uma

February 14, 2003

File No.: 0171-120
FOX-5 3.6

Jim Wall
Technical Advisor
Nunavut Water Board
P.O. Box 119
Gjoa Haven, NU X0B 1J0

Dear Mr. Wall:

RE: Application for Amendment to Water Use Licence NWB5QIK0207

UMA Engineering Ltd. is submitting an application for an amendment to the above-noted water use licence for the clean up of the FOX-5 DEW Line Site. The application is being submitted on behalf of Defence Construction Canada (DCC) and the Department of National Defence.

As part of the application, we have included a copy of a letter that was sent to the Nunavut Impact Review Board outlining the details of the amendments. This letter contains design drawings, a summary of potential impacts and mitigative measures, and a copy of the report completed by DCC regarding the due diligence work completed at FOX-5 during 2002.

We trust the information provided is sufficient for you to process the amendment. Please feel free to contact the undersigned if you have comments or require additional information.

Sincerely,

UMA ENGINEERING LTD.

Eva Schulz, P.Ag.
Environmental Scientist
eschulz@umagroup.com

EMS:mv

Encl. NIRB Letter
Design Drawings

cc: Scott Hamilton, DCC

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INTERNAL	
PC	I.P
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CEO	
BRD	
EXT.	

UMA Engineering Ltd. 2540 Kensington Road NW Calgary Alberta T2N 3S3 Canada
telephone (403) 270-9200 ***facsimile*** (403) 270-0399 ***web site*** www.umagroup.com

030219NWB5QIK Amend App-ILAE

P.O. Box 119
Gjoa Haven, NU X0E 1J0
Tel: (867) 360-6338
Fax: (867) 360-6369

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NUNAVUT WATER BOARD
NUNAVUT IMALIRIYIN KATIMAYINGI

WATER LICENCE APPLICATION FORM

Application for: (check one)

__New ✓Amendment __Renewal __Assignment

LICENCE NO:
(for NWB use only)

1. NAME AND MAILING ADDRESS OF APPLICANT/LICENSEE

Scott Hamilton, Environmental Officer
Defence Construction Canada Ltd.
Place de Ville, Tower B
112 Kent Street, 17th Floor
Ottawa, Ontario K1A 0K3

Phone: 613-998-4583
Fax: 613-998-1061
e-mail: HAMILTSC@dcc-cdc.gc.ca

as administered by:
Eva Schulz, P.Ag., Environmental Scientist
UMA Engineering Ltd.
2540 Kensington Road NW
Calgary, Alberta T2N 3S3

Phone: 403-270-9200
Fax: 403-270-0399
e-mail: eschulz@umagroup.com

2. ADDRESS OF CORPORATE OFFICE IN CANADA (if applicable)

Phone:_____
Fax: _____
e-mail: _____

3. LOCATION OF UNDERTAKING (describe and attach a topographical map, indicating the main components of the Undertaking)

Latitude: **67° 33' N** Longitude: **63° 49'W** NTS Map No. **16M/12** Scale: **1:50,000**

4. DESCRIPTION OF UNDERTAKING (attach plans and drawings)

The work being undertaken is part of the overall cleanup of the FOX-5 DEW Line site, under current water use licence number NWB5QIK0207. The amendment includes the construction of two landfarms for the treatment and remediation of hydrocarbon contaminated soils and the relocation of a landfill in the middle site area. Please see the attached drawings for locations.

5. TYPE OF UNDERTAKING (A supplementary questionnaire must be submitted with the application for undertakings listed in **"bold"**)

____ Industrial	____ **Remote/Tourism Camps**
____ **Mine Development**	____ **Municipal**
____ **Advanced Exploration**	____ Power
____ **Exploratory Drilling**	✓ Other (describe): **Please see attached.**

6. WATER USE

____ To obtain water	____ To divert a watercourse
____ To modify the bed or bank of a watercourse	____ Flood control
____ To alter the flow of, or store, water	____ Other (describe): _____
____ To cross a watercourse	

N/A

7. QUANTITY OF WATER INVOLVED (litres per second, litres per day or cubic metres per year, including both quantity to be used and quality to be returned to source)

N/A

8. WASTE (for each type of waste describe: composition, quantity, methods of treatment and disposal, etc.)

____ Sewage	____ Waste Oil
____ Solid Waste	____ Greywater
____ Hazardous	____ Sludges
____ Bulky Items/Scrap Metal	____ Other (describe): _____

N/A

9. PERSONS OR PROPERTIES AFFECTED BY THIS UNDERTAKING (give name, mailing address and location; attach if necessary)

DIAND	✓ Yes	____ No	If no, date expected _____
Regional Inuit Association	____ Yes	✓ No	If no, date expected _____
Commissioner	____ Yes	✓ No	If no, date expected _____

10. PREDICTED ENVIRONMENTAL IMPACTS OF UNDERTAKING AND PROPOSED MITIGATION MEASURES (direct, indirect, cumulative impacts, etc.)

NIRB Screening ✓ Yes ___ No If no, date expected _____

11. INUIT WATER RIGHTS

Will the project or activity substantially affect the quality, quantity, or flow of water flowing through Inuit Owned Lands and the rights of Inuit under Article 20 of the Nunavut Land Claims Agreement?

N/A

If yes, has the applicant entered into an agreement with the Designated Inuit organization to pay compensation for any loss or damage that may be caused by the alteration. If no compensation agreement has been made, how will compensation be determined?

N/A

12. CONTRACTORS AND SUB-CONTRACTORS (name, address and functions)
As the contract has not yet been awarded, the names and addresses of the contactors are not available.

13. STUDIES UNDERTAKEN TO DATE (list and attach copies of studies, reports, research, etc.)

These documents were included with the original application.

14. THE FOLLOWING DOCUMENTS MUST BE INCLUDED WITH THE APPLICATION FOR THE REGULATORY PROCESS TO BEGIN

Supplementary Questionnaire (where applicable: see section 5) ___ Yes ✓ No If no, date expected: N/A

Inuktitut/English Summary of Project ___ Yes ✓ No If no, date expected: N/A

Application fee $30.00 (c/o of Receiver General for Canada) ___ Yes ✓ No If no, date expected: N/A

15. PROPOSED TIME SCHEDULE

_____ Annual (or) ✓ Multi Year

Start Date: **August 2003** Completion Date: **October 2006**

Eva Schulz	Environmental Scientist		Feb. 14, 2003
Name (Print)	Title (Print)	Signature	Date

For Nunavut Water Board use only

APPLICATION FEE **Amount: $**_____ **Receipt No.:**_____

WATER USE DEPOSIT **Amount: $**_____ **Receipt No.:** _____

February 12, 2003

Project No.: 0171-120-01-08
FOX-5 3.6

Elizabeth Copland
Vice Chair
Nunavut Impact Review Board
P.O. Box 2397
Cambridge Bay, NU X0B 0C0

Dear Ms. Copland:

RE: Screening Decision 01DN004 for the Clean Up of FOX-5, Broughton Island DEW Line Site

Defence Construction Canada Ltd. (DCC) submitted a project description and environmental screening report to the Nunavut Impact Review Board (NIRB) in October 2000. The screening decision from NIRB approved the project; however, NIRB stated that the Permittee, i.e., DCC, is to notify NIRB if there are to be any changes or plans in operating conditions associated with the land use activity.

On behalf of DCC and the Department of National Defence (DND), UMA Engineering Ltd. (UMA) is submitting the following amendments to the October 2000 project description. The proposed amendments were based on discussions with the Hamlet of Qikiqtarjuaq, as well as changes in construction requirements.

The first amendment to the 2000 NIRB submission is that there will not be a landfill constructed on-site for the disposal of PCB amended painted materials. Materials containing PCB concentrations in excess of 50 parts per million (ppm) are being containerized and placed in a Temporary PCB Storage Area as per the Canadian Environmental Protection Act Storage of PCB Material Regulations (SOR/92-507). The containerized materials will then be transported according to the Transportation of Dangerous Goods Regulations to a licenced southern disposal facility for destruction.

The second amendment to the October 2000 NIRB submission is the construction of two landfarms for the remediation of hydrocarbon-impacted soils. One landfarm is at the Airstrip Area and one landfarm is at the Station Area, where the majority of the hydrocarbon impacted soils are located. Because of the distance between these locations, and the very poor condition of the road to the Station Area, it was determined that two landfarm areas would be required. The locations of the landfarms are shown on Drawing 102.

UMA Engineering Ltd. 2540 Kensington Road NW Calgary Alberta T2N 3S3 Canada
telephone (403) 270-9200 facsimile (403) 270-0399 web site www.umagroup.com

The first proposed landfarm site is located just west of the Heated Vehicle Storage area at the Airstrip Area near the Heated Vehicle Storage (HVS), south of the community airstrip (Drawings 102, 106 and 119) on property currently owned by Nunavut Airports. The soil is predominantly a medium sand with trace gravel in the profile and some gravel and small cobbles at the surface. The topography slopes gradually towards the northwest boundary of the landfarm and is bisected by a number of small drainage channels. A larger drainage channel running along the northwestern, downgradient edge of the landfarm collects drainage from the road and HVS area above the landfarm. The only debris in the area consists of one barrel half-buried in the drainage ditch near the middle of the landfarm length.

The second proposed landfarm location is at the Station Area (Drawings 102, 103 and 109). Most of the site is in disturbed terrain covered by gravel fill and buildings. Undisturbed terrain occupies part of the north side of the site. A road leads from the garage to a gravel pad at the east end of the site. The area between the garage and module train is relatively flat. Beyond the garage, the road slopes gently down to the northeast.

Undisturbed native terrain comprises boulders with isolated pockets of vegetation and sandy soil. The areas of native soil typically slope down, away from the station area. Bouldery terrain was also identified in some disturbed areas, where boulders were likely moved to make room for construction.

Further details on the construction of a landfarm, as well as a summary of the potential impacts and mitigative measures, are attached to this letter.

The last amendment refers to the location of the Tier II Soil Disposal Facility and Non-Hazardous Waste Landfill. Based on discussions with the Hamlet of Qikiqtarjuaq, additional locations for these landfills were investigated in September 2002. The final location, called Landfill N, was chosen based on both environmental and engineering suitability. Landfill N is located at the middle site between the main station and the community (Drawings 101, 105, 116-118).

The area is at the top of a pass approximately 30 m south of the station road. Drainage from the area flows west down towards the community landfill approximately 3 km west of the area. Ultimately, the drainage flows to the ocean approximately 4 km from the proposed site.

The area is undisturbed ground with soils consisting of sand with sorted gravel, cobble and boulder strands. The area north and south of the proposed landfill area contains more and larger boulders. Vegetation consists of mosses and a small amount of grasses. The area slopes to the west at a grade of 6%.

During the environmental investigation a number of test pits were excavated to frozen ground and soil sampled were collected. No contamination was detected in any of the samples analyzed. As well, there was no debris noted in the test pits during excavation.

Details on the construction of these facilities and their potential impacts and associated mitigative measures were provided in the original October 2000 submission and have not been included in this amendment.

The contract for the overall clean up at FOX-5 has been not yet been tendered. However, some work was conducted at the Lower Site POL area at the direction of Environment Canada. A report detailing the work completed was written by DCC and has been attached for your information.

We trust the information provided is sufficient to process the amendment. If you have any questions or comments regarding the proposed amendments, please feel free to contact the undersigned at 403-270-9220.

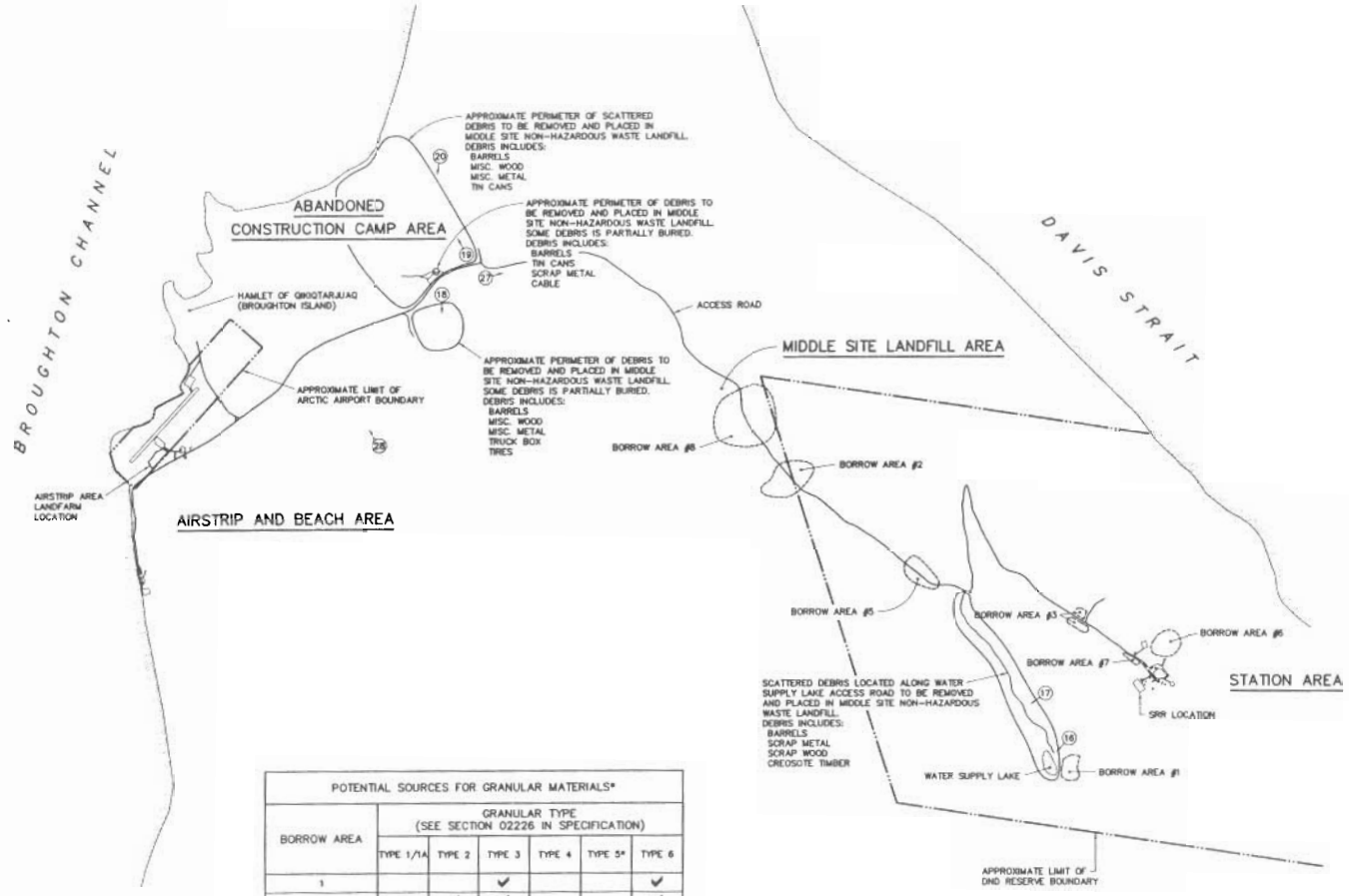
Sincerely,

UMA ENGINEERING LTD.

Eva Schulz, P.Ag.
Environmental Scientist
eschulz@umagroup.com

Encl. Design Drawings
Landfarm Construction Details and Summary of Impacts
Temporary Cutoff Trench Report

cc: Scott Hamilton/Phil Warren, DCC
Jim Wall, Nunavut Water Board
Spencer Dewar, Indian and Northern Affairs Canada, Land Administration



POTENTIAL SOURCES FOR GRANULAR MATERIALS*						
BORROW AREA	GRANULAR TYPE (SEE SECTION 02226 IN SPECIFICATION)					
	TYPE 1/1A	TYPE 2	TYPE 3	TYPE 4	TYPE 5*	TYPE 6
1			✔			✔
2		✔	✔			✔
3	✔		✔			✔
5		✔	✔			✔
6	✔	✔	✔			✔
7	✔	✔	✔			✔
8	✔	✔	✔	✔	✔	✔
INFRASTRUCTURE FILL		✔				✔

* REFER TO GEOTECHNICAL INFORMATION IN APPENDIX E IN SPECIFICATION.

National Defence / Défense nationale

Headquarters
Quartier général

General Notes:

1. ALL NON-HAZARDOUS WASTE FROM UPPER SITE SOURCES TO BE PLACED IN STATION AREA NON-HAZARDOUS WASTE LANDFILL.
2. ALL NON-HAZARDOUS WASTE FROM SOURCES TO THE WEST OF AND ALONG THE WATER SUPPLY LAKE ACCESS ROAD TO BE PLACED IN MIDDLE SITE NON-HAZARDOUS WASTE LANDFILL.

Legend:

- PHOTOGRAPHIC VIEWPOINT
- BODY OF WATER
- APPROXIMATE EXTENT OF DEBRIS AREAS
- APPROXIMATE EXTENT OF BORROW AREAS
- APPROXIMATE LOCATION OF PROPERTY BOUNDARIES

No.	DATE	REVISION / REVISION	APPR.

DRAFT

SCALE - ÉCHELLE 400 200 0 800 1200m

PROJECT - PROJET
FOX-5 BROUGHTON ISLAND

DEW LINE CLEAN UP

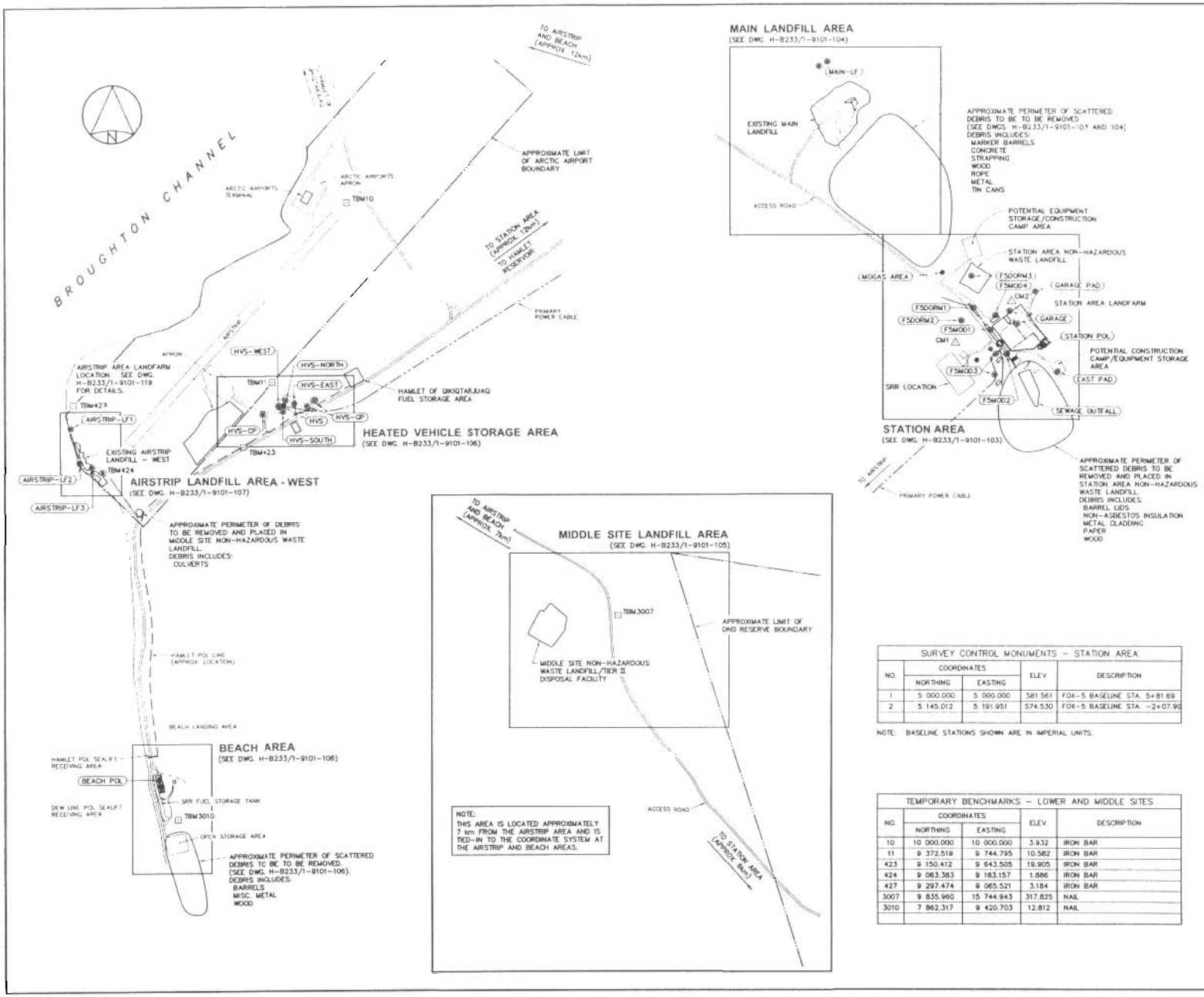
TRADE - METIER: SITING
DATE: 2003-01-14

SUBJECT - SUJET
OVERALL SITE PLAN

PRODUCTION	CONCURRENCE - ASSENTIMENT
DESIGNED / ETUDE: BWY	DES OFF / AGENT CONCEPT
DRAWN / DESSINE: CAE	SECT HD / CHEF SECT
CHECKED / VERIFIE: BER	DES MGR / GEST CONCEPT
COORDINATION: TMT	REVIEWED - REVU

DWG NO. - DESSIN NO.
M-8233/1-9101-101

Canada



SURVEY CONTROL MONUMENTS – STATION AREA				
NO.	COORDINATES		ELEV	DESCRIPTION
	NORTHING	EASTING		
1	5 000.000	5 000.000	581.561	FOX-5 BASELINE STA. 5+81.69
2	5 145.012	5 191.951	574.530	FOX-5 BASELINE STA. -2+07.90

NOTE: BASELINE STATIONS SHOWN ARE IN IMPERIAL UNITS.

TEMPORARY BENCHMARKS – LOWER AND MIDDLE SITES				
NO.	COORDINATES		ELEV	DESCRIPTION
	NORTHING	EASTING		
10	10 000.000	10 000.000	3.932	IRON BAR
11	9 372.519	9 744.795	10.582	IRON BAR
423	9 150.412	9 643.505	19.905	IRON BAR
424	9 063.383	9 163.157	1.886	IRON BAR
427	9 297.474	9 065.521	3.184	IRON BAR
3007	9 835.960	15 744.943	317.825	NAIL
3010	7 862.317	9 420.703	12.812	NAIL

National Defence / Défense nationale

Headquarters
Quartier général

General Notes:

1. ALL ELEVATIONS ARE REFERENCED TO MEAN SEA LEVEL. (REF. DWG. AAP-2, DEPT OF THE AIR FORCE, USAF).
2. HORIZONTAL CONTROL REFERENCED TO SURVEY CONTROL MONUMENTS.
3. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.
4. ALL SHORT RANGE RADAR (SRR) FACILITIES ARE CURRENTLY OPERATIONAL AND ARE NOT TO BE DISTURBED. SEE DWGS. H-B233/1-9101-201 AND 202 FOR ADDITIONAL DETAILS.
5. ALL NON-HAZARDOUS WASTE FROM UPPER SITE SOURCES TO BE PLACED IN STATION AREA NON-HAZARDOUS WASTE LANDFILL.
6. ALL NON-HAZARDOUS WASTE FROM SOURCES TO THE WEST OF AND ALONG THE WATER SUPPLY LAKE ACCESS ROAD TO BE PLACED IN MIDDLE SITE NON-HAZ WASTE LANDFILL.

Legend:

- CM2 SURVEY CONTROL MONUMENT
- TBM11 TEMPORARY BENCHMARK
- CONTAMINATED AREA
- BODY OF WATER

No.	DATE	REVISION	REVISION	APPR.

DRAFT

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SCALE – ECHELLE 100 50 0 200 300m

PROJECT – PROJET
FOX-5 BROUGHTON ISLAND
DEW LINE CLEAN UP

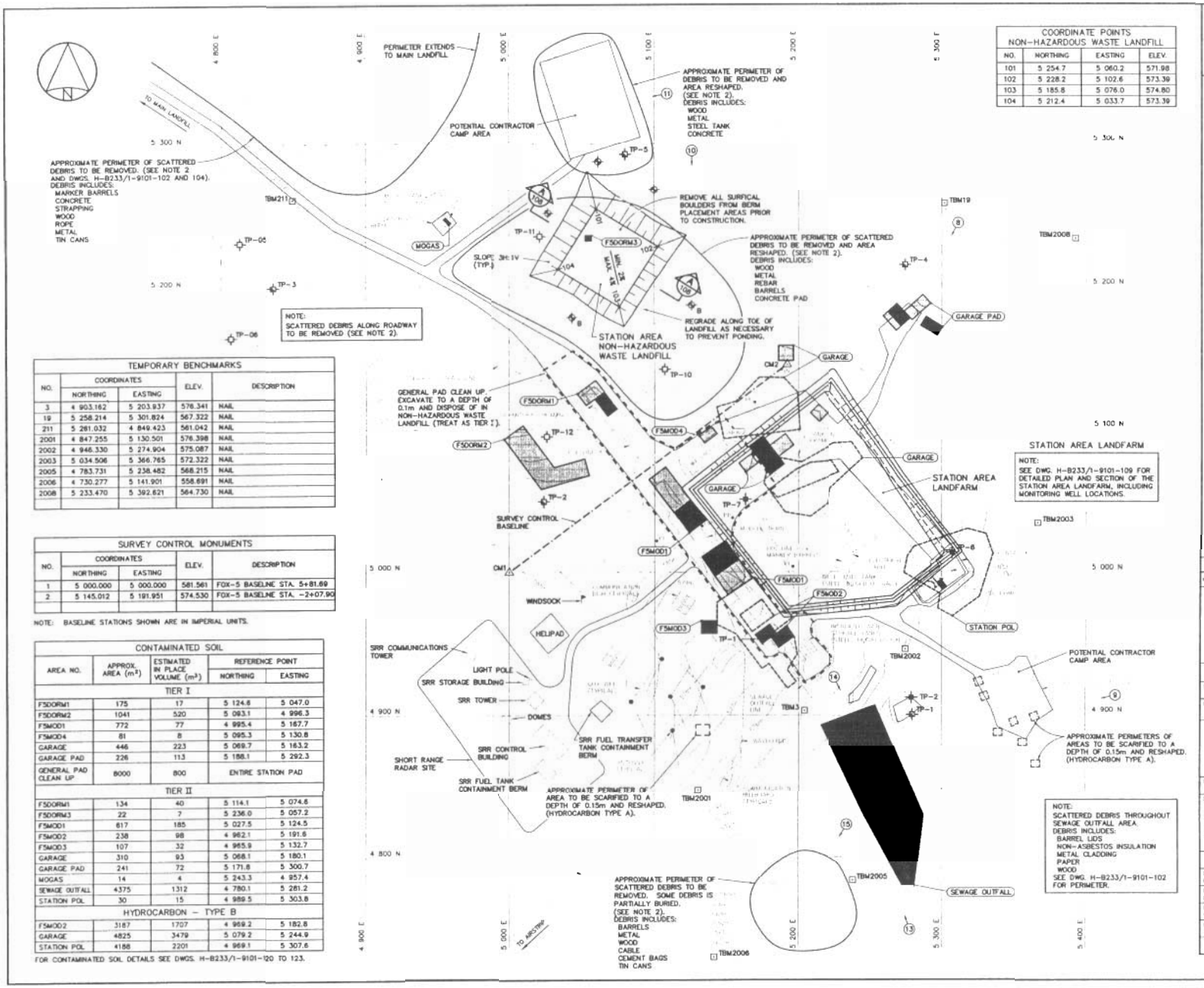
TRADE – METIER: SITING
DATE: 2003-01-14

SUBJECT – SUJET
PROJECT LAYOUT

PRODUCTION	CONCURRENCE – ASSENTIMENT
DESIGNED – ETUDIE: BWF	DES OFF AGENT CONCEPT
DRAWN – DESSINE: DAF	SECT HD CHEF SECT
CHECKED – VERIFIE: BWR	DES MGR GEST CONCEPT
COORDINATION: SWT	REVIEWED – REVU

DWG. NO. – DESSIN NO.
H-B233/1-9101-102

Canada



COORDINATE POINTS NON-HAZARDOUS WASTE LANDFILL			
NO.	NORTHING	EASTING	ELEV.
101	5 254.7	5 060.2	571.98
102	5 228.2	5 102.6	573.39
103	5 185.8	5 076.0	574.80
104	5 212.4	5 033.7	573.39

TEMPORARY BENCHMARKS				
NO.	COORDINATES		ELEV.	DESCRIPTION
	NORTHING	EASTING		
3	4 903.162	5 203.937	576.341	NAIL
19	5 258.214	5 301.824	567.322	NAIL
211	5 281.032	4 849.423	561.042	NAIL
2001	4 847.255	5 130.501	576.398	NAIL
2002	4 946.330	5 274.904	575.087	NAIL
2003	5 034.506	5 366.765	572.322	NAIL
2005	4 783.731	5 238.482	568.215	NAIL
2006	4 730.277	5 141.901	558.691	NAIL
2008	5 233.470	5 392.621	564.730	NAIL

SURVEY CONTROL MONUMENTS				
NO.	COORDINATES		ELEV.	DESCRIPTION
	NORTHING	EASTING		
1	5 000.000	5 000.000	581.561	FOX-5 BASELINE STA. 5+81.69
2	5 145.012	5 191.951	574.530	FOX-5 BASELINE STA. -2+07.90

NOTE: BASELINE STATIONS SHOWN ARE IN IMPERIAL UNITS.

CONTAMINATED SOIL				
AREA NO.	APPROX. AREA (m^2)	ESTIMATED IN PLACE VOLUME (m^3)	REFERENCE POINT	
			NORTHING	EASTING
TIER I				
F5OORM1	175	17	5 124.8	5 047.0
F5OORM2	1041	520	5 083.1	4 996.3
F5MOD1	772	77	4 995.4	5 167.7
F5MOD4	81	8	5 095.3	5 130.8
GARAGE	446	223	5 069.7	5 163.2
GARAGE PAD	226	113	5 158.1	5 292.3
GENERAL PAD CLEAN UP	8000	800	ENTIRE STATION PAD	
TIER II				
F5OORM1	134	40	5 114.1	5 074.6
F5OORM3	22	7	5 236.0	5 057.2
F5MOD1	617	185	5 027.5	5 124.5
F5MOD2	238	98	4 982.1	5 191.6
F5MOD3	107	32	4 965.9	5 132.7
GARAGE	310	93	5 068.1	5 180.1
GARAGE PAD	241	72	5 171.8	5 300.7
MOGAS	14	4	5 243.3	4 957.4
SEWAGE OUTFALL	4375	1312	4 780.1	5 281.2
STATION POL	30	15	4 989.5	5 303.8
HYDROCARBON - TYPE B				
F5MOD2	3187	1707	4 959.2	5 182.8
GARAGE	4825	3479	5 079.2	5 244.9
STATION POL	4188	2201	4 969.1	5 307.6

FOR CONTAMINATED SOIL DETAILS SEE DWGS. H-B233/1-9101-120 TO 123.

National Defence / Défense nationale

Headquarters / Quartier général

General Notes:

1. ALL ELEVATIONS ARE REFERENCED TO MEAN SEA LEVEL.
2. ALL NON-HAZARDOUS DEBRIS WITHIN PLAN AREA TO BE PLACED IN STATION AREA NON-HAZARDOUS WASTE LANDFILL.
3. HORIZONTAL CONTROL REFERENCED TO SURVEY CONTROL MONUMENTS.
4. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.
5. ALL SHORT RANGE RADAR (SRR) FACILITIES ARE CURRENTLY OPERATIONAL AND ARE NOT TO BE DISTURBED. SEE DWGS. H-B233/1-9101-201 AND 202 FOR ADDITIONAL DETAILS.
6. FOR MONITORING WELL INSTALLATION DETAILS, SEE DWG. H-B233/1-9101-125. EXACT LOCATIONS TO BE FIELD DETERMINED BY THE ENGINEER.

Legend:

- SURVEY CONTROL MONUMENT
- TEMPORARY BENCHMARK
- TIER I CONTAMINATED SOIL
- TIER II CONTAMINATED SOIL
- HYDROCARBON - TYPE B CONTAMINATED SOIL
- TEST PIT LOCATION (1992)
- TEST PIT LOCATION (1998)
- TEST PIT LOCATION (2000)
- COORDINATE POINT
- PHOTOGRAPHIC VIEWPOINT
- PROPOSED MONITORING WELL LOCATION (3)
- PROPOSED BACKGROUND MONITORING WELL LOCATION (2)

NO.	DATE	REVISION	REVISION	APPR.

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SCALE - ECHELLE 20 10 0 40 80m

PROJECT - PROJET
FOX-5 BROUGHTON ISLAND

DEW LINE CLEAN UP

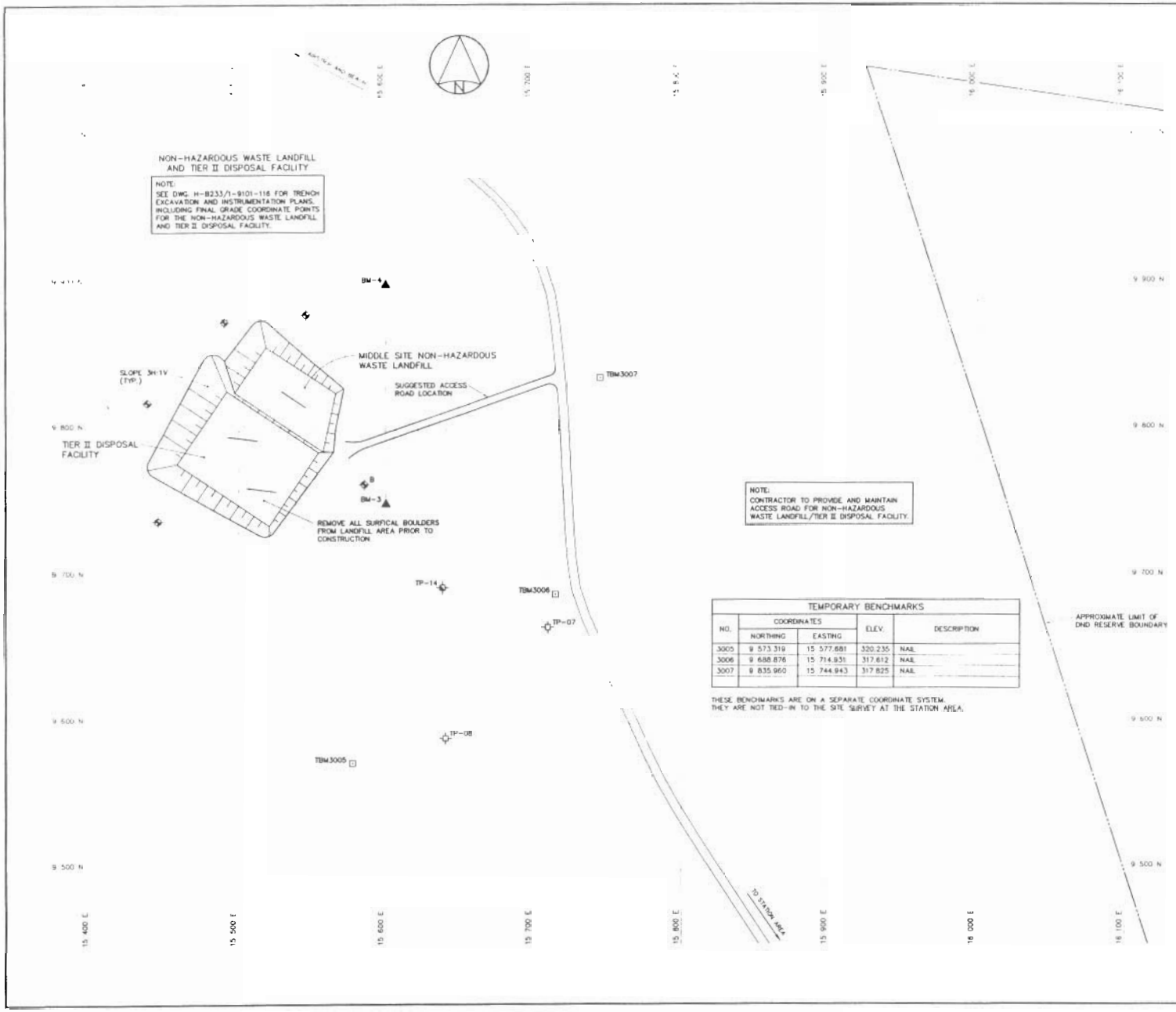
TRADE - METIER	DATE
SITING	2003-01-14

SUBJECT - SUJET
STATION AREA SITE PLAN

PRODUCTION		CONCURRENCE - ASSENTIMENT	
DESIGNED / ETUDE	BWF		DES OFF / AGENT CONCEPT
DRAWN / DESSINE	CM		SECT HD / CHEF SECT
CHECKED / VERIFIE	BBM		DES MGR / DESI CONCEPT
COORDINATION	TRF	REVIEWED - REVU	

DWG. NO. - DESSIN NO.
H-B233/1-9101-103

Canada



TEMPORARY BENCHMARKS				
NO.	COORDINATES		ELEV.	DESCRIPTION
	NORTHING	EASTING		
3005	9 573.319	15 577.681	320.235	NAIL
3006	9 688.876	15 714.931	317.612	NAIL
3007	9 835.960	15 744.943	317.825	NAIL

THESE BENCHMARKS ARE ON A SEPARATE COORDINATE SYSTEM. THEY ARE NOT TIED-IN TO THE SITE SURVEY AT THE STATION AREA.

National Defence / Défense nationale

Headquarters
Quartier général

General Notes:

1. ALL ELEVATIONS ARE REFERENCED TO MEAN SEA LEVEL.
2. HORIZONTAL CONTROL REFERENCED TO SURVEY CONTROL MONUMENTS.
3. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.
4. FOR MONITORING WELL INSTALLATION DETAILS, SEE DWG. H-8233/1-9101-125. EXACT LOCATIONS TO BE FIELD DETERMINED BY THE ENGINEER.
5. FOR THERMISTOR INSTALLATION LOCATIONS, SEE DWG. H-8233/1-9101-116.
6. FOR PERMANENT SURVEY CONTROL (BENCHMARK) INSTALLATION DETAILS, SEE DWG. H-8233/1-9101-125. LOCATIONS TO BE APPROVED BY THE ENGINEER.

Legend:

- TBM3007 TEMPORARY BENCHMARK
- TEST PIT LOCATION (1998)
- TEST PIT LOCATION (2000)
- PROPOSED MONITORING WELL LOCATION (4)
- PROPOSED BACKGROUND MONITORING WELL LOCATION (1)
- BM-3 PROPOSED PERMANENT BENCHMARK LOCATION (2). (SEE NOTE 6).

NO.	DATE	REVISION	REVISION	APPR.

DRAFT

SCALE - ECHELLE 20 10 0 40 60m

PROJECT - PROJET
FOX-5 BROUGHTON ISLAND
DEW LINE CLEAN UP

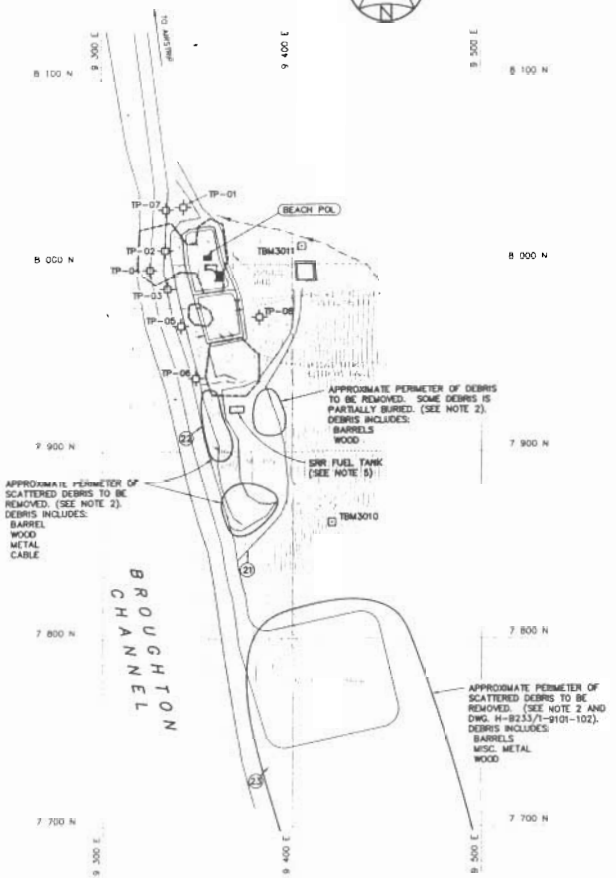
TRADE - METIER	DATE
SITING	2003-01-14

SUBJECT - SUJET
MIDDLE SITE LANDFILL AREA
SITE PLAN

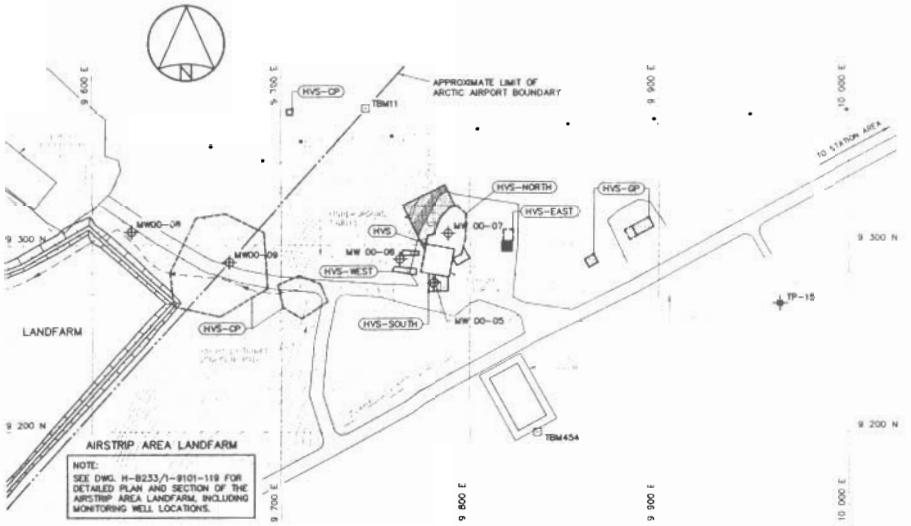
PRODUCTION	CONCURRENCE - ASSENTIMENT	
DESIGNED - ETUDIE BWT		DES OFF AGENT CONCEPT
DRAWN - DESSINE CAE		SECT HD CHEF SECT
CHECKED - VERIFIE SEM		DES MGR GEST CONCEPT
COORDINATION SME	REVIEWED - REVU	

DWG. NO. - DESSIN NO.
H-8233/1-9101-105

Canada



BEACH AREA



HEATED VEHICLE STORAGE AREA

TEMPORARY BENCHMARKS				
NO.	COORDINATES		ELEV.	DESCRIPTION
	NORTHING	EASTING		
11	9 372.519	9 744.795	10.582	IRON BAR
454	9 199.429	9 836.039	28.876	IRON BAR
3010	7 862.317	9 420.703	12.812	NAIL
3011	8 009.680	9 405.196	14.465	NAIL

THESE BENCHMARKS ARE ON A SEPARATE COORDINATE SYSTEM. THEY ARE NOT TIED-IN TO THE SITE SURVEY AT THE STATION AREA.

CONTAMINATED SOIL				
AREA NO.	APPROX. AREA (m^2)	ESTIMATED IN PLACE VOLUME (m^3)	REFERENCE POINT	
			NORTHING	EASTING
TIER I				
HVS-SOUTH	100	30	9 275.1	9 777.9
HVS-WEST	82	49	9 285.9	9 758.6
HVS-GP	103	52	9 295.0	9 865.4
HVS-NORTH	675	684	9 331.8	9 786.7
TIER II				
BEACH POL	41	12	8 007.0	9 357.7
HVS-EAST	37	11	9 302.1	9 816.8
HYDROCARBON - TYPE B				
BEACH POL	2948	2257	8 003.4	9 366.3
HVS	243	122	9 300.5	9 776.8
HVS-EAST	37	22	9 308.1	9 822.8
HVS-CP	3488	2884	9 266.7	9 701.1
HVS-GP	28	14	9 307.7	9 881.9
HVS-NORTH	647	448	9 316.4	9 798.1

FOR CONTAMINATED SOIL DETAILS SEE DWGS. H-B233/1-9101-120 TO 123.

National Defence / Défense nationale

Headquarters / Quartier général

General Notes:

1. ALL ELEVATIONS ARE REFERENCED TO MEAN SEA LEVEL.
2. ALL NON-HAZARDOUS DEBRIS WITHIN PLAN AREA TO BE PLACED IN MIDDLE SITE NON-HAZARDOUS WASTE LANDFILL.
3. HORIZONTAL CONTROL REFERENCED TO SURVEY CONTROL MONUMENTS.
4. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.
5. ALL SHORT RANGE RADAR (SRR) FACILITIES ARE CURRENTLY OPPERATIONAL AND ARE NOT TO BE DISTURBED. SEE DWGS. H-B233/1-9101-201 AND 202 FOR ADDITIONAL DETAILS.
6. ALL EXISTING MONITORING WELLS ARE TO BE REMOVED AND PLACED IN MIDDLE SITE NON-HAZARDOUS WASTE LANDFILL.

Legend:

- TBM11 TEMPORARY BENCHMARK
- TIER I CONTAMINATED SOIL
- TIER II CONTAMINATED SOIL
- HYDROCARBON - TYPE B CONTAMINATED SOIL
- TESTPIT LOCATION (1992)
- TESTPIT LOCATION (2000)
- 21 PHOTOGRAPHIC VIEWPOINT
- EXISTING MONITORING WELL LOCATION
- BODY OF WATER

NO.	DATE	REVISION / REVISION	APPR.

DRAFT

SCALE - ECHELLE 20 10 0 40 60m

PROJECT - PROJET

FOX-5 BROUGHTON ISLAND

DEW LINE CLEAN UP

TRADE - METIER: SITING | DATE: 2003-01-14

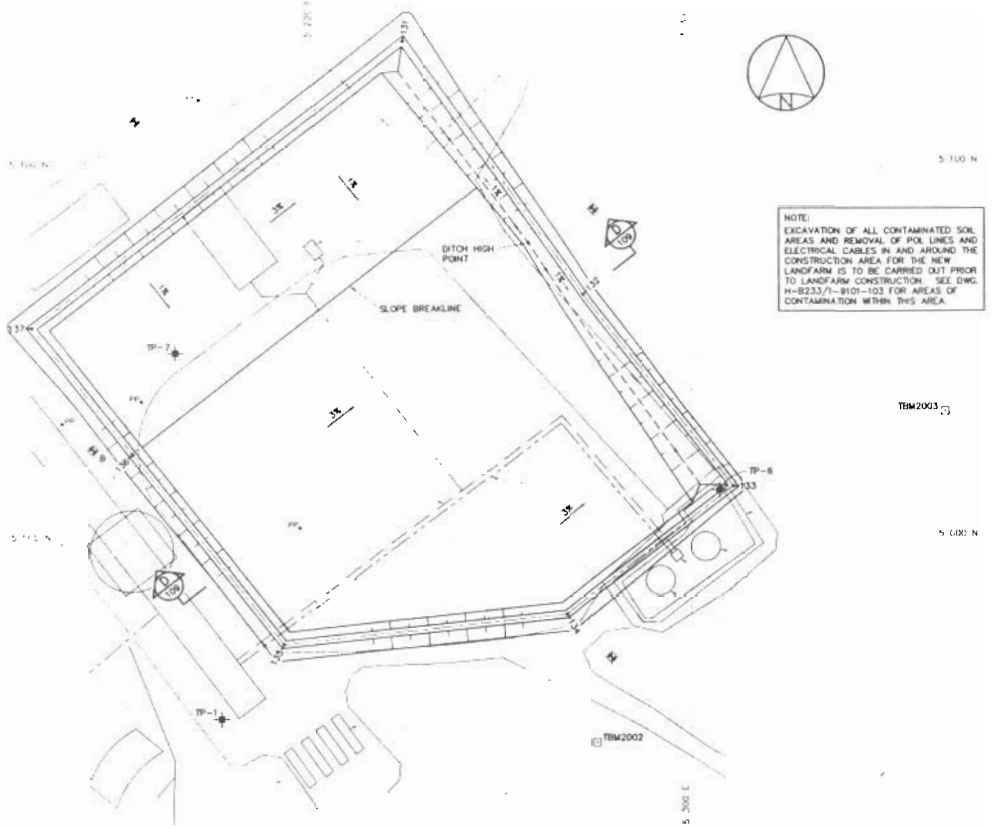
SUBJECT - SUJET

BEACH AREA AND HEATED VEHICLE STORAGE AREA SITE PLANS

PRODUCTION	CONCURRENCE - ASSENTIMENT
DESIGNED - ETUDIE: BWY	DES OFF AGENT CONCEPT
DRAWN - DESSINE: DNF	SECT HD CHEF SECT
CHECKED - VERIFIE: BEM	DES MGR GEST CONCEPT
COORDINATION: DNF	REVIEWED - REVU

DWG. NO. - DESSIN NO. H-B233/1-9101-106

Canada



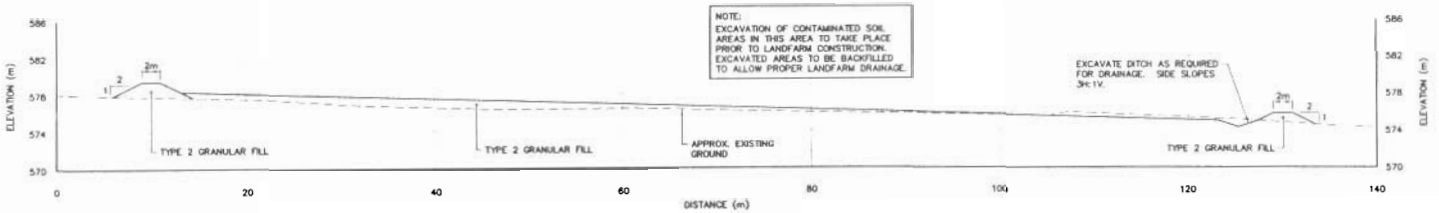
NOTE:
EXCAVATION OF ALL CONTAMINATED SOIL AREAS AND REMOVAL OF POL LINES AND ELECTRICAL CABLES IN AND AROUND THE CONSTRUCTION AREA FOR THE NEW LANDFARM IS TO BE CARRIED OUT PRIOR TO LANDFARM CONSTRUCTION. SEE DWG. H-8233/1-9101-103 FOR AREAS OF CONTAMINATION WITHIN THIS AREA.

COORDINATE POINTS
STATION AREA LANDFARM

NO.	NORTHING	EASTING	ELEV.
131	5 134.0	5 223.4	575.80
132	5 065.9	5 271.1	575.80
133	5 014.6	5 311.0	575.80
134	4 980.2	5 266.8	577.48
135	4 972.5	5 191.7	579.40
136	5 023.8	5 151.8	579.40
137	5 125.4	5 057.8	579.80

LANDFARM – PLAN
0 5 0 10 20 30m

NOTE:
EXCAVATION OF CONTAMINATED SOIL AREAS IN THIS AREA TO TAKE PLACE PRIOR TO LANDFARM CONSTRUCTION. EXCAVATED AREAS TO BE BACKFILLED TO ALLOW PROPER LANDFARM DRAINAGE.



SECTION D/109
0 2 4 8 12m

National Defence / Défense nationale

Headquarters
Quartier général

General Notes:

1. ALL ELEVATIONS ARE REFERENCED TO MEAN SEA LEVEL.
2. HORIZONTAL CONTROL REFERENCED TO SURVEY CONTROL MONUMENTS.
3. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.
4. FOR MONITORING WELL INSTALLATION DETAILS, SEE DWG. H-8233/1-9101-125. EXACT LOCATIONS TO BE FIELD DETERMINED BY THE ENGINEER.

Legend:

- COORDINATE POINT
- PROPOSED MONITORING WELL LOCATION (3)
- PROPOSED BACKGROUND MONITORING WELL LOCATION (1)

NO.	DATE	REVISION	REVISION	APP'D

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SCALE – ECHELLE: AS SHOWN

PROJECT – PROJET
FOX-5 BROUGHTON ISLAND
DEW LINE CLEAN UP

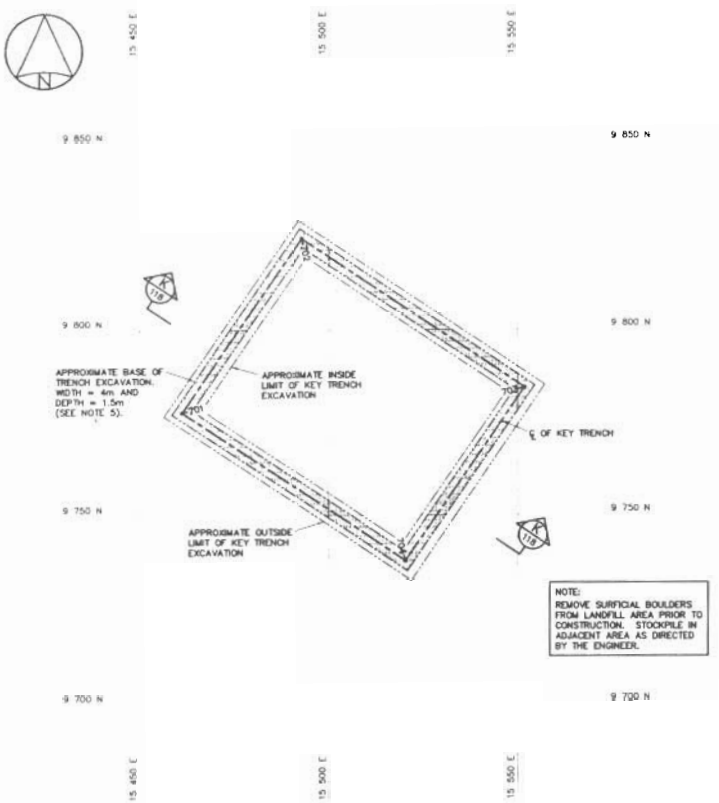
TRADE – METIER: SITING
DATE: 2003-01-14

SUBJECT – SUJET
STATION AREA LANDFARM
PLAN AND CROSS SECTION

PRODUCTION	CONCURRENCE – ASSENTIMENT	
DESIGNED – ETUDIE: BRF		DES. OFF AGENT CONCEPT
DRAWN – DESSINE: GN		SECT HD CHEF SECT
CHECKED – VERIFIE: EER		DES. MGR GEST CONCEPT
COORDINATION: SMC	REVIEWED – REVU	

DWG. NO. – DESSIN NO.
H-8233/1-9101-109

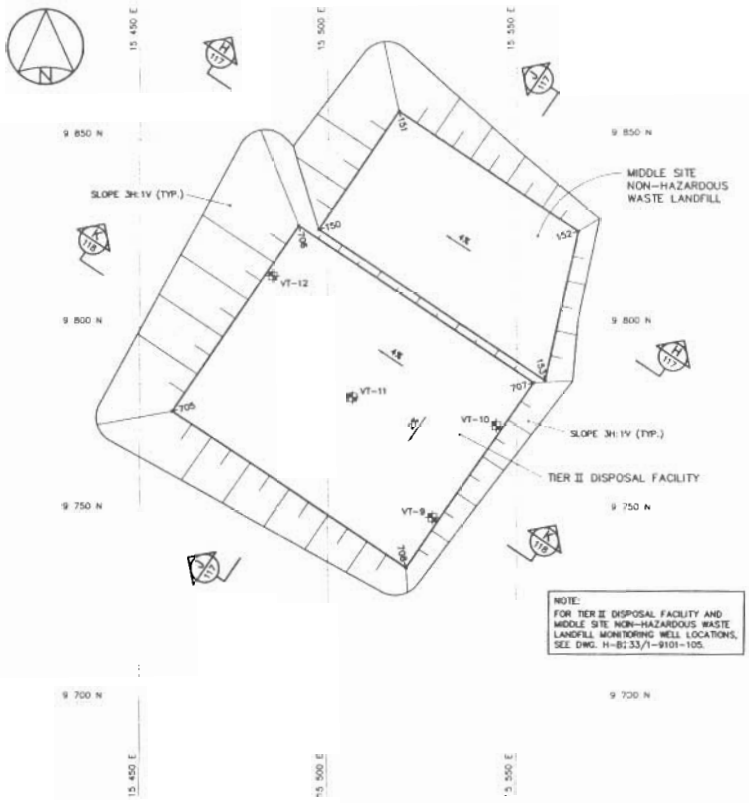
Canada



NOTE:
REMOVE SURFICIAL BOULDERS FROM LANDFILL AREA PRIOR TO CONSTRUCTION. STOCKPILE IN ADJACENT AREA AS DIRECTED BY THE ENGINEER.

KEY TRENCH EXCAVATION PLAN

COORDINATE POINTS KEY TRENCH EXCAVATION		
NO.	NORTHING	EASTING
701	9 777.8	15 461.2
702	9 824.5	15 492.7
703	9 784.5	15 551.9
704	9 737.9	15 520.4



NOTE:
FOR TIER II DISPOSAL FACILITY AND MIDDLE SITE NON-HAZARDOUS WASTE LANDFILL MONITORING WELL LOCATIONS, SEE DWG. H-B233/1-9101-105.

GRADING/INSTRUMENTATION PLAN

COORDINATE POINTS TIER II DISPOSAL FACILITY			
NO.	NORTHING	EASTING	ELEV.
705	9 777.4	15 458.7	310.00
706	9 827.1	15 492.3	311.20
707	9 785.1	15 554.4	311.20
708	9 735.4	15 520.8	313.00

COORDINATE POINTS NON-HAZARDOUS WASTE LANDFILL			
NO.	NORTHING	EASTING	ELEV.
150	9 826.1	15 497.6	310.32
151	9 857.4	15 518.8	310.52
152	9 825.5	15 566.1	312.60
153	9 785.7	15 557.4	313.20

National Défense / Defence nationale

Headquarters
Quartier général

General Notes:

1. ALL ELEVATIONS ARE REFERENCED TO MEAN SEA LEVEL.
2. HORIZONTAL CONTROL REFERENCED TO SURVEY CONTROL MONUMENTS.
3. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.
4. FOR THERMISTOR INSTALLATION DETAILS, SEE DWG. H-B233/1-9101-125. EXACT LOCATIONS TO BE FIELD DETERMINED BY THE ENGINEER.
5. KEY LINER 1.5m MIN. BELOW EXISTING GROUND. EXCAVATION DEPTH TO BE FIELD CONFIRMED BY THE SITE ENGINEER, BASED ON THE PRESENCE OF SATURATED GROUND.

Legend:

- 701 — COORDINATE POINT
- VT-9 — VERTICAL THERMISTOR INSTALLATION (4)

NO.	DATE	REVISION	REVISION	APPR.

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SCALE – ECHELLE 10 5 0 20 30m

PROJECT – PROJET
FOX-5 BROUGHTON ISLAND
DEW LINE CLEAN UP

TRADE – METIER SITING
DATE 2003-01-14

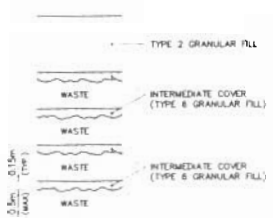
SUBJECT – SUJET
TIER II DISPOSAL FACILITY
KEY TRENCH EXCAVATION PLAN & GRADING/INSTRUMENTATION PLAN

PRODUCTION		CONCURRENCE – ASSENTIMENT	
DESIGNED ETUDE	BRY		DES OFF AGENT CONCEPT
DRAWN DESSINE	CHE		SECT HD CHEF SECT
CHECKED VERIFIE	BRN		DES MGR DIRECT CONCEPT
COORDINATION	SRE	REVIEWED – REVU	

DWG. NO. – DESSIN NO.
H-B233/1-9101-118

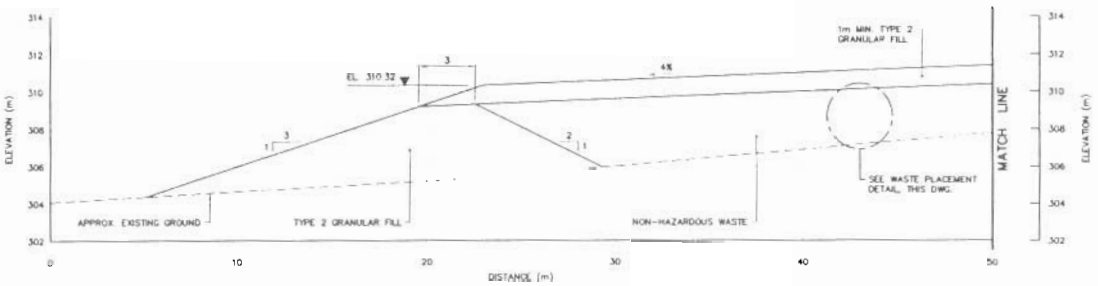
Canada

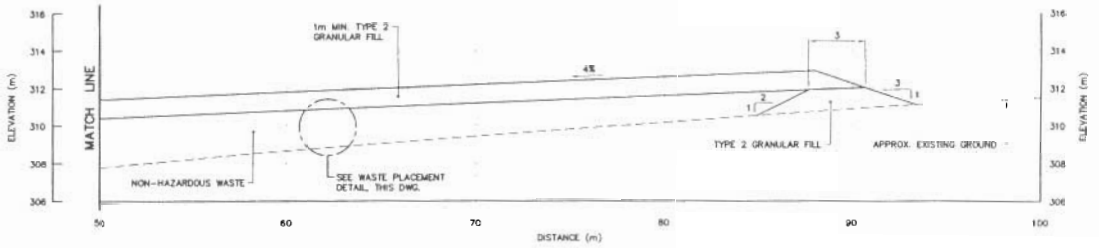
ADD ADDITIONAL LAYERS AS REQUIRED BY THE NON-HAZARDOUS WASTE LANDFILL DESIGN



WASTE PLACEMENT DETAIL

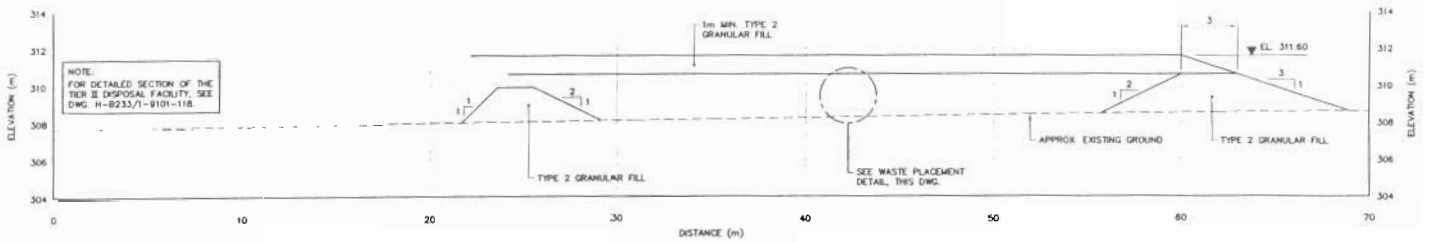
N.T.S.





SECTION H 116

NOTE:
THIS STARTER CROSS SECTION IS INTENDED TO PROVIDE INFORMATION TO CONSTRUCT THE MIDDLE SITE NON-HAZARDOUS WASTE LANDFILL PORTION PRIOR TO CONSTRUCTING THE ADJOINING TIER II DISPOSAL FACILITY.



SECTION J 116

National Defence / Défense nationale

Headquarters
Quartier général

General Notes:

1. ALL ELEVATIONS ARE REFERENCED TO MEAN SEA LEVEL.
2. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.

Legend:

No.	DATE	REVISION	REVISION	APPR.

DRAFT

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SCALE - ECHELLE 2 1 0 4 8m

PROJECT - PROJET
FOX-5 BROUGHTON ISLAND
DEW LINE CLEAN UP

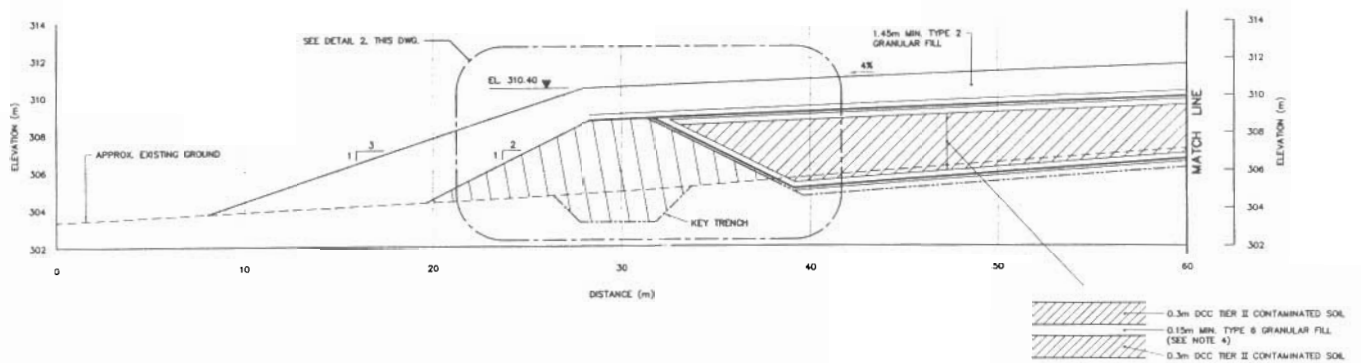
TRADE - METIER	DATE
SITING	2003-01-14

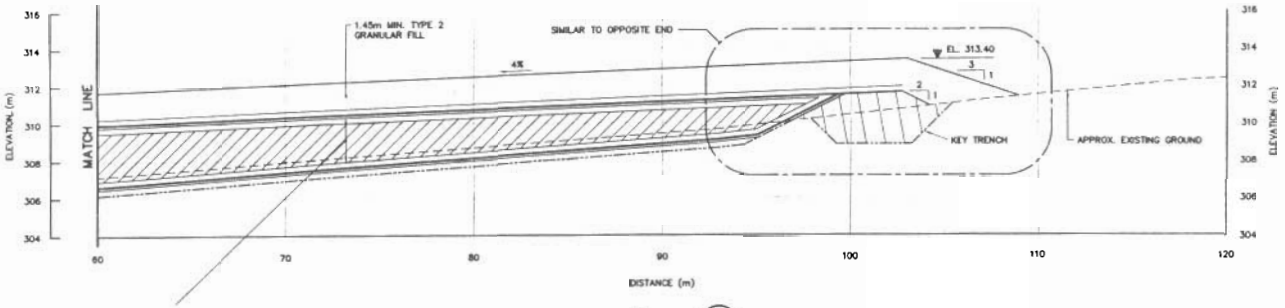
SUBJECT - SUJET
MIDDLE SITE
NON-HAZARDOUS WASTE LANDFILL
CROSS SECTIONS

PRODUCTION	CONCURRENCE - ASSENTIMENT	
DESIGNED ETUDIE BWF		DES OFF AGENT CONCEPT
DRAWN DESSINE DM		SECT HD CHEF SECT
CHECKED VERIFIE EER		DES MGR GEST CONCEPT
COORDINATION	REVIEWED - REVU	

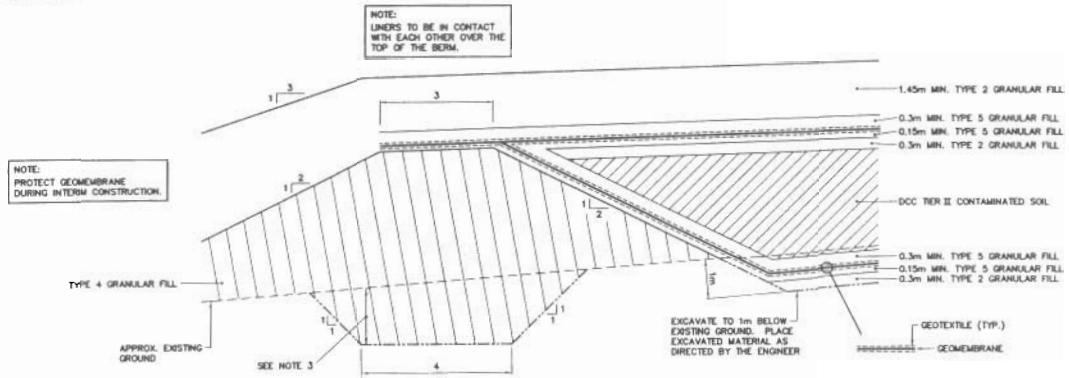
DWG. NO. - DESSIN NO.
H-8233/1-9101-117

Canada





SECTION K 116



DETAIL 2 118

National Defence / Défense nationale

Headquarters / Quartier général

General Notes:

1. ALL ELEVATIONS ARE REFERENCED TO MEAN SEA LEVEL.
2. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.
3. KEY TRENCH FOR SATURATED BERMS TO EXTEND 1.5m MIN. BELOW EXISTING GROUND. EXCAVATION DEPTH TO BE FIELD CONFIRMED BY THE SITE ENGINEER, BASED ON THE PRESENCE OF SATURATED GROUND.
4. TYPE 6 INTERMEDIATE FILL ONLY REQUIRED FOR LANDFILLING OF ORGANIC OR WET SOILS AS DIRECTED BY THE ENGINEER.

Legend:

No.	DATE	REVISION / REVISION	APPR.

DRAFT

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SCALE - ECHELLE 2 1 0 4 6m

PROJECT - PROJET
FOX-5 BROUGHTON ISLAND

DEW LINE CLEAN UP

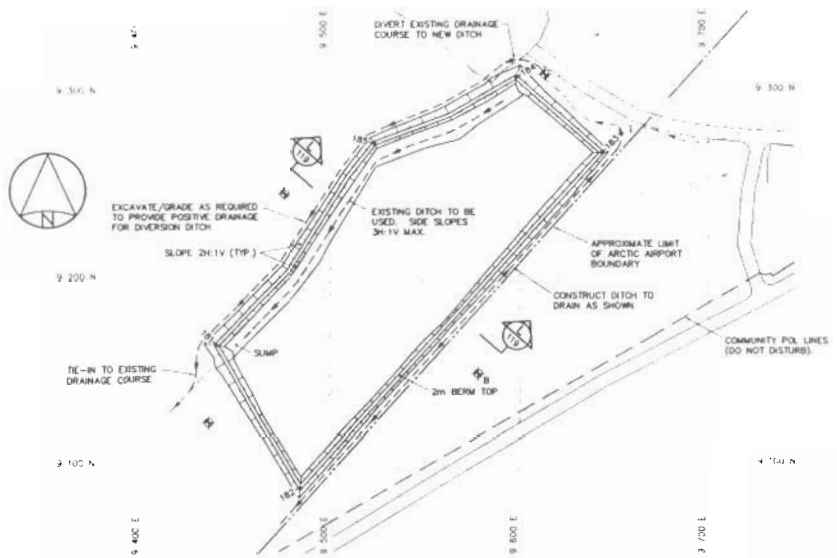
TRADE - METIER	DATE
SITING	2003-01-14

SUBJECT - SUJET
TIER II DISPOSAL FACILITY CROSS SECTION

PRODUCTION	CONCURRENCE - ASSENTIMENT
DESIGNED / ETUDIE: BWF	DES OFF / AGENT CONCEPT
DRAWN / DESSINE: DW	SECT HD / CHEF SECT
CHECKED / VERIFIE: BER	DES MGR / GEST CONCEPT
COORDINATION: BWF	REVIEWED - REVU

DWG. NO. - DESSIN NO.
H-8233/1-9101-118

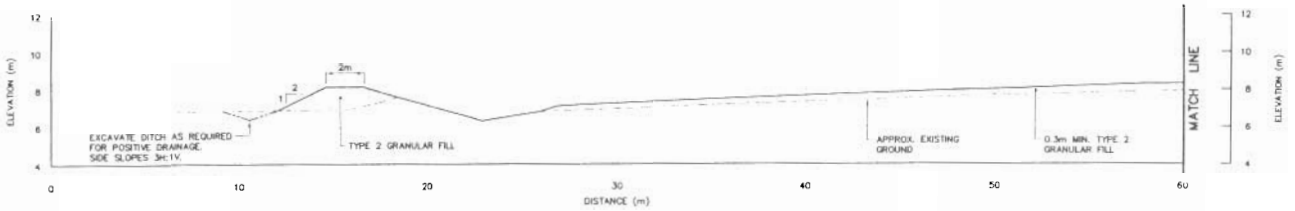
Canada

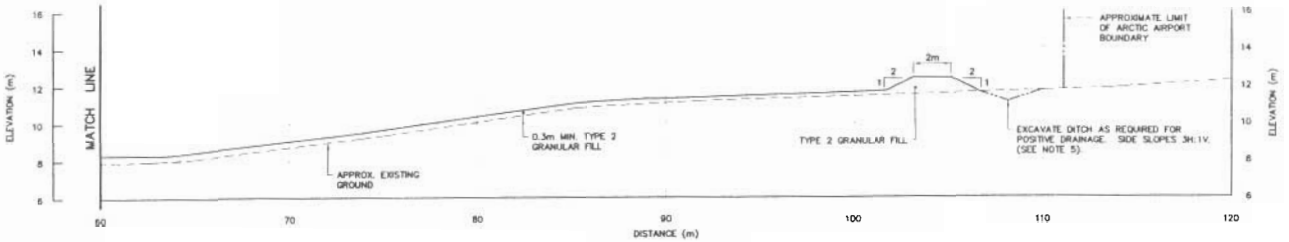


LANDFARM – PLAN

SCALE 1:2000

COORDINATE POINTS LANDFARM			
NO.	NORTHING	EASTING	ELEV.
181	9 167.0	9 439.3	7.5
182	9 090.4	9 483.9	11.7
183	9 269.0	9 643.4	11.5
184	9 309.5	9 598.0	9.3
185	9 274.1	9 523.5	8.2





SECTION L 119

SCALE 1:200

General Notes:

1. ALL ELEVATIONS ARE REFERENCED TO MEAN SEA LEVEL.
2. HORIZONTAL CONTROL REFERENCED TO SURVEY CONTROL MONUMENTS.
3. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.
4. FOR MONITORING WELL INSTALLATION DETAILS, SEE DWG. H-B233/1-9101-125. EXACT LOCATIONS TO BE FIELD DETERMINED BY THE ENGINEER.
5. NO EXCAVATION OR DISTURBANCE IS ALLOWED OUTSIDE THE ARCTIC AIRPORTS PROPERTY FOR LANDFARM CONSTRUCTION.

Legend:

- EXISTING MONITORING WELL LOCATION
- 181 — COORDINATE POINT
- PROPOSED MONITORING WELL LOCATION (3)
- PROPOSED BACKGROUND MONITORING WELL LOCATION (1)

National Défense / Defence nationale

Headquarters / Quartier général

No.	DATE	REVISION	REVISION	APP'D

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SCALE – ECHELLE: AS SHOWN

PROJECT – PROJET: FOX-5 BROUGHTON ISLAND

DEW LINE CLEAN UP

TRADE – METIER	DATE
SITING	2003-01-14

SUBJECT – SUJET

AIRSTRIP AREA LANDFARM
PLAN AND CROSS SECTION

PRODUCTION	CONCURRENCE – ASSENTIMENT	
DESIGNED – ETUDE BRF		DES OFF AGENT CONCEPT
DRAWN – DESSINE CAE		SECT HD CHEF SECT
CHECKED – VERIFIE ELR		DES MGR DEST CONCEPT
COORDINATION SMS	REVIEWED – REVU	

DWG NO – DESSIN NO: H-B233/1-9101-119

Canada

1. LANDFARM

1.1 Construction

The hydrocarbon contaminated soil treatment facilities at FOX-5 consist of landfarms. Development, operation and closure of two landfarms at the FOX-5 site will involve the following work:

- Ground preparation, as required to facilitate treatment operations;
- Construction of perimeter berms and runoff collection ditch (runoff is collected, tested and discharged to the adjacent sump);
- Installation, operation and maintenance of monitoring well installations required to support treatment operations;
- Placement, stockpiling, processing and treatment of Type B hydrocarbon contaminated soil at the treatment area;
- Management of surface water runoff;
- Closure and removal of all equipment and materials following confirmation that treatment has remediated contaminated soil.

The landfarms are located: at least 100 metres away from any water body, and are in an area free of ponded water; to provided for the convenient access of equipment; at least 500 metres from the construction camp, offices and laboratory; and in an area that is relatively free of boulders and that is generally level.

Soil excavations are to remain free of water during soil removal, confirmatory sampling and backfilling activities. Dewatering of ponded water areas may be required. If dewatering is required, the water is to be tested and must comply with the wastewater discharge criteria.

- Excavate granular material from the treatment area perimeter berms and place this material over the consolidated treated soil area;

- Place and compact granular material from the perimeter berms to provide a cover over the contaminated soil area. Additional cover material is to be placed to provide a 300 mm minimum depth of compacted granular fill as cover over the contaminated soil area. All granular fill is to be compacted to 95% Maximum Dry Density;

- Grade the surface of the area, as required, to promote surface water runoff;

- Decommission the groundwater monitoring wells, including backfill with appropriate grout, removal of the protective casing, lockable cap and well pipe to within 300 mm from the ground surface; and backfill and compact all voids with granular fill material.

Summary of Potential Environmental Impacts and Proposed Mitigative Measures

Impact	Mitigation Measure	Significance
The potential for migration of hydrocarbon contaminants from the landfarm could degrade soil and water quality.	Site facilities away from natural drainages. Provide a runoff collection system so that any contaminated runoff can be treated. Water will be tested prior to discharge and will be treated as hazardous if it does not meet the discharge criteria. Grade landfarm cover to promote surface run-off.	Not significant due to design criteria for landfarm development and closure.

Impact	Mitigation Measure	Significance
The potential exists for accidental release of hydrocarbon contaminated soil during excavation and landfarm operation. An accidental release would impact the local environment, including soil and water quality.	Implement proper handling, storage and transportation procedures for hydrocarbon contaminated soils. All workers to be trained in proper handling procedures for hydrocarbon contaminated soils on site. Do not store fuel on beach. Follow the spill contingency plans. Ensure all materials and equipment to implement contingency plans are available on-site. Handle all fuel in accordance with Contingency Plan (included in the original submission).	Not significant provided mitigation measures are implemented.
Excavation of hydrocarbon contaminated soil has the potential to degrade permafrost.	Minimize time permafrost is exposed. Minimize surface area of exposed permafrost or active zone.	Not significant.
Disturbance of the terrain and drainage may occur due to excavation of hydrocarbon contaminated soils.	Regrade and reshape disturbed areas to match existing terrain and drainage paths. Use existing roads for movement around the site.	Not significant provided mitigation measures are implemented.
Loss of habitat as a result of the development of the landfarm in previously undisturbed areas.	Regrade and reshape the disturbed areas to match existing terrain to facilitate recovery of ecosystem components.	Not significant.
Impact on aquatic habitat due to sediment and/or hazardous materials entering an aquatic environment from operation of the landfarm and handling of hydrocarbon contaminated soil.	Implement mitigation measures to prevent deleterious substances from entering the aquatic environment.	Not significant provided mitigation measures are implemented.

Impact	Mitigation Measure	Significance
The operation of the landfarm has the potential to impact health and safety of workers.	Develop and implement a comprehensive health and safety plan. Workers to be trained in use of personal protective equipment and proper handling procedure for hydrocarbon contaminated soils. Workers are to wear and use appropriate personal protective equipment. Proper procedures for working around heavy equipment to be implemented. Signs in both English and Inuktitut are to be placed around the landfarm.	Not significant provided mitigation measures are implemented.

Temporary Cut-off Trench Report

DEW Line Cleanup Project
FOX-5, Broughton Island

By:

Defence Construction Canada
112 Kent Street, 17th Floor
Ottawa, Ontario
K1A 0K3

Date: January 2003

TABLE OF CONTENTS

BACKGROUND:

Past fuel spills have occurred at the FOX-5 DEW Line Fuel Storage Tanks adjacent to the end of the airstrip at Broughton Island, Nunavut. This hydrocarbon contamination was identified during testing undertaken as part of the DEW Line Clean-up Project.

A letter from Environment Canada, on 22 August 2001, stated the plume of hydrocarbon contamination was approaching the ocean and DND was instructed to clean up the plume. In response to the enforcement letter, Defence Construction Canada instructed UMA Engineering to design a remediation method to prevent the deposition of a deleterious substance (i.e./ hydrocarbons) into Davis Strait.

AIM:

In response to the above request UMA Engineering designed a cut-off trench to intercept hydrocarbon contamination and stop it from entering Davis Strait. This cut-off trench was excavated down gradient of the abandoned fuel tanks and filled with sorbent material. Details of the 2001 work plan were presented in the Temporary Cut-Off Trench Report, DEW Line Cleanup Project, FOX-5, Broughton Island October 2001 provided by SGE Inc.

NB. The Interceptor Trench, developed at the FOX-5 Fuel Storage Area, was designed as an interim remedial measure. The entire region of the hydrocarbon contamination is scheduled to be remediated as part of the full FOX-5 DEW Line Clean-up.

Trench construction began in October 2001 and the initial scope was completed prior to freeze up. During the winter additional test results indicated that the area of contamination was more extensive than previously indicated. Accordingly, Defence Construction Canada instructed UMA Engineering to revisit their design with a view to providing containment for the additional hydrocarbon contamination. This report details the additional work undertaken at the FOX-5 Broughton Island Fuel Storage Area in the summer of 2002.

METHODOLOGY:

Sorbent materials were purchased in Pickering, Ontario, shipped to Ottawa, and then flown to Iqaluit. A DEW Line Clean Up (DLCU) Site Engineer accompanied the material to Broughton Island on July 14, 2002 via air charter. This charter mobilized approximately half of the required sorbent materials. Arrangements were made to bring in the remainder of the material on July 15, 2002.

Mr. Don Pickle, the Senior Administrative Officer for the Hamlet of Qikiqtarjuak, met the DLCU Site Engineer at the airport. He also made arrangements to store the sorbent material in the DEW Line warehouse until work was to commence the next day.

The development of the interceptor trench began and was completed on July 15, 2002.

As per the engineering design one layer of the sorbent pillows were placed on the bottom of the trench and two layers of sorbent sweeps were placed on the sides and the bottom of the excavation. An insufficient supply of absorbent pillows were mobilized to Broughton Island requiring a re-design of the final 30.5 meters of the interceptor trench. Design Engineers substituted 2 layers of sorbent sweeps in lieu of the sorbent pillows. The re-design did not compromise the performance of the interceptor trench. For the final 30.5 meters of the trench two layers of the sorbant sweeps were placed on the bottom of the trench (refer to Photo 1) and then two additional layers of the sweeps were placed on the bottom and the sidewalls of the excavation. Rocks were used to hold the sweeps up on the sides until the excavated material was backfilled on top of the sorbant layers.

To prevent any surface run-off, sorbant booms were placed at the surface of the trench excavation, this included replacing the booms that were placed in 2001. An insufficient supply of sorbent booms was also mobilized to Broughton Island. Accordingly, arrangements were made with Mr. Pickle for the remainder of the booms to be installed at a later date. The final length of sorbent booms were placed, under the direction of a DLCU Site Engineer in September 2002.

In addition, the DLCU Site Engineer, along with two labourers, walked the length of the Airstrip landfill and picked up batteries and some items that could not be identified. All collected debris were taken back to the DEW Line garage and deposited in an over-pack drum. All stored debris is scheduled for disposal during the full site clean up in accordance with all applicable regulations.

See Appendix A for a photographic record or the 2002 work plan.

See Appendix B for the As-Built Record Drawing of the Interceptor Trench.

APPENDIX A - PHOTOGRAPHS:

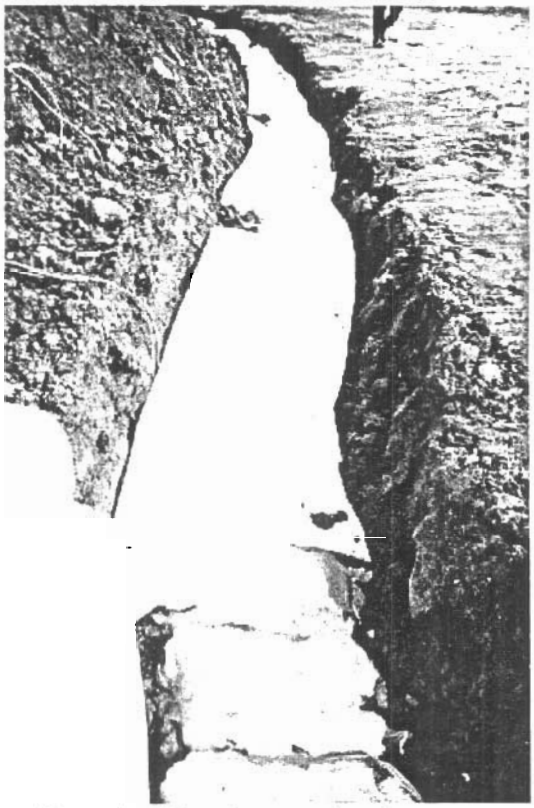


Photo 1 – Two layers of sorbant sweeps placed on bottom instead of pillows.

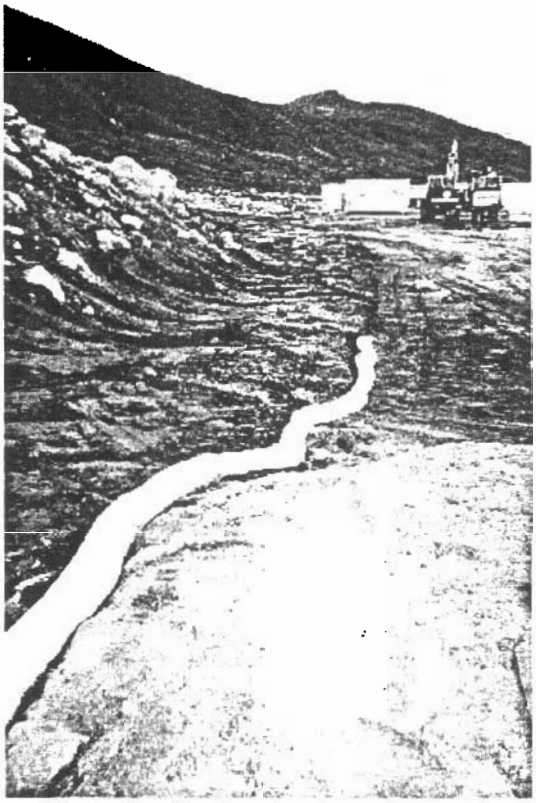


Photo 2 – Section that requires sorbant booms.

Photo 3

Photo 4

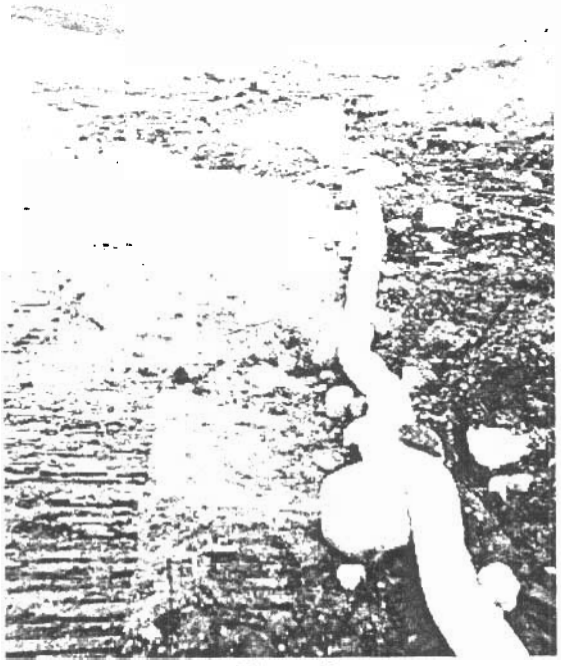


Photo 5

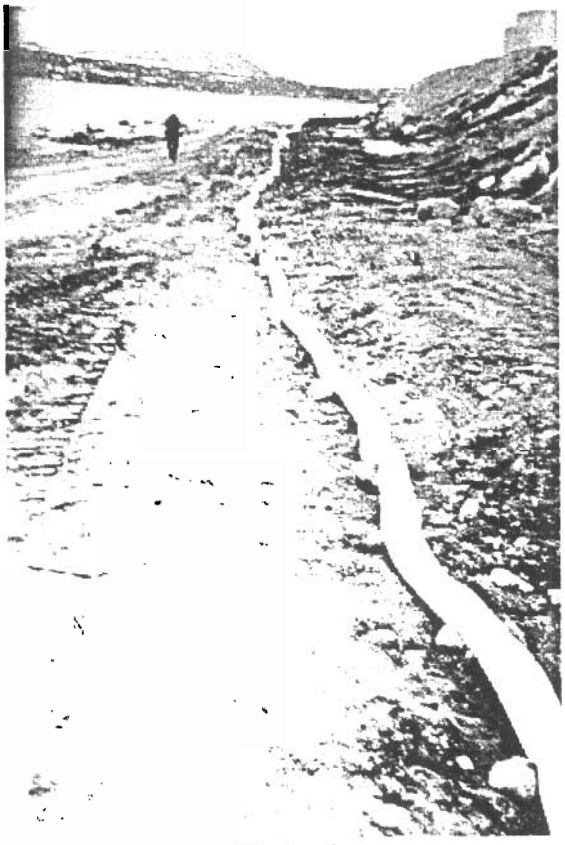


Photo 6

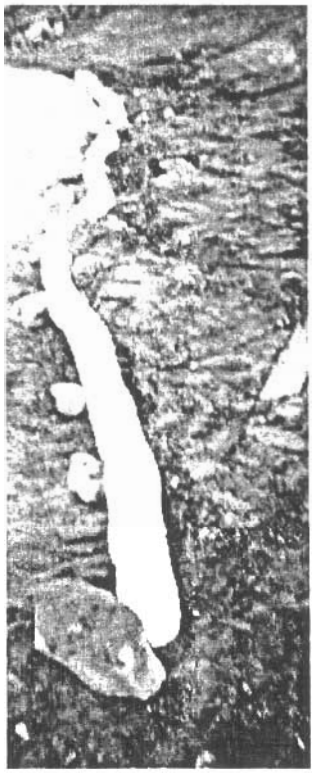
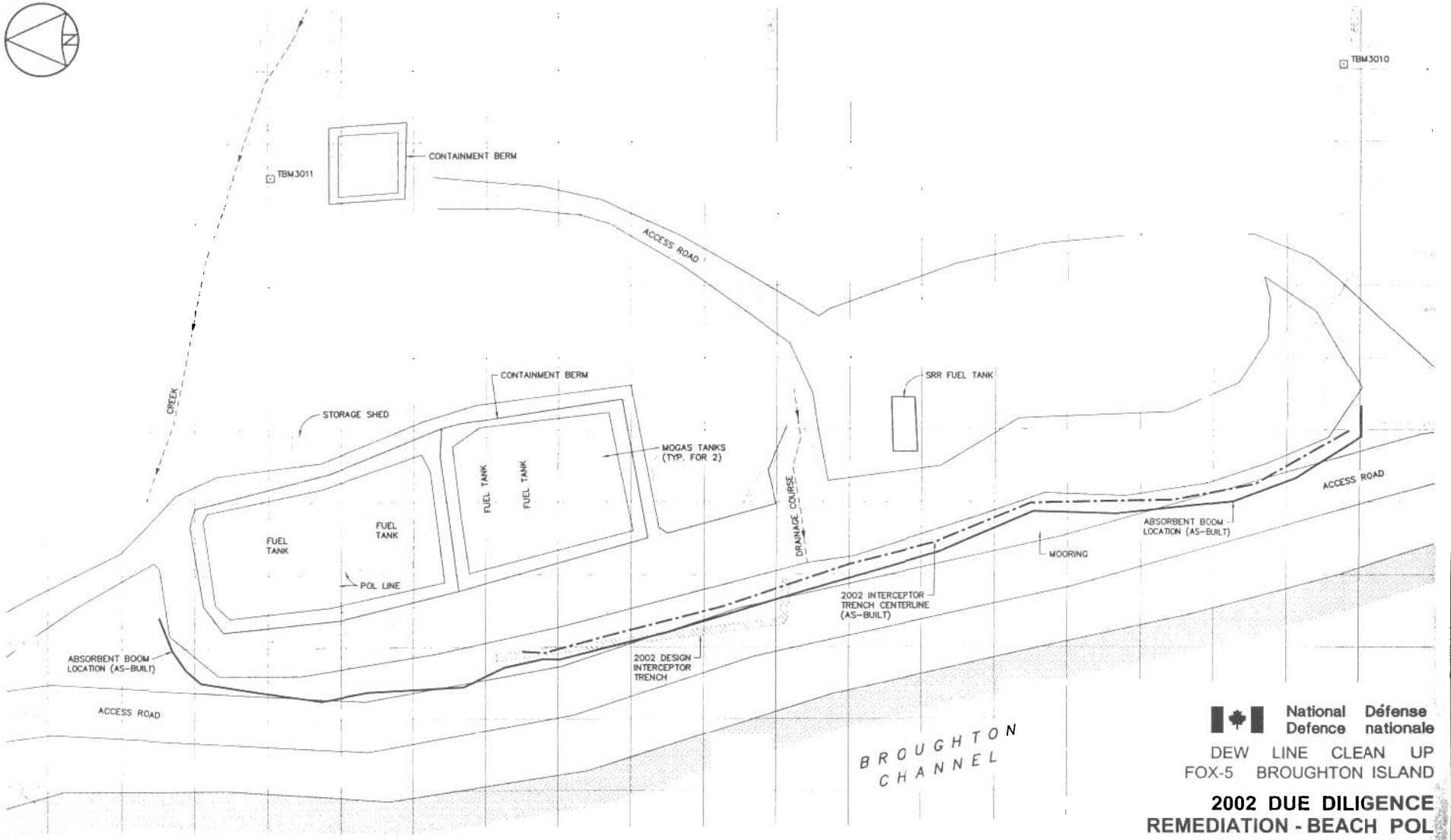


Photo 7

Photo 8

APPENDIX B - FIGURES:



National Défense
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DEW LINE CLEAN UP
FOX-5 BROUGHTON ISLAND

2002 DUE DILIGENCE REMEDIATION - BEACH POL RECORD INFORMATION

NOVEMBER, 2002 FIGURE 1.0