Table 6.8

PIN-4, BYRON BAY: RESULTS - POL 1

Indicator Chemical	Level A	Level B	Level C	Background	P4-014	P4-015	P4-016
Arsenic (mg/kg)	10	30	50	3.6	-	-	1.2
Barium (mg/kg)	200	500	2000	785	-	-	60
Chromium (mg/kg)	75	250	800	-	-	-	17
Lead (mg/kg)	50	200	600	21	-	-	530
Nickel (mg/kg)	50	100	500	8	-	-	11
TPH (mg/kg)	100	1000	5000	-	21000	<5	760
PCB (mg/kg)	0.1	1	10	-	0.1	<0.01	0.22
DDT (mg/kg)	0.1	2	20	-	-	-	2
Dieldrin (mg/kg)	0.1	2	20	-	-	-	2
$C1_4$ Ethylene (mg/kg)	n	n	n	-	-	-	0.018

- Not Analyzed
n No Guidelines

6.4.4 POL 4

6.4.4.1 Visual Observations and Sample Locations

A fuel cache was located on a 0.6 m high gravel pad west of the access road and 100 m west of the hangar. The cache consisted of two pallets containing 45 gallon drums of fuel. The pad slopes at about 2° to the south towards a large pond. No stains or odours were noted in the area. The area is represented by sample P4-027. No analyses were carried out on the sample from this site.

6.5 PALLET LINES

Four pallet lines were inspected and sampled on the PIN-4 site.

6.5.1 PALLET LINE 1

6.5.1.1 Visual Observations and Sample Locations

Pallet Line 1 which comprised the main storage area, is located on a pad on top of a beach ridge about 500 m east of the module train and west of Landfill E. Material stored in this area included drums containing hydrocarbon products, a pipe rack and other equipment. Numerous surface stains up to 8 m^2 in area were present on the pad represented by sample P4-001. A strong odour accompanied some of the stains. One area, represented by sample P4-009 appears to include the remains of burned electrical equipment. Sample P4-009 located between Landfill E and Pallet Line 1 is described in more detail in Section 6.3.1.5. Sample P4-003 was taken at the southeast corner of the storage area near a pile of empty drums and scrap metal. A heater (furnace) which may have been insulated with asbestos was observed in this pile.

Additional samples obtained in the area included P4-002 and P4-004. Sample P4-002 was taken in a 3 m^2 stained area having a tar-like appearance and a hydrocarbon odour. Sample P4-004 was taken in a brown stained area. No odours were detected at this location.

6.5.1.2 Analytical Results

Samples P4-001 and P4-004 were analyzed for all parameters. Sample P4-001, located in a stain next to a group of drums, contained arsenic, barium, chromium, lead, nickel and TPH. Sample P4-004, taken in a lightly stained area, contained arsenic, barium, chromium, lead, nickel and TPH. Sample P4-002, from a smaller stained area (3 m^2), was analyzed for PCBs and TPH, and both were detected. Analyses of P4-009 indicated the presence of arsenic, mercury, barium, cadmium, chromium, lead, TPH and PCBs. Concentrations of parameters detected in the analyses are presented in Table 6.9.

The level of lead detected in sample P4-001 was greater than 50 percent of the Level A criterion but still within typical ranges expected for the area. The hydrocarbon concentration exceeded Level B criterion indicating that the stain (8 m^2) was likely from a localized hydrocarbon spill.

Staining observed at sample location P4-002 also appears to be the result of hydrocarbon spillage or leakage. TPH levels detected in the sample exceeded Level A standards and the PCB concentration exceeded 50 percent of Level A. TPH detected in sample P4-004 was greater than 50 percent of the Level A criterion suggesting the brown staining may be a reflection of a weathered or diluted hydrocarbon spill or leak.

Table 6.9

PIN-4, BYRON BAY: RESULTS - PALLET LINE 1

Indicator Chemical	Level A	Level B	Level C	Background	P4-001	P4-002	P4-004	P4-009*
Arsenic (mg/kg)	10	30	50	3.6	2.4	-	3.5	1.3
Mercury (mg/kg)	0.2	2	10	0.8	<0.05	-	<0.05	0.1
Barium (mg/kg)	200	500	2000	785	98	-	33	39
Cadmium (mg/kg)	1.5	5	20	0.43	<1	-	<1	6
Chromium (mg/kg)	75	250	800	-	35	-	17	21
Lead (mg/kg)	50	200	600	21	38	-	17	670
Nickel (mg/kg)	50	100	500	8	17	-	7	<5
TPH (mg/kg)	100	1000	5000	-	1500	320	82	250
PCB (mg/kg)	0.1	1	10	-	<0.01	0.07	<0.01	1.6

- Not Analyzed
* Also included in Landfill E.

Implications associated with the findings of analyses of sample P4-009 are presented in detail under Landfill E in Section 6.3.5.3. In general mercury exceeded 50 percent of Level A criteria and cadmium and PCBs were greater than Level B and lead was in excess of Level C. The burning of electrical equipment and the presence of PCBs indicates a potential concern regarding the presence of polychlorinated dibenzofurans (PCDF).

6.5.1.3 Evaluation of Risk Assessment and Analytical Results

Analysis of samples from several of the stained areas in this pallet line indicates the presence of metals (lead and cadmium), TPH and PCBs above the Quebec Level B criterion. Additional sampling is required to determine the nature of contamination in the stains not investigated and to determine the areal extent of each stain at depth. Since the elevated levels of PCBs and TPH are due to staining and no migration has been observed, the environmental risk of this area is low. The stains will require further evaluation. The physical hazard associated with this site is low.

6.5.2 PALLET LINE 2

6.5.2.1 Visual Observations and Sample Locations

Pallet Line 2 is located downslope and northeast of POL 2. The storage area slopes at about 3° toward the sea, about 30 m to the southeast (Plate 7). Material consisted of crates, drums on pallets and heavy equipment to be shipped out by barge. No stains or odours were noted in this area and no samples were obtained to represent this area.

6.5.3 PALLET LINE 3

6.5.3.1 Visual Observations and Sample Locations

Pallet Line 3 is located on the beach about 60 m upslope of the sea and 200 m southwest of the mouth of Sinclair Creek. The area which slopes at 3° toward the sea, was used to store drums containing various hydrocarbon products. A partially burned drum was observed about 80 m northeast of the area where the DEW station access road meets the beach. Several spills, up to 4 m^2 in area, some accompanied by a strong odour, were observed on the surface of the area. The 4 m^2 spill area is represented by sample P4-018.

6.5.3.2 Analytical Results

Sample P4-018 was analyzed for all parameters to identify the nature of the stain observed in the area.

The results indicated that the concentrations of lead and TPH exceeded the Level A criterion and the PCB concentration was greater than 50 percent of the Level A criterion. Concentrations of all chemicals detected in the analyses are presented in Table 6.10.

The staining observed at this location appears to be the result of hydrocarbon spillage. The elevated lead level may also be associated with the stain and therefore of limited areal extent. The areal extent of the PCBs has not been determined.

Table 6.10

PIN-4, BYRON BAY: RESULTS - PALLET LINE 3

Indicator Chemical	Level A	Level B	Level C	Background	P4-018
Arsenic (mg/kg)	10	30	50	3.6	1.5
Barium (mg/kg)	200	500	2000	785	50
Chromium (mg/kg)	75	250	800	-	20
Lead (mg/kg)	50	200	600	21	68
Nickel (mg/kg)	50	100	500	8	10
PCB (mg/kg)	0.1	1	10	-	0.07
TPH (mg/kg)	100	1000	5000	-	320

- Not Analyzed

6.5.3.3 Evaluation of Risk Assessment and Analytical Results

The magnitude of the contaminants present at this pallet line was found to have little impact upon the overall site risk assessment. The chemicals were present at concentrations which were below the Quebec Level B soil contamination guidelines. The staining observed, while localized and of limited areal extent, may be more concentrated at depth. This site is assessed as being of low environmental risk and of low physical hazard. Further sampling will be required to provide more information.

6.5.4 PALLET LINE 4

6.5.4.1 Visual Observations and Sample Locations

Pallet Line 4, utilized for the storage of cylinders, is located just south of the DEW station gasoline tank along the access road to the garage. The pad slopes toward the west to a levelled gravel area. A rust coloured stain about 30 m^2 in area, represented by sample P4-024, was observed downslope of the cylinder storage. No odour accompanied the stain.

6.5.4.2 Analytical Results

Sample P4-024 was analyzed for all parameters except the volatile organic compounds. The results indicated the presence of arsenic, mercury, barium, chromium and lead (Table 6.11). Only the mercury concentrations in the sample exceed the Quebec Level A criterion. Although this mercury concentration falls within expected typical ranges for the area, the level is inconsistent with levels detected in other samples.

6.5.4.3 Evaluation of Risk Assessment and Analytical Results

While the concentration of substances detected in the sample from this pallet line did not exceed the Quebec Level B criterion, mercury was a significant contributor to the overall site non-carcinogenic hazard index. Further sampling is required to determine whether the concentration of mercury increases with depth in the gravel pad. The area is of low risk due to the small area and the small migration potential.

6.6 OUTFALL AREAS

6.6.1 SEWAGE OUTFALL

Only one sewage outfall was observed at PIN-4.

6.6.1.1 Visual Observations and Sample Locations

Sewage is piped from the northwest end of the Module Train to a 35 m by 25 m lagoon located about 40 m north of the garage. This lagoon is apparently recent as it was not visible on older aerial photographs. From the lagoon, the effluent appears to run down the slope toward a pond from which water sample P4-C was taken.

The area is represented by soil samples P4-019 and P4-020. Sample P4-019 was obtained in a disturbed area in the recently constructed sewage lagoon. No odours or staining were evident in the area and no vegetation was present. Sample P4-020 was taken in what appeared to be a former effluent discharge area. The area was covered by relatively lush vegetation typical of outfalls observed at other sites.

Table 6.11

PIN-4, BYRON BAY: RESULTS - PALLET LINE 4

Indicator Chemical	Level A	Level B	Level C	Background	P4-024
Arsenic (mg/kg)	10	30	50	3.6	0.1
Mercury (mg/kg)	0.2	2	10	0.08	0.26
Barium (mg/kg)	200	500	2000	785	38
Chromium (mg/kg)	75	250	800	-	8
Lead (mg/kg)	50	200	600	21	13

- Not Analyzed

6.6.1.2 Analytical Results

Samples P4-019 and P4-020 were analyzed for all parameters. P4-019 was found to contain arsenic, barium, chromium, lead and nickel at concentrations below 50 percent of Level A. PAHs, including fluoranthene, phenathrene, benzo(b)fluoranthene and benzo(k)fluoranthene were also present above Level A in P4-019. PCBs were present at concentrations exceeding Level A in P4-019, and above Level B in P4-020. Sample P4-020 also contained arsenic, barium, chromium and nickel below 50 percent of Level A. Total PAHs including trichloroethylene and tetrachloroethylene were above 50 percent of Level A in P4-020. Concentrations of parameters detected in the analyses are presented in Table 6.12.

6.6.1.3 Evaluation of Risk Assessment and Analytical Results

All substances detected were present at concentrations below the Quebec Level B criterion. Further assessment and analysis should be completed to evaluate the extent and implications of the PAHs and PCBs identified in the outfall area. The presence of these compounds in an area that has been recently disturbed indicates concentrations may vary vertically and laterally within the disrupted area. The physical hazard and environmental risks in this area are low.

6.7 BUILDING PROXIMITIES

6.7.1 DEW STATION

6.7.1.1 Visual Observations and Sample Locations

The PIN-4 DEW Station buildings consist of Module Train A, garage and warehouse. The station is situated on top of a low sand and gravel ridge. Drainage from the west side of the ridge in the area of the garage was toward the northwest and west. Drainage on the east side of the ridge, in the area of the warehouse, was toward the north. South of Module Train A, the ridge slopes gently to the southeast. Numerous small surficial stains were observed on the gravel pad around the garage. The largest of these, 2 m^2 in area, was accompanied by a slight odour. This area is represented by sample P4-021 and P4-022. Paint stains and some rust discolouration, observed in the area adjacent to the powerhouse on the west end of Module Train A, are represented by sample P4-026.

6.7.1.2 Analytical Results

Sample P4-022 was taken from a 2 m^2 stained area near the garage and analyzed for TPH and PCBs. Both substances were detected in the sample. Sample P4-026, taken from an orange stained area near the powerhouse, was analyzed for metals, TPH and PCBs. The results indicated the presence of arsenic, mercury, barium, cadmium, chromium, lead, nickel and PCBs. Concentrations of parameters detected in the analyses are presented in Table 6.13.

The TPH concentration in sample P4-022 near the garage, was above 50 percent of the Level A criterion and PCBs were present at a concentration greater than Level A. Sample P4-026 from the stained area near the powerhouse, contained levels of mercury and lead which exceeded Level C criterion. Cadmium was found at a concentration that exceeded Level B. Barium, chromium and PCBs exceeded the Level A criterion.

Based on the results of analysis the staining observed at sample location P4-022 may be the result of hydrocarbons. The orange staining observed at sample P4-026 likely reflects the presence of the metals due to paint spills.

Table 6.12

PIN-4, BYRON BAY: RESULTS - OUTFALL

Indicator Chemical	Level A	Level B	Level C	Background	P4-019	P4-020
Arsenic (mg/kg)	10	30	50	3.6	3	2.7
Barium (mg/kg)	200	500	2000	785	35	81
Chromium (mg/kg)	75	250	800	-	21	22
Lead (mg/kg)	50	200	600	21	15	37
Nickel (mg/kg)	50	100	500	8	9	13
PCB (mg/kg)	0.1	1	10	-	0.12	1.1
PAH (Total) (mg/kg)	1	20	200	-	1.26	0.82

- Not Analyzed

Table 6.13

PIN-4, BYRON BAY: RESULTS - DEW STATION

Indicator Chemical	Level A	Level B	Level C	Background	P4-022	P4-026
Arsenic (mg/kg)	10	30	50	3.6	-	2.5
Mercury (mg/kg)	0.2	2	10	0.08	-	17
Barium (mg/kg)	200	500	2000	785	-	290
Cadmium (mg/kg)	1.5	5	20	0.43	-	8
Chromium (mg/kg)	75	250	800	2.6-34.0	-	96
Lead (mg/kg)	50	200	600	21	-	980
Nickel (mg/kg)	50	100	500	8	-	13
TPH (mg/kg)	100	1000	5000	-	58	<5
PCB (mg/kg)	0.1	1	10	-	0.4	0.46

- Not Analyzed

6.7.1.3 Evaluation of Risk Assessment and Analytical Results

The elevated levels, particularly of mercury as well as cadmium and chromium, contribute to the overall site non-carcinogenic site hazard index. The extent of PCB contamination is unknown, as insufficient data is available to ascertain whether this is a localized condition or perhaps a more widespread problem across the station area. Further assessment and analysis should be completed in order to determine the extent of the PCBs. The presence of cadmium exceeding Level B would not be expected to have a significant influence on overall site risk. The physical hazards in this area are low.

6.7.2 HANGAR

6.7.2.1 Visual Observations and Sample Locations

The hangar building is located on a gravel pad about 1200 m southwest of the Module Train A, south of the west end of the airstrip. The pad slopes at about 5° toward a small lake represented by water sample P4-E. Rust discoloration was observed in low, wet areas in both southeast and southwest corners at the base of the hangar pad fill. A stain accompanied by a mild hydrocarbon odour was noted inside the hangar near the furnace room.

Samples P4-028 through P4-030 were obtained to represent areas near the hangar. Samples P4-028 and P4-029 were obtained in areas adjacent to the gravel pad surrounding the hangar building. Sample P4-030 was collected from a stained area inside the hangar near the furnace room.

6.7.2.2 Analytical Results

Water sample P4-E obtained from the small lake adjacent to the hangar was found to be below detection limits on all parameters analyzed. Sample P4-030 was analyzed for TPH and PCBs to determine the nature of the staining observed in the area. Concentrations of parameters detected in the analyses are presented in Table 6.14.

The TPH levels detected in sample P4-030 exceeded the Quebec Level A criterion while PCB concentrations were well in excess of the Level B criterion.

6.7.2.3 Evaluation of Risk Assessment and Analytical Results

The staining identified in the hangar appears to be hydrocarbon based with a significant presence of PCBs. It is understood that transformer cooling oils were being stored inside the hangar during retrograding, therefore leaks or spillages may have occurred. Additional assessment should be completed to determine if the PCBs are associated with the staining or whether the problem is more widespread. The migration potential from this area is low, therefore, the environmental risk is only moderate. The physical hazard present on the site is low.

Table 6.14

PIN-4, BYRON BAY: RESULTS - HANGAR

Indicator Chemical	Level A	Level B	Level C	Background	P4-030
PCB (mg/kg)	0.1	1	10	<0.01	7.3
TPH (mg/kg)	100	1000	5000	<5	470