

Attachment 2-9

**Kearney, C. PolyMet Unsaturated Overburden Sampling Analysis Plan.
Email to Stuart Arkley and Jennifer Engstrom, MDNR. March 3, 2010
(updated March 4, 2010).**

From: [Christie Kearney](#)
To: [Christie Kearney](#); [David Blaha \(David.Blaha@erm.com\)](#); [Stuart Arkley \(Stuart.Arkley@dnr.state.mn.us\)](#); ["Engstrom, Jennifer N \(DNR\)"](#)
Cc: [John Borovsky](#); [Mehgan M. Blair](#); [Day, Stephen](#); [Tom Radue](#); [Heather Arends \(heather.arends@state.mn.us\)](#); [Dennis Martin \(dennis.martin@state.mn.us\)](#); [Paul Eger \(DNR\) \(a.paul.eger@state.mn.us\)](#); ["Jim Scott"](#); [Cheryl D. Feigum](#); [Michael Olson \(MDNR\)](#)
Subject: PolyMet Unsaturated Overburden Sampling Analysis Plan
Date: Wednesday, March 03, 2010 1:04:26 PM
Attachments: [Soil Genesis Grigal 2010.doc](#)
[Preparation Scheme-Analyses.ppt](#)

Proposed Unsaturated Overburden Sample Analysis Plan March 3, 2010

PolyMet submitted an Overburden Sampling Plan on February 25, 2010 via email from Christie Kearney to Dave Blaha, Stuart Arkley, and Jennifer Engstrom, with copy to several others under the subject *PolyMet Overburden Sampling Plan*. In that email, it was stated that PolyMet would be submitting recommendations regarding the subsequent laboratory analysis. This email lays out the proposed plan for the laboratory analyses of the unsaturated overburden samples that are currently being collected.

In an email on Feb. 9, 2010, Jennifer Engstrom, MDNR-LAM, provided the following:

Suggestions for sample analysis:

- 1) one sample of minus the particle size to be used for construction or other on-site use, crushed and analyzed (total mass) for similar suite of constituents as previous sampling and analysis plan,
- 2) separate sample of minus 2 mm, crushed and analyzed (total mass) for similar suite of constituents as previous sampling and analysis plan,
- 3) particle size distribution (gradations by weight %) to better understand the chemistry,
- 4) test soil horizons separately since previous sampling indicated elevated metal concentrations, and
- 5) remainder of tests that were conducted for the previous overburden sampling

Based on previous analyses and MDNR suggestions, the unsaturated overburden samples collected will be evaluated as shown on the attached figure:

- Rinse test for pH, oxidation/reduction potential, and specific conductivity of the bulk sample
- Particle size distribution of the bulk sample via sieve and hydrometer testing (ASTM D422 – Standard Test Method for Particle-Size Analysis of Soils)
- Meteoric Water Mobility Procedure (MWMP, Nevada DEP) of the bulk sample
- Metals analysis of the minus 2 mm fraction (aqua regia, as was previously done, and 1 N nitric acid)
- Moisture Content
- Acid-Base Accounting

The MWMP test is used to predict leaching by first contact of water when exposed by excavation. This test was used previously to assess the potential effects on water quality as a result of excavation of the overburden material on the site. Therefore, it will be the main tool used to

evaluate leaching. Acid-base accounting will indicate whether there is potential for long term water degradation.

The metal analysis of the minus 2 mm fraction will be used as backup information to confirm the metal concentrations in the sample population and to evaluate the results of the MWMP testing. Although the aqua regia analysis was previously used for metal analysis, the analysis with 1 N nitric acid (HNO_3) is a new extraction method for the overburden evaluation at PolyMet. This extraction is based on the recommendations of the Regional Technical Committee of the USDA (W-124, The Optimum Utilization of Sewage Sludge on Agricultural Land) (Pierce 1980). The extraction is presumed to include both labile (water soluble, exchangeable, associated with organic matter, and adsorbed on oxide surfaces) and other biogenetically available metals. The later term refers to metals that could reasonably be expected to become available to plants via weathering over relatively long time periods. Thus this extraction should provide a reasonable representation of metals available for movement with infiltrating water over the long term and the results from this extraction would provide a basis for a direct comparison to similar data for other Minnesota soils, including Rainy Lobe till (Pierce et al 1982). For further discussion of this extraction in regards to the Mine Site, see the attached paper from Dr. David Grigal that was submitted to the MDNR on March 1, 2010 from John Borovsky (Grigal 2010).

Based on Barr's *Preliminary Agency Preference Meeting Follow-Up: Action Item 1 – Stockpile Liner Construction* (January 27, 2010 Memorandum by Tom Radue to Dave Blaha, ERM, and Stuart Arkley, MDNR):

The selection of the maximum allowable particle size is typically based on engineering experience and judgment. It is Barr's experience that limiting the maximum particle size to approximately 1/3 the compacted soil lift thickness accommodates uniform compaction of the soil layer to the specified density.

Therefore, maximum particle size used for construction is dependent on the application. The maximum particle size for a 9-inch thick soil lift, for example, would be 3 inches, and most construction uses for the unsaturated overburden would also be limited to something similar on the basis of the soil lift thickness as placed during a typical construction sequence. Collection of the samples in the field is done with a trenching shovel, capturing the samples into a bucket and discarding rocks in excess of approximately 5 inches or more. Therefore, the bulk sample encompasses material that is representative of our construction materials. Therefore, interpretation of the MWMP results of the bulk sample will be representative of the actual water quality we could expect from the construction areas where the unsaturated overburden is used.

The proposed analyses would not include metal analyses of the bulk sample or of minus 3 inches, because the MWMP is a better representation of what the actual water quality results will be than the metal assay analysis; therefore we are not proposing to include a sample to meet MDNR Item 1.

The proposed analysis plan does meet the suggestion of MDNR Items 2, 3, and 4. As described in our *Overburden Sampling Plan* email from February 25, 2010, depending on the depths of the soil horizons found at each sump, we will collect additional soil horizon samples for analyses if practical.

MDNR Item 5 suggests that we do the same analyses as was done previously. As described above, we are focusing our efforts on the MWMP evaluation with metal analyses on the less than 2mm

fraction to support the evaluation of MWMP results; therefore we are not proposing to do the full suite of analyses as the previous sampling effort and do not believe the additional analyses are beneficial for understanding the ultimate potential water quality effects of the use of this material in construction applications.

References

Grigal, D. 2010. Soil Materials at NorthMet. February 25.
Pierce, F.J. 1980. The content and distribution of Cd, Cr, Cu, Ni, Pb, and Zn in 16 selected Minnesota soil series. M.S. thesis, University of Minnesota, St. Paul, MN, USA. 140 p.
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Please contact Mehgan Blair at 218-529-8237 or me at 218-262-8629 if you have any questions about or concerns about this sampling program.

Christie M. Kearney
Water Resources Environmental Engineer

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Barr Engineering Company  
3128 14th Ave. E.  
Hibbing, Minnesota 55746

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direct) 218-262-8629
ckearney@barr.com

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Subject: RE: PolyMet Unsaturated Overburden Sampling Analysis Plan
Date: Thursday, March 04, 2010 8:41:05 AM
Attachments: [PolyMet Preparation Scheme-Analyses 3-4-2010.pdf](#)

Please replace the figure sent yesterday with the attached figure, which is a better representation of PolyMet's unsaturated overburden sample analysis plan. I apologize for the inconvenience!
Christie

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