PTL 0001

Particle Technology Lab

0048236

555 ROGERS STREET • DOWNERS GROVE, ILLINOIS 60515
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PARTICLE TECHNOLOGY LABS
ANALYTICAL SERVICES AND CONSULTING

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RICHARD F. KARUHN
President

February 6, 1997

BECHTEL HANFORD
3350 George Washington Way
Richland, WA 99352

ATTN: Mr. John Olson

SUBJECT: Solids Concentration and Particle Size Distribution Analyses of Seven Water Samples

PTL PROJECT: 2063

CC: Ms. Doris Ayres

NOV 1997 RECEIVED ECMC

FEB 1997 RECEIVED Date Log In

Dear Ms. Ayres:

Please find enclosed the results from the particle size and total suspended solid analyses performed on your seven Water samples received 1/23/97. The total suspended solid analyses for your five samples were conducted in a normal routine. Each of the one gallon sample bottles was filtered in its entirety through a 0.4 micron regenerated cellulose filter membrane. Since the combined weight of the water and glass bottle exceeded the capacity of our top-loading balance by 2000 grams, we weighed the filtrate in two liter increments. Please note that the filtrate was weighed so that no suspended solids would be lost during the transfer and weighing operations. While pouring the fluids from the gallon jugs into the filter funnel, we noticed a substantial quantity of large particulate matter that would not easily transfer out of the container. We then pressure washed these particulates out of the bottle, in order to affect a quantitative transfer. Following the transfer of all the fluids, we washed the filter membranes with 0.8 micron, filtered deionized water. This final wash was conducted to remove any dissolved salts which might have been present in the original water samples. Each filter membrane was then removed and placed in our Class 100 Laminar flow bench to dry overnight. After the filters were dried, they were placed in a desiccator for a 24 hour period prior to recording their final weights.

The sensitivity of our Sartorius analytical balance is ± 0.2 milligrams as determined by our independent balance certification company. This balance was certified April 30, 1995. We do not know the sensitivity specifications for our Sartorius top-loading mechanical scale. The full scale maximum weight for this balance is 3 kilograms. Typically, these balances have a sensitivity value of ± 1 gram.

The results from the five total suspended solid analyses have been compiled and appear in Table 1 of this report. We have also listed the net weights of the particulate retained on the filters as well as the major components comprising each sample. Each filter has been placed in individual plastic holders and can be mailed to you for your observation should you request.

Two additional samples were provided for particle size distribution analyses. Visual observations of these suspensions revealed that the fine particle system was unstable and coalesced to form floccy agglomerate structures. A telephone discussion with you concerned our need to concentrate the samples and disperse the agglomerates prior to analysis. As per our discussion, the entire contents of each quart bottle were filtered through 0.4 micron filter membranes. Please note that the filter membranes were not allowed to dry. Instead, they were immediately placed in a clean dispersion vial with a 1% aqueous Triton X-100 wetting agent added to them. The containers were then placed in our standard laboratory ultrasonic bath for a timed 30 seconds. Upon the addition of ultrasonic energy, it was noticed that the filter membranes were liberated from the fine particle burden. Microscope examination of the dispersions revealed an excellent quality of dispersion. It was observed that particles in the 1 micron size range were moving by Brownian Motion and that there was no tendency for reagglomeration to occur. Therefore, each suspension was then analyzed on our Elzone particle size system according to standard operating procedures for this instrumentation type. The data from these analyses have been included in this report as well as an interpretation page entitled, "INTERPRETING YOUR ELECTROZONE FINE PARTICLE ANALYSIS," for your review.

Our review of this project suggests that a microscope examination of the particulate matter obtained from these sample types could be beneficial to the overall scope of this project. Our microscopist has the ability to speciate the various components present on these filters based upon observations made via petrographic examination on a polarizing light microscope. Microchemical tests can verify the nature of the orange stain present on all these filters. In addition, Mr. Solebello has the ability to also identify the black particles collected in the Post Filter samples. The cost for this type of analysis is $60 per sample plus approximately one hour report time for about $100 on the basis of a sample set comprising eight samples.

Phase contrast microscopy of the dispersed sample from BOKOW9 indicates the presence of a large quantity of submicron particles. While there is a large number by count, they constitute only a tiny fraction of the total weight of the sample. Using standard separation techniques, we can characterize this submicron material using a methodology called Photon Correlation Spectroscopy. The analytical range of this tool is five nanometers (0.005 microns) through one micron on the upper end. The cost for this analysis is $150 per sample.

We look forward to continuing services for Bechtel Hanford in the near future. If there are any questions concerning this data, please do not hesitate to contact us here at Particle Technology Labs.

Submitted by,

Richard Karuhn

Reviewed by,

Kelli Parrott

DR:\2063:159

TABLE 1

TOTAL SUSPENDED SOLIDS CONCENTRATION

SAMPLE ID	WEIGHT OF PARTICULATE RETAINED ON FILTER (mg)	PARTS PER MILLION by WEIGHT	MAJOR COMPONENTS
BOKOW4	69.3	16.20	Sand*
BOKOW5	35.2	8.36	Sand*
BOKOW6	16.1	3.83	Sand*
BOKOW8	2.1	0.51	Black** Particulate
BOKOW9	3.1	0.73	Black** Particulate

*Filter also contains heavy orange to rust colored stain--most likey rust.

**Filter contains large, black particles overriding a slightly orange to rust colored film which stained the membrane--most likely rust.

Particle Technology Labs, Ltd.

555 ROGERS STREET • DOWNERS GROVE, ILLINOIS 60515

708/969-2703 • FAX 708/969-2745

AFTER 8/96 AREA CODE CHANGES TO 630

INTERPRETING YOUR ELECTROZONE FINE PARTICLE ANALYSIS

INTRODUCTION

Your samples have been analyzed on an Elzone computerized particle size analyzer. The particle sensing transducer is based upon the electrozone detection method and is sometimes referred to as the Coulter principle. The Coulter Counter and the Elzone Analyzer will therefore yield the same statistical information if the analysis occurs over the same size range and samples are prepared in a similar manner.

Electrozone analysis provides our clients with the highest resolution of any type of analyzer on the market today. Analytical data is essentially distortion free over a working range of about 0.5 microns through 400 microns diameter. The technique is not sensitive to color, refractive index, density, conductivity, or particle opacity. It IS sensitive to the envelope **VOLUME** of the individual particles that are counted and sized in a serial fashion. A typical statistical report is composed of a population base of approximately 250,000 particles over the analytical range with the data being presented on the basis of the **EQUIVALENT SPHERICAL DIAMETER.**

In the electrozone measurement principle, particles suspended in an electrolyte are caused to flow through a small orifice in a non-conductive material (sapphire), along with an electric current. Particles traverse the orifice essentially singly, causing electrical pulses at rates from a few thousand to a few hundred per second or lower, depending upon the orifice size and particle concentration. The amplitude of each voltage pulse is directly proportional to the **VOLUME** of the particle as sensed by its "electrical envelope" displacement within the sensing orifice. While the system responds to particle volume, the computer reports the **DIAMETER** of a sphere of equal volume; the term **"EQUIVALENT SPHERICAL DIAMETER"** is often used.

Since electrozone analyzers are true particle **COUNTERS**, data can be reported in two formats; because we generally do not know how your clients are going to use the data, we report both formats. Your data is presented on a **POPULATION** basis, which is like performing a microscope analysis in which the **NUMBERS** of particles are reported as a function of **SIZE**. Next, data is presented on the basis of **MASS** which is like performing a sieve analysis in which the **WEIGHT** of particles are reported as a function of SIZE.

ELZONE(tm) **Particle Size Analysis**

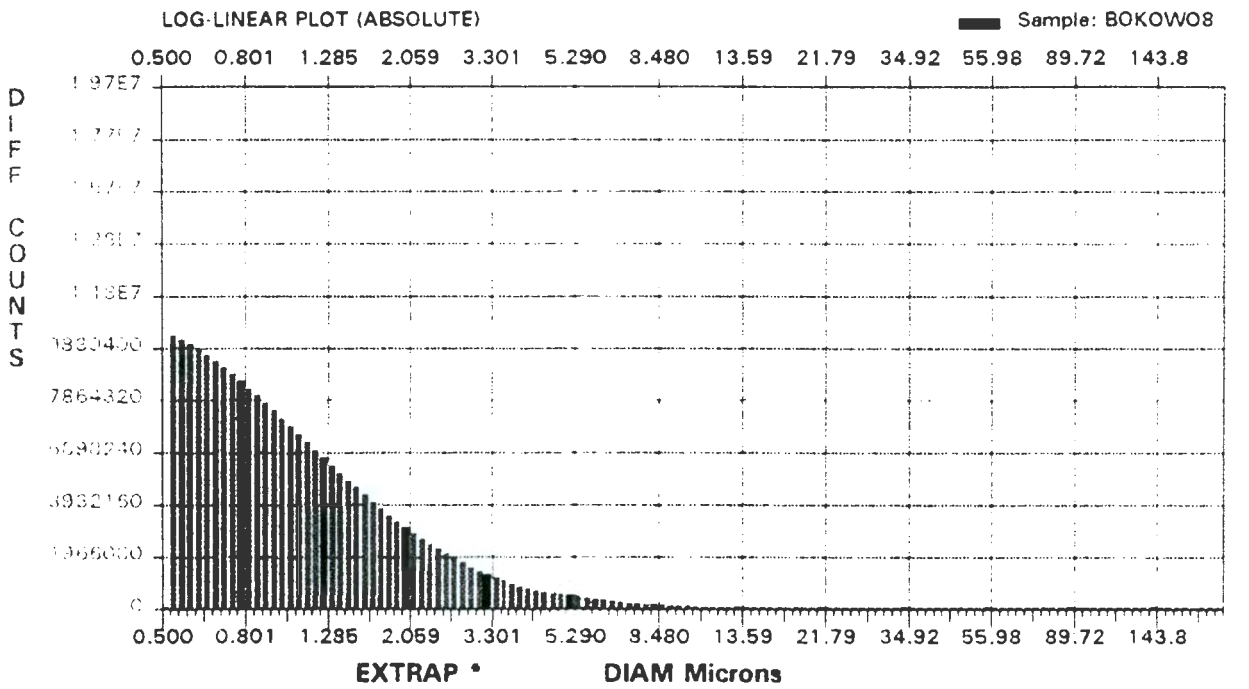
For: BECHTEL HANFORD
3350 GEORGE WASHINGTON WAY
RICHLAND, WA 99352

By: PARTICLE TECHNOLOGY LABS, LTD.
555 ROGERS STREET
DOWNERS GROVE, IL 60515

Operator: MM

Comments:
POPULATION (count) DATA
SN81606

Date done: 16:08 31 Jan 97
Disk File: 2063-01Z.HST
Sample #: BOKOWO8
Lot/Job #: 1963:93
Material: PARTICULATE
Source: MS. DORIS AYRES



Geometric Mean Size:	1.054 um	-- PERCENTILES --
Geom. Std Deviation:	1.767 um	0.100% Counts above 12.23 um
Geom. Skewness:	0.293	1.000% Counts above 6.038 um
Geom. Coeff Variation:	167.7	6.000% Counts above 2.934 um
		22.00% Counts above 1.558 um
Arithmetic Mean Size:	1.290 um	50.00% Counts above 0.926 um
Median Size:	0.905 um	78.00% Counts above 0.650 um
Mode Size:	0.536 um	94.00% Counts above 0.545 um
Kurtosis:	128.093	99.00% Counts above 0.515 um
Arith Std Deviation	1.217 um	99.90% Counts above 0.512 um

ELZONE(tm) Particle Size Analysis

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3350 GEORGE WASHINGTON WAY
RICHLAND, WA 99352

By: PARTICLE TECHNOLOGY LABS, LTD.
555 ROGERS STREET
DOWNERS GROVE, IL 60515

Operator: MM

Comments:
POPULATION (count) DATA
SN81606

Date done: 16:08 31 Jan 97
Disk File: 2063-01Z.HST
Sample #: BOKOW08
Lot/Job #: 1963:93
Material: PARTICULATE
Source: MS. DORIS AYRES

-- Frequency Distribution Data

Total Popl: 227623008

Chnl	Size	Counts	Cuml%	Chnl	Size	Counts	Cuml%	Chnl	Size	Counts	Cuml%
1	0.500	0	100.0	44	3.802	833069	3.30	86	27.58	2970	0.01
2	0.524	1.03E7	97.7	45	3.986	743206	2.96	87	28.92	2526	0.01
3	0.549	1.01E7	93.3	46	4.179	662553	2.65	88	30.31	2049	0.01
4	0.576	9942188	88.9	47	4.380	597810	2.37	89	31.78	1744	0.00
5	0.604	9747069	84.5	48	4.592	552472	2.12	90	33.31	1445	0.00
6	0.633	9536037	80.3	49	4.814	513059	1.88	91	34.92	1195	0.00
7	0.664	9310320	76.2	50	5.047	470507	1.67	92	36.61	985	0.00
8	0.696	9071183	72.1	51	5.290	433982	1.47	93	38.38	807	0.00
9	0.729	8819935	68.2	52	5.546	398993	1.29	94	40.23	664	0.00
10	0.765	8557945	64.4	53	5.814	351580	1.12	95	42.18	568	0.00
11	0.801	8286597	60.7	54	6.095	322732	0.97	96	44.21	486	0.00
12	0.840	8007284	57.1	55	6.389	282896	0.84	97	46.35	415	0.00
13	0.881	7721413	53.6	56	6.698	247676	0.72	98	48.59	360	0.00
14	0.923	7430375	50.3	57	7.021	214054	0.62	99	50.94	313	0.00
15	0.968	7135548	47.1	58	7.361	188208	0.53	100	53.40	270	0.00
16	1.015	6838269	44.0	59	7.716	163368	0.46	101	55.98	239	0.00
17	1.064	6539848	41.1	60	8.089	140605	0.39	102	58.68	208	0.00
18	1.115	6241538	38.3	61	8.480	121005	0.33	103	61.51	178	0.00
19	1.169	5944537	35.6	62	8.890	102318	0.28	104	64.49	153	0.00
20	1.225	5649980	33.1	63	9.319	86456	0.24	105	67.60	130	0.00
21	1.285	5358933	30.6	64	9.769	73031	0.21	106	70.87	111	0.00
22	1.347	5072384	28.4	65	10.24	62180	0.18	107	74.29	95	0.00
23	1.412	4791246	26.2	66	10.74	52598	0.15	108	77.88	79	0.00
24	1.480	4516347	24.1	67	11.25	45034	0.13	109	81.64	67	0.00
25	1.551	4248430	22.2	68	11.80	37956	0.11	110	85.59	57	0.00
26	1.626	3988157	20.4	69	12.37	32610	0.10	111	89.72	48	0.00
27	1.705	3736100	18.7	70	12.97	28014	0.08	112	94.06	40	0.00
28	1.787	3492748	17.1	71	13.59	24064	0.07	113	98.60	33	0.00
29	1.874	3258505	15.6	72	14.25	20668	0.06	114	103.4	28	0.00
30	1.964	3033696	14.3	73	14.94	17940	0.05	115	108.4	23	0.00
31	2.059	2818566	13.0	74	15.66	15126	0.05	116	113.6	19	0.00
32	2.159	2613286	11.8	75	16.42	13129	0.04	117	119.1	15	0.00
33	2.263	2417954	10.7	76	17.21	11483	0.03	118	124.8	12	0.00
34	2.372	2232603	9.66	77	18.04	9968	0.03	119	130.9	10	0.00
35	2.487	2057205	8.71	78	18.91	8652	0.03	120	137.2	8	0.00
36	2.607	1891673	7.85	79	19.82	7510	0.02	121	143.8	6	0.00
37	2.733	1735870	7.05	80	20.78	6519	0.02	122	150.8	5	0.00
38	2.865	1514821	6.34	81	21.79	5659	0.02	123	158.0	4	0.00
39	3.003	1385334	5.70	82	22.84	5041	0.01	124	165.7	3	0.00
40	3.148	1263640	5.12	83	23.94	4449	0.01	125	173.7	2	0.00
41	3.301	1132246	4.59	84	25.10	3942	0.01	126	182.1	1	0.00
42	3.460	1028880	4.12	85	26.31	3492	0.01	127	190.9	0	0.00
43	3.627	919747	3.69								

ELZONE (tm) Particle Size Analysis

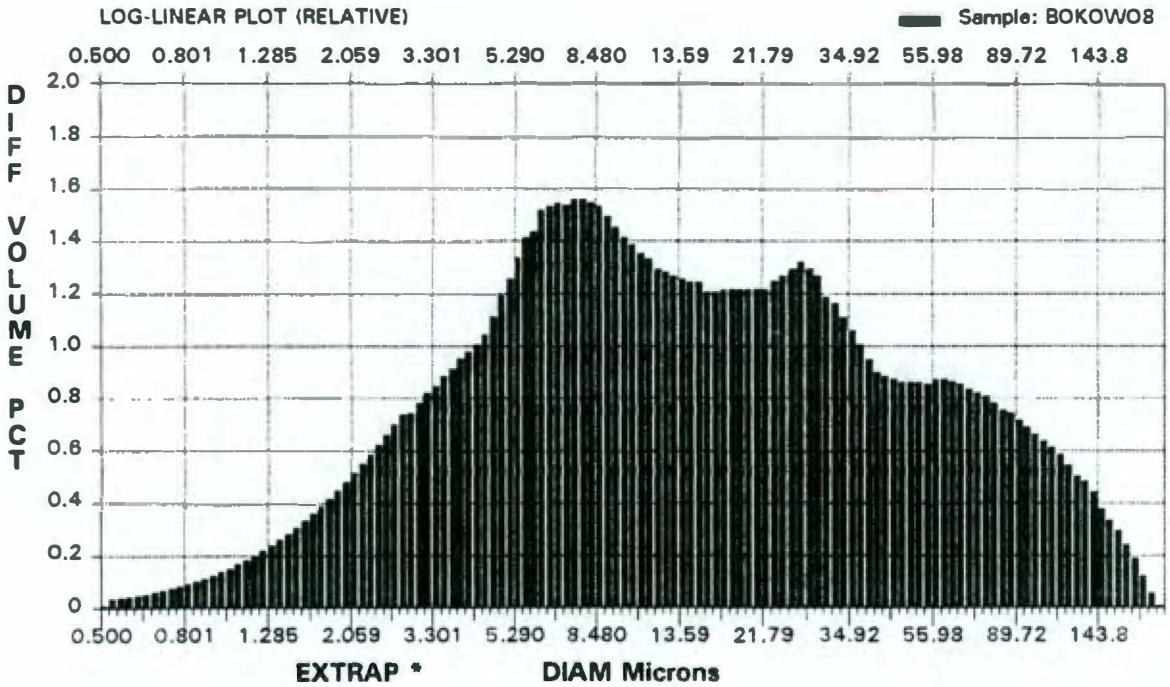
For: BECHTEL HANFORD
3350 GEORGE WASHINGTON WAY
RICHLAND, WA 99352

By: PARTICLE TECHNOLOGY LABS, LTD.
555 ROGERS STREET
DOWNERS GROVE, IL 60515

Operator: MM

Comments:
VOLUME (mass) DATA
SN81606

Date done: 16:08 31 Jan 97
Disk File: 2063-01Z.HST
Sample #: BOKOW08
Lot/Job #: 1963:93
Material: PARTICULATE
Source: MS. DORIS AYRES



		-- PERCENTILES --
Geometric Mean Size:	13.66 um	0.100% Volume above 182.8 um
Geom. Std Deviation:	3.361 um	1.000% Volume above 151.6 um
Geom. Skewness:	1.820	6.000% Volume above 96.35 um
Geom. Coeff Variation:	24.62	22.00% Volume above 38.52 um
Arithmetic Mean Size:	26.98 um	50.00% Volume above 12.84 um
Median Size:	12.69 um	78.00% Volume above 5.121 um
Mode Size:	7.536 um	94.00% Volume above 2.126 um
Kurtosis:	5.222	99.00% Volume above 0.983 um
Arith Std Deviation	35.91 um	99.90% Volume above 0.585 um

ELZONE(tm) Particle Size Analysis

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3350 GEORGE WASHINGTON WAY
RICHLAND, WA 99352

By: PARTICLE TECHNOLOGY LABS, LTD.
555 ROGERS STREET
DOWNERS GROVE, IL 60515

Operator: MM

Date done: 16:08 31 Jan 97
Disk File: 2063-01Z.HST
Sample #: BOKOWO8
Lot/Job #: 1963:93
Material: PARTICULATE
Source: MS. DORIS AYRES

Comments:
VOLUME (mass) DATA
SN81606

-- Volume Distribution Data

Total Volm: 2530305301

Chnl	Size	Volume	Cuml%	Chnl	Size	Volume	Cuml%	Chnl	Size	Volume	Cuml%
1	0.500	0	100.0	44	3.802	2.40E7	84.8	87	28.92	3.20E7	28.7
2	0.524	775155	100.0	45	3.986	2.46E7	83.9	88	30.31	2.99E7	27.5
3	0.549	879115	100.0	46	4.179	2.53E7	82.9	89	31.78	2.93E7	26.3
4	0.576	994961	99.9	47	4.380	2.63E7	81.9	90	33.31	2.80E7	25.2
5	0.604	1123748	99.9	48	4.592	2.80E7	80.8	91	34.92	2.66E7	24.1
6	0.633	1266583	99.8	49	4.814	3.00E7	79.7	92	36.61	2.53E7	23.1
7	0.664	1424627	99.8	50	5.047	3.17E7	78.4	93	38.38	2.39E7	22.1
8	0.696	1599084	99.7	51	5.290	3.36E7	77.1	94	40.23	2.26E7	21.2
9	0.729	1791198	99.6	52	5.546	3.56E7	75.8	95	42.18	2.23E7	20.3
10	0.765	2002251	99.6	53	5.814	3.62E7	74.4	96	44.21	2.20E7	19.4
11	0.801	2233552	99.5	54	6.095	3.83E7	72.9	97	46.35	2.16E7	18.5
12	0.840	2486428	99.4	55	6.389	3.86E7	71.4	98	48.59	2.16E7	17.7
13	0.881	2762220	99.3	56	6.698	3.90E7	69.8	99	50.94	2.16E7	16.8
14	0.923	3062267	99.2	57	7.021	3.88E7	68.3	100	53.40	2.15E7	16.0
15	0.968	3387899	99.0	58	7.361	3.93E7	66.8	101	55.98	2.20E7	15.1
16	1.015	3740418	98.9	59	7.716	3.93E7	65.2	102	58.68	2.20E7	14.3
17	1.064	4121093	98.8	60	8.089	3.90E7	63.7	103	61.51	2.17E7	13.4
18	1.115	4531137	98.6	61	8.480	3.86E7	62.1	104	64.49	2.15E7	12.5
19	1.169	4971695	98.4	62	8.890	3.76E7	60.6	105	67.60	2.10E7	11.7
20	1.225	5443825	98.2	63	9.319	3.66E7	59.1	106	70.87	2.06E7	10.9
21	1.285	5948485	98.0	64	9.769	3.57E7	57.7	107	74.29	2.03E7	10.1
22	1.347	6486509	97.7	65	10.24	3.50E7	56.3	108	77.88	1.96E7	9.28
23	1.412	7058594	97.4	66	10.74	3.41E7	55.0	109	81.64	1.90E7	8.51
24	1.480	7665276	97.2	67	11.25	3.36E7	53.6	110	85.59	1.87E7	7.77
25	1.551	8306917	96.8	68	11.80	3.26E7	52.3	111	89.72	1.80E7	7.05
26	1.626	8983684	96.5	69	12.37	3.23E7	51.0	112	94.06	1.73E7	6.35
27	1.705	9695530	96.1	70	12.97	3.20E7	49.8	113	98.60	1.67E7	5.68
28	1.787	1.04E7	95.7	71	13.59	3.16E7	48.5	114	103.4	1.60E7	5.03
29	1.874	1.12E7	95.3	72	14.25	3.13E7	47.3	115	108.4	1.53E7	4.41
30	1.964	1.20E7	94.8	73	14.94	3.13E7	46.0	116	113.6	1.47E7	3.82
31	2.059	1.29E7	94.4	74	15.66	3.04E7	44.8	117	119.1	1.36E7	3.26
32	2.159	1.38E7	93.8	75	16.42	3.04E7	43.6	118	124.8	1.26E7	2.74
33	2.263	1.47E7	93.3	76	17.21	3.06E7	42.4	119	130.9	1.21E7	2.26
34	2.372	1.56E7	92.7	77	18.04	3.06E7	41.2	120	137.2	1.10E7	1.80
35	2.487	1.66E7	92.0	78	18.91	3.06E7	40.0	121	143.8	9437184	1.40
36	2.607	1.75E7	91.4	79	19.82	3.06E7	38.8	122	150.8	8326174	1.05
37	2.733	1.86E7	90.6	80	20.78	3.06E7	37.5	123	158.0	7327033	0.74
38	2.865	1.87E7	89.9	81	21.79	3.06E7	36.3	124	165.7	5994845	0.47
39	3.003	1.96E7	89.2	82	22.84	3.14E7	35.1	125	173.7	4662657	0.26
40	3.148	2.06E7	88.4	83	23.94	3.20E7	33.9	126	182.1	2997423	0.11
41	3.301	2.13E7	87.5	84	25.10	3.26E7	32.6	127	190.9	1332188	0.03
42	3.460	2.23E7	86.7	85	26.31	3.33E7	31.3	128	200.1	0	0.00
43	3.627	2.30E7	85.8	86	27.58	3.26E7	30.0				

ELZONE (tm) **Particle Size Analysis**

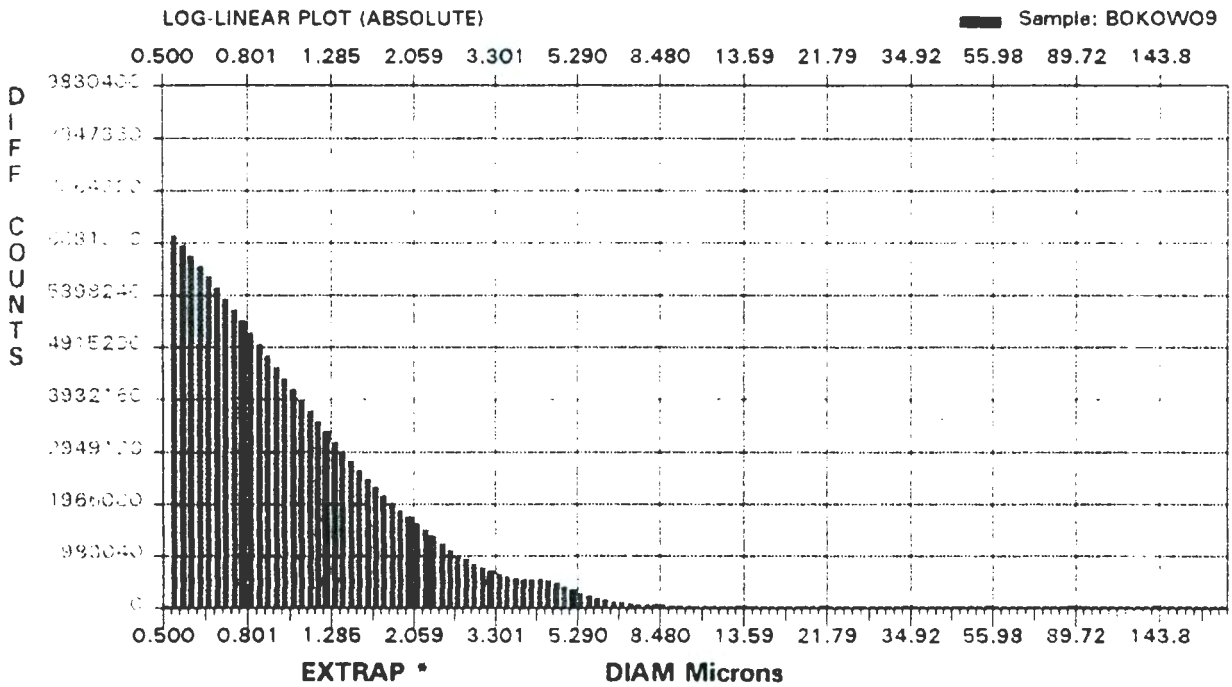
For: BECHTEL HANFORD
3350 GEORGE WASHINGTON WAY
RICHLAND, WA 99352

By: PARTICLE TECHNOLOGY LABS, LTD.
555 ROGERS STREET
DOWNERS GROVE, IL 60515

Operator: MM

Comments:
POPULATION (count) DATA
SN81606

Date done: 17:16 31 Jan 97
Disk File: 2063-02Z.HST
Sample #: BOKOWO9
Lot/Job #: 1963:93
Material: PARTICULATE
Source: MS. DORIS AYRES



Geometric Mean Size:	1.018 um	-- PERCENTILES --
Geom. Std Deviation:	1.745 um	0.100% Counts below 0.512 um
Geom. Skewness:	0.276	1.000% Counts below 0.514 um
Geom. Coeff Variation:	171.5	6.000% Counts below 0.542 um
		20.00% Counts below 0.622 um
Arithmetic Mean Size:	1.236 um	50.00% Counts below 0.889 um
Median Size:	0.864 um	80.00% Counts below 1.564 um
Mode Size:	0.536 um	94.00% Counts below 2.852 um
Kurtosis:	167.823	99.00% Counts below 5.271 um
Arith Std Deviation	1.152 um	99.90% Counts below 11.61 um

ELZONE (tm) **Particle Size Analysis**

For: BECHTEL HANFORD
3350 GEORGE WASHINGTON WAY
RICHLAND, WA 99352

By: PARTICLE TECHNOLOGY LABS, LTD.
555 ROGERS STREET
DOWNERS GROVE, IL 60515

Operator: MM

Date done: 17:16 31 Jan 97
Disk File: 2063-02Z.HST
Sample #: BOKOW09
Lot/Job #: 1963:93
Material: PARTICULATE
Source: MS. DORIS AYRES

Comments:
POPULATION (count) DATA
SN81606

-- Frequency Distribution Data

Total Popl: 138905630

Chnl	Size	Counts	Cuml%	Chnl	Size	Counts	Cuml%	Chnl	Size	Counts	Cuml%
1	0.500	0	0.00	44	3.802	519108	96.8	86	27.58	2989	100.0
2	0.524	7000790	2.52	45	3.986	520565	97.2	87	28.92	2355	100.0
3	0.549	6816595	7.49	46	4.179	533003	97.5	88	30.31	1736	100.0
4	0.576	6625454	12.3	47	4.380	499624	97.9	89	31.78	1314	100.0
5	0.604	6428220	17.0	48	4.592	444629	98.3	90	33.31	975	100.0
6	0.633	6225770	21.6	49	4.814	382481	98.6	91	34.92	744	100.0
7	0.664	6018989	26.0	50	5.047	312576	98.8	92	36.61	574	100.0
8	0.696	5808724	30.3	51	5.290	256981	99.0	93	38.38	461	100.0
9	0.729	5595845	34.4	52	5.546	208389	99.2	94	40.23	377	100.0
10	0.765	5381183	38.3	53	5.814	170493	99.3	95	42.18	314	100.0
11	0.801	5165559	42.1	54	6.095	133274	99.4	96	44.21	266	100.0
12	0.840	4949765	45.7	55	6.389	107496	99.5	97	46.35	226	100.0
13	0.881	4734554	49.2	56	6.698	86989	99.6	98	48.59	200	100.0
14	0.923	4520649	52.6	57	7.021	69621	99.6	99	50.94	170	100.0
15	0.968	4308738	55.7	58	7.361	57753	99.7	100	53.40	148	100.0
16	1.015	4099461	58.8	59	7.716	49038	99.7	101	55.98	131	100.0
17	1.064	3893416	61.6	60	8.089	42566	99.8	102	58.68	114	100.0
18	1.115	3691157	64.4	61	8.480	36948	99.8	103	61.51	101	100.0
19	1.169	3493182	67.0	62	8.890	32072	99.8	104	64.49	90	100.0
20	1.225	3299952	69.4	63	9.319	27839	99.8	105	67.60	78	100.0
21	1.285	3111869	71.7	64	9.769	24165	99.8	106	70.87	69	100.0
22	1.347	2929290	73.9	65	10.24	21441	99.9	107	74.29	60	100.0
23	1.412	2752523	75.9	66	10.74	18612	99.9	108	77.88	52	100.0
24	1.480	2581825	77.9	67	11.25	16506	99.9	109	81.64	44	100.0
25	1.551	2417410	79.7	68	11.80	14633	99.9	110	85.59	38	100.0
26	1.626	2259441	81.3	69	12.37	12966	99.9	111	89.72	33	100.0
27	1.705	2108042	82.9	70	12.97	11255	99.9	112	94.06	28	100.0
28	1.787	1963291	84.4	71	13.59	9969	99.9	113	98.60	23	100.0
29	1.874	1825230	85.7	72	14.25	8653	99.9	114	103.4	19	100.0
30	1.964	1693862	87.0	73	14.94	7661	99.9	115	108.4	16	100.0
31	2.059	1569155	88.2	74	15.66	6650	99.9	116	113.6	13	100.0
32	2.159	1451046	89.3	75	16.42	5990	100.0	117	119.1	11	100.0
33	2.263	1339441	90.3	76	17.21	5449	100.0	118	124.8	8	100.0
34	2.372	1200165	91.2	77	18.04	5251	100.0	119	130.9	6	100.0
35	2.487	1074321	92.0	78	18.91	4849	100.0	120	137.2	5	100.0
36	2.607	989048	92.7	79	19.82	4886	100.0	121	143.8	4	100.0
37	2.733	907571	93.4	80	20.78	5024	100.0	122	150.8	3	100.0
38	2.865	809080	94.0	81	21.79	5079	100.0	123	158.0	2	100.0
39	3.003	739260	94.6	82	22.84	5574	100.0	124	165.7	1	100.0
40	3.148	673776	95.1	83	23.94	5158	100.0	125	173.7	1	100.0
41	3.301	612700	95.6	84	25.10	4623	100.0	126	182.1	1	100.0
42	3.460	580184	96.0	85	26.31	3883	100.0	127	190.9	0	100.0
43	3.627	545578	96.4								

ELZONE(tm) Particle Size Analysis

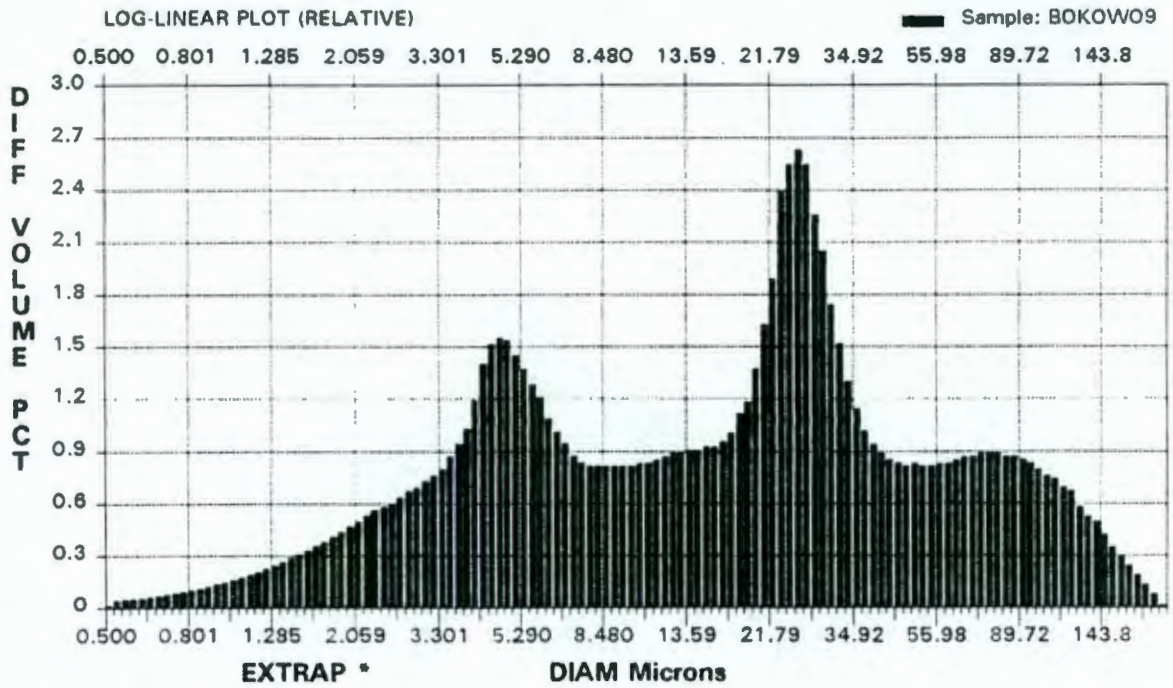
For: BECHTEL HANFORD
3350 GEORGE WASHINGTON WAY
RICHLAND, WA 99352

By: PARTICLE TECHNOLOGY LABS, LTD.
555 ROGERS STREET
DOWNERS GROVE, IL 60515

Operator: MM

Comments:
VOLUME (mass) DATA
SN81606

Date done: 17:16 31 Jan 97
Disk File: 2063-02Z.HST
Sample #: BOKOWO9
Lot/Job #: 1963:93
Material: PARTICULATE
Source: MS. DORIS AYRES



		-- PERCENTILES --
Geometric Mean Size:	15.28 um	0.100% Volume below 0.576 um
Geom. Std Deviation:	3.467 um	1.000% Volume below 0.954 um
Geom. Skewness:	-2.827	6.000% Volume below 2.120 um
Geom. Coeff Variation:	22.68	20.00% Volume below 4.575 um
Arithmetic Mean Size:	29.70 um	50.00% Volume below 19.16 um
Median Size:	18.56 um	80.00% Volume below 46.20 um
Mode Size:	25.08 um	94.00% Volume below 101.4 um
Kurtosis:	4.482	99.00% Volume below 152.0 um
Arith Std Deviation	37.14 um	99.90% Volume below 184.2 um

ELZONE (tm) Particle Size Analysis

For: BECHTEL HANFORD
3350 GEORGE WASHINGTON WAY
RICHLAND, WA 99352

By: PARTICLE TECHNOLOGY LABS, LTD.
555 ROGERS STREET
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Operator: MM

Comments:
VOLUME (mass) DATA
SN81606

Date done: 17:16 31 Jan 97
Disk File: 2063-02Z.HST
Sample #: BOKOWO9
Lot/Job #: 1963:93
Material: PARTICULATE
Source: MS. DORIS AYRES

-- Volume Distribution Data

Total Volm: 1459663619

Chnl	Size	Volume	Cuml%
1	0.500	0	0.00
2	0.524	527873	0.02
3	0.549	592135	0.06
4	0.576	663040	0.10
5	0.604	741115	0.15
6	0.633	826911	0.20
7	0.664	921001	0.26
8	0.696	1023972	0.33
9	0.729	1136433	0.40
10	0.765	1259003	0.48
11	0.801	1392314	0.57
12	0.840	1537005	0.67
13	0.881	1693716	0.79
14	0.923	1863087	0.91
15	0.968	2045753	1.04
16	1.015	2242336	1.19
17	1.064	2453441	1.35
18	1.115	2679650	1.52
19	1.169	2921512	1.72
20	1.225	3179544	1.93
21	1.285	3454215	2.15
22	1.347	3745944	2.40
23	1.412	4055092	2.67
24	1.480	4381950	2.96
25	1.551	4726739	3.27
26	1.626	5089594	3.60
27	1.705	5470565	3.97
28	1.787	5869600	4.35
29	1.874	6286549	4.77
30	1.964	6721149	5.22
31	2.059	7173022	5.69
32	2.159	7641668	6.20
33	2.263	8126463	6.74
34	2.372	8388608	7.31
35	2.487	8650752	7.89
36	2.607	9175040	8.50
37	2.733	9699328	9.15
38	2.865	9961472	9.82
39	3.003	1.05E7	10.5
40	3.148	1.10E7	11.3
41	3.301	1.15E7	12.0
42	3.460	1.26E7	12.9
43	3.627	1.36E7	13.8
44	3.802	1.49E7	14.7
45	3.986	1.73E7	15.8
46	4.179	2.04E7	17.1
47	4.380	2.20E7	18.6
48	4.592	2.25E7	20.1
49	4.814	2.23E7	21.6
50	5.047	2.10E7	23.1
51	5.290	1.99E7	24.5
52	5.546	1.86E7	25.8
53	5.814	1.75E7	27.1
54	6.095	1.58E7	28.2
55	6.389	1.47E7	29.3
56	6.698	1.37E7	30.2
57	7.021	1.26E7	31.1
58	7.361	1.21E7	32.0
59	7.716	1.18E7	32.8
60	8.089	1.18E7	33.6
61	8.480	1.18E7	34.4
62	8.890	1.18E7	35.2
63	9.319	1.18E7	36.0
64	9.769	1.18E7	36.8
65	10.24	1.21E7	37.7
66	10.74	1.21E7	38.5
67	11.25	1.23E7	39.3
68	11.80	1.26E7	40.2
69	12.37	1.28E7	41.0
70	12.97	1.28E7	41.9
71	13.59	1.31E7	42.8
72	14.25	1.31E7	43.7
73	14.94	1.34E7	44.6
74	15.66	1.34E7	45.5
75	16.42	1.39E7	46.5
76	17.21	1.45E7	47.4
77	18.04	1.61E7	48.5
78	18.91	1.72E7	49.6
79	19.82	1.99E7	50.9
80	20.78	2.36E7	52.4
81	21.79	2.75E7	54.2
82	22.84	3.48E7	56.3
83	23.94	3.71E7	58.7
84	25.10	3.83E7	61.3
85	26.31	3.70E7	63.9
86	27.58	3.28E7	66.3
87	28.92	2.98E7	68.4
88	30.31	2.53E7	70.3
89	31.78	2.21E7	72.0
90	33.31	1.89E7	73.4
91	34.92	1.66E7	74.6
92	36.61	1.48E7	75.6
93	38.38	1.36E7	76.6
94	40.23	1.28E7	77.5
95	42.18	1.23E7	78.4
96	44.21	1.21E7	79.2
97	46.35	1.18E7	80.0
98	48.59	1.20E7	80.9
99	50.94	1.18E7	81.7
100	53.40	1.18E7	82.5
101	55.98	1.21E7	83.3
102	58.68	1.21E7	84.1
103	61.51	1.23E7	85.0
104	64.49	1.26E7	85.8
105	67.60	1.26E7	86.7
106	70.87	1.28E7	87.5
107	74.29	1.28E7	88.4
108	77.88	1.28E7	89.3
109	81.64	1.26E7	90.2
110	85.59	1.26E7	91.0
111	89.72	1.23E7	91.9
112	94.06	1.21E7	92.7
113	98.60	1.15E7	93.5
114	103.4	1.10E7	94.3
115	108.4	1.07E7	95.1
116	113.6	9961472	95.8
117	119.1	9699328	96.4
118	124.8	9388608	97.1
119	130.9	7602176	97.6
120	137.2	7077888	98.1
121	143.8	6029312	98.6
122	150.8	4980736	98.9
123	158.0	4194304	99.2
124	165.7	3407872	99.5
125	173.7	2621440	99.7
126	182.1	1835008	99.9
127	190.9	1048576	100.0
128	200.1	0	100.0

Sample Disposition Record

Control #: B97-023
Revision#: 0
Date Initiated: 1/28/97

Section 1 - BACKGROUND

SAF#: B97-002
OU: 200-ZP-1
Project ID: 200-ZP-1 IRM
Task ID: 5.1
Sampling Event: Quarterly Air and Water Monitoring
Laboratory: Particle Technology Labs, LTD
Project Coordinator: Koerner, CC
Task Manager: Buckmaster, MA

Section 2 - SAMPLE INFORMATION

Number of Samples: 1
ID Numbers: B0K0W7
MATRIX: Water
Collection Date: 01/21/97

Section 3 - ISSUE

Class: Lab Direction
NCR Number: N/A
Type: Broken Container
Description: Sample B0K0W7 was shipped to Particle Technology Laboratories on 01/24/97. It was received broken.

N/A

NCR Validation (Print/Sign) Date

Section 4 - DISPOSITION

Type: Reject
Description: The laboratory is directed to cancel the analysis.

Koerner, CC C.L.K. 1/28/97
Project Coordinator (Print/Sign) Date

Buckmaster, MA 1/30/97
Task Manager (Print/Sign) Date

N/A

QA (Print/Sign) Date

Section 5 - INSPECTION (Issue Class: Nonconformance Only)

Inspection Number: N/A
Inspection Results: N/A

N/A

Inspector (Print/Sign) Date