FLUOR DANIEL FERNALD

8085

INTEROFFICE MEMORANDUM

To:	Those Listed	**Date:**	June 29, 1998
Location:	Fernald	**Reference:**	N/A
From:	John Smets, MS52-4	**FD Fernald #:**	M:SP:98-0236
Location:	Fernald	**Client:**	DOE DE-AC24-92OR21972
Extension:	648-4845	**Subject:**	**FORMULATION FOR POP DEMONSTRATION SURROGATE**

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The purpose of this memo is to transmit the formulation for the Demonstration K-65 Surrogate to be used in the Proof of Principle (POP) program. The formulation is:

	grams
Na_2HAsO_4	0.12
$BaSO_4$	5.77
Na_2CrO_4	0.19

1

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-- 8085

INTEROFFICE MEMORANDUM

Fe_2O_3	1.78
$Mg_3(PO4)_2$	1.66
$NaNO_3$	0.73
NiO	0.30
$PbCO_3$	4.66
$PbSO_4$	1.87
PbO	4.00
Na_2SeO_3	0.07
SiO_2 - Course	14.06
SiO_2 - Fine	13.34
SiO_2 - Fume	6.44
V_2O_5	0.06
ZnO	0.01
Tributyl Phosphate	0.65
Kerosene	0.64
Diatomaceous Earth	1.29
Feldspar - $(Na,K)AlSi_3O8$	12.93
Bentonite	0.00
H20	29.43
Total grams	100.00

2

This formulation is believed to be an appropriate test of the remediation technologies and represents a combination of constituents that represent the upper bound of what is expected in the silos. It contains elevated levels of key constituents that will challenge the technologies and provide assurance that the process is robust. The basis for the formulation is the result of an attempt to balance the known chemistry of K-65 material and the need to duplicate the TCLP rate for the heavy metals (primarily Pb) in a predictable range.

The development of this surrogate has gone through an extensive program, although accelerated, that has included work at the Fernald Laboratory and later work with the University of Cincinnati in their laboratory. Many candidate formulations were developed and tested and, during the process, many facts with respect to the interaction of the chemicals were discovered which ultimately assisted in developing the most appropriate formulation. In addition to the chemical characteristics of the surrogate, it is important to assure that the physical aspects are similar to those anticipated in the K-65 material. The final candidates were tested for these physical parameters.

In order to assure that the surrogate could be used for all of the technologies, the physical parameters were a significant issue. Initial adjustments to the Demonstration Surrogate were based on the physical parameters. It is understood that the reaction within a thermal system is very different than within the chemical or cement based technologies. The hygroscopic nature of the surrogate is key since it will provide an accurate challenge for the non-thermal processes. The importance of this characteristic is minimized in the thermal processes since the heat will drive all of the water out of the material rapidly, approximating of the physical characteristics of the K-65 material.

The TCLP leach rate has been adjusted to fall within the upper bound of the leaching rate for the K-65 material (650-850 mg/l). This has been achieved through the substitution of PbO for $PbCO_3$. This substitution was necessary since the remaining constituents $PbCO_3$ and $PbSO_4$ leached at significantly lower rates. The addition of more lead would have resulted in levels significantly higher than anticipated in the K-65 materials.

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-- 8085

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The substitution allows the lead levels to remain reasonable while increasing the TCLP results. In addition, the requirement to have an appropriate level of $BaSO_4$ prohibited the addition of additional $PbSO_4$ compounds. Therefore the most appropriate addition was PbO.

In summary, the Demonstration Surrogate is not intended to mirror the known constituents in the K-65 material at the concentrations that are typically found. It is instead intended to reflect the higher concentrations or combination of higher concentrations that may be found in the K-65 material. The purpose of utilizing these higher concentrations is to test the treatment method.

Please forward this formulation to the Contractors as the Demonstration Surrogate. Testing continues on the surrogate for the Silo 1 and 2 treatability testing. These formulations are nearing completion and are anticipate to be complete within the next couple of weeks. Should you have any questions regarding the technical aspects of this formulation, please feel free to contact Bob Vogel.

JS:RAV:cml