

ANNEX A – BAR-2 SITE-SPECIFIC INFORMATION

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NOTE: ADDITIONAL INFORMATION, INCLUDING UPDATED REPORTS/RECORDS, WILL BE PROVIDED TO THE SUCCESSFUL PROPONENT FOLLOWING CONTRACT AWARD.

A. SITE SPECIFIC INFORMATION – BAR-2 SHINGLE POINT

A.1 Introduction

The BAR-2 Shingle Point former auxiliary DEW Line site is located in the Yukon Territory at approximately 68° 55' 22" N, 137° 15' 38" W. The site is approximately 160 km northwest of the community of Inuvik, Northwest Territories and is located on the Yukon Coastal Plain, adjacent to the Beaufort Sea. Several lakes are present in the site vicinity, and much of the surface drainage moves through relatively flat organic terrain. The site is located within the zone of continuous permafrost.

BAR-2 is accessible via charter aircraft (fixed wing or helicopter); the condition of the runway is unknown. North Warning System (NWS) on-site transportation is not available and the condition of various site access roads is unknown.

BAR-2 was converted to a NWS Long Range Radar (LRR) station in 1989. An environmental clean-up and demolition of facilities not required for LRR operation was completed in 2001, including closure and remediation of three existing landfills. At that time, the Station Area Landfill was constructed for the disposal of non-hazardous waste generated from demolition and consolidation of site debris. Post-clean-up landfill monitoring is being carried out at the site at the following locations shown on Figure BAR-2.1:

1. NWS Landfill
2. Ravine Landfill
3. Station Area Landfill
4. USAF Landfill

The monitoring schedule for BAR-2 Shingle Point is provided in Table A1 below:

Table A1 – Monitoring Schedule BAR-2 Shingle Point		
No. of Years After Construction	Monitoring Event Number	Year
Prior to/During:	Baseline	1998-2001
1	1	2002
2	2	2003
3	3	2004
4	4	2005
5	5	2006
7	6	2008
10	7	2011
15*	8	2016
25	9	2026

Shaded cells are those covered under this contract.

**Year 15 monitoring did not take place in 2016; Year 16 monitoring will be undertaken in 2017 instead.*

A summary of monitoring installations associated with each landfill is provided in Table A2 below.

Table A2 – Summary of Landfill Monitoring/Sampling Locations BAR-2 Shingle Point			
Landfill Designation/Monitoring Locations	Coordinates¹		Elevation
	North (m)	East (m)	(masl)
NWS Landfill			
B2-1 (soil)			
B2-2 (soil)			
B2-3 (soil)			
B2-4 (soil)			
Ravine Landfill			
B2-5 (soil)			
B2-6 (soil)			
B2-7 (soil)			
B2-8 (soil)			
Station Area Landfill			
MW-4 (soil and groundwater)			
MW-5 (soil and groundwater)			
MW-6 (soil and groundwater)			
MW-7 (soil and groundwater)			
USAF Landfill			
MW-8 (soil and groundwater)			
MW-9 (soil and groundwater)			
MW-10 (soil and groundwater)			
MW-11 (soil and groundwater)			
MW-12 (soil and groundwater)			
MW-13 (soil and groundwater)			
VT-1 (ground temperature)			
VT-2 (ground temperature)			
IT-1 (ground temperature)			
IT-2 (ground temperature)			
IT-3 (ground temperature)			
IT-4 (ground temperature)			
IT-5 (ground temperature) ²			
IT-6 (ground temperature) ³			
<p>1. Coordinates of sampling/monitoring locations will be provided to the consultant following contract award.</p> <p>2. Based on the 2011 monitoring report, it may be necessary to by-pass the external COM port to download the data at IT-5.</p> <p>3. IT-6 was brought back south for repairs in 2011 and will need to be re-installed in 2017.</p>			

The following sections provide a brief description of the landfills included in the monitoring program, and the associated general monitoring requirements. Refer also to the Terms of Reference for specific monitoring requirements.

A.2 NWS Landfill

The NWS Landfill is located approximately 50 m south of the USAF Landfill beyond the east end of the airstrip; it was used during the conversion of the DEW Line site to the NWS LRR site. A geophysical survey conducted at the time of the initial landfill assessment indicated a limited amount of buried debris. The landfill depth is estimated at 2 m, based on information regarding operational procedures. No evidence of contaminated leachate or contaminated soil in excess of the remediation criteria was detected at this landfill during the assessment program.

The NWS Landfill was classified as a low potential environmental risk. Remediation consisted of regrading with the placement of additional granular fill in one localized area.

The long term monitoring plan consists of visual inspection of landfill stability, and the periodic collection of soil samples at the locations identified on Figure BAR-2.2.

For the 2017 monitoring event, complete a visual inspection of the landfill and soil sampling and analyses.

A.3 Ravine Landfill

The Ravine Landfill is located north of the airstrip, on the east side of the access road to the Beach Area. The depth of this landfill, although not known, appears to be relatively shallow based on the surrounding terrain. No evidence of contaminated leachate or contaminated soil in excess of the remediation criteria were detected at this landfill during the assessment program.

The Ravine Landfill was classified as a low potential environmental risk. Remediation consisted of regrading with the placement of additional granular fill.

Based on findings from the 2008 monitoring event and following a significant flow event in 2010, emergency repairs were conducted in August 2010 along the toe of the Ravine Landfill to repair erosion/scour and to realign a minor drainage channel. Additional remedial work was completed in 2012 to provide long-term protection of the landfill via infilling of the erosion scour, reconstruction of the landfill toe and realigning the drainage channel to divert water away from the landfill slope. A subsequent quality assurance visit completed by the project team and Technical Working Group in 2015 concluded that the repairs were successful in stabilizing the landfill toe and redirecting flow.

The long term monitoring plan consists of visual inspection of landfill stability, and the periodic collection of soil samples at the locations identified on Figure BAR-2.3.

For the 2017 monitoring event, complete a visual inspection of the landfill and soil sampling and analyses.

A.4 Station Area Landfill

The Station Area Landfill is located on the west side of the access road from the Airstrip Area to the Station Area. The landfill was constructed during the BAR-2 cleanup for the disposal of non-hazardous demolition and site waste. Four groundwater monitoring wells were installed at the landfill.

The long term monitoring plan consists of visual inspection of landfill stability, and the periodic collection of soil and groundwater samples at the locations identified on Figure BAR-2.4.

For the 2017 monitoring event, complete a visual inspection of the landfill along with soil and groundwater sampling and analyses.

A.5 USAF Landfill

The USAF Landfill is located east of the airstrip, along the side of a valley. The depth of the landfill may be as thick as 6 m on the east side, based on evaluation of the surrounding terrain. At the time of the initial landfill assessment, evidence of leachate was detected downgradient of the landfill and contaminated soil in excess of criteria was identified in surface soils at the toe.

The USAF Landfill was classified as a moderate potential environmental risk. Remediation consisted of installation of a leachate containment system comprised of synthetic liners anchored into the existing permafrost and regrading of the landfill surface with additional granular fill of sufficient thickness to cause permafrost aggradation through the landfill contents. Six monitoring wells, two vertical thermistors, and six inclined thermistors with pneumatic piezometers were installed at the landfill.

Based on findings from the 2008 monitoring event, a remedial design was prepared to repair an erosion channel and construct a realigned drainage channel to divert water away from the landfill slope. The subsequent monitoring event completed in 2011 identified additional erosion scour and the development of a pronounced scarp at the northeast toe of the landfill. These erosion features were determined to not impact the landfill integrity based on their distance from the key trench. To prevent further regression of these features, loose coarse material was placed on the surface of the erosion channel in 2012 to dissipate flow energy and reduce the potential for future erosion. A subsequent quality assurance visit completed by the project team and Technical Working Group in 2015 concluded that the repairs were successful in stabilizing the area.

The long term monitoring plan consists of visual monitoring of landfill stability and the periodic collection of soil and groundwater samples and monitoring subsurface ground temperatures at the locations identified on Figure BAR-2.5.

For the 2017 monitoring event, complete a visual inspection of the landfill along with soil and groundwater sampling and analyses and thermal monitoring.

A.6 Climate Normals

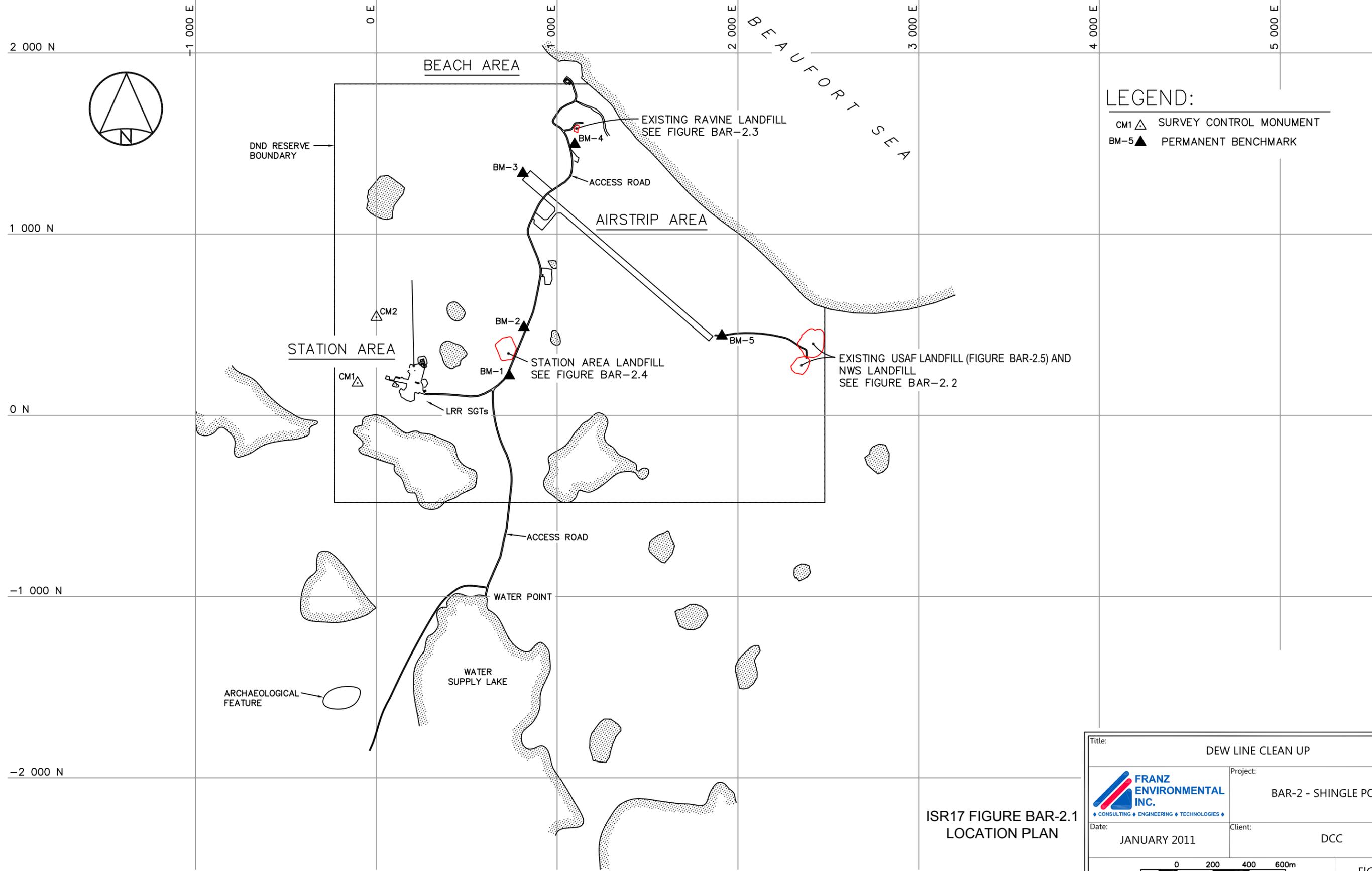
The 1961-1990 and 1971-2000 climate normals prepared by Environment and Climate Change Canada (ECCC) for Shingle Point can be found at the following links, respectively:

http://climate.weather.gc.ca/climate_normals/results_1961_1990_e.html?stnID=1522&lang=e&StationName=shingle+point&SearchType=Contains&stnNameSubmit=go&dCode=0&prov=YT&dispBack=1

http://climate.weather.gc.ca/climate_normals/results_e.html?stnID=1596&lang=e&StationName=shingle+point&SearchType=Contains&stnNameSubmit=go&dCode=5&dispBack=1

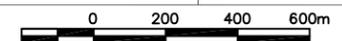
More recent climate normals from ECCC are not available for Shingle Point. The closest location for which more recent climate information is available is Inuvik, NT. Climate normals for the 1981-2010 period for Inuvik can be found at the following link:

http://climate.weather.gc.ca/climate_normals/results_1981_2010_e.html?stnID=1669&lang=e&prouvince=NT&provSubmit=go&dCode=0

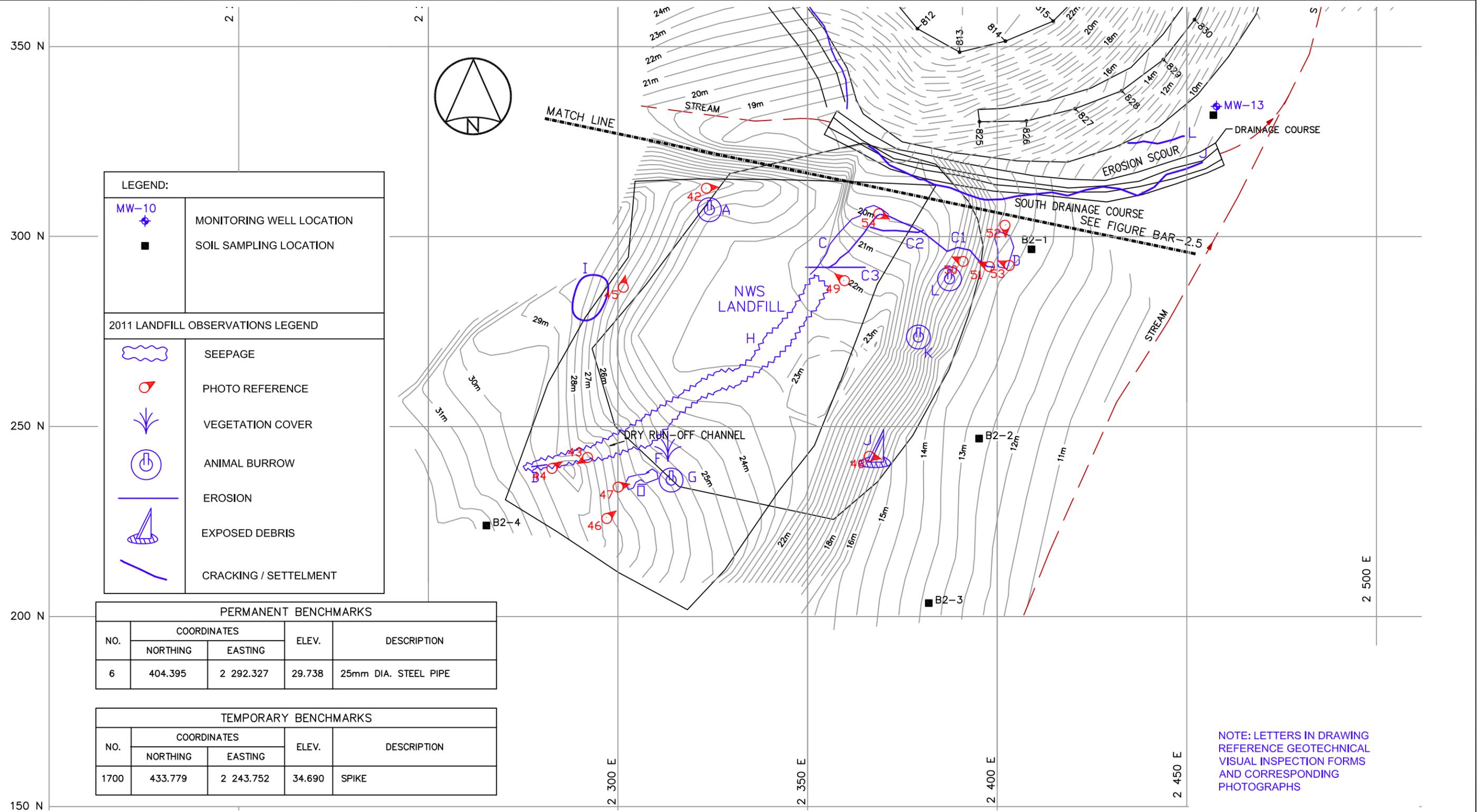


LEGEND:
 CM1 ▲ SURVEY CONTROL MONUMENT
 BM-5 ▲ PERMANENT BENCHMARK

ISR17 FIGURE BAR-2.1
 LOCATION PLAN

Title: DEW LINE CLEAN UP	
 • CONSULTING • ENGINEERING • TECHNOLOGIES •	Project: BAR-2 - SHINGLE POINT
	Client: DCC
Date: JANUARY 2011	
 200 100 1:20000	
FIGURE 2.1	

Z:\Projects\2011\1677-1101 DCC Dew Lines\Figures\1-CAD\0171-146-01_99-H-1001_RX.dwg (layout)



LEGEND:

MW-10 MONITORING WELL LOCATION
 ■ SOIL SAMPLING LOCATION

2011 LANDFILL OBSERVATIONS LEGEND

SEEPAGE
 PHOTO REFERENCE
 VEGETATION COVER
 ANIMAL BURROW
 EROSION
 EXPOSED DEBRIS
 CRACKING / SETTLEMENT

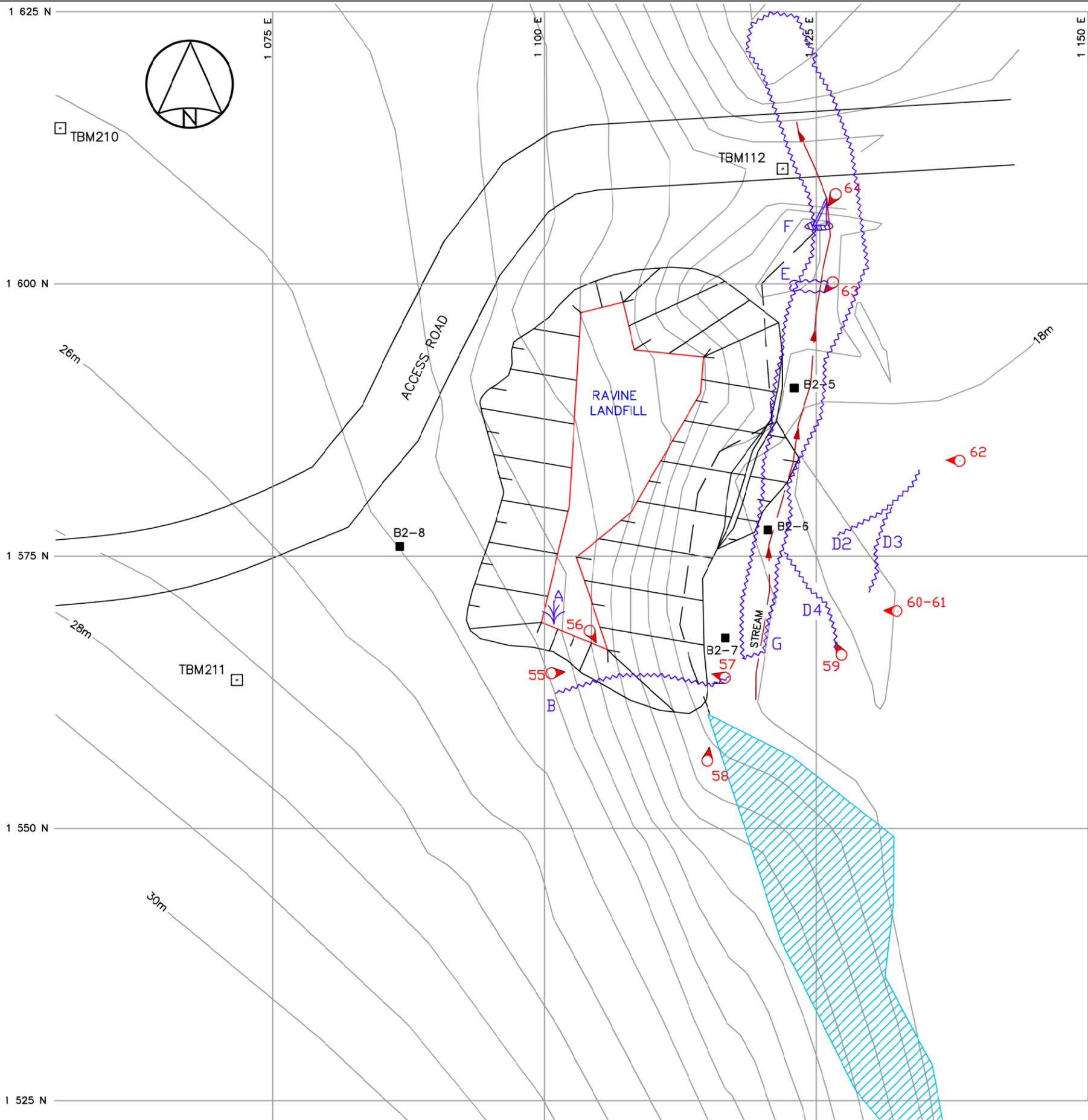
PERMANENT BENCHMARKS				
NO.	COORDINATES		ELEV.	DESCRIPTION
	NORTHING	EASTING		
6	404.395	2 292.327	29.738	25mm DIA. STEEL PIPE

TEMPORARY BENCHMARKS				
NO.	COORDINATES		ELEV.	DESCRIPTION
	NORTHING	EASTING		
1700	433.779	2 243.752	34.690	SPIKE

NOTE: LETTERS IN DRAWING REFERENCE GEOTECHNICAL VISUAL INSPECTION FORMS AND CORRESPONDING PHOTOGRAPHS

ISR17 FIGURE BAR-2.2
NWS LANDFILL

Title: BAR-2 - SHINGLE POINT NWS LANDFILL	
<p>FRANZ ENVIRONMENTAL INC. CONSULTING • ENGINEERING • TECHNOLOGIES</p>	Project: DEW LINE CLEAN UP LANDFILL MONITORING PLAN
	Client: DCC
Date: JANUARY 2012	
FIGURE 2.2	



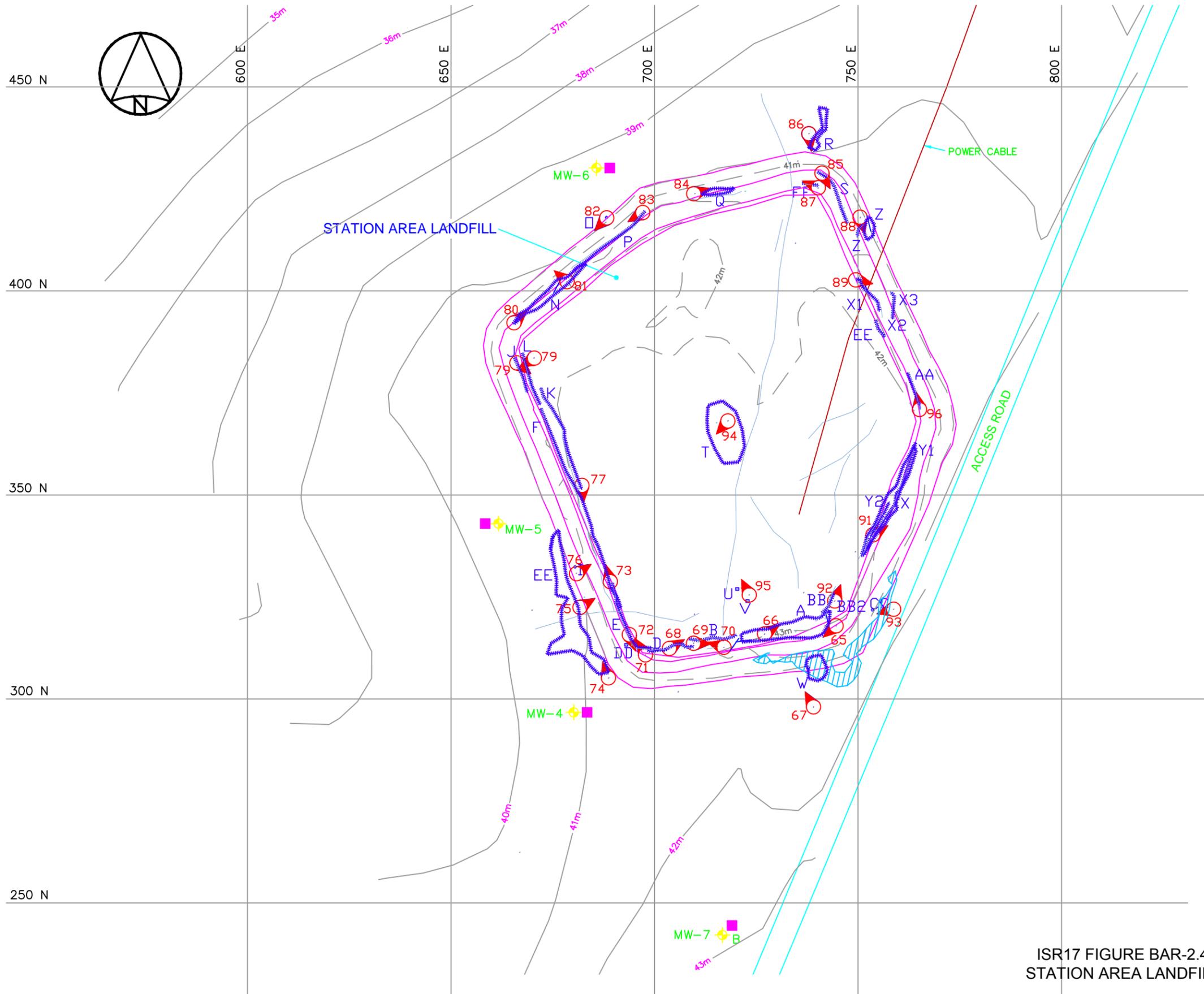
LEGEND:	
TBM112 □	TEMPORARY BENCHMARK
■	SOIL SAMPLING LOCATION
2011 LANDFILL OBSERVATIONS LEGEND	
	PHOTO REFERENCE
	VEGETATION COVER
	EXPOSED DEBRIS
	WATER
	EROSION
	SEEPAGE / VEG DISSTRESS

TEMPORARY BENCHMARKS				
NO.	COORDINATES		ELEV.	DESCRIPTION
	NORTHING	EASTING		
8	1 629.619	1 092.377	23.709	REBAR
112	1 610.567	1 121.932	18.291	????
210	1 614.294	1 055.431	25.910	50mm x 50mm WOODEN STAKE
211	1 563.631	1 071.720	27.550	50mm x 50mm WOODEN STAKE

NOTE: LETTERS IN DRAWING REFERENCE GEOTECHNICAL VISUAL INSPECTION FORMS AND CORRESPONDING PHOTOGRAPHS

ISR17 FIGURE BAR-2.3
RAVINE LANDFILL

Title: BAR-2 - SHINGLE POINT RAVINE LANDFILL	
	Project: DEW LINE CLEAN UP LANDFILL MONITORING PLAN
	Client: DCC
Date: JANUARY 2012	
1:500	
FIGURE 2.3	

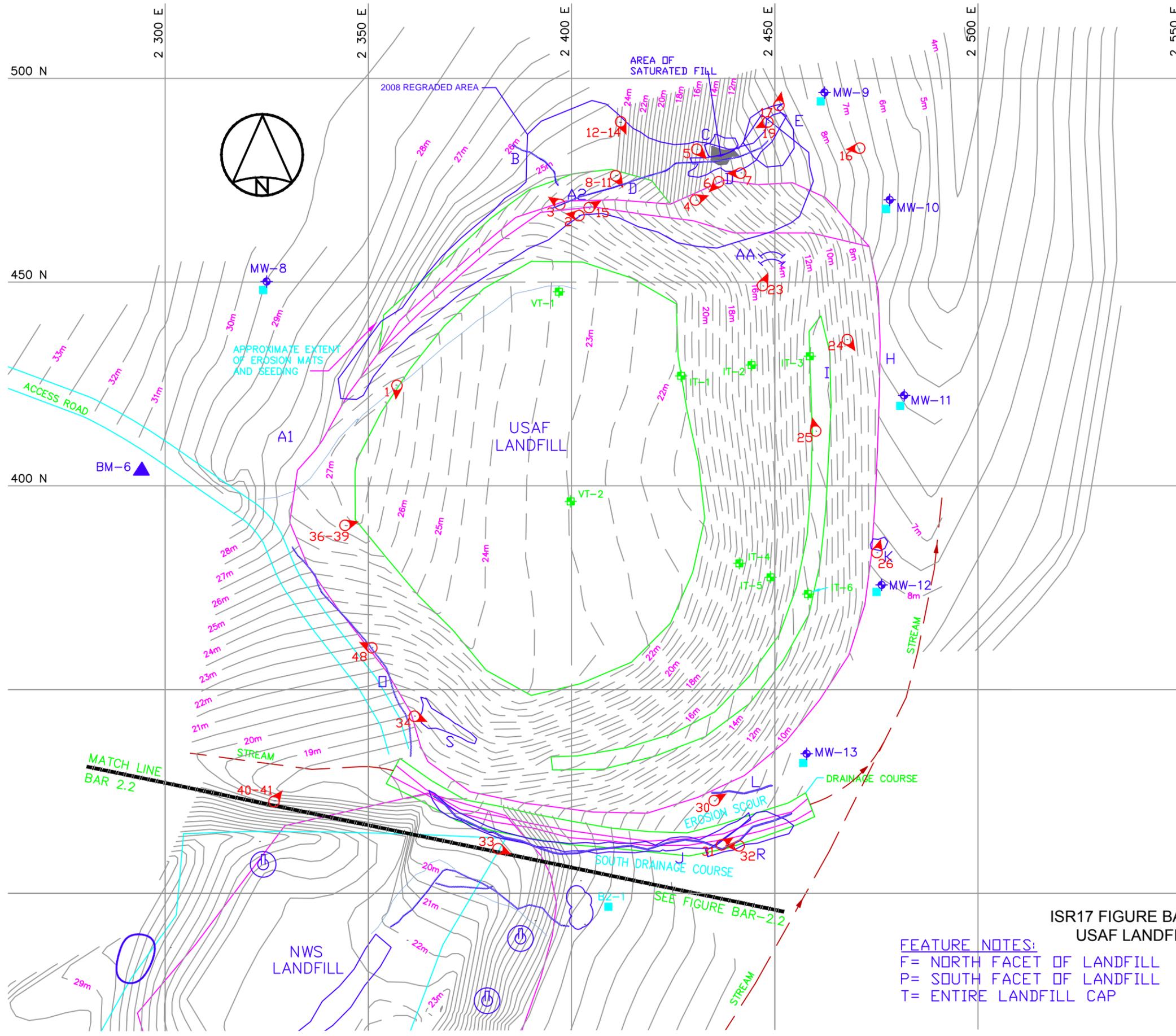


LEGEND:	
MW-4	MONITORING WELL LOCATION
■	SOIL SAMPLING LOCATION
2011 LANDFILL OBSERVATIONS LEGEND	
📍	PHOTO REFERENCE
🌿	VEGETATION COVER
🌊	WATER
📏	CRACKING / SETTLEMENT
👉	SEEPAGE
•	SEEPAGE POINTS
◻	SETTLEMENT
▲	STAINING

NOTE: LETTERS IN DRAWING REFERENCE GEOTECHNICAL VISUAL INSPECTION FORMS AND CORRESPONDING PHOTOGRAPHS

ISR17 FIGURE BAR-2.4
STATION AREA LANDFILL

Title: BAR-2 - SHINGLE POINT STATION AREA LANDFILL	
<p>FRANZ ENVIRONMENTAL INC. CONSULTING • ENGINEERING • TECHNOLOGIES</p>	Project: DEW LINE CLEAN UP LANDFILL MONITORING PLAN
	Client: DCC
Date: JANUARY 2012	
<p>1:1000</p>	
FIGURE 2.4	



LEGEND:

- ▲ BM-6 BENCH MARK
- ◆ MW-10 MONITORING WELL LOCATION
- SOIL SAMPLING LOCATION
- VT+ VERTICAL THERMISTOR
- IT+ INCLINED THERMISTOR AND PNEUMATIC PIEZOMETER

2011 LANDFILL OBSERVATIONS LEGEND

- ☞ SEEPAGE
- 📍 PHOTO REFERENCE
- 🌿 VEGETATION COVER
- 🐾 ANIMAL BURROW
- CRACKING / SETTLEMENT
- EROSION
- 🚗 VEHICLE RUTS

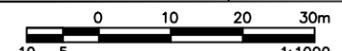
PERMANENT BENCHMARKS				
NO.	COORDINATES		ELEV.	DESCRIPTION
	NORTHING	EASTING		
6	404.395	2 292.327	29.738	25mm DIA. STEEL PIPE

TEMPORARY BENCHMARKS				
NO.	COORDINATES		ELEV.	DESCRIPTION
	NORTHING	EASTING		
1700	433.779	2 243.752	34.690	SPIKE

NOTE: LETTERS IN DRAWING REFERENCE GEOTECHNICAL VISUAL INSPECTION FORMS AND CORRESPONDING PHOTOGRAPHS

**ISR17 FIGURE BAR-2.5
USAF LANDFILL**

FEATURE NOTES:
 F= NORTH FACET OF LANDFILL
 P= SOUTH FACET OF LANDFILL
 T= ENTIRE LANDFILL CAP

Title: BAR-2 - SHINGLE POINT USAF LANDFILL		Project: DEW LINE CLEAN UP LANDFILL MONITORING PLAN	
 FRANZ ENVIRONMENTAL INC. <small>CONSULTING • ENGINEERING • TECHNOLOGIES</small>		Client: DCC	
Date: JANUARY 2012		Client: DCC	
 1:1000		FIGURE 2.5	