SHAMROCK (Original Shamrock) (#28)
(MINFILE# 105M 001ah)

1. LOCATION AND ACCESS

The site is located near the summit on the south west side of Keno Hill and is visible from Keno City (Figure 1). The site is accessible by 2 or 4-wheel drive vehicle from Keno City via a gravel road heading west along the face of Keno Hill and continuing on to the summit. The site is positioned at an elevation between 1505 and 1610 m above sea level. The location is given as 63°56'30"N and 135°14"40.0"W. UTM co ordinates are 7090536.905m N 488018.795m E.

2. SITE PHYSIOGRAPHY

The site, consisting of a series of test pits, shafts and adits, drains down the steep southwest talus slope of Keno Hill through a single ravine. A second larger and deeper ravine to the east cuts across the bottom of this ravine forming the west branch of Erickson Gulch. The gulch enters Christal Creek approximately 5 km to the west of the site, approximately 1.5 km north of Christal Lake. It appears that seasonal runoff through the site has resulted in little vegetation growth or soil accumulating near the bottom of the ravine. The entire site is located within an alpine ecosystem above the treeline. Permafrost features were not noted at the site.

3. GEOLOGY AND MINERALIZATION

The area is underlain by massive quartzite with graphitic schist and phyllite. Two major mineralized structures trend northeast through the area. The veins here are very highly oxidized, with almost no sulphides remaining. Mineralization consists of carbonate, cerussite, limonite, malachite and manganese oxide. Galena was noted in an old shaft dump south of the main adit.

4. SITE HISTORY

The original Shamrock mine was developed and mined from 1919 to 1939. A 37 m inclined shaft was sunk with levels at 65 and 110 feet. The 65 level broke out to an adit. Several small adits, shafts and test pits were mined in the area downslope from the Shamrock in this era. In 1953 and 1954 a new adit was driven at the 200 foot level, with further drifting and production. The 200 level adit is still visible. An open pit mine was constructed around the shaft in the period from 1985 to 1989. The open pit was excavated to the upper levels of the mine.

Several deep bulldozer trenches were dug to the southwest of the Original Shamrock in this era. The Shamrock King vein was mined by shallow open pit in 1988 and 1989. This mine lies about 100m east southeast of the Original Shamrock mine (Minfile).

5. MINE DEVELOPMENT

5.1 Mine Openings and Excavations

Mine development consists of the main adit, two secondary adits (not further reported on), a shallow shaft, two open pits (Shamrock & Shamrock King) and a series of shallow trenches at the bottom end of the site. Site details can be found on Figure 1; see Attachment A for site photos.

200 Level Portal (photo 28-3)

Partially collapsed timbered portal. Underground waste dumps with rails are present on both sides of the adit. The adit is located in a gully, and waste from the open pit above has partially covered the adit site. Constructed in 1953.

Location: Below open pit dump.
Dimensions (L x W x H): Approximately 1.5 m x 1.5 m; length unknown.
Supports: Wood timbers.
Condition: Partially collapsed, mostly blocked by open pit waste and debris
Accessibility: Access is possible but difficult, risk of collapse is evident.

Prospect Shaft

Small waste dump (+/- 5 tonnes); constructed pre-1939.

Location: South of 200 level portal.
Dimensions (L x W x H): 1.5 m x 1.5 m; approximately 3 m depth to ice.
Supports: Log timbers; fair condition
Condition: Appears to be stable.
Accessibility: Surrounded by steep, blocky talus slope.

Note: There are several small test pits and minor adits that are totally collapsed in this area. None of these structures appear to be a hazard, and the small waste dumps associated with them indicate very limited depths. The steep talus slopes in this area limit access.

Open Pit – Original Shamrock (photo 28-1)

An open cut with waste dumped at the lower, southwest end. The pit recovered an ore pillar around the shaft.

Location: Top of hill immediately south of main building.
Dimensions (L x W x H): Approximately 100 m x 20 m x 10 m.

Condition: Very steep pit walls appear to be stable.
Accessibility: Very easy road access.

Open Pit – Shamrock King

A shallow open pit with hand-sorted ore. Eight empty barrels and assorted trash were present. The barrels are thought to be for shipping hand-sorted ore.

Location: See site location map.
Dimensions (L x W x H): 150 m x 6 m x 6 m. Waste rock dumps extend around the pit on all sides.
Condition: Generally stable, some waste dump slopes are steep. Low risk.
Accessibility: Very easy road access.

Six Trenches Southwest of Mine (photo 28-4)

Trenches cut across the mineralized structure that hosts the Original Shamrock mine to the northeast. Very little true outcrop is exposed, however subcrop indicates very strongly oxidized, rusty quartzite with minor schist. Veining and mineralization are weak. Manganese oxides are common. The trenches appear to be from the 1980's.

Location: See site location map. Deep bulldozer trenches are approximately 75 m long, with push piles adjacent to the creek gully. The lowest pile crosses the gully, and forms a dyke that has been breached. One trench is present on the east side of the ridge between the two gullies, the rest are on the NW side.
Dimensions (L x W x H): 6 trenches, each about 75 m x 5 m x 5 m.
Condition: The trench sides are steep, with little revegetation. The adjacent, undisturbed gully area is similarly steep, with little vegetation.
Accessibility: Easy access by steep bulldozer trail.

5.2 Waste Rock Disposal Areas

Waste rock pile - #200 level portal (photo 28-2)

Fine-grained underground muck extends along both sides of the gully at the portal elevation. The western dump is mostly covered by open pit waste, and appears to be mostly unmineralized waste rock. The eastern end of the eastern dump is well mineralized material. The waste that would have originally been in front of the portal has been removed by bulldozer and/or flash flood. The site is in a gully that was dry when visited, but bear evidence of considerable flow in the past. Mining debris is widespread below the site. Although some material is well-mineralized, only traces of sulphide were noted. An acidic pH was noted, however the sulphur levels are very low for all samples.

Location: See site location map.
Dimensions (L x W x H): Eastern dump: about 20 x 3 x 3m. Western dump is approximately the same size.
Sampling: two samples were collected; based on field appearance 01 is highly mineralized, and 02 is of weakly mineralized underground material.

Laboratory and field results are provided in Attachment B.

Waste rock pile - ORIGINAL SHAMROCK (photo 28-1)

Overburden and waste rock were pushed downslope from the open cut. The pit drains through the dump, and deep troughs are present on the dump slope. No significant vegetation was noted. The dump toe rests on an underground waste dump at the 200 level.

Location: See site location map. Pit dump has a slope of 38 degrees.
Dimensions (L x W x H): Approximately 50 m x 50 m x 15 m.
Sampling: One sample was collected approximately mid-slope on the waste rock dump.

Laboratory and field results are provided in Attachment B.

Waste rock pile # SHAMROCK KING

Waste piles surround a long shallow pit developed on fairly flat ground. Most of the waste is overburden and barren quartzite and schist. Mineralized material is highly oxidized. There is no drainage apparent in the area, and although dry when visited it appears that water ponds locally in the pit bottom.

Location: See site location map.
Dimensions (L x W x H): 6400 tonnes
Sampling: No samples were collected.

5.3 Tailings Impoundments

There are no tailings impoundments at this site.

5.4 Minesite Water Treatment

There is no minesite water treatment at this site.

6. MINE SITE INFRASTRUCTURE

6.1 Buildings

There are three buildings located at the main site, all on the flat access area above the site. An old demolished shack is also located below the main adit.

Building 28A – Main Site Building (photo 28-5)

Building appeared to have formerly served as both living quarters and office space for site workers. An addition to the rear of the facility was probably used for storage space.

Location: On a branch road from the Keno Hill summit road.
Dimensions (L x W x H): 12 m x 6 m x 6 m with addition of 6 m x 3 m.
Construction: Wood frame; painted plank finished interior; rolled asphalt roof; fibreglass insulation; windows boarded up from inside.
Paint: Only on interior walls.
Asbestos: None observed.
Non-hazardous contents: Bed; minor kitchen utensils; empty pail.
Foundation: None.
Hazardous products: None.
Two small petroleum hydrocarbon-based stains were noted to the east of the building, both with dimensions of 1 m2 or less. A two-inch diameter pipe was noted extending from the building, however its former usage could not be determined. No staining was noted at the pipe end.

Building 28B – Generator Shed (photo 28-6)

Shed consisted only of a wood frame structure directly on grade. A strong petroleum hydrocarbon odour was present in the building.

Location: Approximately 65 m east of main building; also at top of ravine.
Dimensions (L x W x H): 3 m x 5 m x 2 m.
Construction material: Wood frame; no floor.
Paint: None.
Asbestos: None.
Non-hazardous contents: Pipe lengths and lumber.
Foundation: None.
Hazardous products: None.

Building 28C – Collapsed Shed

The shed's former usage is unknown. The building has completely collapsed.

Location: Approximately 50 m east of main building; also at top of ravine.

Dimensions (L x W x H): Collapsed; previously ~2 m x 4 m x 2 m.
Construction material: Wood frame; no floor.
Paint: None.
Asbestos: None.
Non-hazardous contents: None.
Foundation: None.
Hazardous products: None.

Building 28D – Collapsed Shack (photo 28-7)

The shack was formerly used as temporary living quarters (probably summer only). The building has completely collapsed.

Location: Approximately 200 m downhill from the main building.
Dimensions (L x W x H): Collapsed; previously ~3 m x 2.5 m x 2.5 m.
Construction material: Wood frame; no floor; canvas walls.
Paint: None.
Asbestos: None.
Non-hazardous contents: None.
Foundation: None.
Hazardous products: None.

6.2 Fuel Storage

There is currently no fuel stored at the site. A generator shed located to the east of the main site probably formerly contained a fuel storage tank to power the generator. Other former fuel storage locations were probably associated with the main site building, however, little evidence of this capacity remain.

6.3 Rail and Trestle (photo 28-8)

Located at 200 level portal.
Fabrication: Steel rails, about 20 m long. Some wooden trestle remnants. Large volume of timber and steel trash in area.
Amount of materials: 20 m of rail.
Condition: No significant hazard.

6.4 Milling and Processing Infrastructure

There is no milling or processing infrastructure at the site.

6.5 Electrical Equipment

Electrical equipment at the site was limited to an abandoned power line running approximately east-west to the north of the site. No transformers were noted on any of the nearby poles.

7. SOLID WASTE DUMPS

Location & access: approximately 50 m east of main building, near collapsed building and generator building and adjacent to power pole (photo 28-9).

Dimensions (L x W x H): 3 m x 5 m x 7 m
Drainage: waste materials on cobble/boulder surface would ensure that most drainage from area would be subsurface; ravine into Erickson Gulch approximately 500 m from area.
General composition: Approximately 11 newer paint cans, 6 used oil filters, wire, 1 lead-acid battery; evidence of burning.
Impacted vegetation: None noted.
% covered: 0
Sampling: Due to the small size and lack of nearby receptors, the surrounding media was not sampled.

8. POTENTIAL CONTAMINANTS OF CONCERN

8.1 Out-of-Service Transformers

No transformers are present at the site.

8.2 Metals and Hydrocarbons in Soil

Two small areas potentially impacted by hydrocarbons and/or metals were identified at the site.

Soils within the former generator building were stained and strong odours were present in the building. Stained areas, approximately 4 m^2 in total, did not extend out of the building. Soils under the building are very thin or nonexistent with much of the building situated directly on cobble/rock or bedrock. Due to the substrate, excavation was not possible.
Two very small hydrocarbon stains (< 1 m), possibly associated with former waste oil disposal practices, were noted on the east side of the main site building. Soils were found to be very thin or nonexistent and were not sampled. Due to the substrate, excavation was not possible.

8.3 Liquid Hazardous Materials

All barrels present at the site were empty. No liquid hazardous materials were present at the site.

8.4 Solid Hazardous Materials

No solid hazardous materials were identified at the site, with the exception of the small amount of debris noted above in Section 7.0 of this report.

9. WATER QUALITY

A single surface water sample was collected on Erickson Gulch approximately 300 m upstream of the site (28-WQ-Str-CD-01). Flow in the gulch was estimate at > 5 L/sec. Water was pooling in the adit portal and a small amount of water, much less than 1 L/sec, was noted flowing from the adit. This water was sampled (28-WQ-A-CD-01). Water discharging from the open adit disappeared below ground within 3 m of the adit, however, surface flow was again noted approximately 30 m below the bottom test pit at the site. This flow was sampled (28-WQ-Str-CD-02).

Laboratory sample analysis and field data is provided in Attachment B.

10. RECLAMATION

No reclamation appears to have been completed at this site in the past. Natural revegetation has occurred only to a minor extent within the test pits near the bottom of the site and along the slopes of the ravine. Seasonal runoff appears to have limited natural revegetation along the ravine bottom.

11. OTHER SOURCES OF INFORMATION AND DATA

No additional information was identified.

12. REFERENCES AND PERSONAL COMMUNICATIONS

United Keno Hill Mines Limited. 1996. *United Keno Hill Mines Limited – Site Characterization.* Report No. UKH/96/01, prepared by Access Mining Consultants Limited.

United Keno Hill Mines Limited. 1996. *United Keno Hill Mines Limited – Site Characterization, Technical Appendices I-VI.* Report No. UKH/96/01, prepared by Access Mining Consultants Limited.

Table B4. 1999 Water Quality Results, Shamrock Site

Sample Number		Detection Limit	Units	28-WQ-StrCD-01 - 13/09/99	28-WQ-StrCD-02 - 13/09/99	28-WQ-ACD-01 - 13/09/99
Site Description						
pH (field)			pH	7.3	6.9	5.5
Conductivity (field)			µS/cm	-	-	-
pH (Lab)		0.01	pH	7.45	6.3	5.64
Conductivity (Lab)		0.01	µS/cm	105	48	42
Total Alkalinity		5	mg CaCO3/L	31	8	<5
Chloride		0.25	mg/L	<0.25	<0.25	<0.25
Hardness (CaCO3 equiv)		5	mg/L	44	18	9.2
Nitrate-N		0.05	mg/L	0.2	0.45	1.19
Nitrite-N		0.003	mg/L	<0.003	<0.003	0.003
Sulphate		1	mg/L	14.6	11.2	9.2
Total Dissolved Solids		5	mg/L	61	34	30
Analysis by ICP-USN						
	Aluminum	0.0008	mg/L	0.013	0.083	2.86
	Antimony	0.005	mg/L	<0.005	<0.005	0.396
	Arsenic	0.01	mg/L	<0.01	<0.01	0.02
	Barium	0.00004	mg/L	0.0781	0.054	0.273
	Beryllium	0.00001	mg/L	<0.00001	<0.00001	0.0002
	Bismuth	0.0004	mg/L	<0.0004	<0.0004	<0.0004
	Boron	0.002	mg/L	<0.002	<0.002	<0.002
	Cadmium	0.00001	mg/L	0.00006	0.00179	0.0377
	Calcium	0.002	mg/L	14.3	5.74	4.49
	Chromium	0.00006	mg/L	0.00032	0.00014	0.00656
	Cobalt	0.00003	mg/L	<0.00003	<0.00003	0.00673
	Copper	0.00003	mg/L	<0.00003	0.00064	0.116
	Iron	0.00001	mg/L	0.015	0.114	7.56
	Lead	0.0003	mg/L	<0.0003	0.0932	9.93
	Lithium	0.001	mg/L	0.003	0.026	0.003
	Magnesium	0.0005	mg/L	1.84	1	1.09
	Manganese	0.00002	mg/L	0.00221	0.015	1.68
	Mercury	0.0001	mg/L	<0.0001	<0.0001	0.0002
	Molybdenum	0.00007	mg/L	0.00014	<0.00007	0.0006
	Nickel	0.00001	mg/L	<0.00001	<0.00001	0.0107
	Phosphorus	0.03	mg/L	<0.03	<0.03	0.74
	Potassium	0.4	mg/L	<0.4	<0.4	0.6
	Selenium	0.004	mg/L	<0.004	0.005	<0.004
	Silicon	0.004	mg/L	1.91	2.37	4.55
	Silver	0.00005	mg/L	<0.00005	0.00089	0.176
	Sodium	0.4	mg/L	0.6	0.7	0.7
	Strontium	0.00002	mg/L	0.0489	0.0209	0.0237
	Sulphur	0.008	mg/L	5.03	3.96	3.53
	Thallium	0.001	mg/L	<0.001	<0.001	0.001
	Titanium	0.00002	mg/L	<0.00002	0.00188	0.0911
	Vanadium	0.00003	mg/L	<0.00003	0.0001	0.00568
	Zinc	0.0002	mg/L	0.0033	0.0639	0.554
Total Arsenic by Hydride AA						
	Arsenic	0.0002	mg/L	0.0015	0.001	0.022
Total Selenium by Hydride AA						
	Selenium	0.0001	mg/L	0.0004	<0.0001	0.0003

ATTACHMENT B: 1999 SHAMROCK WASTE ROCK SAMPLES LABORATORY RESULTS					
Site Number	**Detection Limit**	**Units**	**28_WR_TPBM_01**	**28_WR_TPBM_02**	**28_WR_TPBM_03**
Sample Desciption			Waste rock pile - 200 Level portal	Waste rock pile - 200 Level portal	Waste rock pile - original Shamrock
Paste pH (field)	N/A	pH	-	-	-
Conductivity (field)	N/A	µS/cm	-	-	-
pH in Saturated Paste					
pH	0.1	pH	5.7	5.3	5.8
pH in Soil (1:2 water)					
pH	0.01	pH	4.5	4.6	5.2
ICP Semi-Trace Scan					
Aluminum	5	µg/g	21400	24500	14200
Antimony	2	µg/g	880	76	720
Arsenic	2	µg/g	1190	610	49
Barium	0.05	µg/g	184	301	447
Beryllium	0.1	µg/g	0.5	0.6	0.4
Bismuth	5	µg/g	5	<5	8
Cadmium	0.1	µg/g	8.5	2.5	20
Calcium	5	µg/g	153	323	988
Chromium	0.5	µg/g	26.1	36	26.4
Cobalt	0.1	µg/g	3.5	2.6	4
Copper	0.5	µg/g	320	130	255
Iron	1	µg/g	28000	19000	38000
Lead	1	µg/g	12200	7450	611000
Lithium	0.5	µg/g	6.5	12	8.6
Magnesium	1	µg/g	203	335	909
Manganese	0.5	µg/g	2310	1370	2780
Mercury	0.01	µg/g	0.86	0.29	0.53
Molybdenum	1	µg/g	2	<1	1
Nickel	1	µg/g	26.1	12.2	11.5
Phosphorus	5	µg/g	1300	998	1740
Potassium	20	µg/g	3610	6700	3550
Selenium	2	µg/g	<2	<2	<2
Silicon	5	µg/g	176	472	848
Silver	0.5	µg/g	159	29.3	80.6
Sodium	5	µg/g	262	435	880
Strontium	1	µg/g	31	50	25
Sulphur	10	µg/g	540	880	640
Thorium	1	µg/g	5	6	4
Tin	1	µg/g	12	10	23
Titanium	0.2	µg/g	18.9	32.7	174
Uranium	5	µg/g	<5	<5	<5
Vanadium	1	µg/g	23	36	27
Zinc	0.5	µg/g	609	361	873
Zirconium	0.1	µg/g	9.7	15.4	17.3

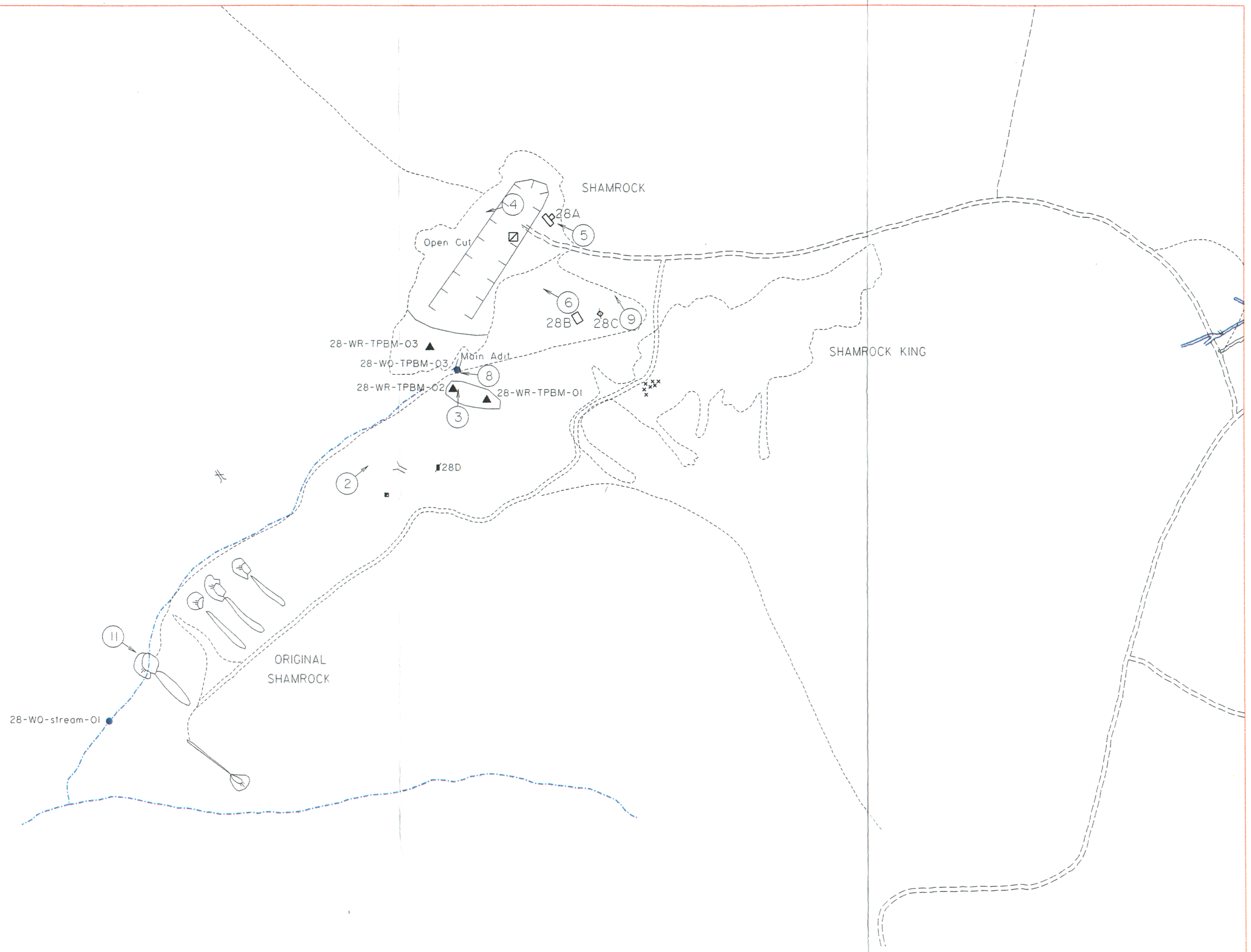
ATTACHMENT 2: 1999 SHAMROCK WASTE ROCK LABORATORY RESULTS
MODIFIED SOBEK METHOD ACID-BASE ACCOUNTING TEST

SAMPLE	SITE DESCRIPTION	PASTE pH	S(T) %	S(SO4) %	AP	NP	NET NP	NP/AP
28_WR_TPBM_01	Waste rock pile - 200 Level portal	6.3	0.03	0.02	0.3	-0.5	-0.8	<0.1
28_WR_TPBM_02	Waste rock pile - 200 Level portal	6.4	0.06	0.04	0.6	0.6	0.0	1.0
28_WR_TPBM_02 RE	Duplicate	-	0.06	0.03	0.9	-	-	-
28_WR_TPBM_03	Waste rock pile - original Shamrock	6.2	0.04	0.03	0.3	1.0	0.7	3.2

AP = ACID POTENTIAL IN TONNES CaCO3 EQUIVALENT PER 1000 TONNES OF MATERIAL.
NP = NEUTRALIZATION POTENTIAL IN TONNES CaCO3 EQUIVALENT PER 1000 TONNES OF MATERIAL.
NET NP = NET NEUTRALIZATION POTENTIAL = TONNES CaCO3 EQUIVALENT PER 1000 TONNES OF MATERIAL.
NOTE: WHEN S(T) AND/OR S(SO4) IS REPORTED AS <0.01, IT IS ASSUMED TO BE ZERO FOR THE AP CALCULATION.
N/D = NO DUPLICATE ASSAY. CALCULATIONS ARE BASED ON ASSAY RESULTS OF THE INITIAL SAMPLE.
RE = REPLICATE.

NOTE - A HIGH LEVEL OF SOLUBLE METALS (ESPECIALLY IRON) WERE OBSERVED IN MANY SAMPLES DURING THE ABA TITRATIONS.
SAMPLES WITH A NEGATIVE NET NP SHOULD BE TESTED FOR MOBILE METALS USING STANDARD SHAKE FLASK EXTRACTION TESTS.

- Building (22A: building site present reference*) / 22A* Indicates Asbestos Material
- 22A Collapsed Building
- Adit
- Collapsed Adit
- Shaft
- Collapsed/Backfilled Shaft
- Mine Rock Dump
- Bedrock Open Pit
- Trench
- Stripped Overburden Stockpile
- Stripped / Disturbed Area
- Outcrop Boundary
- Highway
- Road (gravel, 2 wheel drive)
- Road (gravel, 4X4 accessible)
- Road (inaccessible)
- Trail
- Culvert
- 24501-01 1999 Soil Sample (this study)
- Pre 1999 Soil Sample (other sources)
- 25WR04-01 1999 Waste Rock Sample (this study)
- Pre 1999 Waste Rock Sample (other sources)
- WO-12-06 1999 Water Sample
- Pre 1999 Water Sample
- Tension Cracks
- Mass Movement (note: for Forms; BelleKeno)
- Groundwater Seep
- Surface Water Flow (Stream, Creek, River)
- Lake
- Settling Pond / Water Treatment Pond
- Tailings Dam / Tailings Pond / Mill Tails
- Ponded Water / Trench
- Barrels
- Abandoned Equipment (compressors, ore cars, rails, air and water pipe)
- Mine Rails / Trestle
- Collapsed Trestle
- Solid Waste Disposal Site
- Area of Soil Contamination
- *(6) Transformer Loaction (number of transformer in brackets)
- Power Line
- Power Line Collapsed
- Aerial Transmission Towers
- 5 Photo Site (arrow shows view direction)
- GPS Survey Location
- Former Building Site (Elsa)



0 50 100 150 200

Scale 1:5000

CAD FILE: site28.dgn

Public Works And Government Services Canada / Travaux publics et Services gouvernementaux Canada

Architectural & Engineering Services
Western Region

Drawing title: / Titre du dessin:

Shamrock Site #28
Site Assessment
Yukon Territory

designed by: / concu par:
drawn by: / dessine par: C.S. Nov. / 99
approved by: / approuve par:
revisions:
date:

project no. / no. du projet: 125-12.01

dwg. no. / dessin no. 1 of 1

Photo 28-1: Waste rock below open cut at upper end of site. Note deep erosion path.

Photo 28-2: Ravine below adit and associated waste rock piles.

Photo 28-3: Partially open adit entrance.

Photo 28-4: Small test pit at lower end of site.

Photo 28-5: Main site living quarters (building 28A).

Photo 28-6: Interior of generator shed (building 28B). Note staining on rock.

Photo 28-7: Remains of collapsed shed (building 28D) at old shaft.

Photo 28-8: Rail and trestle at main adit.

Photo 28-9: Small solid waste dump adjacent to generator shed.