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Final

Meeting Minutes Transmittal/Approval

Unit Managers Meeting
303-K Radioactive Mixed Waste Storage Facility Closure Plan
740 Stevens Center, Room 2100
Richland, Washington

Meeting Held December 8, 1992

303-K Radioactive Mixed Waste Storage Facility Unit Managers' Approval

Randall N. Krekel Date: 1-12-93
Randall N. Krekel, RL, EAP/RPB, Regulatory Permits Branch, Unit Manager

Not Present
Date:
Daniel L. Duncan, EPA Region 10, RCRA Program Manager

Scott E. McKinney Date: 1-12-93
Scott E. McKinney, Washington State Department of Ecology, Unit Manager

303-K Radioactive Mixed Waste Storage Facility, WHC Concurrence

J G Ruck III Date: 1/12/93
Fred Ruck III, WHC, Contractor Representative

Not Present
Date:
David J. Watson, WHC, Contractor Representative

Meeting Minutes are attached. Minutes are comprised of the following:

Attachment #1 - Summary of Discussion
Attachment #2 - Agenda for the Meeting
Attachment #3 - Attendance List
Attachment #4 - Commitments/Agreements Status List
Attachment #5 - Determining Inorganic Contamination in Concrete

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C.E. Clark	RL	(A5-15)
D.L. Duncan	EPA	(HW-106)
G.D. Forehand	WHC	(B2-35)
D.M. Korematsu-Olund	WHC	(H6-23)
R.N. Krekel	RL	(A5-15)
R.J. Landon	WHC	(H6-22)
P.J. Mackey	WHC	(B3-15)
S.E. McKinney	Ecology	
S.M. Price	WHC	(H6-23)
J.A. Remaize	WHC	(L6-18)
F.A. Ruck III	WHC	(H6-23)
D.J. Watson	WHC	(X0-41)
E.A. Weakley	WHC	(L6-26)

GSSC RCRA UMM File, A4-35 c/o S. Lijek

ADMINISTRATIVE RECORD (303-K Radioactive Mixed Waste Storage Facility) [Care of EDMC, WHC (H4-22)]

Washington State Department of Ecology, Nuclear and Mixed Waste Library, P.O. Box 47600, Olympia, Washington 98504-7600

Environmental Protection Agency, Region 10, Seattle, Washington 98101, HW-074

Please send comments on distribution list to Steve Lijek (A4-35), 376-0309.

Attachment #1

Summary of Discussion

303-K Radioactive Mixed Waste Storage Facility Closure Plan
December 8, 1992

Unit Managers Meeting

Sign Previous Meeting Minutes: The minutes from the November, 1992 Unit Managers Meeting were reviewed and signed.

Status of Action Items: Action Item 11-21-91:1, This action item was not discussed at this Unit Managers Meeting.

Action Item 11-21-91:2, WHC (Ruck) will provide an example of a Hazardous Waste Operating Permit to Ecology (McKinney) by the end of the month.

Status of the Justification for Using TCLP Extraction Methods for Analyzing Metals in Concrete: The report Determining Inorganic Contamination in Concrete (Attachment #5) was distributed to Ecology. Ecology will review the report. RL/WHC indicated that this report should support the response to the pertinent NOD comment on the closure plan.

New Business: The 303-K Facility is planned to remain open for less than 90-day storage of concreted wastes. The concretion campaign at the 304 Concretion Facility will begin about the fourth quarter of FY93. The 303-K Facility is proposed to be used as a staging area for waste from the 304 Concretion Facility.

The next Unit Manager Meeting was scheduled for January 12, 1993, in Richland, Washington.

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Attachment #2

Agenda
303-K Radioactive Mixed Waste Storage Facility Closure Plan
December 8, 1992

Unit Managers Meeting

- Sign Previous Meeting Minutes
- Status any Action Items
- Status of the Justification for Using TCLP Extraction Methods for Analyzing Metals in Concrete
- Discuss any New Business

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Attachment #3

Attendance
Unit Manager Meeting
303-K Mixed Waste Storage Facility Closure Plan

December 8, 1992

(Please Print)

Name	Organization	Role	Phone
D.L. Banning	WHC	Closure lead.	(509) 376-1057
R.N. Kreikel	RL	Unit Manager	(509) 376-4264
EA Weakley	WHC	Engr	(509) 376-6122
JOHN A REMAIZE	WHC	MGR, FUEL SUPPLY	(509) 372-1462
Scott E. McKinney	Ecology	Unit Mgr.	(206) 459-6725
Fred Ruck	WHC	RCRA Closure	(509) 376-9676
Steve Lijek	Dames & Moore	GSSC	(509) 376-0309
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Attachment #4

Commitments/Agreements Status List

Unit Managers Meeting
303-K Radioactive Mixed Waste Storage Facility Closure Plan

December 8, 1992

ACTION ITEM	COMMITMENTS/AGREEMENTS STATUS LIST
11-21-91: 1	RL/WHC will give the status of the site-wide Health & Safety Plan (HASP). Action: F. Ruck (WHC) OPEN
11-21-91: 2	RL/WHC will give Ecology an example of a Hazardous Waste Operating Permit. Action: F. Ruck (WHC) OPEN

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Handout #1
(1 pp.), 303-K
UMM, 12-8-92

DON'T SAY IT --- *Write It!*

DATE: December 8, 1992

TO: S. E. McKinney, Ecology

FROM: Randall N. Krekel, RL RNK

Telephone: 376-4264

cc: J. E. Rasmussen, RL
A. V. Beard, RL
F. A. Ruck, WHC
D. L. Banning, WHC
J. A. Remaize, WHC
D. L. Duncan, EPA

SUBJECT: DETERMINING INORGANIC CONTAMINATION IN CONCRETE

Please find attached a paper on determining inorganic contamination in concrete. This topic was discussed at the November 5, 1992, Unit Managers Meeting for the 303-K Radioactive Mixed Waste Storage Facility.

Contact me with any questions.

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54-3000-101 (9/59) (EF) GEF014
DSI

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DETERMINING INORGANIC CONTAMINATION IN CONCRETE

INTRODUCTION

Sampling and analysis of concrete for the purpose of detecting contamination is a problem being confronted with respect to the closure of RCRA TSD units. A satisfactory method for determining volatile and semivolatile organic contamination in concrete has been developed, and will be of great use to cleanup activities in the future. Development of a rationale and method for determining inorganic contamination in concrete must consider several potential problems with the sampling and analysis of concrete. This paper discusses some of these problems and proposes a method for evaluating inorganic contamination in concrete.

A basic problem involved in the inorganic evaluation of concrete is deciding the process used to recognize contamination. As with other media (e.g., soil, groundwater), concrete can vary greatly in composition. Unlike other media, it would be difficult to bracket regional background compositions of concrete because variations in composition cannot be accurately predicted. Thus, establishing background composition for concrete using conventional analytical techniques, as is often done for soil and groundwater, would be futile given the potentially extreme variability and lack of knowledge of the origin of the concrete ingredients. Evaluation of the suitability of a particular analytical technique to concrete should be inherent in any program that intends to accurately characterize this medium.

The inorganic composition of concrete is a summation of the contributions from cement, water, aggregate (rocks and sand), and any additives and contaminants. Compositional variation of the aggregate is a particular source of variability at the Hanford Site, because of the wide range of compositions in aggregate found throughout this area. The size of the particles comprising the aggregate can also affect analytical results, as will be discussed below. In addition to the aggregate, cement may contain substantial concentrations of trace elements. The type and amount of trace elements vary with the composition of the limestone and clay used to formulate the cement. These compositions vary with the location of the limestone and clay quarries.

Two sample preparation techniques will be considered: method 3050 described in SW-846 (EPA 1986), and the Toxicity Characteristic Leaching Procedure (TCLP) extraction method (40CFR Pt. 261, App. II). The former uses vigorous hot acid to dissolve at least a portion of the solid; the analysis of the resulting digestate is typically compared to background compositions determined by the same method on demonstrably uncontaminated samples. The TCLP extraction uses a weak acid at room temperature to evaluate the leachability of the solid; results from analysis of the leachate are compared to published tables (40CFR Pt. 261.24 (b)). Analytes of concern that do not currently have defined maximum concentrations could be evaluated using a health-based approach in conjunction with the TCLP extraction.

Because of the potential for wide chemical variations of the constituents in concrete analyses, any sampling and analysis strategy aimed at the evaluation

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of contamination would meet with complications. If background compositions were to be determined, several problems would arise:

- The samples used for background determination would have to be obtained from the same pour as the concrete to be sampled for contamination, since it cannot be assumed that all pours in a structure contained the same ingredients. The pour being sampled for background would have to be convincingly demonstrated to be uncontaminated; each analysis would be comparable only to the background of the pour it was obtained from.

- There would likely be problems in ensuring representative concrete background samples due to the size and amount of the aggregate present.

- It may be difficult to obtain the number of samples necessary for statistical validity.

To help eliminate these potential sources of error, the TCLP extraction method should be employed for inorganic analysis of concrete samples. This method is designed to leach potentially mobile constituents from a sample, and thus has the following advantages over the 3050 method for detecting inorganic contamination in concrete:

- It is less likely to leach naturally occurring elements from the concrete, thus reducing the difficulty of distinguishing contamination from naturally occurring elements.

- It will more accurately represent the type and amount of constituent likely to leach from the concrete.

- Fewer samples would be needed (no establishment of background is necessary).

- There would be less impact on the facility, and a potential for generating less waste (fewer samples would be needed).

- It is a well-established procedure.

The following sections will present chemical data and a discussion of analytical methods which could be applied to concrete.

VARIATIONS IN AGGREGATE AND CEMENT

To assess the potential for analytical variation in concrete, the composition of aggregate and cement must be evaluated. Rocks quarried for use in concrete originated from different borrow pits which can be demonstrated to have rocks of widely varied compositions. Also, the quarry locations of the limestone and clay used to produce cement vary with the manufacturer and the amount of trace elements could be different at the various locations.

Physical characteristics of the aggregate used could also affect analytical variations. The influence of physical variations may be qualitatively characterized in terms of grain size and mineral composition.

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Chemical Variations

The source of the aggregate used in concrete for most of the structures on the Hanford Site is undocumented and probably not traceable with any sort of certainty. A considerable amount of aggregate was quarried from the Hanford Site proper, but much of the concrete was provided by private contractors. These contractors were located in the Pasco Basin, and almost certainly used sediments of the Hanford formation, the same formation that blankets the Hanford Site, for concrete aggregate. It has been demonstrated that a single compositional range represents the entire Hanford formation, because these sediments are all genetically related (WHC 1992). The possible compositions of the aggregate must therefore be considered to lie within the range of all compositions found in and around the Site. The same situation exists with the cement as with the aggregate. Cement could have been shipped to the concrete contractors from many locations and, as stated above, could contain substantial and various amounts of trace elements. In addition, additives to the concrete could have influenced its composition (e.g., iron added to increase density and thus radiation shielding performance).

When evaluating compositional data, it is essential to know and understand the various analytical methods employed to generate the data. Extraction techniques such as the aggressive hot acid of method 3050 will attack mineral grains, and analytical results will be a function of the solubility of the grain and its size (discussed below). Neither method 3050 nor the TCLP measures the true chemical composition of the solid, in most cases. Determination of the true composition is accomplished by utilization of other analytical and/or preparatory techniques, such as using a solid sample in XRF analysis or total acid digestion followed by a spectroscopic analytical technique (e.g., ICP, AA).

The natural range of concentrations for some of the rocks and sediments found around the area is presented in Table 1. All of these samples were analyzed according to Contract Laboratory Program (CLP) protocols, which are nearly identical to method 3050. Most of the samples used for determining the ranges presented in Table 1 were collected for the Site-wide background project, as described in Hanford Site Soil Background (DOE/RL 1992). Also included in this Table are two samples of basalt: one taken from an outcrop at the far northwestern corner of the Hanford Site (SBAS), and the other from a basalt flow that crops out south of the Hanford site, near Finley, Washington (UMAT). This latter basalt has been analyzed for its total composition, so values would be expected to be higher than the samples analyzed by CLP methods. Although it is unlikely that pure basalt was used for aggregate, some of the sediments in the Hanford formation contain over 75% basalt grains.

Tables 1 and 2 list some naturally occurring inorganic elements in aggregate and cement and are not intended to present a comprehensive list of possible contaminants. Table 1 demonstrates that aggregate samples can contain relatively high values of some of these naturally occurring trace elements, notably vanadium, barium, cobalt, copper, lead, and the halides. Table 2 shows the analytical values of two samples of Portland Type I/II Cement used at the Hanford Site Grout Treatment Facility. The cement analyses were conducted using the inductively coupled plasma (ICP) method after total

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digestion of the cement samples with HF and HNO_3 acids. The table shows the cement can contain relatively high concentrations of naturally occurring trace elements, such as barium.

Grain Size Variations In Aggregate

Grain size is another potential source of analytical variation when using strong acid digestion methods, such as 3050. Because the acid attacks the surface of particles most readily, the total surface area (generally, a function of grain size) will influence the amount of material dissolved. Figure 1 illustrates this effect. However, the TCLP extraction solution is less likely to mobilize the naturally occurring constituents, regardless of the physical or chemical nature of the media.

The effect of grain size on analytical values will probably be substantially smaller when using the TCLP extraction, although no data is available to test this hypothesis. The TCLP solution was designed to leach potentially mobile constituents, which would likely include any contaminants deposited on concrete. The amount of dissolution of these materials would be independent of grain size and mineral composition of the sample aggregate. Therefore, more consistent analyses would result when using TCLP extraction for detecting contamination, because neither the composition nor the grain size of the aggregate would influence the result.

CONCLUSIONS

The method used to determine if concrete has been contaminated by inorganic constituents should be decided based on the following points:

- The concrete is a conglomerate of cement, aggregate, and water.
- Of the three ingredients, aggregate and cement are the most likely sources of elevated naturally occurring trace metals.
- Naturally occurring aggregate in the Pasco Basin can contain unusually high concentrations of trace elements, owing to a substantial basalt component.
- Cement produced from naturally occurring limestone and clay can have relatively high concentrations of trace elements. The amount of trace elements in the cement vary with the location of the limestone and clay quarries.
- The analytical method typically employed in the analysis of solids (method 3050) may dissolve a portion of the aggregate.

The information presented in this report confirms the best extraction method, when analyzing concrete for inorganic constituent, is the TCLP. This method is more likely to dissolve only those constituents that could mobilize in a landfill environment.

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REFERENCES

DOE/RL, 1992, Hanford Site Soil Background, DOE/RL-92-24, U.S. Department of Energy,-Richland Operations Office, Richland, Washington.

EPA, 1986, Test Methods for Evaluating Solid Waste: Physical/Chemical Methods, SW-846, 3rd Edition, EPA-600/4-79-019, U.S. Environmental Protection Agency, Washington, D.C.

Hooper, J.R., and Swanson, D.A., 1989, Columbia River Basalt Group and associated volcanic rocks in the Blue Mountains Province, in Walker, G.P., Robinson, P.T., Hooper, P.R., Swanson, D.A., and McKee, E.H., eds., The geology of the Blue Mountains region of Oregon, Idaho, and Washington; Cenozoic geology of the Blue Mountains region: U.S. Geological Survey Professional Paper 1437, p. 63-99.

WHC, 1991, Characterization and Use of Soil and Groundwater Background for the Hanford Site, WHC-MR-0246, Westinghouse Hanford Company, Richland, Washington.

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Table 1. Statistics on analytical values for selected analytes, showing natural range of CLP compositions for the Hanford formation (Site-wide) and two Columbia River basalts. < = less than the detection limit for this analysis, N = number of samples, NA = data is not available. SBAS = multiple CLP analyses of Umtanum basalt, UMAT is XRF analysis of Umatilla basalt, from Hooper and Swanson (1989). All data in ppm.

Analyte	N	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper
Site-wide	151								
Average		<21	<12	94.37	1.06	<0.66	11.40	11.50	15.30
Maximum		<21	<12	294.00	2.10	<0.66	33.20	17.80	36.10
SBAS	8								
Average		<0.74	<0.9	44.30	1.13	<0.3	5.54	20.71	NA
Maximum		<0.74	<0.9	71.70	1.50	<0.3	11.20	30.30	NA
UMAT	1	NA	NA	3532	NA	NA	0.00	NA	13.00

Analyte	Iron	Lead	Manganese	Mercury	Nickel	Selenium	Silver	Thallium
Site-wide								
Average	23978	6.23	380.9	0.25	12.93	<14.5	1.24	<22
Maximum	37000	26.60	814.0	3.80	28.40	<14.5	14.60	<22
SBAS								
Average	33250	21.23	282.1	<0.16	<3.2	<14.5	2.49	<22
Maximum	44400	42.10	401.0	<0.16	<3.2	<14.5	3.90	<22
UMAT	46408	NA	1650.0	NA	NA	NA	NA	NA

Analyte	Vanadium	Zinc	Molybdenum	NH_3	Alkalinity	Silicon	Fluorine	Chlorine
Site-wide								
Average	56.04	51.18	1.31	3.20	2977	25.24	2.11	71.91
Maximum	105.00	119.00	4.00	26.40	37600	583.00	73.30	1480.00
SBAS								
Average	170.64	78.34	<1.4	NA	530	57.54	1.63	20.52
Maximum	244.00	140.00	<1.4	NA	1280	208.00	3.48	57.10
UMAT	185.00	136.00	NA	NA	NA	346076	NA	NA

Analyte	NO_2	NO_3	$O\text{-}PO_4$	SO_4
Site-wide				
Average	<21	36.40	3.92	161.8
Maximum	<21	906.00	225.00	4340.0
SBAS				
Average	0.42	125.46	43.58	215.9
Maximum	0.85	298.00	149.00	407.0
UMAT	NA	NA	NA	NA

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Table 2. Analytical values of two samples of Portland Type I/II Cement used at the Grout Treatment Facility. The extraction method was total digestion using HF and HNO_3 acids followed by inductively coupled plasma (ICP) analysis. NA = not applicable, blank = below detection limit. All data in ppm.

ANALYTE	DETECTION LIMIT	SAMPLE 1	SAMPLE 2
Ag	20		
Al	100	15000	16000
As	200		
B	50	N/A	N/A
Ba	20	1000	1000
Be	10		
Bi	200		
Ca	100	460000	450000
Cd	10		
Ce	200		
Co	20		
Cr	50	100	100
Cu	10	100	80
Dy	50		
Eu	20		
Fe	20	31000	31000
Gd	1000		
K	2000	5000	
La	70	100	100
Li	50		
Mg	200	5600	6500
Mn	10	430	380
Mo	50		
Na	200	1600	2000
Nd	70		
Ni	70		
P	200	900	800

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Table 2. Cont.

ANALYTE	DETECTION LIMIT	SAMPLE 1	SAMPLE 2
Pb	100		
Pd	400		
Rh	200		
Ru	100		
Sb	100	N/A	N/A
Se	200		
Si	100	100000	100000
Sn	2000		
Sr	10	400	440
Te	200		
Th	2000		
Ti	10	1200	1500
Tl	1000		
U	2000		
V	20	80	80
W	200		
Y	20		
Zn	50	100	100
Zr	20	50	60

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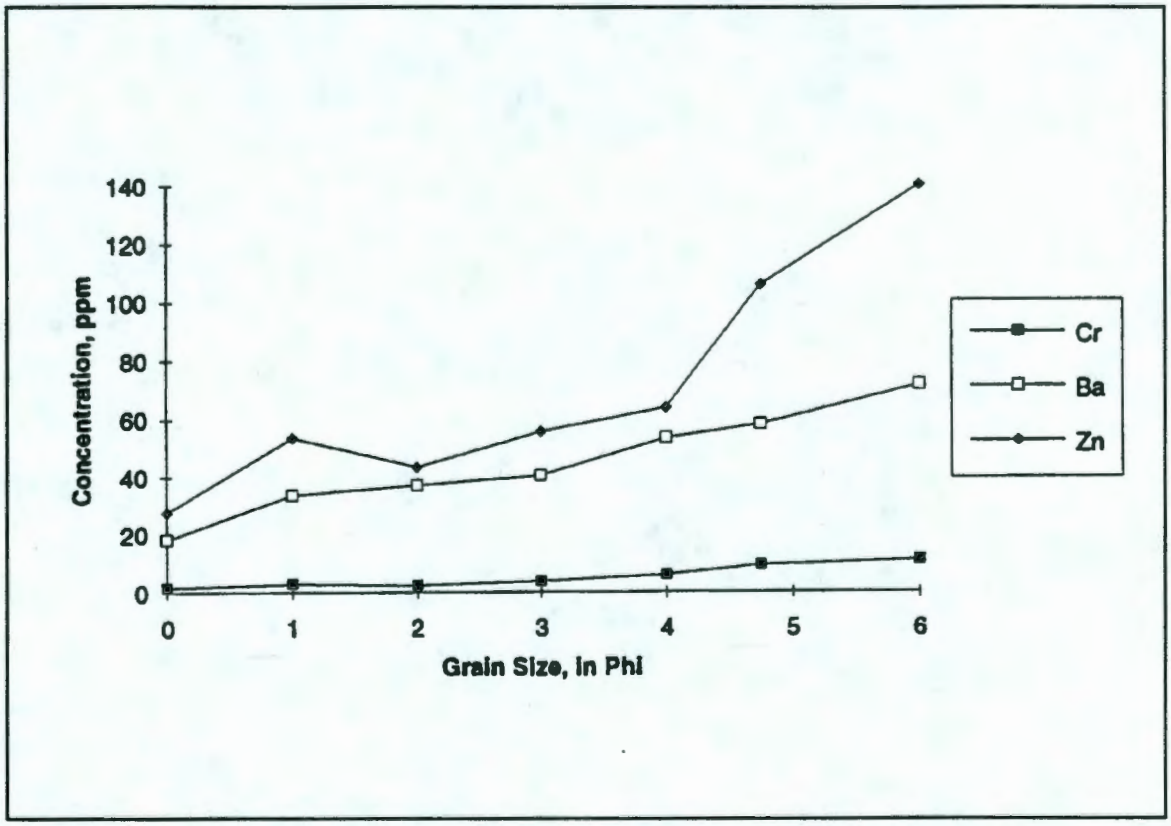
Figure 1. Variation of concentration of selected analytes with grain size. Data is from a sample of homogeneous basalt (SBAS) that was crushed and sieved into different grain sizes. Phi size is a logarithmic transformation in which the negative logarithm to the base 2 of the particle diameter (in millimeters) is substituted for the diameter value. It has integers for the class limits, increasing from -5 for 32 mm to +10 for 1/1024 mm. It is not a dimension but a ratio.