

PWGSC

Quality in Environmental Services



**PHASE II ENVIRONMENTAL ASSESSMENT
OF THE
WHEATON MOUNTAIN
ABANDONED MINE SITE**



prepared for:

**Action on Waste Program
Indian and Northern Affairs Canada**

prepared by:

**Environmental Services
Public Works and Government Services Canada**

March 1997



**Public Works and
Government Services
Canada**

**Travaux publics et
Services gouvernementaux
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EXECUTIVE SUMMARY

A phase II environmental assessment was conducted at the Wheaton Mountain abandoned mine site (60° 15'13" N, 135° 02'06" W) in July, 1996 by Environmental Services, Public Works and Government Services Canada for the Action on Waste Program, Indian and Northern Affairs Canada. Based on the findings of the Phase I investigation performed in 1993 by DIAND Technical Services, a phase II assessment was conducted to a) identify potential environmental and human health risks associated with the present condition of the mine site, and b) provide recommendations for remediation of those risks.

A field investigation of the abandoned mine site was conducted to evaluate environmental and human safety concerns with respect to: mine openings and workings; buildings and infrastructure; waste disposal areas; waste rock disposal areas; surface water (including adit and waste rock seepage, and receiving waters); and hazardous and non-hazardous materials on the site.

The results of the investigation concluded that the primary concern at the site is with regard to a box of explosives remaining at the site. An assessment of the acid rock drainage potential for the waste rock shows that some of the rock is currently acid generating, however, there is no surface water in the area and the topography of the site indicates that there is only a small amount of surface runoff. A container of oil at the site also presents some risk to the environment. Aesthetic concerns arise from wood debris, empty core boxes and empty barrels.

Using applicable federal and territorial criteria as well as northern mine reclamation guidelines, the recommendations are to ensure that the RCMP dispose of the explosives as soon as possible. The container of oil should also be disposed of off site as hazardous waste. The empty barrels, wood debris, bags of cement and empty core boxes should be removed from the site.

No further test work is recommended on the waste rock.

Table 1: Summary of Potential Hazards at Wheaton Mountain Mine Site

ASSESSMENT COMPONENT	RISK	RECOMMENDATION
1. Building, Infrastructure, Equipment		
None		
2. Non-Hazardous Waste Material		
Timber (20 m ³)	Aesthetic concern	Remove from site
7 empty core boxes	Aesthetic concern	Remove from site
4 - 205 L empty barrels	Aesthetic concern	Remove from site
3. Hazardous Materials		
Unlocked .25 m ³ container of explosives	Health and safety concern	RCMP to remove and dispose of explosives
Approx. 22 L oil	Environmental risk	Remove from site and dispose of as hazardous waste
Used battery	Environmental risk	Remove from site and dispose of as hazardous waste
4. Water Quality		
Mine Seepage - None		
Site Drainage - None		
Receiving Waters - None		
5. Waste Rock Disposal Areas		
Waste Rock - ARD potential	Low environmental risk	None
6. Mine Openings		
Trenching only	Aesthetic concern	None
7. Tailings		
None		

1.0 INTRODUCTION AND BACKGROUND

In 1993, assessments of 49 abandoned Yukon mine exploration and development sites were completed under the Arctic Environmental Strategy - Action on Waste program by DIAND Technical Services. These assessments were intended to: provide a general overview of historical activities, describe site infrastructure, workings and wastes; describe existing environmental or safety concerns on each site; and provide general recommendations for remediation and/or mitigation work, as appropriate.

At the Wheaton Mountain abandoned mine site, the 1993 report recommended further investigation into possible environmental impacts resulting from the previous mining activities. According to this report, the potential areas of concern included: a high safety concern with regard to the explosives remaining at the site; a minor environmental concern regarding small volumes of hazardous waste; and aesthetic concerns with regard to various wastes and a compressor noted at the site. No rock, tailings, soil or water samples were collected in this assessment.

In light of these preliminary findings, Indian and Northern Affairs Canada has determined that further investigation is warranted. Environmental Services, Public Works and Government Services Canada was retained to conduct an environmental assessment of the Wheaton Mountain abandoned mine site to a) identify specific environmental and human safety risks; and b) provide clean-up recommendations;.

1.1 LOCATION

The Wheaton Mountain abandoned minesite is located at 60° 15'13"N latitude and 135° 02'06"W longitude. It is approximately 35 km north west of the Village of Carcross and 25 km south west of Robinson on the South Klondike Highway south of Whitehorse. The site is on the west side of Mineral Hill in the Boundary Ranges (Coast Mountains) between 1450 and 1525 m above sea level. The site is only accessible by helicopter.

1.2 OVERVIEW OF SITE DEVELOPMENT

The property was first staked in 1906 and explored with trenching and a 6 m (20 ft) shaft. A bulk sample was taken from surface trenches in 1989 and 1990. Four 227 kg samples were analyzed. Shafting also is reported to have taken place in 1991, however, no records or visual observation confirm underground development.

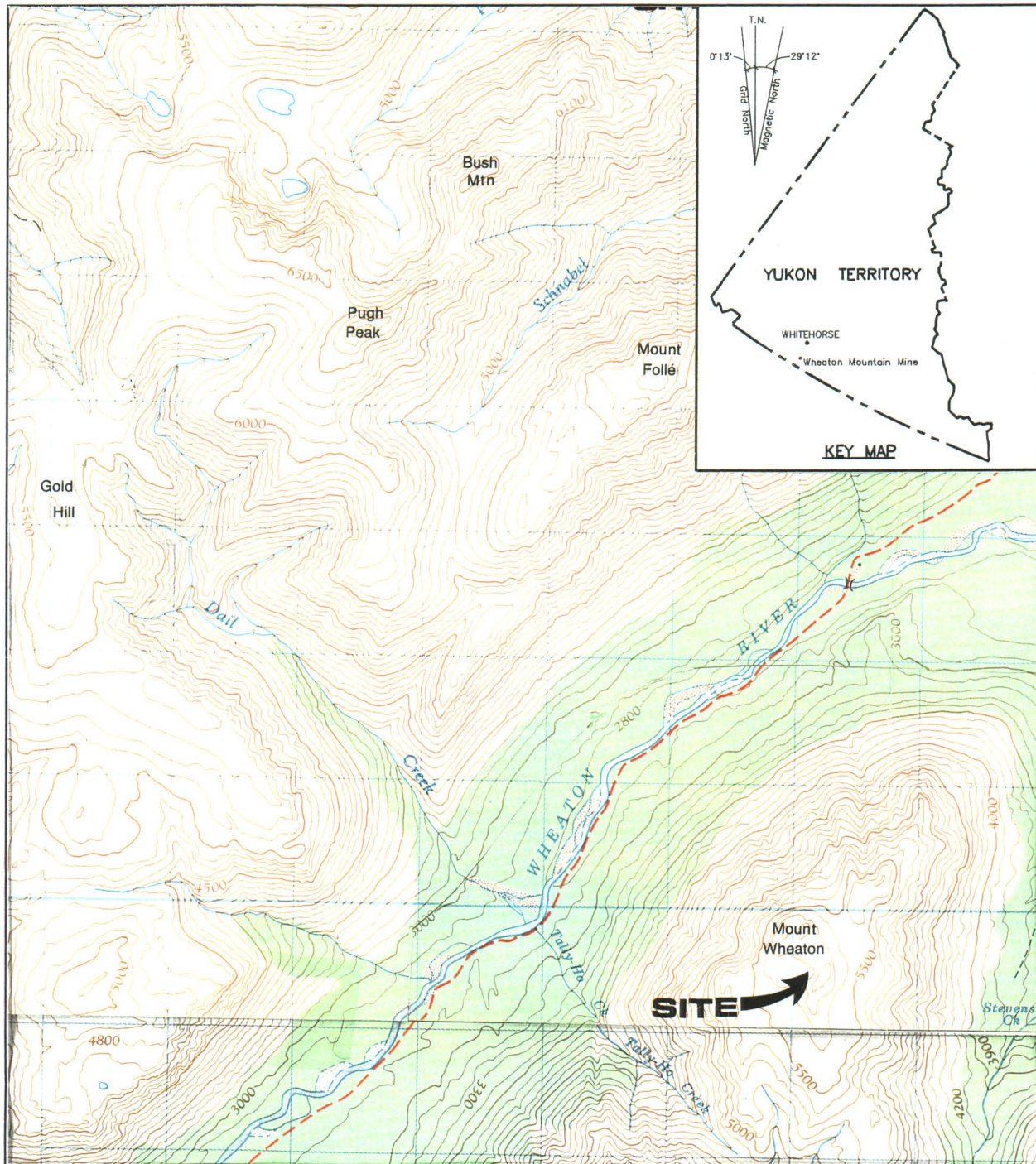


Figure 1. Location of Wheaton Mountain Mine - 1:50,000, NTS- 105 D/3 & D/6 [Energy Mines and Resources Canada: 1986]

1.3 SITE ACCESS

The site is accessible only by helicopter. Road access could not be found from Annie Lake Road, however, a trail from the Tally-Ho Mountain area appears to be in place.

2.0 PURPOSE AND SCOPE OF WORK

The following assessment activities were completed:

- Inspection of mine openings and workings, buildings and infrastructure, and waste disposal areas;
- Photo documentation and mapping of relevant site features;
- Sampling of waste rock disposal areas, stained soils, surface water (including adit and waste rock seepage, and receiving waters) and barrel contents;
- Identification and inventory of hazardous and non-hazardous materials on the site;
- Identification of potential or actual environmental pathways and receptors for site contaminants; and
- Assessment of human safety hazards and potential for accidental or deliberate access to hazardous areas.

Upon completion of these activities, recommendations were generated to meet the following remediation/mitigation requirements:

- Physical stabilization of waste rock disposal areas;
- Chemical stabilization of the waste rock disposal areas as appropriate to local and background conditions, taking into account impact, on-site resources, and accessibility;
- Sealing of all mine openings;
- Consolidation and landfill of all non-hazardous, non-combustible solid wastes;
- Remediation or removal and disposal of contaminated soils as required to meet the more stringent of: Yukon Government's Contaminated Sites Regulations (1996) Schedule 1; and Canadian Council of Ministers of the Environment's Interim Canadian Environmental Quality Criteria for Contaminated Sites (1991) Commercial/Industrial criteria for soils;
- Removal and disposal of hazardous solid wastes;

- Draining, cleaning and disposal of drums or other containers containing petroleum products or other liquid hazardous wastes;
- Onsite flaring or removal and off-site disposal of petroleum products and other liquid hazardous wastes; and
- Demolition of buildings and infrastructure to foundation level and burning of combustible non-hazardous materials in approved location.

3.0 SITE ASSESSMENT METHODOLOGY

3.1 ASSUMPTIONS

The assessment was limited to the area specifically developed or occupied for exploration or mining purposes, and adjacent areas and resources believed to be affected by these activities. Water samples were taken off-site to determine potential impact to surface water bodies due to mining activities. Access roadways to mine sites were not included in the assessments.

3.2 ASSESSMENT CRITERIA

3.2.1 Criteria and Guidelines

Contaminated Sites Regulations (draft) (Yukon Government, 1996)

According to these draft regulations a site is contaminated if it is used for agricultural, commercial, industrial, parkland, or residential land use and contains a substance in concentration greater than or equal to:

- (i) the generic numerical soil standard of Schedule 1, or
- (ii) the matrix (pathway specific) numerical soil standards of Schedule 2

and, surface or groundwater used for aquatic life, irrigation, livestock, or drinking water which exceeds a concentration greater than or equal to:

- (i) the generic numerical water standard of Schedule 3, or
- (ii) the local background concentration of that substance in the soil, surface water, or groundwater.

Below 3 metres of the surface, commercial land use criteria is applicable.

3.2.2 Application of Criteria and Guidelines

For the Wheaton Mountain abandoned mine site assessment the following criteria were used:

A. Soils:

CCME: Remediation Criteria for Soil - Commercial/Industrial standard

YUKON RENEWABLE RESOURCES: Draft Contaminated Sites Regulation - used for hydrocarbon screening parameters

B. Water:

ENVIRONMENT CANADA: Metal Mining Liquid Effluent Regulations and Guidelines - are compared to seepage from mine openings and river/stream quality

BACKGROUND: Downstream water quality results of rivers and streams are compared to the results of upstream (background) water quality (where available)

CCME: Remediation Criteria for Water - Freshwater Aquatic Life standard

[Note: In this screening assessment of water quality, analytical results are primarily compared to background values which may more accurately characterize the local environment.]

C. Mine Clean-Up and Reclamation:

INAC: Mine Reclamation in Northwest Territories and Yukon Territory

3.3 METHODS

3.3.1 Background Information

Available background information was consolidated from the Yukon Chamber of Mines mine records, Whitehorse Public Library, Yukon Archives holdings, and records and reports from the Yukon Renewable Resources Library, Yukon Water Board, DIAND Lands Branch, DIAND Water Resources, and DIAND Library. INAC (1994) provided an overview assessment of the Wheaton Mountain abandoned mine site to that date. Other published information sources were examined for site or regional information as applicable. On the basis of available information, knowledge gaps regarding existing or potential safety and environmental risks at the site were identified and a site assessment plan was developed.

3.3.2 Site Assessment Components

A site assessment was conducted to identify existing or potential safety and environmental risks on the site. The assessment included the following components:

Waste Rock disposal areas were inspected and sampled by a professional geologist to assess acid rock drainage potential by:

- Identifying waste rock mineralization with potential to release acidic and/or metal-contaminated drainage;
- Mapping and logging waste rock, tailings, pit walls and rock faces;
- Collecting and field testing representative samples of mine wastes.

Mine Openings were inspected and documented to identify closure requirements.

Non-Hazardous Site Debris was inventoried.

Contaminated Soil Areas were measured and sampled to determine the degree and type of contamination and estimate soil volumes for remediation.

Hazardous Materials were inventoried and sampled for analyses of contaminant constituents, as necessary.

Buildings and other Structures were inspected for hazardous materials and assessed for stability.

to minimize head space, placed in a cooler, and maintained at 4° C until delivery to the laboratory.

Soil Sampling

Soil lithology was recorded from observations of the side walls of the test pit, and soil samples for both field and laboratory testing were collected. Observations were recorded for each soil sample site, including soil particle size, consistency, colour, moisture, discolouration, stratification, odour, and any other observations of significance.

Samples were collected at depth intervals selected on the basis of stratigraphic observations and anticipated or apparent contamination. The lab samples were collected using disposable latex gloves and decontaminated stainless steel sampling utensils. All samples intended for organic analyses were stored in laboratory-cleaned 250 ml glass jars; samples intended for metals analyses were placed in new "Whirl-Pak" bags. All samples were placed in a cooler for shipment to the laboratory.

Barrel Sampling

Barrels containing hydrocarbons were sampled with 1.2 m clean hollow glass rods ("drum thieves"), capable of extracting up to 25 ml of product. The rods were inserted into the drum or pail, and the uppermost open tip was sealed to maintain the sample within the rod as it was extracted from the drum or pail. The sampled hydrocarbon was then drained into a 40-ml laboratory-cleaned vial. The extractions were repeated until at least 20-30 ml of product was obtained. The vial was then sealed and placed in a container for shipment to the laboratory. Each used drum thief rod was subsequently destroyed to prevent accidental re-use.

Since hydrocarbon samples were collected only for analyses of Total Halides and metals, no cooling or other preservative was required.

Quality Assurance

Quality Assurance (QA) is a set of procedures for ensuring that the results of chemical analyses are, and can be shown to be, accurately representative of field conditions. A complete QA program includes both a field component and a laboratory component.

In addition to the standard sample collection methods outlined above, the field QA measures that were implemented for this assessment study include:

- chain of custody procedures and forms;
- a sample labeling and sample location identification scheme;
- laboratory preparation of all sampling containers;
- laboratory defined sample preservation and shipping procedures; and
- regular maintenance (including re-calibration) and cleaning of field equipment.

Laboratory QA measures included replicate analyses of selected soil and water samples. Replicate analytical results were submitted with each analytical report.

4.0 ENVIRONMENTAL SETTING

4.1 MINERALIZATION

The mineralization at Wheaton Mountain is hosted in a granitic intrusion within greywacke (Open File Report 1990-4). It consists of chiefly sericitic and chloritic schists, quartzite, hornblende gneiss and limestone. The commodities of interest at this site are gold and silver, with minor amounts of lead and copper.

4.2 SURFACE HYDROLOGY

No site drainage was noted. Regional drainage is north and west towards Wheaton River (see Figure 1).

No seepage from the waste rock piles was detected. Site topography does not lend itself to seepage through the waste rock piles as a result of site drainage or surface infiltration from precipitation.

4.3 CLIMATE

The closest climatological information is from the town of Carcross, 60° 11' N, 134° 41' W; 663m above sea level (Environment Canada, 1980). Total annual precipitation is 211.4 mm. This consists of 118.7mm of rainfall and 101.3mm of snowfall. Highest levels of rainfall occur in August and highest levels of snowfall occur in January. Temperatures range from -19.4° C in January to 12.7° C in July.

The mean annual temperature is -1.4°C . Due to its higher elevation, it is assumed that Wheaton Mountain experiences slightly colder temperatures.

4.4 VEGETATION

The Wheaton Mountain mine site occurs within the Yukon Stikine Highlands ecoregion. Alpine tundra dominates the site, with vegetation including scrub heather, dwarf birch, willow, grass and lichen. At lower elevations, particularly those in the Wheaton River valley north and west of the site, subalpine ecosystems are dominated by white spruce, alpine fir and white birch. Vegetation typical of disturbed areas was not noted at the site.

4.5 FISH AND WILDLIFE RESOURCES

Typical carnivores in the area include grizzly and black bear and wolf. Arctic ground squirrel, pika and hoary marmot are common rodents noted at the site. Bird species representative of this alpine habitat include several ptarmigan species and rosy finch. Raptors species, such as bald eagle and peregrine falcon hunt and nest in the area. Waterfowl, including mergansers, are characteristic of the rivers at lower elevations.

4.6 SITE TOPOGRAPHY AND SOILS

The soils within the Yukon Stikine Highlands ecoregion are predominantly brunisolic and regosolic. Occasionally, cryosolic soils, dystric brunisols and eutric brunisols are also found.

The site is located on the flat mountain top of Wheaton Mountain. The peak slopes strongly towards the north, west and east into the Wheaton River valley.

4.7 PERMAFROST

Wheaton Mountain is in an area of discontinuous permafrost. No evidence of permafrost was discovered during the site visit and is not likely to affect project components.

5.0 SITE DESCRIPTION AND FINDINGS

5.1 BUILDING, INFRASTRUCTURE, EQUIPMENT

No buildings, infrastructure or equipment were noted at the Wheaton Mountain mine site.

5.2 NON-HAZARDOUS WASTE MATERIALS

The non-hazardous waste material observed in and around the site are listed in Table 2.

Table 2: Non-Hazardous Waste Materials

Waste Material	Number/ Volume	Location
empty 205 L barrels	4	adj. to waste rock
timbers	20 m ³	adj. to waste rock
empty core boxes	7	adj. to waste rock

5.3 HAZARDOUS MATERIALS

Hazardous materials were limited to an unlocked container of explosives measuring 91.5 cm x 61 cm x 61 cm. A 22 L container of unused oil was also found.

5.4 SURFACE WATER QUALITY

No surface water was noted at the Wheaton Mountain site and, as such, no water samples were collected.

5.5 WASTE ROCK DISPOSAL AREAS

Waste rock at the Wheaton Mountain site is limited to small piles near trenches and pits. Two grab samples were collected from along side of trenches excavated in mineralized, altered granite and submitted for analysis. Sample WM/WR/P201 is representative of 20% of the disturbed rock and sample WM/WR/P203 is representative of the remaining 80%.

Samples WM/WR/P201 and WM/WR/P203 were collected from trenches excavated in the granitic intrusion. The samples had neutral paste pH values of 7.6 to 7.7, respectively. The total sulphur contents were low (0.11% and 0.06%) as were metal concentrations. The NP:AP ratios were 0.95 and 1.80, indicating that the exposed rock has the potential to generate acid. Accounting test results are shown in Table 3.

Table 3: Summary Acid/Base Accounting Test Results

Sample #	Paste pH	Total S (%)	SO ₄ (%)	AP	NP	Net NP	NP/AP
WM/WR/P201	7.58	0.11	no assay	3.44	3.25	-0.19	0.95
WM/WR/P203	7.72	0.1	no assay	1.88	3.38	1.5	1.8

5.6 MINE OPENINGS AND EXCAVATIONS

No underground openings were observed during the site visit. It is expected that the 6 m shaft advanced in 1906 has since sloughed in.

5.7 TAILINGS

No milling of ore has occurred at the site and, therefore, there are no tailings.

6.0 CONCLUSIONS

The primary concern at the Wheaton Mountain mine site is the health and safety of humans and wildlife relating to explosives remaining at the site. Secondary concerns are a small volume of hazardous waste representing some risk to the environment and some non-hazardous wastes representing an aesthetic concern.

6.1 HEALTH AND SAFETY

An unlocked container of explosives noted at the site represents a very high risk to human and wildlife safety.

6.2 ENVIRONMENTAL RISKS

A container holding approximately 22 L of oil remains at the site. If left as is, the oil container will degrade and may eventually result in a hazardous waste spill.

The waste rock at the site is not currently generating acid. Although rock at the site has the potential to generate acid, the amount of rock exposed to weathering conditions is minimal since material has been exposed only by trenching and shallow blasting. Furthermore, there is no water flow through the potentially acid generating material with the minor exception of rainfall and snow melt runoff. Any rain contacting this material and picking up contaminants would likely seep into the ground quickly without significant impact to the receiving environment.

6.3 AESTHETIC CONCERNS

Aesthetic concerns arise from timbers, a number of empty barrels, empty core boxes and the waste rock.

7.0 RECOMMENDATIONS

Recommended remediation and management actions are compliant with applicable federal or territorial regulations and criteria, are reliant upon available technology, and are intended to be appropriate for local conditions and sensitivities.

Recommendation 1.

It is strongly recommended that the RCMP be notified of the presence of the abandoned explosive container and asked to dispose of it.

Recommendation 2.

It is recommended that the oil container be transported from the site and incinerated at a suitable location.

Recommendation 3.

It is recommended that the timbers, empty core boxes, and empty barrels be transported off site and disposed of at a suitable landfill. These activities can be accomplished using locally available resources and labour.

REFERENCES

- Canadian Council of Ministers of the Environment, 1991. Interim Canadian Environmental Quality Criteria for Contaminated Sites. The National Contaminated Sites and Remediation Program.
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- 1993 Trenching & Summary Report on the Wheaton Mountain Property, Whitehorse Mining District, Y. T., 093166, Aurum Geological Consultants Inc., 1994.
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APPENDIX A
SITE PHOTOGRAPHS

WHEATON MOUNTAIN

Photographic Record

July 28, 1996

Photos	Description
W.M. # 1	Wheaton Mountain - Northwest Face
W.M. # 2	Wheaton Mountain - Southeast Face
W.M. # 3	Unprotected Explosives
W.M. # 4	Wood Debris
W.M. # 5	Barrel, Cable and Core Sample Box
W.M. # 6	Core Sample Boxes and Debris
W.M. # 7	Barrel, Box Containing Garbage
W.M. # 8	Location of Pit 201
W.M. # 9	Wheaton Mountain - North Face
W.M. # 10	Wheaton Mountain - Northeast Face



Photo # 1 - Wheaton Mountain - Northwest Face



Photo # 2 - Wheaton Mountain - Southeast Face



Photo # 3 - Unprotected Explosives



Photo # 4 - Wood Debris



Photo # 5 - Barrel, Cable and Core Sample Box



Photo # 6 - Core Sample Boxes and Debris



Photo # 7 - Barrel, Box Containing Garbage



Photo # 8 - Location of Pit 201



Photo # 9 - Wheaton Mountain - North Face



Photo # 10 - Wheaton Mountain - Northeast Face

APPENDIX B

DRAWINGS

