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WHITEWOOD CREEK SUPERFUND SITE POST-REMEDY OPERATIONS, MAINTENANCE AND REPORTING PLAN

Amended May 1, 2003

Submitted to:

U. S. Environmental Protection Agency, Region VIII
Hazardous Waste Management Division
Superfund Remedial Branch

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1.0 INTRODUCTION

This Amended Operations, Maintenance, and Reporting Plan (Amended 0&M Plan) replaces the O&M plan dated July 27, 1994, and covers all of the O&M and reporting requirements from this point forward for the former Whitewood Creek NPL Site, which is located near Lead, South Dakota. The requirements of this Amended O&M Plan reflect the analyses of the monitoring activity carried out at the Site since the issuance of EPA's Record of Decision (ROD) for the Site, as well as the results of the first five-year review for the Site, issued July 17, 2002. That five-year review concluded that the selected remedy continues to be protective of human health and the environment. This Amended O&M Plan is consistent with the Environmental Protection Agency's (EPA) ROD and follows applicable guidance offered in EPA's Statement of Work (SOW).

This Amended O&M Plan directs the operations, maintenance, and reporting at the Site following completion of the first five-year review. The following elements are included in the plan:

- Surface Water Monitoring
- Education Program
- Future Development
- Post-Remedy Residential Site Soil Surveillance, Sampling and Remediation Activities
- Disposal Site

The objective of this Amended O&M Plan activity is to provide continuing assurance that human health and the environment are being protected by the remedial action that has been implemented.

2.0 SITE BACKGROUND

Discussion of site background including site location, site contamination, and the selected remedy is presented in "Whitewood Creek Superfimd Site Sampling and Analysis Plan for Residential Remediation and Surface Water Monitoring" (SAP) -- Section 2.0 -- Site Background, attached as Addenda A and B.

3.0 SURFACE WATER MONITORING

The ROD, which was issued in 1990, had required that the surface water quahty of Whitewood Creek be monitored to evaluate the effect of unknown rates of release of arsenic from the tailings deposits, with samples to be completed four times a year at the two USGS sampling stations on Whitewood Creek. With over ten years of sampling data from those two locations, EPA has determined that the sampling program can be modified to require these samples to be taken twice annually at the existing locations. The complete amended sampling program is discussed in the attached Addendum B.

4.0 EDUCATION PROGRAM

An annual site resident education program is prescribed by the ROD. The existing program, which will be continued, is meant to acquaint current and future residents with the potential health hazards within the site by providing annual infonnation sheets regarding the Site and the institutional controls goveming the Site. It is also intended to help residents minimize incidental ingestion of contaminated soils. The contents and maintenance of the education program are more fully discussed in Section III, Educational Program of "The Whitewood Creek Superfund Site Institutional Controls Plan" dated October 30, 1992, which is included as Addendum C.

5.0 FUTURE DEVELOPMENT

A key element of the EPA remedy as expressed in the ROD is the Institutional Controls. These controls are intended to limit future exposure to tailings. A complete discussion of the controls restricting future development is included in the "County Building Permit Handbook" dated January 10, 1993. Sections of the County Handbook relating to these controls are attached as Addendum D. For further information relating to residential development within the Superfund Site, please refer to the complete "Whitewood Creek Tailings Area Building Permit Handbook."

6.0 POST-REMEDY RESIDENTIAL SOIL SURVEILLANCE, SAMPLING AND REMEDIATION PROGRAM ACTIVITIES

- Visual inspection of remediated areas after a significant (fifty-year flood) high flow event;
- Visual inspection of residential remediation during five-year review ; and
- Appropriate action to be taken to retum any contaminated areas discovered in the above described monitoring activities to remediation standards.

6.1 SOIL SAMPLING AND ANALYSIS PROGRAMS FOLLOWING MAJOR FLOOD EVENTS

Experience during the twelve years since the issuance of the ROD have shown that the remediation is unaffected by normal high flow events. For future monitoring, visual inspection of the remediated areas and residential high use areas will be undertaken at the time of the five-year review or after major high flow events, defined as a fifty-year flood event. If the visual inspection indicates the possibility of significant recontamination of high use areas from the flooding, investigative soil sampling will be completed. Discrete samples will be collected at 50 foot intervals along lines spaced 100 feet apart. Sample lines will tend to transect floodwater flow direction. Samples will be collected, handled, documented and analyzed identical to residential samples as described in Addendum E, except samples will be collected from a depth of 0 to 1 inch only.

If investigative soil sampling analytical results for specific residential properties indicate arsenic levels greater than the site action level (i.e. > 100 mg/kg), remediation as per Section 6.3 will be completed.

6.2 FIVE-YEAR REMEDIAL ACTION VERIFICATION PROGRAM

As required by Statute, EPA will review the site no less often than every five-years after initiation of Remedial Action. The next five-year remedial action review will be conducted in July 2007. One part of this review is an examination of the long-term effectiveness of the residential remediation, including an evaluation of remediated properties.

As part of the five-year review, all remediated properties will be inspected by Homestake with EPA and DENR oversight to evaluate the integrity of the remedial cover material. Homestake will coordinate the inspection schedule with EPA and DENR 30-days in advance of the inspections. Remediated high use areas will be examined for evidence of recontamination, including obvious excavations, exposed geotextile fabric, or exposed tailings-containing alluvial gravels. During the inspection, each property ovmer will be interviewed conceming any excavations within, or importation of tailings materials to, the property high use area.

If the property inspection, with its integral interview, does not provide any indication of recontamination, a report documenting the inspection/interview will be completed and included in the five-year review reporting. If areas of suspected recontamination due to excavation or importation exceed 10 percent of the high use area, the suspect areas will be sampled. Soil sample(s) will be collected and analyzed as per techniques outlined in Addendum E. Discrete samples will be collected in each suspect area, with a minimum sampling trequency of one sample per 2500 sq ft' in disturbed areas.

Following the completion of any required soil sampling and analysis, data evaluation will be completed. Data review may include the use of statistical evaluation as per Section 9.1 through 9.4 of the SAP (attached as Addendum F to this document). If the data evaluation concludes that there is no significant exceedance above 100 mg/kg soil arsenic concentration at any specific property, that property will be designated as needing no further action until the next required review. EPA may remove specific properties trom the five-year review program. If the data evaluation concludes that there is a significant exceedance above 100 mg/kg soil arsenic concentrations, Homestake may attempt to outline in greater detail high arsenic soil areas through additional sampling, analysis, and statistical evaluation prior to remediation of high arsenic soil areas. As an altemative, Homestake may elect to remediate the entire high use area represented by specific samples exceeding the 100 mg/kg soil arsenic concentration action level.

6.3 RESIDENTIAL SOIL REMEDIATION

If sampling activities indicate that previously remediated residential areas contain soil arsenic levels that statistically exceed remediation standards, those specific areas will be remediated per the project selected remedy. All phases of these remediation efforts will be consistent with the ROD dated March 30, 1990. Property remediation would be commenced within one year of the determination that remediation is necessary. The Constmction Completion Report shall be submitted to EPA within 60 days of the completion of remediation.

If remediation is necessary, Homestake will conduct the following activities:

1. Prepare a detailed landscape drawing of the area where remediation is necessary.
2. Detennine the scope of construction necessary to meet ROD standards and landovmer interests by discussions with the EPA RPM, landovmer, constmction foreman, and Homestake.
3. Determine the volume of cover material needed.
4. Sample and analyze the cover material as per Section 4.6 of the SAP.
5. Complete earth moving activities.
6. Open and close the disposal site, if necessary.
7. Complete surveys to confinn cover depths.
8. Complete landscaping activities.
9. Complete the Constmction Completion Report as per Section 3.1.6 of SOW.
10. Obtain EPA approval of Completion Report.

7.0 DISPOSAL SITE

An annual site visit-review will be completed at the on-site disposal site. Specifically, the integrity of site fencing, vegetative cover, surface slopes, and rip-rap will be reviewed. Any disposal site conditions not consistent with the "Transportation and Disposal Plan for the Whitewood Creek Superfund Site" will be repaired or corrected according to a timetable agreed upon by EPA and Homestake. If the repair or correction of such conditions is not feasible, the disposal site design will be re-evaluated. Any changes to the above referenced disposal plan deemed necessary by re-evaluation, will be presented to EPA for their approval.

If soil sampling and analysis programs following major flood events, a five-year review finding, or future development warrant re-opening the disposal site for disposal of residential soils due to remedial activities, all activities at the disposal site will be performed consistent with the "Transportation and Disposal Plan for Whitewood Creek Superfimd Site."

Disposal site O&M plan activities will be addressed in the annual reports and in five-year review site reporting.

8.0 REPORTING

The five-year review will continue to include a review of the ordinances promulgated and development activity within the site. This shall include a description of the effectiveness of the ordinances and include any ordinances which have been changed or repealed during the five-year period. If development has taken place which is inconsistent with specifications as described in EPA's ROD, these properties will be required to be remediated in a manner consistent with the ROD. The five-year review will also include reviews of compliance with the shallow waterwell ban in the floodplain and the surface water quality data collected from Whitewood Creek to assure that levels protective of human health and aquatic life are being maintained.

9.0 O&M ACTIVITIES TABLE

Activity	*Due Date*
Annual Report	March 31 of each year.
Remediated Residential Site Inspection	July 17, 2007 and every five-years thereafter for as long these inspections are required
Soil Sampling	Where visual observation after major flood events (fifty-year floods) indicates significant recontamination of residential high use areas.
Renewed Remediation Activities	One year after determination that remediation was necessary.
Surface Water Monitoring	May (peak mnoff), September (late summer), with findings included in amual report
Disposal Site Monitoring	Annually, with findings reported in annual report
Education Material	Amually during the first calendar quarter after EPA approval of information package.
Future Development	Annual review of residential building activity within site.
Five-Year Review Data Report	Initial submittal July 1, 2007, and on the 5 year anniversary of this date, so long as required.

ADDENDA

ADDENDUM A

Whitewood Creek Superfund Site Sampling and Analysis Plan for Residential Remediation and Surface Water Monitoring

2.0 SITE BACKGROUND

The former Whitewood Creek Superfund Site (the Site) is located in the northem Black Hills in Lawrence, Meade, and Butte Counties, South Dakota. The Site lies within portions of Townships 6, 7, and 8 North, Ranges 4, 5, and 6 East (Black Hills Meridian). The Site extends for approximately 18 stream miles, beginning at the Crook City Bridge, southwest of the town of Whitewood and extending northeast, to the confluence of Whitewood Creek with the Belle Fourche River. The Site encompasses approximately 2,000 acres.

The Site is situated on the northeastem flank of the Black Hills uplift. The uplift is a broad, northwestfrending dome, approximately 40 miles in width and 85 miles in length. The core of the dome is composed of intensely deformed metasediments and granite of Archean and Proterozoic age. These units were uplifted and eroded in late Proterozoic to middle Cambrian time, providing materials for the sediments of the Cambrian Deadwood Formation. Overlying the Deadwood Formation is a relatively thin sequence (< 10,000 feet) of detrital and chemical sediments deposited in a stable shelf environment[i].

Whitewood Creek fraverses a complete sequence of Mesozoic strata from the Triassic Spearfish Formation through the Cretaceous Pierre Shale. This bedrock sequence dips gently to the north and consists primarily of shale with lesser amounts of argillaceous sandstone and limestone.

Beginning in the 1870s, a number of gold mining companies discharged tailings and mine waste from gold mining and milling operations to Whitewood Creek. A portion of the mill tailings was deposited as alluvium on the Whitewood Creek floodplain.

Whitewood Creek was originally a small meandering, intermittent stream with insufficient capacity to transport the large quantities of tailings discharged into it by various mining and milling operations prior to the tum of the century. The deposited tailings and some alluvial material subsequently filled in the meanders of the Creek, thereby straightening its channel and increasing its gradient. This, in tum, caused the Creek to downcut its channel to the resistant shale bedrock which today forms the channel bottom for most of the length of the eighteen-mile stretch of the Superfund site[ii].

By 1880, nonmechanized methods of milling were replaced by more than 60 stamp mills[iii]. The coarse sand-sized material resulting from these mills was also discharged to the Creek. Around 1920, rod and ball mills replaced the stamp mills and the tailings discharged to the Creek contained a much higher percentage of finely-ground material. As underground mining went deeper, a high percentage of the coarse fraction of mill wastes was used as mine backfill. Therefore, the physical characteristics of the material discharged to the Creek changed from sand-sized during the first 30 years to mostly less than 0.075 mm material.

Reddish-brown tailings from ore mined prior to the tum of the century make up the majority of the deposit. Grayish-green tailings from ore mined later are also present. Both types of tailings may be interbedded with the natural alluvium. The natural alluvium consists of sandy to sandy silt materials with variable amounts of intermixed tailings[iv].

In all but a few locations, the tailings deposits support vegetation including grasses, shmbs, and trees. Most unvegetated areas have a thin gypsum cmst at the surface[v].

Numerous studies and investigations have been conducted within the Site in connection with Superfund actions. These have constituted the functional equivalent of a remedial investigation (RI) as prescribed by the draft, "Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA"[vi]. Based on the extensive data gathering efforts conducted under this RI, numerous conclusions were reached. These area listed in the Remedial Design/Remedial Action Work Plan[vii]. Of those, the following conclusions are especially pertinent to this Sampling and Analysis Plan:

- "There are presently only minimal releases of metals out of the tailings to the groundwater and surface water due to the extensive buffering capacity."
- "Widespread contamination is evidently prevented by lack of oxidizable sulfur, little available oxygen in deeper zones, buffering and absorption of arsenic and other solutes on hydroxides."
- "Elevated arsenic concentrations existed in the soils of the two existing residential properties located on the fringe lands outside the tailings deposit areas."

An Endangennent Assignment"[viii] and a Remedial Investigation/Feasibility Study[ix] were prepared and, with respect to sampling and analysis considered by this Plan, also concluded:

> "Arsenic is the only constituent of increasing carcinogenic risk at the Site via incidental ingestion. Although the tailings contained high concentrations of arsenic, so long as the Site resident does not spend significant amounts of time over a lifetime in the tailings deposit areas, the risk to that individual from the tailings is minimal. However, some residential areas and irrigated cropland do contain concentrations of arsenic which may present a health risk to people living and working in these areas because of the large amount of time the individuals are exposed to arsenic over their lifetimes."

In summary, the tailings are not a hazardous waste under the Resource Conservation and Recovery Act (RCRA).

The Environmental Protection Agency (EPA), based on its assessments of the potential risk of both carcinogenic and non-carcinogenic effects, concluded that arsenic was the constituent of concern associated with site exposure. The pathway for exposure at the Site of which the Assessment focused was inadvertent and incidental ingestion of tailings (see EPA Record of Decision, "Attachment A"[x] under "Risk Characterization").

Following the completion of the RI/FS and the Endangerment Assessment, the EPA issued a Proposed Plan for the Site in January, 1990. The Plan identified the EPA's preferred option for addressing contaminated areas. The Plan also included summaries of nine altemative actions. The action preferred by the EPA involves implementation of Institutional Controls (with allowances for future development) and limited cleanup of existing contaminated residential properties. On March 30, 1990, the EPA issued its Record of Decision (ROD) Declaration Statement and Decision Summary for the Site supporting its preferred action.

The selected remedy is discussed in full in the Remedial Design/Remedial Action Work Plan.[xi] For purposes of this Sampling and Analysis Plan, only those major components of the selected remedy that require arsenic concentration determinations. The pertinent components are:

- "Cover and/or remove soils in the existing residential areas containing arsenic levels of 100 milligrams per kilogram or greater." ("At a minimum, a five-year review would be performed five-years after initiation of RA as specified under Section 4.2 of the SOW.")
- "Continue monitoring the surface waters of Whitewood Creek for significant changes in water quality."
- "Resample remediated residential areas after major flood events."

The Work Plan also notes that five-year review(s) will be performed commencing five years after initiation of remedial actions.

The response objectives for soil remediation at the Site are to control exposure through incidental and inadvertent ingestion of tailings deposits, alluvial soils contaminated with tailings, and residential soils contaminated with tailings. The target "cover and/or remove" remedial action level, based upon minimizing health risks, is 100 mg/kg for the residential soils.

The major pre-design activity subject to this Sampling and Analysis Plan is the determination of the areal extent to which arsenic levels exceed 100 mg/kg in residential soils at the Site. After collection of adequate arsenic data, the necessary site maps, excavation plans, disposal plans, and other necessary plans and specif.cations will be prepared and submitted pursuant to the Work Plan.

The remediation of the Site was approved as complete by EPA on September 25, 1994. The Site was deleted from the National Priority List (NPL) on August 1, 1996. The first Five-Year Review for the Site included a full Ecological Risk Assessment of the Site, carried out pursuant to EPA's 1997 guidance document for Ecological Risk Assessments. The Five-Year Review was completed on July 17, 2002, and concluded that contamination remaining at the Site does not pose an unacceptable risk to human health and the environment, and the site remedy continues to be protective of human health and the environment.

ADDENDUM B

EXECUTIVE SUMMARY

The overriding program objective for Remedial Design/Remedial Action (RD/RA) for the Whitewood Creek Superfund Site is the protection of human health and welfare and the environment from arsenic-rich tailings deposits. One of the activities designed to satisfy RD/RA objectives is the Operation and Maintenance (O&M) of the selected remedy.

A component of the O&M is the monitoring of arsenic concenfrations in surface-water at two stations in Whitewood Creek (ROD, Attachment A, "Decision Summary," Section VI, page 31). The monitoring of surface-water quality during the first Five-Year Review was evaluated to determine the effect of uncertain future rates of release of arsenic from the tailings on the environment. That evaluation determined that modifications could be made to the monitoring plan consistent with protection of human health and welfare and the environment.

This Addendum **B** addresses sampling and monitoring surface waters for arsenic at two locations on Whitewood Creek.

This Addendum identifies the locations to be sampled, the water-quality parameters to be measured, the frequency of measurements, the protocols for sampling and laboratory analytical methods, quality assurance and quality control, the reporting of the data, and the analysis of the data.

ADDENDUM B

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1.0 INTRODUCTION

This Addendum B addresses the sampling, sample analysis, and data management methods for monitoring the quality of the surface waters of Whitewood Creek to assure that future rates of release of arsenic from tailings deposits are at levels that do not pose an unacceptable risk to human health and welfare and the environment (see ROD, Section IV, pages 17 and 31 for the scope of monitoring[xii]). This Addendum defines the sampling locations, sampling frequencies, parameters for analysis, quality assurance procedures, and the analysis of the water-quality data necessary to comply with the Record of Decision (ROD).

2.0 BACKGROUND INFORMATION

The USGS has been involved in several investigations of residual mine tailings impacts in Whitewood Creek. In 1983 and 1984, the Survey conducted a reconnaissance of the surface and ground waters and sediments in cooperation with the South Dakota Department of Water and Natural Resources. Since 1985, an extensive series of research studies examining arsenic geochemistry and mobility has been conducted under the Survey's Thmst Program (Toxic Substances in Surface Waters and Sediments). Throughout this period, the Survey has conducted surface-water monitoring at two sites on lower Whitewood Creek. These are sites 06436180 (Whitewood Creek above Whitewood) and 06436198 (Whitewood Creek Above Vale).

The EPA's decision with regard to this Site stipulated that the surface water quality of Whitewood Creek would be monitored at the U.S. Geological Survey (USGS) sampling stations near Whitewood and Vale four times a year. Those sampling times were: (1) in late winter before major snow-melt mnoff; (2) during peak mnoff in the spring; (3) during the low flow period in late summer; and (4) once immediately following a major precipitation event. Based on the results of water quality sampling since 1990, and the results of the first Five-Year Review, EPA has determined that the cunent levels do not pose an unacceptable risk to human health and welfare and the environment. Accordingly, EPA has determined that future sampling will be at the same two locations, but will be required only during peak runoff in the spring, and during the low flow period in the late summer. The objective of the future measurements will be to compare future measurements against past data, to assure that those conditions have not changed to a degree that poses an unacceptable risk to human health and welfare and the environment.

3.0 SAMPLING OBJECTIVES

3.1 Pumose of Sampling and Water

Future surface water monitoring of the site was originally designed to evaluate the effect of uncertain future rates of release of arsenic from the tailings deposits on surface water. The results of the sampling since 1990 and the First Five-Year Review indicate that the rates of release do not pose an unacceptable risk to human health and the environment. Future sampling will continue as provided in 4.0 below, with the sampling conducted to collect representative samples of surface water from Whitewood Creek from a location upstream of the Site (above Whitewood) and from a location essentially dovmsfream of the Site (above Vale).

The water-quality data generated by the program will be summarized in preparation for the next five-year review. At that time, the surface-water monitoring program will be reviewed to determine whether it may be changed. The water quality data summarization and analysis for the next five-year period are addressed in Section 6.0.

4.0 SAMPLING APPROACH

4.1 Surface-Water Sampling Program

4.1.1 Sampling Locations

Water samples for analysis will be collected at two locations, both of which are established USGS water resource data collection stations. Stream flow data are also to be collected at these stations. The location descriptions are:

Station 06436180: "Whitewood Creek Above Whitewood. "
Location: Latitude 44° 26' 32", longitude 103° 37'44", in SE'/ SE'/ NE1/4NE1/4 sec.33, T. 6 N., R. 4 E., Lawrence County, Hydrologic Unit 10120202, on left bank 90 feet downstream from Crook Mountain Road and 1.1 mile south of Whitewood. Drainage Area: 56.3 mi2.

Station 06436198: "Whitewood Creek Above Vale."
Location: Latitude 44° 37' 04", longitude 103° 28'52", in SE'/ NW 1/4NE1/4NW1/4 sec.35, T. 8 N., R. 5 E., Butte County, Hydrologic Unit 10120202, on right (revised) bank at point where South Central Canal crosses creek, 3.2 miles above mouth, and 3.7 miles west of Vale. Drainage Area: 102 mil.

4.1.2 Water Quality Measurements

The water samples will be collected for analysis of dissolved and total arsenic. The parameter of significance to the Site and the quality of Whitewood Creek is dissolved arsenic. Concurrent with these analyses, pH (hydrogen ion content) and specific conductance (SC) will be measured and samples will be collected for Total Suspended Solids (TSS) analysis. These additional analyses are included only for purposes of assessing additional information that may bear on the mechanics of arsenic occurrence in Whitewood Creek. At present, there are no indications that pH, TDS (represented by SC), or TSS are influenced by the tailings or that they correlate with arsenic concentrations.

4.1.3 Frequency of Water Quality Measurements

Based on the results of past sampling and the First Five-Year Review, the sampling program will be modified to require that for the future the water samples be collected at two time periods annually, representing peak runoff in the spring, and the low flow period in late summer.

Assessment of the USGS flow records for the two stations of the period of record allow identification of the most appropriate months historically for samples to be collected to represent the sample periods specified. The period of the "peak runoff in the spring" has been represented by samples collected in May. The two samples representing the "low flow period in late summer" are expected to be collected in September. If stream conditions, or unforeseen logistical difficulties do not allow sampling in May or September as expected, the two samples will be collected as soon thereafter as possible, which will likely be the next month.

While the historical flow data defines the period or months in which the conditions for sampling are expected (during peak mnoff in spring, and during low flow period in late summer) Homestake recognizes that there are annual variations when these conditions occur. Therefore, Homestake will review flow data available from USGS to assure that samples are taken that reasonably represent the periods of general flow conditions stated in the ROD.

For example, if major snow-melt occurs earlier or later than when expected in May, sampling will occur during the period of peak runoff as required in the ROD, as opposed to sampling in the month in which it is expected. If a local rainfall occurs in September when low flow is expected, Homestake will not collect samples during the rainfall and corresponding higher flow event but will rather wait until the general low flow period, and sample during that time as required by the ROD. The flow data taken during sampling under this SAP will serve to confirm flow conditions during sampling. Those conducting the program live local to the area and can easily observe the general weather conditions during those times when conditions for sampling are expected to occur. The USGS monthly flow data is available in the public record for review of annual flow conditions.

Based on the data collected and/or reviewed by EPA in the course of the past ten years for WWC, including the data and other information on the health of the biological communities along the Creek, EPA would not consider any change in water quality to pose an unacceptable risk to human health or welfare and the environment, absent finding at either sampling location surface water concentrations that exceeded 150 ppb for dissolved arsenic for two consecutive sampling events. The 150 ppb dissolved arsenic standard is the ambient water quality criterion for chronic effects used by EPA in its Screening Level Ecological Risk Assessment for the former Whitewood Creek NPL Site in its initial Five-Year Review. In the event that there is an exceedance of 150 ppb for dissolved arsenic for one season's (i.e., spring high flow or summer low flow) samples, Homestake will collect a second sample at that location within 30 days of receipt of the analysis of the first sample, to confirm the result. If the result is confirmed, Homestake will institute quarterly sampling for dissolved arsenic at that location unless and until the sampling at that location shows a concentration below 150 ppb for dissolved arsenic for four consecutive quarters. If arsenic concentrations exceed 150 ppb for two consecutive quarters, Homestake will undertake an investigation of whether, and by what potential release mechanisms, the elevated concentrations result from known concentration areas of mining-related materials.

4.1.4 Flow Measurements and Frequency

Flow measurements are made at the time of sample collection at these two stations using USGS-established gauging stations. Both stations are established streamflow gauging stations. Current meters are used to obtain flows during sampling and these measurements are compared to gauge heights. The USGS will continue to obtain these data, reduce them, and provide them to Homestake. The flow data are reported as daily mean values.

4.1.5 Sequence of Collecting Individual Samples

To the degree weather and sampling conditions allow, the samples for any one month will be collected in an upstream-to-downstream sequence. As soon as possible after the upstream sample is taken, the samplers will proceed to the downstream sampling location. If sampling conditions prohibit collection of a sample at one of the locations, this preferred sequence does not apply. In fact, the "normal" sequence of sampling is the reverse, so as to eliminate the possibility of contaminating the downstream samples. In view of the distance between stations and the minimal effect of sampling on in-stream water quality, the normal sequence need not be observed. Further, because there is no evidence that water quality varies rapidly in Whitewood Creek, if samples cannot be collected in close succession so as to satisfy the EPA's preference for sampling a "slug" of water, the data should still represent the changes in water quality between the two sampling stations.

4.2 Sample Collection. Preservation, and Laboratory Analysis

4.2.1 Sample Collection and Preservation

Grab samples will be collected from beneath the surface of the flowing channel at a representative location on the stream cross section, using the multiple vertical method described in the USGS reference listed below. The samples will be prepared and preserved in accordance with the applicable portions of the USGS's standard procedures, or equivalent Environmental Protection Agency procedures of 40 CFR 136 for preservation and analysis. The pH and SC measurements will be made in the field on unpreserved samples. The current USGS sampling and analytical procedures are those described in U.S. Geological Survey Open-File

Report 90-,40 (Ward, Janice R. and C. Albert L.aT, Ed., 1990 *Methods for Collection and Processing of Surface-Water and Bed-Material Samples for Physical and Chemical Analysis; USGS,* Box 25425, Denver). The complete reference is available to the EPA through the USGS. This document is also being provided as Appendix I to this Plan. The pertinent EPA requirements for preservation are in the federal regulations for "Test Procedures for the Analysis of Pollutants" (40 CFR Part 136) (Appendix II).

The sample will be collected in a manner that provides a sample representative of water quality across the majority of the channel. The usual procedure for Whitewood Creek is to collect a depth-integrated set of samples that are then mixed prior to filling the sample container. The portion of the sample to be analyzed for dissolved concentrations of arsenic will normally be filtered in the field through 0.101,m (micron) cellulose (or equivalent) membrane filter paper[xiii].

Sample containers and preservation procedures will follow those specified in 40 CFR 136 (Appendix II).

All samples will be labeled on a tag affixed to the bottle to show the sample location, sampling date and time, sampler, and parameters to be measured. Weather-proof markings will be used.

The "chain of custody" record will be prepared with each sample to record the sample(s), sampler(s), receipt at the analytical facility, and analysis.

Field sampling sheets will be completed for the information appropriate for this sampling program, at the time of sampling, in accordance with standard USGS practices. A copy of the USGS standard field sheet is included as Appendix VI.

4.2.2 Sample Analysis (Analytical Mothods)

The analytical methods will follow the procedures discussed in the EPA's regulatory requirements for NPDES sample analysis in 40 CFR 136, which includes references to the USGS's *Methods for Determination of Inorganic Substances in Water and Fluvial Sediments* (Chapter A1 in Fishman, Marvin J. and Linda C. Friedman, Eds, 1989, *Techniques of Water-Resources Investigations of the United States Geological Survey,* Third edition, Book 5, "Laboratory Analysis," USGS, Box 25425, Denver). The complete USGS reference is available to the EPA through the USGS. The portions of the USGS document most pertinent to this Plan are included as Appendix III.

Arsenic, both total and dissolved, will be measured using USGS Method "Arsenic, atomic adsorption spectrometric, hydride" or an equivalent EPA-listed method (40 CFR 136). For the USGS method, the dissolved fraction is measured by method 1-2062-85 (previously designated as 1-1062-85) and the total content is measured using method 1-4062-85 (previously designated as 1-3062-85).

Equivalent arsenic methods that could be employed are EPA method 206.3, *Standard Methods* 303E, ASTM method D2972-84(B). It may also be appropriate to use EPA method 200.7 (Inductively Coupled Plasma or "ICP") should conditions of sample load, sample matrix, and concentration levels dictate. Concentrations are sufficient to justify ICP.

Hydrogen Ion content (pH) will be measured in the field with a calibrated pH meter (see USGS method pH, electrometric, glass electrode, 1-1587-85). Total suspended Solids will be measured using USGS method Solids, residue upon evaporation at 105°C, total, gravimetric, 1-3753-85.

Specific Conductance (SC) will also be measured in the field using a calibrated conductance meter (see USGS method specific conductance, electrometric, Wheatstone bridge 1-1781-85).

The minimum concentration that is currently reported by the USGS for the arsenic hydride method is 0.001 mg/l. The minimum concentration for Total Suspended Solids, the only other parameter to which the reporting level may be pertinent, is 1.0 mg/1. These levels will be used as the reporting methods for this sampling plan.

4.2.3 Sample and Analytical Quality Control and Assurance

Laboratory quality control practices estabhshed through the U.S. Geological Survey are published in Quality *Assurance Practices for the Chemical and Biological Analysis of Water and Fluvial Sediments* in Friedman, Linda C. and David E. Erdmann, 1982, *Techniques of Water-Resources Investigations of the United States Geological Survey,* Chapter A6 in Book 5, "Laboratory Analyses," USGS, Box 25425, Denver. ':'he complete USGS reference. is available to the EPA through the USGS. A copy of the more pertinent guidance is included here as Appendix IV.

When the USGS collects the samples, the principal analytical laboratory will be that of the USGS. In the case of samples collected by the USGS, the principal analytical laboratory is the National Water Quality Laboratory located in Denver (Lakewood), Colorado. Should other analytical laboratories be used, they will be required to have at least equivalent (to the 40 CFR 136) analytical capabilities and controls. They will also be required to have a quality assurance plan and be familiar with performing the EPA analytical methods. Further, laboratory quality control is guided by *Quality Control Manual of the U.S. Geological Survey's National Water Quality Laboratory, U.S.* Geological Survey, Open File Report 87-457, which is included as Appendix V to this Plan.

USGS standard quality assurance and quality control practice in water sampling is to provide one replicate sample and one blank sample for approximately 10% of samples collected. This sampling plan calls for four samples annually at two locations. One replicate sample and one blank sample will be collected at each station per year.

4.3 Sampling Personnel

Arrangements have been made with USGS,(Water Resources Division, South Dakota District Office, Rapid City, South Dakota), for this sampling and analytical effort. Under this approach, the USGS will provide sampling for the routine sampling and the analytical work will be conducted through the USGS in USGS laboratories.

If the USGS is unable to provide this service in the future, or if it is found by Homestake to be inappropriate to continue with the USGS, it is likely that Homestake personnel will collect the sample and the flow data. If Homestake personnel should assume the sampling responsibilities, they will be thoroughly instmcted in the proper methods of collecting representative water samples, sample preparation, sample preservation, and chain of custody. If the sampling is conducted by Homestake personnel, this SAP will be revised and submitted to the EPA for concurrence.

5.0 REPORTING OF DATA

5.1 Reports to EPA

All data will be initially compiled by the U.S. Geological Survey. The data will then be formally reported by the USGS annually in *Water Resources Data, South Dakota.* The data are also entered, by the USGS, into the USGS's WATSTORE data base and thus are available to EPA through that source. Interim reports will be made by the USGS to Homestake as the data are validated by the USGS. This latter reporting process nonnally takes three months from the date of sample collection. These interim reports will be included in the appropriate annual O&M reports to EPA for the Site.

6.0 ANALYSIS OF DATA

6.1 Analysis of Arsenic Data

The ROD provides that the review of site conditions will occur every five-years and that the review, among other items, will include the surface water quality data collected from Whitewood Creek[xiv]. As a result of the sampling data collected since 1990, existing conditions and their potential for adverse impact on human health and the environment are now well known..

The arsenic data collected in future sampling will be added to the existing data base andthe data will be added to temporal (time-based) plots. These plots will be reviewed for increases in arsenic concentrations over and above the existing conditions for the various time periods and flow conditions represented by the samples. At the time of the five-year review, the arsenic data as well as this surface-water monitoring program will be reviewed to determine whether changes in the program are appropriate.

ADDENDUM C

SECTION III
EDUCATIONAL PROGRAM

An integral part of the Institutional Controls Plan is the educational program required by the ROD. Homestake has developed an informational package that is distributed to the landowners within the site on an annual basis. The package includes a discussion of the Environmental Protection Agency's established risks associated with the tailings and tailings impacted soils. The scope of the Remedial Action program is outlined. A compilation of the land-use restrictions and discussion of the intent of these ordinances is also be included. In addition, a list of personal precautions to limit exposure has been drafted. Individual maps have been provided to each landowner to aid in their understanding of the areas affected by the Enviromnental Protection Agency's risk calculations.

The annual distribution of educational materials is intended to keep the tailings concems in the forefront of the minds of those most likely to be impacted by long-term exposure to the Environmental Protection Agency's established risks. This annual distribution began in December 1992.

ADDENDUM D

Portions of:

WHITEWOOD CREEK TAILINGS AREA BUILDING PERMIT HANDBOOK
BUILDING PROHIBITED IN TAILINGS DEPOSITS

Commercial (non-agricultural) and residential constmction on the tailings deposits themselves are prohibited by county ordinance. Tailings deposits are identified and shown on the maps. The tailings deposits are largely in the flood plain.

BUILDING RESTRICTED ON TAILINGS IMPACTED SOILS

Residential constmction is restricted on soils with arsenic levels of greater than 100 ppm. The Tailings Impacted Soils are shovm on the Area maps. Residential building within the Tailings Impacted Soils is allowed on locations that have arsenic levels of 100 ppm or less. Areas with arsenic levels greater than 100 part per million may be lowered by activities such as those described in the section of this Handbook entitled Activities Reducing Soil Arsenic Levels. If the building site selected has soil arsenic levels 100 parts per million or less, the developer must demonstrate this fact by soil sampling. The sampling requirements are described in Appendices A & C of this Handbook. If the arsenic levels of the building site selected cannot be easily reduced through agricultural tillage, a soil covering process may be used to reduce the soil arsenic levels. The covering process is described in Addendum B. The developer is responsible for implementing activities that reduce soil arsenic levels to the acceptable level of 100 ppm or less, and demonstrating these levels through soil sampling. Developers must also resample new homesites every five-years to verify that soil arsenic levels remain at 100 ppm or less. Details of this verification sampling are outlined in Addendum D.

Because soils within the district contain elevated levels of arsenic, landowners and constmction workers should exercise extra precautions when working. Recommended precautions include practicing good personal hygiene and controlling dust.

OTHER ORDINANCE RESTRICTIONS

Removal or use of tailings is prohibited. This prohibition eliminates the potential contamination of other areas by removal and relocation of tailings materials.

The constmction of shallow wells within the tailings deposits is prohibited by state law ARSD 74:02:04:26.

All land use activities other than those specifically prohibited or restricted by county ordinances and state laws referenced above, are allowed as regulated by applicable Federal, State or local laws and regulations.

ENDNOTES

[i] DeWitt and others, 1986, "Mineral Resource Potential and Geology of the Black Hills National Forest, South Dakota and Wyoming," USGS Bulletin 1580.
[ii] EPA Record of Decision, previously cited, page 9.
[iii] Goddard, 1986, "Composition, Distribution, and Hydrologic Effects of Contaminated Sediments Resulting from the Discharge of Gold Milling Wastes to Whitewood Creek at Lead and Deadwood, South Dakota," USGS Water Resources Investigation Report.
[iv] Ibid.
[v] EPA Record of Decision, previously cited; page 14.
[vi] U.S. Environmental Protection Agency, 1988. "Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA." INTERIM FINAL. October 1988.
[vii] Previously cited, page 1.
[viii] Jacobs Engineering Group Inc., 1989. "Final Endangerment Assessment Summary Document for Whitewood Creek Superfimd Site." Prepared for U.S. EPA Region VIII, July, 1989. Based on U.S. EPA 1989 "Endangerment Assessment for the Whitewood Creek Superfund Site, Southwestern South Dakota." FINAL REVIEW DRAFT, March, 1989 and preliminary investigations by ICF Technology, Inc., April, 1989.
[ix] ICF Technology, 1989. "Feasibility Study for Whitewood Creek, South Dakota, CERCLA SITE." Volumes I and II. Prepared for U.S. EPA Region VIII. Volumes I and II. December; 1989.
[x] U.S. Environmental Protection Agency, Region VII, 1990. "Record of Decision - Attachment A Whitewood Creek Superfund Site Decision Summary." March 30, 1990. Pages 21 and 22.
[xi] Previously cited; pages 1 and 5.
[xii] U.S. Environmental Protection Agency, Region VIII, 1990. "Record of Decision - Attachment A Whitewood Creek Superfund Site Decision Summary," March 30, 1990, Section VI.
[xiii] The small pore-size filter is customarily used for Whitewood Creek samples because of a high concentration of colloidal material in the samples. The pore-size is retained for continuity.
[xiv] The USGS data base for arsenic in Whitewood Creek was provided in tabular form to the EPA in early 1992. It was included in the complete printout of all USGS data that Whitewood Creek Development Corporation was able to obtain from the USGS.

564066

FORMER WHITEWOOD CREEK NPL SITE
LEAD, SOUTH DAKOTA

Amended Post-Closure Operations, Maintenance and Reporting Plan
February 2003

O&M and reporting obligations for the former Whitewood Creek NPL Site ("Site") are governed by the Post-Closure Operations, Maintenance and Reporting Plan ("O&M Plan") submitted to EPA by Whitewood Development Corporation on July 27, 1994. In several respects, as that document states, the requirements of that Plan were instituted to deal with then-existing uncertainties about the extent of arsenic releases into WWC, and data gaps regarding the presence of metals and other contaminants in the surface water.

As a result of monitoring carried out by Homestake, which began prior to the July 27, 1994 Plan and has continued to the present, EPA now has over ten years of surface water data, as well as experience with the effectiveness of the soil remediation carried out pursuant to the ROD under normal use and flood conditions. That information, summarized most recently in the EPA's 2002 Five Year Review and Ecological Risk Assessment, indicate that the remediation continues to be protective of human health and the environment, and that absent a significant, adverse change in the conditions existing at the Site, the contamination remaining at the Site does not pose an unacceptable risk to human health and welfare and the environment. Accordingly, EPA has determined that future O&M obligations for surface water and soil monitoring should be modified.

EPA and Homestake have agreed to the following modifications of the July 27, 1994 Plan, and the Sampling and Analysis Plan documents attached as addenda thereto, with respect to the frequency and nature of surface water monitoring (Section 3.0 and Addendum B) and residential soil monitoring and sampling (Section 6.0-6.3). Sampling and analytical methodology for these two programs will remain unchanged.

Surface Water Monitoring:

The intent of the continued monitoring required by the O&M Plan was to determine if there were "significant changes in water quality" for a suite of contaminants under a variety of flow conditions. Water quality sampling was to be conducted in the winter, spring, summer, and after a high precipitation event. Although the ROD for the WWC Site had concluded that arsenic was the contaminant of concem for the Site, Homestake agreed to sample for several other constituents to address EPA concems about the absence of a significant record of data for other potential contaminants. Based on the now extensive existing sampling record, EPA has concluded that for the future, surface water monitoring will be required twice a year, in the peak nmoff period in the spring, and in the low flow period in late summer. The parameters measured will be limited to total and dissolved arsenic; pH (hydrogen ion content); specific conductance; and Total Suspended Solids (TSS) analysis. The sampling will continue to be carried out at USGS Stations 06436180 and 06436198. Flow measurements will be taken, as now, at the time of sampling.

EPA's evaluation of the surface water quality and its impact on biological receptors along WWC indicates that there is no significant risk of adverse impact to human health, public welfare or the environment from current levels of arsenic in the water, sediment and soil at the Site. In the event that the monitoring shows a significant adverse change, i.e., one that may potentially pose an unacceptable risk to human health or welfare and the environment, in the on-going water quality conditions in WWC potentially related to arsenic in the mine tailings, EPA may require that the monitoring program be adjusted in scope or frequency.

Based on the data collected and/or reviewed by EPA in the course of the past ten years for WWC, including the data and other information on the health of the biological communities along the Creek, EPA would not consider any change in water quality to pose an unacceptable risk to human health or welfare and the environment, absent finding at either sampling location surface water concentrations that exceeded 150 ppb for dissolved arsenic for two consecutive sampling events. The 150 ppb dissolved arsenic standard is the ambient water quality criterion for chronic effects used by EPA in its Screening Level Ecological Risk Assessment for the former Whitewood Creek NPL Site in its initial Five-Year Review. In the event that there is an exceedance of 150 ppb for dissolved arsenic for one season's (i.e., spring high flow or summer low flow) samples, Homestake will collect a second sample at that location within 30 days of receipt of the analysis of the first sample, to confirm the result. If the result is confirmed, Homestake will institute quarterly sampling for dissolved arsenic at that location unless and until the sampling at that location shows a concentration below 150 ppb for dissolved arsenic for four consecutive quarters. If arsenic concentrations exceed 150 ppb for two consecutive quarters, Homestake will undertake an investigation of whether, and by what potential release mechanisms, the elevated concentrations result from known concentration areas of mining-related materials.

Residential Soil Sampling:

The residential soil monitoring program is intended to assure that the remediated high-use areas for residences within the Site are not recontaminated through importation of contaminated materials or through deposition of materials after high flow events. Visual observation of the remediated areas after flood events has demonstrated that there is no significant impact on the effectiveness of the remediation even from substantial high flow events.

For the future, visual inspection of the remediated areas will be required (1) after a fifty-year flood event and (2) at the time of a five-year review, with the inspection intended to determine visually if there is evidence of recontamination. If, as currently provided in Section 6.2 of the O&M Plan, that inspection indicates that there may be recontamination of more than 10% of a high use remediated area, Homestake will carry out soil sampling at that area to determine if remediation is necessary, per the guidehnes currently set out in the Amended O&M Plan.

Reporting:

The O&M Plan currently provides for quarterly reports to EPA regarding water quality sampling and other activities. For the future, Homestake need submit only an annual report setting forth the sampling and monitoring activities required under the Amended O&M Plan, with the annual report due to be filed with EPA Region 8 by March 31 of the following year. The Annual Report will also continue to include discussion of effectiveness of the institutional controls on land use within the Site.

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May 1, 2003

Rebecca Thomas
Regional Project Manager
US EPA, Region VIII
999 18th Street, Suite 500
Denver, Colorado 80202-2466

Re: Revised O&M Plan, former Whitewood Creek NPL Site, Lead, South Dakota

Dear Ms. Thomas:

Pursuant to our discussion yesterday, I understand that EPA Region 8 has reviewed and approved the revisions proposed for the original O&M Plan dated July 27, 1994. Those revisions incorporate the agreement of EPA Region 8 and Homestake regarding future water quality and soil sampling requirements and other elements of the O&M plan. A copy of that agreement is attached to this letter.

As you have requested, I have enclosed a final copy of the Amended Operations and Maintenance Plan for the former Whitewood Creek NPL Site, dated May 1, 2003. As we agreed yesterday, you will provide Homestake with a letter approving this revised plan so that going forward the parties will have the O&M obligations set out in a single document.

In addition, I am enclosing a draft joint stipulation addressing the need to modify the consent decree regarding the dates for five-year reviews.

If you have any questions, please give me a call at 510/238-0930.

Sincerely,

Gerald F. George

Gerald F. George

Enclosures

cc: Mia Woods, Esq.
Richie Haddock, Esq.
Harold Barnes
Al Cox