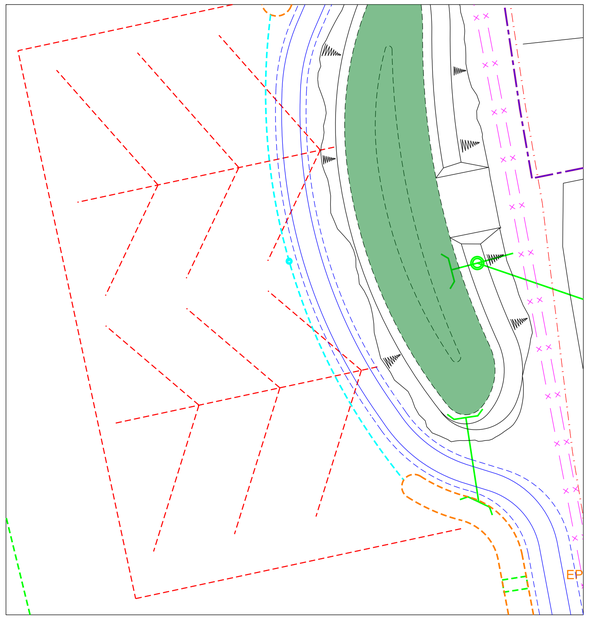
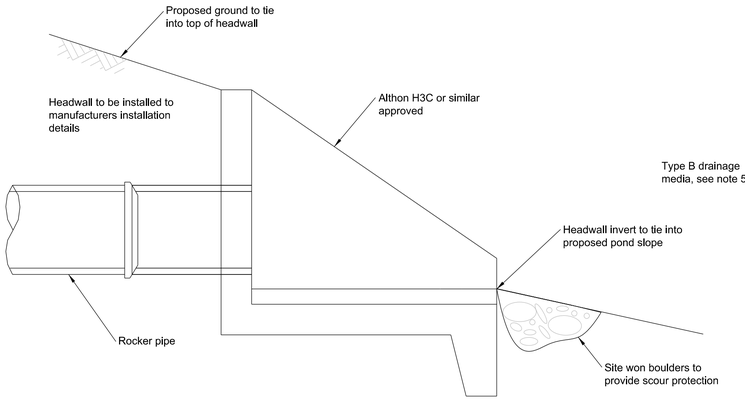


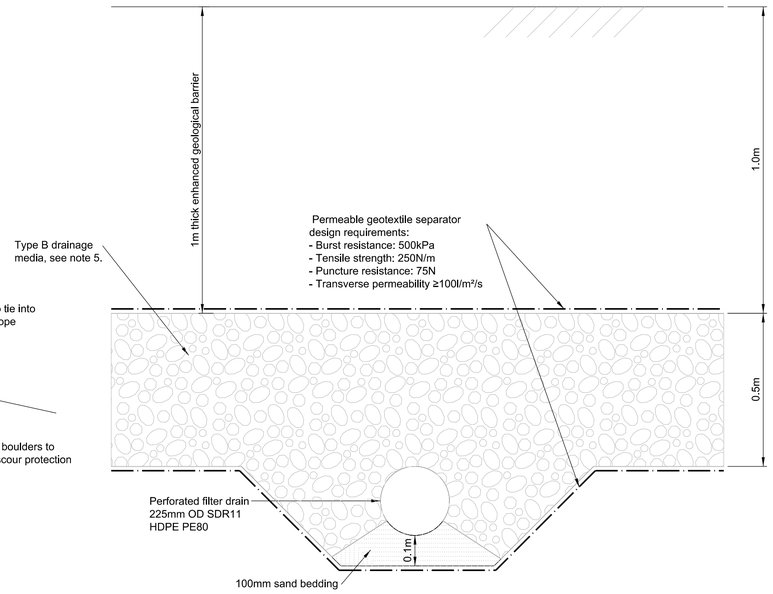
Plan of filter drain arrangement beneath drainage blanket

Scale 1:500



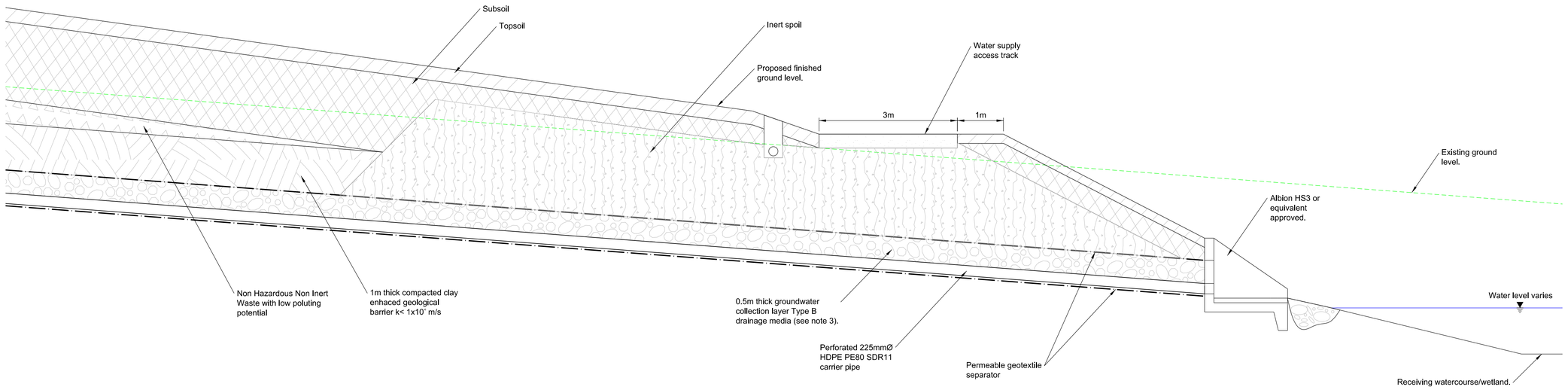
Typical Headwall Detail

Scale 1:10



Typical Detail of Filter Drain for Under Bund Drainage Blanket

Scale 1:10



Typical Long Section Groundwater Drainage Blanket

Scale 1:50

Notes:

1. Rocker pipe lengths as follows:

Schedule of rocker pipe length	
Nominal diameter of pipe (mm)	Rocker pipe length (mm)
150 to 600	600
675 to 750	1000
over 750	1250

Issue	Date	By	Chkd	Appd
0	31/03/17	JB	CW	AH
	Issue for Planning			
B	30/03/17	TC	CW	AG
	Draft			
A	07/03/17	TC	CW	AH
	Draft Issue			

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Client
Sirius Minerals Plc

Job Title
Woodsmith Mine

Woodsmith Mine Site
Drainage Blanket

Scale at A1: As shown

Discipline: Drainage

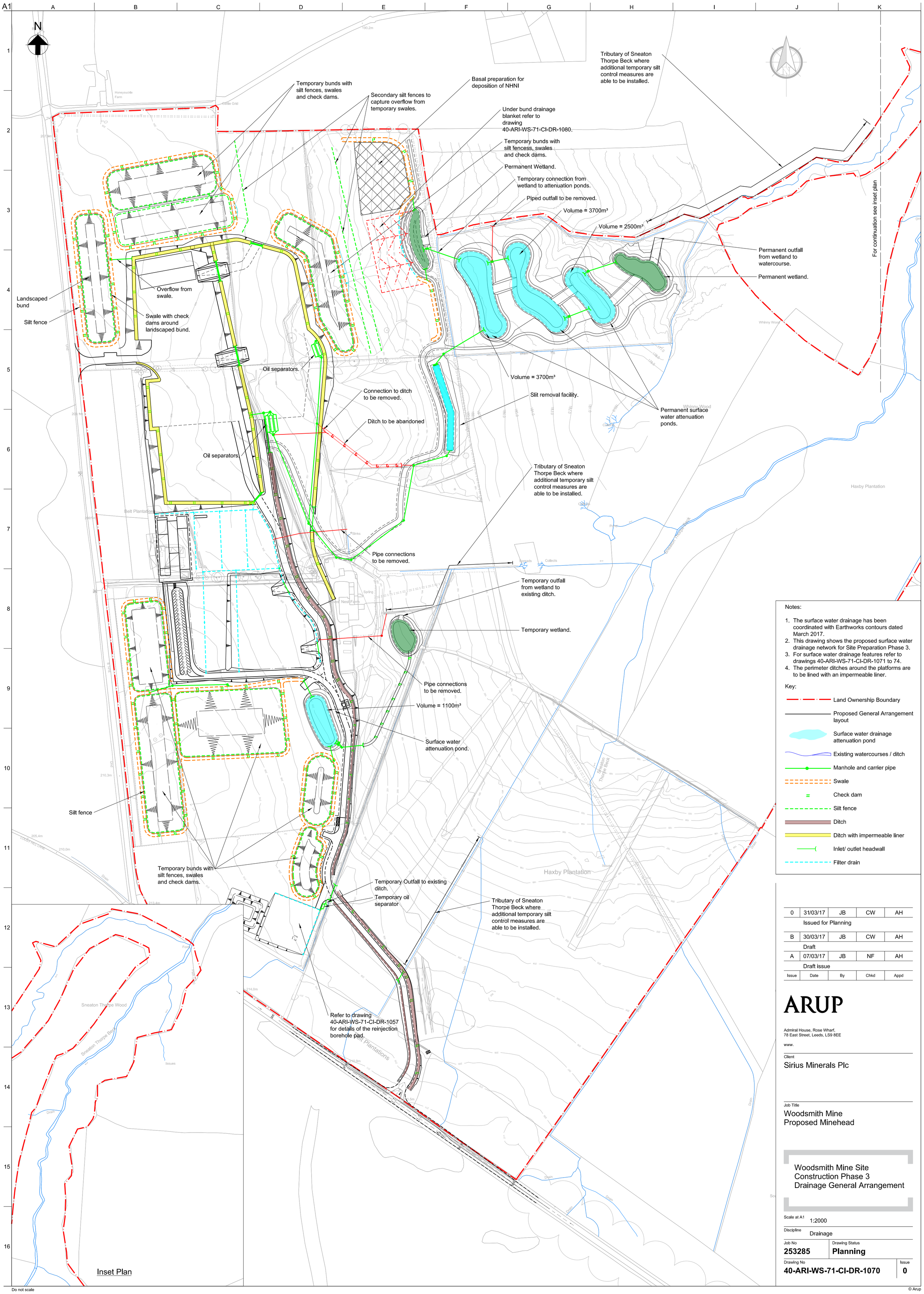
Job No: **253285**

Drawing Status: **Planning**

Drawing No: **40-ARI-WS-71-CI-DR-1080**

Issue: **0**

\\Global\europe\Leeds\Jobs\250000\253285-001\2 Arup - P10 Platform Redesign\6-20 CAD P10 - Platform Redesign\IU_Drawings\YP-P10-WS-CD-060.dgn



Notes:

1. The surface water drainage has been coordinated with Earthworks contours dated March 2017.
2. This drawing shows the proposed surface water drainage network for Site Preparation Phase 3.
3. For surface water drainage features refer to drawings 40-ARI-WS-71-CI-DR-1071 to 74.
4. The perimeter ditches around the platforms are to be lined with an impermeable liner.

Key:

- Land Ownership Boundary
- Proposed General Arrangement layout
- Surface water drainage attenuation pond
- Existing watercourses / ditch
- Manhole and carrier pipe
- Swale
- Check dam
- Silt fence
- Ditch
- Ditch with impermeable liner
- Inlet/ outlet headwall
- Filter drain

Issue	Date	By	Chkd	Appd
0	31/03/17	JB	CW	AH
	Issued for Planning			
B	30/03/17	JB	CW	AH
	Draft			
A	07/03/17	JB	NF	AH
	Draft issue			

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Sirius Minerals Plc

Job Title
Woodsmith Mine
Proposed Minehead

Woodsmith Mine Site
Construction Phase 3
Drainage General Arrangement

Scale at A1 1:2000

Discipline Drainage

Job No **253285**

Drawing Status **Planning**

Drawing No **40-ARI-WS-71-CI-DR-1070**

Issue **0**

Do not scale

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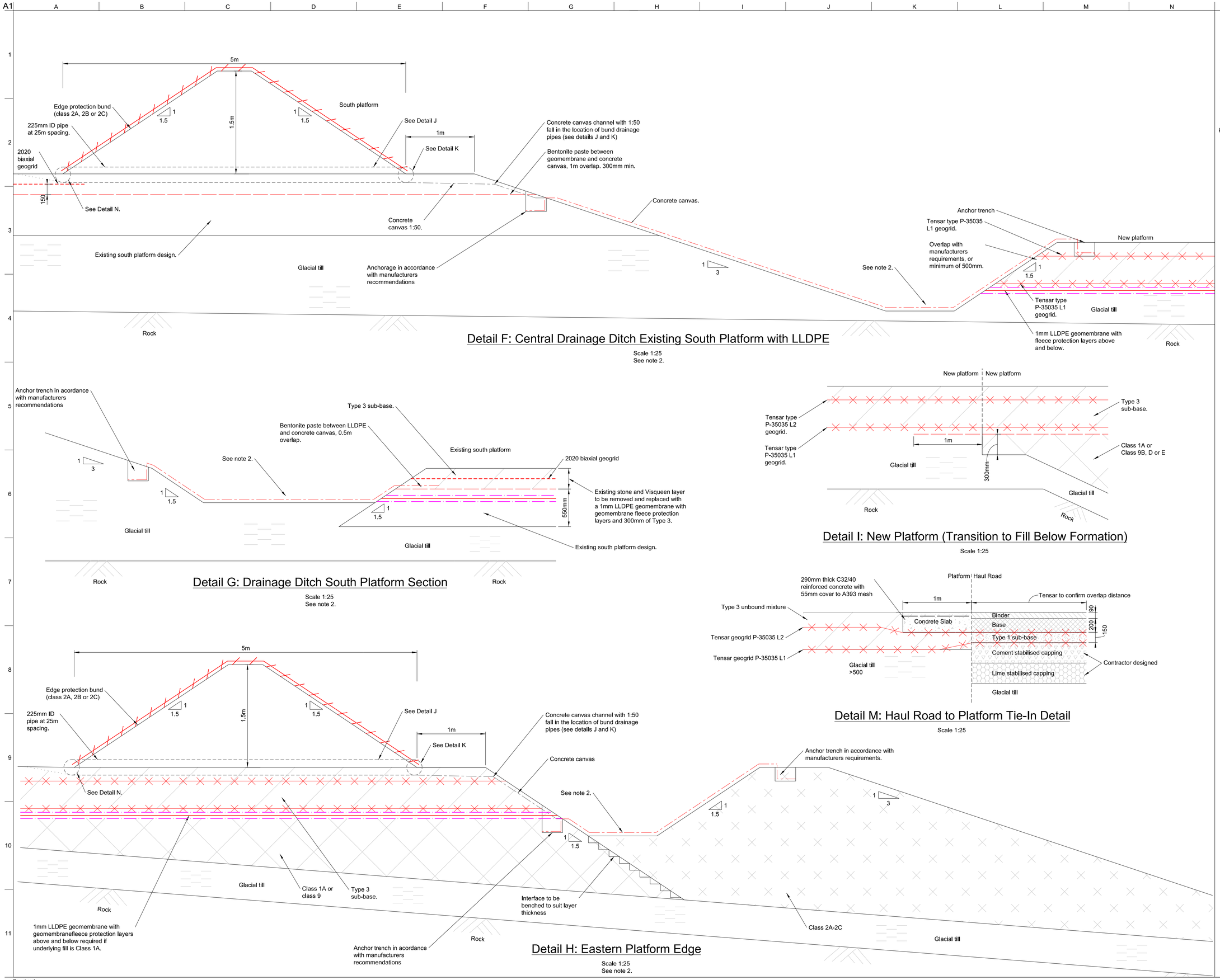

Detail F: Central Drainage Ditch Existing South Platform with LLDPE

Scale 1:25
See note 2.

Detail G: Drainage Ditch South Platform Section

Scale 1:25
See note 2.

Detail I: New Platform (Transition to Fill Below Formation)

Scale 1:25

Detail M: Haul Road to Platform Tie-In Detail

Scale 1:25

Detail H: Eastern Platform Edge

Scale 1:25
See note 2.

Notes:

1. Where glacial till is less than 500mm thick, geomembrane is to be provided at formation level. Glacial till thickness to be confirmed during construction with trial pits at 25m c/c.
2. Concrete canvas to be installed in accordance with the manufacturers guidance.
3. Formation soft spots to be excavted and replaced with compacted 6F1.
4. Edge protection bund to be hydroseeded.
5. LLDPE geomembrane to be double hot wedge welded and protected above and below by geotextile protection fleece. Refer to specification for protection fleece requirements.

Key:

- Tensar geogrid
- Existing geogrid
- 1mm LLDPE geomembrane
- Existing impermeable membrane
- Concrete canvas (CC8 or equivalent approved)
- Terram 1000
- Erosion protection netting (Terracoir 400 or equivalent approved)
- 300g/m² Geomembrane protection fleece to GRI12 (Wrekin Multitrack SNW 40UV or equivalent approved)
- 400g/m² Geomembrane protection fleece to GRI12 (Wrekin Multitrack SNW 50SP or equivalent approved)
- 2020 biaxial geogrid (Wrekin E'grid 2020 or equivelant approved)
- 225mm ID drainage pipe
- Type 1 unbound mixture (clause 803)
- Type 3 unbound mixture (clause 805)
- Class 1A
- Class 2A - 2C
- Class 6F1
- Class 6H
- Glacial till
- Rock
- Cement stabilised capping
- Lime stabilised capping
- Concrete slab with mesh

Issue	Date	By	Chkd	Appd
0	31/03/17	TC	CW	AH
	Issue for Planning			
A	30/03/17	TC	CW	AH
	Draft			

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Job Title
Woodsmith Mine

Earthworks Sections
Tie-in Details
Sheet 2 of 2

Scale at A1 1:50

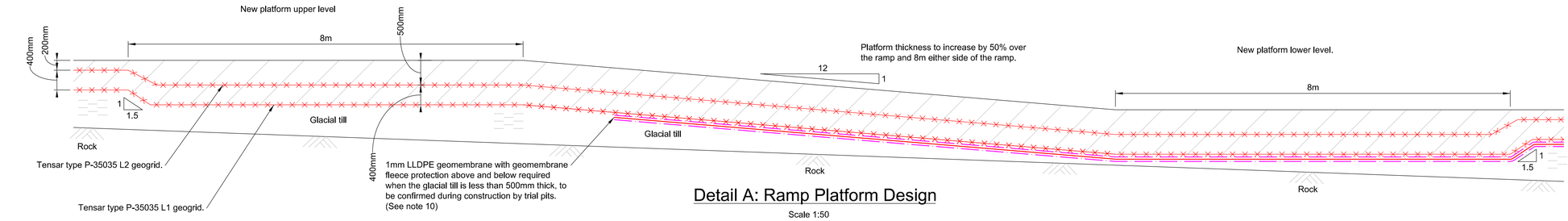
Discipline Earthworks

Job No 253285

Drawing Status **Planning**

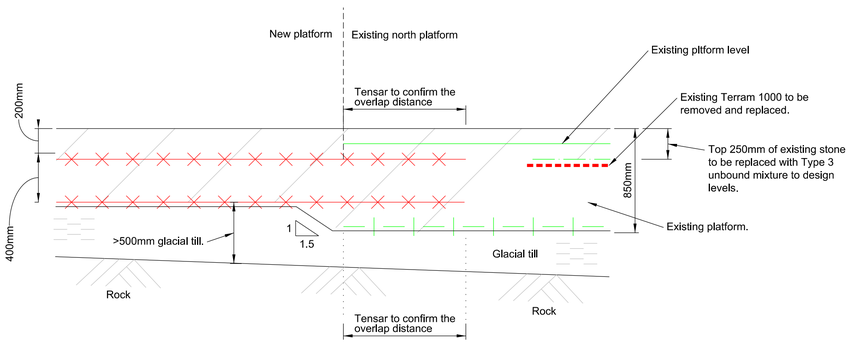
Drawing No **40-ARI-WS-71-CI-DR-1061**

Issue **0**



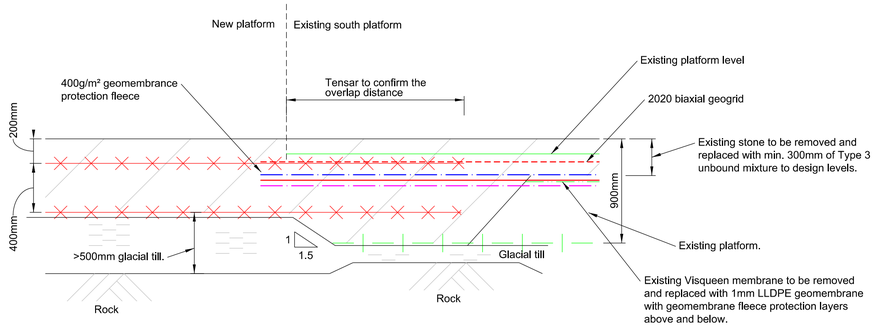
Detail A: Ramp Platform Design

Scale 1:50



Detail B: Existing North Platform Tie-in

Scale 1:25

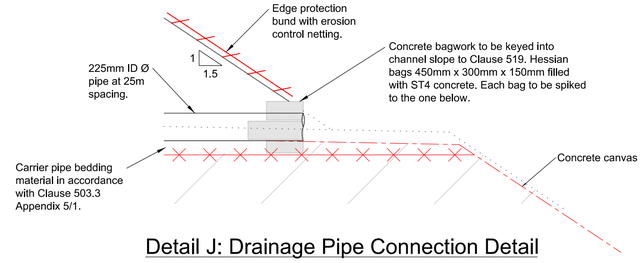


Detail C: Existing South Platform and Tie-In

Scale 1:25

Detail D: Drainage Ditch West WS Platform and LLDPE

Scale 1:25
See note 2.

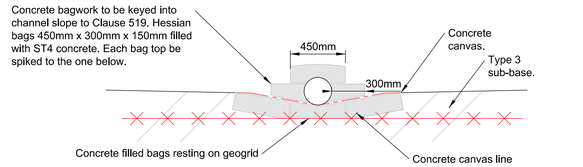


Detail J: Drainage Pipe Connection Detail

Scale 1:25

Detail E: Drainage Ditch Central Slope and LLDPE

Scale 1:25
See note 2.



Detail K: Drainage Pipe Headwork detail.

Notes:

1. Where glacial till is less than 500mm thick, geomembrane is to be provided at formation level. Glacial till thickness to be confirmed during construction with trial pits at 25m c/c.
2. Concrete canvas to be installed in accordance with the manufacturers guidance.
3. Formation soft spots to be excavted and replaced with compacted 6F1.
4. Edge protection bund to be hydroseeded.
5. LLDPE geomembrane to be double hot wedge welded and protected above and below by geotextile protection fleece. Refer to specification for protection fleece requirements.

Key:

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- Existing geogrid
- 1mm LLDPE geomembrane
- Existing impermeable membrane
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- 300g/m² Geomembrane protection fleece to GRI12 (Wrekin Multitrack SNW 40UV or equivalent approved)
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- 225mm ID drainage pipe
- Type 1 unbound mixture (clause 803)
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- Class 2A - 2C
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- Class 6H
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- Rock
- Cement stabilised capping
- Lime stabilised capping
- Concrete slab with mesh

Issue	Date	By	Chkd	Appd
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Client
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Job Title
Woodsmith Mine

Earthworks Sections
Tie-in Details
Sheet 1 of 2

Scale at A1 1:50

Discipline Earthworks

Job No 253285

Drawing Status Planning

Drawing No 40-ARI-WS-71-CI-DR-1060

Issue 0

A1

N

B 1416

Existing drainage ditch.

Discharge from dewatering system to existing ditch.

Existing drainage pipe.

Dewatering system discharge to existing drainage pipe.

Notes:

1. Dewatering during phase 3 to a maximum of 3m below platform level.

Key:

- Approximate location of dewatering wells. Actual number and location to be determined by specialist dewatering contractor.
- Temporary dewatering pipeline
- Existing culvert

Issue	Date	By	Chkd	Appd
0	31/03/17	JB	CW	AH
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	Draft			
A	07/03/17	JB	CW	AH
	Draft Issue			

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Client
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Job Title
Woodsmith Mine
Proposed Minehead

Woodsmith Mine
Construction Phase 3
Platform Dewatering
Infrastructure

Scale at A1 1:1250

Discipline Civil

Job No 253285

Drawing Status Planning

Drawing No 40-ARI-WS-71-CI-DR-1058

Issue 0

Do not scale

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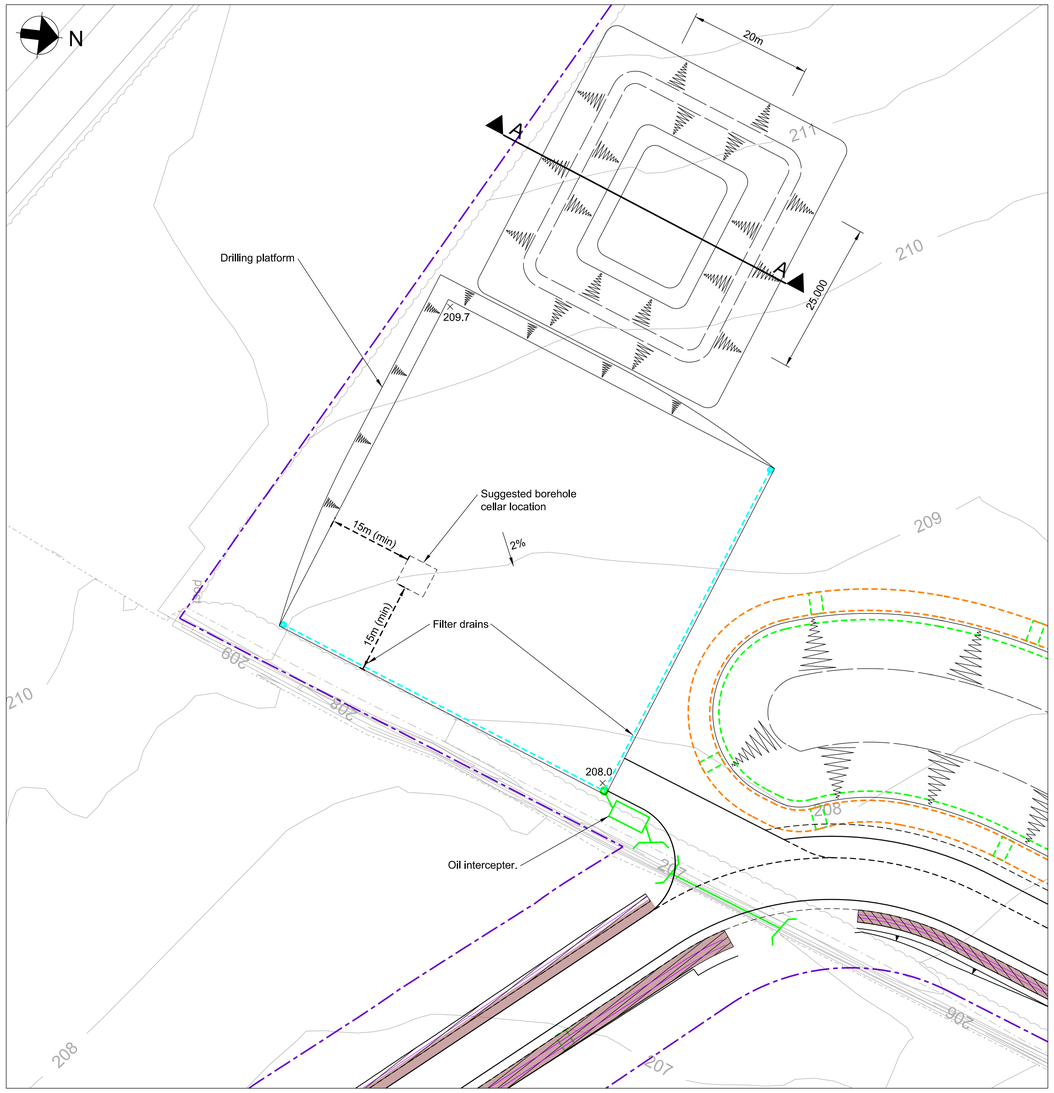
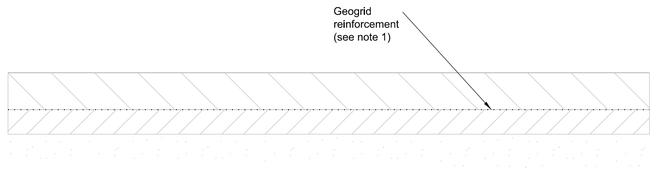


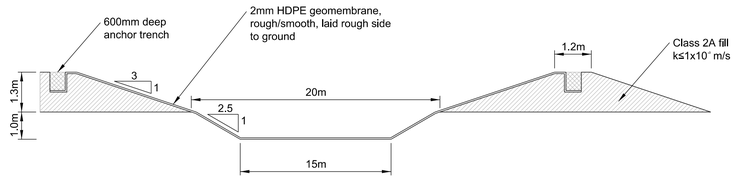


Recharge Borehole Drilling Platform Typical Detail

Not to scale

Notes:

1. Geogrid reinforcements in accordance with Tensar design P35035.
2. LLDPE liner to be placed at formation level if thickness of glacial till is less than 0.5m to be established by trial pits. Liner to be laid on smooth formation free from stones or roots that could drainage the membrane. Liner to be protected by a geomembrane liner protection geotextile with a mas/m² > 300 g/m².

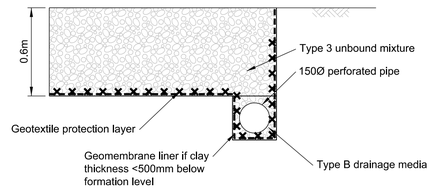


Typical Section through Saline Water Storage Lagoon (A-A)

Not to scale

Notes:

1. Geomembrane to be fully welded using double hot wedge welding technique.
2. All welds to be air pressure tested.
3. Repairs / details to be extrusion welded.
4. All extrusion welds to be vacuum box tested.
5. Geomembrane to comply with GRI standard GM13.
6. Start up weld testing to be carried out in accordance with LFE5 - Using geomembranes in landfill engineering, Appendix A, published by the Environment Agency.
7. Geomembrane testing to be carried out in accordance with LFE5.
8. Formation to geomembrane to be smooth, free from stones, roots or other deleterious materials that may damage the geomembrane and free from sharp changes in level that exceed 10mm under a 1m straight edge.
9. Minimum thickness of clay beneath lagoon liner to be 1.0m



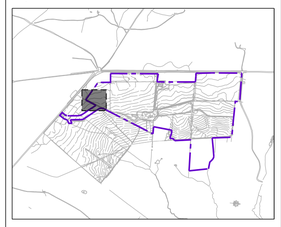
Typical section of filter drain

Not to scale

Notes:

1. Refer to details for notes.

Key Plan:



Issue	Date	By	Chkd	Appd
0	31/03/17	JB	CW	AH
	Issued for Planning			
B	30/03/17	JB	CW	AH
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A	07/03/17	JB	CW	AH
	Draft			

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Client
Sirius Minerals Plc

Job Title
Woodsmith Mine Development

Woodsmith Mine Site
Construction Phase 3
Reinjection Borehole
GA and details

Scale at A1 1:500

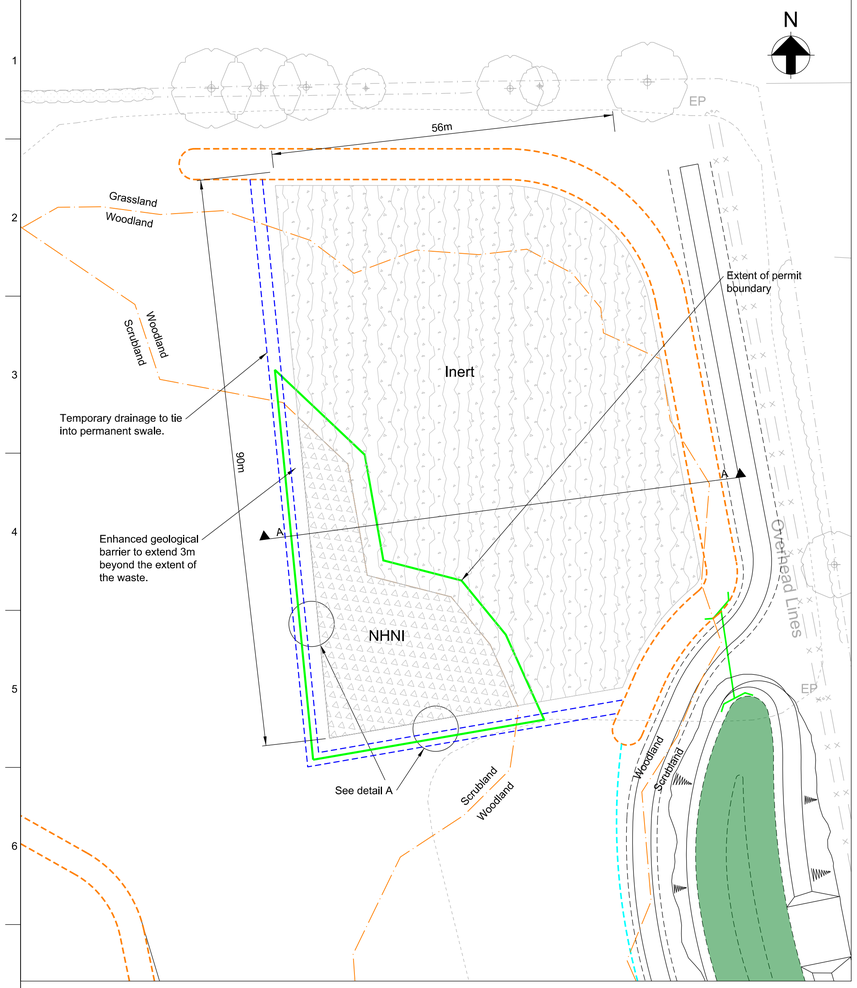
Discipline Civil

Job No **253285**

Drawing Status **Planning**

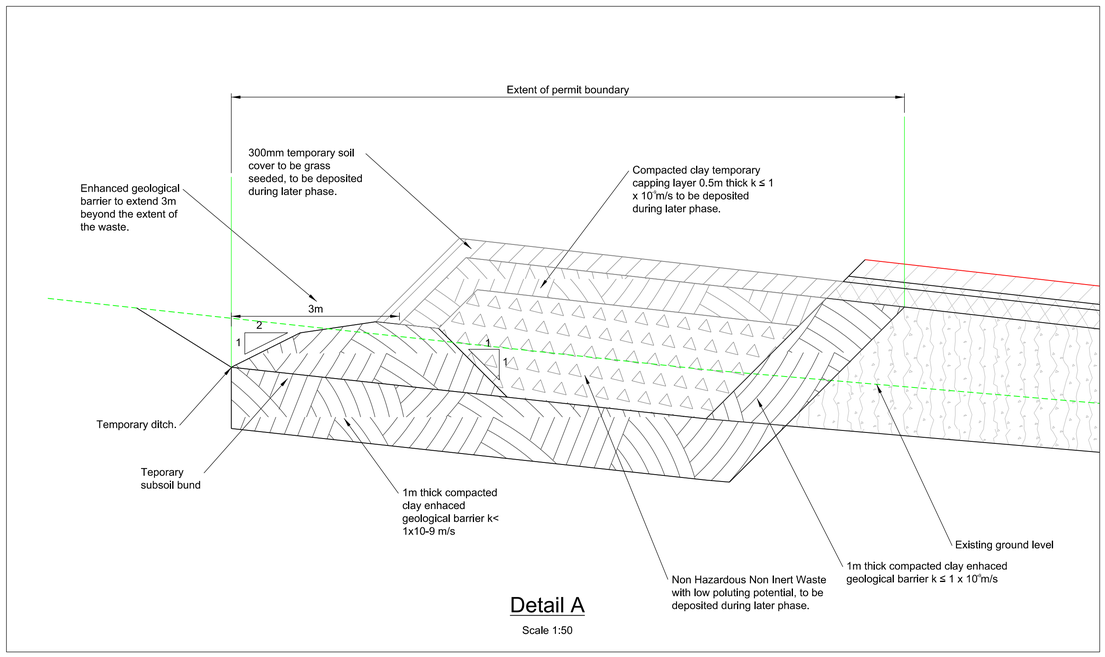
Drawing No **40-ARI-WS-71-CI-DR-1057**

Issue **0**



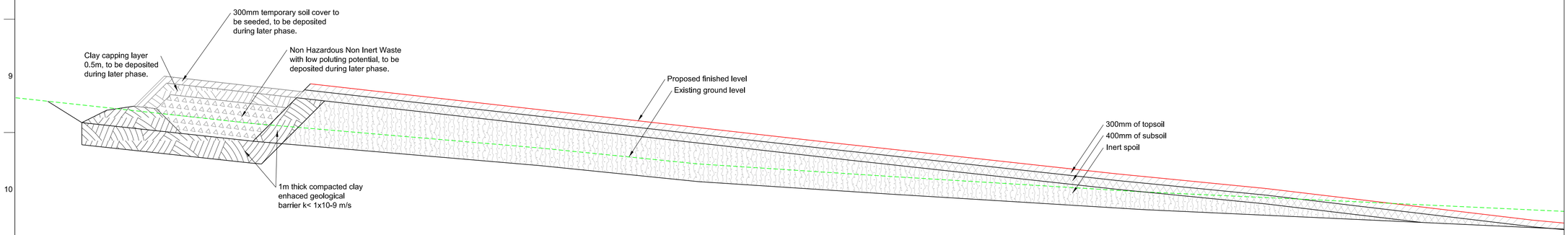
Plan

Scale 1:500



Detail A

Scale 1:50



Section A-A

Scale 1:100

Notes:

1. Restoration area designation from Estell Warren drawing 2309-MH03.
2. Restoration topsoil and subsoil thickness from 2322_landscape appendix1_doves nest farm_ rev00.
3. Contractor to manage surface water to minimise ponding and silt run off.
4. Only non-hazardous non-inert spoil with low polluting potential to be deposited within the storage area.
5. NHNI spoil to be compacted in layers not exceeding 300mm thick, 6 passes of a vibrating roller with mass = 3500kg/m width.

Volume within waste storage facility:

Inert	=	3,900 m³
NHNI	=	1,500m³

Key:

- Proposed GL
- Existing GL
- Permit boundary
- Enhanced geological barrier
- NHNI waste
- Inert waste
- Restoration soil
- Wetland

Issue	Date	By	Chkd	Appd
0	31/03/17	JB	CW	AH
	Issued for Construction			
C	30/03/17	JB	CW	AH
	Draft			
B	17/03/17	JB	TC	AH
	Draft			
A	10/03/17	KK	TC	AH
	Draft Issue			

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Client
Sirius Minerals Plc

Job Title
Woodsmith Mine

Woodsmith Mine Site
Phase 3 NHNI Store
General Arrangement

Scale at A1: As shown

Discipline: Drainage

Job No: 253285

Drawing Status: Planning

Drawing No: 40-ARI-WS-71-CI-DR-1055

Issue: 0

				Phase 2															Phase 3													
				Cut (m3)							Permanent Fill (m3)								Temporary Stockpiles		Cut (m3)				Permanent Fill (m3)								Temporary Stockpiles	
	Area	Location	Area m2	Top Soil		Subsoil		Existing Platform Material	Superficial / Clay		Top Soil	Sub Soil	Tip	Superficial / Clay	Existing Platform	Type 1 (Import)	Platform Construction Class 1A (Import)	Platform Construction Type 3 (Import)	Bituminous Surfacing		Comments3	Top Soil	Sub Soil	Superficial / Inert	Clay	Top Soil	Sub Soil	Superficial	Clay	Platform Construction Class 1A (Import)	Type 1 (Import)	Platform Construction Type 3 (Import)	Bituminous Surfacing	
				To Tip	Reuse	To Tip	Reuse		To Tip	Reuse / Clay																							
A	1	North Platform	3,055	611		1,528		917	4,780									1,315			0.3m depth of existing platform to be removed and new construction provided on top. It is assumed that top, sub and sperficial soil cut volumes from this area are currently stored in the landscaped bunds surrounding the northern platform.														
A	2	South Platform	5,360	1,072		2,680		1,340		5,580								2,080			0.25m depth of existing platform to be removed and new construction provided on top. Assumes all material previously stripped from this area is stockpiled in Area 9.			8,454										
A	3	Middle Extension	3,285		657		1,643			3,160								1,970															
A	3a	Upper Eastern Extension	3,560																			712	1,780	60				830			2,150		
A	4	North Extension	5,600		1,120		2,800			9,730								3,360															
A	5	East (Lower) Extension	22,240		4,448		11,120		6,330	1,900					2,257		13,000	13,350															
A	6	Slope	2,625		525		1,313			2,190	788						100																
A	7	Slope	4,835		967		2,418			990	1,451			4,720																			
A	8	Slope	1,665		333		833			1,100	500			200			110																
B	9	Vent Shaft Platform	13,800																			2,760	6,900	21,930							7,000		
C	10	Laydown Area	12,000																			2,400	6,000	366				3,110			6,000		
C	11a	Laydown Area	10,000																			2,000	5,000	525				2,100			4,320	680	
C	11b	Laydown Area	14,000																			2,800	7,000	5,650				4,800			6,850	150	
C	12	Laydown Area	12,100																			2,420	6,050	6,508				400			6,050		
D	13	Access Road	7,300		1,460		3,650			1,227				5,580		1,700			1,600		Assume 30% of area top soiled												
E	14	Recharge Well	3,600																			720	1,800								2,160		
F	15	Access Tracks	6,520																			1,304	3,260					1,200		1,200			
G	16	Attenuation Ponds (Ph2)	7,600		1,520					2,323	2,290			3,963																			
G	17	Attenuation Ponds (Ph3)																				4,926		4,926				14,400					
H	18	Bund A	5,500		1,100		2,750				310	1,245	18,616								Assumed Scrub planting for basis of restoration soils thickness.												
	20	Spoil Disposal Area	4,800																			960	2,400										
I	21	Inert Bund	8,400																			1,680											
I	22	Temp Top Soil Bund 1	5,790		1,158													8,779															6,377
I	23	Temp Sub Soil Bund 1	6,400		1,280													21,177															
I	24	Temp Top Soil Bund 2	2,400		480													3,631															720
I	25	Temp Sub Soil Bund 2	2,700		540													9,510															
I	26	Temp Top Soil Bund 3	3,800																			760											12,000
I	27	Temp Sub Soil Bund 3	3,700																			740											35,881
I	28	Clay Stockpile	7,160		1,432													24,730															
Total			189,795	1,683	17,020	4,208	26,525	2,257	11,110	28,200	5,338	1,245	18,616	14,463	2,257	1,700	13,210	22,075	1,600	67,827		24,182	40,190	48,419	0	0	0	26,840	0	0	1,200	34,530	830	54,978
				91,002							41,919					36,985			1,600	67,827		112,791				26,840				35,730		830	54,978

			Cut	Bulking	Cut (Total)	Fill	Stockpile
Cut	Top Soil	0.2	Top Soil	17,020	1.05	17,871	5,338	12,534
	Sub Soil	0.5	Sub Soil	26,525	1.10	29,178	1,245	27,933
Fill	Platform Construction	0.6	Superficial / Clay	28,200	1.10	31,020	14,463	16,557
	Road Construction	0.85	Existing Platform	2,257	1.00	2,257	2,257	-1
	Laydown Construction	0.2	Tip – Top Soil	1,683	1.05	1,767	18,616	0
			Tip – Sub Soil	4,208	1.10	4,628		
			Tip – Other (Inert	11,110	1.10	12,221		
			Total	91,002		98,941	41,919	57,023

	Cut	Bulking	Cut (Total)	Fill	Stockpile	Total In Stockpile
Top Soil	24,182	1.05	25,391	0	25,391	37,925
Sub Soil	40,190	1.10	44,209	0	44,209	72,142
Clay	0	1.10	0	0	0	16,557
Tip (inert material)	48,419	1.05	50,840	26,840	24,000	24,000
Total	115,265		122,660	5,086	117,574	184,076

Notes:

1. For the area locations refer to 40-ARI-WS-71-CI-DR-1053.
2. The volumes shown do not account for any additional granular material import that may be required by the contractor for the creation of temporary construction haul roads, in addition to those shown on this drawing.

Platform levels and material volumes are subject to confirmation and change.

Issue	Date	By	Chkd	Appd
0	31/03/17	JB	CW	AH
	Issue for Planning			
B	30/03/17	JB	CW	AH
	Draft			
A	07/03/17	JB	CW	AH
	Draft			

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Client
Sirius Minerals Plc

Job Title
Woodsmith Mine

Woodsmith Mine Site
Construction Phase 3
Earthworks Strategy
Volume Calculations

Scale at A1: As Shown
Discipline: Civil
Job No: 253285
Drawing Status: Planning
Drawing No: 40-ARI-WS-71-CI-DR-1054
Issue: 0