Agreement Log #: KIF-10-006

Time-Critical Concurrence

Area:
Completion of northern portion of the east embayment

Agreement:

Ash that had been released in the northern portion of the east embayment (defined as the area north of the ash berm constructed for the clean water ditch), was removed by amphibious trackhoes and placed inside the berm for future treatment with lime and transport to storage or the trains. Before ash removal began, the underlying ash/sediments were sampled for the presence of ash. No ash was found in the northern most samples representing roughly the last 100 feet of the embayment. Therefore, samples were not taken across Swan Pond Circle Road and the assumption is that ash did not move through the culvert to the northern side of the embayment.

After completion of the removal based on visual cues, the remaining sediment was sampled according to a draft plan that is attached. Also attached is a figure showing sampling locations. All results came back below 10% ash except for one location with a 13 and 16% result (results attached). Many of the samples had no detectable ash at all. Sample locations 1 and 26 were not sampled because they fell on the berm and the culvert, respectively, and would require too great of a move distance to be meaningful. The area is considered free of ash and when appropriate, will be allowed to refill with water. The banks of the embayment area are being reseeded.

Based on non-detectable and very low level of ash results from a statistically-based sampling strategy, concurrence with this form signifies that no further action is needed to remove ash in the northern portion of the east embayment.

Concurrence Comments:

Julie L Pfeiffer — Jacobs Project Manager — 3/15/10 — Date

Michael T Scott — Tennessee Valley Authority — 3/16/10 — Date

Leo Fink — U. S. Environmental Protection Agency — 3/18/10 — Date

Consulted. w/ TDEC

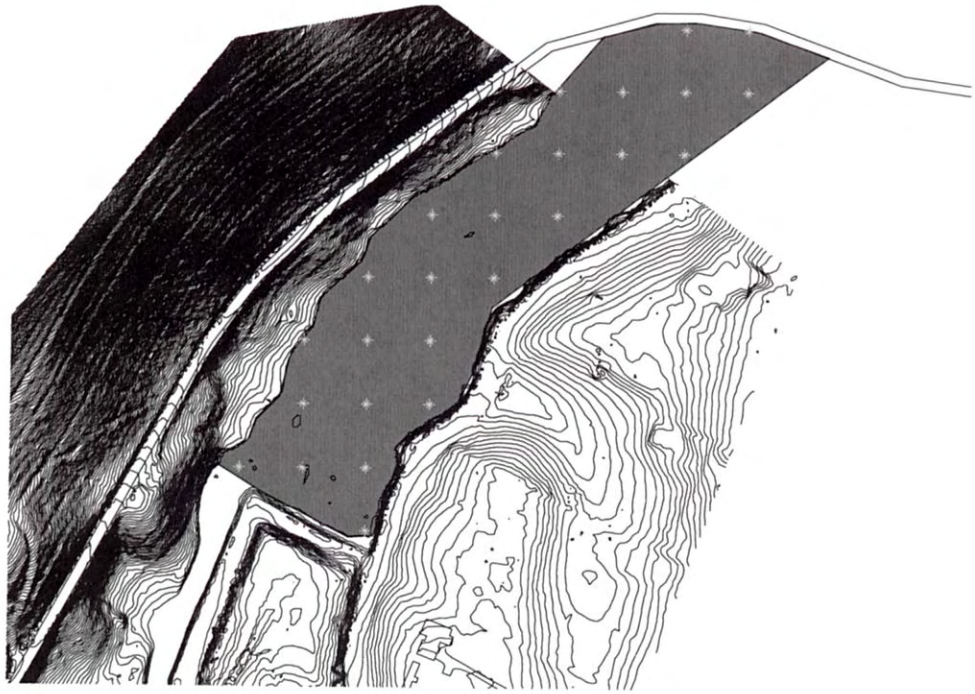
Systematic sampling locations for detecting a hot spot that is 5% of the area of the East Embayment

This report summarizes the sampling design used, associated statistical assumptions, as well as general guidelines for conducting post-sampling data analysis. Sampling plan components presented here include how many sampling locations to choose and where within the sampling area to collect those samples. The type of medium to sample (i.e., soil, groundwater, etc.) and how to analyze the samples (in-situ, fixed laboratory, etc.) are addressed in other sections of the sampling plan.

The following table summarizes the sampling design developed. A figure that shows sampling locations in the field and a table that lists sampling location coordinates are also provided below.

SUMMARY OF SAMPLING DESIGN	
Primary Objective of Design	Detect the presence of a hot spot that has a specified size and shape
Type of Sampling Design	Hot spot
Sample Placement (Location) in the Field	Systematic (Hot Spot) with a random start location
Formula for calculating number of sampling locations	Singer and Wickman algorithm
Calculated total number of samples	24
Type of samples	Point Samples
Number of samples on map [a]	26
Number of selected sample areas [b]	1
Specified sampling area [c]	386067.39 ft^2
Grid pattern	Square
Size of grid / Area of grid [d]	127.192 feet / 16177.8 ft^2

[a] This number may differ from the calculated number because of 1) grid edge effects, 2) adding judgment samples, or 3) selecting or unselecting sample areas.
[b] The number of selected sample areas is the number of colored areas on the map of the site. These sample areas contain the locations where samples are collected.
[c] The sampling area is the total surface area of the selected colored sample areas on the map of the site.
[d] Size of grid / Area of grid gives the linear and square dimensions of the grid spacing used to systematically place samples.



Area: Area 1					
X Coord	Y Coord	Label	Value	Type	Historical
2442924.6152	559407.4081		0	Hotspot	
2442670.2308	559534.6002		0	Hotspot	
2442797.4230	559534.6002		0	Hotspot	
2442924.6152	559534.6002		0	Hotspot	
2442797.4230	559661.7924		0	Hotspot	
2442924.6152	559661.7924		0	Hotspot	
2443051.8073	559661.7924		0	Hotspot	
2442797.4230	559788.9846		0	Hotspot	
2442924.6152	559788.9846		0	Hotspot	
2443051.8073	559788.9846		0	Hotspot	
2442924.6152	559916.1767		0	Hotspot	
2443051.8073	559916.1767		0	Hotspot	
2443178.9995	559916.1767		0	Hotspot	
2443051.8073	560043.3689		0	Hotspot	
2443178.9995	560043.3689		0	Hotspot	
2443306.1917	560043.3689		0	Hotspot	
2443178.9995	560170.5611		0	Hotspot	
2443306.1917	560170.5611		0	Hotspot	
2443433.3839	560170.5611		0	Hotspot	
2443560.5760	560170.5611		0	Hotspot	
2443306.1917	560297.7533		0	Hotspot	
2443433.3839	560297.7533		0	Hotspot	
2443560.5760	560297.7533		0	Hotspot	
2443687.7682	560297.7533		0	Hotspot	

2443560.5760	560424.9454		0	Hotspot	
2443687.7682	560424.9454		0	Hotspot	

Primary Sampling Objective
The primary purpose of sampling at this site is to detect "hot spots" (local areas of elevated concentration) of a given size and shape with a specified probability, 1-β.

Selected Sampling Approach
This sampling approach requires systematic grid sampling with a random start. If a systematic grid is not used, the probability of detecting a hot spot of a given size and shape will be different than desired or calculated.

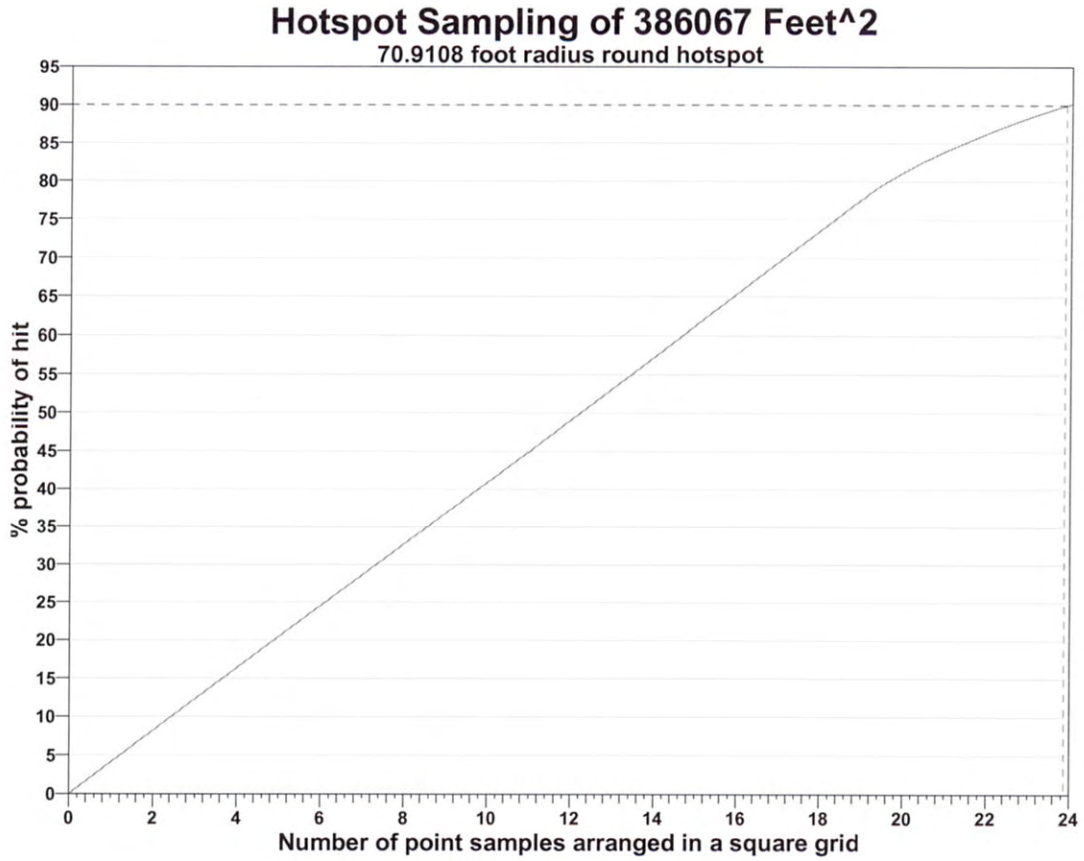
Number of Total Samples: Calculation Equation and Inputs
The algorithm used to calculate the grid size (and hence, the number of samples) is based on work by Singer and Wickman for locating geologic deposits [see Singer and Wickman (1969) and Hassig et al. (2004) for details]. Inputs to the algorithm include the size, shape, and orientation of a hot spot of interest, an acceptable probability of finding a hot spot, the desired type of sampling grid, and the sampling budget. For this design, the grid size was calculated based on the given hot spot size and other parameters.

The inputs to the algorithm that result in the grid size are:

Parameter	Description	Value
Inputs		
1-β	Probability of detection	90%
Grid Type	Grid pattern (Square, Triangular or Rectangular)	Square
Sample Type	Point samples or square cells	Points
Hot Spot Shape	Hot spot height to width ratio	1
Hot Spot Size	Length of hot spot semi-major axis	70.9108 feet
Hot Spot Area [a]	Area of hot spot (Length^2 * Shape * π)	15797 ft^2
Angle	Angle of orientation between hot spot and grid	Random
Sampling Area	Total area to sample	386067.39 ft^2
Outputs		
Grid Size	Spacing between samples	127.192 feet
Grid Area	Area represented by one grid	16177.8 ft^2
Samples [b]	Optimum number of samples	23.864
Cost	Total cost of sampling	$2,400.00

[a] Length of semi-major axis is used by Singer-Wickman algorithm. Hot spot area is provided for informational purposes.
[b] The optimum number of samples is calculated by dividing the sampling area by the grid area.

The following graph shows the relationship between the number of samples and the probability of finding the hot spot. The dashed blue line shows the actual number of samples for this design (which may differ from the optimum number of samples because of edge effects).



Assumptions that Underlie the VSP Locating a Hot Spot Design Method

1. The shape of the hot spot of concern is circular or elliptical.
2. The level of contamination that defines a hot spot is well defined.
3. The location of the hot spot is unknown, and if a hot spot is present, all locations within the sampling area are equally likely to contain the hot spot.
4. Samples are taken on a square, rectangular or triangular grid pattern.
5. Each sample is collected, handled, measured or inspected using approved methods that yield unbiased and sufficiently precise measurements.
6. A very small proportion of the surface being studied will be sampled (the sample is much smaller than the hot spot of interest).
7. Sample locations are independent of the measurement process.
8. The systematic grid is placed at a randomly determined starting place to cover the surface area of interest.
9. There are no classification errors (if a hot spot is sampled, it is not mistakenly overlooked or an area is not mistakenly identified as a hot spot).

Sensitivity Analysis

The sensitivity of the calculation of number of samples was explored by varying the probability of hit (%), hot spot shape (height to width ratio) and hot spot size (length of semi-major axis). The following table shows the results of this analysis.

Number of Samples				
		Size=35.4554	Size=70.9108	Size=106.366
1-β=85	Shp=0.8	110	28	13
	Shp=0.9	96	24	11
	Shp=1	86	22	10
1-β=90	Shp=0.8	121	31	14
	Shp=0.9	107	27	12
	Shp=1	96	24	11
1-β=95	Shp=0.8	137	35	16
	Shp=0.9	123	31	14
	Shp=1	111	28	13

1-β = Probability of Hit (%)
Shp = Hot Spot Shape (Height to Width Ratio)
Size = Hot Spot Size (Length of Semi-major Axis)

References

EPA 2006. *Data Quality Assessment: Statistical Methods for Practitioners EPA QA/G-9S*, EPA/240/B-06/003, U.S. Environmental Protection Agency, Office of Environmental Information, Washington DC.

Gilbert, R.O. 1987. *Statistical Methods for Environmental Pollution Monitoring*. Wiley & Sons, Inc., New York, NY.

Hassig, N.L., J.E. Wilson, R.O. Gilbert and B.A. Pulsipher. 2004. *Visual Sample Plan Version 3.0 User's Guide*. PNNL-14970. Pacific Northwest National Laboratory, Richland, WA, December 2004.

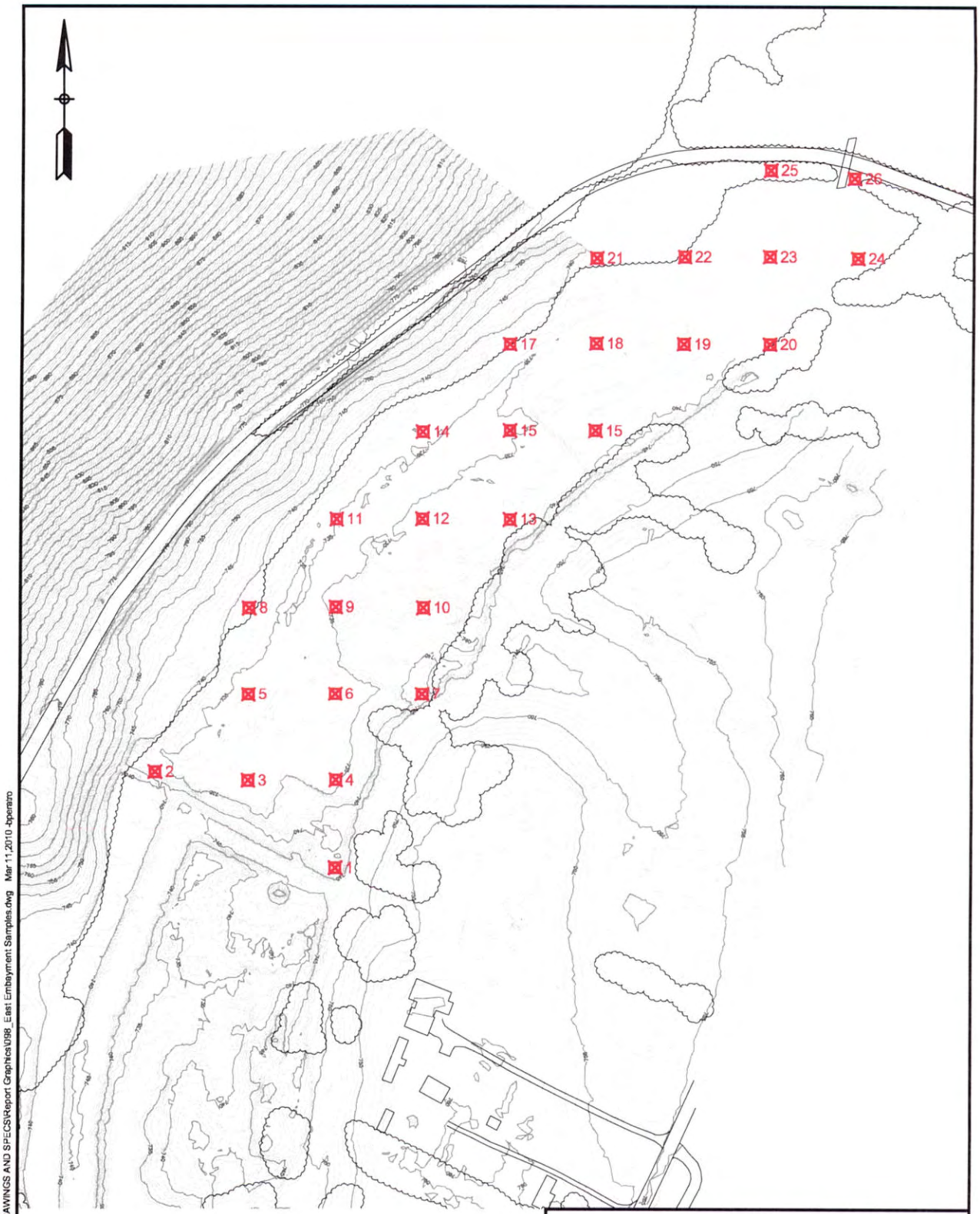
Singer, D.A. and J.E. Wickman. 1969. *Probability Tables for Locating Elliptical Targets with Square, Rectangular, and Hexagonal Point Nets*. Pennsylvania State University, University Park, Pennsylvania. Special Publication 1-69.

This report was automatically produced* by Visual Sample Plan (VSP) software version 5.3.

Software and documentation available at http://dqo.pnl.gov/vsp

Software copyright (c) 2010 Battelle Memorial Institute. All rights reserved.

* - The report contents may have been modified or reformatted by end-user of software.



0 1250 2500 5000

SCALE IN FEET

EAST EMBAYMENT SEDIMENT SAMPLING RESULTS MARCH 2010

TENNESSEE VALLEY AUTHORITY

DATE: 11 March 10

PHASE:

T:\00002 ENGINEERING\01 DRAWINGS AND SPECS\Report Graphics\098_East Embayment Samples.dwg Mar 11,2010 kperazzo

RJ LeeGroup, Inc.

Mineral Identification

Polarized Light Microscopy (PLM) Laboratory Report

Dr. Bill Rogers
Tennessee Valley Authority
PO Box 15500
Knoxville, TN 37901 United States
Email: tva_deliverables@envstd.com
Main: 256-762-6904

Report Date: 03/09/2010
Sample Received Date: 02/25/2010
RJLG Project: TOH1009525-11
Client Project: COC # P1DSED0223Y10B
Purchase Order: 3066
Analytical Method: Fly Ash Determination by PLM

Sample ID	RJLG ID	Date Analyzed	Date Sampled	Area % Fly Ash	Non-Fly Ash Components	Comments
KIF-EEMBAY_GRID_02-SED-022310	10093496	3/8/2010	2/23/2010	2%	Quartz	Light gray, clay like consistency, coarse, predominantly quartz, few fly ash
KIF-EEMBAY_GRID_02-A-SED-022310	10093497	3/8/2010	2/23/2010	7%	Clay Opaques Organic Particulate Quartz	Hard gray clay
KIF-EEMBAY_GRID_03_SED-022310	10093498	3/8/2010	2/23/2010	4%	Organic Particulate Quartz	Gray brown clay sample, coarse to to silty compsition, predominatnly quartz particulate, few fly ash
KIF-EEMBAY_GRID_03-A-SED-022310	10093499	3/8/2010	2/23/2010	1%	Coal Diatoms Opaques Organic Particulate Quartz	Gray silty/clay-like appearance, consistency: coarse, silty, predominately quartz particulate, few organic and fly ash particles
KIF-EEMBAY_GRID_04-SED-022310	10093500	3/8/2010	2/23/2010	2%	Misc. Silicates Opaques Organic Particulate Quartz	Light grayish tan silt

350 Hochberg Road, Monroeville, PA 15146 | Phone: (724) 325-1776 | Fax: (724) 733-1799

Sample ID	RJLG ID	Date Analyzed	Date Sampled	Area % Fly Ash	Non-Fly Ash Components	Comments
KIF-EEMBAY_GRID_04-A-AED-022310	10093501	3/8/2010	2/23/2010	1%	Clay Diatoms Coal Opaques Organic Particulate Quartz	Hard gray clay with shrinkage cracks.
KIF-EEMBAY_GRID_04-A-SED-022310	10093599	3/8/2010	2/23/2010	<1%	Clay Coal Organic Particulate Quartz	Light brown plant material

Authorized Signature:

Matthew Sanchez
Manager Optical Group

Disclaimer Notes
* Samples will be returned to client
* These results are submitted pursuant to RJ Lee Group's current terms and conditions of sale, including the company's standard warranty and limitation of liability provisions. No responsibility or liability is assumed for the manner in which these results are used or interpreted.
* This test report relates to the items tested.
* Any reproduction of this document must include the entire document in order for the report to be valid.
* This report may not be used to claim product endorsement by NVLAP or any agency of the U.S. Government.
* Sample(s) for this project were analyzed at our: Monroeville, PA (AIHA # 100364, NVLAP # 101208-0, NY ELAP # 10884) facility.
* If RJ Lee Group, Inc. did not collect the samples analyzed, the verifiability of the laboratory's results is limited to the reported values.
* For the purposes of this method, Fly Ash is defined as any particle consistent with Coal Ash.

Quartz – Angular anisotropic particulate with low relief.
Feldspar – Angular to blocky anisotropic particulate, low to moderate relief, biaxial, can have polysynthetic twinning.
Clay – Sheet silicates with polycrystalline or display non-uniform extinction with low to moderate relief, and zero to low birefringence. Clay also refers to particles that are less than 2.0 microns.
Opaques – Opaque is a generic term for a particle that does not transmit light. Opaque minerals are distinguished from opaque bottom ash based on morphology of fracture.
Fly Ash – Isotropic to opaque spheres, agglomeration of spheres, and angular ash particles.
Organic Particulate – Pollen, plant and insect matter, and carbonaceous matter.
Carbonates – High birefringent, can be rhombohedral, with high relief.
Diatoms – Silica rich isotropic particles with various morphologies.
Mica – Sheet silicate with moderate to high relief and low birefringence, mono-crystalline, and normal extinction.
Miscellaneous Silicate – Isotropic and anisotropic silicates, with low to high relief, identification unsure and beyond the scope of the method to identify.
Amphibole – Elongated anisotropic particulate with moderate to high relief.
Coal – Irregular to angular particles with moderate opacity, edges and thin particles are reddish brown in color.
<1% Fly Ash – Fly Ash observed, none counted.
ND – No Fly Ash detected

350 Hochberg Road, Monroeville, PA 15146 | Phone: (724) 325-1776 | Fax: (724) 733-1799

RJ LeeGroup, Inc.

Mineral Identification

Polarized Light Microscopy (PLM) Laboratory Report

Dr. Bill Rogers
Kingston Fossil Plant
714 Swan Pond Road
Harriman, TN 37748
Email: tva_deliverables@envstd.com
Main: 256-762-6904

Report Date: 03/09/2010
Sample Received Date: 02/25/2010
RJLG Project: TOH1009525-9
Client Project: COC # P1DSED0222Y10B
Purchase Order: 3066
Analytical Method: Fly Ash Determination by PLM

Sample ID	RJLG ID	Date Analyzed	Date Sampled	Area % Fly Ash	Non-Fly Ash Components	Comments
KIF-EEMBAY_GRID_05-SED-022210	10093456	3/8/2010	2/22/2010	7%	Opaques Organic Particulate Quartz	Hard dense light brown
KIF-EEMBAY_GRID_05_A-SED-022210	10093457	3/8/2010	2/22/2010	<1%	Organic Particulate Quartz	Light brown, small amount of light gray material
KIF-EEMBAY_GRID_06-SED-022210	10093458	3/8/2010	2/22/2010	<1%	Coal Opaques Organic Particulate Quartz	Dark brown with hard mat
KIF-EEMBAY_GRID_06_A-SED-022210	10093459	3/8/2010	2/22/2010	8%	Quartz	Grayish-brown silty appearance, fine to slightly coarse texture, many quartz particles
KIF-EEMBAY_GRID_07-SED-022210	10093460	3/8/2010	2/22/2010	2%	Coal Opaques Organic Particulate Quartz	Gray/brown sandy clay

350 Hochberg Road, Monroeville, PA 15146 | Phone: (724) 325-1776 | Fax: (724) 733-1799

Sample ID	RJLG ID	Date Analyzed	Date Sampled	Area % Fly Ash	Non-Fly Ash Components	Comments
KIF-EEMBAY_GRID_07_A-SED-022210	10093461	3/8/2010	2/22/2010	<1%	Clay Coal Opaques Organic Particulate Quartz	Hard gray clay with coal fragments
KIF-EEMBAY_GRID_08-SED-022210	10093462	3/8/2010	2/22/2010	ND	Clay Coal Opaques Organic Particulate Quartz	Hard brown clay
KIF-EEMBAY_GRID_09-SED-022210	10093463	3/8/2010	2/22/2010	4%	Quartz	Gray, sandy clay; coarse sample was hard, predominately quartz particulate
KIF-EEMBAY_GRID_09_A-SED-022210	10093464	3/8/2010	2/22/2010	ND	Coal Organic Particulate Quartz	Dense light brown
KIF-EEMBAY_GRID_10-SED-022210	10093465	3/8/2010	2/22/2010	ND	Clay Coal Opaques Organic Particulate Quartz	Hard gray sandy clay
KIF-EEMBAY_GRID_10_A-SED-022210	10093466	3/8/2010	2/22/2010	1%	Coal Opaques Organic Particulate Quartz	Hard light brown material
KIF-EEMBAY_GRID_10_B-SED-022210	10093467	3/8/2010	2/22/2010	<1%	Clay Diatoms Coal Opaques Organic Particulate Quartz	Hard gray clay
KIF-EEMBAY_GRID_11-SED-022210	10093468	3/8/2010	2/22/2010	1%	Organic Particulate Quartz	Medium brown, hard clay, predominately quartz and organic particulate, few fly ash

350 Hochberg Road, Monroeville, PA 15146 | Phone: (724) 325-1776 | Fax: (724) 733-1799

Sample ID	RJLG ID	Date Analyzed	Date Sampled	Area % Fly Ash	Non-Fly Ash Components	Comments
KIF-EEMBAY_GRID_11 _A-SED-022210	10093469	3/8/2010	2/22/2010	ND	Coal Organic Particulate Quartz	Hard, orangish brown
KIF-EEMBAY_GRID_12-SED-022210	10093470	3/8/2010	2/22/2010	1%	Quartz	Tan colored clay; coarse and hard sample, predominately quartz
KIF-EEMBAY_GRID_13-SED-022210	10093471	3/8/2010	2/22/2010	3%	Clay Coal Opaques Organic Particulate Quartz	Hard gray clay
KIF-EEMBAY_GRID_13 _A-AED-022210	10093472	3/8/2010	2/22/2010	<1%	Quartz	Gray-colored clay; coarse, hard sample, predominately quartz, few fly ash, seen mostly incorporated into agglomerations
KIF-EEMBAY_GRID_13 _A-SED-022210	10093473	3/8/2010	2/22/2010	ND	Clay Coal Opaques Organic Particulate Quartz	Hard gray clay
KIF-EEMBAY_GRID_14-SED-022210	10093474	3/8/2010	2/22/2010	9%	Clay Opaques Organic Particulate Quartz	Orange/brown
KIF-EEMBAY_GRID_14 _A-SED-022210	10093475	3/8/2010	2/22/2010	1%	Clay Coal Opaques Organic Particulate Quartz	Hard gray clay with shrinkage cracks
KIF-EEMBAY_GRID_14 _B-SED-022210	10093476	3/8/2010	2/22/2010	1%	Organic Particulate Quartz	Orangish/brown, dense

350 Hochberg Road, Monroeville, PA 15146 | Phone: (724) 325-1776 | Fax: (724) 733-1799

Sample ID	RJLG ID	Date Analyzed	Date Sampled	Area % Fly Ash	Non-Fly Ash Components	Comments
KIF-EEMBAY_GRID_17-SED-022210	10093477	3/8/2010	2/22/2010	ND	Clay Coal Opaques Organic Particulate Quartz	Reddish brown clay with coarse rock fragments
KIF-EEMBAY_GRID_17_A-SED-022210	10093478	3/8/2010	2/22/2010	3%	Organic Particulate Quartz	Medium brown-colored clay, hard sample, more silty in composition than coarse, predominately organic particulate with small amounts of quartz
KIF-EEMBAY_GRID_21-SED-022210	10093479	3/8/2010	2/22/2010	ND	Coal Organic Particulate Quartz	Light gray
KIF-EEMBAY_GRID_21_A-SED-022210	10093480	3/8/2010	2/22/2010	<1%	Quartz	Whitish-gray colored clay, coarse sample, predominately quartz particulate
KIF-EEMBAY_GRID_22-AED-022210	10093481	3/8/2010	2/22/2010	ND	Clay Organic Particulate Quartz	Light brown, dense
KIF-EEMBAY_GRID_22-SED-022210	10093482	3/8/2010	2/22/2010	ND	Clay Opaques Organic Particulate Quartz	Hard brown mudstone with coarse fragments
KIF-EEMBAY_GRID_22_A-SED-022210	10093483	3/8/2010	2/22/2010	ND	Clay Opaques Organic Particulate Quartz	Hard gray/brown clay with shrinkage cracks

350 Hochberg Road, Monroeville, PA 15146 | Phone: (724) 325-1776 | Fax: (724) 733-1799

RJ LeeGroup, Inc.

Mineral Identification

Polarized Light Microscopy (PLM) Laboratory Report

Dr. Bill Rogers
Tennessee Valley Authority
PO Box 15500
Knoxville, TN 37901 United States
Email: tva_deliverables@envstd.com
Main: 256-762-6904

Report Date: 03/09/2010
Sample Received Date: 02/23/2010
RJLG Project: TOH1009525-5
Client Project: COC # P1DSED0219Y10B
Purchase Order: 3066
Analytical Method: Fly Ash Determination by PLM

Sample ID	RJLG ID	Date Analyzed	Date Sampled	Area % Fly Ash	Non-Fly Ash Components	Comments
KIF-EEMBAY_GRID_15-SED-021910	10093141	3/3/2010	2/19/2010	13%	Coal Organic Particulate Quartz	Hard tan sandy clay
KIF-EEMBAY_GRID_15_A-SED-021910	10093142	3/3/2010	2/19/2010	16%	Opaques Organic Particulate Quartz	Sandy gray appearance, sandy clay composition, numerous organic particles present, few quartz and fly ash particulate
KIF-EEMBAY_GRID_15_B-SED-021910	10093143	3/3/2010	2/19/2010	ND	Organic Particulate Quartz	Light gray, dense
KIF-EEMBAY_GRID_16-SED-021910	10093144	3/3/2010	2/19/2010	6%	Organic Particulate Quartz	Gray silty/clay-like appearance, consistency: coarse, silty, predominately quartz particulate, few organic and fly ash particles
KIF-EEMBAY_GRID_16_A-SED-021910	10093145	3/3/2010	2/19/2010	4%	Clay Organic Particulate Quartz	Rocky, light brown
KIF-EEMBAY_GRID_18-SED-021910	10093146	3/3/2010	2/19/2010	ND	Diatoms Coal Organic Particulate Quartz	Gray/brown, hard/clay

350 Hochberg Road, Monroeville, PA 15146 | Phone: (724) 325-1776 | Fax: (724) 733-1799

Sample ID	RJLG ID	Date Analyzed	Date Sampled	Area % Fly Ash	Non-Fly Ash Components	Comments
KIF-EEMBAY_GRID_18_A-SED-021910	10093147	3/3/2010	2/19/2010	4%	Organic Particulate Quartz	Light brown plant material
KIF-EEMBAY_GRID_19-SED-021910	10093148	3/3/2010	2/19/2010	4%	Quartz	Coarse, granular sample, sand brown in color, predominately quartz particulate
KIF-EEMBAY_GRID_19_A-SED-021910	10093149	3/3/2010	2/19/2010	2%	Coal Quartz	Coarse, sandy sample, slate gray in color, predominately quartz, few coal particles
KIF-EEMBAY_GRID_20-SED-021910	10093150	3/3/2010	2/19/2010	<1%	Diatoms Coal Organic Particulate Quartz	Dense brownish material
KIF-EEMBAY_GRID_20_A-SED-021910	10093151	3/3/2010	2/19/2010	2%	Coal Quartz	Sandy and coarse appearance, slate gray in color, predominately quartz particulate
KIF-EEMBAY_GRID_23-SED-021910	10093152	3/3/2010	2/19/2010	5%	Opaques Organic Particulate Quartz	Dense light brown
KIF-EEMBAY_GRID_23_A-SED-021910	10093153	3/3/2010	2/19/2010	1%	Coal Quartz	Coarse, sandy material upon appearance, gray color, predominately quarz particulate
KIF-EEMBAY_GRID_24-SED-021910	10093154	3/3/2010	2/19/2010	2%	Opaques Organic Particulate Quartz	Light gray sand with organic debris
KIF-EEMBAY_GRID_24_A-SED-021910	10093155	3/3/2010	2/19/2010	<1%	Quartz	Beige appearance: clay-like appearance on top, sand-like; interior predominately quartz particulate
KIF-EEMBAY_GRID_24_B-SED-021910	10093156	3/3/2010	2/19/2010	<1%	Clay Opaques Organic Particulate Quartz	Gray clay with shrinkage cracks
KIF-EEMBAY_GRID_25-SED-021910	10093157	3/3/2010	2/19/2010	1%	Quartz	Brown, soil-like appearance Small, organic material present on top of sample Predominately quartz particulate

350 Hochberg Road, Monroeville, PA 15146 | Phone: (724) 325-1776 | Fax: (724) 733-1799

Sample ID	RJLG ID	Date Analyzed	Date Sampled	Area % Fly Ash	Non-Fly Ash Components	Comments
KIF-EEMBAY_GRID_25_ A-SED-021910	10093158	3/3/2010	2/19/2010	<1%	Coal Opaques Organic Particulate Quartz	Hard gray clay with organic debris

Authorized Signature: Matt Sa

Matthew Sanchez
Manager Optical Group

Disclaimer Notes
* Samples will be returned to client
* These results are submitted pursuant to RJ Lee Group's current terms and conditions of sale, including the company's standard warranty and limitation of liability provisions. No responsibility or liability is assumed for the manner in which these results are used or interpreted.
* This test report relates to the items tested.
* Any reproduction of this document must include the entire document in order for the report to be valid.
* This report may not be used to claim product endorsement by NVLAP or any agency of the U.S. Government.
* Sample(s) for this project were analyzed at our: Monroeville, PA (AIHA # 100364, NVLAP # 101208-0, NY ELAP # 10884) facility.
* If RJ Lee Group, Inc. did not collect the samples analyzed, the verifiability of the laboratory's results is limited to the reported values.
* For the purposes of this method, Fly Ash is defined as any particle consistent with Coal Ash.

Quartz – Angular anisotropic particulate with low relief.
Feldspar – Angular to blocky anisotropic particulate, low to moderate relief, biaxial, can have polysynthetic twinning.
Clay – Sheet silicates with polycrystalline or display non-uniform extinction with low to moderate relief, and zero to low birefringence. Clay also refers to particles that are less than 2.0 microns.
Opaques – Opaque is a generic term for a particle that does not transmit light. Opaque minerals are distinguished from opaque bottom ash based on morphology of fracture.
Fly Ash – Isotropic to opaque spheres, agglomeration of spheres, and angular ash particles.
Organic Particulate – Pollen, plant and insect matter, and carbonaceous matter.
Carbonates – High birefringent, can be rhombohedral, with high relief.
Diatoms – Silica rich isotropic particles with various morphologies.
Mica – Sheet silicate with moderate to high relief and low birefringence, mono-crystalline, and normal extinction.
Miscellaneous Silicate – Isotropic and anisotropic silicates, with low to high relief, identification unsure and beyond the scope of the method to identify.
Amphibole – Elongated anisotropic particulate with moderate to high relief.
Coal – Irregular to angular particles with moderate opacity, edges and thin particles are reddish brown in color.
<1% Fly Ash – Fly Ash observed, none counted.
ND – No Fly Ash detected

350 Hochberg Road, Monroeville, PA 15146 | Phone: (724) 325-1776 | Fax: (724) 733-1799