



Nevada Specific Analytical Requirements for Kinetic (Humidity Cell) Testing Leachate (aka HCT Protocol)

21 November 2024

Introduction

The Nevada Division of Environmental Protection (Division), Bureau of Mining Regulation and Reclamation (BMRR) has determined that additional sample preparation and analysis steps are required to obtain the necessary information from Kinetic (Humidity Cell) Testing (HCT). The Division accepted procedure, ASTM D5744 Option “A”, is followed as written up to the point of extract collection and leachate analysis. The modifications described in this procedure are related to leachate collection, filtration, and sample analysis requirements. This procedure is required for all HCT leachate analysis conducted for projects located within the State of Nevada.

The HCT method shall be performed by a Nevada-approved laboratory. All HCT leachate analyses shall be performed by a Nevada-certified laboratory. For any laboratory to be Nevada-approved to perform the ASTM D5744 HCT method, it must also be certified by the State of Nevada under the Clean Water Act (CWA) for the following parameters: pH, electrical conductivity (EC), acidity, alkalinity, and sulfate and approved through the Lab Certification Program for oxidation-reduction potential (Eh), and iron (Fe^{+2} , Fe^{+3}).

Procedure:

1. Follow ASTM D55744 to the point of extract collection.
2. Following leachate collection, volume and weight of the leachate is then recorded. Then pH, Eh, EC, and $\text{Fe}^{+2}/\text{Fe}^{+3}$ (as appropriate) must be analyzed from a sub-sample of the unfiltered leachate. All remaining collected solution shall be pre-filtered using a coarse filter paper having an approximate 8 - 12 μm retention. If collection of the entire leachate volume cannot be completed by the end of leach day, then pH, Eh, EC, and $\text{Fe}^{+2}/\text{Fe}^{+3}$ (as appropriate) must be analyzed as above. By default, pH, Eh, EC, and $\text{Fe}^{+2}/\text{Fe}^{+3}$ must be analyzed within 24 hours of leachate collection.

A. Each Week (Short List):

3. Immediately following weighing of leachate, split a sub-sample and analyze for the following:
 - a. pH (standard units [S.U.]);
 - b. Oxidation/reduction potential (mV); and
 - c. Specific conductance ($\mu\text{S}/\text{cm}$).
4. Based on leachate pH, analyze for the following, as appropriate:
 - a. If pH is ≤ 5.0 SU, analyze sub-sample for $\text{Fe}^{+2}/\text{Fe}^{+3}$ speciation;
 - b. Acidity when pH ≤ 5.0 S.U.;

- c. Alkalinity, only when $\text{pH} \geq 4.5$ S.U.; and
- d. Acidity and alkalinity when $\text{pH} \geq 4.5$ S.U but ≤ 5.0 S.U.

Note: **ONLY** the initial extract Short List parameters shall be reported. No additional results shall be reported or accepted by the State, e.g. if a split is sub-contracted and the subcontract lab analyzes these parameters, do not include in any report.

- 5. Regardless of leachate pH, analyze for the following:
 - a. From an unpreserved extract sub-sample:
 - Sulfate
 - b. Within 12 hours of coarse filtration of the leachate, collect a sub-sample and filter at 0.45 μm and preserve with HNO_3 to $\text{pH} < 2$ S.U. No sooner than 24 hours following preservation, digest and analyze for the following as dissolved metals content. :
 - Calcium, and
 - Magnesium.
 - c. Within 12 hours of coarse filtration of the leachate, collect a sub-sample and preserve with HNO_3 to $\text{pH} < 2$ S.U. No sooner than 24 hours following preservation, digest and analyze for the following as total recoverable metals content:
 - Iron

Note: The laboratory approved for the HCT protocol **must** perform the weekly constituent analyses for pH, Eh, EC, sulfate, acidity, alkalinity, and $\text{Fe}^{+2}/\text{Fe}^{+3}$ speciation, when required; and **must** be certified or approved by the State of Nevada for those analyses. Weekly samples for total iron and uranium and dissolved calcium and magnesium may be sub-contracted to a Nevada-certified CWA laboratory.

B. Weeks 0, 1, 2, 4, 8, 12, 16, and Every 4th Week (Long List):

- 6. On Weeks 0, 1, 2, 4, 8, 12, 16, and every 4th week thereafter (e.g., weeks 20, 24, 28, 32, etc.), conduct all weekly analyses as required (Short List), described above in steps 1-4, and complete the analyses specified in steps 6 or 7 depending on characterization purpose, e.g., quarterly compliance monitoring, development of waste rock management plans, closure plans, general material characterization, i.e., spent ore, alluvial materials, etc., or pits that will not penetrate the water table, the leachate, generated per the method, shall be coarse filtered, and analyzed per the following:
 - a. Profile I and Uranium - The Profile I analytical suite can be found on the Division website.
 - a. The HCT leachate should be split into the following sub-samples for Profile I and total recoverable uranium and iron analysis (suggested volume only):
 - i. 200 ml – filtered at 0.45 μm , preserved with HNO_3 for dissolved metals;
 - ii. 100 ml - unfiltered and preserved for total iron and uranium;

- iii. 200 ml - unfiltered, unpreserved for general chemistry parameters; this split is further sub-sampled for Cl, F, TDS, etc. analysis, as needed;
 - iv. 100 ml – unfiltered, preserved with H₂SO₄ for NO₂+NO₃-N and N(T) analysis; and,
 - v. Unless otherwise requested by the Division, analysis for WAD cyanide is not required.
7. Optional - If the collected sample is for characterization of a site where a pit lake is predicted to form, both filtered and unfiltered leachate, generated per the method will be coarse filtered, preserved, digested (as applicable), and analyzed for the following:
- b. Profile IV - The Profile IV analytical suite can be found on the Division website. The HCT should be split and analyzed into the following sub-samples for analysis (suggested volume only):
 - i. 150 ml – unfiltered, preserved with HNO₃ for total recoverable metals;
 - ii. 150 ml – filtered at 0.45 μm, preserved with HNO₃ for dissolved metals;
 - iii. 200 ml - unfiltered, unpreserved for general chemistry parameters; this split may be further sub-sampled for Cl, F, TDS, etc. analysis, as needed;
 - iv. 100 ml – unfiltered, preserved with H₂SO₄ for NO₂+NO₃-N and N(T) analysis; and,
 - v. Unless otherwise requested by the Division, analysis for WAD cyanide is not required.

NOTE: The Permittee may choose to use Profile IV in lieu of Profile I to gather additional data for compliance with NAC445A.429.4.b. At this time it is not a requirement.

A request to terminate an HCT may be submitted following a minimum of 20 weeks of available data. The request shall include, at a minimum, the initial ABA data, all weekly analytical parameters, and all Profile I, III, and IV results, as applicable. The HCT shall continue its testing protocol until a decision to approve termination is made by the Division. Under no circumstance will the HCT be placed on 'hold' pending Division review. If the project is on public land, separate concurrence from the BLM and/or USFS will be required.