materials located in the area, it appears heavy construction equipment was repaired in this area.

Located on the downhill side of the Quonset Buildings #3 and #4 is a large stain approximately 200 m^2 in size. This stain covers a bedrock slope and extends down gradient towards a barrel dump. Portions of the stain area below the bedrock slope are covered with large boulder sized material as well as various types of vehicle and machinery parts (Photo 18). Minor amounts of stained soils were observed in depressions in the bedrock slope. Mapping the limits of the stained area was difficult due to the amount of snow coverage at the time the investigation was completed. As was observed at Barrel Dump #2, the stained material appeared to have migrated vertically downwards between boulder sized materials at the base of the slope. Some staining was observed in the rock material approximately 4 m away from the slope.

A total of two soil samples were collected at this site. Sample BD6 was in the middle of the stained area in a depression on the bedrock slope and sample MS-1094 was collected below a group of barrels down gradient of the stained slope. Figure 5.0 shows the sample locations.

Sample BD6 was analyzed for PCBs, hydrocarbons, PAHs and metals. Sample MS-1094 was analyzed for hydrocarbons only. Tables 8.1 to 8.4 present a summary of the analytical data from the two soil samples. The analytical results indicated exceedances of F3 and F4 above the CCME criteria in sample BD6. The F3 and F4 concentrations in BD6 were recorded at 17800 and 13800 ppm for F3 and F4 respectively. Metal exceedances above DCC Tier 2 criteria for copper, lead, and zinc were detected in sample BD6. The analytical results indicated that there was an F3 exceedance of 972 ppm, slightly above the CCME criteria of 800 ppm in sample MS-1094.

Based on field observations, the stained area may cover an area of approximately 200 m^2. Calculation of the volume of impacted material is difficult due to the lack of soil media within the contaminant plume. Remediation of the impacted material is also difficult to impracticable due to the difficulty in removing contaminants from around rock material. Assuming a maximum depth of contamination of 0.3 m in the accessible soils within the stained area, the volume of hydrocarbon impacted soils may be approximately 60 m^3. It is recommended that this material be removed since it continues to be a source for future down gradient contamination.

It is also recommended that the barrel storage areas be re-inspected once the barrels have been removed to confirm if there is any residual hydrocarbon impacted soils located below the barrels. At the time the barrels are removed, it is recommended that the area be re-inspected to confirm if there is any residual hydrocarbon impacted soils located below the barrels.

4.5.6 Barrel Dump #7

Barrel Dump #7 consists of approximately 300 empty barrels separated by the Upper station access road. In order to confirm that there was no residual hydrocarbon contamination in this area, one grab sample was collected in an area immediately below the barrel dump. This sample (MS-1095) was collected between the depths of 0 cm and

10 cm in an area where fine materials had accumulated. This sample was analyzed for hydrocarbons and the analysis indicated that the BTEX concentrations were below detectable levels. The F1-F4 fractions were detectable however, they were also below the applicable CCME residential/parkland remediation criteria. Table 8.1 presents a summary of the analytical data from the sample analyzed at this site.

Based on results from this investigation and from the metal analysis completed in the previous investigation, no additional investigation is recommended at this location. At the time the barrels are removed, it is recommended that the area be re-inspected to confirm if there is any residual hydrocarbon impacted soils located below the barrels.

4.6 Upper Station Area

4.6.1 General

The main operations center of the site was located on the summit (elev. 770 m asl) of a rocky mountain overlooking Ekalugad Fiord to the north and a large glacier/icefield to the south. The mountain is characterized with a series of small benches located on the sides of the mountain, below the summit. At approximately 60 m from the summit, the north slope of the mountain increased to a steep, nearly vertical face.

Access to the summit was achieved with the construction of a road located on the southern and eastern sides of the mountain. Facilities of the Upper Station area included the modular train, warehouse, garage, POL storage facility, barrel storage areas, antenna remains as well as the remains of several buildings (Quonset style house, paint shed and Inuit house). Large amounts of waste debris, including vehicles, barrels, and misc. metal and wood pieces are scattered around the summit. Figure 6.0 and Photo 21 presents the layout and features of the Upper site.

Previous background reports had identified the following environmental concerns on the summit area.

- PCB contamination in the areas surrounding the modular train, garage, east and west of the garage and in surface stains scattered around the site.
- Hydrocarbon contamination in the sewer outfall area, areas surrounding the garage, in the POL area, south of the Inuit House and in surface stains scattered around the summit area.
- Metal contamination in the area east of the garage, north of the modular train, and in surface stains scattered around the site.
- Dumpsites were also reported on the north and south sides of the mountain, near the Inuit House.

The upper station area is located on the summit and north and south faces of a mountain. Study areas typically had no to little soil media and there was no vegetation cover. As was seen in the mid station area, fine to coarse grained, weathered material was encountered on the ground surface in some areas, however the site is dominated with large boulder sized (>300 mm) rocks.

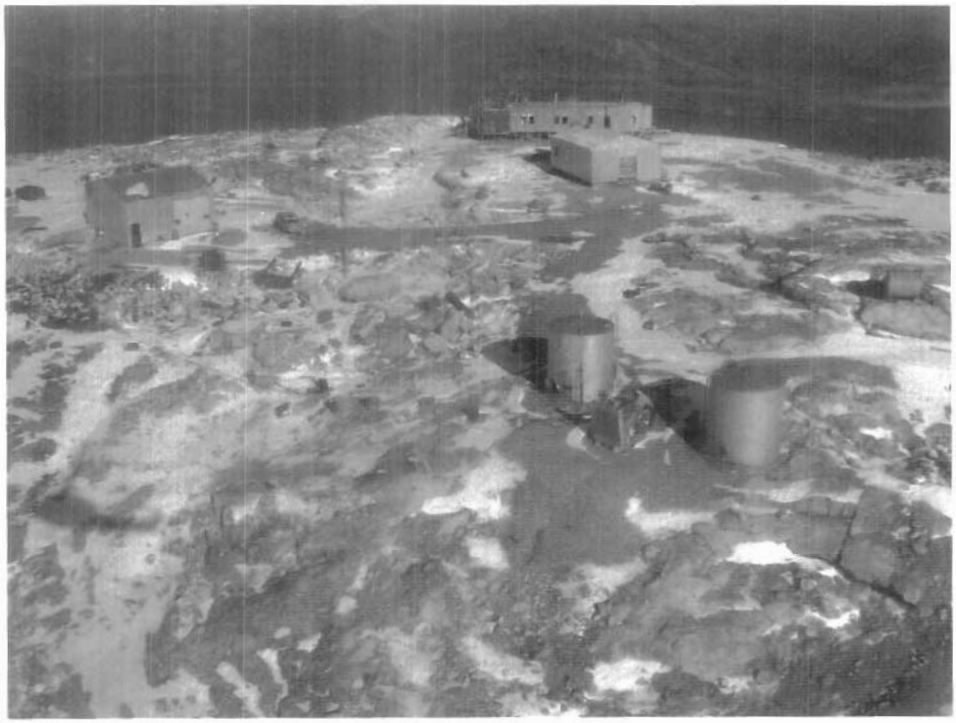

Photo 21 FOX- C Upper Station

Photo 22 PCB impacted area on south side of Module Train

In some areas, the area had been leveled and sand or gravel sized rock had been used for fill/leveling. Runoff surface water was occasionally encountered, in some locations, this water was visible, however it was commonly located within a gully filled with coarse/fine grained material or with boulder sized material.

4.6.2 Module Train Area

During the previous investigation, two areas of concern were identified adjacent to the modular train these included the following.

- PCB contamination on the south side of the train (RRMC flag #3) and
- Elevated metal concentrations on the west end of the train (RRMC flag #5).

The following paragraphs summarize the results at these two locations.

PCB Contamination

The previous investigation identified PCB contamination in the vicinity of the staircase on the south side of the train. This location was labeled as RRMC #3 and had a recorded PCB concentration of 5.6 ppm (highest level recorded in 1994 investigation and only exceedance above DCC Tier 2 criteria for PCBs). This site was partially delineated with sample locations RRMC # 2 (PCB <1 ppm) and RRMC #4 (PCB<1 ppm). Figure 6.1 and Photo 22 show the location of this site.

The scope of work for the 2004 investigation included the excavation of thee testpits around the site and one testpit (US-1037) adjacent to sample location RRMC #3 in order to confirm the maximum depth of PCB contamination. The four testpits advanced in this investigation were labeled US-1034 through US-1037. The analytical results from this investigation program are summarized in Table. 9.1. This data indicates that all PCB levels in the delineating boreholes were less than detection limits.

Based on the information obtained in this investigation it is assumed that the maximum depth of PCBs in the vicinity of RRMC #3 sample point is less than 0.45 m (sample depth of US-1037) and the volume of PCB contaminated soils is approximately 7 m^3.

Metals

The 1994 investigation identified elevated zinc levels (316 ppm) in soils in an area off the west end of the modular train. The recorded zinc levels were below DCC Tier 2 criteria. This location was labeled as RRMC #5. Figure 6.1 and Photo 23 show the location of this site.

The scope of work for the 2004 investigation included the excavation of thee testpits around the site and one testpit adjacent to sample location RRMC #5 in order determine if any higher levels were detectable in the area. The four testpits advanced in this investigation were labeled US-1038 through US-1041. During the excavation of these testpits a hydrocarbon odor was encountered at a depth of 25 mm and all sample locations were frozen below a depth of 50 mm. The analytical results from this

investigation program are summarized in Tables 9.1 – 9.3. The recovered soils samples were analyzed for metals and due to the presence of a hydrocarbon odor the soil samples were also analyzed for PCBs and hydrocarbons. This data indicates that all metal concentrations (including zinc) were below DCC and CCME residential criteria. All PCB levels in the delineating boreholes were less than detection limits. Hydrocarbon analysis indicated that there were exceedances for hydrocarbons in US-1038 (F2 and F3), US-1040 (F2 and F3) and US-1041 (F2).

Based on the results of this investigation program it appears that the elevated zinc levels in soil determined in the previous investigation are contained to material located on the ground surface. Based on the placement of the testpits, the hydrocarbon contamination plume covers an area of at least 25 m^2. Vertical delineation of the hydrocarbon contamination could not be achieved due to the presence of frozen materials. However, assuming that the fill in this area is approximately 0.45 m thick and the hydrocarbon impacted material covers an area of 30 m^2, there may be approximately 14 m^3 of hydrocarbon impacted soils in this area.

4.6.3 Sewage Outfall/Dump Area

Located on the north side of the modular train is the sewage outfall as well as an area that was previous referenced as a dump. This portion of the summit consists of a number of steps, which drop in elevation prior to becoming a steep cliff (approximately) 60 – 80 m north of the modular train. The sewage outfall area extended from the end of the sewer discharge line down the north mountain face. Pieces of the drain line are visible, however the original alignment and the discharge end of the sewer line are unknown. Due to the site conditions and the amount of snow at the time of the 2004 investigation, the identification of surface stained areas as well as the location of the previous sample points was difficult. Photos 24, 25 and 26 show the sewage outfall and dump area.

An inspection of the north side of the mountain indicated that the dump consisted of occasional piles of scattered debris over the northern slope. The debris consisted of piles of filters, barrels, strapping, cable, wire, wooden crates and assorted steel pieces. One partially filled and leaking barrel was also located at the location of RRMC flag #10. Located in the vicinity of the barrel was a narrow (0.6 m wide ribbon of staining which followed a natural drainage pathway down the mountain face. Field observations indicated that this drainage pathway originated higher up on the mountain and it potentially may have received runoff from the sewer outfall. Due to the terrain on this site of the mountain there were a number of natural pathways, which lead to areas down gradient. Various amounts of sand and gravel material (depths between 0.1 to 0.5 m) were located in the drainage pathways as well as along portions of the rock faces. Surface water was not observed on the north face of the mountain in 2004.

The 1994 investigation at this site included the analysis of ten samples for metals and PCBs. Exceedances above DCC criteria were detected in six of the samples for PCBs and in two of the samples for metals (copper and lead). The highest PCB and metals concentrations recorded in this area in 1994 were located below the sewer outfall.

Photo 23 Metal impacted at west end of Modular Train

Photo 24 Discharge area of sewage outfall

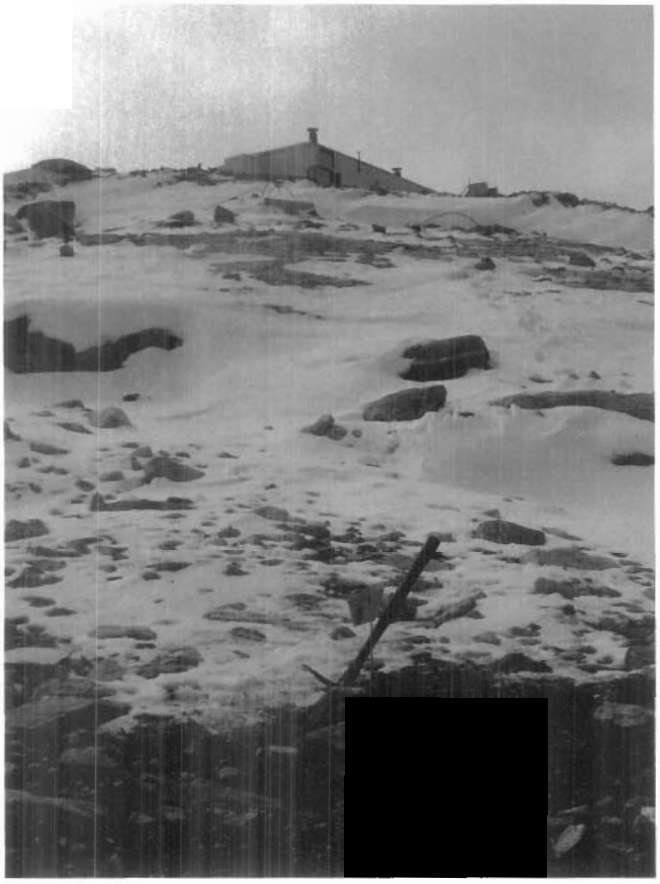

Photo 25 Sample location US-1028 below sewage outfall

Photo 26 Scattered debris in outfall dump area

The 2004 investigation included the collection of nine additional samples that were analyzed for PCB and metals. Hydrocarbons were also analyzed in seven of the soil samples. In order to complete delineation, samples locations were selected in down gradient areas that would receive runoff from areas that had been previously determined to be impacted. Sampling depths were limited due to the lack of soil or gravel like material on top of the large sized rock.

A summary of the analytical data is presented in Table 10.1, 10.2 and 10.3 in Appendix D. The analytical data indicates that delineation of the metal and PCB contamination was achieved in all areas of the study area except PCBs in Testpit US-1028. The analytical data, indicated this sample had a PCB concentration of 2.2 ppm and a F3 concentration of 1050 ppm, both of which exceeded the respective DCC Tier 1 and CCME remediation criteria. Testpit US-1028 is located approximately 80 m northeast of the outfall area (Photo 25). Delineation down gradient of US-1028 is achieved with US-1026. Metals, hydrocarbons and PCBs were all below DCC and CCME criteria in this testpit.

Based on the information obtained in this investigation, there may be approximately 30 m^3 of PCB and hydrocarbon contaminated material and 5 m^3 of metal contaminated material at this site.

4.6.4 Garage Area

The previous investigation, identified a number of environmental concerns around the garage area (Shown in Figure 6.2), the concerns included the following.

- PCB contamination and metal contamination south, and east of the garage.
- Hydrocarbon and PCB impacted soils to the west of the garage.
- Hydrocarbon contamination in dump area south of the garage.

During an inspection of this area in 2004, it was also noticed that a surface stain was visible around the base of the D8 cat that was located on the west side of the garage. This stain covered an area of approximately 16 m^2. The following sections provide details of all the investigation activities that were completed in the Garage area.

West of Garage - PCB Contamination

Located 2 m west of the Garage is a surface stain that covers an area of approximately 2 m x 2.5 m (5 m^2). This site is presented in Figure 6.2 and in Photo 27. The analysis of a surface sample (RRMC tag #22) from this stain in 1994, determined that there was PCB and metal exceedances above CCME residential criteria. The PCB concentration was 3.8 ppm and there were elevated metal concentrations for chromium, lead and zinc. One testpit was hand excavated at this site in 2004 (US-1075) in an area close to the previous sample point. The maximum depth of excavation in this testpit was limited to 0.20 m due to the presence of solid rock below that depth. One soil sample was recovered between the depths of 0.15 m to 0.20 m and was analyzed for hydrocarbons, PCBs and metals.

Tables 11.1, 11.2 and 11.3 in Appendix D present a summary of the analytical data for sample collected at this surface stain. The analytical data indicated that the sample collected from US-1075 had a PCB concentration of 0.1 ppm, BTEX concentrations were

less than detection limits and CWS F1-F4 fractions were below criteria. Metal analysis indicated that all metal concentrations were below DCC criteria.

Due to the concentrations of PCBs in the sample analyzed, it appears that the contamination in this area is confined to the near surface levels and is less than DCC Tier 2 criteria. Based on the size of the surface stain and the maximum depth of fill in this location, there is approximately 1 m^3 of PCB contaminated material at this location.

West of Garage – D8 Cat Stain

Located northwest of the Garage is a D8 Cat, below the cat is a surface stain that covers an area of approximately 4 m x 4 m (16 m^2). This stain appeared to be originating from liquids dripping out of the back end of the cat. The previous environmental investigation did not include any investigation in this stain area. This site is presented in Figure 6.2 and in Photo 28.

The 2004 investigation included the excavation of one testpit (US-1076) in this stain to determine hydrocarbon concentrations in the granular material located on top of the underlying rock. Two soil samples were analyzed from this testpit. One sample was collected from a depth of 0-15 cm and the second was collected at a depth of 20 cm. The analytical data presented in Table 11.2 indicates that there were exceedances above the CCME criteria for the F2 (6540 ppm) and F3 (15600) ppm in the sample collected at a depth of 0-15 cm and there were no hydrocarbon exceedances from the sample collected at 20 cm. Based on the scope of work completed at this stain and the depth of fill materials in this area, there is approximately 4 m^3 of hydrocarbon contaminated material in this area.

West of Garage – Gravel Pad Stain

Located west of two portable fuel tanks and a truck, on the west side of the garage is a level pad with a sandy gravel surface. A light stain was visible on the surface of this pad. This pad has approximate dimensions of 14 m x 40 m. and the stained area covered approximately 60% of this area. This site is presented in Figure 6.2 and in Photo 29.

The previous investigation in this area included the collection of two soil samples (RRMC #26, #27) from the surface of the pad as well as the collection of one sample down gradient towards the south (RRMC #28). The analysis of these three soil samples indicated that metal and PCB levels were less than the CCME remediation criteria. The previous report also estimated that 15 m^3 of hydrocarbon contaminated soils may be present at in this area, however no hydrocarbon analysis was completed.

In order to confirm if hydrocarbon contamination was present at this location, the 2004 investigation included the excavation of one testpit in the middle of the stained area (US-1071). During the excavation of this testpit it was noticed that the surficial geology profile of this area consisted of 0.75 m of moist sandy gravel fill material placed on top of rock. At a depth of 0.50 m the gravel was wet and had a very faint hydrocarbon odor. Two soil samples were collected at this testpit, one from a depth of 0.20 m and the second from a depth of 0.50 m.

Photo 27 PCB impacted area west of Garage

Photo 28 Stain below D8 Cat, west of Garage

Photo 29 Staining on gravel pad west of Garage

Photo 30 PCB and metal impacted area, east of Garage

These two samples were submitted for hydrocarbon analysis. Table 11.2 presents a summary of the data from sample US-1071. The data indicates that there were no exceedances in the sample collected at a depth of 0.2 m however, there was a F3 exceedance (1210 ppm vs. criteria of 800) in the sample collected at a depth of 0.5 m. Due to the small amount of evidence in the field which indicated hydrocarbon contamination at this site, no additional boreholes were installed around the perimeter of the pad area. Assuming that there is a layer of hydrocarbon impacted material between the depths of 0.5 m and 0.75 m over the entire area of the pad, there may be approximately 140 m^3 of material, which exceeds CCME residential criteria for the F3 hydrocarbon fraction, in this area.

East of Garage - PCB Contamination

The previous investigation identified a surface stain approximately 16 m^2 in size on the east side of the Garage. The stain was located between the man door and the overhead door on the east side of the garage. One soil sample, RRMC flag #21, was collected from this area and was analyzed for PCBs and metals. The PCB concentration was determined to be 3.6 ppm and the metals that exceeded DCC Tier 2 criteria included copper, lead and zinc. This site is presented in Figure 6.2 and in Photo 30.

At the time of the 2004 investigation, the previously identified 16 m^2 size stain was not apparent in this area however, a black stain approximately 8 m^2 was visible along the garage wall and a second stain <2 m^2 in size was visible off the northeast corner of the garage. The scope of work in the 2004 investigation included the excavation of four testpits at this site in order to delineate subsurface contamination. One of the testpits was excavated adjacent to RRMC flag #21 (US-1079) in order to determine the vertical extent of contamination and three testpits (US-1050, US-1078 and US-1079) were excavated to delineate the horizontal extent.

Tables 11.1 and 11.2 present a summary of the PCB and hydrocarbon analysis from this location. The analysis of the sample from US-1079 indicated that the maximum depth of PCB contamination was less than 0.3 m and was delineated horizontally in testpits, US-1050 and US-1078. An exceedance of the DCC Tier 1 criteria of 1.3 ppm was detected in US-1079 (1.7 ppm) therefore PCB delineation to the north was not achieved. Hydrocarbon contamination (F3) exceeding CCME criteria was detected in all boreholes, except for US-1050. Figure 6.2 shows the approximate extent of the PCB and hydrocarbon contaminant plume in this area. Based on the position of the boreholes, the PCB and hydrocarbon plume covers an area of approximately 40 m^2, assuming a maximum depth of contamination at 0.2 m, there is at least 8 m^3 of PCB (DCC Tier 1) and metals (DCC Tier 2) and hydrocarbon impacted material at this site.

South of Garage

The previous investigation identified a surface stain and a dump area on the south side of the Garage. An inspection of this site in 2004 identified a very large surface stain in this area as well as areas where debris had been discarded. The debris consisted of barrels (some of which were leaking), semi buried barrels, vehicle parts and scrap metal pieces.

The surface stain was visible on the rocky slope immediately below the Garage, and appeared to get more extensive at the base of the slope and in the areas adjacent to the pipeline from the POL storage facility (See Photos 31 - 35). A second large surface stain was visible below a pile of leaking 45 L barrels. This stain had migrating down an access road and then flowed down the mountain slope (Photo 36-38) to the south (approximately 60 m from the Garage). Due to the presence of a number of small cliffs and valleys, the contaminants were directed to migrate down gradient through a number of natural drainage courses.

The previous investigation at this dump area consisted of the collection of 10 surface soil samples. Two of these soil samples exceeded the CCME PCB criteria and there was one elevated chromium metal concentration. The scope of work of the 2004 investigation included the excavation of 12 testpits. Figure 6.2 shows the location of the testpits and Tables 12.1, 12.2 and 12.3 present a summary of the analytical data.

Metals

The previous investigation identified an elevated chromium concentration in surface sample RRMC 29 (67 ppm). To determine if there was any higher concentrations of chromium in this area, the 2004 investigation included the collection of additional testpits in the area around RRMC 29 (US-1042 and US 1044). As indicated in Table 12.1, there were no additional elevated chromium concentrations recorded in the additional soil samples. Figure 6.2 presents the location of the boreholes in the vicinity of RRMC 29 (southwest of garage).

PCBs

The 1994 investigation identified PCB concentrations above DCC Tier 1 criteria in sample RRMC #13 and RRMC #16. Earth Tech was able to complete delineation of these two areas using existing RRMC data and with the collection of soil samples from additional testpits. Figure 6.2 presents the location of the PCB plume around RRMC flag #13 and flag #16. Two additional areas with PCBs levels above DCC Tier 1 criteria were also encountered (US-1052 and US-1074). Delineation east of borehole US-1074 was not achieved in this investigation. Based on the location of the delineating boreholes, the PCB plume may be approximately 170 m^2 in size, assuming the same vertical conditions as in the metals investigation, there may be 35 m^3 of PCB impacted material at this site (< DCC Tier 2).

Hydrocarbons

An extensive amount of surface staining was observed on the side and at the bottom of the embankment below the Garage. The source of the staining appeared to be from the disposal of waste oil. There was also an extensive amount of staining observed in the vicinity of the POL storage pipeline that was located at the base of the embankment. Potentially this pipeline may have been leaking while it was in use. Very high F3 and F4 fractions were identified in samples collected in US-1051, US-1052 and US-1073. Delineation to the down gradient side of the stain was achieved with testpits US-1042,

Photo 31 Staining below southwest corner of Garage

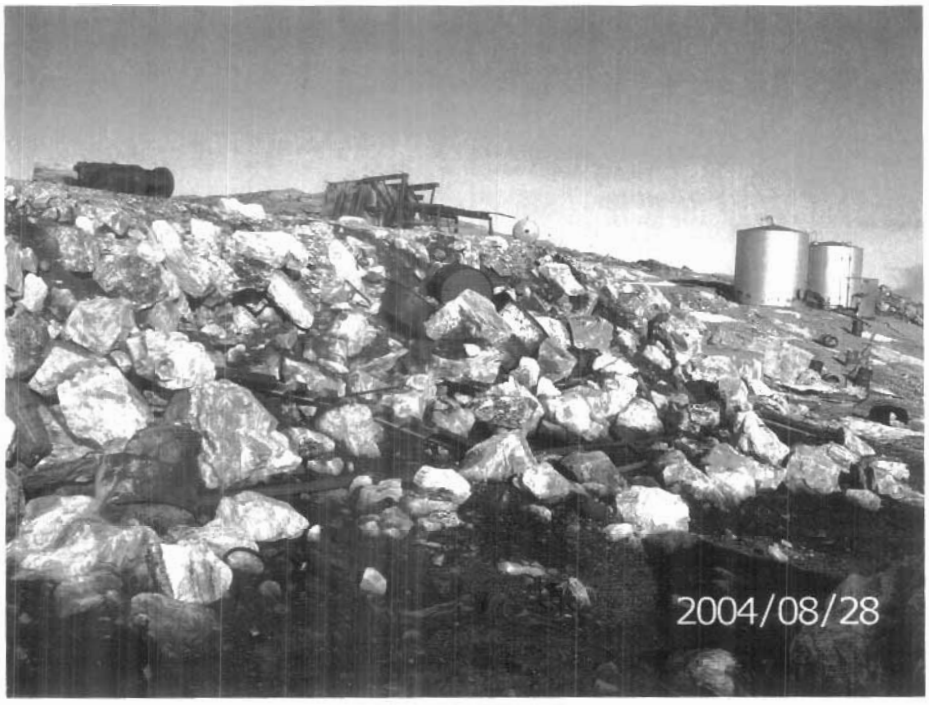

Photo 32 Staining below southeast corner of Garage, note semi buried fuel pipeline

Photo 33 Staining below Garage, looking north

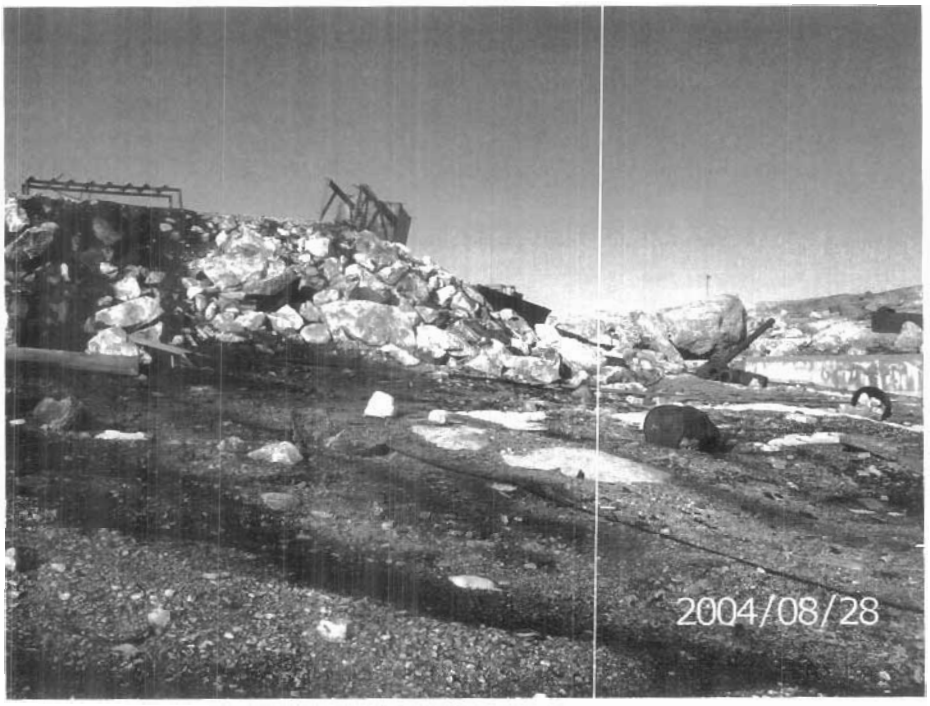

Photo 34 Staining below Garage, looking north east

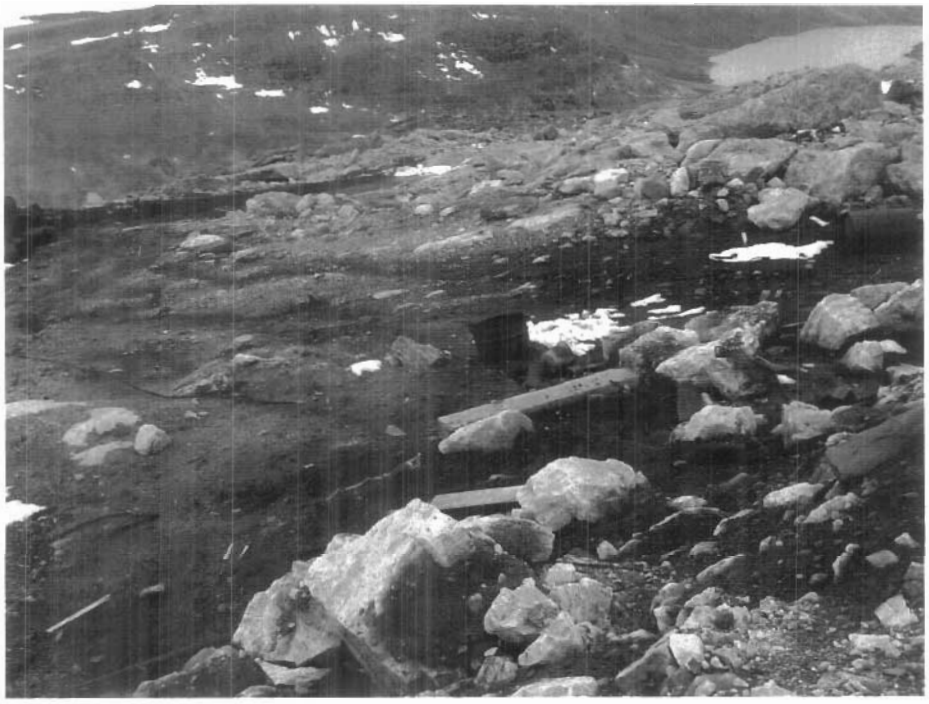

Photo 35 Staining below Garage, looking south

Photo 36 Staining below leaking barrels in Garage dump area

Photo 37 Staining below leaking barrels, looking south

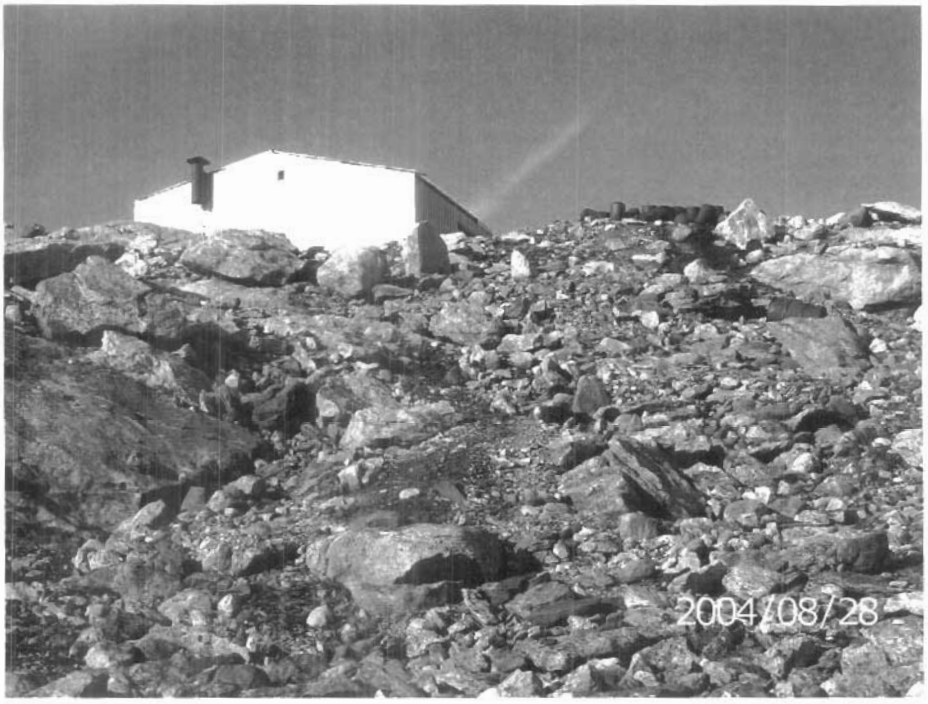

Photo 38 Sample location US-1045, down-gradient of dump