
D1630RIM13	Lead	mg/kg	48.6		0.49	D1630RIM13-A
D1630RIM14	Lead	mg/L	0.04	U	0.04	D1630RIM14-A
D1630RIM14	Lead	mg/kg	389		0.53	D1630RIM14-A
D1630RIM15	Lead	mg/L	1.5		0.04	D1630RIM15-A
D1630RIM15	Lead	mg/kg	955		9.9	D1630RIM15-A
D1630RIM16	Lead	mg/L	0.15		0.04	D1630RIM16-A
D1630RIM16	Lead	mg/kg	103		0.52	D1630RIM16-A
D1630RIM17	Lead	mg/L	0.04	U	0.04	D1630RIM17-A
D1630RIM17	Lead	mg/kg	185		0.47	D1630RIM17-A
D1630RIM18	Lead	mg/L	0.057	B	0.04	D1630RIM18
D1630RIM19	Lead	mg/L	0.31		0.04	D1630RIM19
D1630RIM20	Lead	mg/L	0.2		0.04	D1630RIM20
D1630RIM21	Lead	mg/L	0.04	U	0.04	D1630RIM21
D1630RIM22	Lead	mg/L	9.2		0.04	D1630RIM22

Location ID	Chemical Name	Units	Result	Lab Qualifi	Detection Limit	Sample Id
D1630RIM01	Lead	mg/L	0.04	U	0.04	D1630RIM01-A
D1630RIM03	Lead	mg/L	0.04	U	0.04	D1630RIM03-A
D1630RIM04	Lead	mg/L	0.04	U	0.04	D1630RIM04-A
D1630RIM05	Lead	mg/L	0.04	U	0.04	D1630RIM05-A
D1630RIM08	Lead	mg/L	0.04	U	0.04	D1630RIM08-A
D1630RIM09	Lead	mg/L	0.04	U	0.04	D1630RIM09-A
D1630RIM12	Lead	mg/L	0.04	U	0.04	D1630RIM12-A
D1630RIM12D	Lead	mg/L	0.04	U	0.04	D1630RIM12-E
D1630RIM13	Lead	mg/L	0.04	U	0.04	D1630RIM13-A
D1630RIM14	Lead	mg/L	0.04	U	0.04	D1630RIM14-A
D1630RIM17	Lead	mg/L	0.04	U	0.04	D1630RIM17-A
D1630RIM02	Lead	mg/L	0.063	B	0.04	D1630RIM02-A
D1630RIM16	Lead	mg/L	0.15		0.04	D1630RIM16-A
D1630RIM10	Lead	mg/L	0.18		0.04	D1630RIM10-A
D1630RIM15	Lead	mg/L	1.5		0.04	D1630RIM15-A
D1630RIM07	Lead	mg/L	7		0.04	D1630RIM07-A
D1630RIM11	Lead	mg/L	10.7		0.04	D1630RIM11-A
D1630RIM18	Lead	mg/L	0.057	B	0.04	D1630RIM18
D1630RIM19	Lead	mg/L	0.31		0.04	D1630RIM19
D1630RIM20	Lead	mg/L	0.2		0.04	D1630RIM20
D1630RIM21	Lead	mg/L	0.04	U	0.04	D1630RIM21
D1630RIM22	Lead	mg/L	9.2		0.04	D1630RIM22
min		**mg/L**	**0.04**			
median		**mg/L**	**0.04**			
max		**mg/L**	**10.7**			
mean		**mg/L**	**1.4**			
UCL-90		**mg/L**	**3.97**	**Pert Beta**		
UCL-95		**mg/L**	**4.84**	**Pert Beta**		

Location ID	Chemical Name	Units	Result	Lab Qualifier	Detection L	Sample Id
D1630RIM01	Lead	mg/kg	11.3		0.49	D1630RIM01-A
D1630RIM02	Lead	mg/kg	47.2		0.49	D1630RIM02-A
D1630RIM03	Lead	mg/kg	136		2.3	D1630RIM03-A
D1630RIM04	Lead	mg/kg	21.4		0.46	D1630RIM04-A
D1630RIM05	Lead	mg/kg	101		0.5	D1630RIM05-A
D1630RIM06	Lead	mg/kg	27600		9.1	D1630RIM06-A
D1630RIM07	Lead	mg/kg	510		0.5	D1630RIM07-A
D1630RIM08	Lead	mg/kg	26.1		0.46	D1630RIM08-A
D1630RIM09	Lead	mg/kg	73.1		0.49	D1630RIM09-A
D1630RIM10	Lead	mg/kg	147		0.5	D1630RIM10-A
D1630RIM11	Lead	mg/kg	4120		2.3	D1630RIM11-A
D1630RIM12	Lead	mg/kg	21.3		0.46	D1630RIM12-A
D1630RIM12D	Lead	mg/kg	35.9		0.46	D1630RIM12-E
D1630RIM13	Lead	mg/kg	48.6		0.49	D1630RIM13-A
D1630RIM14	Lead	mg/kg	389		0.53	D1630RIM14-A
D1630RIM15	Lead	mg/kg	955		9.9	D1630RIM15-A
D1630RIM16	Lead	mg/kg	103		0.52	D1630RIM16-A
D1630RIM17	Lead	mg/kg	185		0.47	D1630RIM17-A
D1630RIM18	Lead	mg/kg	47.2	*N	0.45	D1630RIM18
D1630RIM19	Lead	mg/kg	179	*N	0.47	D1630RIM19
D1630RIM20	Lead	mg/kg	345	*N	0.48	D1630RIM20
D1630RIM21	Lead	mg/kg	27.4	*N	0.47	D1630RIM21
D1630RIM22	Lead	mg/kg	122	*N	0.46	D1630RIM22

General UCL Statistics for Full Data Sets

User Selected Options	
From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	90%
Number of Bootstrap Operations	2000

C0

General Statistics

Number of Valid Samples	22	Number of Unique Samples
Raw Statistics		Log-transformed Statistics
Minimum	0.04	Minimum of Log Data
Maximum	10.7	Maximum of Log Data
Mean	1.356	Mean of log Data
Median	0.04	SD of log Data
SD	3.163	
Coefficient of Variation	2.332	
Skewness	2.384	

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test
Shapiro Wilk Test Statistic	0.474	Shapiro Wilk Test Statistic
Shapiro Wilk Critical Value	0.911	Shapiro Wilk Critical Value
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level
Assuming Normal Distribution		Assuming Lognormal Distribution
90% Student's-t UCL	2.249	90% H-UCL
		90% Chebyshev (MVUE) UCL
90% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL
90% Adjusted-CLT UCL	2.465	97.5% Chebyshev (MVUE) UCL
90% Modified-t UCL	2.306	99% Chebyshev (MVUE) UCL

Gamma Distribution Test		Data Distribution
		Data do not follow a Discernable
k star (bias corrected)	0.29	Distribution (0.05)
Theta Star	4.676	
nu star	12.76	
Approximate Chi Square Value (.05)	6.866	Nonparametric Statistics
Adjusted Level of Significance	0.0873	90% CLT UCL
Adjusted Chi Square Value	6.617	90% Jackknife UCL
		90% Standard Bootstrap UCL
Anderson-Darling Test Statistic	4.06	90% Bootstrap-t UCL
Anderson-Darling 5% Critical Value	0.847	90% Hall's Bootstrap UCL
Kolmogorov-Smirnov Test Statistic	0.341	90% Percentile Bootstrap UCL
Kolmogorov-Smirnov 5% Critical Value	0.201	90% BCA Bootstrap UCL
Data not Gamma Distributed at 5% Significance Level		90% Chebyshev(Mean, Sd) UCL
		95% Chebyshev(Mean, Sd) UCL
		97.5% Chebyshev(Mean, Sd) UCL
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL
90% Approximate Gamma UCL	2.521	
90% Adjusted Gamma UCL	2.616	

Potential UCL to Use	Recommendation Provided only for 95% Confidence Coefficient

General UCL Statistics for Full Data Sets

User Selected Options	
From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

C0

General Statistics			
Number of Valid Samples	22	Number of Unique Samples	11
Raw Statistics		**Log-transformed Statistics**	
Minimum	0.04	Minimum of Log Data	-3.219
Maximum	10.7	Maximum of Log Data	2.37
Mean	1.356	Mean of log Data	-1.987
Median	0.04	SD of log Data	1.932
SD	3.163		
Coefficient of Variation	2.332		
Skewness	2.384		

Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.474	Shapiro Wilk Test Statistic	0.681
Shapiro Wilk Critical Value	0.911	Shapiro Wilk Critical Value	0.911
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	2.517	95% H-UCL	4.765
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	2.357
95% Adjusted-CLT UCL	2.832	97.5% Chebyshev (MVUE) UCL	3.064
95% Modified-t UCL	2.574	99% Chebyshev (MVUE) UCL	4.453

Gamma Distribution Test		Data Distribution	
k star (bias corrected)	0.29	Data do not follow a Discernable Distribution (0.05)	
Theta Star	4.676		
nu star	12.76		
Approximate Chi Square Value (.05)	5.734	Nonparametric Statistics	
Adjusted Level of Significance	0.0386	95% CLT UCL	2.466
Adjusted Chi Square Value	5.385	95% Jackknife UCL	2.517
		95% Standard Bootstrap UCL	2.461
Anderson-Darling Test Statistic	4.06	95% Bootstrap-t UCL	3.382
Anderson-Darling 5% Critical Value	0.847	95% Hall's Bootstrap UCL	2.252
Kolmogorov-Smirnov Test Statistic	0.341	95% Percentile Bootstrap UCL	2.455
Kolmogorov-Smirnov 5% Critical Value	0.201	95% BCA Bootstrap UCL	2.778
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	4.296
		97.5% Chebyshev(Mean, Sd) UCL	5.568
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	8.067
95% Approximate Gamma UCL	3.019		
95% Adjusted Gamma UCL	3.215		

Potential UCL to Use		
	Use 99% Chebyshev (Mean, Sd) UCL	8.067

General UCL Statistics for Data Sets with Non-Detects

User Selected Options	
From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	90%
Number of Bootstrap Operations	2000

X

General Statistics			
Number of Valid Samples	22	Number of Detected Data	10
Number of Unique Samples	10	Number of Non-Detect Data	12
		Percent Non-Detects	54.55%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.057	Minimum Detected	-2.865
Maximum Detected	10.7	Maximum Detected	2.37
Mean of Detected	2.936	Mean of Detected	-0.508
SD of Detected	4.274	SD of Detected	2.062
Minimum Non-Detect	0.04	Minimum Non-Detect	-3.219
Maximum Non-Detect	0.04	Maximum Non-Detect	-3.219

UCL Statistics			
Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.703	Shapiro Wilk Test Statistic	0.862
5% Shapiro Wilk Critical Value	0.842	5% Shapiro Wilk Critical Value	0.842
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	1.345	Mean	-2.365
SD	3.168	SD	2.198
90% DL/2 (t) UCL	2.239	90% H-Stat (DL/2) UCL	3.72
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE yields a negative mean		Mean in Log Scale	-3.874
		SD in Log Scale	3.768
		Mean in Original Scale	1.337
		SD in Original Scale	3.172
		90% Percentile Bootstrap UCL	2.266
		90% BCA Bootstrap UCL	2.481
Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	0.356	Data appear Lognormal at 5% Significance Level	
Theta Star	8.253		
nu star	7.115		
A-D Test Statistic	0.869	Nonparametric Statistics	
5% A-D Critical Value	0.793	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.793	Mean	1.366
5% K-S Critical Value	0.284	SD	3.087
Data not Gamma Distributed at 5% Significance Level		SE of Mean	0.694
		90% KM (t) UCL	2.283

Assuming Gamma Distribution		90% KM (z) UCL	2.255
Gamma ROS Statistics using Extrapolated Data		90% KM (jackknife) UCL	2.254
Minimum	0	90% KM (bootstrap t) UCL	2.75
Maximum	19.09	90% KM (BCA) UCL	2.178
Mean	4.294	90% KM (Percentile Bootstrap) UCL	2.246
Median	1.191	90% KM (Chebyshev) UCL	3.447
SD	5.622	95% KM (Chebyshev) UCL	4.389
k star	0.191	97.5% KM (Chebyshev) UCL	5.697
Theta star	22.49	99% KM (Chebyshev) UCL	8.267
Nu star	8.402		
AppChi2	3.761	Potential UCL to Use	
90% Gamma Approximate UCL	9.594	Recommendation Provided only	
90% Adjusted Gamma UCL	10.07	for 95% Confidence Coeficient	

Note: DL/2 is not a recommended method.

General UCL Statistics for Data Sets with Non-Detects

User Selected Options	
From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

X

General Statistics			
Number of Valid Samples	22	Number of Detected Data	10
Number of Unique Samples	10	Number of Non-Detect Data	12
		Percent Non-Detects	54.55%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.057	Minimum Detected	-2.865
Maximum Detected	10.7	Maximum Detected	2.37
Mean of Detected	2.936	Mean of Detected	-0.508
SD of Detected	4.274	SD of Detected	2.062
Minimum Non-Detect	0.04	Minimum Non-Detect	-3.219
Maximum Non-Detect	0.04	Maximum Non-Detect	-3.219

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test, Detected Values Only	
Shapiro Wilk Test Statistic	0.703	Shapiro Wilk Test Statistic	0.862
5% Shapiro Wilk Critical Value	0.842	5% Shapiro Wilk Critical Value	0.842
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	1.345	Mean	-2.365
SD	3.168	SD	2.198
95% DL/2 (t) UCL	2.508	95% H-Stat (DL/2) UCL	6.406

Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE yields a negative mean		Mean in Log Scale	-3.874
		SD in Log Scale	3.768
		Mean in Original Scale	1.337
		SD in Original Scale	3.172
		95% Percentile Bootstrap UCL	2.487
		95% BCA Bootstrap UCL	2.84

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only
k star (bias corrected)	0.356	Data appear Lognormal at 5% Significance Level
Theta Star	8.253	
nu star	7.115	

		Nonparametric Statistics	
A-D Test Statistic	0.869	Kaplan-Meier (KM) Method	
5% A-D Critical Value	0.793	Mean	1.366
K-S Test Statistic	0.793	SD	3.087
5% K-S Critical Value	0.284	SE of Mean	0.694
Data not Gamma Distributed at 5% Significance Level		95% KM (t) UCL	2.559

Assuming Gamma Distribution		95% KM (z) UCL	2.507
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	2.522
Minimum	0	95% KM (bootstrap t) UCL	3.259
Maximum	19.09	95% KM (BCA) UCL	2.602
Mean	4.294	95% KM (Percentile Bootstrap) UCL	2.518
Median	1.191	95% KM (Chebyshev) UCL	4.389
SD	5.622	97.5% KM (Chebyshev) UCL	5.697
k star	0.191	99% KM (Chebyshev) UCL	8.267
Theta star	22.49		
Nu star	8.402	Potential UCLs to Use	
AppChi2	2.97	99% KM (Chebyshev) UCL	8.267
95% Gamma Approximate UCL	12.15		
95% Adjusted Gamma UCL	13.2		

Note: DL/2 is not a recommended method.

APPENDIX D

Post-Treatment Grab Sampling Results

APPENDIX D

Post Treatment Grab Sampling Results

Sample ID	TCLP Pb (mg/L)	TCLP Cd (mg/L)
D1630RCRAPL5-23	0.04U	0.014B
D1630RCRAPL5-24	0.04U	0.013B
D1630RCRAPL5-25	0.04U	0.1
D1630RCRAPL5-26	0.72	0.44
D1630RCRAPL5-26	0.04U	0.028B
D1630RCRAPL5-27	0.14	0.21
D1630RCRAPL5-28	0.04U	0.075
D1630RCRAPL5-29	0.04U	0.089
D1630RCRAPL5-30	0.04U	0.11
D1630RCRAPL5-31	0.127	0.126
D1630RCRAPL5-32	0.001U	0.001U
D1630RCRAPL5-33	0.528	0.33
D1630RCRAPL5-34	0.0496	0.0959
D1630RCRAPL5-34D	0.046	0.0932
D1630RCRAPL5-35	0.01U	0.0196
D1630RCRAPL5-36	0.232	0.184
D1630RCRAPL5-37	0.0536	0.103
D1630RCRAPL5-38	0.226	0.215
D1630RCRAPL5-39	0.0512	0.119
D1630RCRAPL5-40	0.0243U	0.0644

B=Target analyte detected in associated blank
D = duplicate
TCLP = Toxicity Characteristic Leaching Procedure
U = below detection limits

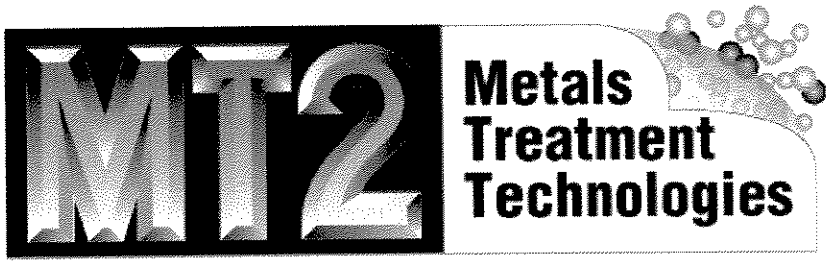
Witherspoon Site Remediation Final Report

Prepared For:

Bechtel Jacobs Company, LLC

Knoxville, TN

December 2007



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2.0 SITE HISTORY AND CURRENT CONDITIONS

The David Witherspoon Inc 1630 site is located in Knoxville, TN. The site is a former scrap yard. Lead and cadmium contaminated soil that was determined to be RCRA-characteristic from several locations at the site were combined into a stockpile of approximately 600 cubic yards. The stockpile contained some rocks, bricks, wood, and other debris. The stockpile was situated on a relative flat clear area. The stockpile was approximately 90'x 90' and 2' in height at the time of treatment.

3.0 TREATABILITY STUDY

In August of 2007, Bechtel Jacobs/RSI personnel collected a representative composite sample of soil from the stockpile for a treatability study. At the MT2 laboratory, the sample was analyzed and treated with ECOBOND® to determine the appropriate level of treatment necessary at the Witherspoon site. As reported in the MT2 Treatability Study, TCLP Pb and Cd concentrations dropped by at least 90% after treatment. MT2 applied 6%, by weight, ECOBOND® Pb/Cd to the soil at the Witherspoon site. As indicated by the Treatability Study, this level of treatment would result in the effective stabilization of the lead and cadmium contaminated soil.

4.0 SOIL SAMPLING AND ANALYSIS

MT2 visited the site on 29 August 2007 to assess the site conditions and the nature of the soil stockpile. Although the stockpile did contain some bricks, sticks, and other debris under one foot in diameter, the soil was determined to be treatable without any further processing.

In August of 2007, Bechtel Jacobs/RSI sampled the untreated stockpile with samples being sent to an independent third-party laboratory designated by Bechtel Jacobs. The

untreated TCLP Pb results varied from 44.5 to 119 mg/L and the untreated TCLP Cd results varied from 3.1 to 4.8 mg/L.

5.0 SITE PREPARATION

Prior to treatment BJC removed large pieces of debris from the pile using a tractor and rake and mixed the remaining pile to provide a homogeneous soil. The large pieces of debris were determined to be non-RCRA.

Bechtel Jacobs provided all necessary equipment and operators to treat the soil. A CAT 330 excavator was used to mix in the treatment product. A 2500-gallon water truck was used to add water for dust control. MT2 provided technical oversight and directed the treatment.

6.0 SOIL TREATMENT WITH ECOBOND®

Lead and cadmium contaminated soil stabilization treatment with ECOBOND® was performed at the Witherspoon site on October 25 and 26, 2007. About 600 cy of lead and cadmium contaminated soil was treated with 25.01 tons of ECOBOND Cd and 23.27 tons of ECOBOND Pb utilizing a CAT 330 excavator to mix the soil. A small portion of ECOBOND Pb was withheld (3 to 5 tons) for further treatment use, if needed. Due to the reactivity of the ECOBOND Cd with water, none of that material was withheld. A small part of the pile did not pass the Cd goal initially so Bechtel Jacobs purchased 900 pounds of hydrated lime under the advise of MT2 and retreated only that portion of the soil on November 13, 2007. The reason for not reaching the goal was likely to be incomplete mixing. The remaining Ecobond Pb was added to the soil that already passed to allow for disposal. No unused ECOBOND remains at the site.

7.0 CONFIRMATION OF PROJECT CLEANUP GOALS

After all stockpile soils had been treated with ECOBOND®, Bechtel Jacobs / RSI personnel divided the stockpile into separate sampling grids. Composite samples were collected from the grids and analyzed for TCLP Pb and TCLP Cd to verify treatment meeting project criteria. Bechtel Jacobs provided MT2 with these initial treated soil sample results. See Table 7-1 for sample results. Station IDs 13 and 14 were considered to not meet the goals (below 5 mg/L Pb TCLP and 1.0 mg/L Cd TCLP.) After the retreatment, grab samples were taken randomly-6 in the already treated portion and 2 in the retreated portion. These results are designated as final results. All final results passed the criteria of 5 mg/L TCLP Pb and 1.0 mg/L TCLP Cd.

Table 7.1 Post-Treatment Sampling Results

Station ID	TCLP Pb (mg/L)	TCLP Cd (mg/L)	Status
12	0.04U	0.31	Initial
13	4.4	1.3	Initial
14	2.8	1.1	Initial
15	0.52	0.39	Initial
16	0.04U	0.01U	Initial
17	0.04U	0.01U	Initial
18	0.04U	0.01U	Initial
19	0.04U	0.01U	Initial
20	0.04U	0.02B	Initial
21	0.04U	0.01U	Initial
22	0.04U	0.01U	Initial
23	0.04U	0.014B	Final
24	0.04U	0.013	Final
25	0.04U	0.1	Final
26	0.72	0.44	Final
26D	0.04U	0.28	Final
27	0.14	0.21	Final
28	0.04U	0.075	Final
29	0.04U	0.089	Final
30	0.04U	0.11	Final

U = Below detection limits
B = Found in blank sample
D = Duplicate sample

8.0 SITE CLEANUP AND DEMOBILIZATION

Site cleanup included extra ECOBOND® being appropriately mixed into the treated stockpile. All ECOBOND® was mixed into the soil stockpile and no extra ECOBOND® remained after the treatment was complete. Cleaning and/or decontamination of the equipment used for soil treatment was accomplished by Bechtel Jacobs personnel.

9.0 CONCLUSION

MT2 provided 25.01 tons of ECOBOND Cd and 23.27 tons of ECOBOND Pb to the Bechtel Jacobs David Witherspoon 1630 Site. The two ECOBOND products were used for the treatment approximately 600 cubic yards of Pb and Cd contaminated soil, with

treatment oversite provided by MT2 personnel. An additional 900 pounds of hydrated lime was used to retreat part of the pile that initially did not pass the goal of 1.0 mg/L TCLP Cd. The soil was initially treated with the ECOBOND on October 25 and 26, 2007 and retreated on November 13, 2007. All treated soil met the project RCRA criteria of 5.0 mg/L leachable lead and 1.0 mg/L leachable cadmium.

Appendix A

ECOBOND MSDS

MT2– ECOBOND® Cd / Pb
Material Safety Data Sheet

MT2, LLC
14045 W. 66th Ave
Arvada, CO 80004

Phone: 888-435-6645
Fax: 303-456-6998

SECTION 1: PRODUCT IDENTIFICATION

ECOBOND® Cd / Pb

Chemical Name and Synonyms: ECOBOND, Inorganic Salts, Alkali Salts

Chemical Family: Phosphate Salts and Alkali Salts

Hazard Class ID #: NOS

SECTION 2: HAZARDOUS INGREDIENTS

Not applicable

SECTION 3: PHYSICAL DATA

Boiling Point, decomposes / 2800 degree C

Vapor Pressure (mmHg.): N/A

Vapor Density (Air=1): N/A
Solubility in Water: 40%

Appearance and Odor: A blend of gray to white granular powder. No odor.

Specific Gravity (H2O=1): 2.2 – 3.2

pH: 8.5-10.0

Percent Volatile by Volume (%): Nil

Evaporation Rate: NA

Melting Point: Over 2500°F

SECTION 4: FIRE AND EXPLOSION HAZARD DATA

Extinguishing media: non-combustible – use extinguishing media appropriate to fire

Flash Point: Non detected

Auto ignition temperature: Non detected

SECTION 5: HEALTH HAZARD DATA

Skin Effects: Moderately irritating. Protect with gloves, clothing.
Eye Effect: Wear protective goggles
Swallowing: This material can cause irritation to severe burns if inhaled, swallowed or comes in contact with eyes or skin.

Threshold Limit Value: None
OSHA (TWA): None

Carcinogenicity: None determined

Emergency and First Aid Procedures

Skin: Wash all areas with plenty of water for approx 15 minutes.

Eye Contact: Flush eyes and lids thoroughly with water for at least 15 minutes. Notify physician.

Swallowing: If swallowed give large amounts of water, followed by fruit juice. Notify physician

Dust Inhalation: Remove to fresh air. Flush mouth with cold water. Notify physician

SECTION 6: REACTIVITY DATA

Compatibility (Conditions to avoid): Can react with water or steam to produce heat.

Incompatibility (materials to avoid): Avoid contact with acids.

SECTION 7: SPILL OR LEAK PROCEDURES

Steps to be taken in case material is released or spilled:

1. Avoid direct contact with water.
2. Make certain waste cannot contact acid.
3. Sweep up carefully to remove as much uncontaminated materials as possible.
4. Avoid skin and eye contact. Avoid inhalation.
5. Dispose of according to Federal, State and local regulations.

SECTION 8: SPECIAL PROTECTION INFORMATION

Respiratory Protection: Use dust mask or NIOSH approved HEPA respirator cartridge. Use positive pressure self-contained breathing apparatus for emergency use.

Ventilation: Local exhaust usually adequate. Dust collector equipment may be indicated in some instances.

Other Protective Equipment: Eye wash fountain should be provided in work areas.

SECTION 9: SPECIAL PRECAUTIONS

Handling and Storage: Keep containers closed to avoid reaction with water.

Other Precautions: Wash from skin or eyes as quickly as possible after exposure. Do not allow contact acids. Remove and wash contaminated clothing.

DISCLAIMER

The information and recommendations herein are taken from data contained in independent, industrial recognized references, including NIOSH, OSHA, ANSI, and NFPA. Thus MT2, LLC makes no guarantee, warranty, or other representation concerning this substance, since the conditions of its use are beyond the control of MT2, LLC. MT2, LLC disclaims any liability for loss or damage incurred in connection with the use of this substance.

APPENDIX E

Final Treatment Report

Witherspoon Site Remediation Final Report

Prepared For:

Bechtel Jacobs Company, LLC

Knoxville, TN

December 2007

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24	0.04U	0.013	Final
25	0.04U	0.1	Final
26	0.72	0.44	Final
26D	0.04U	0.28	Final
27	0.14	0.21	Final
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Not applicable

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Boiling Point, decomposes / 2800 degree C

Vapor Pressure (mmHg.): N/A

Vapor Density (Air=1): N/A
Solubility in Water: 40%

Appearance and Odor: A blend of gray to white granular powder. No odor.

Specific Gravity (H2O=1): 2.2 – 3.2

pH: 8.5-10.0

Percent Volatile by Volume (%): Nil

Evaporation Rate: NA

Melting Point: Over 2500°F

SECTION 4: FIRE AND EXPLOSION HAZARD DATA

Extinguishing media: non-combustible – use extinguishing media appropriate to fire

Flash Point: Non detected

Auto ignition temperature: Non detected

SECTION 5: HEALTH HAZARD DATA

Skin Effects: Moderately irritating. Protect with gloves, clothing.
Eye Effect: Wear protective goggles
Swallowing: This material can cause irritation to severe burns if inhaled, swallowed or comes in contact with eyes or skin.

Threshold Limit Value: None
OSHA (TWA): None

Carcinogenicity: None determined

Emergency and First Aid Procedures

Skin: Wash all areas with plenty of water for approx 15 minutes.

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