EFFLUENT DISCHARGE
N: 7 976 338
E: 503 636

E 503 600

FOR FUEL TANK FARM DETAILS SEE DRAWING• H349000-2613-10-014-0001

E 503 800

MILNE INLET

E 504 000

RAMP TO SEALIFT BARGE LANDING AREA

2615-BLD-001 MARINE MANIFOLD BUILDING

2521-BLD-002 WELDING SHOP BUILDING

2521-BLD-001 MAINTENANCE BUILDING

NORTH HAZARDOUS WASTE CONTAINMENT CELL

TOROMONT MAINTENANCE BUILDING

SHIPPING CONTAINERS LAYDOWN AREA

BIM CONSTRUCTION OFFICES

CONTRACTOR OFFICES

2521-BLD-003 WORKSHOP OFFICE BUILDING

LIGHT VEHICLE PARKING

N 7 976 200

2750-BLD-003 SERVICES AREA E-HOUSE •1

7235-BLD-002 SITE SERVICES HEATED WAREHOUSE

7235-BLD-003 SITE SERVICES UNHEATED WAREHOUSE

CONTRACTOR SHOP

MOBILE EQUIPMENT PARKING

2521-BLD-004 WORKSHOP OFFICE WASHCAR

CONTRACTOR SEACAN SHOP

SERVICE BERM

2511-BLD-003 ACCOMMODATION LAUNDRY

LIGHT VEHICLE PARKING

2750-BLD-001 ACCOMMODATION AREA E-HOUSE •1

FOUNTIAN TIRE SHOP

READYLINE (TYP.)

2511-BLD-002 ACCOMMODATION OFFICE

REEFER SEACAN LINE-UP

REEFER READYLINE PLUGS AND TRANSFORMER 2X10 GANG

BIM WAREHOUSE

2511-BLD-001 ACCOMMODATION SERVICE CORE

2512-BLD-003 ACCOMMODATION WING C

LIGHT VEHICLE PARKING

WAREHOUSE WASHCAR

2750-BLD-005 FUEL TANK FARM E-HOUSE

EFFLUENT POND

N 7 976 000

SOUTH HAZARDOUS WASTE CONTAINMENT CELL

DIVERSION DITCH FOR DETAILS SEE DWG. H349000-2130-10-016-0002

NOTE 6

NEW PAD CORNER
N: 7 975 972.690
E: 504 030.682

2512-BLD-001 ACCOMMODATION WING A

2512-BLD-004 ACCOMMODATION WING D

2731-BLD-001 SEWAGE CHEMICAL STORAGE CONTAINER

2720-BLD-001 WATER BUILDING

2512-BLD-002 ACCOMMODATION WING B

2510-PP-001 RAW SEWAGE LIFT STATION

4731-VP-005 SEWAGE TREATMENT PLANT

2513-BLD-002 EMERGENCY RESPONSE GARAGE

2750-BLD-002 ACCOMMODATION AREA E-HOUSE •2

FOR SERVICE BERM DETAILS SEE DWG• H349000-2000-00-014-0005

2513-BLD-001 EMERGENCY RESPONSE OFFICE

2530-BLD-009 & 010 POWER GENERATION E-HOUSE •1 AND •2

2530-BLD-001 TO 007 POWER GENERATION MODULE •1 TO •7 FOR DETAILS SEE DRAWING• H349000-2530-50-042-0001

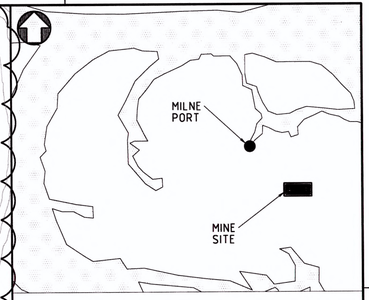
2540-BLD-001 WASTE MANAGEMENT BUILDING

INCINERATOR

2732-BLD-001 SEWAGE TRUCK BUILDING

2750-BLD-004 SERVICES AREA E-HOUSE •2

0 10 20 30 40 50
SCALE IN METRES



KEY-PLAN

LEGEND:

- PIPE LINE & ELECTRICAL
- PIPE LINE
- ELECTRICAL ABOVE GRADE
- ROAD CROSSING
- ELECTRICAL BELOW GRADE

NOTES:

1. TOPOGRAPHY PROVIDED BY TERRAPOINT CANADA INC.
2. COORDINATE GRID IS SHOWN IN UTM (NAD83) ZONE 17 AND IS IN METRES.
3. CONTOURS ARE IN METRES. CONTOUR INTERVAL IS 1.5 METRES.
4. ALL 7000 SERIES MODULAR BUILDINGS ARE FOR CONSTRUCTION AND THEIR FINAL LOCATIONS WILL BE DETERMINED AT SITE BY THE CONSTRUCTION GROUP.
5. FOR FOLD-AWAY BUILDINGS SETOUT COORDINATES REFER TO APPLICABLE FOUNDATION DRAWINGS.
6. NOT CONSTRUCTED (FUTURE WORK) AS INDICATED.

REFERENCE DRAWINGS	
H349000-2000-00-014-0001	EARLY REVENUE PHASE – SITE LAYOUT
DRAWING NO.	DRAWING TITLE

THIS AS-BUILT DOCUMENT HAS BEEN PREPARED BASED ON INFORMATION PROVIDED BY THIRD PARTIES. HATCH HAS NOT VERIFIED THE ACCURACY OR COMPLETENESS OF THIS INFORMATION AND SHALL NOT BE RESPOSIBLE FOR, AND DISCLAIMS ANY LIABILITY IN CONJUNCTION WITH, ANY ERRORS OR OMISSIONS THAT MAY BE INCORPORATED HEREIN AS A RESULT.

NO.	DESCRIPTION	BY	CHK'D	APP'D	DATE
3	AS BUILT	JB	SH	JC	2015-02-09
2	CHANGED BUILDING LOCATIONS & COORDINATES	DK	CL	TT	2013-08-28
1	SCALE CHANGED & BLDG. COORDINATES ADDED	DK	CL	TT	2013-08-13

REVISIONS

AS BUILT

REVISED AS MARKED. ALL OTHER DETAILS CONSTRUCTED WITHIN ACCEPTABLE TOLERANCES.

REV.	ISSUE FOR	AUTH. BY	DATE
3	AS BUILT	SH / JC	2015-02-09
2	FOR CONSTRUCTION	TT / JC	2013-08-29
1	FOR CONSTRUCTION	TT / JC	2013-08-13
0	FOR CONSTRUCTION	TT / JC	2013-05-09

ISSUE AUTHORIZATION

HATCH

DESIGNED BY T. THERTELL DATE 2013-08-27	DRAWN BY D. KARUNAKARAN DATE 2013-08-27
CHECKED BY T. THERTELL DATE 2013-08-29	DISCIP. ENGR. J. LEMAY DATE 2013-08-29
PROJ. DES. COORD. T. THERTELL DATE 2013-08-29	PROJ. ENGR. J. CLELAND DATE 2013-08-29
PROJ. MGR. S. PERRY DATE 2013-08-29	

Baffinland

MARY RIVER PROJECT

MILNE PORT
INFRASTRUCTURE
SITE LAYOUT

SCALE	DWG. NO.	REV.
1:1000 OR AS NOTED	H349000-2000-00-014-0004	3

ORIGINAL SHEET SIZE: ISO A1 (841 x 594)

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2/9/2015 11:39:14 AM
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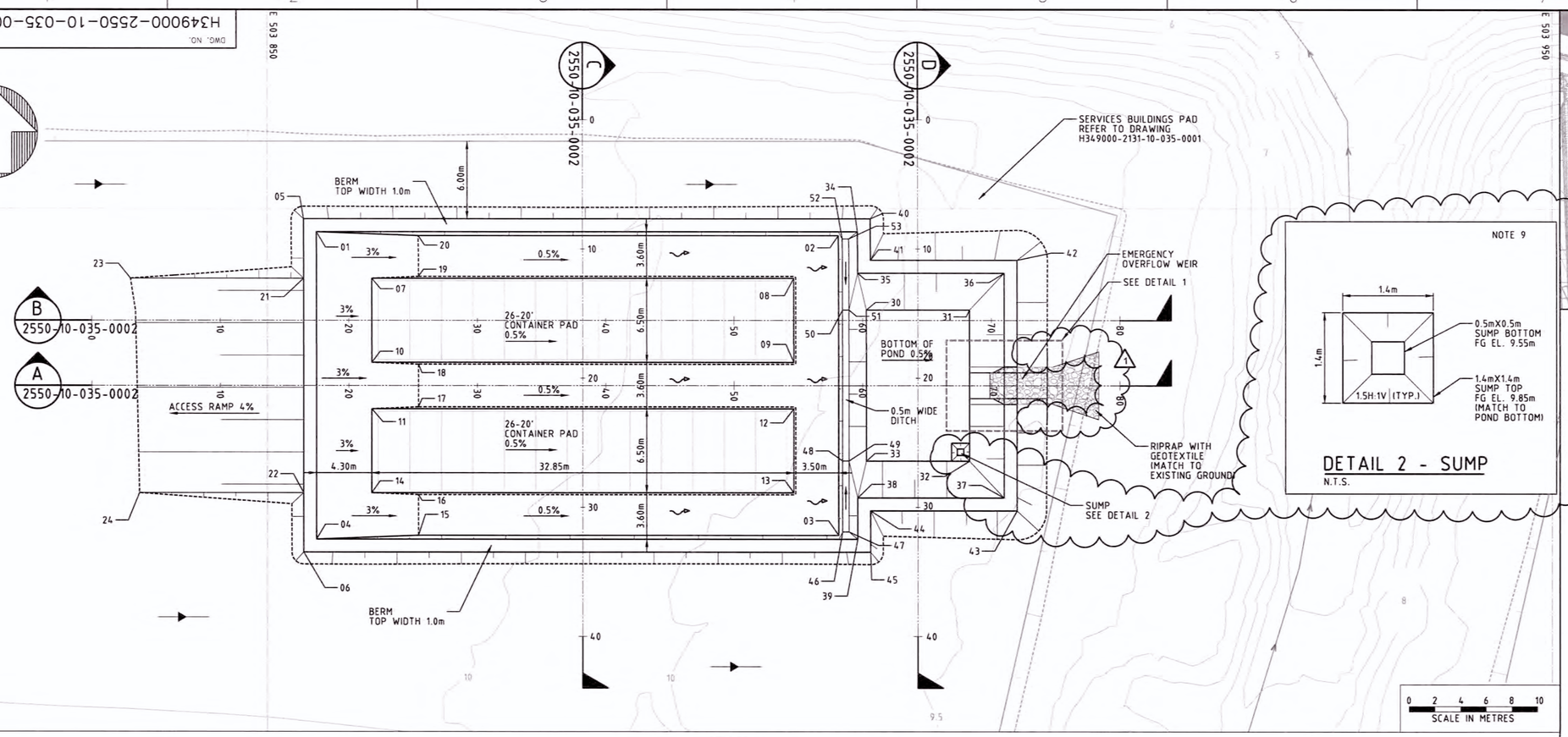
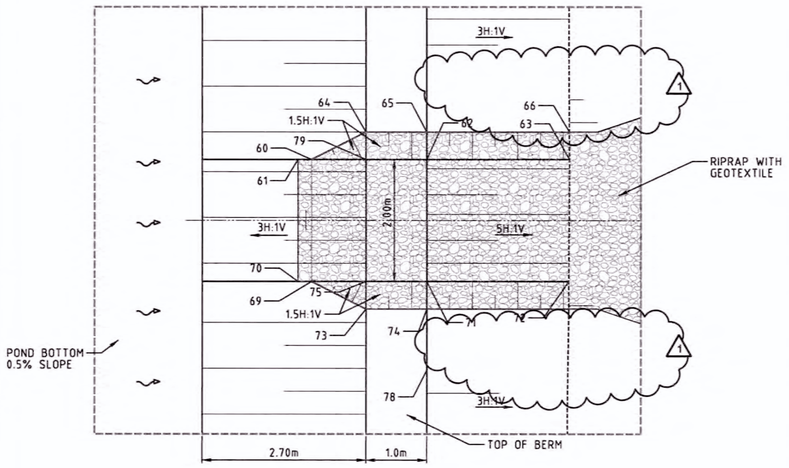
DWG. NO. H349000-2550-10-035-0001



LEGEND:

- EXISTING GROUND CONTOUR
- EXISTING STREAM
- FILL SLOPE
- CUT SLOPE
- TOE OF SLOPE
- GRADING SLOPE
- CENTERLINE OF SWALE/DITCH
- FG — FINISHED GRADE ELEVATION
- CROSS SECTION DISTANCE
- FLOW DIRECTION
- EXTERNAL FLOW DIRECTION



DETAIL 1 - EMERGENCY OVERFLOW WEIR
1:50

PLAN
1:200

SETOUT POINTS FOR CELL

POINT No.	NORTHING	EASTING	ELEV.
01	7 976 303.00	503 853.83	10.95
02	7 976 303.00	503 894.48	10.55
03	7 976 282.00	503 894.48	10.55
04	7 976 282.00	503 853.83	10.95
05	7 976 305.00	503 852.83	11.26
06	7 976 280.00	503 852.83	11.19
07	7 976 301.00	503 858.13	10.90
08	7 976 301.00	503 890.98	10.62
09	7 976 294.00	503 890.98	10.67
10	7 976 294.00	503 856.00	10.95
11	7 976 290.00	503 856.28	10.94
12	7 976 291.00	503 890.98	10.57
13	7 976 284.00	503 890.98	10.67
14	7 976 284.00	503 855.00	10.93
15	7 976 281.00	503 861.76	10.71
16	7 976 285.00	503 861.76	10.71
17	7 976 291.00	503 861.76	10.71
18	7 976 294.00	503 861.76	10.71
19	7 976 301.00	503 861.76	10.71
20	7 976 303.00	503 861.76	10.71
21	7 976 300.00	503 852.83	11.03
22	7 976 284.00	503 852.83	11.03
23	7 976 299.00	503 841.00	10.32
24	7 976 282.00	503 842.00	10.32

SETOUT POINTS FOR POND

POINT No.	NORTHING	EASTING	ELEV.
30	7 976 298.00	503 896.63	9.90
31	7 976 298.00	503 904.63	9.85
32	7 976 286.00	503 904.63	9.85
33	7 976 286.00	503 896.63	9.90
34	7 976 305.00	503 895.96	10.75
35	7 976 301.00	503 895.96	10.75
36	7 976 301.00	503 907.33	10.75
37	7 976 284.00	503 907.33	10.75
38	7 976 284.00	503 895.96	10.75
39	7 976 281.00	503 895.96	10.75
40	7 976 305.00	503 896.96	11.05
41	7 976 302.00	503 896.96	10.75
42	7 976 302.00	503 908.33	10.75
43	7 976 282.00	503 908.33	10.75
44	7 976 282.00	503 896.96	10.75
45	7 976 279.00	503 896.96	10.90
46	7 976 282.00	503 894.78	10.37
47	7 976 282.00	503 895.28	10.37
48	7 976 286.00	503 894.78	10.35
49	7 976 286.00	503 895.28	10.35
50	7 976 299.00	503 894.78	10.35
51	7 976 299.00	503 895.28	10.35
52	7 976 305.00	503 894.78	10.37
53	7 976 305.00	503 895.28	10.37

SETOUT POINTS FOR EMERGENCY OVERFLOW WEIR

POINT No.	NORTHING	EASTING	ELEV.
60	7 976 293.00	503 906.43	10.45
61	7 976 293.00	503 906.21	10.30
62	7 976 293.00	503 908.33	10.45
63	7 976 293.00	503 910.69	9.98
64	7 976 294.00	503 907.33	10.75
65	7 976 294.00	503 908.33	10.75
66	7 976 294.00	503 910.69	10.28
69	7 976 291.00	503 906.43	10.45
70	7 976 291.00	503 906.21	10.30
71	7 976 291.00	503 908.33	10.45
72	7 976 291.00	503 910.67	9.98
73	7 976 290.00	503 907.33	10.75
74	7 976 290.00	503 908.33	10.75
75	7 976 291.00	503 907.33	10.45
76	7 976 290.00	503 910.67	10.28
79	7 976 294.00	503 907.33	10.45

NOTES:

1. TOPOGRAPHY PROVIDED BY TERRAPOINT CANADA INC.
2. COORDINATE GRID IS SHOWN IN UTM (NAD83) ZONE 17 AND COORDINATES ARE IN METRES.
3. CONTOURS ARE IN METRES. CONTOUR INTERVALS ARE 0.5 METRES.
4. ALL DIMENSIONS AND ELEVATIONS SHOWN ARE IN METRES UNLESS NOTED OTHERWISE.
5. FOR OVERALL GRADING REFER TO DRAWING H349000-2130-10-035-0001.
6. MAKE FIELD ADJUSTMENTS IF ANY DISCREPANCY IS FOUND BETWEEN THE OVERALL GRADING DRAWING AND ACTUAL AS-BUILT CONDITIONS.
7. FOR STANDARD EARTHWORK DETAIL, REFER TO DRAWINGS H349000-0000-10-041-0001 & 0002.
8. ANY DAMAGE TO THE EXISTING FINISHED GRADE DURING CONSTRUCTION OF THE CELL SHALL BE FIXED AND REGRADED TO THE ORIGINAL CONDITIONS.
9. AS BUILT DETAILS NOT VERIFIED AS INDICATED.

1

AS BUILT

REVISED AS MARKED. ALL OTHER DETAILS CONSTRUCTED WITHIN ACCEPTABLE TOLERANCES.

THIS AS-BUILT DOCUMENT HAS BEEN PREPARED BASED ON INFORMATION PROVIDED BY THIRD PARTIES. HATCH HAS NOT VERIFIED THE ACCURACY OR COMPLETENESS OF THIS INFORMATION AND SHALL NOT BE RESPOSIBLE FOR, AND DISCLAIMS ANY LIABILITY IN CONJUNCTION WITH, ANY ERRORS OR OMISSIONS THAT MAY BE INCORPORATED HEREIN AS A RESULT.

DRAWING NO.	DRAWING TITLE

REFERENCE DRAWINGS

NO.	DESCRIPTION	BY	CHK'D	APP'D	DATE
1	AS BUILT	JB	SH	JC	2015-01-13

REVISIONS

REV.	ISSUE FOR	AUTH. BY	DS	DATE
1	AS BUILT	SH	JC	2015-01-13
0	CONSTRUCTION	SH	DS	2013-12-06

ISSUE AUTHORIZATION

HATCH

DESIGNED BY D. SINGH DATE 2013-11-04	DRAWN BY D. SINGH DATE 2013-11-04
CHECKED BY K. FALLAHI DATE 2013-12-06	DISCIP. ENGR. S. HASSAN DATE 2013-12-06
PROJ. DES. COORD. T. THERTELL DATE 2013-12-06	PROJ. ENGR. J. CLELAND DATE 2013-12-06
PROJ. MGR. S. PERRY DATE 2013-12-06	

Baffinland

MARY RIVER PROJECT

MILNE PORT
HAZARDOUS WASTE CONTAINMENT CELL-NORTH
PLAN & DETAILS

SCALE	DWG. NO.	REV.
1:200 OR AS NOTED	H349000-2550-10-035-0001	1

ORIGINAL SHEET SIZE: ISO A1 (841 x 594)

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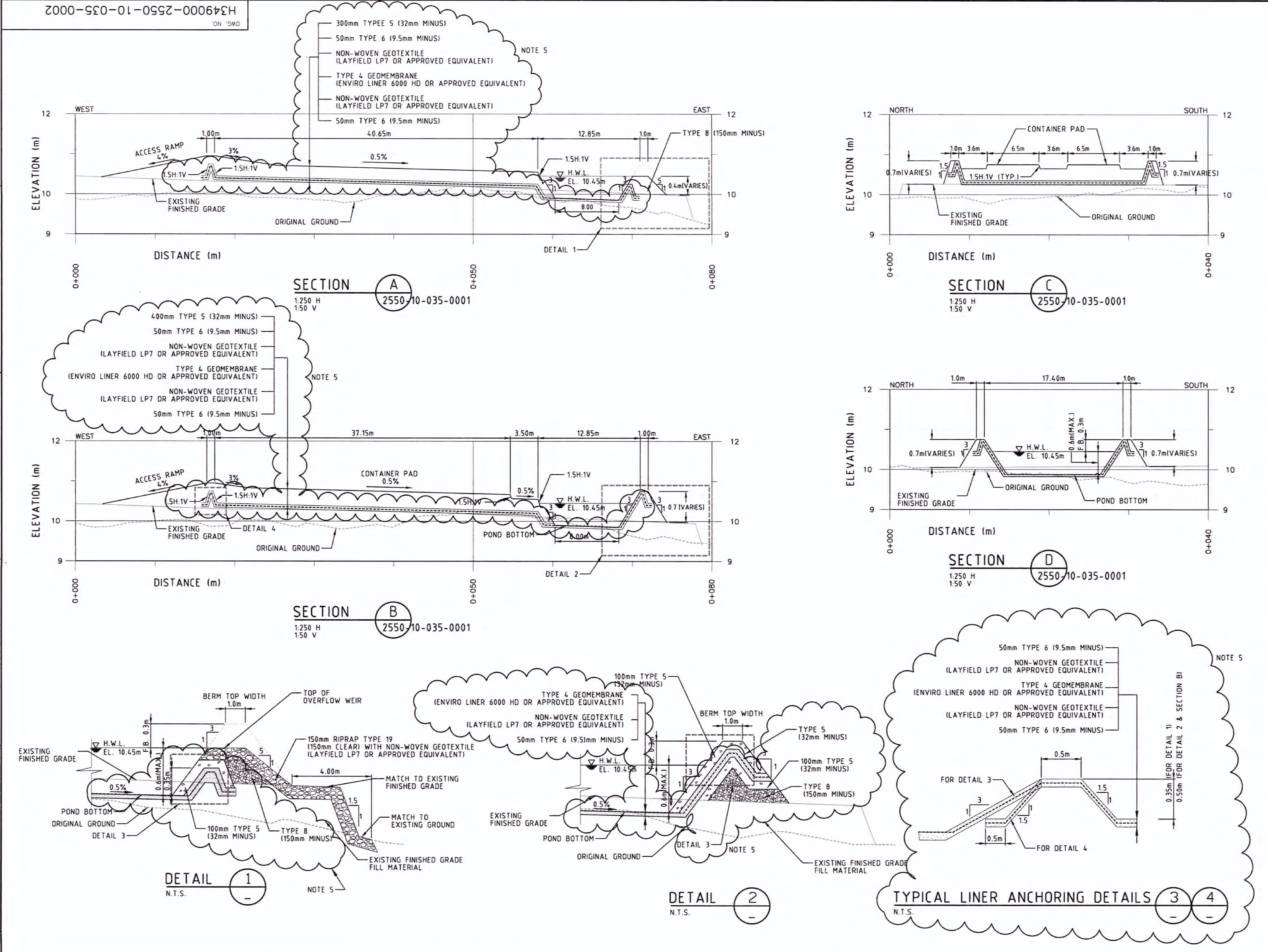

LEGEND:

%	GRADING SLOPE
H.W.L.	HIGH WATER LEVEL

NOTES:

1. TOPOGRAPHY PROVIDED BY TERRAPOINT CANADA INC.
2. COORDINATE GRID IS SHOWN IN UTM (NAD83) ZONE 17 AND COORDINATES ARE IN METRES.
3. ALL DIMENSIONS AND ELEVATIONS SHOWN ARE IN METRES UNLESS NOTED OTHERWISE.
4. FOR STANDARD EARTHWORK DETAIL, REFER TO DRAWINGS ~~H349000-6000-10-241-0001 & -0002.~~
5. AS BUILT DETAILS NOT VERIFIED AS INDICATED.

DRAWING NO.	DRAWING TITLE
REFERENCE DRAWINGS	

REVISIONS

NO.	DESCRIPTION	BY	CHK'D	APP'D	DATE
1	AS BUILT	JB	SH	JC	2015-01-08

AS BUILT

REVISED AS MARKED. ALL OTHER DETAILS CONSTRUCTED WITHIN ACCEPTABLE TOLERANCES.

ISSUE AUTHORIZATION

REV.	ISSUE FOR	AUTH. BY		DATE
1	AS BUILT	SH	JC	2015-01-08
0	CONSTRUCTION	SH	DS	2013-12-06

HATCH

DESIGNED BY D. SINGH DATE 2013-11-05	DRAWN BY D. SINGH DATE 2013-11-04
CHECKED BY K. FALLAHI DATE 2013-12-06	DISCIP. ENGR. S. HASSAN DATE 2013-12-06
PROJ. DES. COORD. T. THERTELL DATE 2013-12-06	PROJ. ENGR. J. CLELAND DATE 2013-12-06
PROJ. MGR. S. PERRY DATE 2013-12-06	

Baffinland

MARY RIVER PROJECT

MILNE PORT
HAZARDOUS WASTE CONTAINMENT CELL-NORTH
SECTIONS & DETAILS

SCALE	DWG. NO.	REV.
1:250 OR AS NOTED	H349000-2550-10-035-0002	1

ORIGINAL SHEET SIZE: ISO A1 (841 x 594)

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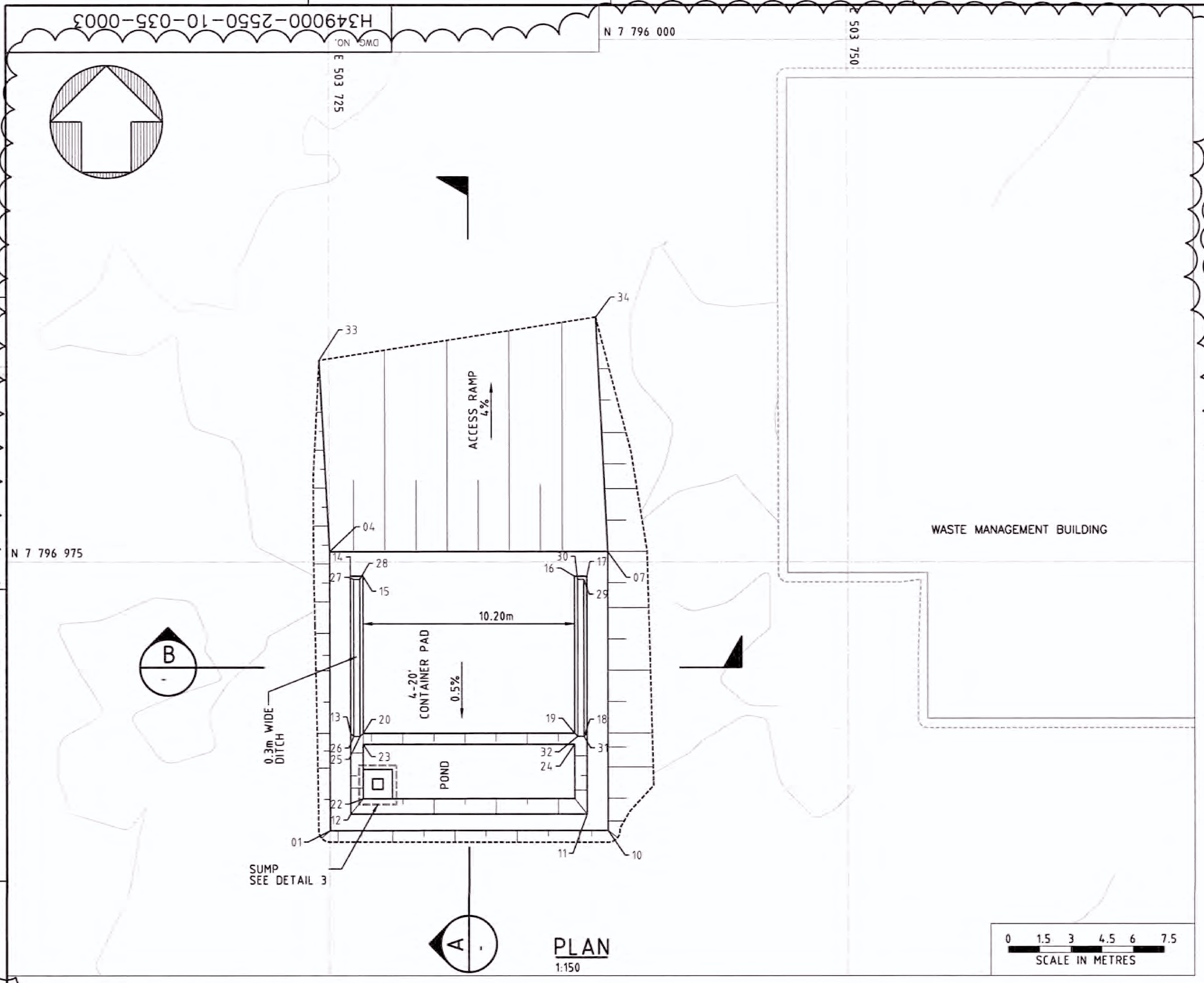
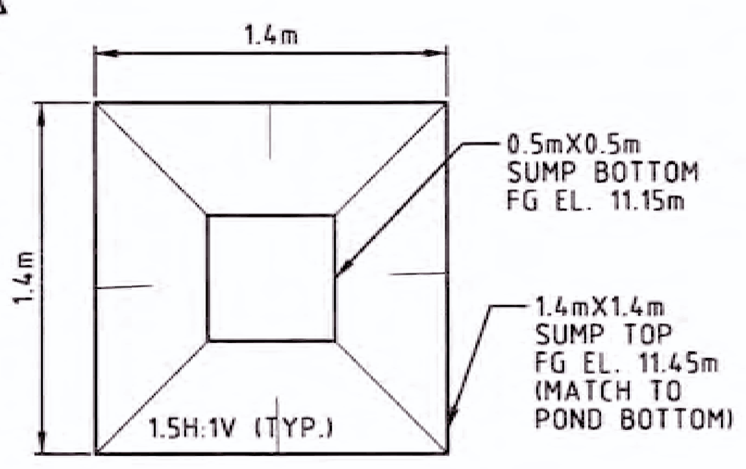
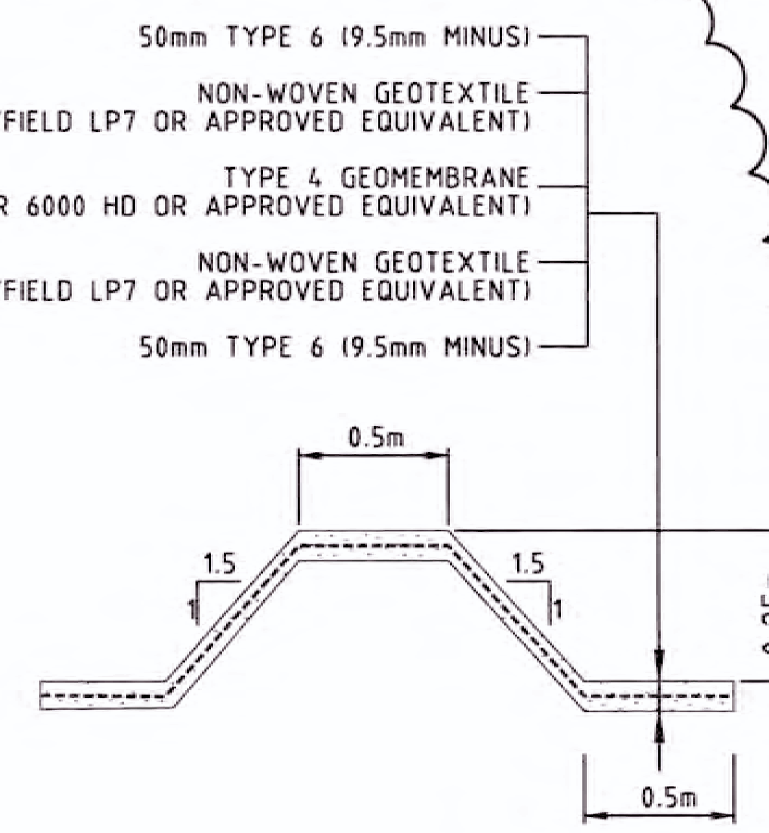


PLAN
1:150



DETAIL 3 - SUMP
N.T.S.



TYPICAL LINER ANCHORING DETAIL
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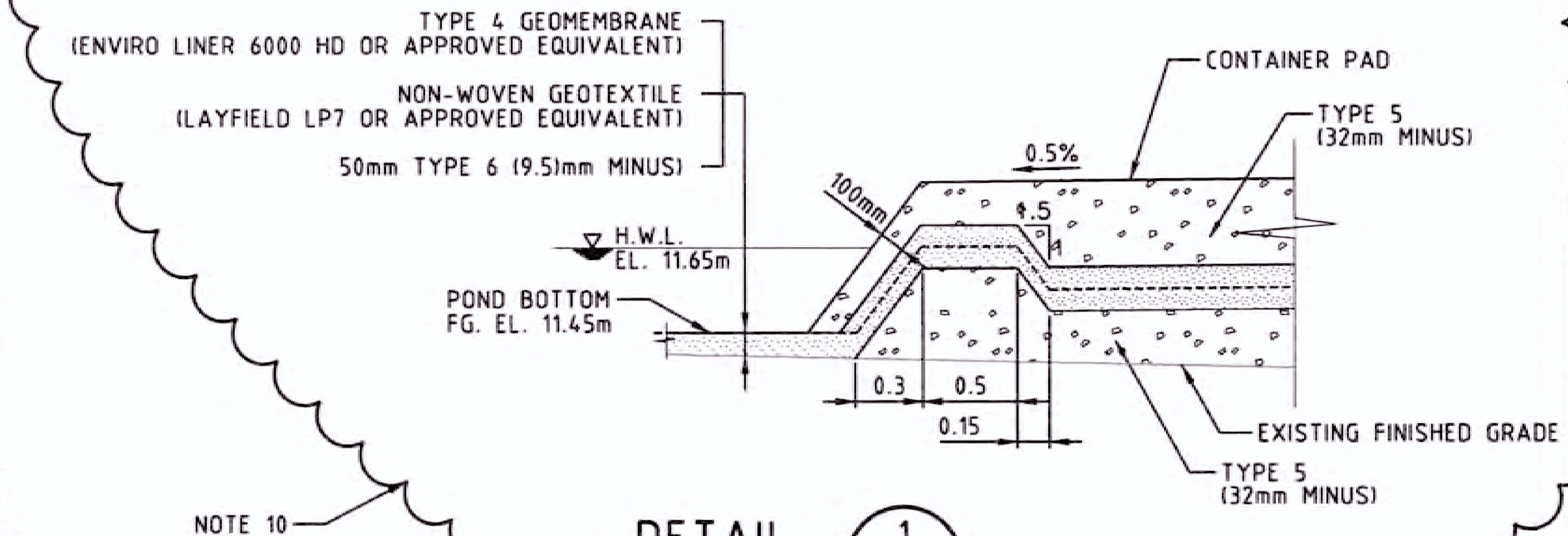
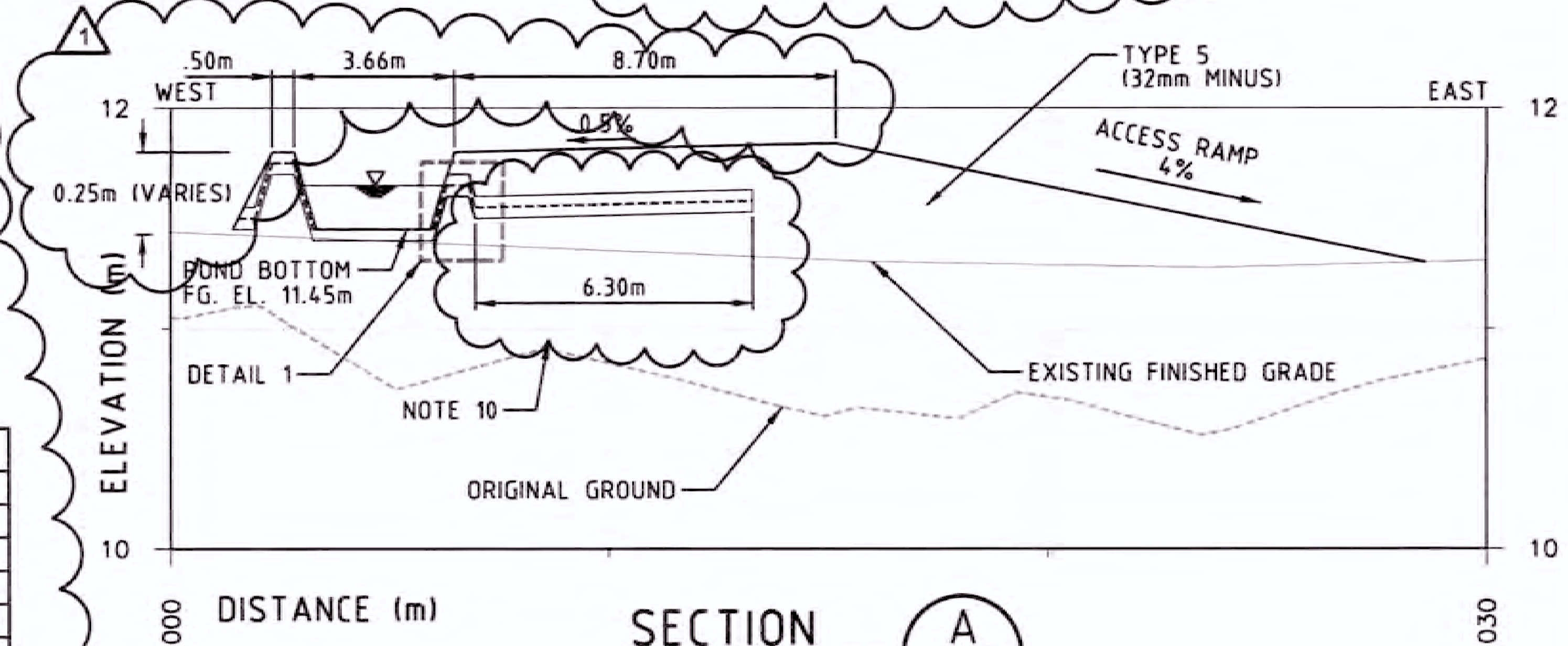


DETAIL 1
N.T.S.



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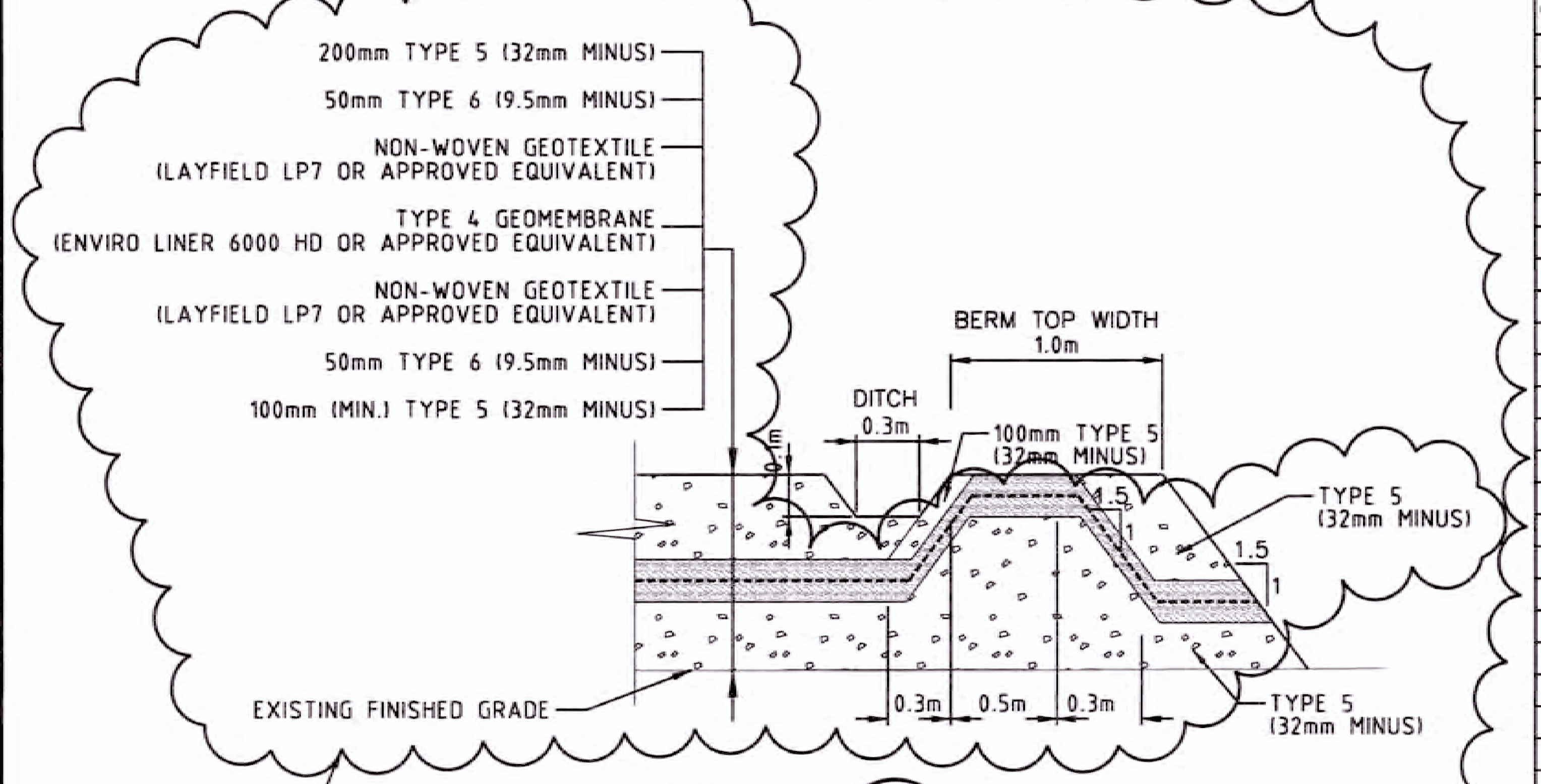
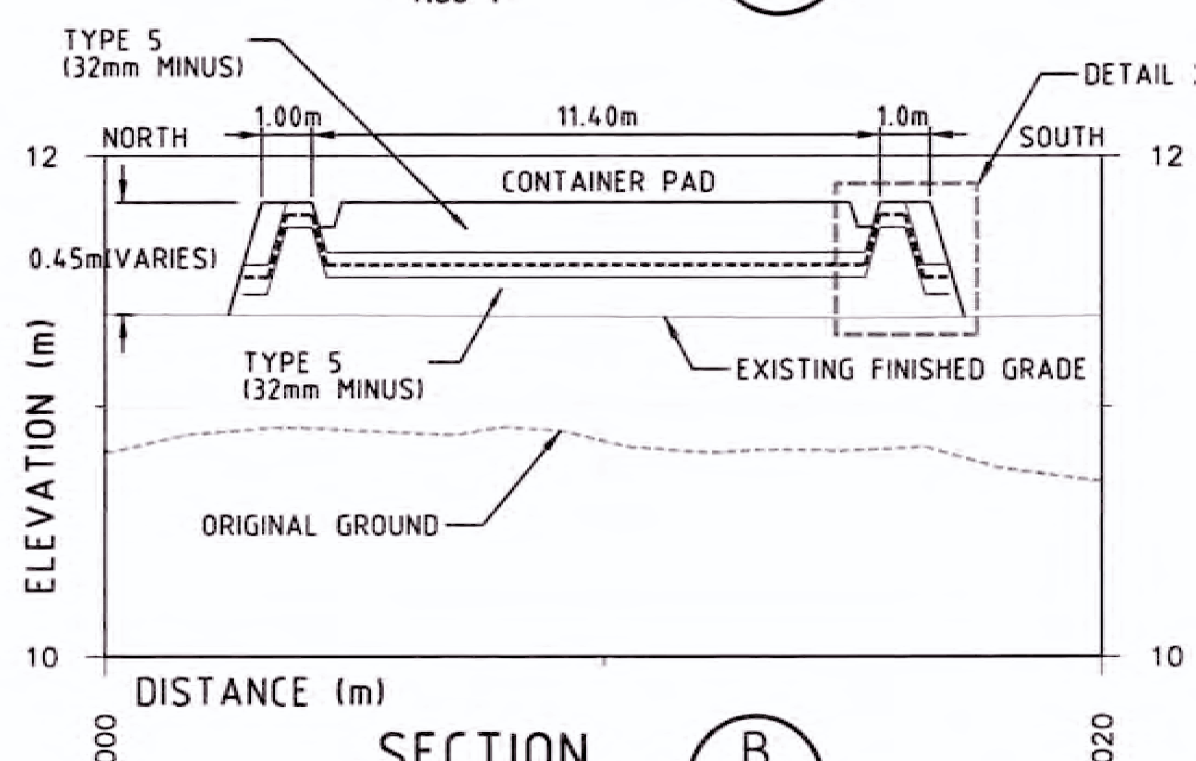


DETAIL 2
N.T.S.

SETOUT POINTS FOR CELL			
POINT No.	NORTHING	EASTING	ELEV.
01	7 975 963.06	503 726.6	11.86
05	7 975 974.63	503 724.97	11.94
06	7 975 963.08	503 738.93	12.03
10	7 975 963.08	503 738.13	11.91
11	7 975 964.12	503 736.82	11.60
12	7 975 966.81	503 726.34	11.40
13	7 976 026.77	503 735.97	11.98
14	7 975 974.35	503 726.20	12.05
15	7 975 974.33	503 726.78	12.04
16	7 975 974.93	503 736.79	12.07
17	7 975 975.00	503 737.33	12.07
18	7 795 966.76	503 738.06	11.92
19	7 975 966.42	503 737.59	11.84
20	7 975 966.13	503 727.18	11.66
22	7 975 964.08	503.727.77	11.42
23	7 975 965.68	503 727.30	11.57
24	7 975 965.57	503 737.00	11.60
25	7 975 966.69	503 726.80	11.90
26	7 975 966.70	503 726.55	11.87
27	7 975 974.15	503 726.33	11.98

SETOUT POINTS FOR CELL			
POINT No.	NORTHING	EASTING	ELEV.
28	7 975 974.15	503 726.60	11.98
29	7 975 974.93	503 737.19	12.00
30	7 975 974.87	503 736.93	12.06
31	7 975 966.42	503 737.83	11.84
32	7 975 966.42	503 737.59	11.84
33	7 975 984.65	503 724.53	11.44
34	7 975 986.72	503 737.86	11.31



SECTION B
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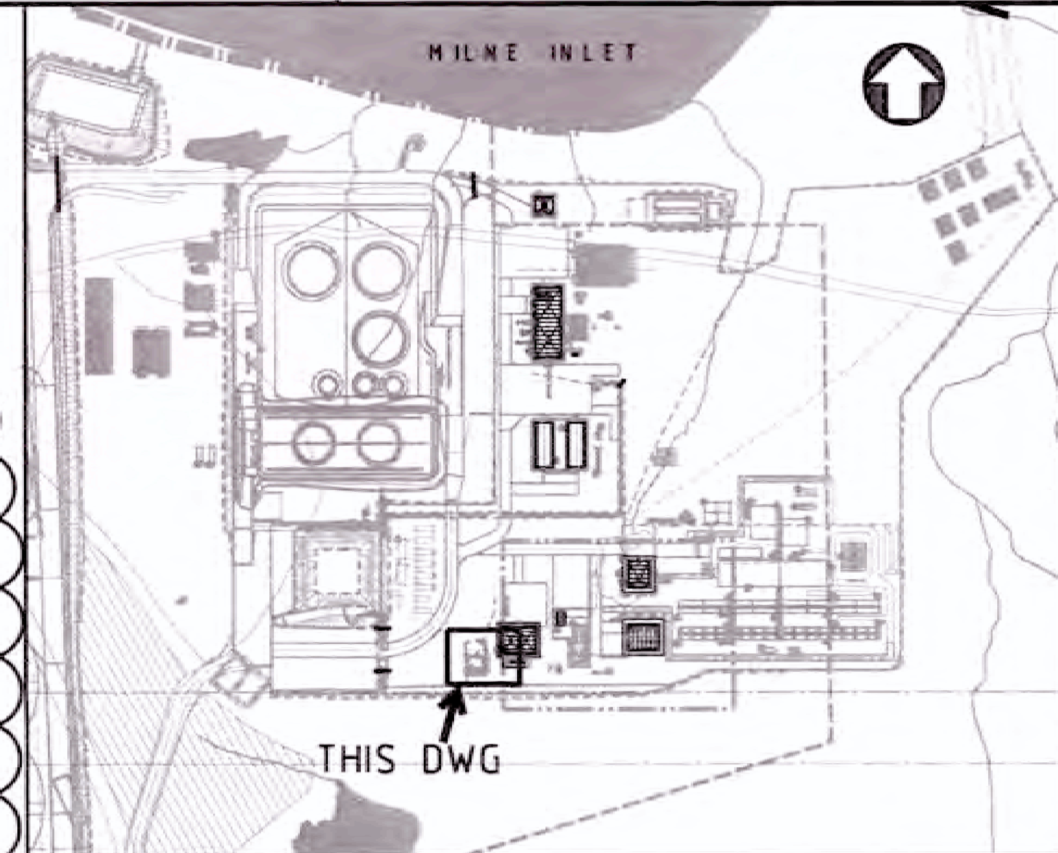
1:30 V



KEY PLAN

LEGEND:

- EXISTING GROUND CONTOUR
- EXISTING STREAM
- FILL SLOPE
- CUT SLOPE
- TOE OF SLOPE
- GRADING SLOPE
- CENTERLINE OF SWALE/DITCH
- FG — FINISHED GRADE ELEVATION
- CROSS SECTION DISTANCE
- FLOW DIRECTION
- EXTERNAL FLOW DIRECTION
- FILL TO AVOID PONDING

NOTES:

1. TOPOGRAPHY PROVIDED BY TERRAPOINT CANADA INC.
2. COORDINATE GRID IS SHOWN IN UTM (NAD83) ZONE 17 AND COORDINATES ARE IN METRES.
3. CONTOURS ARE IN METRES. CONTOUR INTERVALS ARE 0.5 METRES.
4. ALL DIMENSIONS AND ELEVATIONS SHOWN ARE IN METRES UNLESS NOTED OTHERWISE.
5. FOR OVERALL GRADING REFER TO DRAWING H349000-2130-10-035-0001.
6. MAKE FIELD ADJUSTMENTS IF ANY DISCREPANCY IS FOUND BETWEEN THE OVERALL GRADING DRAWING AND ACTUAL AS-BUILT CONDITIONS.
7. FOR STANDARD EARTHWORK DETAIL, REFER TO DRAWINGS H349000-0000-10-041-0001 & 0002.
8. ANY DAMAGE TO THE EXISTING FINISHED GRADE DURING CONSTRUCTION OF THE CELL SHALL BE FIXED AND REGRADED TO THE ORIGINAL CONDITIONS.
9. EXISTING FINISHED GRADE SHALL BE RAISED BY PLACEMENT OF TYPE 5 (32mm MINUS) MATERIAL UPTO THE NOTED ELEVATION TO AVOID LOCALIZED PONDING.
10. AS BUILT DETAILS NOT VERIFIED AS INDICATED.

DRAWING NO.	DRAWING TITLE
REFERENCE DRAWINGS	

THIS AS-BUILT DOCUMENT HAS BEEN PREPARED BASED ON INFORMATION PROVIDED BY THIRD PARTIES. HATCH HAS NOT VERIFIED THE ACCURACY OR COMPLETENESS OF THIS INFORMATION AND SHALL NOT BE RESPOSIBLE FOR, AND DISCLAIMS ANY LIABILITY IN CONJUNCTION WITH, ANY ERRORS OR OMISSIONS THAT MAY BE INCORPORATED HEREIN AS A RESULT.

NO.	DESCRIPTION	BY	CHK'D	APP'D	DATE
1	AS BUILT	JB	SH	JC	2015-01-06

REVISIONS

AS BUILT

REVISED AS MARKED. ALL OTHER DETAILS CONSTRUCTED WITHIN ACCEPTABLE TOLERANCES.

REV.	ISSUE FOR	AUTH. BY	DATE
1	AS BUILT	S.H. J.C.	2015-01-06
0	CONSTRUCTION	S.H. D.S.	2013-12-06

ISSUE AUTHORIZATION

HATCH

DESIGNED BY D. SINGH DATE 2013-11-15	DRAWN BY D. SINGH DATE 2013-11-15
CHECKED BY K. FALLAHI DATE 2013-12-06	DISCIP. ENGR. S. HASSAN DATE 2013-12-06
PROJ. DES. COORD. T. THERTELL DATE 2013-12-06	PROJ. ENGR. J. CLELAND DATE 2013-12-06
PROJ. MGR. S. PERRY DATE 2013-12-06	

Baffinland

MARY RIVER PROJECT

MILNE PORT
HAZARDOUS WASTE CONTAINMENT CELL-SOUTH
PLAN, SECTIONS & DETAILS

SCALE 1:150 OR AS NOTED | DWG. NO. H349000-2550-10-035-0003 | REV. 1

ORIGINAL SHEET SIZE: ISO A1 (841 x 594)

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Appendix C

Survey Data

Waste Management Building As Built - Blocks - 11Dec2013.asc

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0003	7975995.537676	503759.007681	12.742	Zgln
0004	7975996.422499	503758.998068	12.752	Zgln
0005	7975995.678471	503755.073583	12.734	Node
0006	7975995.976224	503753.099956	12.733	Node
0007	7975995.909079	503752.915169	12.731	Node
0008	7975995.948259	503750.981214	12.722	Node
0009	7975995.798723	503750.977438	12.736	Node
0010	7975996.416431	503751.069225	12.718	Zgln
0011	7975996.277204	503751.062556	12.728	Zgln
0012	7975996.267962	503749.046247	12.750	Zgln
0013	7975993.933130	503749.555321	12.814	Node
0014	7975990.908962	503749.494262	12.762	Node
0015	7975987.928507	503749.607435	12.752	Node
0016	7975984.901285	503749.421530	12.762	Node
0017	7975981.883795	503749.328642	12.742	Node
0018	7975978.900477	503749.335502	12.748	Node
0019	7975976.640253	503749.069359	12.735	Zgln
0020	7975976.666733	503751.027280	12.706	Zgln
0021	7975976.505168	503751.036415	12.713	Zgln
0022	7975976.494696	503753.219816	12.728	Zgln
0023	7975977.872394	503753.199046	12.735	Xgln
0024	7975976.531138	503753.922405	12.757	Zgln
0025	7975977.847481	503753.890730	12.753	Zgln
0026	7975977.632332	503758.245179	12.757	Node
0027	7975977.730467	503762.351664	12.726	Node
0028	7975977.811817	503766.418399	12.696	Node
0029	7975977.472266	503768.627981	12.709	Node
0030	7975977.474878	503770.831564	12.709	Node
0031	7975977.633281	503773.036008	12.732	Node
0032	7975977.901388	503773.037387	12.711	Zgln
0033	7975976.535971	503773.013272	12.760	Zgln+1
0034	7975976.682872	503773.011047	12.753	Zgln+1
0035	7975976.693534	503775.001689	12.767	Zgln+1
0036	7975978.858894	503773.808309	12.728	Node
0037	7975981.853449	503773.876236	12.731	Node
0038	7975984.870010	503773.841088	12.735	Node
0039	7975987.895486	503773.782640	12.726	Node
0040	7975990.878470	503773.807975	12.733	Node
0041	7975993.897932	503773.874078	12.729	Node
0042	7975995.179906	503773.030887	12.699	Node
0043	7975994.666213	503773.037670	12.703	Zgln
0044	7975996.234198	503774.962078	12.613	Zgln+1
0045	7975995.329732	503771.131133	12.740	Node
0046	7975995.432956	503770.953313	12.743	Node
0047	7975995.371870	503769.053026	12.682	Node
0048	7975994.643501	503765.209485	12.734	Zgln
0049	7975995.499982	503765.188647	12.748	Zgln
0050	7975995.519371	503765.086358	12.740	Xgln
0051	7975996.385522	503765.073726	12.752	Xgln+1
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Waste Management Building As Built - Building - 29Oct2014.asc

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0006	7976275.632925	503881.442118	10.017	ZBOS
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0012	7976278.607671	503901.859202	9.954	ZBOS
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0017	7976289.103279	503913.598530	9.703	ZBOS
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0024	7976295.849422	503912.950319	9.811	ZBOS
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0035	7976308.219965	503864.039417	10.256	ZBOS
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0044	7976300.988006	503852.349855	11.275	ZTOS
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0083	7976284.887655	503894.498268	10.503	ZBOS
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0086	7976281.800966	503893.804612	10.543	ZBOS
0087	7976281.641216	503891.062150	10.535	ZBOS
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0090	7976281.605537	503855.065438	10.958	ZBOS
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0115	7976288.717663	503908.694561	10.889	ZTOS
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0228	7976286.997011	503917.522569	9.268	ZBOS
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0231	7976288.353700	503918.641985	9.312	XTOS
0232	7976288.352749	503918.639887	9.310	ZBOS
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0244	7976293.835859	503908.032417	10.921	ZBOS
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0246	7976294.233954	503910.431268	10.655	ZBOS
0247	7976294.033399	503911.672216	10.395	ZBOS
0248	7976294.006139	503913.505712	9.795	ZBOS
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0250	7976294.637713	503916.078944	9.681	ZBOS
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0253	7976295.611565	503919.541536	9.279	ZBOS
0254	7976295.609893	503919.549871	9.277	ZTOS
0255	7976295.843604	503918.798313	9.700	ZTOS
0256	7976296.279674	503918.709427	9.340	ZBOS
0257	7976296.170938	503917.140869	9.364	ZBOS
0258	7976295.154778	503917.158959	9.823	ZTOS
0259	7976295.162604	503915.360185	9.997	ZTOS
0260	7976296.192137	503915.112268	9.508	ZBOS
0261	7976295.852999	503913.715588	9.706	ZBOS
0262	7976295.264826	503914.020384	10.022	ZTOS
0263	7976294.430547	503913.356235	10.045	ZTOS
0264	7976295.046701	503913.158768	9.808	ZBOS
0265	7976294.885688	503912.266696	10.092	ZBOS
0266	7976294.302506	503912.285906	10.392	ZTOS
0267	7976294.474956	503910.973422	10.705	ZTOS
0268	7976295.165882	503910.912985	10.369	ZBOS
0269	7976295.073793	503909.428882	10.743	ZBOS
0270	7976294.664309	503909.479982	10.984	ZTOS
0271	7976294.178525	503908.515913	11.083	ZTOS
0272	7976294.458892	503908.334970	10.897	ZBOS
0273	7976294.361892	503907.566668	10.937	ZBOS
0274	7976294.142189	503907.651048	11.093	ZTOS
0275	7976294.319977	503906.668507	10.724	XTOS
0276	7976294.320105	503906.662385	10.726	XBOS

0001	7975984.648844	503724.524773	11.444	ZTOS
0002	7975984.646235	503724.524612	11.442	ZBOS
0003	7975979.138635	503724.236531	11.453	ZBOS
0004	7975979.083681	503724.820331	11.632	ZTOS
0005	7975974.530924	503724.965283	11.944	ZTOS
0006	7975974.590894	503724.274363	11.503	ZBOS
0007	7975970.997336	503724.268661	11.522	ZBOS
0008	7975971.154955	503725.096213	12.003	ZTOS
0009	7975966.401158	503725.244462	11.897	ZTOS
0010	7975966.447750	503724.624193	11.577	ZBOS
0011	7975961.544208	503724.745528	11.695	XBOS
0012	7975962.210758	503738.489468	11.869	ZTOS
0013	7975963.055258	503739.463099	11.929	ZTOS
0014	7975964.219412	503739.793755	11.920	ZTOS
0015	7975964.308320	503740.657237	11.608	ZBOS
0016	7975968.634245	503740.612374	11.577	ZBOS
0017	7975968.717898	503739.601418	11.981	ZTOS
0018	7975975.353518	503738.933285	12.031	ZTOS
0019	7975975.532322	503740.316976	11.611	ZBOS
0020	7975980.257160	503739.552633	11.338	ZBOS
0021	7975979.964988	503738.631530	11.639	ZTOS
0022	7975986.719798	503737.860466	11.309	XTOS
0023	7975986.712826	503737.860553	11.306	XBOS
0024	7975974.973844	503737.330450	12.067	ZTOS
0025	7975974.873112	503736.787688	12.067	ZTOS
0026	7975966.541773	503737.539181	11.905	ZTOS
0027	7975966.689504	503726.984475	11.894	ZTOS
0028	7975974.328573	503726.779763	12.041	ZTOS
0029	7975974.351293	503726.209108	12.048	ZTOS
0030	7975966.576662	503726.348248	11.978	ZTOS
0031	7975962.928179	503726.599168	11.858	ZTOS
0032	7975963.077616	503738.127494	11.912	ZTOS
0033	7975966.756641	503738.062213	11.920	XTOS
0034	7975974.943434	503737.183216	11.991	ZBOS
0035	7975974.927967	503736.930911	11.997	ZBOS
0036	7975966.415374	503737.588068	11.835	ZBOS
0037	7975965.571138	503737.006371	11.598	ZBOS
0038	7975965.982061	503734.350407	11.582	ZBOS
0039	7975966.003500	503730.573859	11.537	ZBOS
0040	7975965.896730	503727.730996	11.542	ZBOS
0041	7975966.124961	503727.182594	11.662	ZBOS
0042	7975966.810705	503726.803156	11.855	ZBOS
0043	7975974.153773	503726.604488	11.983	ZBOS
0044	7975974.196072	503726.330962	11.976	ZBOS
0045	7975966.192140	503726.562006	11.857	ZBOS
0046	7975965.675973	503727.292398	11.566	ZBOS
0047	7975964.659087	503727.379330	11.415	ZBOS
0048	7975963.901656	503727.433100	11.403	ZBOS
0049	7975963.808022	503728.184770	11.412	ZBOS
0050	7975963.672409	503733.825783	11.603	ZBOS
0051	7975964.119438	503736.816437	11.595	ZBOS
0052	7975965.171924	503737.089245	11.596	ZBOS
0053	7975966.420118	503737.828996	11.875	ZBOS
0054	7975972.803339	503737.426646	12.035	ZBOS
0055	7975974.533131	503737.250602	11.994	XBOS
0056	7975974.557733	503735.369824	12.082	Node
0057	7975971.596671	503735.396034	12.044	Node
0058	7975968.268425	503735.661578	11.969	Node
0059	7975968.291756	503732.713686	11.982	Node
0060	7975971.014503	503732.667358	12.056	Node
0061	7975974.554180	503732.359921	12.095	Node
0062	7975974.218509	503729.363031	12.087	Node
0063	7975970.934954	503729.312022	12.027	Node

0064	7975967.337096	503729.199636	11.910	Node
0065	7975964.083268	503727.766748	11.306	Node
0066	7975965.458186	503728.272049	11.487	Node
0067	7975964.268808	503729.331458	11.484	Node
0068	7975964.228449	503730.403171	11.524	Node
0069	7975965.231971	503730.375433	11.504	Node
0070	7975965.376645	503732.000187	11.532	Node
0071	7975964.259880	503732.076016	11.553	Node
0072	7975964.244535	503733.743937	11.573	Node
0073	7975965.350769	503733.678677	11.540	Node
0074	7975965.508792	503735.475085	11.567	Node
0075	7975963.986357	503735.652318	11.571	Node
0076	7975964.743568	503736.432845	11.550	Node

Appendix D

Facility Description Supporting Documents

A. E349000-TX001-00-118-0001: Equipment Manual – EWS Mobile Incinerator: ECO M2TN ***[148 pages]***

B. E349000-TX001-00-083-0001: Waste Incinerator Control Philosophy ***[17 pages]***

Document been superseeded by
E349000-TX001-00-118-0002

EQUIPMENT MANUAL

Revision B

EWS Mobile Incinerator: ECO M2TN

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☐ **C3** – Do not proceed, revise as noted & resubmit	
No further submission required - Complete ☐	
☒ **C4** - No further submission required - Cancelled ☐	
No further submission required - Superseded ☒	

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AMENDMENT LIST

Section	Description of Change (Subject of Amendment)	Rev Status (AL #)	Rev Date (AL Date)	Initials
All	Submittal to Hatch	Rev 0	6-Aug-13	CM
All	Added Retrieval of Data from PLC	Rev A	7-Aug-13	KD
All	Replaced nota with note	Rev B	16-Dec-13	CM
3.3.4	Added procedure for fuel valves	Rev B	16-Dec-13	CM

TABLE OF CONTENTS

1.0 GENERAL INFORMATION

1.1 COMMON ACRONYMS

Acronym	Full Name
AC	Air Conditioning
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
Cd	Cadmium
CO	Carbon Monoxide
CO_2	Carbon Dioxide
CSA	Canadian Standards Association
DCH0	Default Channel Zero
DP	Delta Pressure (amount of pressure change)
EPC	Electronic Proportional Control
ESC key	Escape Key
EWS	Eco Waste Solutions
EWS Mobile	EWS Mobile Incinerator
H20	Water
HCl	Hydrochloric Acid
HCL	Hydrogen chloride
Hg	Mercury
HMI	Human Machine Interface
IEC	International Electrotechnical Commission
ISO	International Organization for Standards
KPa	Kilopascals
LCD	Liquid Crystal Display
LED	Light-emitting Diode
MCR	Master Control Relay
ME	Mist Eliminator
MPCB	Motor Protection Circuit Breaker
N.C.	Normally Closed
N.O.	Normally Open
NO_x	Oxides of Nitrogen
O_2	Oxygen
Pb	Lead
PCCD/PCCF	Dioxins & Furans
PDT	Pole Double Throw
PET	Polyethylene Terephthalate
pH meter	pH meter
P&ID	Process & Instrumentation Diagram
PLC	Programmable Logic Controller
PM	Particulate Matter

Acronym	Full Name
PPM	Parts Per Million
SPDT	Single Pole Double Throw
SCFM	Standard Cubic Feet Meter
SO2	Sulphur Dioxide
SOC	Southern Operational Command
SOW	Statement of Work
SO_x	Oxides of Sulphur
SP	Static Pressure
TEFC	Totally Enclosed, Fan-Cooled
THC	Total Hydrocarbon
USB key	Universal Serial Bus
VDC	Volts Direct Current
VFD	Variable Frequency Drive
W.C.	Water Column

1.2 EWS CONTACT INFORMATION

	CONTACT INFORMATION	
Eco Waste Solutions	5195 Harvester Road, Unit 14	
	Burlington, Ontario, Canada	
	L7L 6E9	
Phone	905-634-7022	
Toll Free	1-866-326-2876	
Fax	905-634-0831	
email	info@ecosolutions.com	
Ask for/Address to	Customer Service Manager	

1.3 HEALTH & SAFETY PRECAUTION

1.3.1 Health and Safety Precautions

PLEASE READ THIS SECTION BEFORE READING THE REST OF THE MANUAL

1.3.2 Safety Warnings

 The **EWS Mobile Incinerator** has a number of safety related hazards that need to be recognized by all operators:

- Electricity
- Heavy mechanical parts which may move due to gravity
- High Temperature
- Explosive Gases
- Flammable Liquids

IMPORTANT POINTS TO FOLLOW

THE EWS MOBILE INCINERATOR CAN CAUSE SERIOUS INJURY OR DEATH, please follow these points below:

1.3.2.1 KEEP CLEAR OF ANY MOVING PARTS AT ALL TIMES.

1.3.2.2 BEFORE STARTING THE CYCLE OF THE SYSTEM ENSURE THAT ALL PERSONNEL ARE CLEAR OF THE EWS MOBILE INCINERATOR.

1.3.2.3 DO NOT ATTEMPT TO START OR OPERATE THIS EQUIPMENT UNTIL THIS MANUAL IS READ THOROUGHLY AND IS UNDERSTOOD

1.3.2.4 RESPONSIBILITY FOR THE SAFE OPERATION AND MAINTENANCE OF THE EQUIPMENT SUPPLIED REST SOLELY ON THOSE OPERATION IT.

1.3.2.5 OBEY THE FOLLOWING GENERAL SAFETY INSTRUCTIONS AT ALL TIMES.

NOTE

A qualified operator is a person whom the owner of the equipment deems as having the required experience, training and skills to perform the required work and shall be limited to Construction Engineering trades only.

1.3.3 General Safety Instructions

1.3.3.1 Keep the electrical panel doors closed at all times except when performing electrical maintenance or troubleshooting.

1.3.3.2 Allow only qualified operators to perform maintenance and troubleshooting on the machine.

1.3.3.3 Open and lockout the Main Disconnect Switch on the electrical control panel while working on the machine.

1.3.3.4 Do not bypass or tie down any of the door safety limit switches.

1.3.3.5 Do not open any of the doors while the Primary or Secondary Chambers are above 200°F (93 °C).

1.3.3.6 Do not enter the Primary Chamber unless the Emergency Stop Button is pushed

1.3.3.7 When opening or closing the Primary Chamber door keep clear of the door and ensure that the path for the door is clear.

1.3.3.8 Secure the Primary Chamber door when it is open so it cannot move accidentally.

1.3.3.9 Immediately correct any fuel leaks.

1.3.3.10 Do not fill the Primary Chamber above the breech opening. Overfilling can result in poor burning and damage to the **EWS Mobile Incinerator.**

1.3.3.11 Use proper tools; wear impact resistant, CSA certified industrial goggles, full face dust mask (such as Advantage 3000 Respirator) and industrial leather gloves while loading and cleaning the **EWS Mobile Incinerator.**

1.3.3.12 Be aware of component-specific safety hazards listed within each section of this manual.

1.3.4 General Operating and Maintenance Safety Instructions

Proper operating and maintenance procedures must be followed in order for the **EWS Mobile Incinerator** to perform at maximum efficiency. Do not attempt to start or operate this equipment until this manual is read thoroughly and is understood.

The equipment has been designed with many safety features, however, like all thermal processes; this equipment is not free from the inherent hazards of high temperature processes. Safety procedures and precautions must be followed at ALL times during operation.

There are component-specific safety procedures outlined in this manual, however, no amount of written instruction can replace good judgment and safe operating practices.

NOTE

Responsibility for the safe operation and maintenance of the equipment supplied rests solely on those operating it.

There are many engineered features incorporated into the **EWS Mobile Incinerator** to free the operator of repetitive chores. They do not, however, relieve the operator of maintenance responsibilities. In order to maximize the operating life of the equipment, it is strongly recommended that the maintenance schedule be followed diligently (please refer to the Incinerator Maintenance Plan). It is advisable to keep an equipment log) for recording maintenance activities along with unusual operation. In the event that the equipment is not operating in the normal manner contact Eco Waste Solutions immediately (please refer to *Section 1.2 EWS Contact Information*). It is important to report problems as soon as they are noticed to minimize damage that faulty operation could cause.

Proper maintenance of the equipment is essential to ensure long term, reliable operation of the **EWS Mobile Incinerator**. The preventive maintenance procedures outlined in Section 4 of this manual should be adhered to strictly for best service life.

The warranty will become void if proper maintenance is not performed as instructed.

Please note that some of the diagrams and/or photos in this EQUIPMENT MANUAL are conceptual in nature and may not be exact representations of equipment purchased.

2.0 OVERVIEW OF TECHNOLOGY

2.1 INTRODUCTION TO WASTE INCINERATION

2.1.1 Protecting the Environment

2.1.1.1 Why Incinerate?

An advanced technology incinerator like the **EWS Mobile Incinerator** is the basis of a pollution prevention approach to waste management for camp operations. Having an incinerator that can be transported to the point-of-need provides immediate and complete control over the disposal of camp waste.

Incineration is considered to be a sustainable waste management practice because it deals with the waste on-site and as it's generated. Landfills operate on the premise that once it is buried the problem is eliminated. However even landfills with the most advanced engineering can fail. The very fact that a landfill is forever predicts the deterioration and failure of landfill safety systems. The creation of a well-designed landfill has a high upfront capital cost, takes many months to build and requires on-going maintenance in perpetuity making them a poor fit for a mobile camp.

Often camps consider using open air burning to deal with waste. This may involve simply setting fire to the waste pile or the use of a barrel or pit to contain the waste while burning. Open air burning creates air pollution and can lead to damaging health effects for the operator and those living and or working nearby.

By contrast, modern advanced incineration with air pollution control allows for the complete destruction of domestic waste without polluting the air, land or water. The waste material is completely converted to a non-toxic ash that does not attract wildlife.

The primary advantages of incineration are:

- **REDUCTION** of the weight and volume of waste material that must be disposed of using landfills or other means
- **DESTRUCTION** of materials that may be an attractant to wildlife and any pathogenic agents that may be contained within waste materials

2.1.1.2 The Operator – Your Role

As the Operator of the incinerator you have an extremely important role in protecting the environment through the correct operation of this equipment. It is the operator's role and responsibility to protect the environment by:

1. Ensuring that no inappropriate materials are processed and that each batch contains an average mix of waste that resembles the design waste characteristics (particularly volume/weight per batch, average density, and overall heat value). See Waste Table in Section 2.4.2 for details.

2. Understanding the environmental operating permits and commitments made by your employer to regulatory bodies and other stakeholders. This includes the emission targets, monitoring and recording requirements. Understanding the wastes that can and cannot be processed in the equipment as specified by the manufacturer as well as applicable regulatory permits or

other commitments. Undertaking all necessary operational and maintenance practices to ensure compliance with applicable emission limits and operating requirements.

3. Ensuring the burn cycle is long enough to allow for thorough burn-out and the generation of high quality ash residual that is safe for disposal

4. Minimizing particulate matter (dust) emissions during ash removal and handling

5. Disposing of ash properly by sending it to appropriate disposal sites

6. Taking responsibility for regular maintenance inspections and ensuring the appropriate attention is given to any problems immediately.

2.1.1.3 Air Pollutants of Concern

All combustion processes produce an exhaust emission. The **EWS Mobile Incinerator** is technologically advanced and designed to thoroughly combust the waste while producing minimal emissions.

Correct operation and rigorous attention to maintenance will ensure that the **EWS Mobile Incinerator** operates with the least possible impact on the environment.

It is recommended that incinerator operators understand the potential for the creation of pollution from incorrect operation. The following table lists the pollutants that can occur in incinerator exhaust emissions.

POLLUTANT	CONCERN	SOURCE OR CAUSE
CO (Carbon Monoxide)	Combustion Indicator	High levels of CO indicates poor quality combustion
SOx (Oxides of Sulphur)	Contributes to acid rain, respiratory irritant	High sulphur content fuels
NOx (Oxides of Nitrogen)	Contributes to acid rain, respiratory irritant	Incorrect air input, too high operating temperatures
HCl (Hydrochloric Acid)	Contributes to acid rain, corrosive, respiratory irritant	Primarily from the burning of PVC (polyvinyl chloride) plastics
PM (Particulate Matter)	Respiratory effects	Incomplete combustion, rich fuel to air ratio, dust-laden waste stream
PCCD/PCCF (Dioxins & Furans)	Persistent organic compound known to bioaccumulate	Incomplete combustion due to overloading, air ingress, improper waste mix
Heavy Metals including: Pb (Lead), Hg (Mercury), Cd (Cadmium), etc.	Toxic and known to be hazardous to human health and living ecosystems	Presence of heavy metals in the waste stream will lead to appearance in the exhaust gases

2.1.2 Basic Combustion Principles

Combustion is a rapid chemical reaction between oxygen and combustible elements such as carbon or hydrogen. Combustion uses the oxygen in air to react with the combustible materials producing heat which continues the process. Most of the products of combustion are gases. Good combustion produces clean gases that are invisible. Poor combustion will create smoke.

2.1.2.1 Products of Combustion Reaction (Ideal Combustion)

The ideal combustion reaction is often used to explain combustion. In the ideal reaction a completely combustible material - a compound of carbon, hydrogen and oxygen is heated and allowed to react with oxygen. As it is heated water is vaporized and the carbon bonds with the oxygen and heat is released.

Carbon, Hydrogen, Oxygen + Oxygen + $\longrightarrow$ Heat Carbon Dioxide + Water and Heat

2.1.2.2 Incomplete Combustion

This ideal reaction is theoretical and does not occur in waste combustion systems. Factors that lead to a less than ideal reaction are poor mixing, too little combustion air, and low temperatures. Under those conditions products of incomplete combustion are emitted with the stack gases or system exhaust. The products of incomplete combustion are typically elemental carbon (or soot) and carbon monoxide (CO). Soot particles are very fine and generally result in high opacity (smoke) at the combustion stack. Other products of incomplete combustion that cause concern are hazardous organic compounds such as benzene, dioxins, and furans. Although these compounds are not found in the waste, under incomplete combustion conditions they can be formed as intermediate combustion products.

The waste feed also includes inorganic materials; generally, they are not involved in the combustion reaction. The inorganic materials in the waste feed (ash) are either retained in the ash or are emitted as particulate matter in the combustion gas. Air velocities in the combustion chamber are controlled to reduce the amount of inorganic material entrained (picked up by) the combustion gas and emitted with the combustion gas. If combustion is not complete, organics will remain in the ash.

2.1.2.3 Combustion Indicators

One of the most obvious combustion indicators is the presence of a visible exhaust emission or smoke.

2.1.2.4 Stack Gas Oxygen and Carbon Monoxide

More reliable indicators that can be used to monitor combustion quality are the concentrations of key compounds in the stack gas.

2.1.2.5 Stack Gas: O_2 (Oxygen) concentration

The stack gas O_2 concentration provides a measure of excess air. Waste incinerators typically operate at 140 to 200 percent excess air, which roughly corresponds to 12 to 14 percent O_2 in the stack gas.

- High O_2 means too much excess air (cools gases).
- Low O_2 means insufficient air (incomplete combustion).

2.1.2.6 Stack Gas: Carbon Monoxide (CO) concentration

Each combustion system has a "typical operating range" for CO. If the stack gas, CO concentration goes above this typical range, combustion problems are likely. With a waste incinerator this is typically <100 ppm.

2.1.2.7 Waste Characteristics

Different waste types have different heating values, densities and moisture contents. These primary characteristics of the waste will affect the combustion process.

The **HEATING VALUE** of waste is a measure of the energy released when the waste is burned. It is measured in units of joules per kilogram (j/kg). The heating value is proportional to the energy released when burned. A heating value of about 11.6 MJ/kg or greater is needed to sustain combustion. Wastes with lower heating values can be burned but they will not maintain adequate temperature without the addition of auxiliary fuel.

The **MOISTURE CONTENT** of waste is a measure of the quantity of water contained or saturated in solid dry waste material. It is measured by a ratio or a percentage. The wetter the waste, the higher the moisture content and the longer it will take the waste to burn. As a result, a longer burn time requires more fuel while operating the incinerator. On the contrary, drier waste has lower moisture content. This dry waste requires a shorter burn time which results in less fuel being required.

2.1.2.8 Ash Quality

Visual appearance of the ash can be an indicator of combustion problems. If an incinerator is operating properly, little organic material will remain in the ash. Whitish gray ash indicates better burnout and less carbon than black. The extent of organics combustion can be measured by the quantity of combustible materials remaining in the ash. A noted increase in ash combustibles indicates a combustion problem which may include temperatures that are too low, improper distribution of combustion air in the chamber (plugged air inlets), or burn cycle time is too short.

2.1.2.9 Summary of Key Operation Factors Affecting Combustion

2.1.2.9.1 Combustion Air supply
- i. Sufficient air for complete reaction
- ii. Distributed to promote mixing

2.1.2.9.2 Mixing/Turbulence
- i. Assure contact of oxygen and organics

2.1.2.9.3 Temperature
- i. High enough to sustain combustion
- ii. High enough to complete reaction

2.1.2.9.4 Residence time/Retention time
- i. Sufficient time to allow reaction to complete

2.1.2.9.5 Waste Feed Characteristics

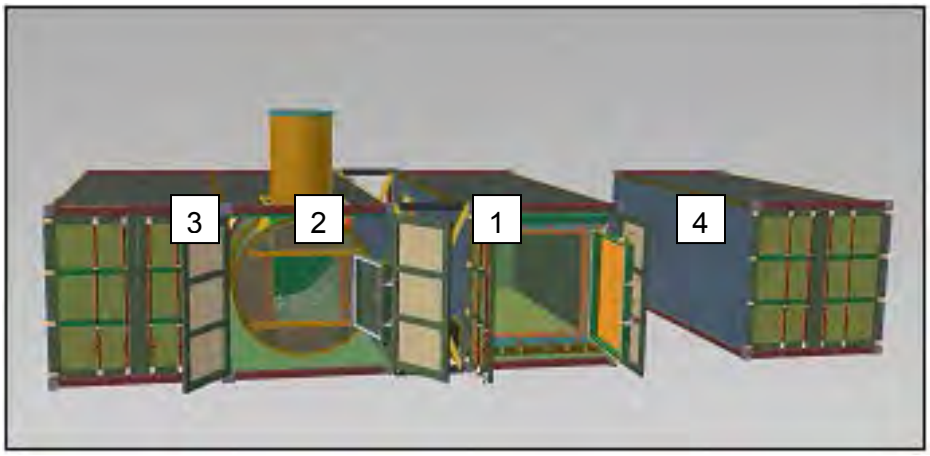
i. Waste feed must be representative of the waste feed assumptions used for the design of the incinerator

All of these key factors are interrelated.

2.1.3 Technology Overview

2.1.3.1 System Description

The **EWS Mobile Incinerator** is a fully containerized transportable waste incinerator system designed to meet the strictest environmental standards. The EWS Mobile Incinerator is comprised of 3 containerized modules and additional shipping container shown below.



View of the EWS Mobile Incinerator Containers

(Left to right: Container 3 - Controls Container, Container 2 - Secondary Chamber Container, Container 1 - Primary Chamber Container, Container 4 – Shipping Container)

2.1.3.2 System Process

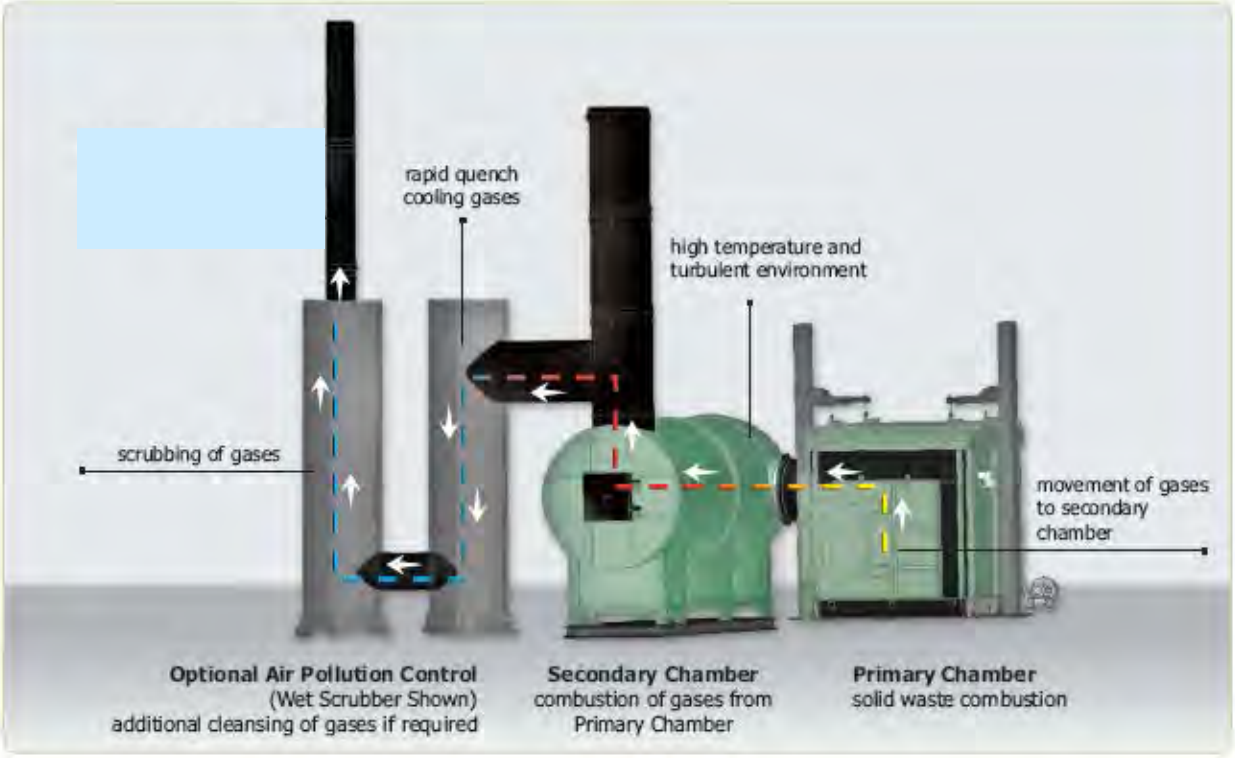
Stage One (Container 1 in diagram)
This container houses the incinerator's **Primary Chamber**. Waste is placed into the chamber until it is full, then the door is sealed shut and the system can be started. The waste will remain in this chamber, for the entire cycle, where it will be burned down to ash.

Stage Two (Container 2 in diagram)
This container houses the Incinerator's **Secondary Chamber** which burns the off-gases coming from the Primary Chamber that are continually formed as the waste is burned.

2.1.3.3 Process Overview

The following illustration depicts the process flow described previously and provides a schematic representation of the creation of gases and their flow through the system.

The system shown below is a graphic representation of the process and does not show the modules housed in ISO containers.



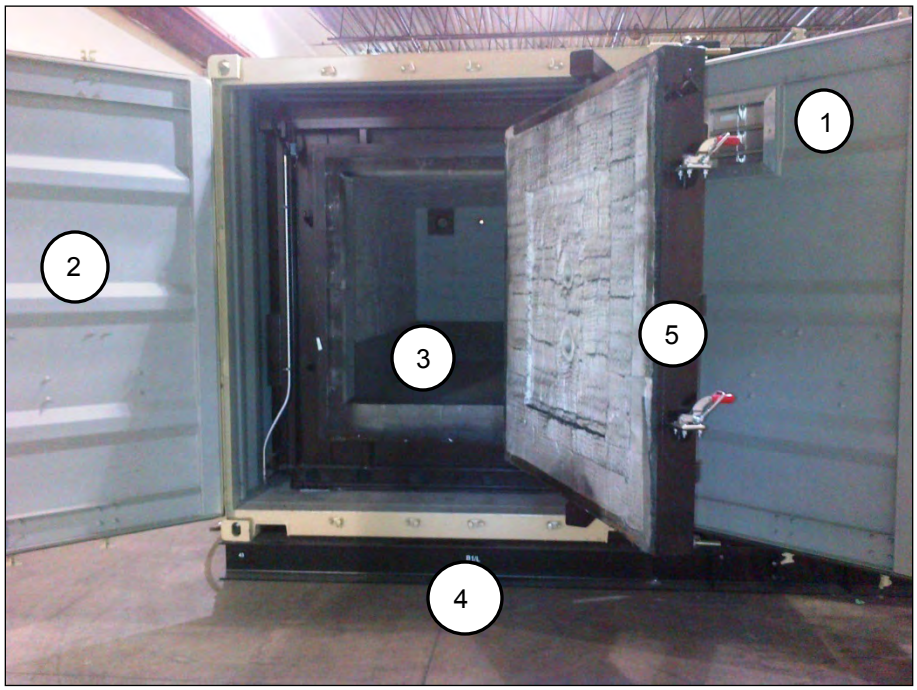
2.1.3.4 Functional Description of Major Components

The components within the Mobile Incinerator package that involve combustion are referred to as the incinerator. The main modules of the incinerator are the Primary Chamber and the Secondary Chamber. Both Chambers are large vessels constructed of steel with a special insulating liner known as refractory. The Primary and Secondary Chambers are described in detail below.

2.1.3.4.1 Primary Chamber

The **Primary Chamber** has a large front-opening door for loading of solid waste and removal of the ash residuals. Waste is loaded using a small skid-steer loader. The waste is dumped into the front of the chamber then pushed towards the back until full. Once the chamber is full, the door is closed and sealed shut using the toggle clamps. The operator will then use the control panel located in the Control Container to start the system. The Secondary Chamber must be at operating temperature before the Primary Chamber can activate.

To begin the process of burning the solid waste the **Primary Chamber Burner** is used to elevate the temperature of the Primary Chamber to ignite the waste. The burner package has a single motor that operates both the diesel fuel pump and combustion air supply fan of the burner. The burner ignites the fuel and supplies combustion air to create heat.



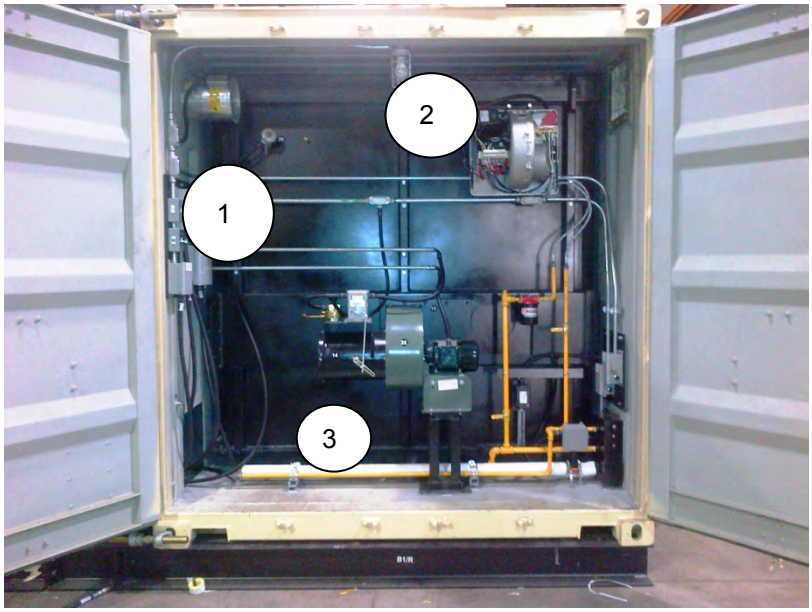
1. Louver
2. Container door
3. Opening for loading
4. Base frame
5. Toggle clamps

Front View: Primary Chamber Container (Chamber open)

A **Thermocouple** is used to measure the temperature of the Chamber. Once the Chamber reaches a temperature of approximately 650-850°C, the burn process becomes self-fuelling and the burner will shut off. To save fuel and control temperatures, only when the energy contained within the waste is depleted will the burner periodically turn on.

The amount of heat released from the oxidation of the waste, is controlled by limiting the air into the Primary Chamber to less than what is required for complete combustion. This is described as *starved air* conditions. With controlled air and temperature the waste is dried, heated and oxidized thereby releasing moisture and volatile components. The non-volatile, combustible portion of the waste is burned to provide heat while the non-combustible portion accumulates as residual. These conditions ensure that the waste is allowed to fully combust and is rendered sterile. Waste volume is reduced by over 90%. After enduring the combustion process, metals and glass remain intact. Preservation of metals and glass protects the refractory lining from damage caused by melted and fused metals and glass, but also allows for post-combustion recycling where possible.

This chamber also has a small **cooling fan**, typically referred to as the **Primary Chamber Blower**. The blower does not operate during the burn cycle but will activate automatically once the burn is complete and the system goes into cool down phase. The blower then cools the chamber for a period of 12 hours so that the chamber will be sufficiently cool for the Operator to safely remove the ash and begin to load a new batch of waste.



1. Thermocouple
2. Burner (Diesel-fired)
3. Primary Chamber Blower/Cooling Fan

Rear View: Primary Chamber Container

2.1.3.4.2 Secondary Chamber

As waste burns in the Primary Chamber, gases containing the products of combustion are pulled continuously into the high temperature zone of the **Secondary Chamber** where the oxidation reaction of the combustible products is completed.

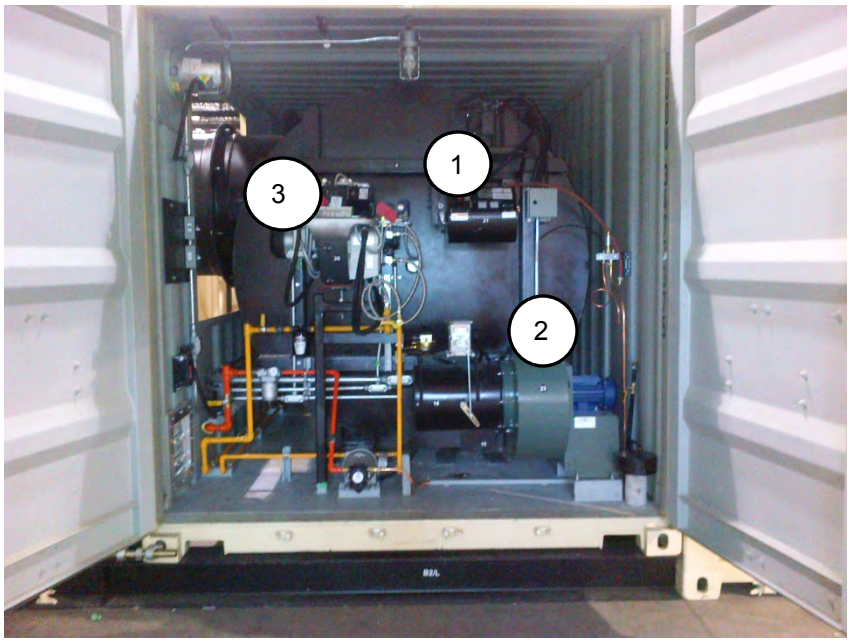
To accomplish this, the Secondary Chamber controls the temperature at 1000°C using a thermocouple to constantly measure the temperature inside the chamber. The temperature readings are monitored by the system's PLC and the PLC will initiate operational changes such as increasing or decreasing the speed of the **Secondary Chamber Blower** and the output of the **Secondary Chamber Burner (Diesel-fired).**

The **Secondary Chamber Blower** air is introduced into the chamber by an air ring manifold that surrounds the Secondary Chamber. The manifold has small air jets called tweers that open into the chamber at the side walls and create a powerful vortex of excess air to mix the incoming gases and ensure complete combustion. The flow of air is tightly managed by the control system using a Variable Frequency Drive (VFD) to control the speed of the fan and modulating motors on the blower inlet dampers.

The blower is extremely important as it creates the turbulence required to mix the gases and oxygenate them. This fosters the high efficiency combustion required to break hydrocarbon chains into carbon dioxide and water vapour. It also acts to cool the chamber and prevent temperature overruns.

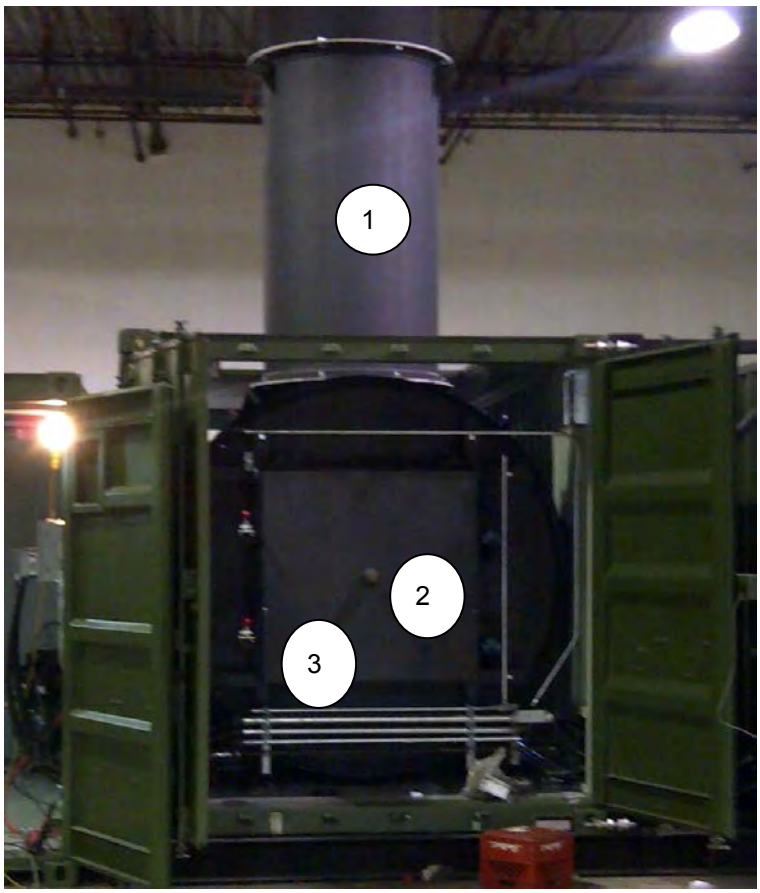
Secondary Chamber Burner (Diesel-fired) is similar to the burner used in the Primary Chamber except that it is a much higher output burner and its output is self-modulated over a broad range for very precise temperature control.

The Secondary Chamber is sized to allow two seconds of retention time. This is the time that the gases from the Primary Chamber are retained in the Secondary Chamber before they exit to the next stage. Two seconds of retention is considered to be ideal to destroy any harmful organic hydrocarbons produced from the Primary Chamber.



1. Waste Oil Burner
2. Secondary Chamber Blower/Fan
3. Secondary Chamber Burner (Diesel-fired)

Front View: Secondary Chamber Container



1. Stack
2. Secondary Chamber View Port
3. Secondary Chamber Access Door

Sample Rear View: Secondary Chamber Container

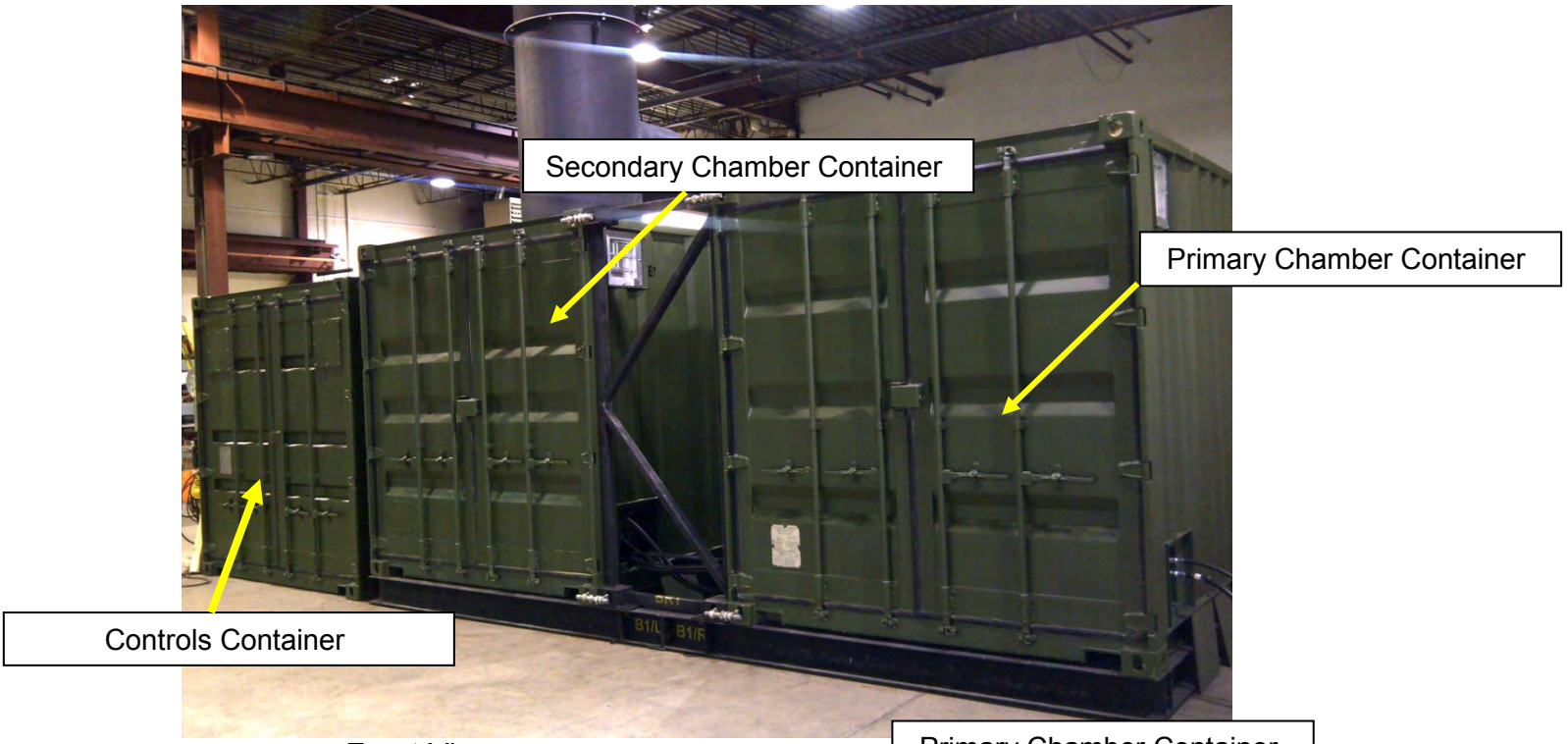
2.1.3.4.3 Main Control Panel

There is one Main Control Panel that controls all of the interconnecting modules. The Operator has one simple interface to start the equipment, view system status and change control settings if required. The entire process is managed using a **PLC** (programmable logic controller) to automate the operation. The critical process parameters such as temperature, combustion airflow and burner output are operated using EWS' patented system control program to maintain optimal combustion.

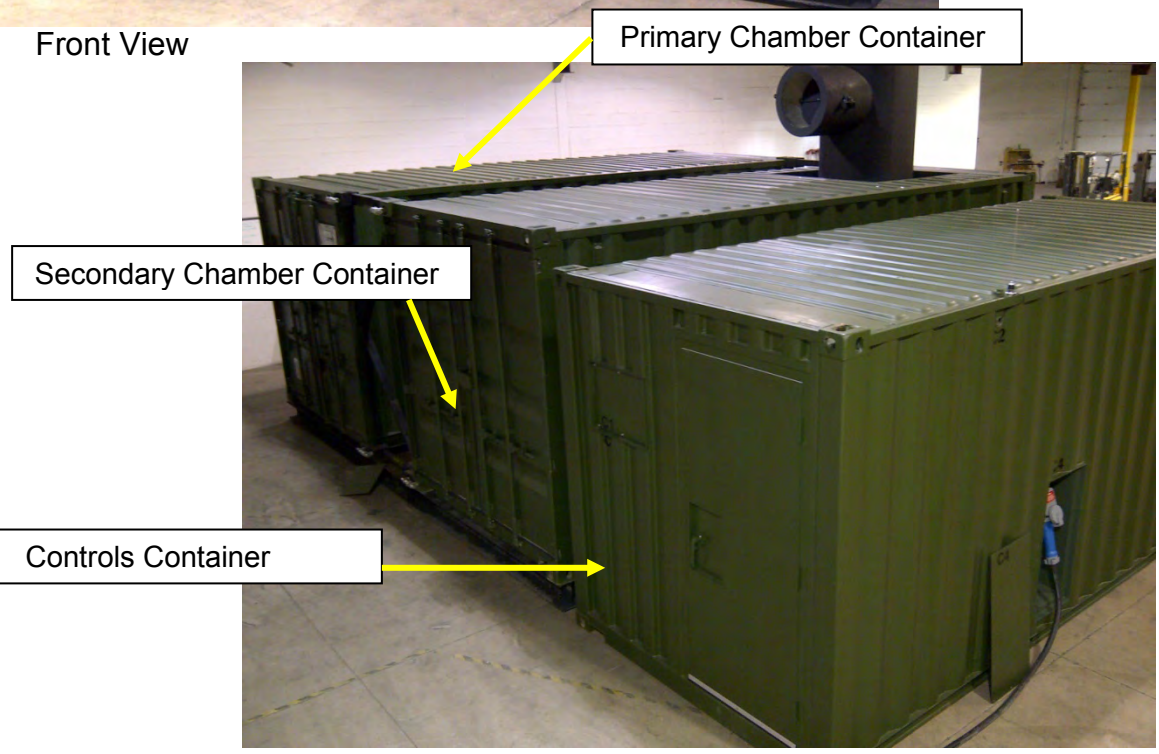
Front View: Main Control Panel

2.2 DESCRIPTION OF EWS MOBILE INCINERATOR

2.2.1 EWS Mobile Incinerator Containers



Front View



Rear View

The **EWS Mobile Incinerator** consists of the following containers as depicted in the drawing.

2.2.1.1 **Primary Chamber Container:** containing the Primary Chamber and diesel oil connectors

2.2.1.2 **Secondary Chamber Container:** containing the Secondary Chamber

2.2.1.3 **Controls Container:** containing the Main Control Panel (Monitoring and Control Centre) as well as the electrical hook-ups and Air Compressor

2.2.1.4 **Shipping Container:** Container to hold components during transportation (Not Shown)

EWS Mobile Incinerator: Description of each Container

2.2.1.1 #1 Primary Chamber Container

a. This standard 20' ISO shipping container permanently encloses the **Primary Chamber.**

b. At one end of the container the operator can open the container and gain access to the large front-loading primary chamber door. The Primary Chamber door will pivot on its hinge to allow for an opening of 90°.

c. At the other end of the container the doors will allow for unencumbered access to the auxiliary fuel (diesel) burner. Also located at this end is the Primary Chamber cooling fan. Other than during periodic maintenance and installation and disassembly, there is no need to regularly access these components and therefore these doors will be kept closed.
   i. The Primary Chamber including all of its major components and plumbing will be shipped fully assembled within the container, with minimal assembly of interconnections required in the field.

d. This container includes its own air handling system.

e. This container is modified to allow interconnections to the other containers:
   i. Hatch opening for interconnecting duct Breech between Primary and Secondary Chamber Containers
   ii. Utility Bridge for fuel in, fuel return line out, electrical power in and instrument cables out