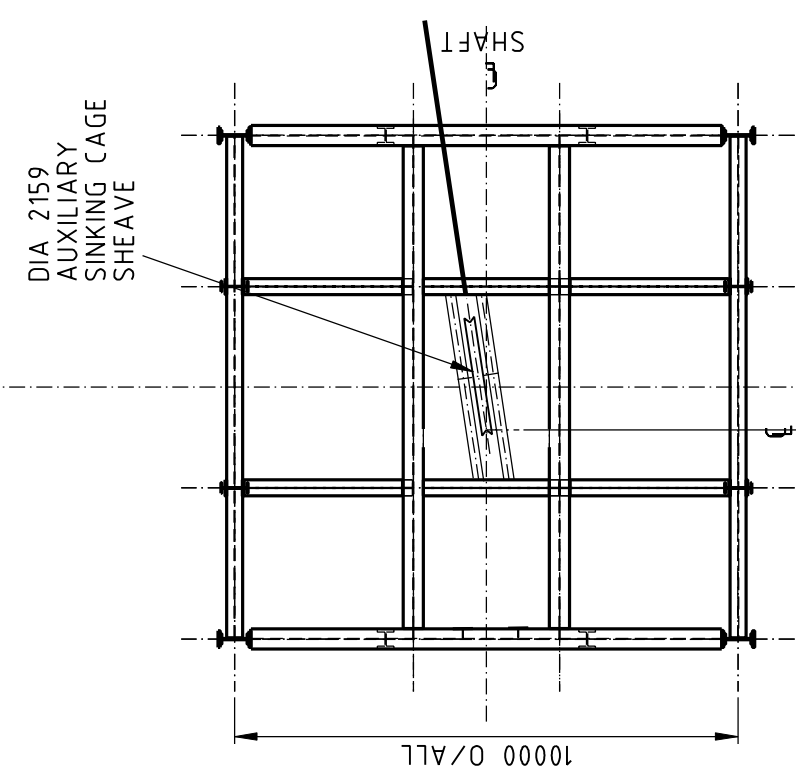
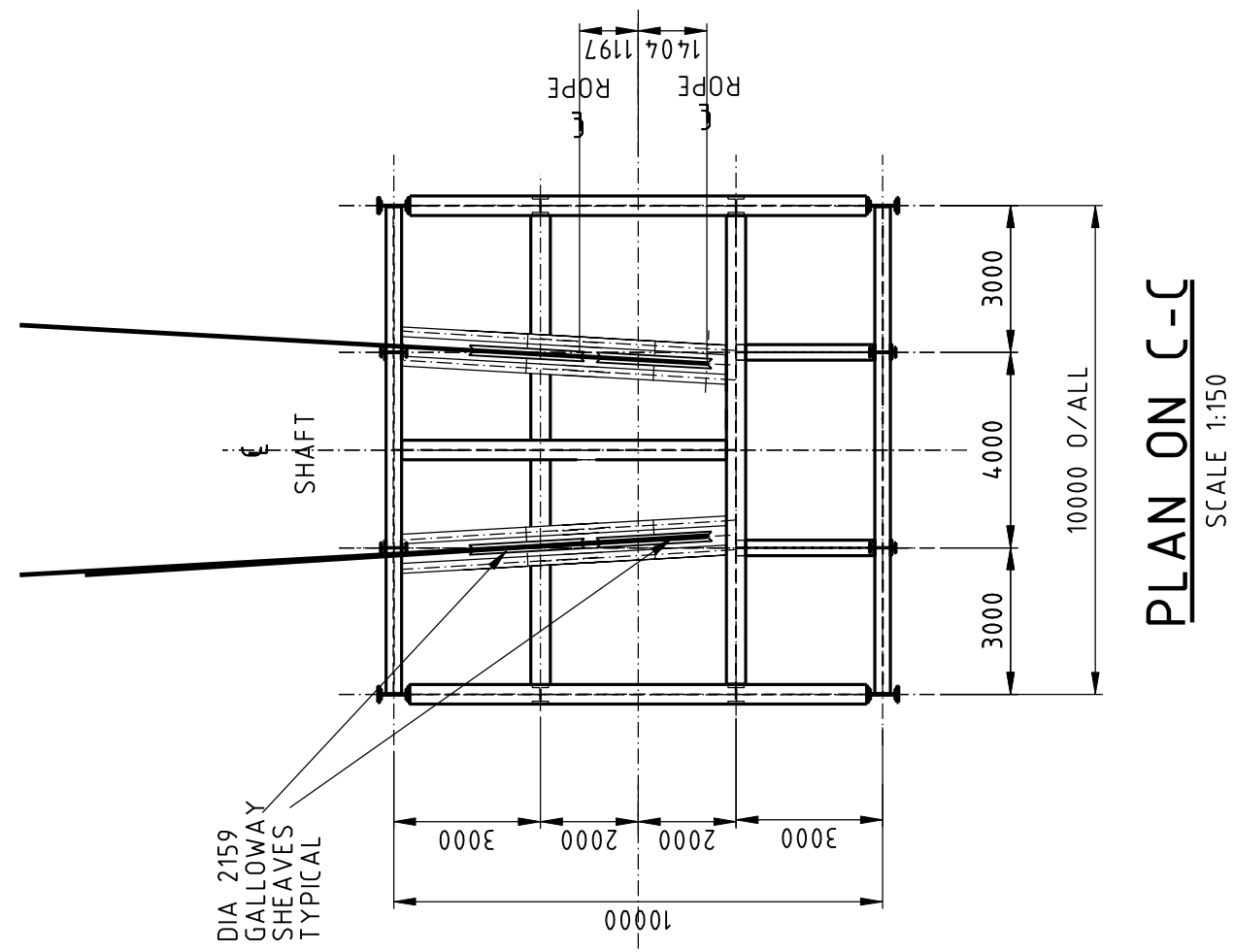


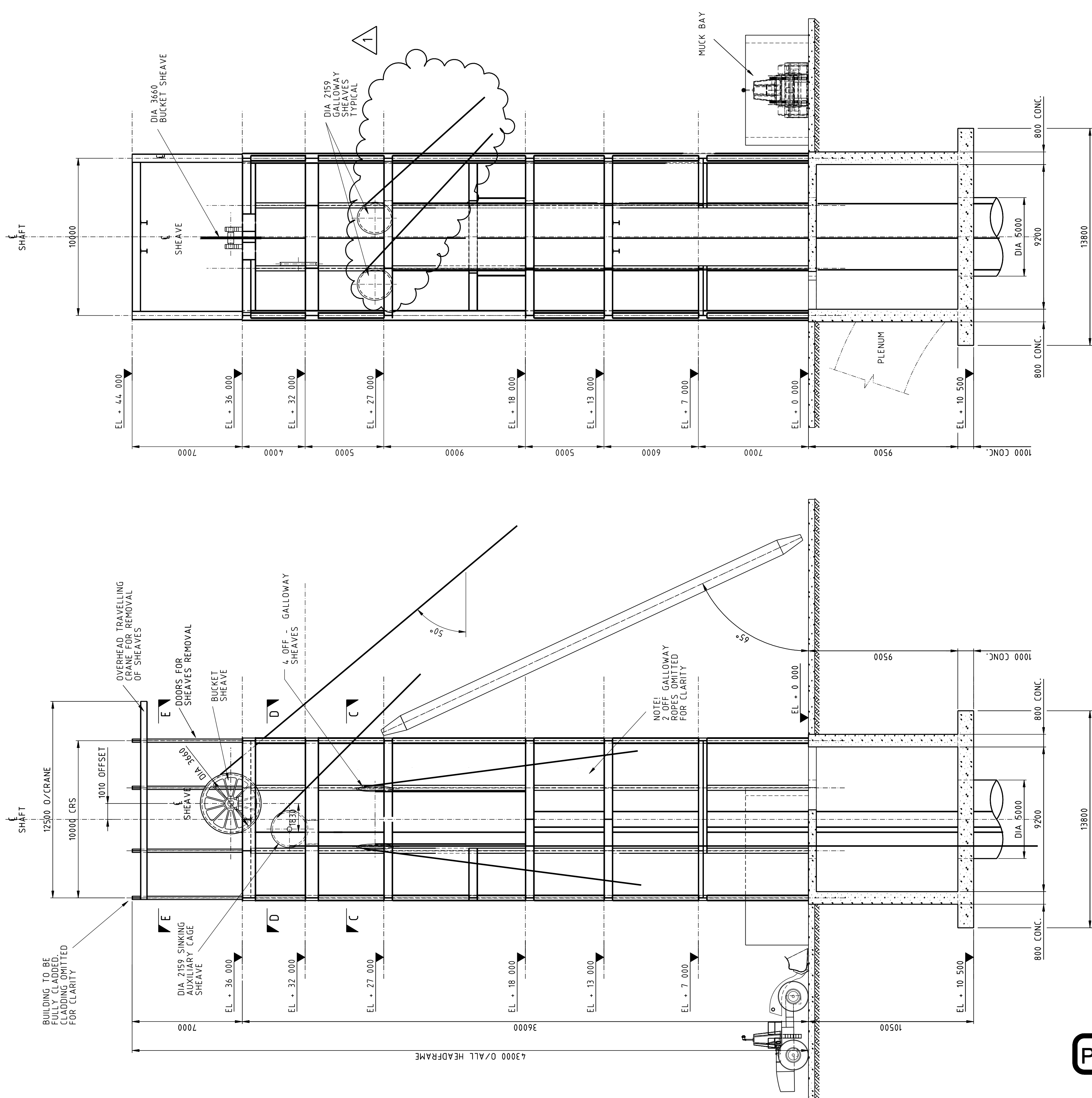
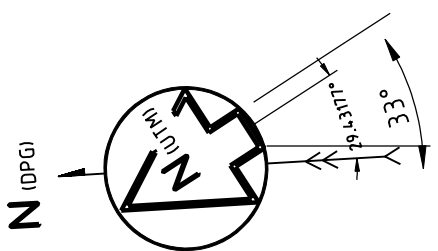
PLAN ON E-E
SCALE 1:150



PLAN ON D-D
SCALE 1:150



PLAN ON C-C
SCALE 1:150



ELEVATION B-B
SCALE 1:150

ELEVATION A-A
SCALE 1:150

PRELIMINARY

DRAWING NO.	DRAWING TITLE
	REFERENCE DRAWINGS

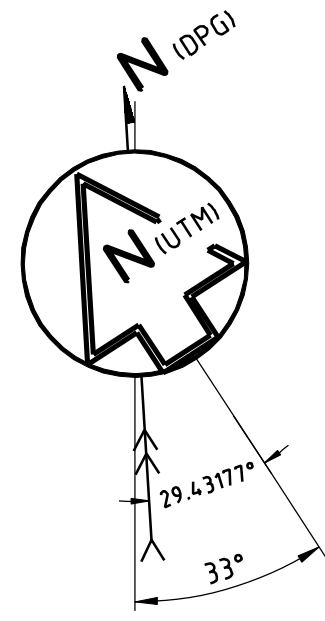
NO.	DESCRIPTION	CHK'D	APP'D	DATE
01	ROPE LINE DIRECTIONS CHANGED			
REVISIONS				

REV.	ISSUE FOR	AUTH. BY	DATE
01	APPROVED FOR USE	GRD SAA	01/03/10
00	APPROVED FOR USE	GRD SAA	12/01/10

ISSUE AUTHORIZATION			
PROJ. MGR.	DATE	DATE	DATE
M DAWBORN	2009-12-08		

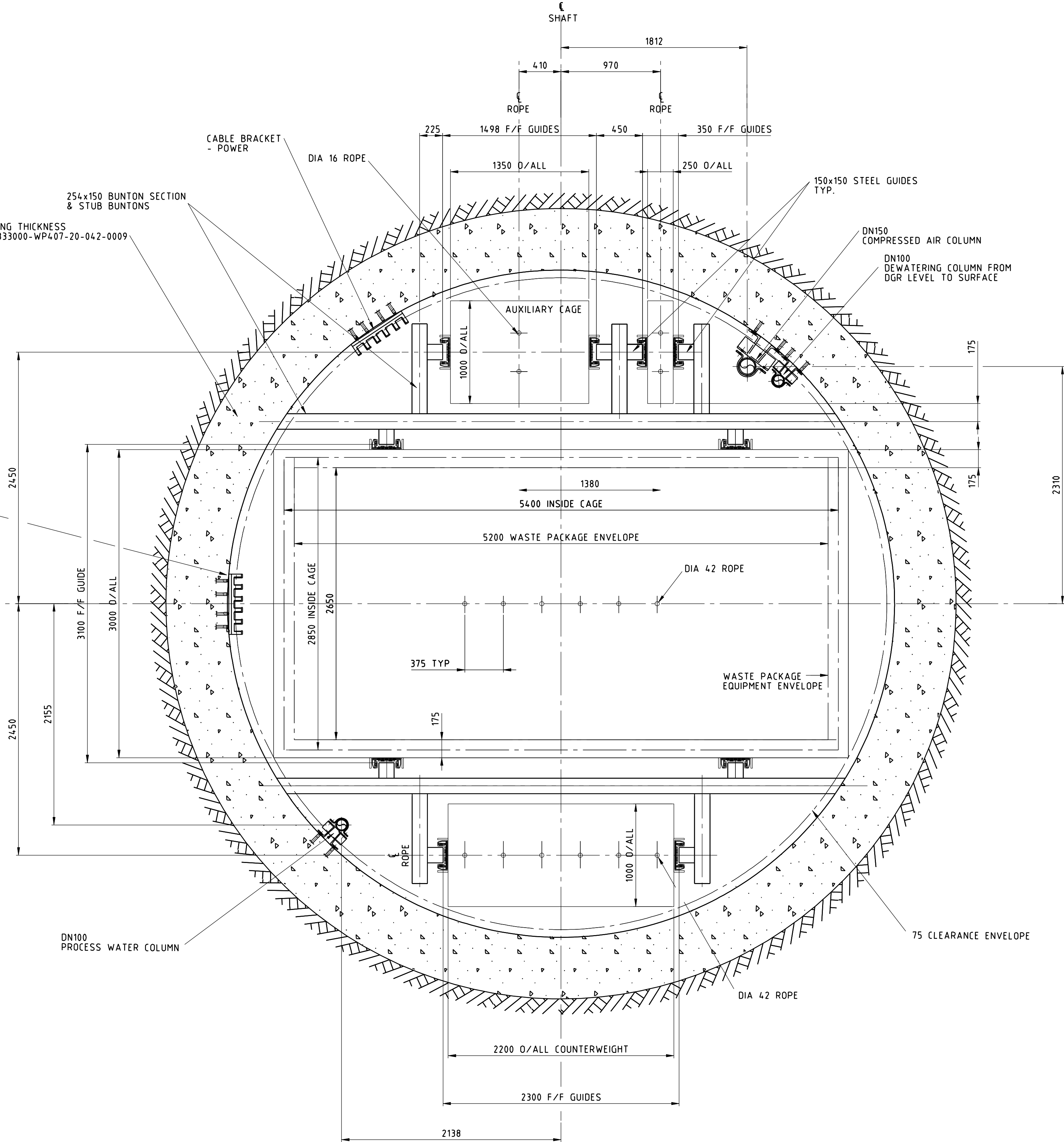
HATCH	
DESIGNED BY S. LO DRAGO DATE 2009-12-08	DRAWN BY K ARMSTRONG DATE 2009-11-27
CHECKED BY	DISCIPL. ENGR.
DATE	DATE
PROJ. DES. COORD.	PROJ. ENGR.

NUCLEAR WASTE MANAGEMENT ORGANIZATION DEEP GEOLOGIC REPOSITORY PROJECT	
HEADFRAMES	
VENTILATION SHAFT HEADFRAME - SINKING CONDITION GENERAL ARRANGEMENT	
SCALE 1:150 OR AS NOTED	DWG. NO. H333000-WP406-20-042-0008
REV. 01	



254x150 BUNTON SECTION & STUB BUNTONS
FOR SHAFT LINING THICKNESS
SEE DRG No. H333000-WP407-20-042-0009

CABLE BRACKET
- LEAKY FEEDER
- FIBRE OPTICS (COMMS)
- SIGNALLING
- FIRE DETECTION



PRELIMINARY

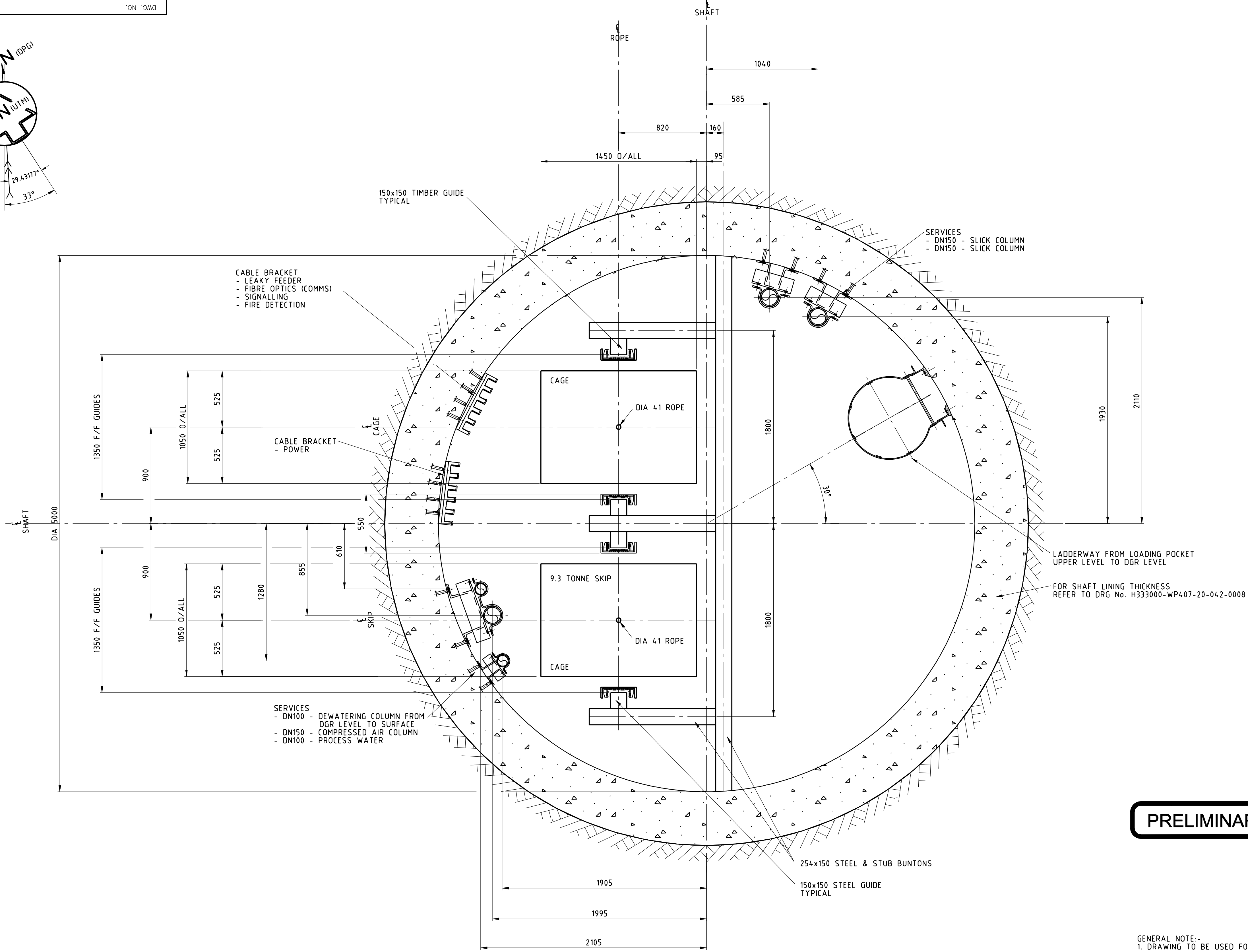
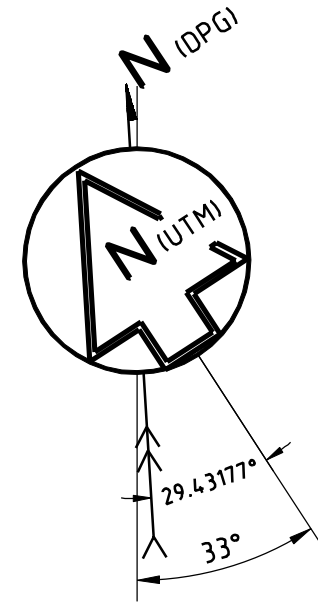
GENERAL NOTE--
1. DRAWING TO BE USED FOR PRELIMINARY DESIGN ONLY, NOT TO BE USED FOR CONSTRUCTION

THIS LINE MEASURES 50mm
ON FULL SIZE DRAWING

6.5 M INTERNAL DIA PERMANENT MAIN SHAFT CROSS-SECTION
SCALE 1:25

DRAWING NO.		DRAWING TITLE		NO.		DESCRIPTION		CHK'D		APP'D		DATE		NOT FOR CONSTRUCTION This drawing has been reviewed for the purposes of DGR Preliminary Engineering only and must not be used for other purposes. Work Package Owner Stephen Keen Area Lead G.R. Davy Engineering Manager Project Manager Accepted by Owner		HATCH DESIGNED BY S. Lo DRAGO DATE 04/11/09 CHECKED BY DATE PROJ. DES. COORD. DATE PROJ. ENGR.		DRAWN BY MC BOTHMA DATE 04/11/09 DISCIPLINE ENGR.		NUCLEAR WASTE MANAGEMENT ORGANIZATION DEEP GEOLOGIC REPOSITORY PROJECT SHAFTS MAIN SHAFT PRELIMINARY SHAFT SECTION GENERAL ARRANGEMENT		SCALE 1:25 OR AS NOTED		DWG. NO. H333000-WP407-20-042-0001		REV. 00	
REFERENCE DRAWINGS				REVISIONS				ISSUE AUTHORIZATION				00 APPROVED FOR USE GRD SAA 09/12/09 REV. ISSUE FOR AUTH. BY DATE PROJECT MGR. MARTYN DAWBORN DATE 04/11/09															

P:\NUCLEAR\333000\CAD\CAD\DCN\H333000-WP407-20-042-0001 - Main Shaft.dwg
12/10/2009 7:33:50 AM
dani57041



PRELIMINARY

GENERAL NOTE:-
1. DRAWING TO BE USED FOR PRELIMINARY DESIGN ONLY, NOT TO BE USED FOR CONSTRUCTION

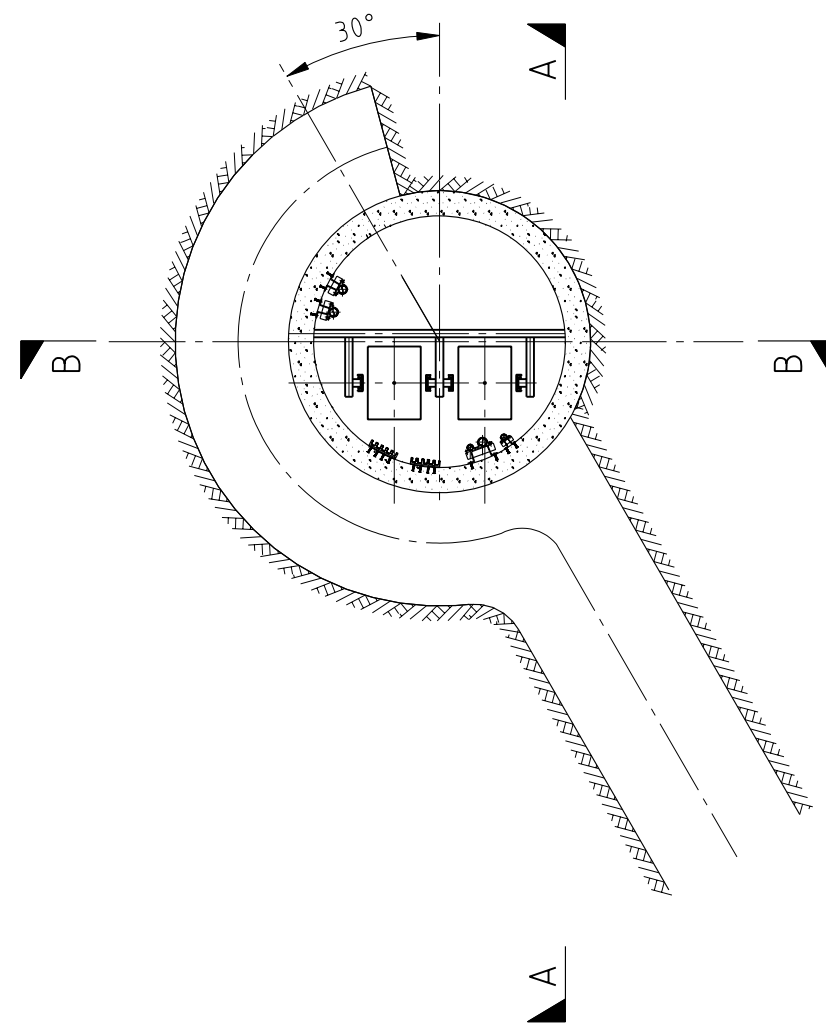
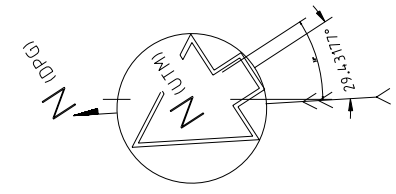
5 M INTERNAL DIA PERMANENT VENT SHAFT CROSS-SECTION
SCALE 1:20

THIS LINE MEASURES 50mm
ON FULL SIZE DRAWING

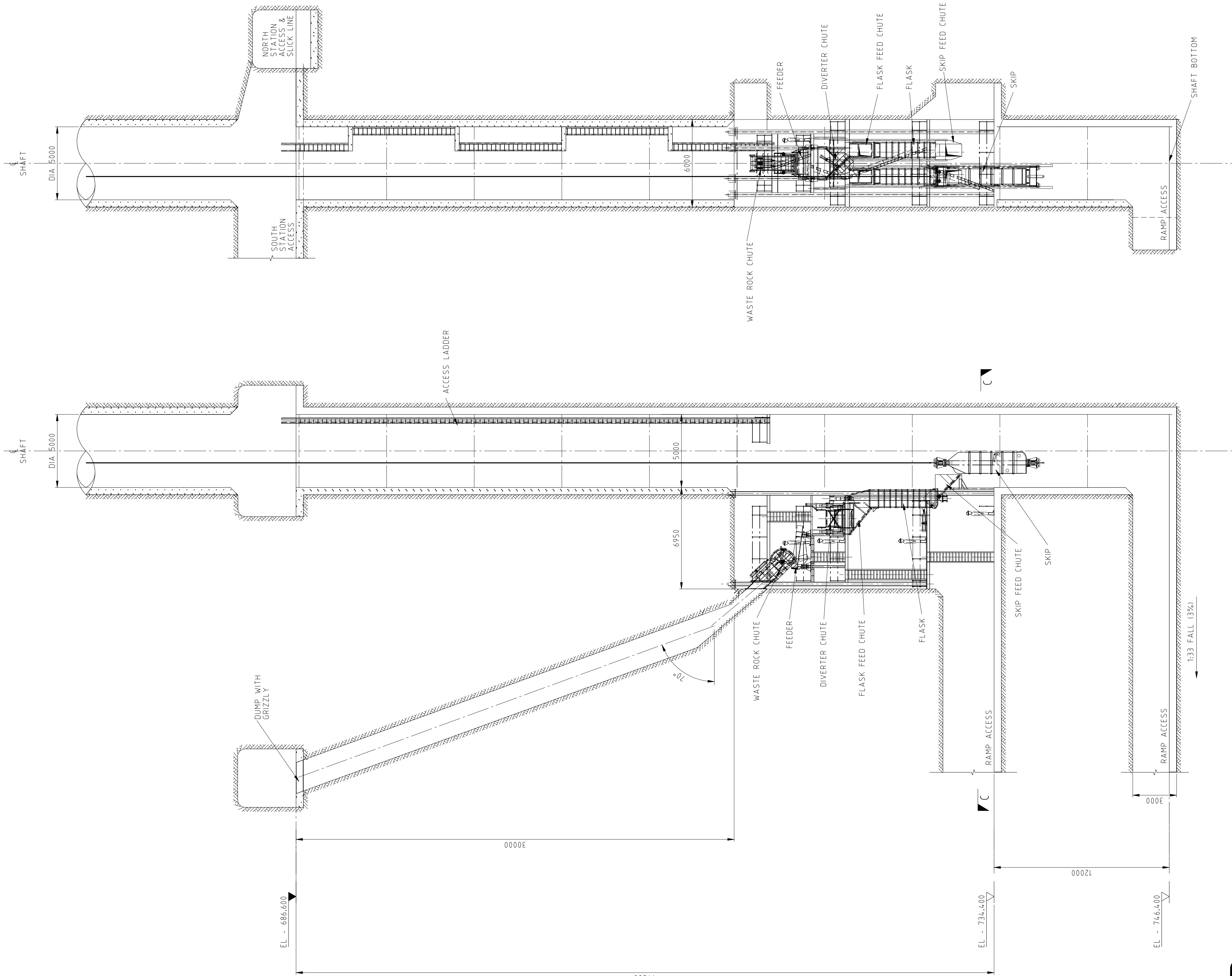
DRAWING NO.		DRAWING TITLE		NO.		DESCRIPTION		CHK'D		APP'D		DATE		NOT FOR CONSTRUCTION This drawing has been reviewed for the purposes of DGR Preliminary Engineering only and must not be used for other purposes. Work Package Owner Stephen Keen Area Lead G.R. Davy Engineering Manager Sherwin Adams Project Manager Accepted by Owner Digitally signed by David Wilson DN: cn=David Wilson, o=Hatch, ou=Engineering, email=d.wilson@hatch.com, c=AU Date: 2009.12.11 09:55:43 -05'00' Digitally signed by M. S. Davidson DN: cn=M. S. Davidson, o=Hatch, ou=Engineering, email=m.s.davidson@hatch.com, c=AU Date: 2009.12.11 10:10:30 -05'00'		HATCH DESIGNED BY: S. LO DRAGO DATE: 14/10/09 CHECKED BY: DATE: PROJ. DES. COORD. DATE: PROJ. MGR. MARTYN DAWBORN DATE: 14/10/09		NUCLEAR WASTE MANAGEMENT ORGANIZATION DEEP GEOLOGIC REPOSITORY PROJECT SHAFTS VENTILATION SHAFT PRELIMINARY SHAFT SECTION GENERAL ARRANGEMENT		SCALE: 1:20 OR AS NOTED		DWG. NO. H333000-WP407-20-042-0002		REV. 00	
REFERENCE DRAWINGS				REVISIONS				ISSUE AUTHORIZATION				00 APPROVED FOR USE GRD SAA 09/12/09 DATE													

P:\Nuclear\333000\CAD\C\DCN\H333000-WP407-20-042-0002 - 11.rvt - Shaft CA.dgn
 12/10/2009 7:24:37 AM
 doni57041

NOTE!
ALL ELEVATIONS ARE FROM
EL. 000,000 = BELOW COLLAR LEVEL



PLAN C-C
SCALE 1:150



ELEVATION B-B
SCALE 1:150

ELEVATION A-A
SCALE 1:150

PRELIMINARY

GENERAL NOTE:
1. DRAWING TO BE USED FOR PRELIMINARY DESIGN ONLY, NOT TO BE USED FOR CONSTRUCTION.

DRAWING NO.	DRAWING TITLE
REFERENCE DRAWINGS	

NO.	DESCRIPTION	CHK'D	APP'D	DATE
REVISIONS				

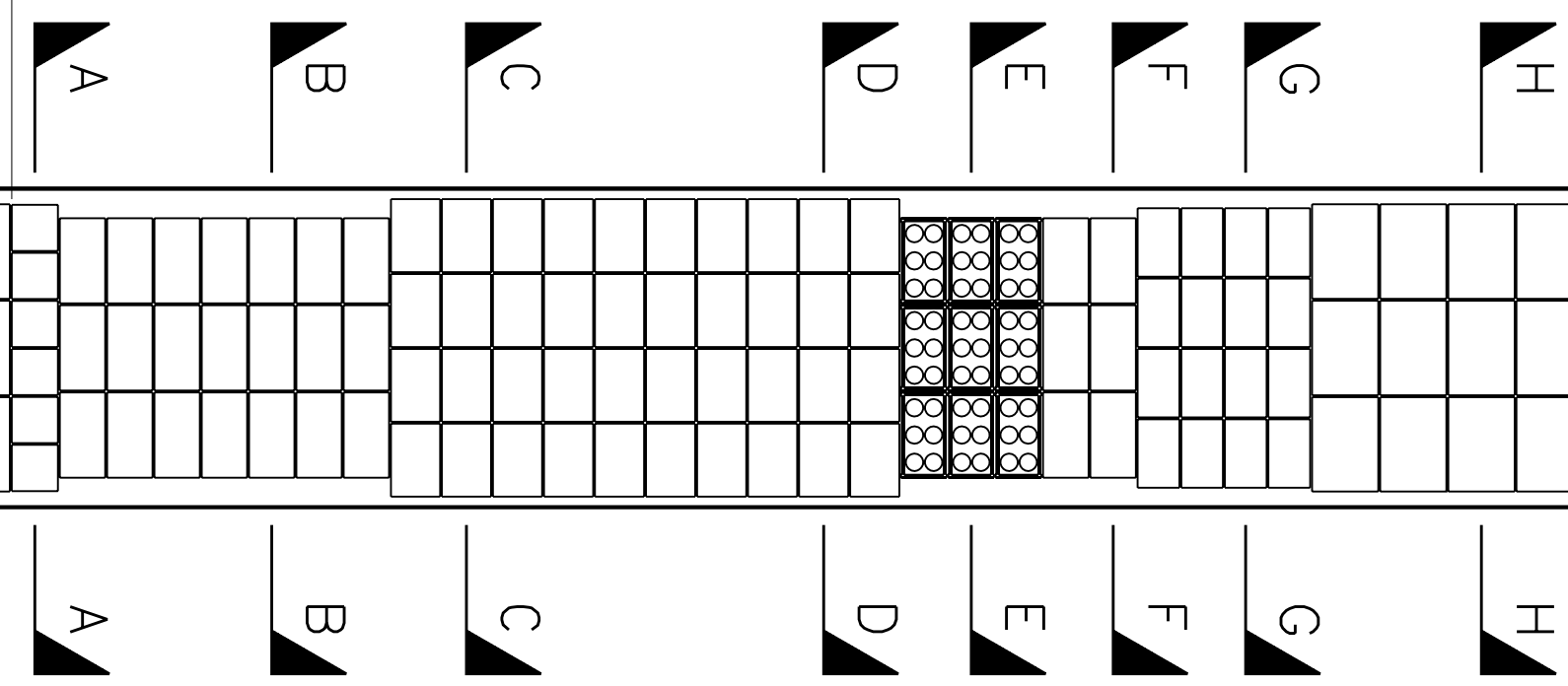
NOT FOR CONSTRUCTION
This drawing has been reviewed for the purposes of DGR Preliminary Engineering only and must not be used for other purposes.
Work Package Owner
Stephen Keen
Area Lead
G.R. Davy
Engineering Manager
Sherrin Astron
2009.12.11 13:24:28 - 0200
Project Manager
Accepted by Owner

00	APPROVED FOR USE	GRD	SAA	09.12.10
REV.	ISSUE FOR	AUTH.	BY	DATE
ISSUE AUTHORIZATION				

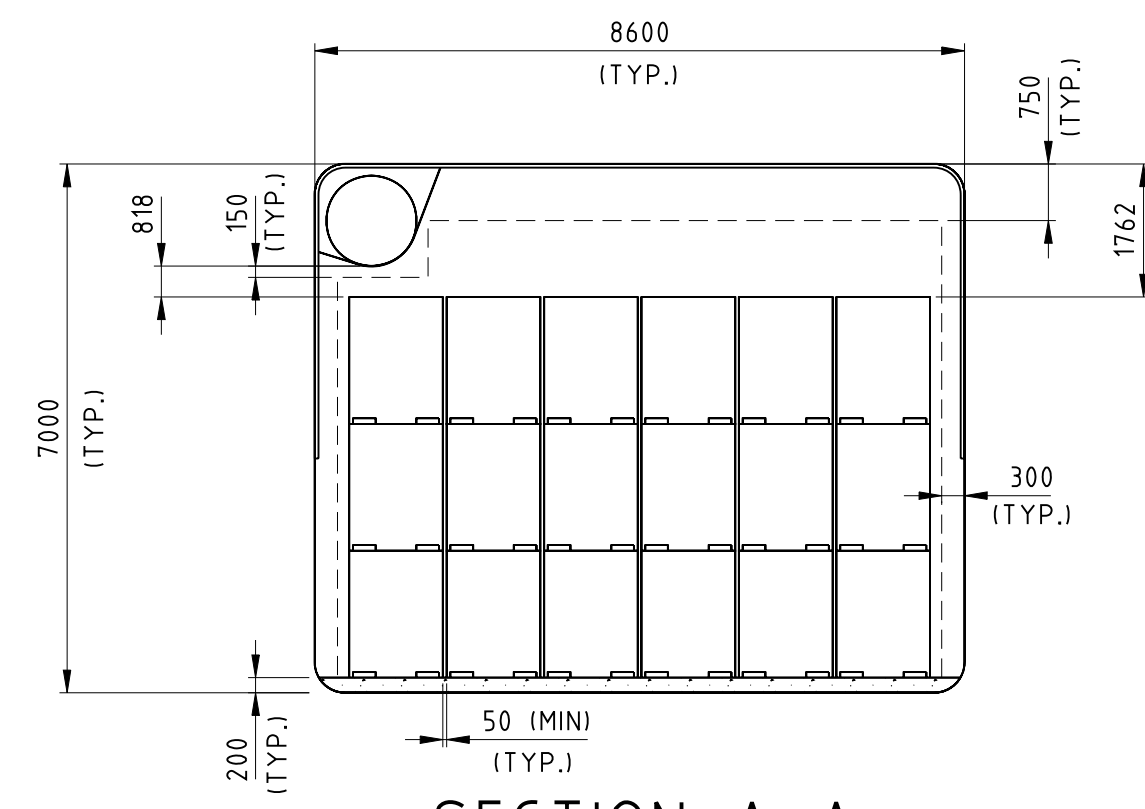
HATCH
DESIGNED BY
S. LO DRAGO
DATE 15/10/09
CHECKED BY
DATE
PROJ. DES. COORD.
DATE
DRAWN BY
R. LABUSCHAGNE
DATE 2009-10-15
DISCIP. ENGR.
DATE
PROJ. ENGR.
DATE

NUCLEAR WASTE MANAGEMENT ORGANIZATION
DEEP GEOLOGIC REPOSITORY PROJECT
SHAFTS
VENTILATION SHAFT
LOADING POCKET & SHAFT BOTTOM
GENERAL ARRANGEMENT
SCALE
1:150
OR AS NOTED
DWG. NO.
H333000-WP407-20-042-0005
REV.
00

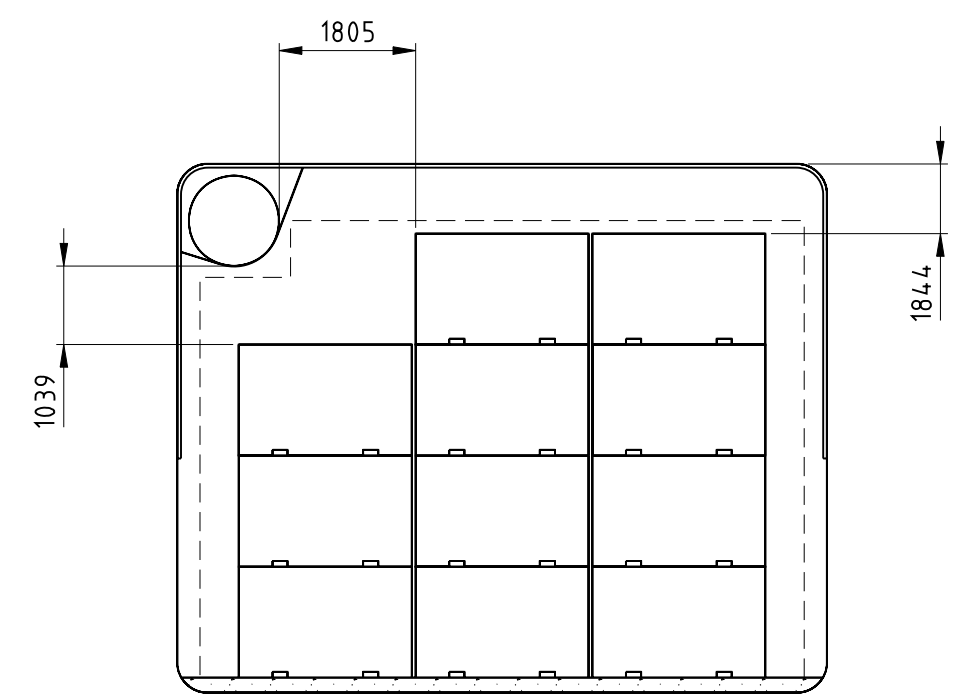
42180 (TYP. GROUPING)



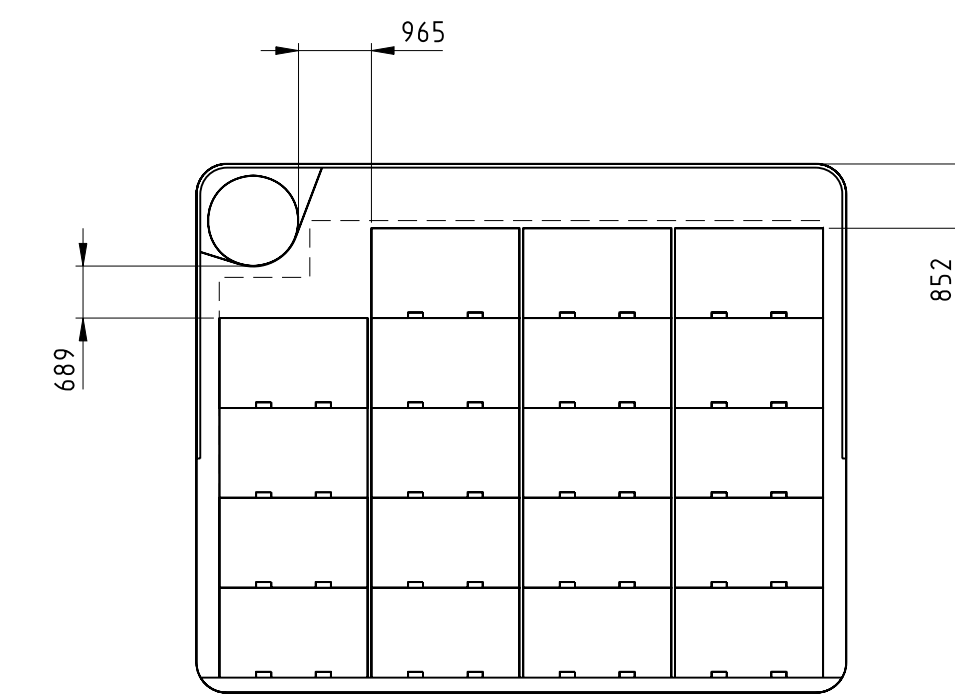
PLAN



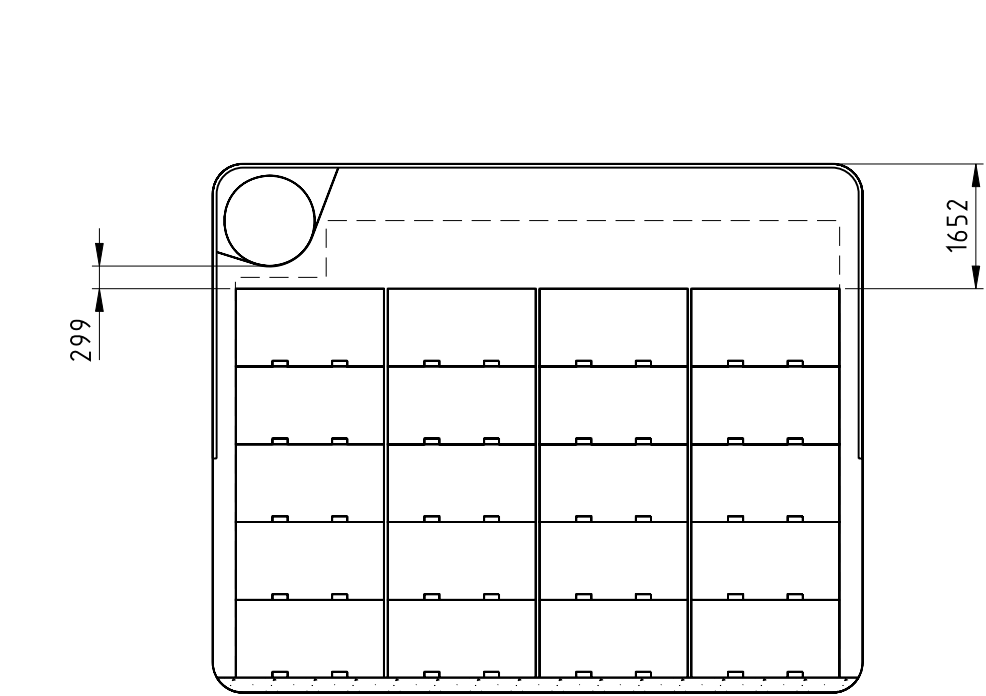
SECTION A-A
LL RESIN PALLET TANKS (RTK)
SCALE: 1:100



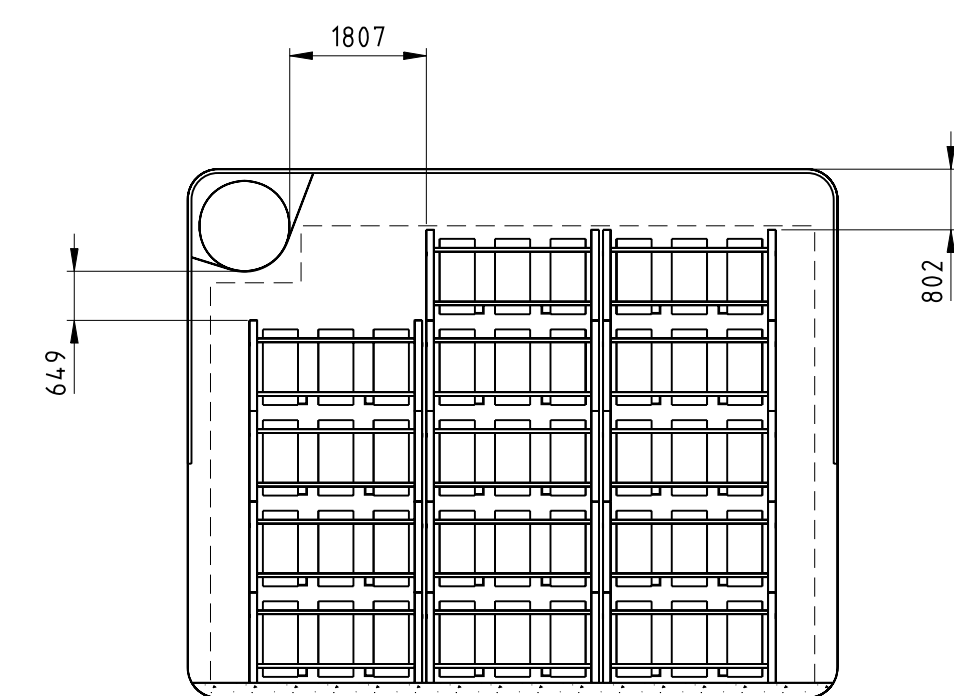
SECTION B-B
NON-PRO BINS (NPB4)
SCALE: 1:100



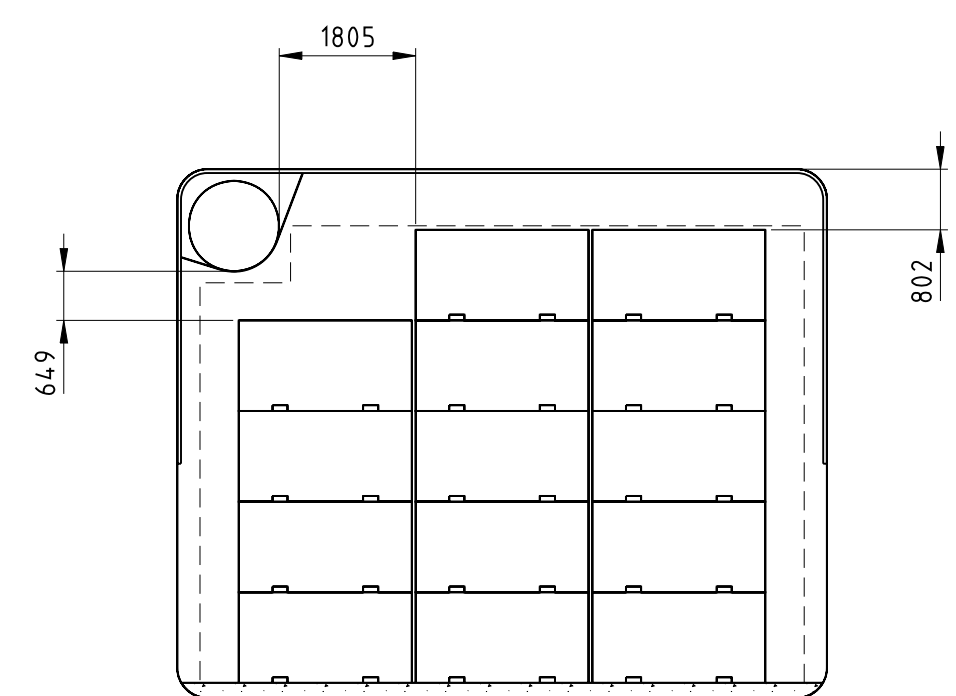
SECTION C-C
NON-PRO BINS (47" HIGH) (NPB47)
SCALE: 1:100



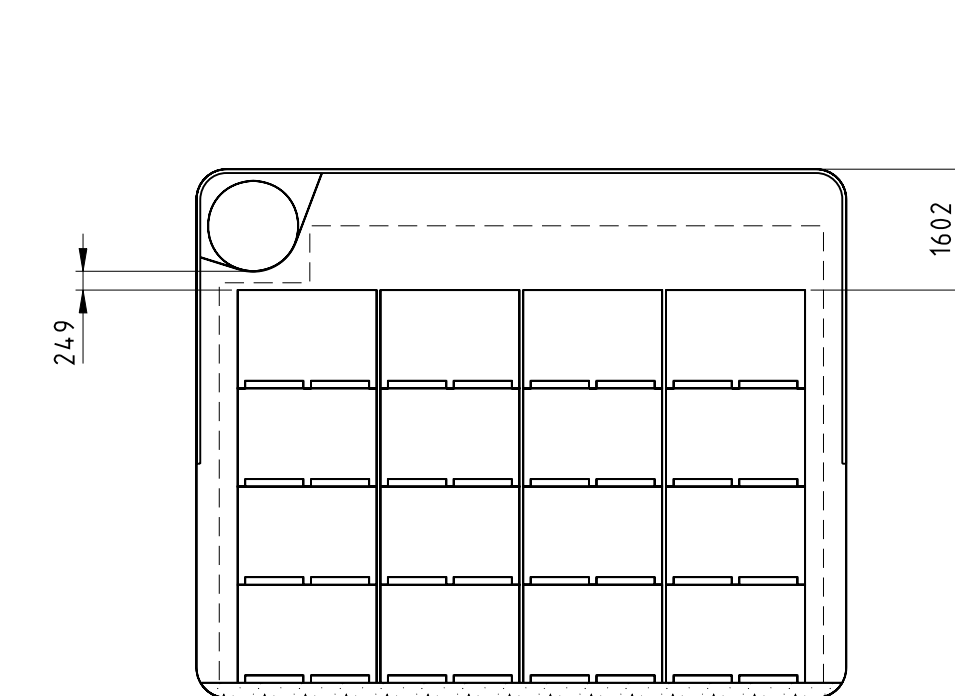
SECTION D-D
DRUM BINS (DBIN)
SCALE: 1:100



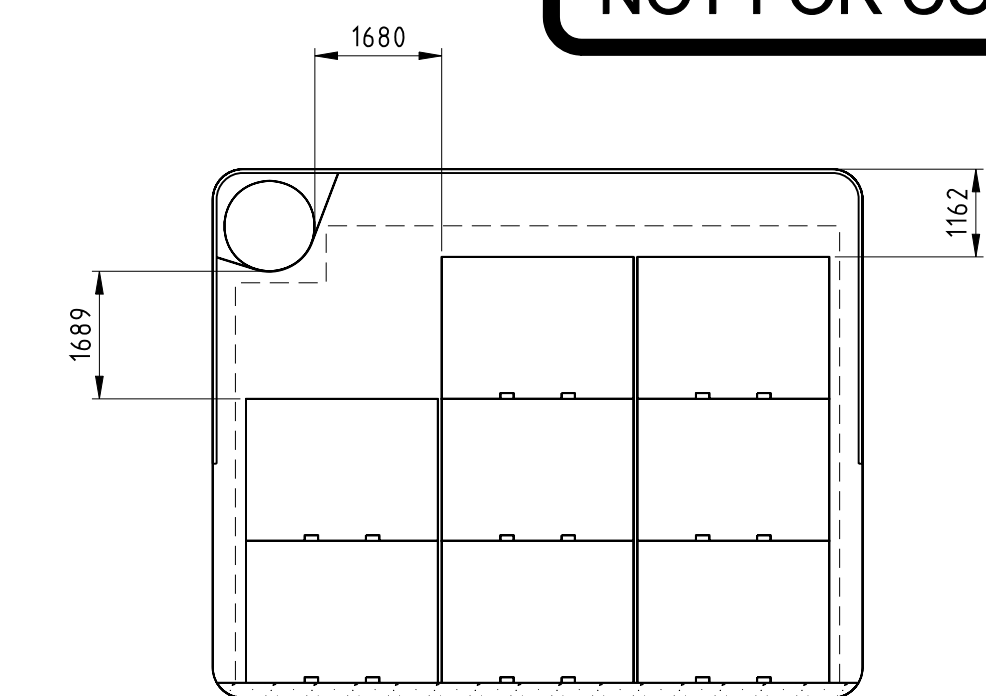
SECTION E-E
DRUM RACKS (DRACK)
SCALE: 1:100



SECTION F-F
BALE RACKS (BRACK)
SCALE: 1:100



SECTION G-G
COMPACTOR BOXES (B25)
SCALE: 1:100



SECTION H-H
LLW CONTAINER OVERPACKS (BINOPK)
SCALE: 1:100

PRELIMINARY

NOT FOR CONSTRUCTION

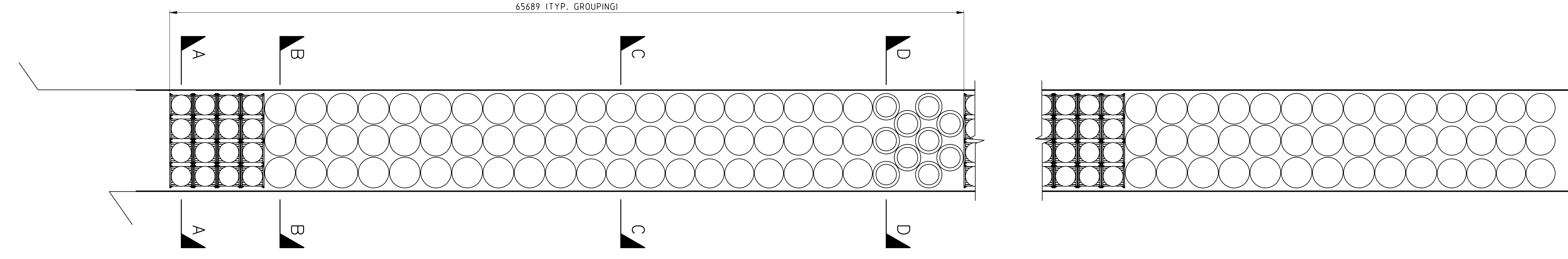
DRAWING NO.	DRAWING TITLE
1	REFERENCE DRAWINGS

NO.	DESCRIPTION	CHK'D	APP'D	DATE
REVISIONS				

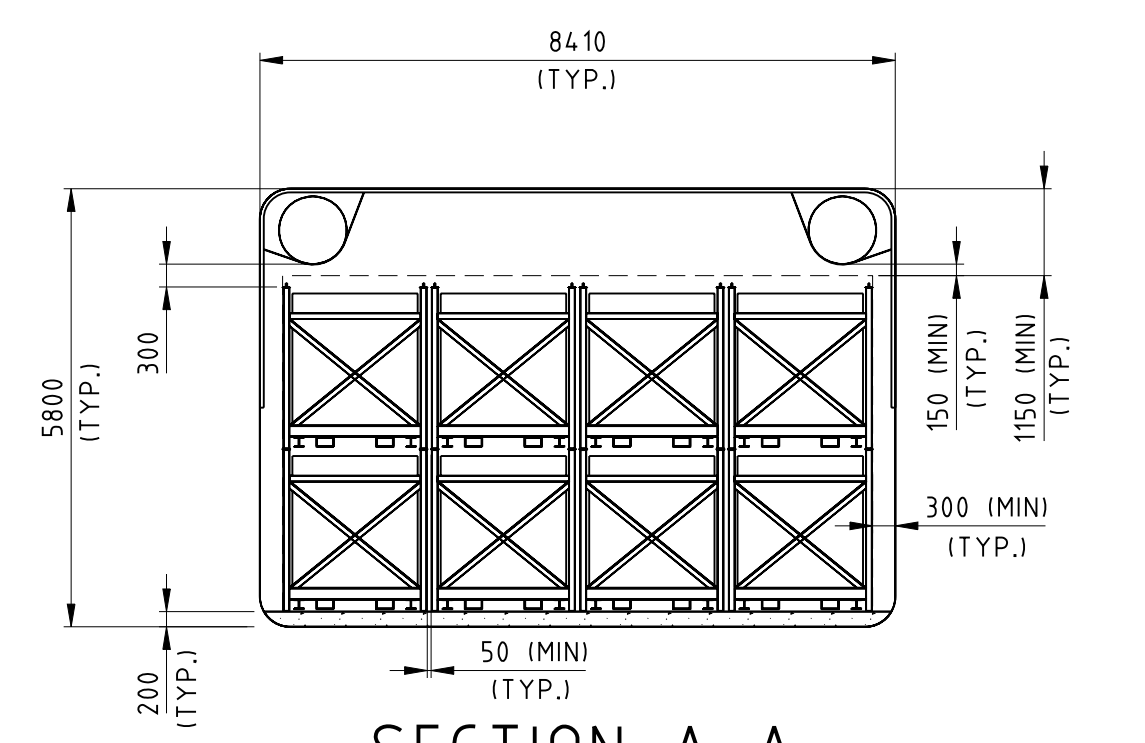
NOT FOR CONSTRUCTION This drawing has been reviewed for the purposes of DGR Preliminary Engineering only and must not be used for other purposes. Work Package Owner				
Area Lead	Craig Innie	2009.10.27	14:37:12	04/00
Engineering Manager	Shonin Jacobs	2009.10.27	15:37:38	04/00
Project Manager	M.R. Dawborn	2009.10.28	09:47:55	04/00
Accepted by Owner	M.R. Dawborn	2009.10.28	13:10:14	04/00
00	APPROVED FOR USE	GRD	SAA	2009-10-27
ISSUE AUTHORIZATION				

HATCH	
DESIGNED BY B. PERRY DATE 2990-09-30	DRAWN BY K. BUSHEY DATE 2009-09-30
CHECKED BY	DISCIPL. ENGR.
DATE	DATE
PROJ. DES. COORD.	PROJ. ENGR.
M.R. DAWBORN	

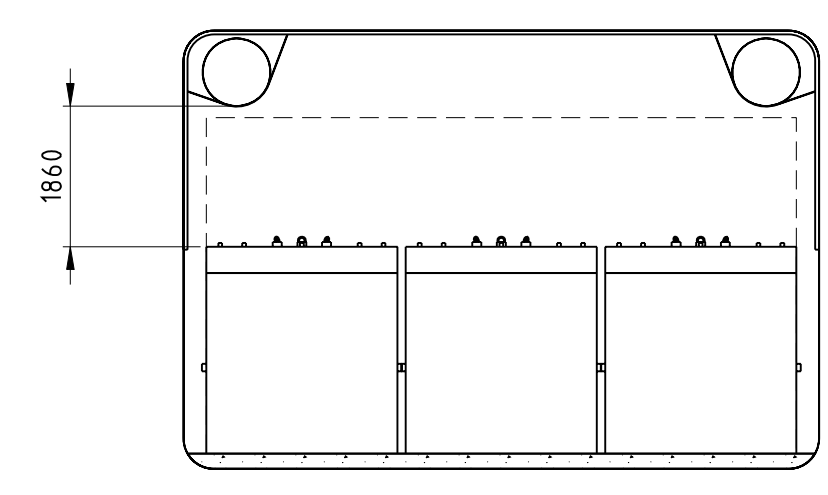
NUCLEAR WASTE MANAGEMENT ORGANIZATION DEEP GEOLOGIC REPOSITORY PROJECT	
P1 EMPLACEMENT ROOM	
ALLOCATION OF WASTE PACKAGES TO EMPLACEMENT ROOMS	
SCALE 1:200 OR AS NOTED	DWG. NO. H333000-WP408-05-042-0001
REV. 00	



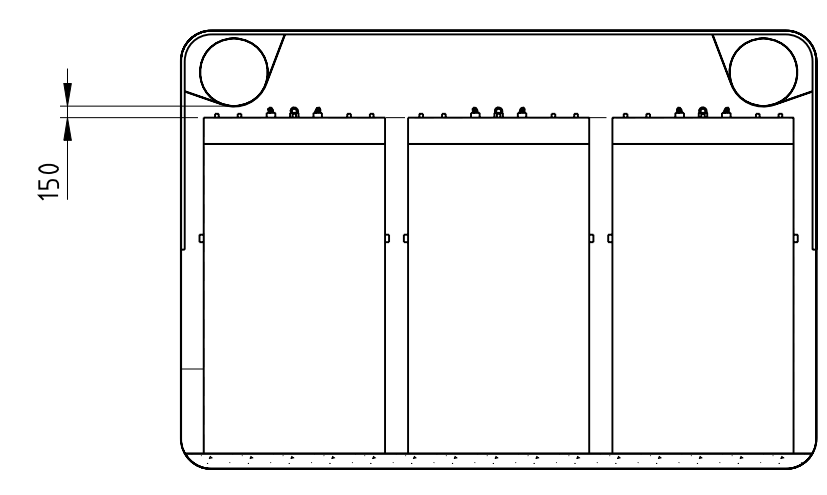
PLAN



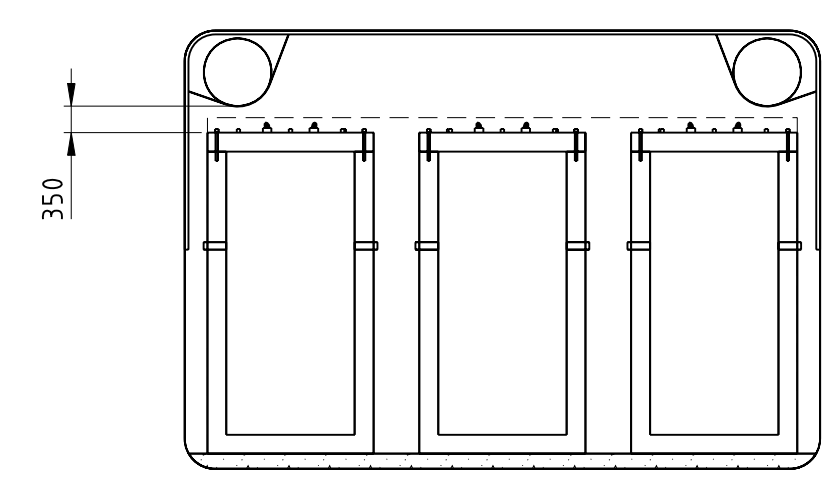
SECTION A-A
RESIN LINER (RL) AND
RESIN LINERS IN STAINLESS STEEL
OVERPACK (RLOPK)
SCALE: 1:100



SECTION B-B
RESIN LINER SHIELD 3 (RLSHLD3)
SCALE: 1:100



SECTION C-C
RESIN LINER SHIELD 2 (RLSHLD2)
SCALE: 1:100



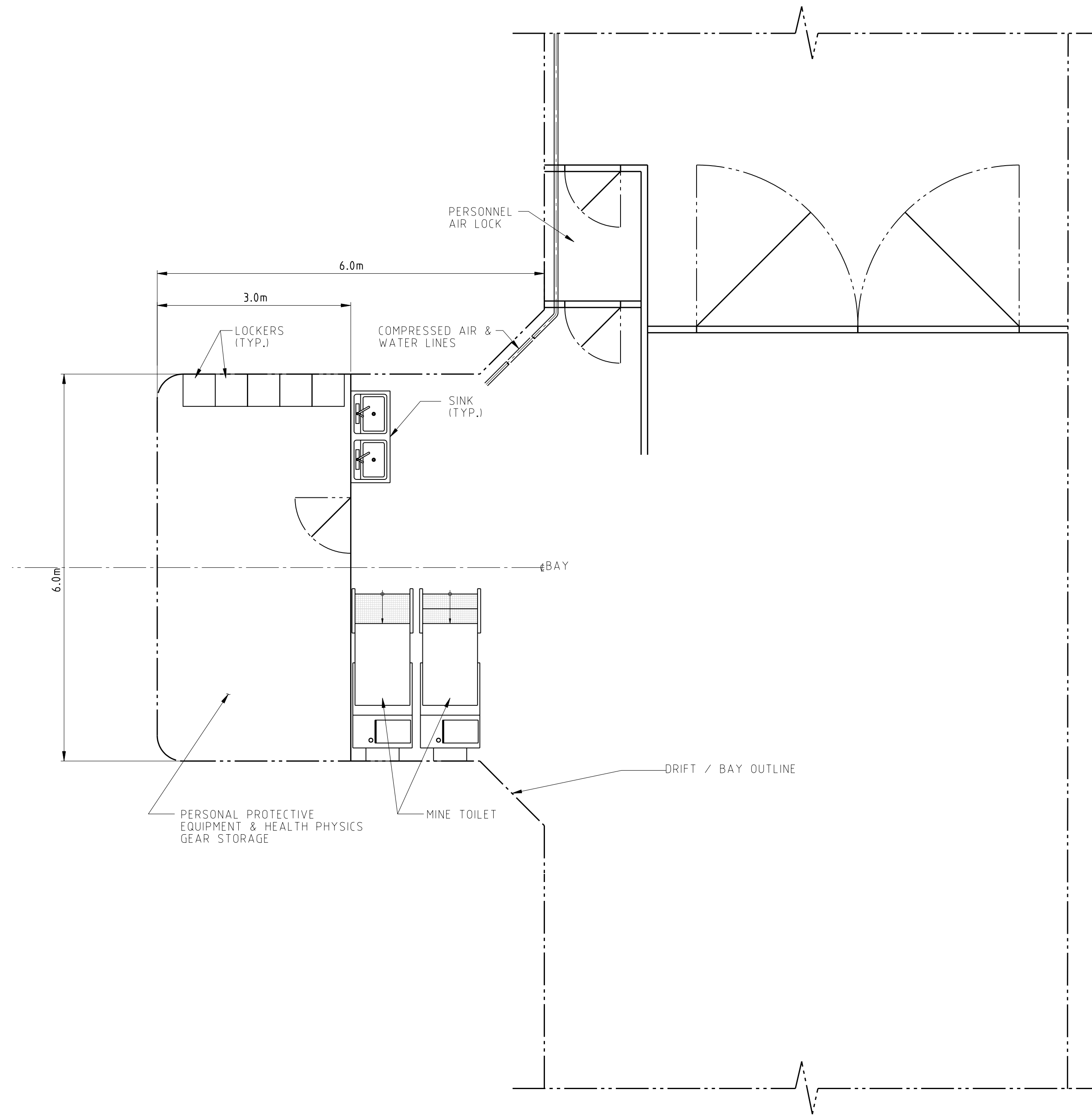
SECTION D-D
RESIN LINER SHIELD 1 (RLSHLD1)
SCALE: 1:100

PRELIMINARY

NOT FOR CONSTRUCTION

DRAWING NO.		DRAWING TITLE		NO.		DESCRIPTION		CHK'D	APP'D	DATE	<p>NOT FOR CONSTRUCTION</p> <p>This drawing has been reviewed for the purposes of DGR Preliminary Engineering only and must not be used for other purposes.</p> <p>Work Package Owner</p> <p>Area Lead</p> <p>Engineering Manager</p> <p>Project Manager</p> <p>Accepted by Owner</p>		<p>DESIGNED BY</p> <p>B. PERRY</p> <p>DATE 2009-10-05</p> <p>CHECKED BY</p> <p>DATE 2009-10-05</p> <p>DATE</p> <p>PROJ. DES. COORD.</p> <p>DATE</p> <p>PROJ. ENGR.</p>		<p>DRAWN BY</p> <p>K. BUSHEY</p> <p>DATE 2009-10-05</p> <p>DISCIPL. ENGR.</p> <p>DATE</p> <p>PROJ. ENGR.</p>		<p>NUCLEAR WASTE MANAGEMENT ORGANIZATION DEEP GEOLOGIC REPOSITORY PROJECT</p> <p>P3 EMPLACEMENT ROOM</p> <p>ALLOCATION OF WASTE PACKAGES TO EMPLACEMENT ROOMS</p>		SCALE	DWG. NO.	REV.
REFERENCE DRAWINGS												<p>00 APPROVED FOR USE</p> <p>GRD SAA 2009-10-27</p> <p>ISSUE AUTHORIZATION</p>		<p>PROJ. MGR.</p> <p>M.R. DAWBORN</p> <p>DATE</p>		SCALE	DWG. NO.	REV.			
														1:200	H333000-WP408-05-042-0003	00					

- NOTES:
- SEE DRAWING H333000-WP408-20-042-0003 FOR LOCATIONS OF UNDERGROUND FACILITIES.
 - EXCAVATION HEIGHT OF SANITARY FACILITIES: 4.0m



SANITARY AND HEALTH PHYSICS
GEAR STORAGE

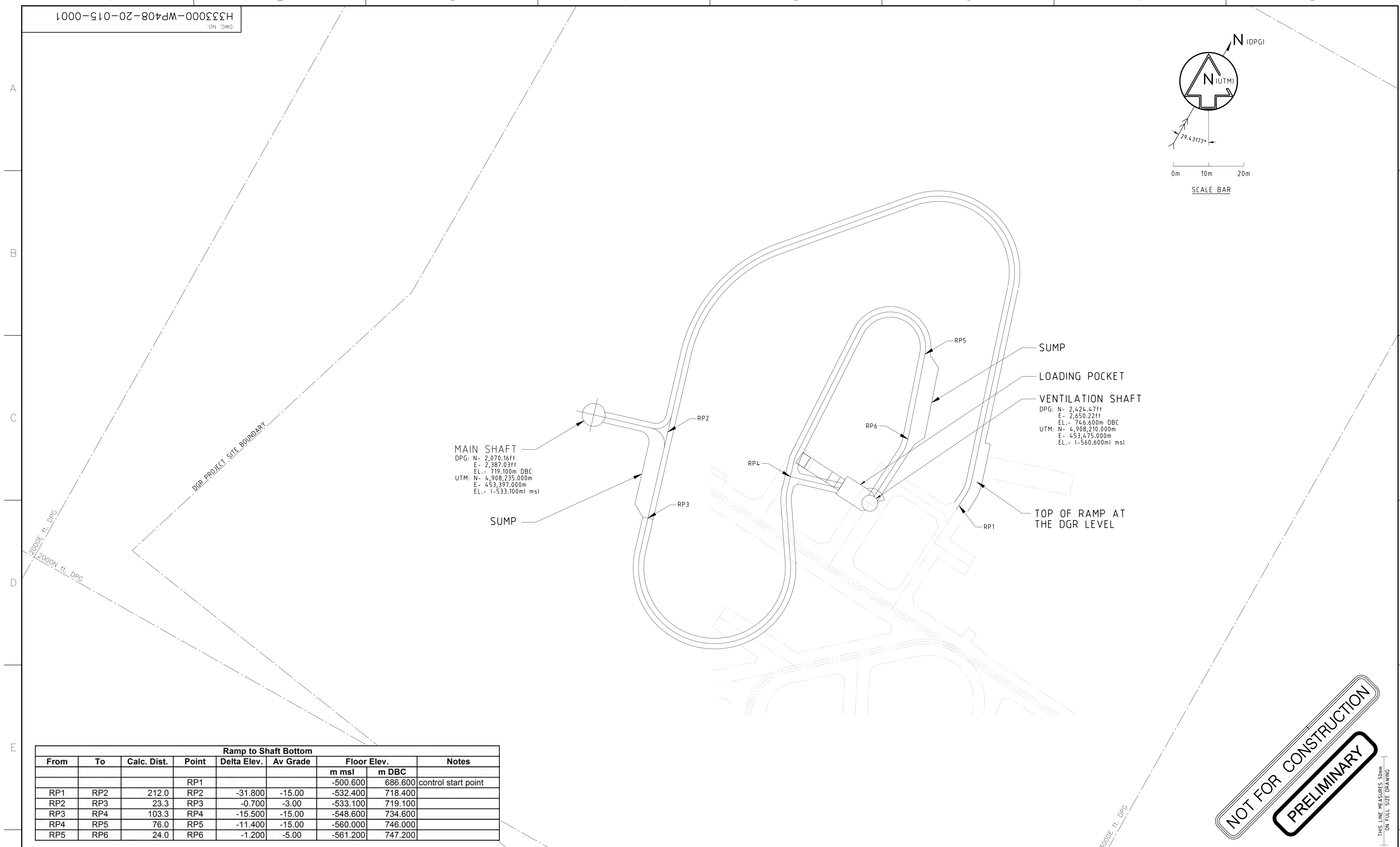
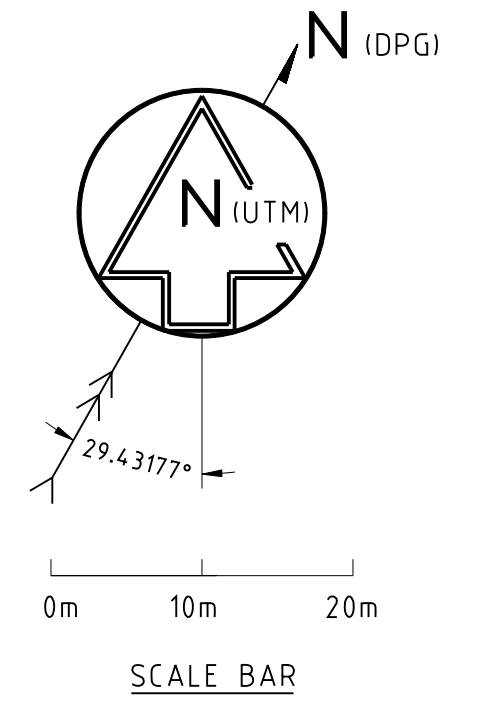
PRELIMINARY

NOT FOR CONSTRUCTION

DRAWING NO.		DRAWING TITLE		<p>NOT FOR CONSTRUCTION</p> <p>This drawing has been reviewed for the purposes of DGR Preliminary Engineering only and must not be used for other purposes.</p> <p>Work Package Owner Craig Irvine 2009.11.26 16:59:39 -05'00'</p> <p>Area Lead G.R. Davidge Digitally signed by G.R. Davidge Date: 2009.11.27 11:21:10 -05'00'</p> <p>Engineering Manager Shawn Astors 2009.11.27 11:21:10 -05'00'</p> <p>Project Manager Digitally signed by M.R. Date: 2009.11.27 11:57:44 -05'00'</p> <p>Accepted by Owner Digitally signed by Dawn Wilson Date: 2009.12.02 10:47:14 -05'00'</p>		<p>DESIGNED BY B. PERRY DATE 2009-10-06</p> <p>DRAWN BY K. BUSHEY DATE 2009-10-06</p> <p>CHECKED BY</p> <p>DATE PROJ. DES. COORD.</p> <p>DATE PROJ. ENGR.</p>		<p>NUCLEAR WASTE MANAGEMENT ORGANIZATION DEEP GEOLOGIC REPOSITORY PROJECT</p> <p>PRELIMINARY DESIGN</p> <p>UNDERGROUND SERVICES SANITARY AND HEALTH PHYSICS GEAR STORAGE GENERAL ARRANGEMENT</p>	
REFERENCE DRAWINGS		REVISIONS		<p>00 APPROVED FOR USE</p> <p>CI SAA2009-11-28</p> <p>ISSUE AUTHORIZATION</p>		<p>SCALE 1:50 OR AS NOTED</p> <p>DWG. NO. H333000-WP408-10-042-0001</p> <p>REV. 00</p>			

P:\NUG\EAR\333000\CAD\WDCM\Approved for Use\H333000-WP408-10-042-0001.dgn
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 Per:55554

H333000-WP408-20-015-0001
ON DGM



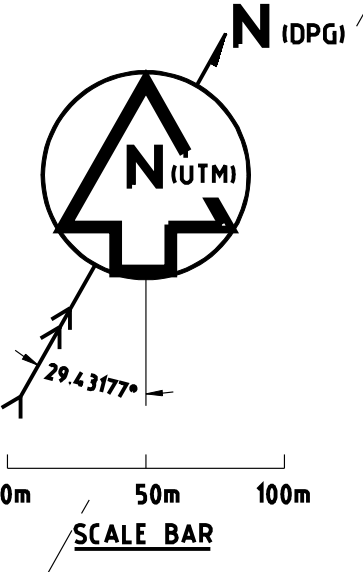
Ramp to Shaft Bottom								
From	To	Calc. Dist.	Point	Delta Elev.	Av Grade	Floor Elev.		Notes
						m msl	m DBC	
			RP1			-500.600	686.600	control start point
RP1	RP2	212.0	RP2	-31.800	-15.00	-532.400	718.400	
RP2	RP3	23.3	RP3	-0.700	-3.00	-533.100	719.100	
RP3	RP4	103.3	RP4	-15.500	-15.00	-548.600	734.600	
RP4	RP5	76.0	RP5	-11.400	-15.00	-560.000	746.000	
RP5	RP6	24.0	RP6	-1.200	-5.00	-561.200	747.200	

NOT FOR CONSTRUCTION
PRELIMINARY

DRAWING NO.		DRAWING TITLE		NO.		DESCRIPTION		CHK'D	APP'D	DATE	NOT FOR CONSTRUCTION This drawing has been reviewed for the purposes of DGR Preliminary Engineering only and must not be used for other purposes. <small>Work Package Owner</small> Craig Imrie 2009.12.16 16:26:04 -05'00' <small>Area Lead</small> G.R. Davidge Digitally signed by G.R. Davidge Date: 2009.12.16 10:40:37 -05'00' <small>Engineering Manager</small> Sherwin Aarons 2009.12.16 16:12:43 -05'00' <small>Project Manager</small> Digitally signed by M.E. Davidson Date: 2009.12.16 16:30:05 -05'00' <small>Accepted by Owner</small> Digitally signed by Debra Wilson Date: 2010.04.15 10:48:00 -05'00'		HATCH DESIGNED BY C. IMRIE DATE 09-10-22 CHECKED BY DATE PROJ. DES. COORD. DATE DRAWN BY A. MUHAMMAD DATE 09-10-22 DISCIPL. ENGR. DATE PROJ. ENGR. DATE		NUCLEAR WASTE MANAGEMENT ORGANIZATION DEEP GEOLOGIC REPOSITORY PROJECT UNDERGROUND FACILITIES SHAFT BOTTOM RAMP CONCEPT SKETCH		SCALE 1:500 OR AS NOTED	DWG. NO. H333000-WP408-20-015-0001	REV. 00
REFERENCE DRAWINGS		REVISIONS		ISSUE AUTHORIZATION		00 APPROVED FOR USE CI SAA 09-12-15 DATE		PROJ. MGR. M. DAWBORN DATE 09-12-15		DATE 09-12-15									

P:\N\LE\H333000\CAD\DWG\WP4-8\333000-WP408-20-015-0001.dgn
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 buzh55169

H333000-WP408-20-042-0001



- NOTES**
- 1- NOMINAL ELEVATION OF DGR IS -500m msl OR 686m DBC.
 - 2- EMPLACEMENT ROOM LAYOUT IS BASED ON "NEAT" EXCAVATION SIZE FOR PILLAR SIZE DETERMINATION. THE LAYOUT WILL REQUIRE FURTHER ENGINEERING BASED ON GEOTECHNICAL MODELING OF THE EFFECTIVE EXCAVATION SIZE WITH DRILL AND BLAST METHODOLOGY.
 - 3- BOREHOLE STANDOFF DISTANCE IS 100m RADIUS
 - 4- TYPICAL PILLAR WIDTH IS 17m (2 x ROOM WIDTH)
 - 5- MAIN SHAFT STATION ORIENTATION IS 123° UTM AZ.

Location Name	Location Description	DGR Project Locations in Douglas Point Grid (DPG) (Calculated see note 2 below)		DGR Project Locations in NAD83 UTM Zone 17N		Elevation (msl)	Depth Below Collar (DBC)
		Northing	Easting	Northing	Easting		
	NOTE: all elevation points are for the excavation floor level	ft	ft	m	m	m	(see note 1 below)
Main Shaft	Center Line @ DGR Level	2,370.16	2,387.03	4,908,235.000	453,397.000	-500.600	686.600
Ventilation Shaft	Center Line @ DGR Level	2,424.47	2,650.22	4,908,210.000	453,475.000	-500.600	686.600
WP-1	Junction of Main Access & S Services Tunnel	2,343.19	2,789.01	4,908,167.638	453,499.669	-501.189	687.189
WP-2	Junction of Main Access & S Access Tunnel	2,429.80	2,807.13	4,908,187.913	453,517.451	-501.067	687.067
WP-3	Junction of Panel 1 Access & Room 1	2,329.18	3,044.22	4,908,125.691	453,565.321	-500.645	686.645
WP-4	Junction of Panel 1 Access & Room 14	2,242.92	4,427.52	4,907,895.609	453,919.617	-497.732	683.732
WP-5	End of Panel 1 Access	2,240.36	4,468.54	4,907,888.787	453,930.121	-497.848	683.848
WP-6	Junction of South Access & Panel 2 Access	1,556.50	2,949.49	4,907,934.763	453,424.447	-502.803	688.803
WP-7	Junction of Panel 2 Access & Room 1	1,556.72	3,101.29	4,907,912.085	453,464.776	-500.533	686.533
WP-8	Junction of Panel 2 Access & Room 17	1,455.02	4,732.23	4,907,640.813	453,882.497	-495.737	681.737
WP-9	End of Panel 2 Access	1,443.11	4,770.33	4,907,631.945	453,890.828	-495.623	681.623
WP-10	End of Panel 1 - Room 1	2,988.37	3,569.85	4,908,221.957	453,803.587	-500.015	686.015
WP-11	End of Panel 1 - Room 14	2,881.56	4,936.76	4,907,988.873	454,150.453	-497.122	683.122
WP-12	End of Panel 2 - Room 1	2,206.56	3,624.01	4,908,006.304	453,700.868	-499.909	685.909
WP-13	End of Panel 2 - Room 17	2,069.66	5,226.88	4,907,729.892	454,105.866	-495.147	681.147
WP-14	Top of Ramp to Shaft Bottom	2,467.16	2,722.32	4,908,210.534	453,500.535	-500.805	686.805
DGR-1	Collar Location	2,352.27	5,571.87	4,907,753.243	454,239.777	185.709	0.291
DGR-2	Collar Location	2,208.39	5,536.81	4,907,720.300	454,208.921	185.836	0.164
DGR-3	Collar Location	444.92	2,281.00	4,907,739.800	453,080.500	187.350	-1.350
DGR-4	Collar Location	3,794.15	1,513.17	4,908,743.900	453,378.300	181.600	4.400
DGR-5	Collar Location	2,291.63	5,538.53	4,907,742.140	454,221.845	185.650	0.350
DGR-6	Collar Location	3,500.93	3,843.43	4,908,317.046	453,952.980	183.500	2.500

- NOTES:**
- 1) Depth below collar is based on the shaft area terrace elevation, datum at 186m msl, (this is also approximate ground surface elevation)
 - 2) The calculated Douglas Point Grid coordinates are based on the following:
 - the DPG origin is located at (452,408.341E, 4,907,963.328N) NAD83 UTM Zone 17N in the UTM system
 - the angle of rotation is -29.43177° from DPG north to UTM North

NO.	DESCRIPTION	CHK'D	APP'D	DATE
01	UPDATED EMPLACEMENT PERIOD YEARS	CI	SAA	10-04-21

REV.	ISSUE FOR	AUTH.	BY	DATE
01	APPROVED FOR USE	CI	SAA	10-04-21
02	APPROVED FOR USE	CI	SAA	09-12-11

HATCH

DESIGNED BY: C. IMRIE
 DATE: 09-09-15
 CHECKED BY: A. MUHAMMAD
 DATE: 09-09-15
 DISCIPLINE: ENGR.

DATE: 09-12-11
 PROJ. DES. COORD. DATE: 09-12-11
 PROJ. MGR. DATE: 09-12-11
 M. DAWBORN

SCALE: 1:2500
 DWG. NO.: H333000-WP408-20-042-0001
 REV: 01

**NOT FOR CONSTRUCTION
PRELIMINARY**

THIS LINE MEASURES 50mm ON FULL SIZE DRAWING
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0000-24-20-042-0003
ON DMD

13.8kV ELECTRICAL SUB STATION
H333000-WP408-70-042-0001

LOW VOLTAGE ELECTRIC,
COMMUNICATION &
INSTRUMENTATION ROOM
H333000-WP408-70-042-0002

REFUGE STATION 1
H333000-WP402-05-042-0001

LUNCH ROOM & OFFICE
H333000-WP408-50-042-0002

GEOSCIENCE
FACILITY

GEOSCIENCE LAB STORAGE

SANITARY FACILITY
& NON-ROUTINE PPE & HP
EQUIPMENT STORAGE ROOM
H333000-WP408-10-042-0001

OPERATIONS STORAGE AREA
(DAY STORAGE OF EXPLOSIVES
DURING DEVELOPMENT PHASE)

PARTS WAREHOUSE
STORAGE AREA II

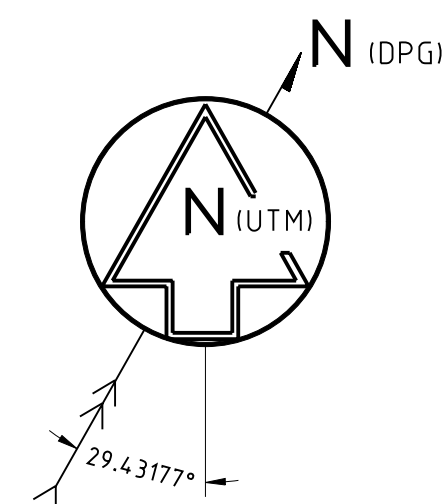
EQUIPMENT
WASH BAY

MOBILE EQUIPMENT
MAINTENANCE FACILITY
H333000-WP408-50-042-0001

FUEL STORAGE &
RE-FUELING BAY
H333000-WP408-20-042-0017

MAIN SHAFT
DPG: N- 2,070.16ft
E- 2,387.03ft
EL.- 686.600m DBC
UTM: N- 4,908,235.000m
E- 453,397.000m
EL.- (-500.600m) msl

VENTILATION SHAFT
DPG: N- 2,424.47ft
E- 2,650.22ft
EL.- 686.600m DBC
UTM: N- 4,908,210.000m
E- 453,475.000m
EL.- (-500.600m) msl



SCALE BAR

WEST SERVICES TUNNEL

SOUTH SERVICES TUNNEL

MAIN SHAFT ACCESS TUNNEL
UTM AZ 123° 00' 00"

SOUTH ACCESS TUNNEL UTM AZ 101° 00' 00"

PANEL 1 ACCESS TUNNEL

NOT FOR CONSTRUCTION
PRELIMINARY

THIS LINE MEASURES 50mm
ON FULL SIZE DRAWING

DRAWING NO.	DRAWING TITLE
1	REFERENCE DRAWINGS

NO.	DESCRIPTION	CHK'D	APP'D	DATE
REVISIONS				

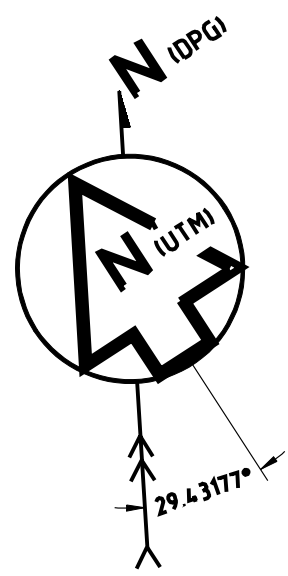
NOT FOR CONSTRUCTION This drawing has been reviewed for the purposes of DGR Preliminary Engineering only and must not be used for other purposes.				
Work Package Owner <i>[Signature]</i> Craig Innis 2009.12.15 16:27:12 -05'00'				
Area Lead <i>[Signature]</i> G.R. Davidge Digitally signed by G.R. Davidge Date: 2009.12.15 16:27:12 -05'00'				
Engineering Manager <i>[Signature]</i> Shawn Adams 2009.12.16 16:13:27 -05'00'				
Project Manager <i>[Signature]</i> Digitally signed by M.R. Chatham Date: 2009.12.16 16:32:11 -05'00'				
Accepted by Owner <i>[Signature]</i> Digitally signed by Steve Wilson Date: 2010.04.15 09:46:05'00'				
00 APPROVED FOR USE		CI	SAA	09-12-15
REV.	ISSUE FOR	AUTH. BY	DATE	
ISSUE AUTHORIZATION				

HATCH	
DESIGNED BY C. IMRIE DATE 09-09-15	DRAWN BY A. MUHAMMAD DATE 09-09-21
CHECKED BY	DISCIPLINE ENGR.
DATE	DATE
PROJ. DES. COORD.	PROJ. ENGR.
DATE	DATE
PROJ. MGR. M. DAWBORN DATE 09-12-15	

NUCLEAR WASTE MANAGEMENT ORGANIZATION DEEP GEOLOGIC REPOSITORY PROJECT	
UNDERGROUND FACILITIES	
SHAFT & SERVICES AREA (PLAN VIEW - UNDERGROUND) - GENERAL ARRANGEMENT	
SCALE 1:500 OR AS NOTED	DWG. NO. H333000-WP408-20-042-0003
REV.	00

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12/15/2009 11:17:33 PM
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H333000-WP408-20-042-0005



0m 50m 100m

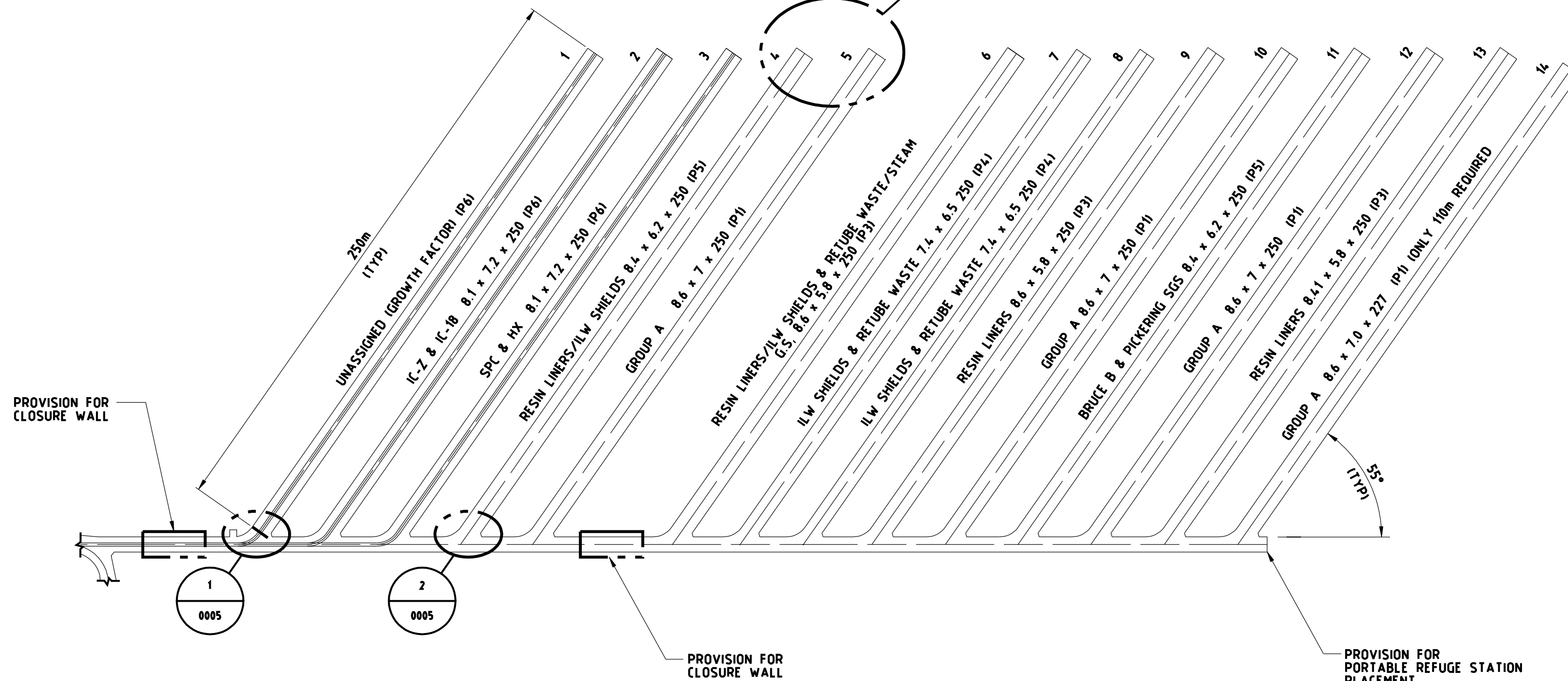
SCALE BAR

NOTES:

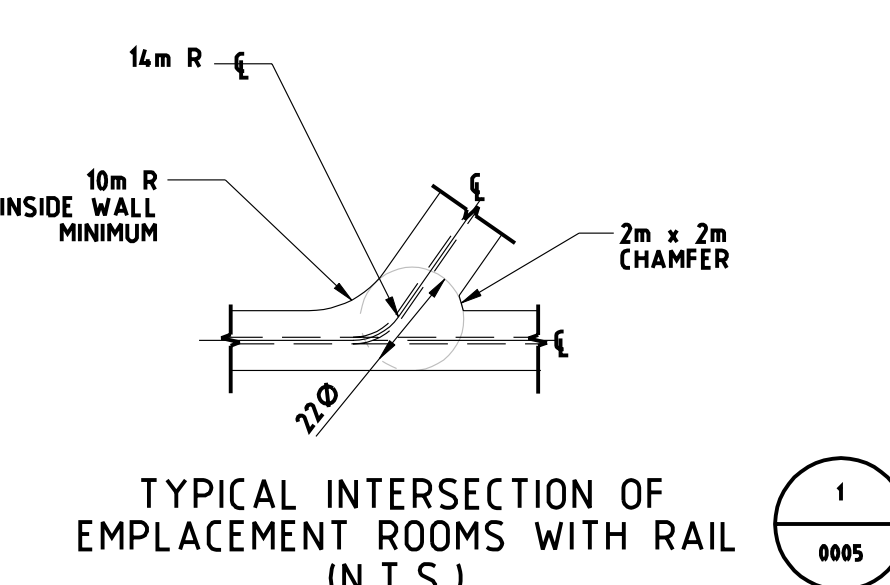
- 1- EMPLACEMENT ROOM LAYOUTS ARE TYPICALLY MEASURED ON THE SHORT WALL DISTANCE.
- 2- MAIN PILLAR WIDTH BETWEEN ADJACENT ROOMS IS DETERMINED ON BASIS OF THE SUM OF THE ADJACENT ROOM SPANS.
- 3- TYPICAL PILLAR WIDTH IS 17m 12 x ROOM WIDTH.
- 4- AN 8m ALLOWANCE IS PROVIDED TO CONSTRUCT A SHIELD WALL AT THE ENTRANCE TO ALL EMPLACEMENT ROOMS.
- 5- EMPLACEMENT ROOM LAYOUT IS BASED ON "NEAT" EXCAVATION SIZE FOR PILLAR SIZE DETERMINATION. THE LAYOUT WILL REQUIRE FURTHER ENGINEERING BASED ON GEOTECHNICAL MODELING OF THE EFFECTIVE EXCAVATION SIZE WITH DRILL AND BLAST METHODOLOGY.
- 6- PORTABLE REFUGE STATION WILL BE MOVED AS EMPLACEMENT ROOMS ARE FILLED TO REDUCE THE DISTANCE TO ACCESS IT.

EMPLACEMENT PERIOD 1
ALL ROOMS 1-3 ROOMS 4&5
Y3 TO Y35 Y21 TO Y35

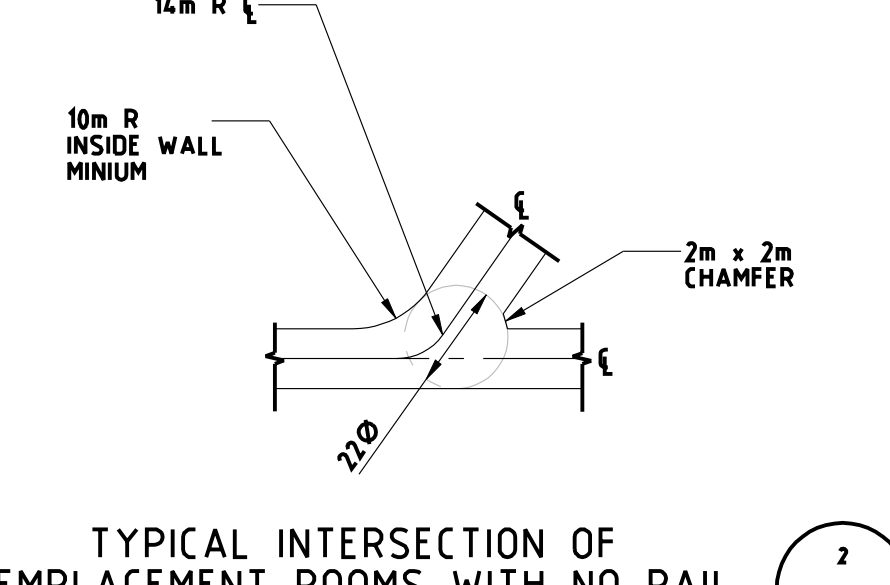
EMPLACEMENT PERIOD 2:
Y6 TO Y20



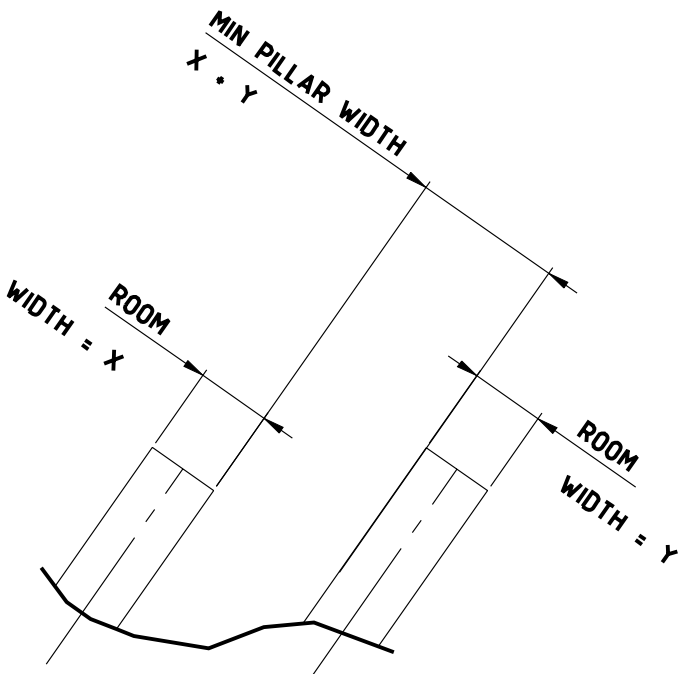
PANEL 1



1
0005



2
0005



3
0005

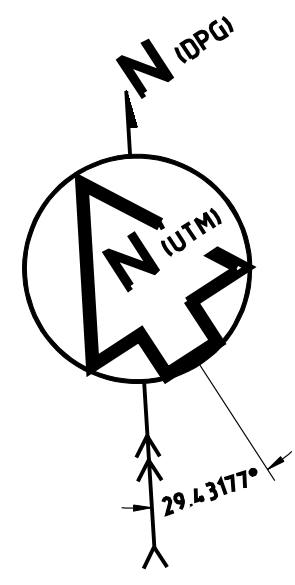
NOT FOR CONSTRUCTION
PRELIMINARY

THIS LINE MEASURES 50mm ON FULL SIZE DRAWING

REFERENCE DRAWINGS		REVISIONS		ISSUE AUTHORIZATION				NUCLEAR WASTE MANAGEMENT ORGANIZATION DEEP GEOLOGIC REPOSITORY PROJECT	
						DESIGNED BY: C. IMMRIE DATE: 09-10-06 CHECKED BY: DATE: PROJECT MGR.: M. DAWBORN DATE: 09-12-15		UNDERGROUND FACILITIES PANEL 1 WASTE EMPLACEMENT ROOM - PLAN VIEW GENERAL ARRANGEMENT	
DRAWING NO. H333000-WP408-20-042-0005		DRAWING TITLE		01 APPROVED FOR USE 00 APPROVED FOR USE		CI SAA 10-04-21 CI SAA 09-12-11		DWG. NO. H333000-WP408-20-042-0005 SCALE 1:1500 OR AS NOTED	
								REV. 01	

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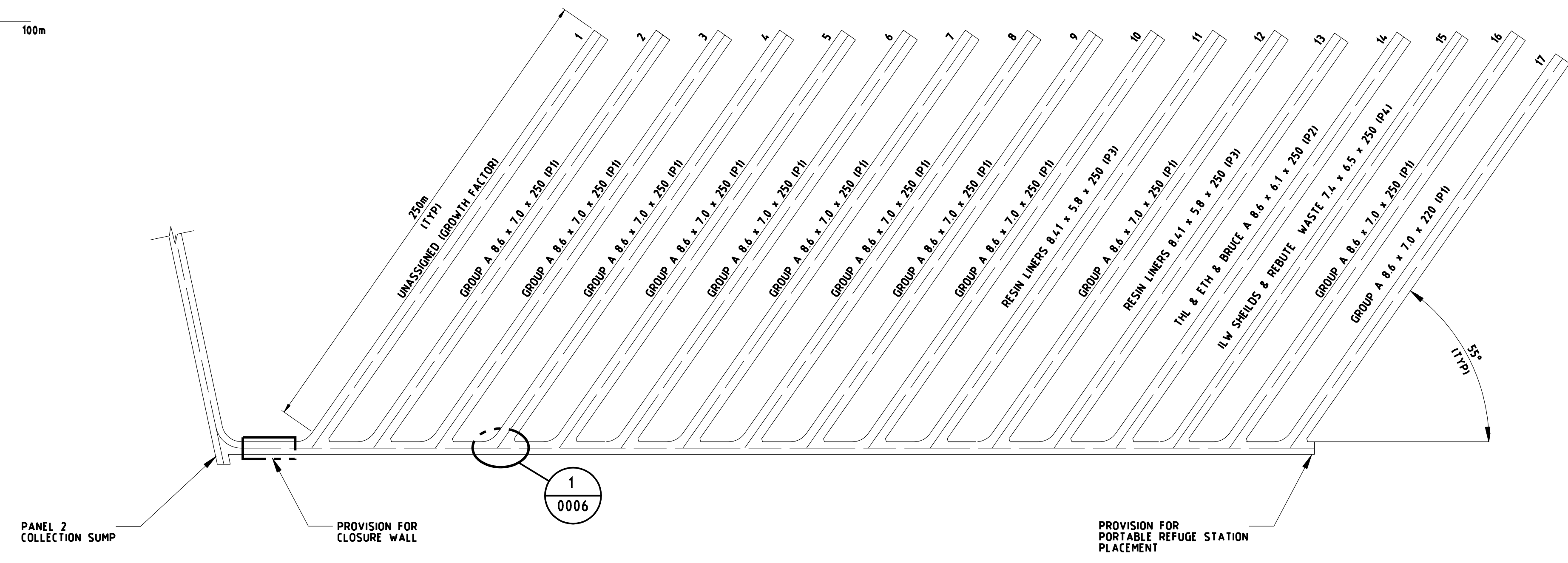
H333000-WP408-20-042-0006
ON DWG



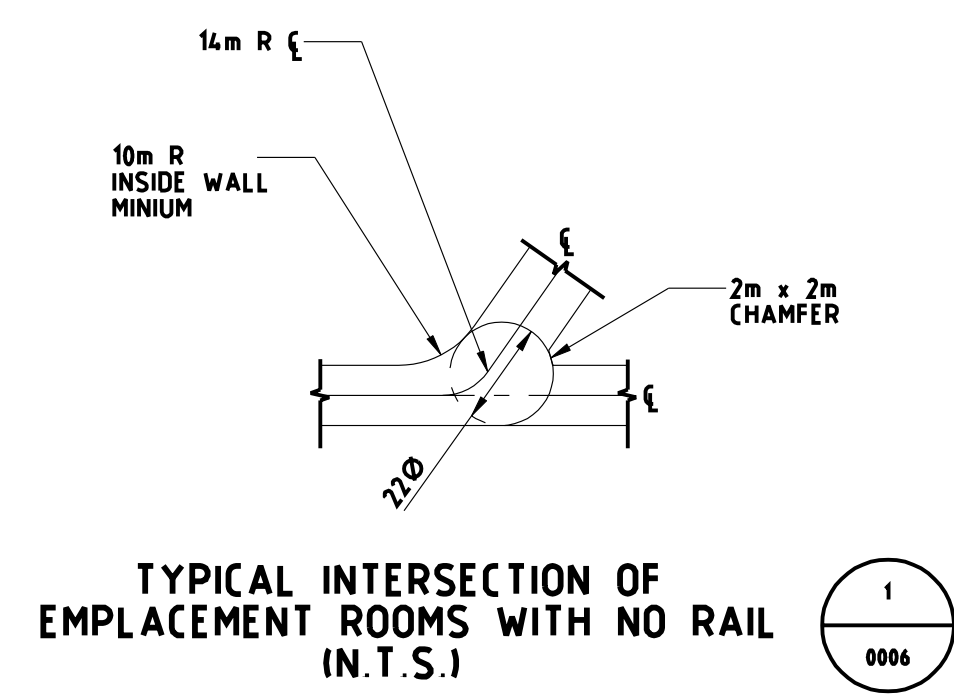
SCALE BAR

01
EMPLACEMENT PERIOD 1: Y1 TO Y5

- NOTES:**
- 1- EMPLACEMENT ROOM LAYOUTS ARE TYPICALLY MEASURED ON THE SHORT WALL DISTANCE
 - 2- MIN PILLAR WIDTH BETWEEN ADJACENT ROOMS IS DETERMINED ON BASIS OF THE SUM OF THE ADJACENT ROOM SPANS.
 - 3- TYPICAL PILLAR WIDTH IS 17m (2 x ROOM WIDTH).
 - 4- AN 8m ALLOWANCE IS PROVIDED TO CONSTRUCT A SHIELD WALL AT THE ENTRANCE TO ALL EMPLACEMENT ROOMS.
 - 5- EMPLACEMENT ROOM LAYOUT IS BASED ON "NEAT" EXCAVATION SIZE FOR PILLAR SIZE DETERMINATION. THE LAYOUT WILL REQUIRE FURTHER ENGINEERING BASED ON GEOTECHNICAL MODELING OF THE EFFECTIVE EXCAVATION SIZE WITH DRILL AND BLAST METHODOLOGY.
 - 6- PORTABLE REFUGE STATION WILL BE MOVED AS EMPLACEMENT ROOMS ARE FILLED TO REDUCE THE DISTANCE TO ACCESS IT.



PANEL 2

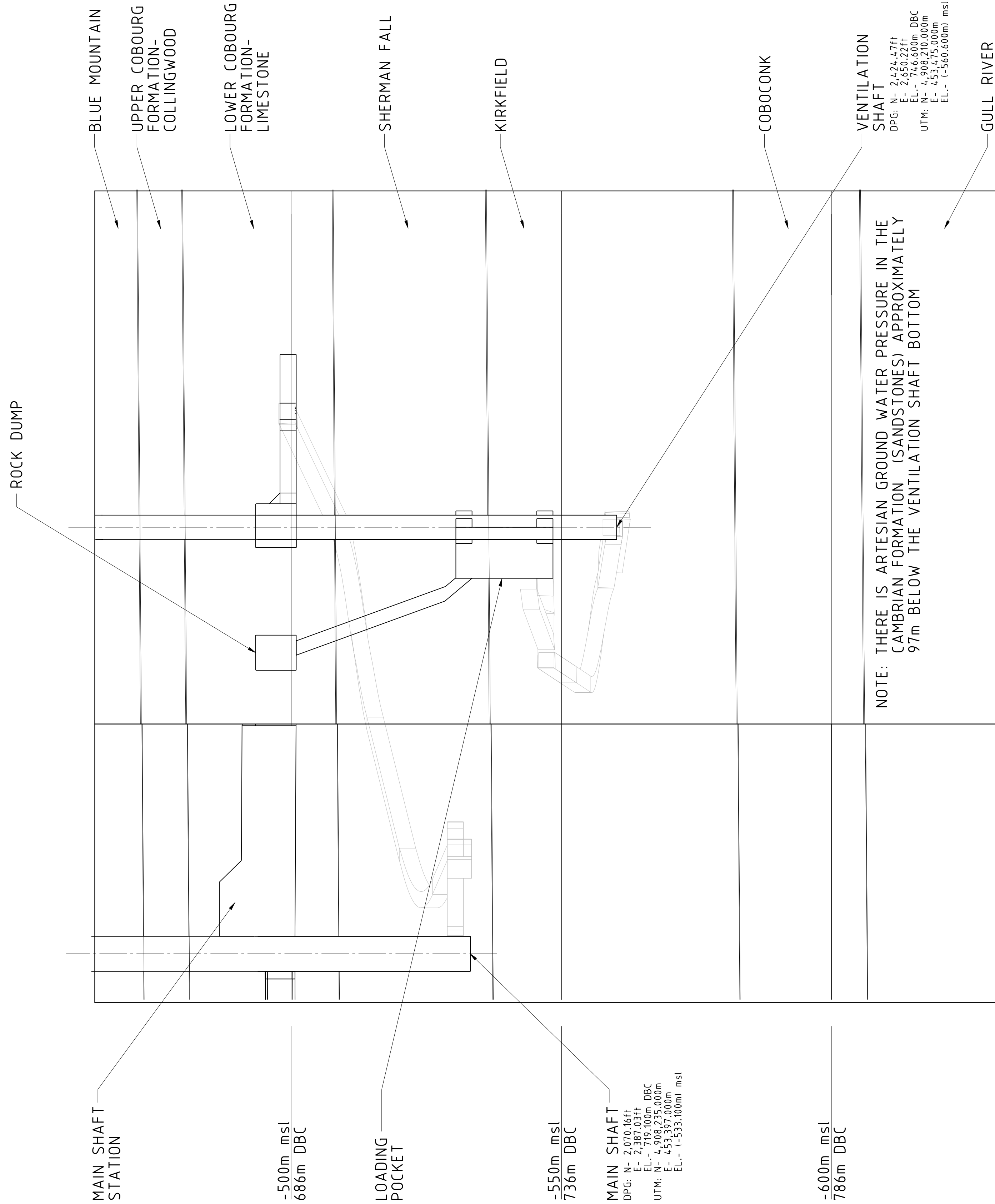


NOT FOR CONSTRUCTION
PRELIMINARY

THIS LINE MEASURES 50mm ON FULL SIZE DRAWING

<p>NOT FOR CONSTRUCTION This drawing has been reviewed for the purposes of DGR Preliminary Engineering only and must not be used for other purposes. Work Package Owner: [Signature]</p>		<p>HATCH</p>		<p>DESIGNED BY: C. IMRJE DATE: 09-10-06 CHECKED BY: [Signature] DATE: 09-12-11</p>		<p>DRAWN BY: A. MUHAMMAD DATE: 09-10-06 DISCIP. ENGR. DATE: 09-12-11 PROJ. ENGR.</p>		<p>NUCLEAR WASTE MANAGEMENT ORGANIZATION DEEP GEOLOGIC REPOSITORY PROJECT</p>	
<p>01 UPDATED EMPLACEMENT PERIOD YEARS NO. DESCRIPTION CHK'D APP'D DATE</p>		<p>01 APPROVED FOR USE CI SAA 10-04-21</p>		<p>00 APPROVED FOR USE CI SAA 09-12-11</p>		<p>PROJ. MGR. M. DAWBORN DATE 09-12-15</p>		<p>UNDERGROUND FACILITIES</p>	
<p>REFERENCE DRAWINGS</p>		<p>REVISIONS</p>		<p>ISSUE AUTHORIZATION</p>		<p>SCALE: 1:1500 OR AS NOTED</p>		<p>DWG. NO. H333000-WP408-20-042-0006</p>	
<p>DRAWING NO. [Blank]</p>		<p>DRAWING TITLE [Blank]</p>		<p>DATE 09-12-15</p>		<p>DATE 09-12-15</p>		<p>REV. 01</p>	

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bush65169



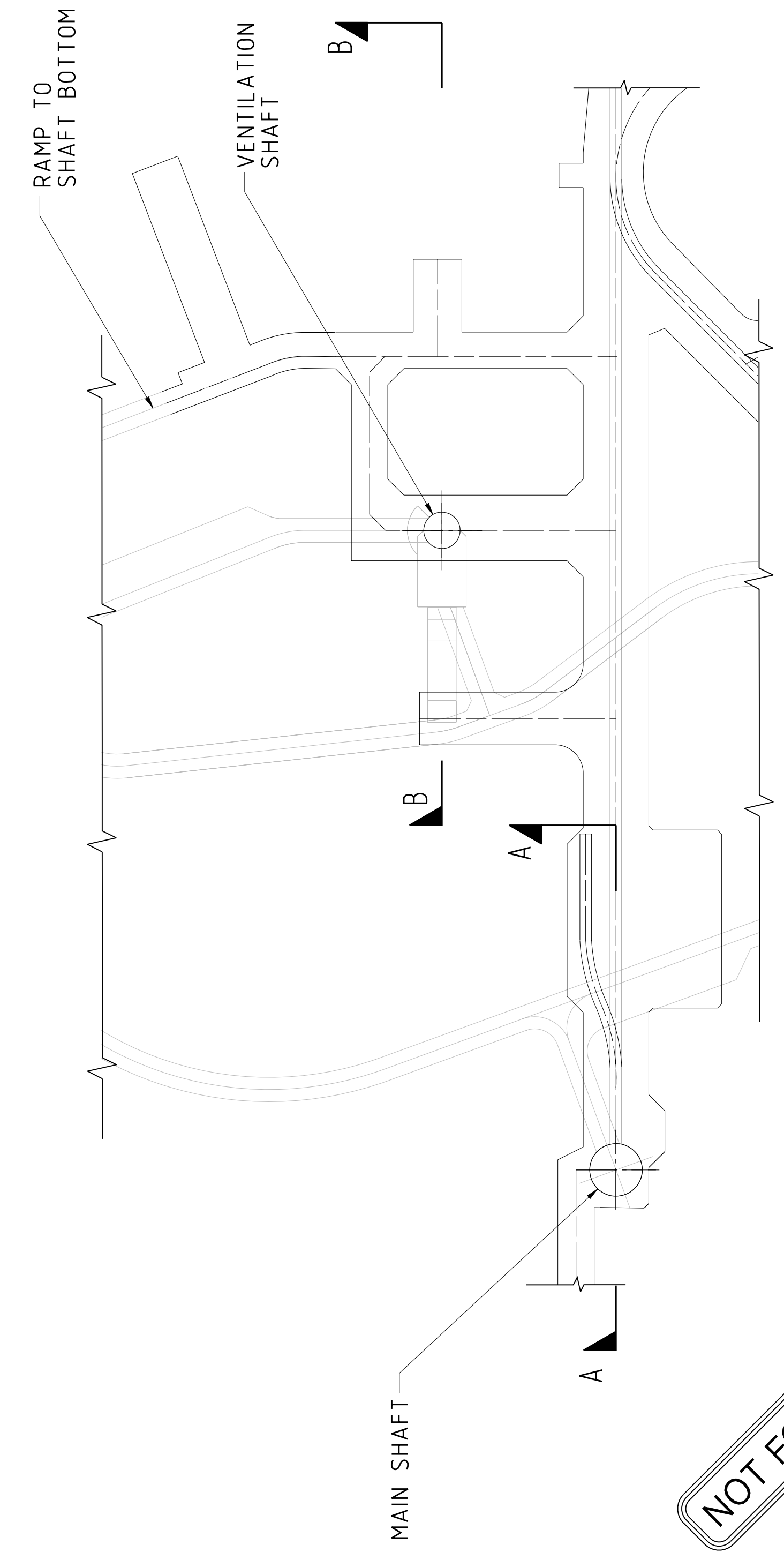
NOTE: THERE IS ARTESIAN GROUND WATER PRESSURE IN THE CAMBRIAN FORMATION (SANDSTONES) APPROXIMATELY 97m BELOW THE VENTILATION SHAFT BOTTOM

VENTILATION SHAFT
 DPG: N- 2,424,47ft
 E- 2,920,220m DBC
 UTM: N- 4,908,210,000m
 E- 4,534,75,000m
 EL.- (-560,600m) msl

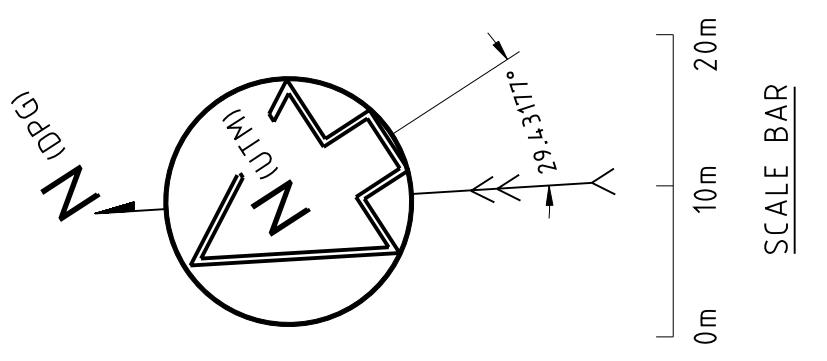
MAIN SHAFT
 DPG: N- 2,070,16ft
 E- 2,387,03ft
 UTM: N- 4,908,098,000m
 E- 4,533,927,000m
 EL.- (-533,100m) msl

SECTION
SCALE: 1:500

SECTION
SCALE: 1:500



PLAN VIEW



NOT FOR CONSTRUCTION
PRELIMINARY

THIS LINE MEASURES 50mm ON FULL SIZE DRAWING

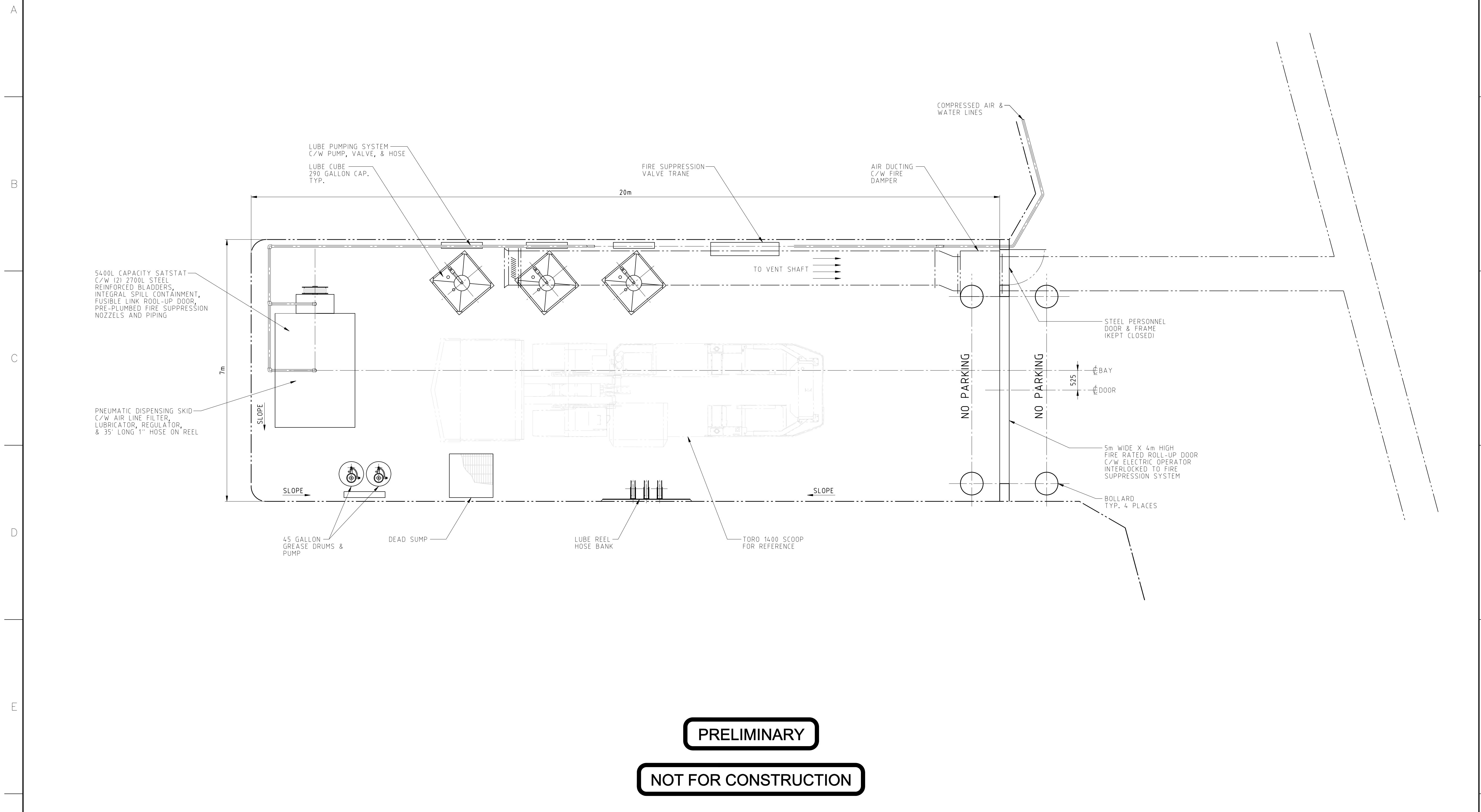
NO.	DESCRIPTION	CHK'D	APP'D	DATE
REVISIONS				
REFERENCE DRAWINGS				

NO.	DESCRIPTION	CHK'D	APP'D	DATE
REVISIONS				

NOT FOR CONSTRUCTION This drawing has been reviewed for the purposes of DGR Preliminary Engineering only and must not be used for other purposes.				
Work Package Owner	Craig Imrie	2009.12.16 13:13:20	-05'00'	
Area Lead	Digitally signed by G.R. Davidge	2009.12.16 13:28:41	-05'00'	
Engineering Manager	Sherwin Aarons	2009.12.16 16:11:25	-05'00'	
Project Manager	Digitally signed by M. Dawborn	2009.12.16 16:29:38	-05'00'	
Accepted by Owner	Digitally signed by Owen Wilson	2010.01.04 16:16:16	-05'00'	
REV.	ISSUE FOR	CUI	SAA	09-12-15
ISSUE AUTHORIZATION				

HATCH	
DESIGNED BY C. IMRIE DATE 09-10-22	DRAWN BY A. MUHAMMAD DATE 09-10-22
CHECKED BY	DISCIPL. ENGR.
DATE	DATE
PROJ. DES. COORD.	PROJ. ENGR.
DATE	DATE
PROJ. MGR. M. DAWBORN DATE 09-12-15	

NUCLEAR WASTE MANAGEMENT ORGANIZATION DEEP GEOLOGIC REPOSITORY PROJECT	
UNDERGROUND FACILITIES	
DEVELOPMENT ROCK HANDLING FACILITY GENERAL ARRANGEMENT	
SCALE 1:500 OR AS NOTED	DWG. NO. H333000-WP408-20-042-0010
REV. 00	



PRELIMINARY
NOT FOR CONSTRUCTION

		NOT FOR CONSTRUCTION This drawing has been reviewed for the purposes of DGR Preliminary Engineering only and must not be used for other purposes. Work Package Owner: Craig Innie 2009.11.26 17:00:03 -05007			HATCH		NUCLEAR WASTE MANAGEMENT ORGANIZATION DEEP GEOLOGIC REPOSITORY PROJECT		
		Area Lead: G.R. Davig Digitally signed by G.R. Davig Date: 2009.11.27 10:25:37 -0500			DESIGNED BY: B. PERRY DATE 09.10.06 CHECKED BY: T. KLEIN DATE 09.10.06 DISCIPLINE: ENGR.		PRELIMINARY DESIGN		
		Engineering Manager: Sherwin Aarons 2009.11.27 11:21:27 -0500			DATE: PROJ. DES. COORD. DATE: PROJ. ENGR.		UNDERGROUND SERVICES FUEL STORAGE & REFUELING BAY GENERAL ARRANGEMENT		
		Project Manager: Digitally signed by M.R. Dawborn Date: 2009.11.27 11:56:07 -0500			DATE: PROJ. MGR. M.R. DAWBORN DATE:		SCALE: 1:50 OR AS NOTED		
DRAWING NO.		DRAWING TITLE			REV.		DWG. NO.		
REFERENCE DRAWINGS		NO. DESCRIPTION CHK'D APP'D DATE			00 APPROVED FOR USE CI SAA 2009-11-25		H333000-WP408-20-042-0017		
		REVISIONS			ISSUE AUTHORIZATION		00		

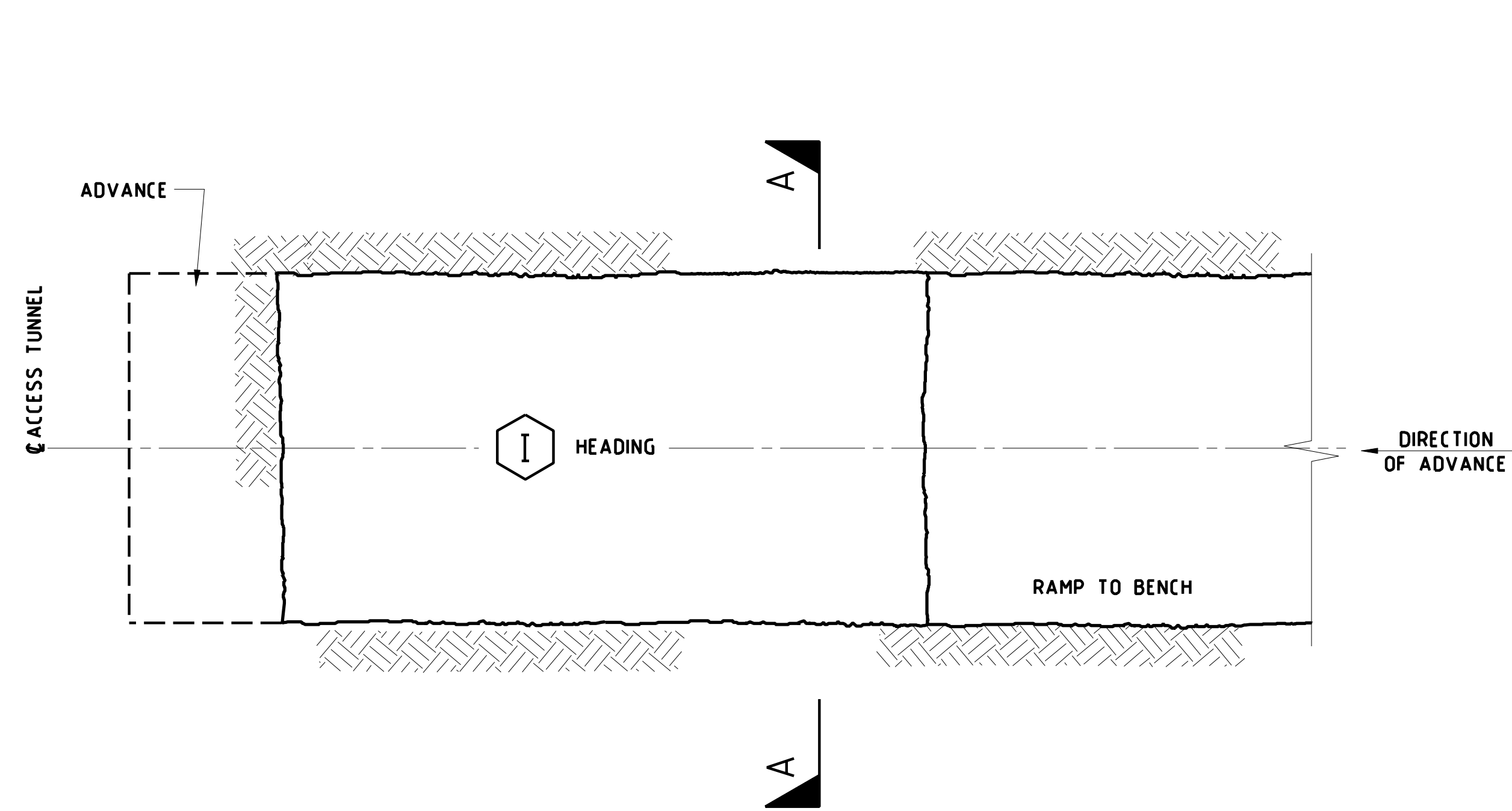
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NOTES:

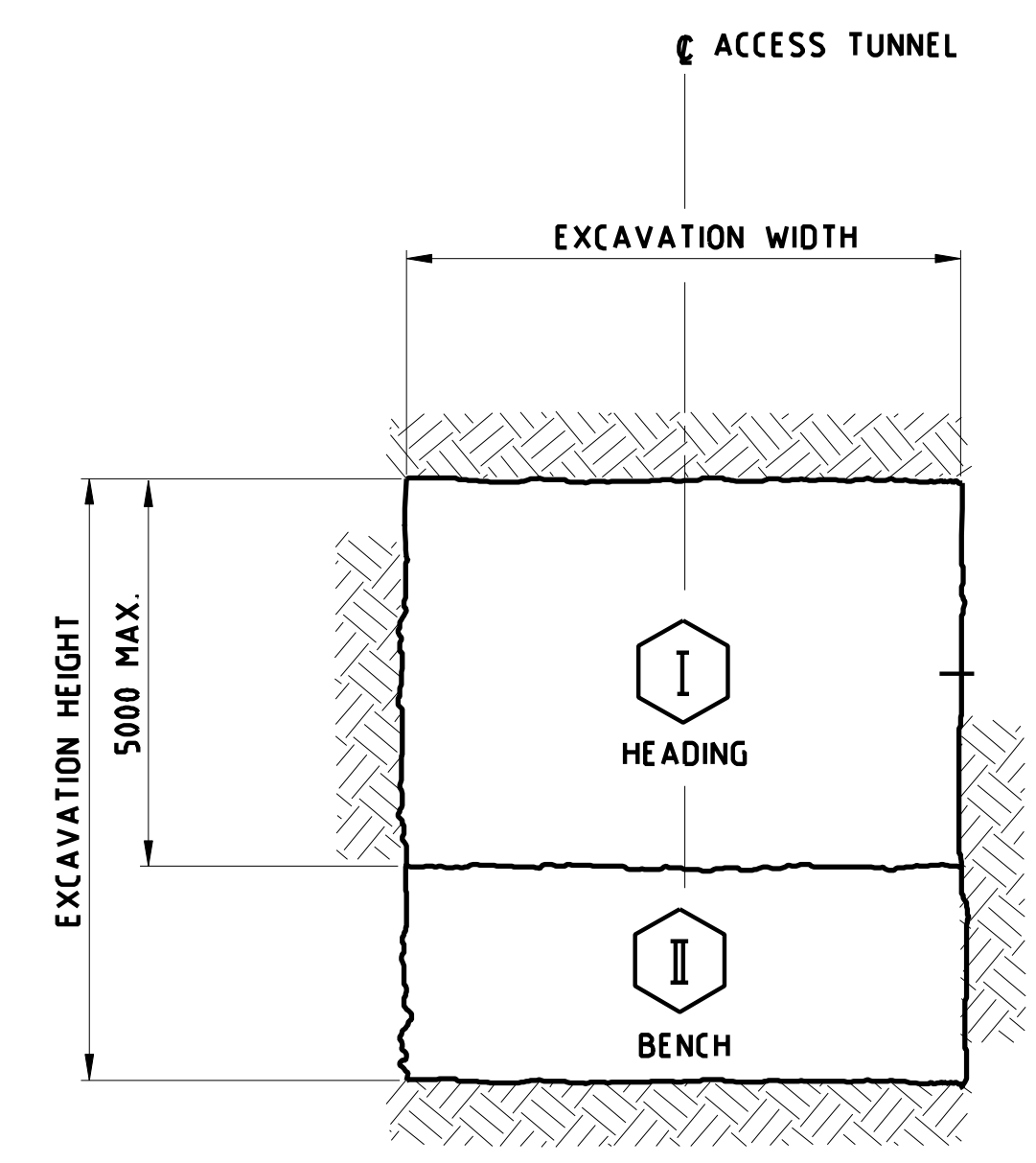
1. ALL DIMENSIONS ARE IN mm.
2. COMPLETE INSTALLATION OF DOWELS AND SHOTCRETE IN EACH DRIFT TO FACE OF EXCAVATION BEFORE ADVANCING HEADING TO NEXT ROUND.
3. SMOOTH-WALL BLASTING METHODS AS DEFINED IN SPECIFICATIONS TO BE USED ON ALL PERIMETER CUTS.
4. MAXIMUM ROUND LENGTH IN TOP HEADING IS 4m.
5. MAXIMUM ROUND LENGTH IN BENCH IS 8m.

LEGEND:

I SEQUENCE OF EXCAVATION



FULL WIDTH HEADING AND BENCH
PLAN



FULL WIDTH HEADING AND BENCH
SECTION A-A

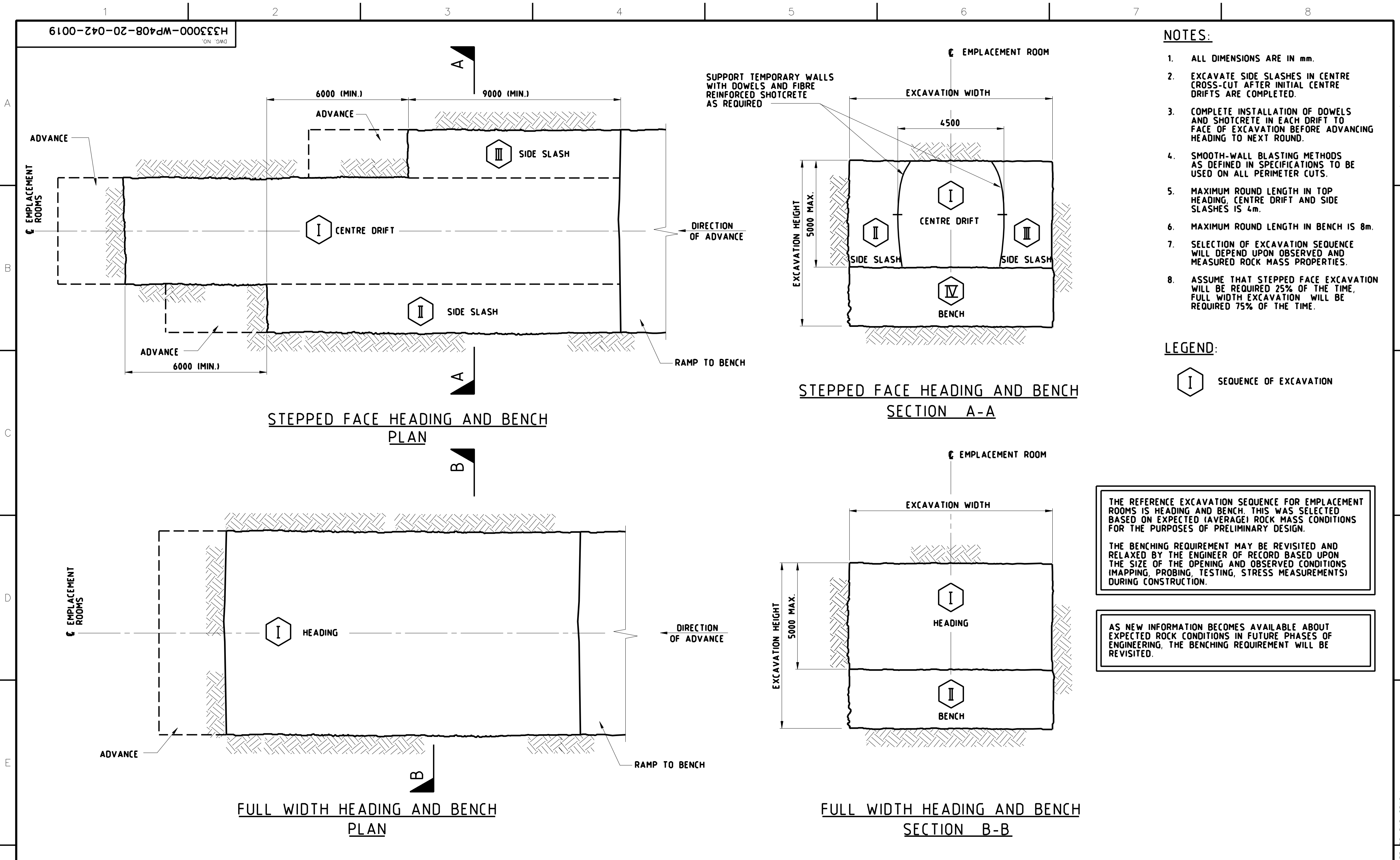
THE REFERENCE EXCAVATION SEQUENCE FOR ACCESS TUNNELS IS HEADING AND BENCH. THIS WAS SELECTED BASED ON EXPECTED (AVERAGE) ROCK MASS CONDITIONS FOR THE PURPOSES OF PRELIMINARY DESIGN.

THE BENCHING REQUIREMENT MAY BE REVISITED AND RELAXED BY THE ENGINEER OF RECORD BASED UPON THE SIZE OF THE OPENING AND OBSERVED CONDITIONS (MAPPING, PROBING, TESTING, STRESS MEASUREMENTS) DURING CONSTRUCTION.

AS NEW INFORMATION BECOMES AVAILABLE ABOUT EXPECTED ROCK CONDITIONS IN FUTURE PHASES OF ENGINEERING, THE BENCHING REQUIREMENT WILL BE REVISITED.

DRAWING NO.		DRAWING TITLE		NO.		DESCRIPTION		CHK'D		APP'D		DATE		<p>NOT FOR CONSTRUCTION</p> <p>This drawing has been reviewed for the purposes of DOR Preliminary Engineering only and must not be used for other purposes.</p> <p>Work Package Owner</p> <p>Area Lead</p> <p>Engineering Manager</p> <p>Project Manager</p> <p>Accepted by Owner</p>		<p>HATCH</p> <p>DESIGNED BY: G.J.E. KRAMER DATE: 2009-11-02</p> <p>DRAWN BY: O. HORAK DATE: 2009-11-10</p> <p>CHECKED BY:</p> <p>DATE:</p> <p>PROJ. DES. COORD. DATE:</p> <p>DATE:</p> <p>PROJ. MGR. M. R. DAWBORN DATE: 2009-11-27</p>		<p>NUCLEAR WASTE MANAGEMENT ORGANIZATION DEEP GEOLOGIC REPOSITORY PROJECT</p> <p>UNDERGROUND FACILITIES</p> <p>ACCESS TUNNEL DRILL & BLAST EXCAVATION SEQUENCE PLAN AND SECTION</p>		<p>SCALE: 1:75 OR AS NOTED</p> <p>DWG. NO. H333000-WP408-20-042-0018</p>		<p>REV. 00</p>	
REFERENCE DRAWINGS				REVISIONS				ISSUE AUTHORIZATION															

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 HORAK0238



- NOTES:**
1. ALL DIMENSIONS ARE IN mm.
 2. EXCAVATE SIDE SLASHES IN CENTRE CROSS-CUT AFTER INITIAL CENTRE DRIFTS ARE COMPLETED.
 3. COMPLETE INSTALLATION OF DOWELS AND SHOTCRETE IN EACH DRIFT TO FACE OF EXCAVATION BEFORE ADVANCING HEADING TO NEXT ROUND.
 4. SMOOTH-WALL BLASTING METHODS AS DEFINED IN SPECIFICATIONS TO BE USED ON ALL PERIMETER CUTS.
 5. MAXIMUM ROUND LENGTH IN TOP HEADING, CENTRE DRIFT AND SIDE SLASHES IS 4m.
 6. MAXIMUM ROUND LENGTH IN BENCH IS 8m.
 7. SELECTION OF EXCAVATION SEQUENCE WILL DEPEND UPON OBSERVED AND MEASURED ROCK MASS PROPERTIES.
 8. ASSUME THAT STEPPED FACE EXCAVATION WILL BE REQUIRED 25% OF THE TIME, FULL WIDTH EXCAVATION WILL BE REQUIRED 75% OF THE TIME.

LEGEND:

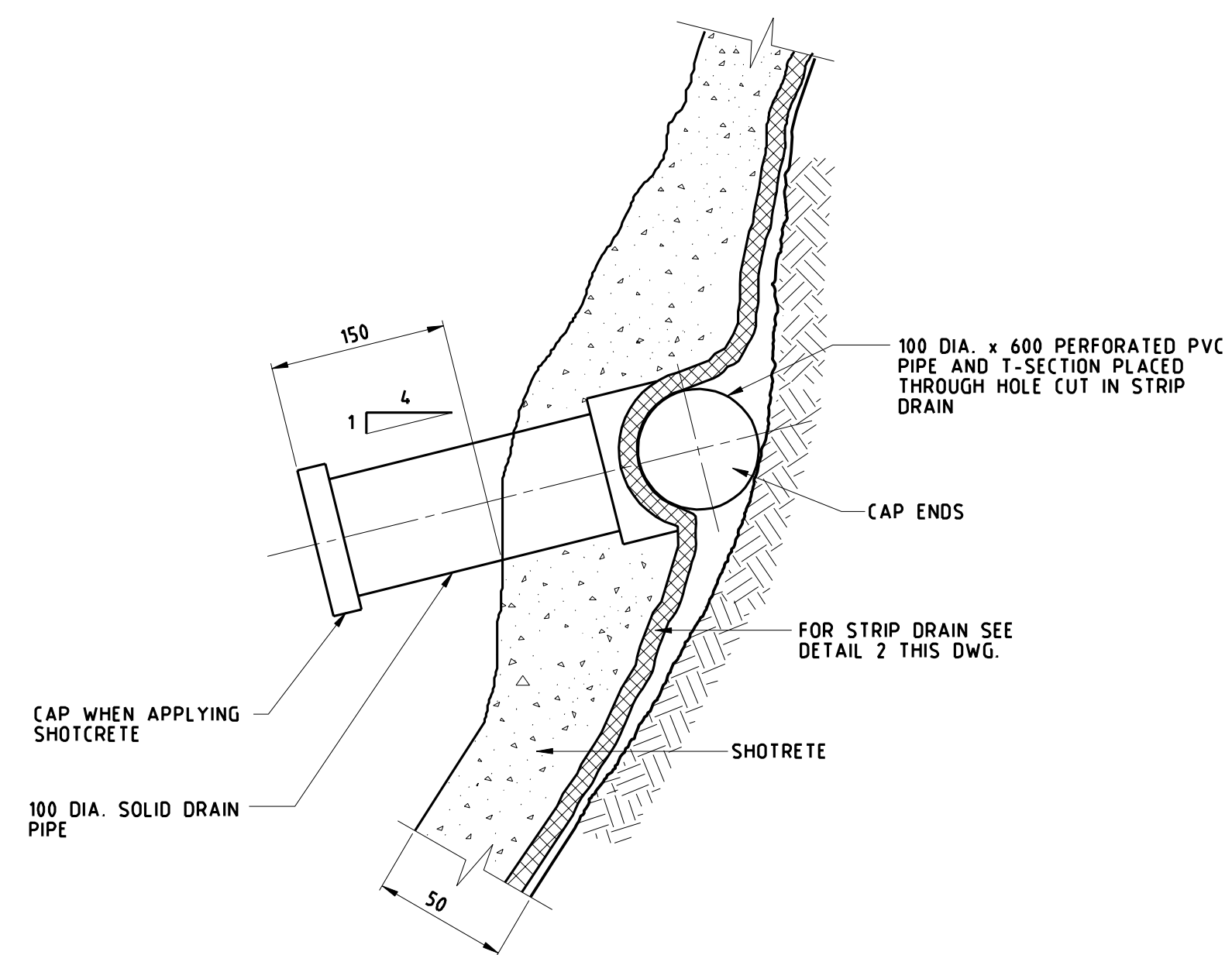
I SEQUENCE OF EXCAVATION

THE REFERENCE EXCAVATION SEQUENCE FOR EMPLACEMENT ROOMS IS HEADING AND BENCH. THIS WAS SELECTED BASED ON EXPECTED (AVERAGE) ROCK MASS CONDITIONS FOR THE PURPOSES OF PRELIMINARY DESIGN.

THE BENCHING REQUIREMENT MAY BE REVISITED AND RELAXED BY THE ENGINEER OF RECORD BASED UPON THE SIZE OF THE OPENING AND OBSERVED CONDITIONS (MAPPING, PROBING, TESTING, STRESS MEASUREMENTS) DURING CONSTRUCTION.

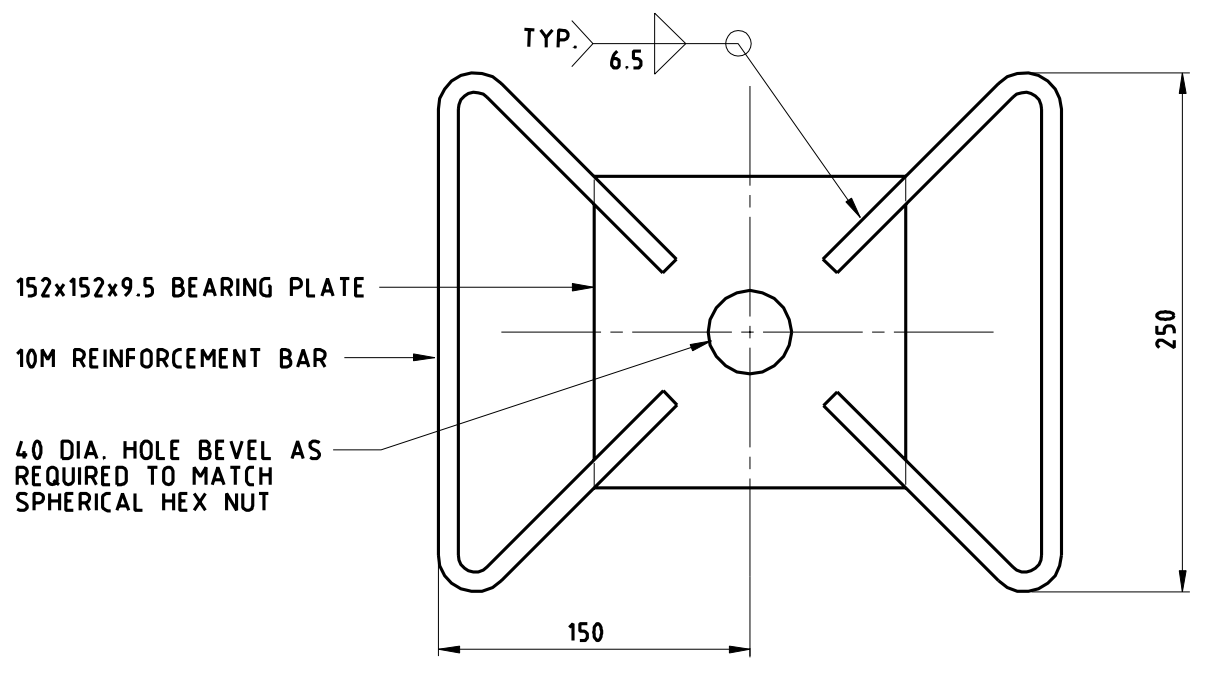
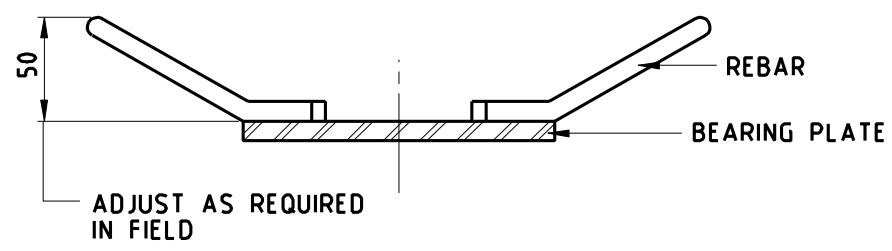
DRAWING NO. H333000-WP408-20-042-0019		DRAWING TITLE		NOT FOR CONSTRUCTION				NUCLEAR WASTE MANAGEMENT ORGANIZATION DEEP GEOLOGIC REPOSITORY PROJECT	
REFERENCE DRAWINGS		REVISIONS		This drawing has been reviewed for the purpose of SGR Preliminary Engineering only and must not be used for other purposes. Work Package Center		DESIGNED BY: G.J.E. KRAMER DATE: 2009-11-02 CHECKED BY: M. R. DAWBORN DATE: 2009-11-27		UNDERGROUND FACILITIES EMPLACEMENT ROOM DRILL & BLAST EXCAVATION SEQUENCE PLANS AND SECTIONS	
DRAWING NO.		DRAWING TITLE		NO.		DESCRIPTION		SCALE: 1:75 DWG. NO. H333000-WP408-20-042-0019	
DRAWING NO.		DRAWING TITLE		NO.		DESCRIPTION		REV. 00 APPROVED FOR USE (GJEK) SAA 10-04-09 ISSUE FOR AUTH. BY DATE	

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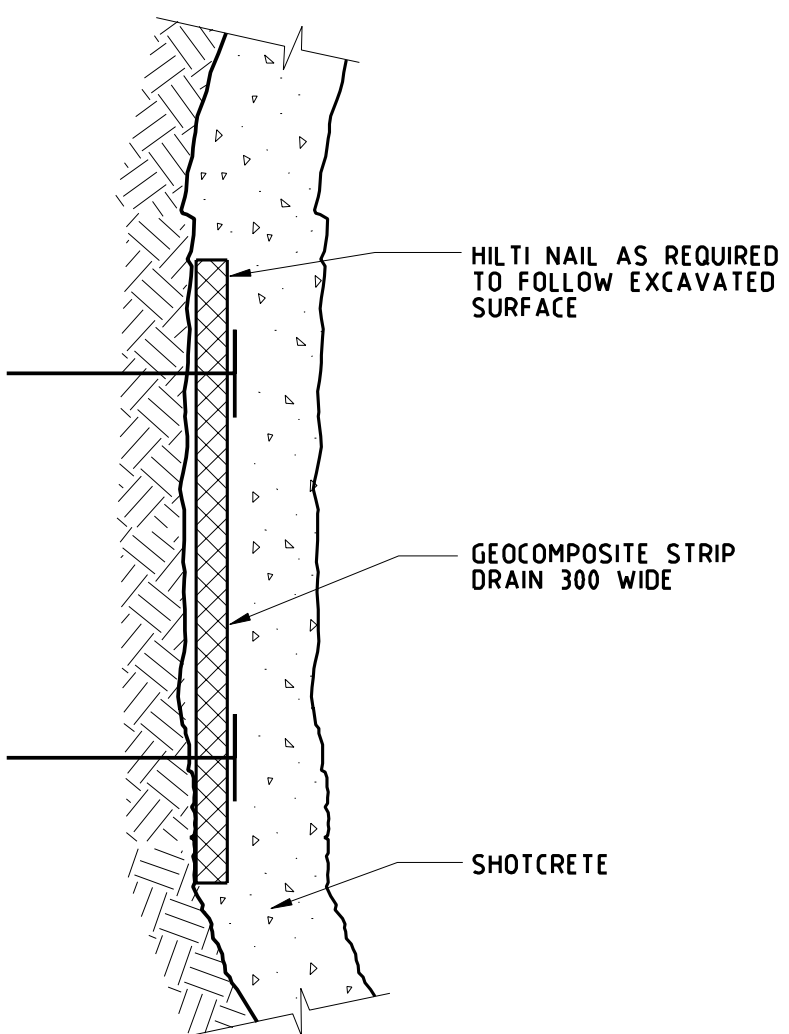


DETAIL 1
STRIP DRAIN & DRAIN PIPE
N.T.S.

NOTE: TRIM TO SUIT WASTE PACKAGE STACKING (AFTER SHOTCRETE PLACEMENT)

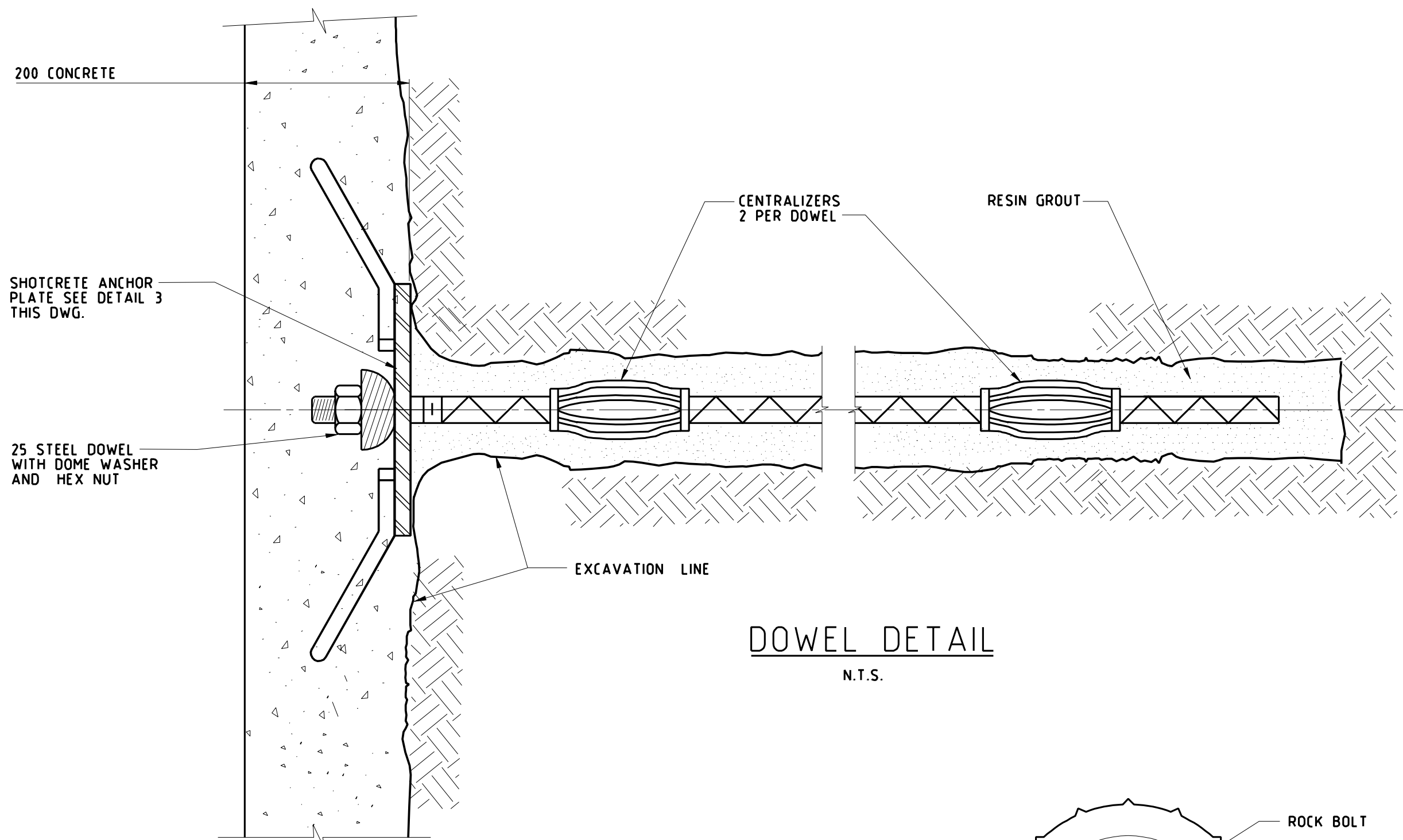


DETAIL 3
SHOTCRETE ANCHOR PLATE
N.T.S.

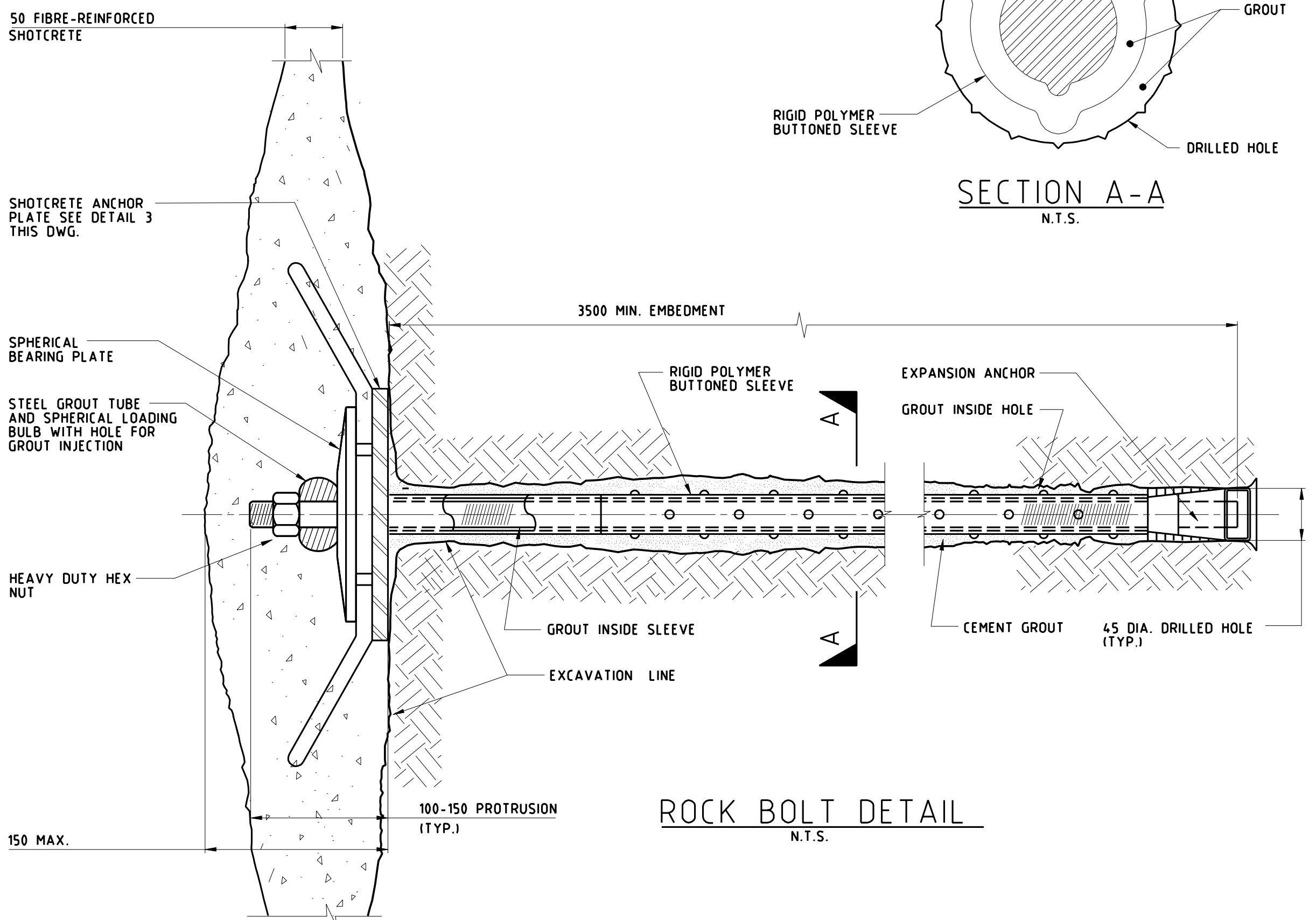


DETAIL 2
N.T.S.
(SEE DETAIL 1)

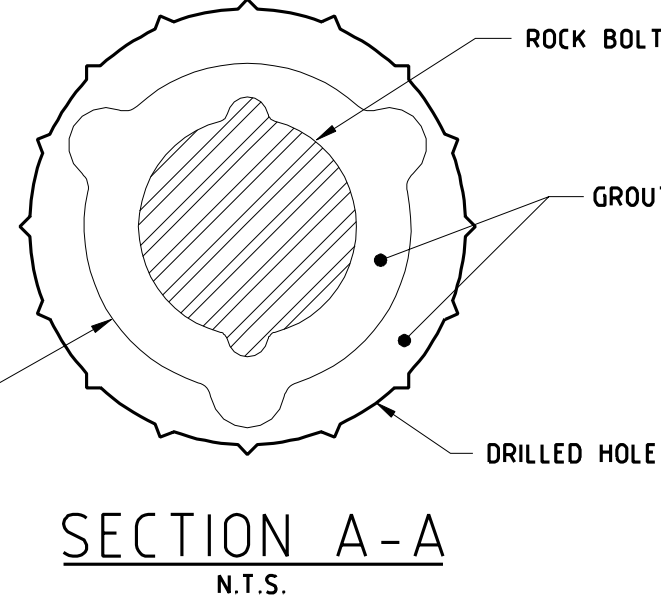
THE ROCK SUPPORT SHOWN ON THIS DRAWING HAS BEEN DEVELOPED FOR EXPECTED (AVERAGE) ROCK MASS CONDITIONS FOR THE PURPOSES OF PRELIMINARY DESIGN. ADDITIONAL CLASSES OF ROCK SUPPORT WILL BE DEVELOPED IN SUBSEQUENT PHASES OF DESIGN TO ADDRESS CATEGORIES OF POORER AND BETTER THAN EXPECTED ROCK MASS CONDITIONS. THE SELECTION OF SUPPORT CLASS TO BE IMPLEMENTED WILL BE MADE BY THE ENGINEER OF RECORD BASED UPON OBSERVED CONDITIONS (MAPPING, PROBING, TESTING, STRESS MEASUREMENTS) DURING CONSTRUCTION.



DOWEL DETAIL
N.T.S.



ROCK BOLT DETAIL
N.T.S.



SECTION A-A
N.T.S.

DRAWING NO.	DRAWING TITLE
REFERENCE DRAWINGS	

NO.	DESCRIPTION	CHK'D	APP'D	DATE
REVISIONS				

NOT FOR CONSTRUCTION
This drawing has been reviewed for the purposes of DGR Preliminary Engineering only and must not be used for other purposes.
Work Package Owner
Area Lead
Engineering Manager
Project Manager
Accepted by Owner

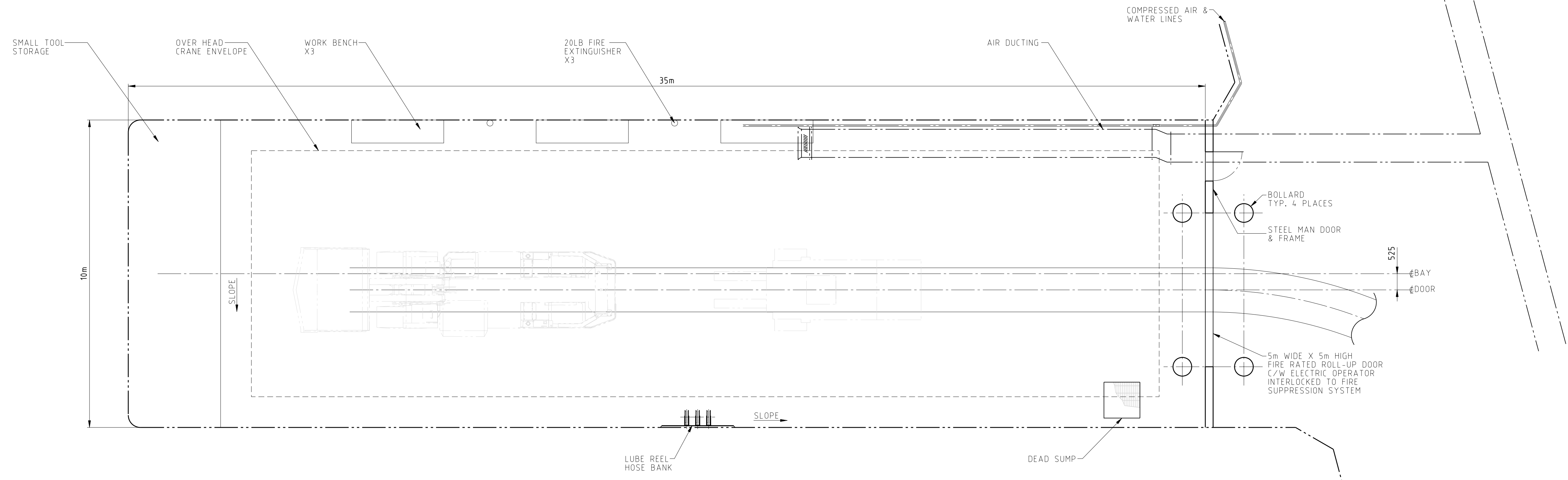


DESIGNED BY: G.J.E. KRAMER
DATE: 2009-11-02
CHECKED BY: M. R. DAWBORN
DATE: 2009-11-27
DRAWN BY: Q. HORAK
DATE: 2009-11-12
DISCIP. ENGR.
PROJ. ENGR.
DATE: _____
DATE: _____
PROJ. MGR.
M. R. DAWBORN
DATE: 2009-11-27

NUCLEAR WASTE MANAGEMENT ORGANIZATION
DEEP GEOLOGIC REPOSITORY PROJECT
UNDERGROUND FACILITIES
ACCESS TUNNEL AND EMPLACEMENT ROOM
ROCK SUPPORT DETAILS

SCALE: N.T.S. OR AS NOTED
DWG. NO.: H333000-WP408-20-042-0021
REV: 00

- NOTES:
- SEE DRAWING H333000-WP408-20-042-0003 FOR LOCATION OF UNDERGROUND FACILITIES.
 - EXCAVATION HEIGHT: 11.0m

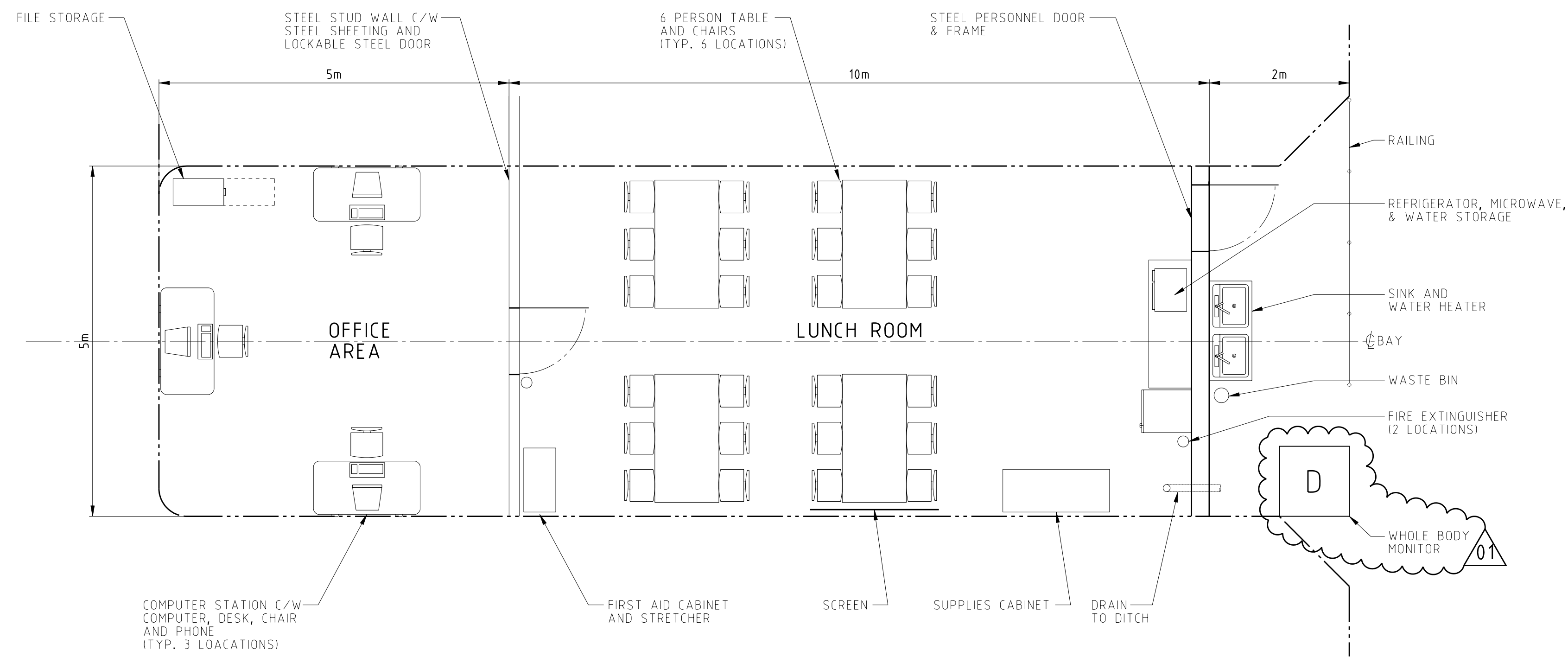


PRELIMINARY

NOT FOR CONSTRUCTION

		<p>NOT FOR CONSTRUCTION This drawing has been reviewed for the purposes of DGR Preliminary Engineering only and must not be used for other purposes. Work Package Owner Craig Irvine 2009.11.26 17:00:25 -0500</p> <p>Area Lead Digitally signed by G.R. Davidge Date: 2009.11.27 10:28:18 -0500</p> <p>Engineering Manager Sherwin Aarons 2009.11.27 11:21:51 -0500</p> <p>Project Manager Digitally signed by M.R. Dawborn Date: 2009.11.27 11:56:31 -0500</p> <p>Accepted by Owner Digitally signed by Derek Wilson DN: cn=Derek Wilson, o=Hatch, email=d.wilson@hatch.com, c=CA Date: 2009.12.02 10:45:30 -0500</p>			<p>HATCH</p> <p>DESIGNED BY B. PERRY DATE 09.10.08</p> <p>DRAWN BY K. BUSHEY DATE 09.10.08</p> <p>CHECKED BY DATE 09.10.08</p> <p>DATE PROJ. DES. COORD.</p> <p>DATE PROJ. ENGR.</p>		<p>NUCLEAR WASTE MANAGEMENT ORGANIZATION DEEP GEOLOGIC REPOSITORY PROJECT</p> <p>PRELIMINARY DESIGN</p> <p>UNDERGROUND SERVICES MOBILE EQUIPMENT MAINTENANCE WORKSHOP GENERAL ARRANGEMENT</p>	
<p>DRAWING NO. REFERENCE DRAWINGS</p>		<p>NO. DESCRIPTION CHK'D APP'D DATE</p> <p>REVISIONS</p>			<p>00 APPROVED FOR USE CI SAA 2009-11-25</p> <p>ISSUE AUTHORIZATION</p>		<p>PROJ. MGR. M.R. DAWBORN DATE</p> <p>SCALE 1:75 OR AS NOTED</p> <p>DWG. NO. H333000-WP408-50-042-0001</p>	

- NOTE:
- SEE DRAWING H333000-WP408-20-042-0003 FOR LOCATIONS OF UNDERGROUND FACILITIES.
 - EXCAVATION HEIGHT: 3.0m
 - MECHANICAL VENTILATION TO BE PROVIDED.

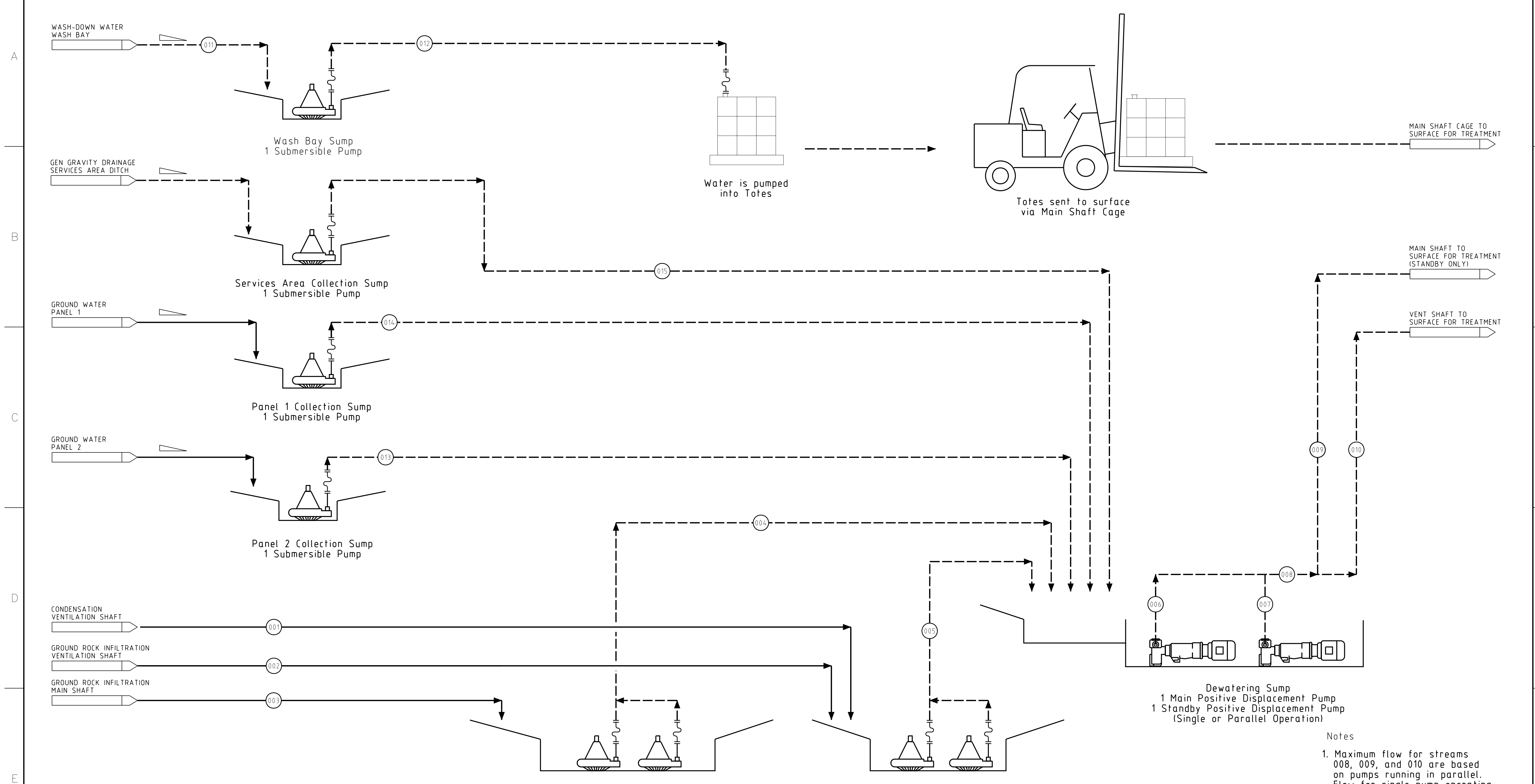


PRELIMINARY

NOT FOR CONSTRUCTION

				<p>NOT FOR CONSTRUCTION</p> <p>This drawing has been reviewed for the purposes of DGR Preliminary Engineering only and must not be used for other purposes.</p> <p>Work Package Owner Craig Imrie 2009.12.07 11:49:07 -0500</p> <p>Area Lead G.R. Davidge Digitally signed by G.R. Davidge Date: 2009.12.07 12:04:12 -0500</p> <p>Engineering Manager Shirawn Aarons 2009.12.07 12:56:07 -0500</p> <p>Project Manager Digitally signed by M.R. Dawborn Date: 2009.12.07 13:19:08 -0500</p> <p>Accepted by Owner Digitally signed by Derek Wilson Date: 2009.12.11 14:50:12 -0500</p>		<p>HATCH</p> <p>DESIGNED BY B. PERRY DATE 09.10.30</p> <p>DRAWN BY K. BUSHEY DATE 09.10.30</p> <p>CHECKED BY DATE</p> <p>PROJ. DES. COORD. DATE</p> <p>PROJ. ENGR. DATE</p>		<p>NUCLEAR WASTE MANAGEMENT ORGANIZATION DEEP GEOLOGIC REPOSITORY PROJECT</p> <p>PRELIMINARY DESIGN</p> <p>UNDERGROUND LUNCH ROOM AND OFFICE AREA GENERAL ARRANGEMENT</p>							
DRAWING NO.		DRAWING TITLE		<p>01 WHOLE BODY MONITOR RELOCATED</p> <p>NO. DESCRIPTION CHK'D APP'D DATE</p>		<p>01 APPROVED FOR USE CI SAA 2009-12-07</p> <p>00 APPROVED FOR USE CI SAA 2009-11-26</p>		<p>PROJ. MGR. M.R. DAWBORN DATE</p>		<p>SCALE 1:50 OR AS NOTED</p>		<p>DWG. NO. H333000-WP408-50-042-0002</p>		<p>REV. 01</p>	
REFERENCE DRAWINGS		REVISIONS		ISSUE AUTHORIZATION											

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 12/7/2009 11:29:55 AM
 bushaf5169



PRELIMINARY

- Notes
1. Maximum flow for streams 008, 009, and 010 are based on pumps running in parallel. Flow for single pump operating is 11 l/s. Flow is either in Vent Shaft or in Main Shaft.
 2. Flow at Services area anticipated to be minimal.

— Continuous Primary Process Flow
 - - - Intermittent Primary Process Flow

Stream Number		001	002	003	004	005	006	007	008	009	010	011	012	013	014	015
Max	L/s	1.00	15.63	15.63	20.00	20.00	11.00	11.00	22.00	22.00	22.00	0.30	14.00	1.00	1.00	-
Min	L/s	-	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Average	L/s	-	-	-	-	-	-	-	-	-	-	0.02	-	-	-	-
Design Flow	L/s	1.00	0.63	0.63	20.00	20.00	11.00	11.00	22.00 ^[1]	22.00 ^[1]	22.00 ^[1]	0.02	14.00	1.00	1.00	- ^[2]

Main Shaft Sump
 1 Main Submersible pump
 1 Standby Submersible pump
 (No Parallel Operation)

Vent Shaft Sump
 1 Main Submersible pump
 1 Standby Submersible pump
 (No Parallel Operation)

Dewatering Sump
 1 Main Positive Displacement Pump
 1 Standby Positive Displacement Pump
 (Single or Parallel Operation)

DRAWING NO.		DRAWING TITLE		NO.		DESCRIPTION		CHK'D		APP'D		DATE		NOT FOR CONSTRUCTION This drawing has been reviewed for the purposes of DGR Preliminary Engineering only and must not be used for other purposes. Work Package Owner Area Lead G.R. Davidge Digitally signed by G.R. Davidge Date: 2009.12.02 13:46:02 Engineering Manager Shantini Aarons 2009.12.02 15:08:04 - 05:07 Project Manager Digitally signed by M. Dawborn Date: 2009.12.02 15:15:45 -05:07 Accepted by Owner Digitally signed by Drew Wilson DN: cn=Drew Wilson, o=Hatch, ou=Environmental Services, c=CA, Date: 2009.12.02 15:15:29 -05:07		DESIGNED BY D. WITOW DATE 2009-11-30 CHECKED BY R. SETO DATE 2009-11-30 DISCIPL. ENGR. DATE PROJ. DES. COORD. DATE PROJ. ENGR.		HATCH NUCLEAR WASTE MANAGEMENT ORGANIZATION DEEP GEOLOGIC REPOSITORY PROJECT DRAINAGE AND DEWATERING SYSTEM PRELIMINARY PROCESS FLOW DIAGRAM		SCALE N.T.S. OR AS NOTED		DWG. NO. H333000-WP409-50-030-0002		REV. 00	
REFERENCE DRAWINGS		REVISIONS		00 APPROVED FOR USE		SA		AA		GD		2009-11-30		DATE		PROJ. MGR. M. DAWBORN DATE 2009-11-30		DATE							

GENERAL NOTES

- LOCATION OF AND NEED FOR ADDITIONAL BULKHEADS TO BE PREDICTED BY NUMERICAL MODELING IN SUBSEQUENT DESIGN PHASES AND ON THE BASIS OF OBSERVATIONS AND GEOMECHANICAL FIELD TESTING DURING SHAFT SINKING. FINAL BULKHEADS REQUIREMENTS TO BE CONFIRMED AT TIME OF SHAFT SEAL CONSTRUCTION.
- REQUIRED LIFT HEIGHT FOR LINING REMOVAL AND SEALING LIFT THICKNESS TO BE PREDICTED BY NUMERICAL MODELING. SUBSEQUENT DESIGN PHASES AND ON THE BASIS OF OBSERVATIONS AND GEOMECHANICAL FIELD TESTING DURING SHAFT SINKING. FINAL LIFT DIMENSIONS TO BE CONFIRMED AT TIME OF SHAFT SEAL CONSTRUCTION.
- DEPTH OF HDZ REMOVAL TO BE ESTIMATED BY NUMERICAL MODELING IN SUBSEQUENT DESIGN PHASES AND ON THE BASIS OF OBSERVATIONS AND GEOMECHANICAL FIELD TESTING DURING SHAFT SINKING. FINAL HDZ REMOVAL DEPTH TO BE CONFIRMED AT TIME OF SHAFT SEAL CONSTRUCTION.
- MONOLITH TO EXTEND A MINIMUM OF 60m FROM SHAFT LOCATIONS, INCLUDING SUMPS, RAMPS AND TUNNELS AS NECESSARY. FINAL EXTENT OF MONOLITH TO BE DETERMINED BY GEOMECHANICAL TESTING AND OBSERVATIONS DURING LATERAL DEVELOPMENT.
- LOCATION AND EXTENT OF ASPHALT COMPONENT TO BE OPTIMIZED.
- EFFECTIVE SHAFT SEAL DIAMETER INCLUDES REMOVAL OF 600mm THICK CONCRETE LINER, 75mm THICK INITIAL SUPPORT, AN ASSUMED OVERBREAK THICKNESS OF 150mm AND 500mm THICK HDZ.
- SHAFT SEAL DESIGN SHALL BE TYPICAL FOR BOTH MAIN AND VENTILATION SHAFTS.
- ELEVATIONS TO BE ADJUSTED FOR STRIKE AND DIP UNITS AT ACTUAL SHAFT LOCATIONS AND OBSERVED CONTACTS DURING SINKING.

STRATIGRAPHIC LEGEND

- PLEISTOCENE
 1 DRIFT
- MIDDLE DEVONIAN
 2 LUCAS
 3 AMHERSTBURG FORMATION
 - LIMESTONE AND DOLOSTONE
- LOWER DEVONIAN
 4 BOIS BLANC FORMATION
 - CHERTY DOLOSTONE
 SILURIAN / DEVONIAN DISCONTINUITY
- UPPER SILURIAN
 5 BASS ISLANDS FORMATION - DOLOSTONE
 SALINA FORMATION
 6 G UNIT - DOLOSTONE AND SHALE
 7 F UNIT - DOLOMITIC SHALE AND SHALE
 8 E UNIT - DOLOSTONE
 9 D UNIT - DOLOMITIC SHALE AND SHALE
 10 C UNIT - DOLOSTONE
 11 B UNIT - ANHYDRITE 2m
 12 B ANHYDRITE - ANHYDRITE
 13 A-2 CARBONATE - CARBONATE
 14 A-2 EVAPORITE - EVAPORITE
 15 A-1 CARBONATE - CARBONATE
 16 A-1 EVAPORITE - EVAPORITE
 17 A-0 UNIT - LIMESTONE/DOLOSTONE
- MIDDLE SILURIAN
 18 GUELPH - DOLOSTONE
 19 GOAT ISLAND - LIMESTONE/DOLOSTONE
 20 GASPORT - DOLOSTONE
- LOWER SILURIAN
 21 LIONS HEAD - LIMESTONE/DOLOSTONE
 22 FOSSIL HILL - DOLOSTONE
- UPPER ORDOVICIAN
 23 CABOT HEAD - GREY SHALE
 24 MANITOULIN - ARGILLACEOUS DOLOSTONE
 25 QUEENSTON - RED SHALL AND SILTSTONE
- MIDDLE ORDOVICIAN
 26 GEORGIAN BAY - GREY SHALE AND SILTSTONE
 27 BLUE MOUNTAIN 1 - GREY SHALE
 28 BLUE MOUNTAIN 2 - GREY SHALE
 29 COLLINGWOOD - SHALE
 30 COBOURG - LIMESTONE AND ARGILLACEOUS LIMESTONE
 31 SHERMAN FALL - LIMESTONE
 32 KIRKFIELD - SHALY LIMESTONE AND ARGILLACEOUS LIMESTONE
 33 COBOCONK - SHALY LIMESTONE AND CRYSTALLINE LIMESTONE
 34 GULL RIVER - LITHOGRAPHIC LIMESTONE
 35 SHADOW LAKE FORMATION - SILTSTONE, SANDSTONE
- CAMBRIAN
 36 PRECAMBRIAN - SANDSTONE
 37 PRECAMBRIAN - GRANITIC GNEISS

STRATIGRAPHIC COLUMN LEGEND

- SOIL
- LIMESTONES/DOLOSTONES
- SHALES
- ANHYDRITE / EVAPORITE
- CARBONATES
- GRANITIC GNEISS
- SANDSTONE

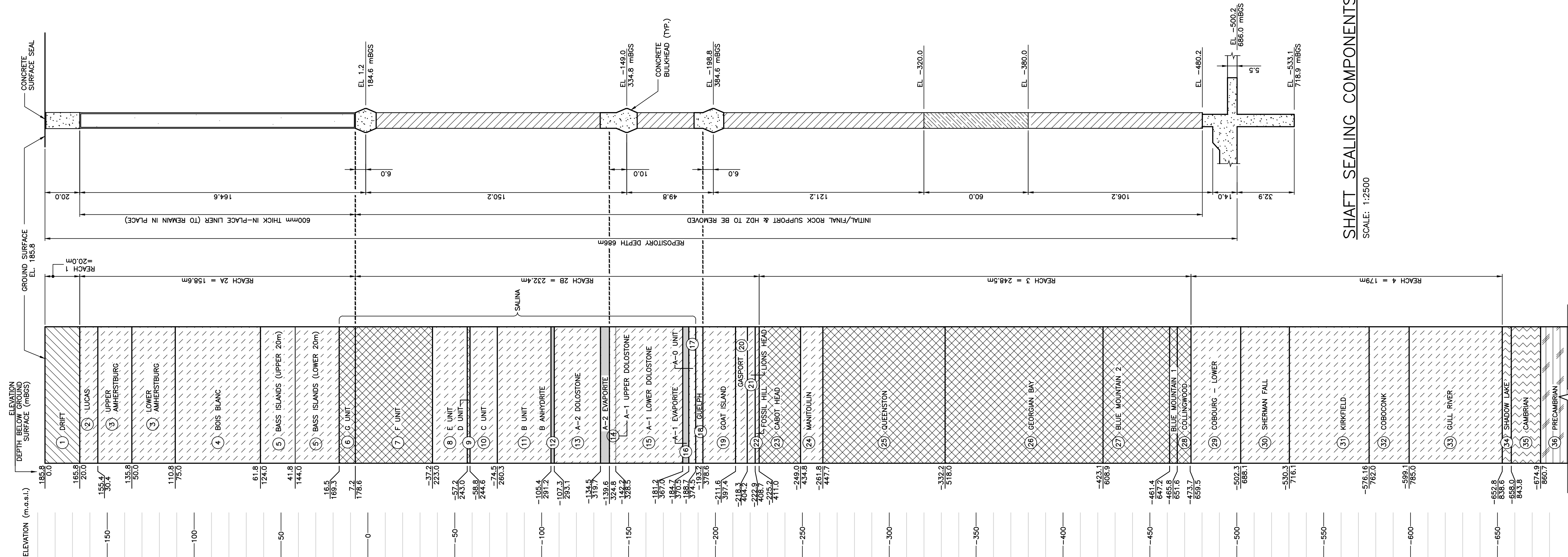
SEALING SYSTEM LEGEND

- CONCRETE
- COMPACTED, ENGINEERED FILL (EXCAVATED ROCK MATERIALS)
- COMPACTED BENTONITE/SAND MIX
- ASPHALT
- CONCRETE SHAFT SEALING BULKHEAD (SEE DWG. H333000-WP411-10-042-0002)

SOURCE OF GEOLOGICAL DATA:
 1. STRATIGRAPHY AND HYDROGEOLOGICAL DATA BENEATH BRUCE SITE AT DEEP VERTICAL BOREHOLES DGR-1 & DGR-2, REV. 10, 21 JANUARY 2008.
 2. FORMATION THICKNESSES UPDATED BASED ON INTERA "BEDROCK FORMATIONS IN DGR-1, DGR-2, DGR-3 AND DGR-4", TR-08-12 TABLE 2, R1A., MARCH 2010.

SHAFT SEALING COMPONENTS

SCALE: 1:2500



STRATIGRAPHIC COLUMN

BASED ON DGR-1 & DGR-2 R10
 DEPTH 0.0m TO DEPTH 876.5+m
 SCALE: 1:2500

PRELIMINARY
 NOT FOR CONSTRUCTION

NOT FOR CONSTRUCTION
 This drawing has been reviewed for the purposes of DGR Preliminary Engineering only and must not be used for other purposes.
 Work Package Owner
 Area Lead
 Engineering Manager
 Project Manager
 Accepted by Owner
 R.J. Haynes
 2010.04.29 14:47:11 -0400



DESIGNED BY
 W. HOYLE
 DATE
 CHECKED BY
 DATE
 DATE
 PROJ. DES. COORD.
 M.R. DAWBORN
 DATE

DRAWN BY
 A. LACOURSIERE
 DATE
 DISCIPL. ENGR.
 DATE
 PROJ. MGR.
 DATE

NUCLEAR WASTE MANAGEMENT ORGANIZATION
 DEEP GEOLOGIC REPOSITORY PROJECT

SHAFTS

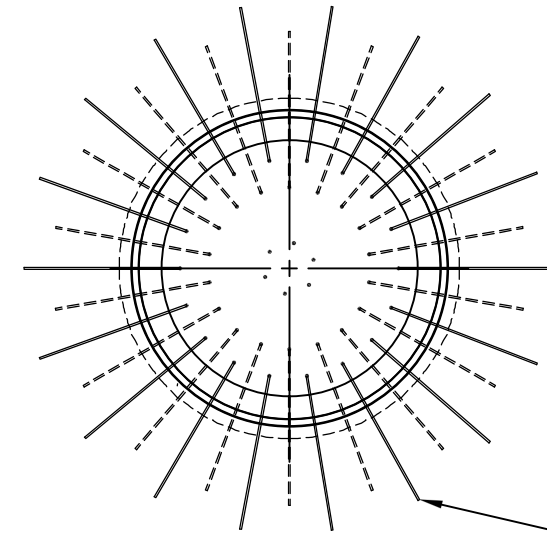
STRATIGRAPHY AND SHAFT
 SEALING SYSTEM LAYOUT
 GENERAL ARRANGEMENT

DRAWING NO.	DRAWING TITLE
1	REFERENCE DRAWINGS
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NO.	DESCRIPTION	CHK'D	APP'D	DATE
	REVISIONS			

REV.	ISSUE FOR	GJEK	SA	10-04-23
00	APPROVED FOR USE			

SCALE	DWG. NO.	REV.
OR AS NOTED	H333000-WP411-10-042-0001	00



GROUTING PLAN
SCALE: 1:200

NOTES GENERAL

1. LOCATION OF AND NEED FOR ADDITIONAL BULKHEADS TO BE PREDICTED BY NUMERICAL MODELING IN SUBSEQUENT DESIGN PHASES AND ON THE BASIS OF OBSERVATIONS AND GEOMECHANICAL FIELD TESTING DURING SHAFT SINKING. FINAL BULKHEAD REQUIREMENTS TO BE CONFIRMED AT TIME OF SHAFT SEAL CONSTRUCTION.
2. REQUIRED LIFT HEIGHT FOR LINING REMOVAL AND SEALING LIFT THICKNESS TO BE PREDICTED BY NUMERICAL MODELING IN SUBSEQUENT DESIGN PHASES AND ON THE BASIS OF OBSERVATIONS AND GEOMECHANICAL FIELD TESTING DURING SHAFT SINKING. FINAL LIFT DIMENSIONS TO BE CONFIRMED AT TIME OF SHAFT SEAL CONSTRUCTION.
3. DEPTH OF HDZ REMOVAL TO BE ESTIMATED BY NUMERICAL MODELING IN SUBSEQUENT DESIGN PHASES AND ON THE BASIS OF OBSERVATIONS AND GEOMECHANICAL FIELD TESTING DURING SHAFT SINKING. FINAL HDZ REMOVAL DEPTH TO BE CONFIRMED AT TIME OF SHAFT SEAL CONSTRUCTION.
4. MONOLITH TO EXTEND A MINIMUM OF 60m FROM SHAFT LOCATIONS, INCLUDING SUMPS, RAMPS, AND TUNNELS AS NECESSARY. FINAL EXTENT OF MONOLITH TO BE DETERMINED BY GEOMECHANICAL TESTING AND OBSERVATIONS DURING LATERAL DEVELOPMENT.
5. LOCATION AND EXTENT OF ASPHALT COMPONENT TO BE OPTIMIZED.
6. EFFECTIVE SHAFT SEAL DIAMETER INCLUDES REMOVAL OF 600mm THICK CONCRETE LINER, 75mm THICK INITIAL SUPPORT, AN ASSUMED OVERBREAK THICKNESS OF 150mm AND 300mm THICK HDZ.

CONCRETE GENERAL

1. PORTLAND CEMENT: TO CAN/CSA-A3000
2. SUPPLEMENTARY CEMENTING MATERIALS: TO CAN/CSA-A3000
3. WATER: TO CAN/CSA-A23.1
4. AGGREGATES: TO CAN/CSA-A23.1. AGGREGATE TYPE TO BE CONSISTENT WITH ADJACENT HOST ROCK
5. CHEMICAL ADMIXTURES: TO CAN3-A266.2.

CONCRETE IN MONOLITH AND BULKHEADS

1. PLACED BY CONTINUOUS POUR METHOD.
2. PROPORTION NORMAL DENSITY CONCRETE IN ACCORDANCE WITH CAN/CSA-A23.1.

PROPERTIES:
a. TYPE GU PORTLAND CEMENT, LOW PERMEABILITY, LOW HEAT OF HYDRATION, AND EXPANSIVE CEMENT TYPE AS REQUIRED, OR AS OTHERWISE SPECIFIED.
b. MINIMUM COMPRESSIVE STRENGTH AT 28 DAYS: 30 MPa.
c. HIGH PERFORMANCE.
d. SLUMP AT TIME AND POINT OF DISCHARGE: 200 mm.
e. CHEMICAL ADMIXTURES: WATER REDUCER AND SUPERPLASTICIZER AS REQUIRED.
f. SALT PROPORTION TO MEET EQUIVALENT CONCENTRATION OF HOST ROCK.
g. AIR CONTENT: 2%, OR AS OTHERWISE SPECIFIED.

CONCRETE IN SURFICIAL CAP

1. PLACED IN LIFTS (LIFT THICKNESS TO BE DETERMINED).
2. PROPORTION NORMAL DENSITY CONCRETE IN ACCORDANCE WITH CAN/CSA-A23.1

PROPERTIES:
a. TYPE GU PORTLAND CEMENT
b. MINIMUM COMPRESSIVE STRENGTH AT 28 DAYS: 30 MPa.
c. SLUMP AT TIME AND POINT OF DISCHARGE: 150 mm.
d. AIR CONTENT: 4 TO 7%

ASPHALT MASTIC MIX

1. HIGH FLUIDITY (SELF LEVELING, PUMPABLE) - AR4000 INTERMEDIATE VISCOSITY.
2. HYDRATED LIME: 10% BY WEIGHT.
3. SAND AND MINERAL FILLER: 2.4 mm DIAMETER MAX.
4. AIR VOID: 2% MAX.
5. PLACED IN LIFTS (LIFT THICKNESS TO BE DETERMINED).

BENTONITE AND SAND MIX

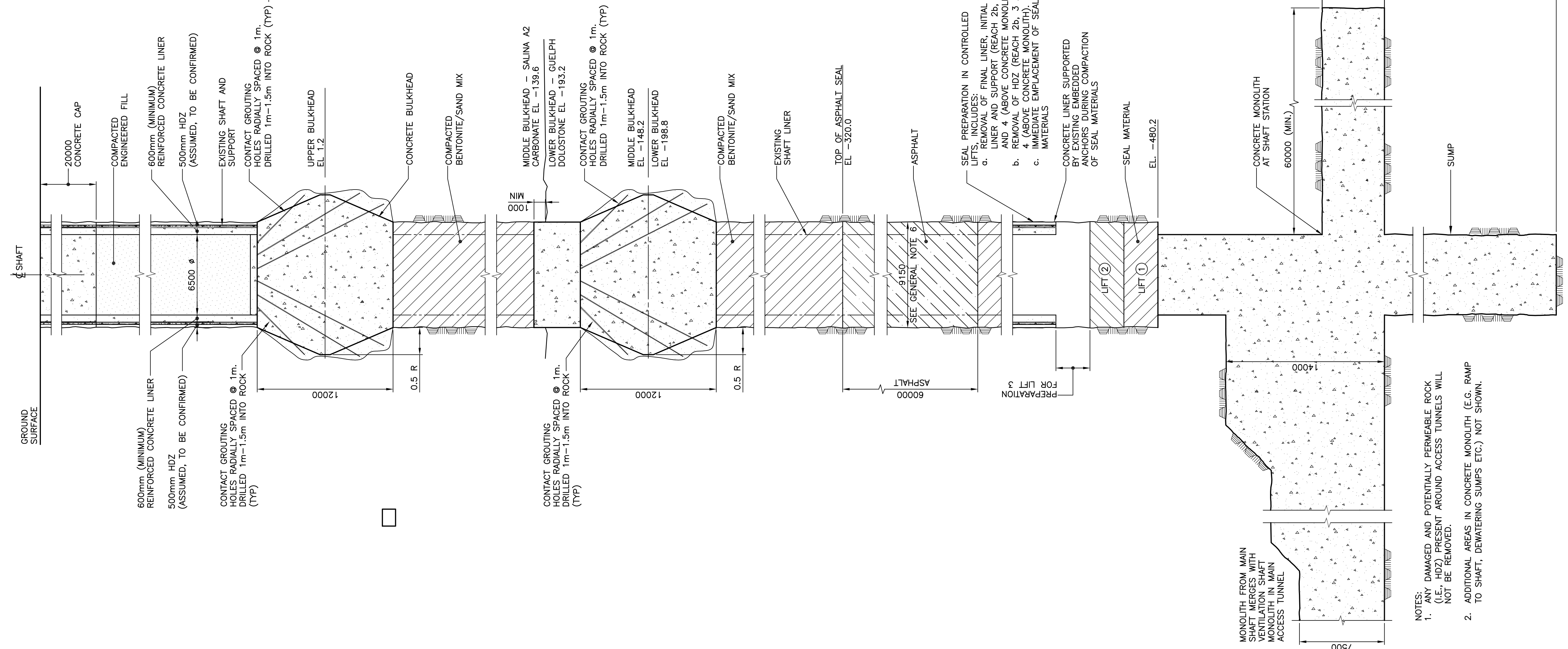
1. WYOMING TYPE BENTONITE - Mx80
2. SAND: WASHED, SILICA BASED MATERIAL WITH UNIFORM GRADATION AND PARTICLE SIZES NO GREATER THAN 2.5 mm; <2% PASSING 200 MESH SIZE.
3. WATER: TO CAN/CSA-A23.1
4. AGGREGATE: TO CAN/CSA-A23.1; COMPOSITION CONSISTENT WITH SURROUNDING GEOSPHERE.
5. TARGET EMPLOYED DRY DENSITY: 1.6 Mg/m³ (APPROXIMATELY)
6. PLACED IN LIFTS (LIFT THICKNESS TO BE DETERMINED)

GROUT

1. ULTRAFINE SULFATE-RESISTANT CEMENTITIOUS: TO CAN/CSA-A3000
2. AGGREGATE: TO CAN/CSA-A23.1
3. CHEMICAL ADMIXTURES: WATER REDUCER AND SUPERPLASTICIZER AS REQUIRED
4. MINIMUM COMPRESSIVE STRENGTH AT 28 DAYS: 40 MPa

COMPACTED ENGINEERED FILL

1. CRUSHED NATIVE EARTHEN/ROCK MATERIALS; "GRANULAR A" TYPE.
2. WATER CONTENT: AT OPTIMUM % FOR PLACEMENT.
3. COMPACTION: TO 98% STANDARD PROCTOR.



- NOTES:
1. ANY DAMAGED AND POTENTIALLY PERMEABLE ROCK (I.E., HDZ) PRESENT AROUND ACCESS TUNNELS WILL NOT BE REMOVED.
 2. ADDITIONAL AREAS IN CONCRETE MONOLITH (E.G. RAMP TO SHAFT, DEWATERING SUMPS ETC.) NOT SHOWN.

SHAFT SEALING SEQUENCE DETAILS
SCALE: 1:200

PRELIMINARY
NOT FOR CONSTRUCTION

NOTE:
SIMILAR SEQUENCE SHALL BE USED
IN THE SEALING OF THE VENT SHAFT

NOT FOR CONSTRUCTION
This drawing has been reviewed for the purposes of DGR Preliminary Engineering only and must not be used for other purposes.
Work Package Owner
Area Lead
Engineering Manager
Project Manager
Accepted by Owner
R.J. Heystre
2010.04.29 10:24:27 -0400

HATCH
DESIGNED BY W. HOYLE
DRAWN BY A. LACOURSIERE
DATE
CHECKED BY
DISCIPL. ENGR.
DATE
PROJ. DES. COORD.
DATE
PROJ. ENGR.
M.R. DAWBORN
DATE

NUCLEAR WASTE MANAGEMENT ORGANIZATION
DEEP GEOLOGIC REPOSITORY PROJECT
SHAFTS
SEALING SYSTEM
MAIN SHAFT SEALING
CONSTRUCTION SEQUENCE
SCALE DWG. NO. H333000-WP411-10-042-0002
OR AS NOTED

DRAWING NO.	DRAWING TITLE
1	REFERENCE DRAWINGS
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NO.	DESCRIPTION	CHK'D	APP'D	DATE

REV.	ISSUE FOR	GJEK	SA	AA	10-04-23
00	APPROVED FOR USE				