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April 13, 2007 TO-001-06-03-0013-DCN056

Greg Weigel
On-Scene Coordinator
US EPA – Region 10
1435 N. Orchard
Boise, ID 83706

RE: Contract Number EP-S7-06-03, Technical Direction Document (TDD) Number 06-03-0013; Salmon River Uranium Development Mill Removal Assessment Report

Dear Mr. Weigel:

Enclosed, please find the report "Salmon River Uranium Development Mill Removal Assessment Report. If you have any further questions or comments, please contact me at (360) 871-8787.

Sincerely,

Neal Amick

Neal Amick
START-3 Project Leader

Enclosures

cc: Sharon Nickels, EPA PO (letter only)
John Fellinger, START-3 Program Manager, TechLaw Inc.

Salmon River Uranium Development Mill Removal Assessment Report

TDD: 06-03-0013

TechLaw Inc.
Contract: EP-S7-06-03
April 13, 2007

Region 10

START-3

Superfund Technical Assessment and Response Team

SALMON RIVER URANIUM DEVELOPMENT MILL REMOVAL ASSESSMENT/SITE INSPECTION REPORT

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LIST OF ACRONYMS

Acronym	Definition
% R	percent recovery
AEC	U.S Atomic Energy commission
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
DEQ	Idaho Division of Environmental Quality
DQOs	data quality objectives
EPA	United States Environmental Protection Agency
ESSAP	Environmental Survey and Site Assessment Program
GPS	global positioning system
IDW	investigation-derived waste
kg	kilograms
mg/kg	milligrams per kilogram
MS	matrix spike
MSD	matrix spike duplicate
NIST	National Institute of Standards and Technology
NRC	United States Nuclear Regulatory Commission
QA	Quality assurance
QC	Quality control
RA	Removal Action
SRUD	Salmon River Uranium Development
START	Superfund Technical Assessment and Response Team
TAL	Target Analyte List
TECHLAW	TechLaw Incorporated
TDD	Technical Direction Document
uR/hr	micro rads per hour
XRF	x-ray fluorescence

SALMON RIVER URANIUM DEVELOPMENT MILL REMOVAL ASSESSMENT REPORT

1. INTRODUCTION

The United States Environmental Protection Agency (EPA) tasked TechLaw Incorporated (TechLaw) to provide technical support and conduct a removal assessment (RA) at the Salmon River Uranium Development site (Site) located adjacent the Salmon River near North Fork, Idaho. TechLaw completed the RA activities under Technical Direction Document (TDD) Number 06-03-0013 issued under EPA, Region 10, Superfund Technical Assessment and Response Team (START)-3 Contract Number EP-S7-06-03. The RA was conducted with input and support provided by the United States Nuclear Regulatory Commission (NRC).

The RA included field screening and limited sampling of potential contaminant source and target areas. The specific goals for this RA were intended to address removal assessment objectives and are presented below:

- Collect and analyze samples to characterize potential contaminant sources;
- Determine possible off-site migration of contaminants;
- Provide the EPA with information necessary to make a determination with regard to the need for removal action;
- Document significant threats or potential threats to public health or the environment posed by the Site.

The following assessment objectives were completed:

- Contaminant sources were identified. Field screening methods and laboratory samples identified sources of elevated radiation and high concentrations of toxic metals.
- No evidence of off-site migration of these contaminants was found during this investigation.
- This report provides the EPA with information to assist in making a determination with regard to potential removal action.

Completion of this RA included reviewing site information, identifying site characteristics, collecting receptor information within the site's range of influence, executing a sampling plan, and producing this report.

2. SITE BACKGROUND

The Site consists of a former ore processing facility built in about 1958 to process ore from nearby mines. Information presented in this section is based on a review of site background information, observations made during the sampling event, and interviews with representatives from various regulatory agencies.

2.1. Site Location

The Site is located on Forest Service Developed Road 030 approximately 5 miles west of State Highway 93 in Lemhi County, Idaho. The precise location is latitude: 45° 22' 46" North, longitude: 114° 04' 58" West. The property extends from the north side of the Salmon River up a steep hillside at an elevation between 3600 and 4200 feet above sea level. The road runs along a 35-foot easement near the southern boundary of the Site. The Site is private property owned by Orval and Antonia Baird and is surrounded by U.S. government land managed by the Forest Service. The nearest residents are located five miles east of the Site in North Fork, Idaho. The primary land use is recreational with the Site located within the Salmon River National Wild and Scenic Rivers System.

2.2. Site Description

The primary features of the Site include a former ore processing building and several unattached storage sheds, located on a leveled area part way up a steep slope. The building is a 750 square meter (m^2) wooden structure with a partial sheet metal exterior siding on a poured concrete floor with some exposed soil areas. Much of the exterior siding had been recently removed by the property owner. An equipment trench is located in the floor in the center of the building. A large ore hopper is located in the northwest corner of the building. There are also numerous concrete pedestals interspersed throughout the building. A large amount of debris covers the floor of the building in several areas. Two concrete pads are adjacent to the building at the east and west sides where buildings had been recently removed by the property owner.

The Site's exterior property has two aboveground corrosive storage tanks, dilapidated camper trailers, and an ore inlet chute structure located on the northwest corner of the building and extending up the hillside. There are several piles of what are reported to be unprocessed and processed ores dumped near the processing building on the site. The exterior grounds of the Site include an area of approximately 5 acres. Approximately 2 acres comprise the area of the Site impacted by prior processing activities.

Down gradient of the former processing building are two dry holding ponds. A direct surface water runoff path no longer exists from the Site to the Salmon River. Berms created for the holding ponds and road construction block the natural drainage path named "Buster Gulch".

Adjacent to the Site property are one or more abandoned mines. These mines are north of the current property owner's private land and are known as the "Sunnyside Claims". These mines were most likely the raw source material for most of the processing activities at the Site.

2.3. Site Ownership History

In March 1958 the Salmon River Uranium Development, Inc. (SRUD) purchased the Site property. By letter dated October 6, 1958, SRUD applied for a U.S Atomic Energy Commission (AEC) license to chemically process source material from the Sunnyside Claims at North Fork, Idaho. During the period of October 1958 to October 1959, SRUD operated under two licenses issued by the AEC. The first license entitled SRUD to transfer, deliver, possess and have title to raw source material from the Sunnyside Claims at North Fork, Idaho. The second license authorized SRUD to process raw source material from the Agency Creek Thorium Corporation of Salmon, Idaho. All of the activities were to take place at the SRUD facility. The licenses expired in 1959 and SRUD ceased activities at the Site.

The Site property was owned by James V. Joyce from 1969 until 1978, when it was sold to the National Nuclear Reserves Corporation, of which Mr. Joyce was president.

In 1992, the property was sold to Antonia Baird, and later transferred to Antonia and Orval Baird. Mr. Baird had previously worked for the Joyce Corporation. In 1998 or 1999, Mr. Baird conducted some processing of thorium ore at the Site. The Bairds are the current property owners

2.4. Previous Investigations

Previous site investigations have been conducted by the Idaho Division of Environmental Quality on August 14 to 18, 1996, and by the Oak Ridge Institute for Science and Education from October 6 to 8, 2003. In addition, other government agencies made site visits, which are presented in chronological order in this section.

- June 1962 by the Atomic Energy Commission (AEC). During June 1962, the AEC conducted a site visit to the processing mill. Records in the docket file imply that this was the only AEC inspection of the facility. The inspector observed, "…that the road to the ore pad was overgrown with weeds; that there was no visible stock piled ore; and, that the tailings pond was dry". At the time, the inspector noted that Minerals Refining Company owned the mill.
- August 14, 1996 by the Idaho Division of Environmental Quality (DEQ). Representatives from the DEQ were accompanied by Antonia Baird (current owner of the site) on this investigation. Inside the processing building, six 5-gallon plastic jugs containing a cloudy liquid were discovered. Ms. Baird said the liquid was concentrated thorium. Also in the found were five 5-gallon jugs of product sulfuric acid. To the north of the processing building's boiler is a space that is below the room's floor. In this sunken space another 5-gallon jug of was observed. Also observed during this inspection were other chemicals including sulfuric acid, liquid petroleum based material, soda ash, phosphorous pentasulfide, and various paints, cleaners, and lubricants. The phosphorous pentasulfide was labeled Monsanto Corporation. Monsanto was contacted and on September 12, 1996 they removed the material as a product. Included with the report are 83 documented photographs.
- May 22, 2001 by the NRC. Staff from the NRC Region VI office visited the site and identified thorium contamination in the form of partially processed ore. Laboratory results confirmed that the material onsite was "source" material" (i.e., > 0.05 wt% Th). No sulfuric acid or 5-gallon jugs of liquid processed thorium were observed during this inspection.
- October 6, 2003 by the Environmental Survey and Site Assessment Program (ESSAP) for the NRC. The ESSAP conducted a radiological scoping survey of the site. The survey included

scans of building and soil surfaces, direct and removable surface activity measurements, exposure rate measurements, and surface soil sampling and analysis. Residues with thorium and uranium contamination were noted at numerous locations in and around the processing buildings. Soils surrounding the process buildings were contaminated at varying levels with a mixture of thorium and uranium, but predominantly thorium. Perimeter areas of the site near the access road were also impacted where material had been dumped. Localized areas of elevated thorium activity were identified in the tailings pond.

3. FIELD ACTIVITIES AND ANALYTICAL PROTOCOL

The START team conducted a sampling site visit of the site from June 5 through June 7, 2006. Representatives from the EPA, NRC, Idaho DEQ, and the US Forest Service accompanied the START team, along with the current property owners. The field activities followed the site-specific sampling plan for the site prepared by the START team prior to field mobilization. This plan describes in detail the sampling strategy, sampling methodology, and analytical program used to investigate potential hazardous substance sources and potential targets. Two analytical screening tools were used during the investigation; a Ludlum Model 192 micoR^{TM} gamma radiation meter (Ludlum Measurements, Inc., Sweetwater, Texas), and an Innov-X^{TM} x-ray fluorescence (XRF) detector (Innov-X systems, Inc., Woburn, Mass).

As part of the site visit, photographs documenting potential sources of contamination and sample locations using a digital camera (Appendix A). Locations of samples and other relevant features were surveyed with a global positioning system (GPS) unit to assist with preparation of site maps and sample location figures. The GPS used was a Garmin eTrex Legend^{TM}.

3.1. Sampling and Analytical Strategy

3.1.1. Ludlum 192 Screening

During the Site removal assessment, areas were screened at locations or features considered potential contamination sources and the area within and surrounding the site property. The locations or features to be screened were determined based on information derived from a review of background information, interviews with site representatives, and input from EPA and NRC representatives. All field screening was conducted on-site. The readings were taken in microRoentgens per hour (μR/hr). Based on field screening results, soil samples were selected for fixed laboratory analysis for TAL metals confirmation analysis and uranium and thorium. The results were documented in the SRUD project Ludlum 192 logbook and the sample locations were documented using the GPS.

The Ludlum was used to screen background areas, north and south property lines, areas surrounding building one, inside of building one, in the dry impoundment, down gradient and up gradient of Buster Gulch, at locations where XRF samples were taken, areas where soil samples were taken, and potential hotspots.

- Background areas were selected for screening based on distinguishing characteristics and property boundary lines. These areas were screened directly above the survey markers and the area surrounding the survey markers from waist height (approximately three feet). The east borders of the property were screened by walking the property line.
- The area surrounding the building was screened using the Ludlum by starting from south of the building and moving north. A reading was taken every fifty feet. The areas east and west of the sample location were also screened for radiation.
- The building interior was screened using the Ludlum by walking the inside perimeter and the center of the building from waste height (approximately three feet). Specific areas within the building were chosen because of location of large equipment, spilled materials, or ore piles. These areas were screened directly around sample location and the area surrounding the sample location.

- The tailings pond was screened by taking a reading every 50 feet going north to south and every 25 feet going east to west.
- Up and down gradients of Buster Gulch were screened at locations directly above the site where the gulch enters the site, and directly below the site where Buster Gulch disappears underground. Buster Gulch is the primary surface water drainage from the mountains above the site to the Salmon River. The drainage into the site from Buster Gulch is natural; however, the tailing ponds on the site have blocked the natural on-site flow to the river. Surface water flow enters the upper tailings pond, then flows underground, and exits to lower tailings pond into seep-holes. From there, the flow is further blocked by the Forest Service road. The sample location up gradient was located just before Buster Gulch enters the site, the down gradient sample location was at the lowest elevation where Buster Gulch disappears.
- XRF sample locations, soil sample locations, and potential hotspots were also screened with the Ludlum. These areas were screened directly on top of sample location. The hotspots were determined by background information, input from NRC and EPA representatives, and field observations.

3.1.2. Innov-X XRF

During the site RA, areas were screened at locations or features considered potential contamination sources. The locations or features to be screened were determined based on information derived from a review of background information, interviews with site representatives, and input from EPA and NRC representatives. All field screening was conducted on-site. Based on field screening results, soil samples were selected for fixed laboratory analysis for TAL metals confirmation analysis and uranium and thorium. The data was documented in the SRUD project XRF logbook and the sample locations were documented using the GPS.

The XRF was used to screen soil for metals. These locations were determined by background information, input from NRC and EPA representatives, and field observations. The XRF was calibrated at the beginning of each day and the beginning of each XRF use. The XRF was also calibrated at the beginning of each day with National Institute of Standards and Technology (NIST) 2710 Standard. Grass, leaves and other vegetative material, rocks, and other debris unsuitable for analysis were removed as much as practicable before sampling each area. The XRF was then placed against the soil surface; trigger was pressed, and the XRF was left against the soil surface for sixty seconds. The results for each sample were automatically stored in a personal digital assistant (PDA) as a spectrum and in a spreadsheet. These results contained information about the types of metals found in the soil and the concentrations of the different metals, measured in parts per million.

3.1.3. Soil Sampling

During the site removal assessment (RA), samples were collected for laboratory analyses to confirm on-site screening activities. The locations or features to be sampled were determined based on information derived from a review of background information, interviews with site representatives, and input from Environmental Protection Agency (EPA) and Nuclear Regulatory Commission (NRC) representatives. Sampling matrices included surface soil and waste piles. Surface soil samples were field screened for total metals using Innov-X X-ray fluorescence (XRF) analyzer. All field screening was conducted on-site. Based on field screening results, samples were selected for fixed laboratory analysis for Target Analyte List (TAL) metals confirmation analysis and Uranium and Thorium. The results were documented in the SRUD project GPS logbook. Photos were also taken of each sample location and the location was documented using the Garmin eTrex handheld GPS Unit.

Grass, leaves and other vegetative material, rocks, and other debris unsuitable for analysis were removed as much as practicable from samples before being placed into sample containers. Samples were stored on ice in coolers continuously maintained under the custody of START personnel.

A total of thirteen surface soil samples were collected, including one MS/MSD soil sample and one duplicate soil sample. Surface soil samples were collected from zero to six inches below ground surface using a dedicated spoon. At piles inside of building one with high metal readings, the START attempted to collect primarily fine-grained material and sample locations were selected from several areas on the piles. The sample material was placed in a dedicated bowl and homogenized. An aliquot of the sample material was then placed into one 4-ounce sample jar with a Teflon-lined lid for analysis of TAL metals laboratory confirmation analysis and Uranium and Thorium by GPL Laboratory, LLLP. A second aliquot was placed into one pre-labeled, 8-ounce sample jar with a Teflon-lined lid to be taken back and screened for total metals in a laboratory using the XRF.

3.2. INVESTIGATION-DERIVED WASTE

IDW generated during the RA sampling effort consisted of solid disposable sampling equipment, disposable personal protective equipment, and small quantities of liquids used to decontaminate the hand auger. Solid IDW was disposed as non-hazardous waste by START at the local municipal landfill. The minor quantities of liquid were collected at the time of equipment decontamination in 5-gallon plastic buckets and evaporated. No IDW remains at the site.

4. QUALITY ASSURANCE/QUALITY CONTROL

4.1. Field Screening

The field survey instruments are factory calibrated for specific contaminants. The XRF and the gamma radiation detector were checked at least once daily to assure instrument calibration specifications were being met. The check standard for the gamma radiation detector was a known source containing thorium. This was an unopened archived Coleman lantern mantel containing thorium. Consistent results were observed with the daily measurements of the known source. The gamma detector was operated with batteries, with the battery power level checked at least twice daily.

The XRF required calibration each time the instrument was powered on. The instrument software required this calibration before any measurements are allowed. The calibration consists of measuring a known standard of stainless steel. The instrument software uses this standard to "tune" the instrument. In addition, a daily calibration check standard was measured to assure factory specifications were being meet. The check standard was a National Institute of Standards and Technology standard reference material number 2710 – Montana Soil.

4.2. Quality Assurance/ Quality Control Samples

Trip blank samples were not collected for this project. Trip blanks are only required for volatile organic compound analysis. One matrix spike and matrix spike duplicate sample analyses was submitted for laboratory analysis. A duplicate sample was also submitted to the laboratory.

4.3. Project-Specific Data Quality Objectives

The commercial laboratory data were reviewed to ensure that data quality objectives (DQOs) for the project were met. The following is a summary of the field team's ability to meet project DQOs. The laboratory and the field team were able to meet DQOs for the project.

Accuracy of the XRF was measured with the calibration check standards analyzed daily. A comparison of the results with the certified "true" values is presented in Table 1. The results show good accuracy for these compounds.

Precision measures the reproducibility of the sampling and analytical methodology. Good precision was indicated with the blind duplicate sample submitted to the laboratory, with results presented in Table 2.

Data completeness is defined as the percentage of usable data (usable data divided by the total possible data). All data were reviewed for usability. No sample results were rejected; therefore, the project DQO for completeness was met.

Data representativeness expresses the degree to which sample data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point or environmental condition. The number and selection of samples were determined in the field to account accurately for site variations and sample matrices.

Comparability is a qualitative parameter expressing the confidence with which one data set can be compared to another. Results of the laboratory samples compare well with the field screening with the XRF, as shown in Tables 11. This table compares the field XRF screening results with the laboratory results for arsenic, copper, lead, and zinc. Too few data points were obtained for a statically valid regression analysis, however the average relative percent difference between the two method results show a high bias for the XRF screening. For field screening, this is preferred to a low bias. The gamma radiation screening results (measured as total gamma radiation) are not directly comparable with the laboratory results (measured in concentration units). However, laboratory samples collected at field screening locations with elevated gamma readings contained elevated concentrations of thorium.

5. ANALYTICAL RESULTS REPORTING

This section describes the reporting and methods applied to analytical results presented in Sections 6 and 7 of this report. The data presented in these sections are only the compounds of concern for this site.

The compounds selected from the TAL laboratory analytes include the Resource Conservation and Recovery Act (RCRA) regulated metals plus uranium and thorium. The XRF data include the compounds of interest that were above the instrument detection level: arsenic, copper, lead, selenium, and zinc. The data summary tables include the GPS sample locations, and the gamma radiation screening results.

6. BACKGROUND SAMPLES

6.1. Screening Results

Background screening for gamma radiation include the site perimeter, and undisturbed areas within the site property. A summary of the screening data is presented in Table 3. The property is not plotted on a geometrical grid, but marked by a series of "meets and bounds" monuments. Therefore, descriptions such as "east boundary" are the along the eastern most extent of property. Gamma radiations at the southern, eastern, and western perimeter were from 12 to 15 uR/Hr. The northern perimeter boundary was not easily accessed because of a steep up gradient slope, so some of the measurements were taken within the property. In general, the gamma radiation levels are lowest at the site perimeter and increase near the building and disturbed areas. Screening sample locations L1 to L5 were made along the northern boundary starting at the western property edge while walking toward the building. The readings increased from 15 to 36 uR/Hr.

6.2. Background Soil Samples

Three background soil samples were selected for laboratory confirmation analyses, one sample up gradient and two samples down gradient of the site. A summary of these samples are presented in Table 4, and discussed below.

- One soil sample was collected up gradient of site in Buster Gulch, a natural surface water runoff entry point through the property. The sample identification (ID) is **BGUG-SS-01**.The sample was located approximately 30 feet north of the property survey marker where the entrance road crosses the gulch.

- One soil sample was collected down gradient of the site in Buster Gulch. The sample ID is **BGDG-SS-01.** This location is at the lowest elevation of the property near the property line. From this point there is no direct surface water runoff to the Salmon River do to embankment grades constructed for dike or road construction. The location was moist indicating surface water goes underground. The sample was selected based on the location to determine if potential contaminate migration was occurring from the mine site potentially contaminating water sources.

- One soil sample was collected down gradient of the site along the Salmon River. Sample ID is **RVDG-SS-01**. The sample was selected based on the location to determine if potential contamination runoff was occurring. The location was selected because it was the south of the Forest Service road at the property marker along the river. No natural surface water runoff from the site was found during the investigation as no culverts under the Forest Service road were found during the investigation. The survey markers indicate part of the original property line along the southern border are under water, as the river changed course during the early part of the last century.

7. IDENTIFIED SOURCES OF CONTAMINATION

This section provides a discussion of sources of contamination identified during the investigation under this RA, including sample locations and analytical results for these sources. The areas of concern are separated into three sections: inside the former processing building, surrounding the building, and the dry tailings pond.

7.1. Inside Former Processing Building

Radiation readings within the building ranged from 11 to 40 uR/Hr, similar to the radiation levels surrounding the building. The gamma screening results are listed in Table 5. The XRF screening survey indicated two areas within the building with high concentrations of contaminants, one area with high levels of arsenic, and the other area with high levels of lead. These two areas were sampled as described below, with a result summary presented in Table 6.

7.1.1. Spent Processed Ore Pile

XRF screening showed large concentrations of arsenic and copper in a spent processed ore pile within the building. Laboratory results (sample ID **BLDG-SS-01**) confirm the XRF results. Arsenic concentration was 116,000 mg/Kg (11.6%) and the copper concentration was 178,000 mg/Kg (17.8%). The pile contains about 14 cubic yards of material. The material is black with greenish mineral discolorations. A GIS reading could not be taken as the pile was inside the covered building. If entering the building from the southwest, the pile is 50 feet inside the building, 12 feet from the southern wall. Photographs of the site are labeled SRUD-05 and SRUD-27.

7.1.2. Sandy Area

A high concentration of lead was detected with the XRF in sand located in the northeast corner of the building. This high concentration of lead was confirmed with laboratory analysis of sample ID **BLDG-005** with a lead result of 48,600 mg/Kg. The sandy material covers an area of approximately 100 square feet six inches deep, or about two cubic yards. The photograph is SRUD-26.

7.1.3. Miscellaneous Debris

The interior of the building contained numerous items of debris, including small containers of unknown liquids and solids. These materials were documented with photos found in the appendix labeled SRUD-06 to SRUD-13. Due to the limited scope of the RA, these items were not characterized except with screening by the gamma detector and the PID, where no readings above background were detected. The bags of solid material were labeled as caustic soda or soda ash. Two plastic one-gallon jugs contained visible liquid. An unopened container labeled Texaco appeared to contain grease. The other containers shown in the photos where not opened.

7.2. Surrounding Building

Four areas surrounding the former processing building were identified as sources of contamination during the field survey using the gamma radiation detector and the XRF metals detector. The results of the gamma radiation survey are in Table 7. The primary contaminants

are radiation and arsenic. These four areas were sampled and laboratory analyses confirmed the field results. These four areas are described below, with analytical results summarized in Table 8.

7.2.1. Sample XRF-SS-01

Potential Thorium Pile. One soil sample was taken from a pile outside of building that according to the current site owner contained processed thorium waste. The area was located with the high readings of the Ludlum gamma radiation detector. The pile is located just off the pad at the east corner of the building. The pile is not well defined and overgrown with weeds, so the exact amount of material is difficult to determine, but appears to be about ten cubic yards in volume. The laboratory sample ID is **XRF-SS-01**.

7.2.2. Sample XRF-SS-02

Potential Uranium Pile. One soil sample was taken from a pile outside of the building that according to the site owner is processed waste from an off site source containing uranium ore. The laboratory sample ID is **XRF-SS-02.** The location is at the northern most corner of the building with two distinct disturbed small piles with a total volume of about two cubic yards.

7.2.3. Sample XRF-SS-03

Waste area. An area along the northwest side of the building was identified with both the gamma radiation and the XRF metals detector as having high levels of contamination. The XRF field screening showed levels of arsenic between 99 to 2600 ug/Kg in this area. The area includes a "trash barrel", a decomposed five gallon bucket and scattered material. The total volume is approximately 15 cubic yards. The laboratory sample ID is **XRF-SS-03.**

7.2.4. Sample XRF-SS-05

Thorium waste pile. This sample is from a waste pile located west of the building that showed high gamma radiation during the field survey. The pile is approximately 15 cubic yards in volume. The laboratory sample ID is **XRF-SS-05.**

7.2.5. Ore Specimens

A small pile of ore is located west of the thorium waste pile XRF-SS-05. This pile was not sampled as the material was composed of large rock specimens not suitable for standard environmental material analysis. Most of the ore is probably from the mine above the site (Sunnyside Claim #5). Some ore specimens show total gamma radiation above 1000 uR/Hr.

7.3. Upper Tailings Pond

Tailings Pond. The tailings pond showed no elevated gamma radiation, with reading similar with the gamma radiation levels at the site perimeter. Field survey results shown in Table 9. Two soil samples were taken from separate areas in the upper tailings ponds do to high arsenic screening levels found during the site survey (from 2200 to 4300 mg/Kg). The samples IDs are **XRF-SS-07** and **XRF-SS-09** with compiled documentation summarized in Table 10. The area of contamination is about 25 feet by 100 feet in area. The depth of contamination is unknown; however from visual observation the disturbed area does not extent beyond surface elevation. The area of the arsenic contamination is near the lowest elevation of the "upper" tailings pond. Photograph SRUD-031 shows this area.

8. SUMMARY AND CONCLUSIONS

Several areas of localized contamination were identified on the site from former ore processing activities. No evidence of off-site migration of these contaminants was found. The Site is remote and is likely visited infrequently by the property owner and occasional trespassers. Vehicular access to the Site is controlled by a locked gate on the private mill access road.

Contaminated areas were identified with field analytical screening instruments and were verified with laboratory analyses. The contamination was from radiation sources (primarily thorium) and heavy metals (primarily arsenic and lead). The highest contamination is located within and surrounding the former processing building in isolated piles, although scattered areas of contamination were detected in the vicinity of these piles. An area with elevated concentration of arsenic was detected in the upper tailings impoundment.

Surface water is blocked from migrating from the site to the Salmon River. Two dry impoundments block the natural dry gulch carrying surface water from the identified contamination sources. An average of only ten inches of annual rainfall is not sufficient to allow accumulation of impounded water, so any drainage is subsurface. Down gradient of the impoundments, two road grades with no observed culverts block further surface water runoff. Although migration of contaminants from the site into the Salmon River seems unlikely, a subsurface route is possible, the possibility of which was beyond the scope of this investigation.

9. REFERENCES

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U.S. Nuclear Regulatory Commission, February 16, 2001 to March 2, 2006, Electronic Reading Room. http://www.nrc.gov/reading-rm.html.

Idaho Division of Environmental Quality, January 23, 1998. Memo to document the Joyce Corporation Compliance Inspection on August 14 and 15, 1996.

Idaho Geological Survey, undated, "Programs and Services Mines and Prospect Database", http://www.idahogeology.org/Services/MinesAndMinerals/searchmines.asp

Table 1. XRF Calibration Check Standards

Date	Compound mg/Kg Arsenic	Copper	Lead	Zinc
6/5/2006	641	3089	5252	7117
6/5/2006	617	3209	5522	7319
6/6/2006	604	3315	5670	7647
6/7/2006	605	2869	5034	6785
6/15/2006	595	2957	5312	6997
Mean Found	612	3088	5358	7173
"True"	626	2950	5532	6952

Table 2. Duplicate Soil Sample Results (Laboratory)

Compound	XRF-SS-02	Duplicate
Aluminum	2640	2770
Antimony	7.8	8
Arsenic	791	757
Barium	639	649
Beryllium	0.19	0.19
Cadmium	1	1
Calcium	218000	217000
Chromium	13.6	14.2
Cobalt	31.3	30.8
Copper	23.1	23.4
Iron	53300	51600
Lead	32	31.2
Magnesium	47300	46800
Manganese	138	137
Nickel	129	129
Potassium	775	808
Selenium	90.5	89.9
Silver	0.63	0.68
Sodium	261	249
Thallium	24.6	24
Vanadium	3950	3830
Zinc	718	711
Mercury	0.66	0.71
Thorium	39.3	42.2
Uranium	57.4	54.1

Table 3. Background Gamma Screening Results

Screening ID	Latitude	Longitude	Reading (µ-R/hour)	Comments
Background #1	45°23.232	114°03.518	12	Entry Gate
VDG-SS-01	45°23.157	114°03.545	13	Southern property line.
Eastern border	N/A	N/A	12 to 13	Walked the Eastern property line.
Background #3	45°23.132	114°03.717	13	Southern property line
Background #4	45°23.130	114°03.690	14	Lowest elevation of property line in gulch. Corresponding soil sample ID is BGDG-SS-01.
L1	45°23.069	114°04.069	15	Western edge of property
L2	45°23.069	114°04.059	18 to 20	Location is 50 feet northeast from L1.
L3	45°23.073	114°04.053	19 to 20	Location is 50 feet northeast from L2
L4	45°23.074	114°04.057	22 to 25	Location is 50 feet northeast from L3
L5	45°23.079	114°04.057	32 to 36	Location is 50 feet northeast from L4
L14	45°23.113	114°03.961	20	Location is 50 feet north from L13.
L15	45°23.137	114°03.969	27	Location is 50 feet north from L14.
L16	45°23.119	114°03.973	24	Location is 50 feet north from L15.
L17	45°23.119	114°03.953	21	Located 50 feet north of L14.
L18	45°23.134	114°03.947	20	Located 50 feet north of L17.
L19	45°23.090	114°03.987	29	Approximately 50 feet southwest of building
L20	45°23.084	114°04.003	29	Located 50 feet south of L19.
L21	45°23.085	114°04.007	37	Located 50 feet south of L20
L22	45°23.080	114°04.021	24	Located 50 feet south of L21
L23	45°23.068	114°04.038	22	Located 50 feet south of L22.
L24	45°23.013	114°04.065	18	Located 50 feet south of L23.
L25	45°23.057	114°04.052	17	Located 50 feet south of L24.
L26	45°23.057	114°04.061	16	Located 50 feet south of L25.
BGUG	45°23.211	114°03.978	15	Northern property line.

Table 4. Summary of Background Soil Samples

Sample ID	BGUG-SS-01	BGDG-SS-01	RVDG-SS-01
Description	Background Up gradient	Background Down gradient	Background Down gradient
Location			
Latitude	N 45° 23.211	N 45° 23.130	N 45° 23.157
Longitude	W 114° 03.978	W 114° 03.690	W 114° 03.545
Photo ID	SRUD-30 and -31	SRUD-14 to -017	SRUD-03
Laboratory Results			
Compound	**mg/Kg**	**mg/Kg**	**mg/Kg**
Arsenic	18.3	4.9	13
Barium	65.4	171	139
Chromium	10.3	28.1	19.6
Cobalt	6.1	8.2	8.2
Copper	11.5	24.2	17.7
Lead	4.8	14.8	8.6
Selenium	3.7 U	6.2 U	4.2 U
Silver	0.031	0.14	0.075
Zinc	19.8	58.2	36.6
Mercury	0.036 U	0.037	0.034
Thorium	6.5	10.9	12.9
Uranium	1.8	5.5	1.9
XRF Screening Results			
Compound	**mg/Kg**	**mg/Kg**	**mg/Kg**
Arsenic	17	10	10
Copper	24 U	20	33
Lead	11 U	10 U	12 U
Selenium	5.4 U	5 U	5.8 U
Zinc	44	56	67
Gamma Radiation			
	micro R/hr	**micro R/hr**	**micro R/hr**
	15	14	13

Table 5. Inside Building Gamma Radiation Screen Results

Screening ID	Latitude	Longitude	Reading (µ-R/hour)	Comments
SW Corner	N/A	N/A	21	Southwest corner of building inside.
Near Washtub	N/A	N/A	25	Location is at southwest corner in the building near a washtub.
SW Corner #2	N/A	N/A	35 to 40	Location is at southwest corner of building
Bathroom	N/A	N/A	25	Location is inside of building
Near Boiler	N/A	N/A	20	Inside of building ear the Boiler
Near Hopper	N/A	N/A	15	Inside of building at the northwest corner near the Hopper.
NE Corner	N/A	N/A	24	Location is inside of Building one in the Northeast corner.
Center of Building	N/A	N/A	31	Location is inside of Building one in the approximate center.
BLD01	N/A	N/A	11	Soil sample ID BLD-SS-01. Pile dimensions are 12 feet 10 inches by 8 feet.

Table 6. Summary of Samples from Inside Building

Sample ID	**BLD-SS-01**	**BLD-SS-05**
Description	Spent processed material	Sandy material
Location	In building	In building
Photo ID	SRUD Photo 05 and 27	SRUD Photo 26
	Laboratory Results	
compound	**mg/Kg**	**mg/Kg**
Arsenic	116000	38.1
Barium	27.9	148
Chromium	12.1	14.7
Cobalt	16600	13.5
Copper	178000	85.1
Lead	335	48600
Selenium	207	19.5
Silver	119	134
Zinc	734	112
Mercury	0.68	0.021
Thorium	5.4	43.8
Uranium	0.88	5.1
	XRF Screening Results	
compound	**mg/Kg**	**mg/Kg**
Arsenic	68000	166 U
Copper	210000	61 U
Lead	267	12000
Selenium	123	27 U
Zinc	1600	48
	Gamma Radiation	
	micro R/hr	**micro R/hr**
	11	24

Table 7. Gamma Radiation Screening Surrounding the Building

Screening ID	Latitude	Longitude	Reading (µ-R/hour)	Comments
Corrosive Container #1	N/A	N/A	150	Corrosive container nearest the building.
Corrosive Container #1	N/A	N/A	110	Corrosive container nearest the building.
Corrosive Container #2	N/A	N/A	120	Corrosive container furthest from building.
Corrosive Container #2	N/A	N/A	28	Corrosive container furthest from building.
Corrosive Tanks	45°23.095	114°04.034	120 to 170	Located at containers marked corrosive
Waste pile	N/A	N/A	280	Ore Pile
Waste pile	N/A	N/A	1,100	Ore Pile
Waste pile	N/A	N/A	1,000	Ore Pile
Waste pile (L6)	45°23.085	114°04.018	600	sampling point XRF-SS-05
Waste pile (L6)	45°23.085	114°04.018	240	Center of road adjacent to pile
Waste pile (L6)	45°23.085	114°04.018	100	Southern edge of road adjacent to pile
L7	45°23.089	114°04.010	100 to 150	near the southwest corner of the building
L8	45°23.096	114°03.989	37	Location is 50 feet north from L7 lined up with the southwest corner of Building
L9	45°23.099	114°04.009	20	Location is 50 feet east from L8, lined up with the southeast corner of the building.
L10	45°23.093	114°03.991	22	Southwest corner of building
L11	45°23.099	114°03.980	18	Location is 50 feet north from L10 adjacent to the shoot.
L12	45°23.102	114°03.976	120	Location is 50 feet north from L11 on the northwest corner of Building 1.
L13	45°23.107	114°03.970	90	Location is 50 feet north from L12.
L XRF 06	45°23.102	114°03.969	31	XRF ID is XRF06. Located near water pipe draining toward tailings pond.
L XRF 04	45°23.113	114°03.994	19	XRF ID is XRF04. Located on pile under shoot along Building 1.
L XRF 11	45°23.099	114°03.966	39.5	
L XRF 12	45°23.099	114°03.976	26	
L XRF 13	45°23.091	114°03.982	27.5	
XRF-01	45°23.116	114°03.976	470 to 500	Soil sample ID is XRF-SS-01.
XRF-02	45°23.092	114°03.962	130 to 350	Soil sample ID is XRF-SS-02.
XRF-03	45°23.113	114°03.975	1,100	. Soil Sample ID is XRF-SS-03.
XRF-05	45°23.088	114°04.021	1100 to 1400	Soil Sample ID is XRF-SS-05

Table 8. Summary of Samples Surrounding the Building

Sample ID	**XRF-SS-01**	**XRF-SS-02**	**XRF-SS-03**	**XRF-SS-05**
Description	thorium waste	uranium waste	waste area	thorium pile
Location				
Latitude	N 45° 23.116	N 45° 23.092	N 45° 23.113	N 45° 23.088
Longitude	W 114° 03.976	W 114° 03.962	W 114° 03.975	W 114° 04.021
Photo ID	SRUD-025	SRUD-024	SRUD-028	SRUD-22 and -23
Laboratory Results				
compound	**mg/Kg**	**mg/Kg**	**mg/Kg**	**mg/Kg**
Arsenic	58	791	999	27.7
Barium	1360	639	551	1520
Chromium	35.2	13.6	16.1	33.5
Cobalt	25.5	31.3	350	15.1
Copper	314	23.1	123	186
Lead	285	32	77	198
Selenium	8.4	90.5	14.5	10.4
Silver	0.76	0.63	4.5	0.81
Zinc	302	718	71.8	138
Mercury	0.33	0.66	3.8	0.14
Thorium	4970	39.3	8200	14100
Uranium	18.6	57.4	65.2	28.6
XRF Screening Results				
compound	**mg/Kg**	**mg/Kg**	**mg/Kg**	**mg/Kg**
Arsenic	35 U	509	96	32
Copper	404	38	819	231
Lead	426	38	127	388
Selenium	21 U	62	43	28
Zinc	401	733	287	211
Gamma Radiation				
	micro R/hr	**micro R/hr**	**micro R/hr**	**micro R/hr**
Before sampling	470	130	1100	1100
After sampling	500	350		1400

Table 9. Tailings Pond Gamma Screening Results

Screening ID	Latitude	Longitude	Reading (µ-R/hour)	Comments
TP01	N 45°23.074	W 114°03.858	15	Located in the Northwest corner of the Tailings Pond.
TP02	N 45°23.060	W 114°03.864	22	Located 50 feet south of TP01
TP03	N 45°23.089	W 114°03.865	18	Located 50 feet south of TP02
TP04	N 45°23.069	W 114°03.888	18	Located 50 feet south of TP03
TP05	N 45°23.073	W 114°03.888	20	Located 50 feet south of TP04
TP06	N 45°23.078	W 114°03.887	18	Located 37 feet east of TP05
TP07	N 45°23.075	W 114°03.893	18	Located 50 feet north of TP06
TP08	N 45°23.077	W 114°03.879	15	Located 50 feet north of TP07
TP09	N 45°23.077	W 114°03.874	17	Located 50 feet north of TP08
TP10	N 45°23.084	W 114°03.862	18	Located 50 feet north of TP09
TP11	N 45°23.090	W 114°03.862	19	Located 25 feet east of TP10
TP12	N 45°23.087	W 114°03.868	20	Located 50 feet south of TP11
TP13	N 45°23.085	W 114°03.880	19	Located 50 feet south of TP12
TP14	N 45°23.089	W 114°03.906	15	Located 50 feet south of TP13
TP15	N 45°23.087	W 114°03.906	19	Located 50 feet south of TP14
L XRF 08	N 45°23.068	W 114°03.910	16	XRF ID is XRF08. Located near "bottom" of tailings pond.
L XRF 07	N 45°23.094	W 114°03.871	16	XRF ID is XRF07. Soil sample ID is XRF-SS-07.

Table 10. Summary of Tailing Pond Samples

Sample ID	XRF-SS-07	XRF-SS-09
Description	Tailings Pond	Tailings pond
Location		
Latitude	N 45°23.094	N 45°23.081
Longitude	W 114°03.871	W 114°03.889
Photo ID	SRUD photos-20, 21, and 31	SRUD photos-18, 19 and 31
Laboratory Results		
Compound	**mg/Kg**	**mg/Kg**
Arsenic	3440	5910
Barium	142	117
Chromium	36.7	39.1
Cobalt	475	616
Copper	1080	3650
Lead	77.2	163
Selenium	2.8	7.2
Silver	2.4	4.9
Zinc	154	399
Mercury	0.029	0.024
Thorium	10.3	13.3
Uranium	2.3	2.9
XRF Screening Results		
compound	**mg/Kg**	**mg/Kg**
Arsenic	2161	4806
Copper	709	2015
Lead	47	135
Selenium	13 U	21 U
Zinc	164	402
Gamma Radiation		
	micro R/hr	**micro R/hr**
	16	16

Table 11. Comparison of XRF Screening to Laboratory Analyses

Sample ID	Arsenic		Copper		Lead		Zinc	
	XRF	Lab	XRF	Lab	XRF	Lab	XRF	Lab
	mg/Kg		mg/Kg		mg/Kg		mg/Kg	
BGUG-SS-01	17	18.3	24U	11.5	11U	4.8	44	19.8
BGDG-SS-01	10	4.9	20	24.2	10U	14.8	56	58.2
RVDG-SS-01	10	13	33	17.7	12U	8.6	67	36.6
BLD-SS-01	68000	116000	210000	178000	267	335	1600	734
BLD-SS-05	166U	38.1	61U	85	12000	48600	48	112
XRF-SS-01	35U	58	404	314	426	285	401	302
XRF-SS-02	509	791	38	23.1	38	32	733	718
XRF-SS-03	96	999	819	123	127	77	287	71.8
XRF-SS-05	32	27.7	231	186	288	198	211	138
XRF-SS-07	2161	3440	709	475	47	77	164	154
XRF-SS-09	4806	5910	2015	3650	135	163	402	399
Average %RPD		20		84		18		54

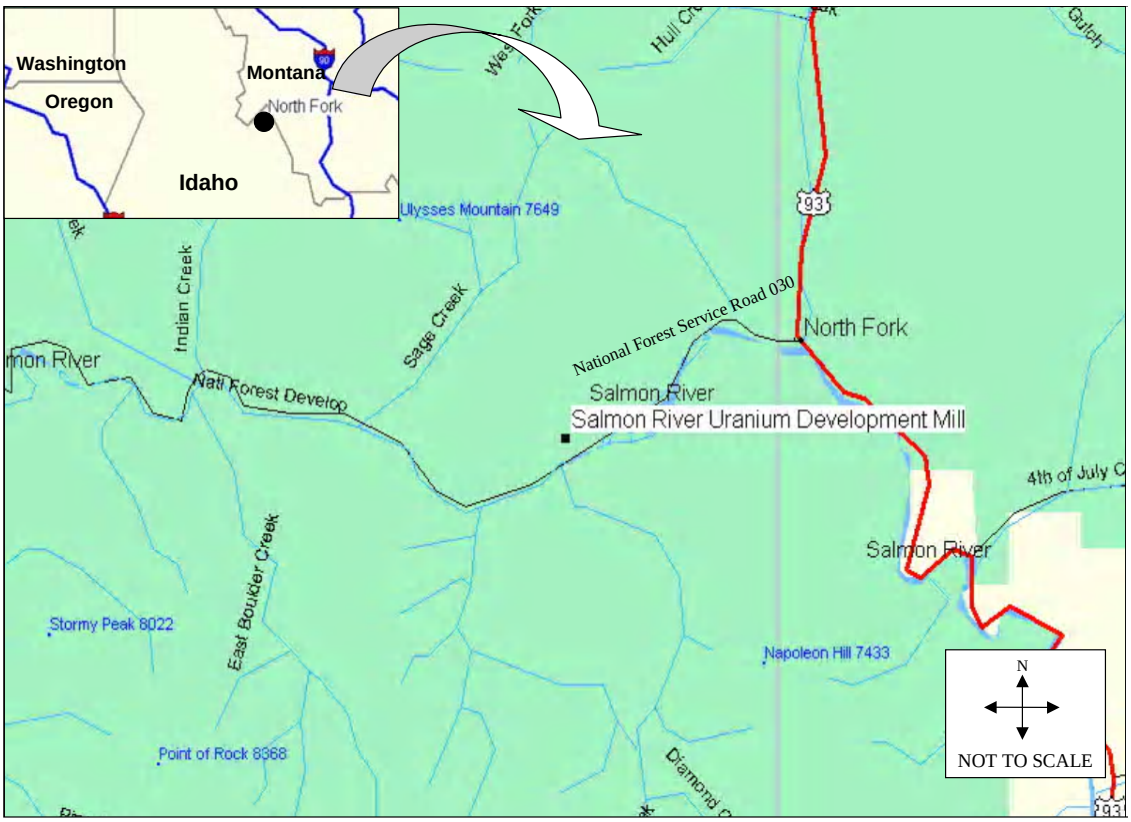
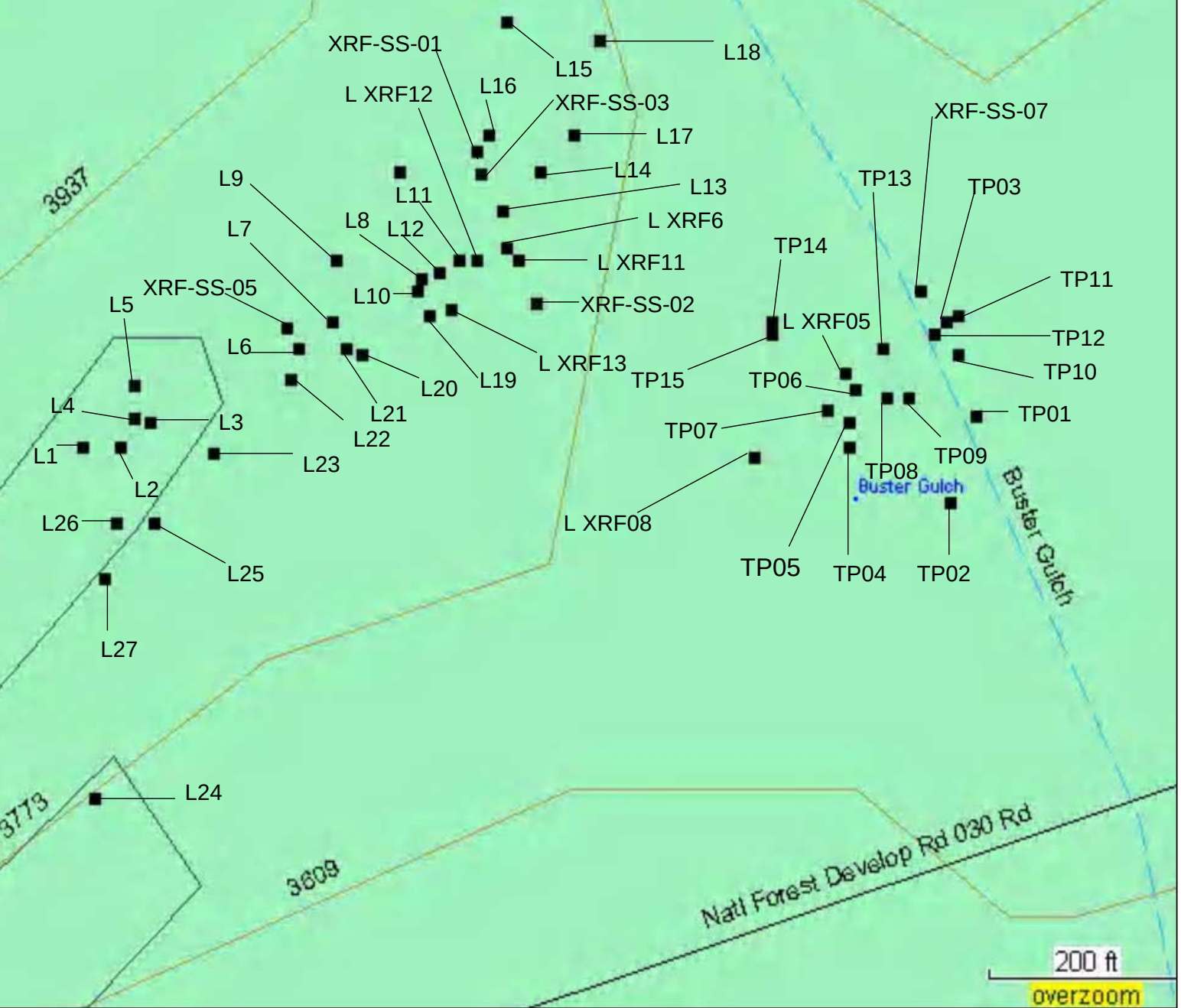


FIGURE 1: Location of the Salmon River Uranium Development Mill



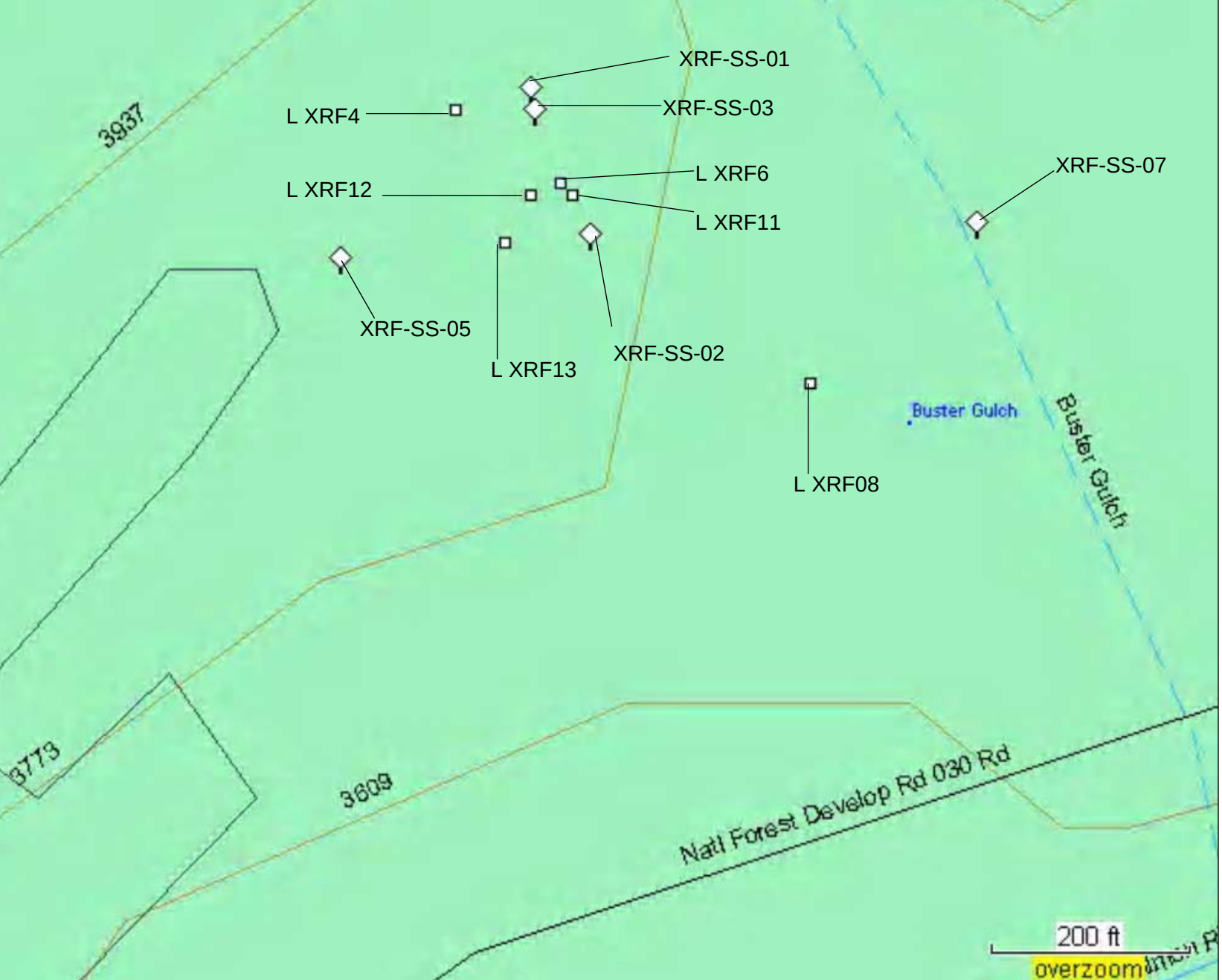
Salmon River Uranium Development Mill Removal Assessment Report

Figure 2 Gamma Radiation Screening Locations

Legend

- Screened with the Ludlum 192

N



Salmon River Uranium Development Mill Removal Assessment Report

Figure 3
Innov-X X-Ray Fluorescence Screening Locations

Legend

◇ **Screened with the XRF and Sampled for Lab Analysis**

□ **Screened with the XRF**

N

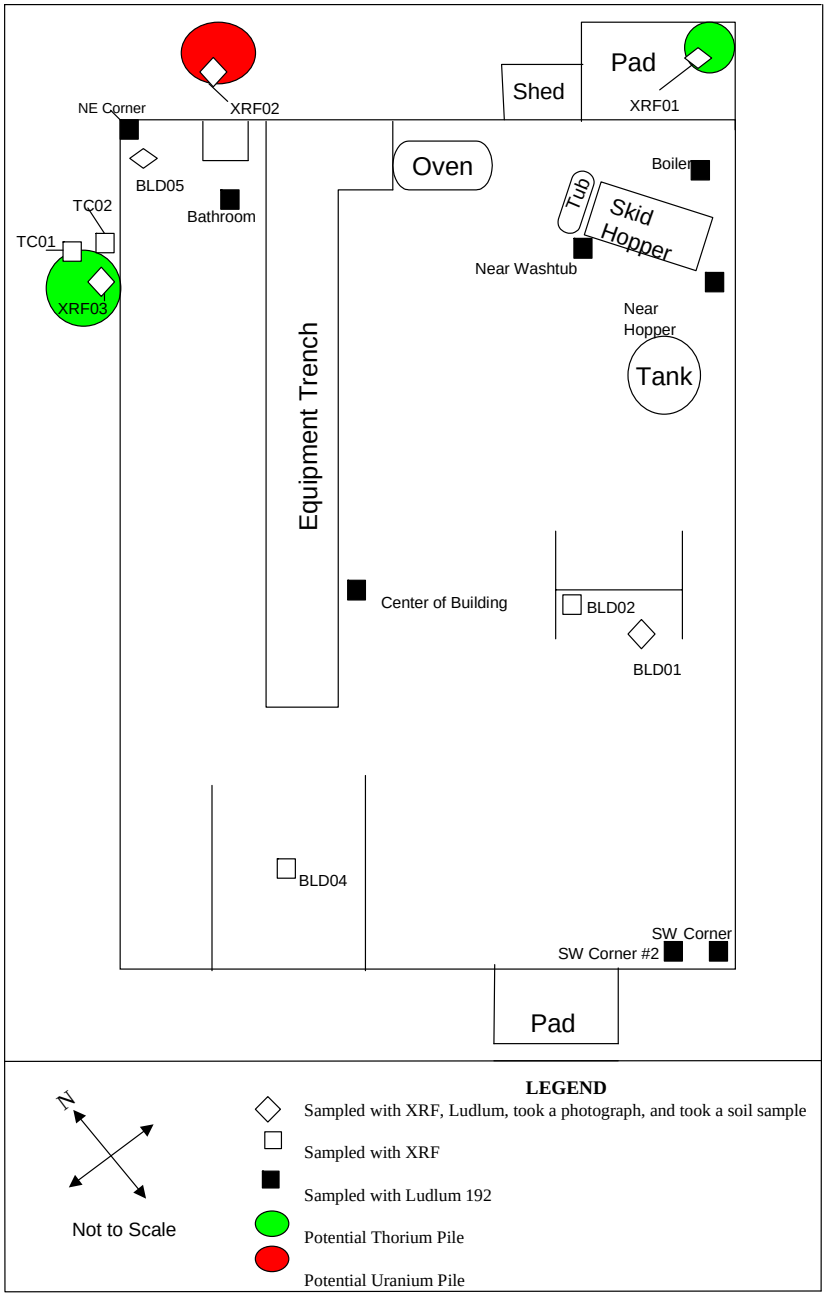


FIGURE 4: Building Plot Plan and Sample Locations

APPENDIX A

PHOTO DOCUMENTATION

Photograph Logbook

Photo Identification	Latitude	Longitude	Description
SRUD Photo 02	N 45º23.232	W 114º03.518	Located at site entry gate. Sampled site with Ludlum 192 and Innov-X XRF.
SRUD Photo 03	N 45º23.157	W 114º03.545	Survey Marker 1 located upstream from old building along Salmon River. Sampled point with Ludlum 192 and Innov-X XRF. Also took soil sample (RVDG-SS-01)
SRUD Photo 05	10 feet Southeast from the Southwest Corner inside of Building 1. Photo taken facing East.	50 feet Northwest from the Southwest Corner inside of Building 1	View of a pile inside of Building 1. Pile was sampled with Ludlum 192 and Innov-X XRF. Soil Sample was also taken (BLD-SS-01).
SRUD Photo 06	Photo taken facing West	N/A	View of broken caustic soda bag and contents released onto concrete floor
SRUD Photo 07	Photo taken facing North	N/A	View of 1 gallon container half full of unknown liquid
SRUD Photo 08	N/A	N/A	View of 5 gallon container labeled Texaco. 1/3 full of grease.
SRUD Photo 09	N/A	N/A	View of two 50 pound bags of Soda Ash (1 broken)
SRUD Photo 10	N/A	N/A	View of partially full 5-gallon paint can
SRUD Photo 11	N/A	N/A	View of full 1-gallon container of unknown liquid. Located near former boiler.
SRUD Photo 14	N 45º23.130	W 114º03.690	Soil Sampling at Down Gradient Buster Gulch. Soil Sample ID = DGBG-SS-01
SRUD Photo 15	N 45º23.130	W 114º03.690	Soil Sampling at Down Gradient Buster Gulch. Soil Sample ID = DGBG-SS-01
SRUD Photo 16	N 45º23.130	W 114º03.690	Cat Den at Down Gradient Buster Gulch. Soil Sample ID = DGBG-SS-01
SRUD Photo 17	N 45º23.130	W 114º03.690	Cat Den at Down Gradient Buster Gulch. Soil Sample ID = DGBG-SS-01

Photo Identification	Latitude	Longitude	Description
SRUD Photo 19	N 45º23.081	W 114º03.889	Soil Sampling at XRF-09 located in Tailings Pond. Soil Sample ID = XRF-SS-09
SRUD Photo 21	N 45º23.094	W 114º03.871	Soil Sampling at XRF-07 located in Tailings Pond. Soil Sample ID = XRF-SS-07
SRUD Photo 22	N 45º23.088	W 114º04.021	Soil Sampling at XRF-05. Hot location. Soil Sample ID = XRF-SS-05.
SRUD Photo 24	N 45º23.092	W 114º03.962	Soil Sampling at XRF-02. Soil Sample ID = XRF-SS-02.
SRUD Photo 25	N 45º23.116	W 114º03.976	Soil Sampling at XRF-01. Soil Sample ID = XRF-SS-01.
SRUD Photo 26	Inside of building 1. 6 feet Southeast from the Northeast corner.	Inside of building 1. 3 feet northwest from the northeast corner.	Soil Sampling at Bld 5. Soil Sample ID = BLD-SS-05.
SRUD Photo 27	Inside of building 1. 10 feet Southeast from the Southwest corner.	Inside of building 1. 3 feet northwest from the southwest corner.	Soil Sampling at Bld 1. Soil Sample ID = BLD-SS-01.
SRUD Photo 28	N 45º23.113	W 114º03.975	Soil Sampling at XRF-03. Soil Sample ID = XRF-SS-03.
SRUD Photo 29	N 45º23.211	W 114º03.978	Background photo of Buster Gulch up gradient. Soil Sample ID = BGUG-SS-01.
SRUD Photo 31	N/A	N/A	Photo of upper tailings pond facing southwest.

SRUD 02 Site Entry

SRUD 03 Survey Marker

SRUD 05 Inside Former Processing Building

SRUD 06 Broken Caustic Soda Bag

SRUD 07 Gallon Container of Unknown Liquid

SRUD 08 Five Gallon Container Labeled Texaco

SRUD 09 Two 50-Pound Bags of Soda Ash

SRUD 10 Five Gallon Paint Can

SRUD 11 One Gallon Container of Unknown Liquid

SRUD 14 Buster Gulch Down Gradient Soil Sampling

SRUD 15 Buster Gulch Down Gradient Soil Sampling

SRUD 16 Sinkhole that Appears to be Occupied by a Cat

SRUD 17 Low Point of Buster Gulch where Natural Drainage is Blocked by Road Grade

SRUD 19 Sampling Location XRF-SS-009

SRUD 21 Sampling Location XRF-SS-007

SRUD 22 Sampling Location XRF-SS-005

SRUD 24 Sampling Location XRF-SS-002

SRUD 25 Sampling Location XRF-SS-001

SRUD 26 Sampling Location BLD-SS-05

SRUD 27 Sampling Location BLD-SS-01

SRUD 28 Sampling Location XRF-SS-03

SRUD 29 Sampling Location BGUG-SS-01, Up Gradient on Buster Gulch

SRUD 31 Upper Tailings Pond Looking Southwest