

Appendix B

Photos



1. General Overview



Photo B- 1.1 – View of Scrivener Dam from downstream



Photo B- 1.2 – Scrivener Dam looking towards left abutment



Photo B- 1.3 – View of area downstream



Photo B- 1.4 – View of area downstream from right abutment

2. Stilling Basing, Training Walls and Overflow section



Photo B- 2.1 – Photo of Overflow Section



Photo B- 2.2 – -Photo of Overflow Section



Photo B- 2.3 – -View of Chute blocks, apron and baffle piers



Photo B- 2.4 – View of Stilling Basin looking downstream (minor erosion downstream)



Photo B- 2.5 – Stilling Basin looking towards River



Photo B- 2.6 – Stilling Basin looking downstream and left



Photo B- 2.7 – Stilling Basin looking towards left side



Photo B- 2.8 – Stilling Basin looking downstream to Bay 1



Photo B- 2.9 – Stilling Basin looking towards chute blocks and baffles



Photo B- 2.10 – Internal Splitter Wall in Stilling Basin



Photo B- 2.11 – Stilling Basin divider/ splitter wall



Photo B- 2.12 – Internal Splitter Wall in Stilling Basin



Photo B- 2.13 – Left downstream spillway training wall



Photo B- 2.14 – Left Spillway Training Wall



Photo B- 2.15 – Right downstream spillway training wall



Photo B- 2.16 – Right Spillway Training Wall



Photo B- 2.17 – Right downstream spillway training wall



Photo B- 2.18 – Downstream view of top of right training wall looking towards stilling basin



Photo B- 2.19 – Right downstream spillway training wall from Top



Photo B- 2.20 – Downstream end of Bay 1



Photo B- 2.21 – Looking along End Sill



Photo B- 2.22 – Looking left along end sill



Photo B- 2.23 – Typical cracking Bay 4



Photo B- 2.24 – Typical Cracking Bay 1



Photo B- 2.25 – Typical Crack Bay 4 and 5



Photo B- 2.26 – End sill Cracking



Photo B- 2.27 – View of Chute blocks, apron and baffle piers and Spillway Gate

3. Outlet Works



Photo B- 3.1 – Sluice Outlet Chute Block



Photo B- 3.2 – Sluice Outlet



Photo B- 3.3 – Sluice in Operation



Photo B- 3.4 – Sluice Outlet

Appendix C

Comments-response register

Scrivener Dam Stilling Basin Upgrade

Comments-Response Register

Issue Date 20/08/2021



INCORPORATION STATUS		REVIEWER ACCEPTANCE	
1	OPEN (GHD has not closed out the issue)	1	NOT ACCEPTED
2	IN PROGRESS (GHD to provide further clarification or amend documentation)	3	ACCEPTED
4	NEXT PHASE (item to be addressed in subsequent phases)		
3	CLOSED (issue fixed by GHD)		

Comment #	Document Reference	Chapter/ Section Reference	NCA/ Peer Reviewer Comment	NCA Comment Date	GHD Comment/ Response	GHD Response Date	Status	NCA/ Reviewer Acceptance
1	Design Criteria	Consultant Brief - Section 4			GHD suggests that the Design Criteria is tabulated. A suggested format has been provided.	20/08/2021	1	
2	Design Criteria	Consultant Brief - Section 4			It is suggested that relevant codes and guidelines are added to the Design Criteria	20/08/2021	1	
3	Design Criteria	Consultant Brief - Section 4			It is suggested that the structural design criteria is added to the Design Criteria (e.g. stilling basin must meet stability and structural strength requirements)	20/08/2021	1	
4	Design Criteria	Consultant Brief - Section 4			It is recommended that operational and maintenance requirements are added to the Design Criteria	20/08/2021	1	
5	Design Criteria	Consultant Brief - Section 4			It is recommended that a review be undertaken on the requirement for fish passage	20/08/2021	1	
6	Design Criteria	Consultant Brief - Section 4			It is recommended that regulatory requirements are added to the Design Criteria	20/08/2021	1	
7	Design Criteria	Consultant Brief - Section 4			It appears that the proposed flood loading recommended in the original Design Criteria is slightly different to that proposed in the ANCOLD Guidelines for Gravity Dams and the AFC guidelines. We have made proposed changes to these loads.	20/08/2021	1	

Appendix D

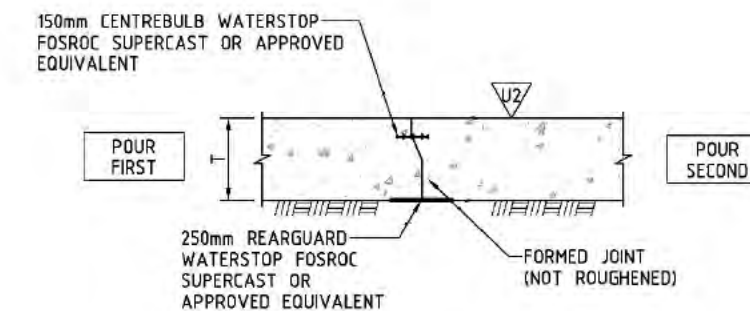
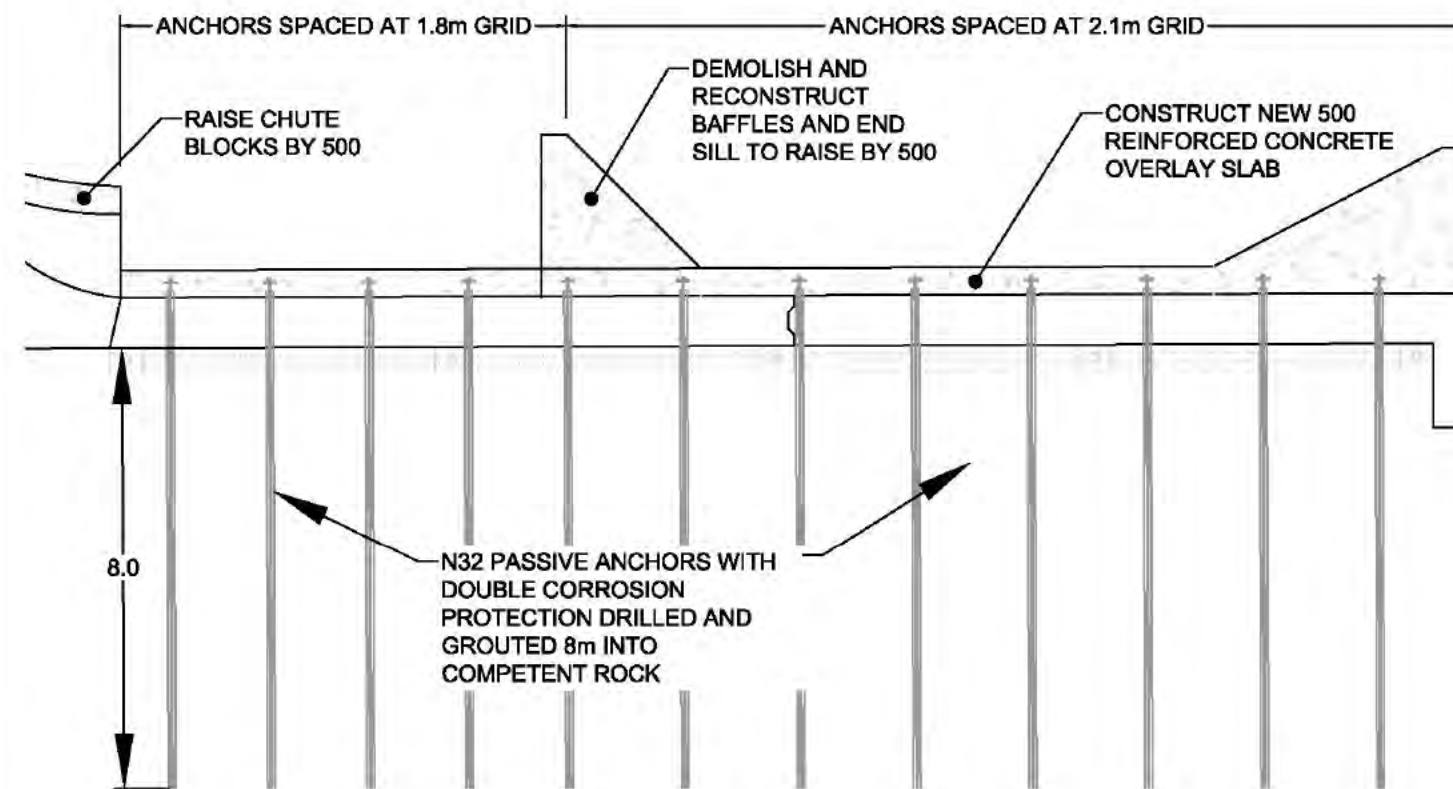
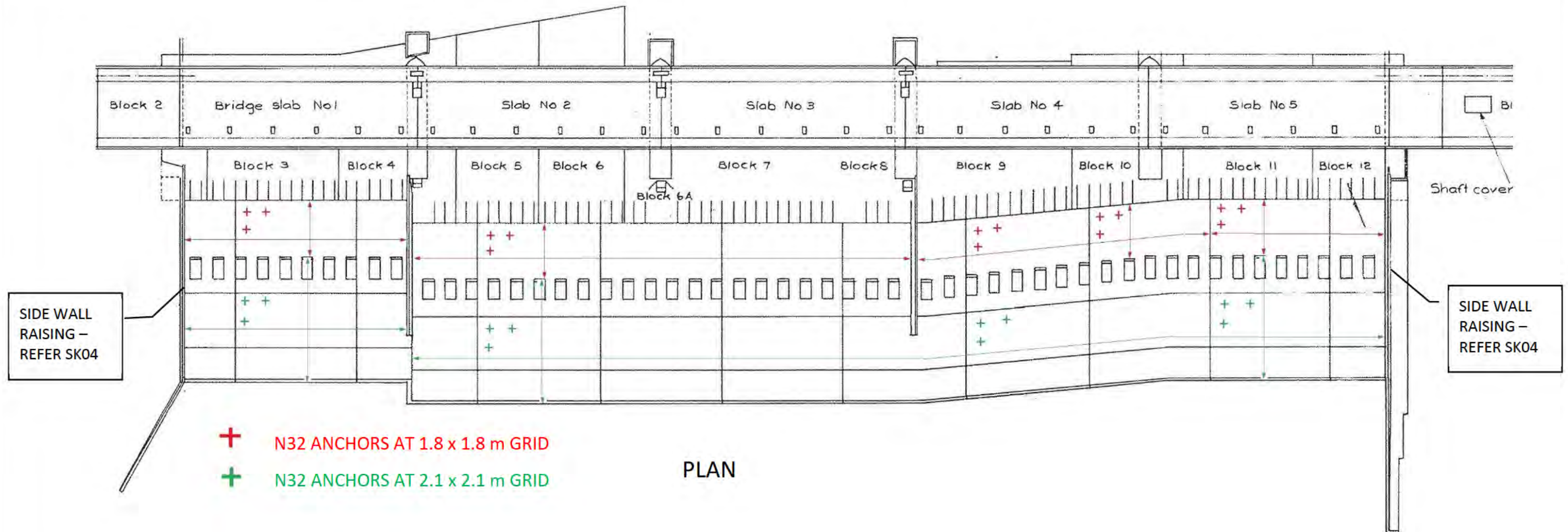
Option Identification Workshop Minutes

Appendix B

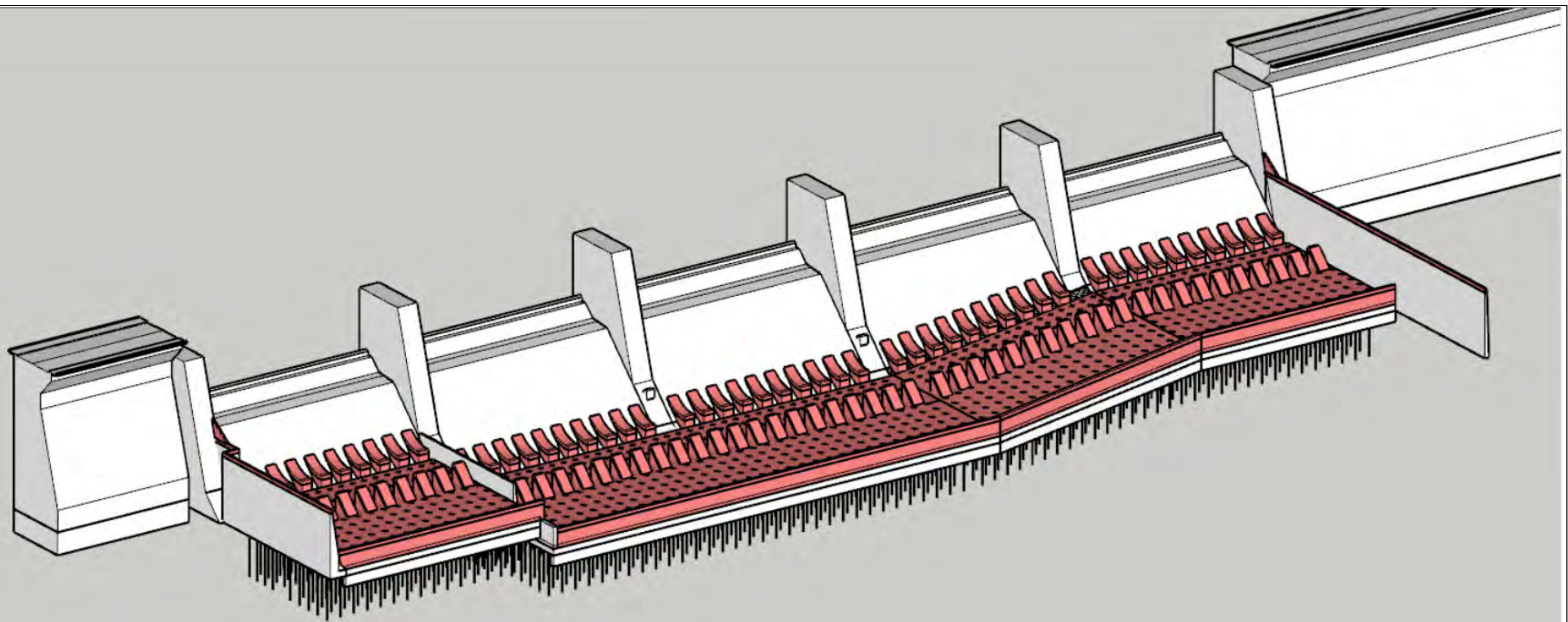
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Appendix E

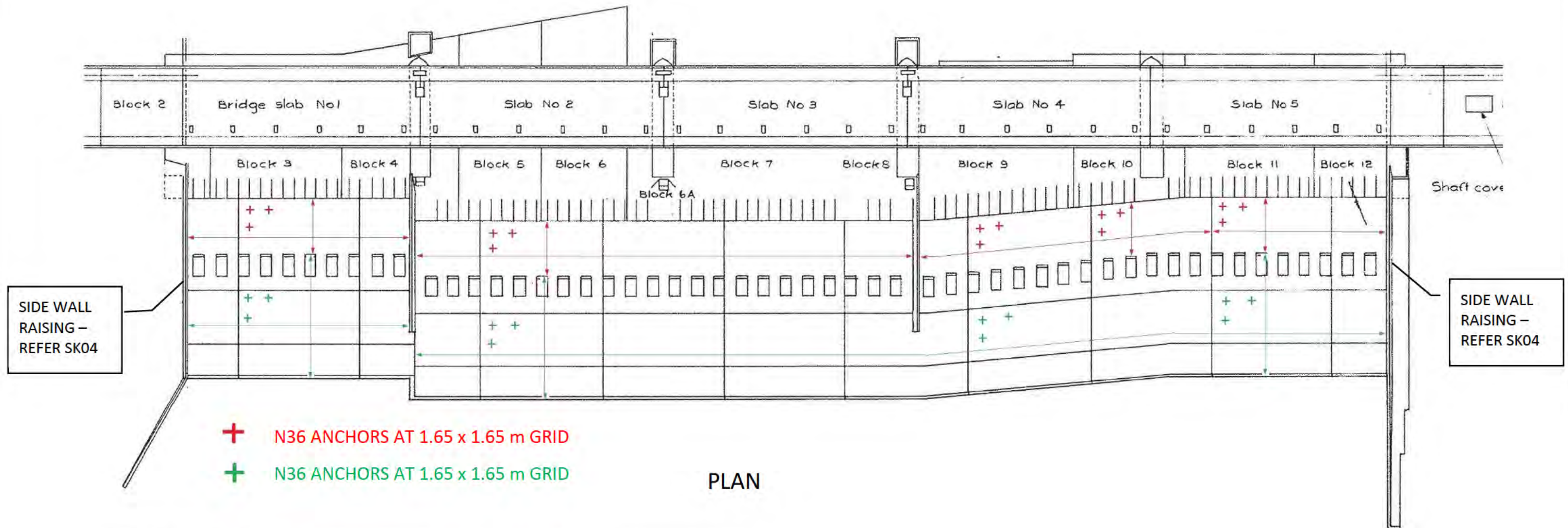
Option Sketches



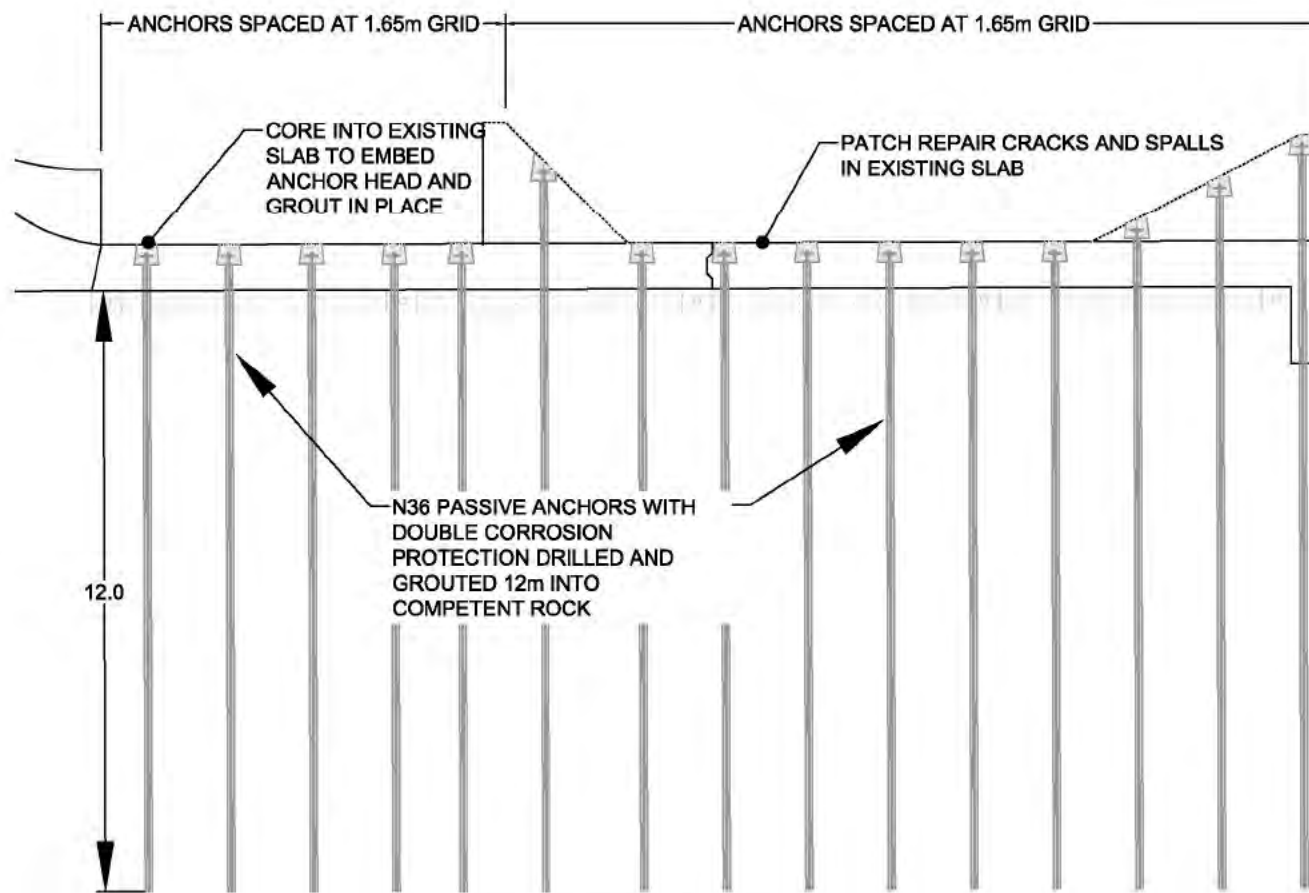
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	OPTION 3 – OVERLAY SLAB WITH ANCHORS		FOR DISCUSSION
			REVISION 1
			DATE 160921



	SCRIVENER DAM STILLING BASIN UPGRADE PROJECT		SK01-2
	OPTION 3 – OVERLAY SLAB WITH ANCHORS		FOR DISCUSSION
			REVISION 1
			DATE 160921



PLAN



TYPICAL SECTION



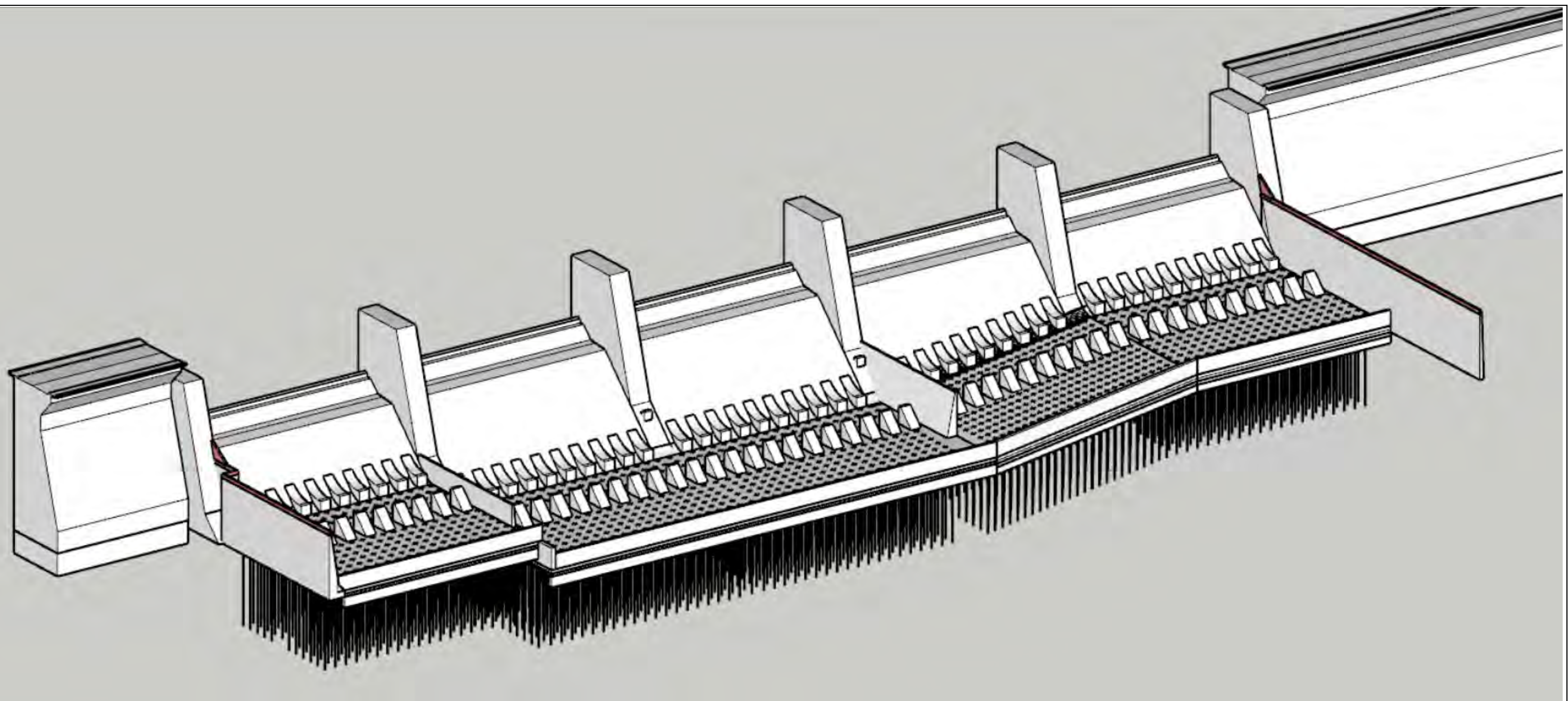
SCRIVENER DAM STILLING BASIN
UPGRADE PROJECT
OPTION 4 – RETROFIT
ANCHORS

SK02-1

FOR DISCUSSION

REVISION 1

DATE 160921



**SCRIVENER DAM STILLING BASIN
UPGRADE PROJECT**

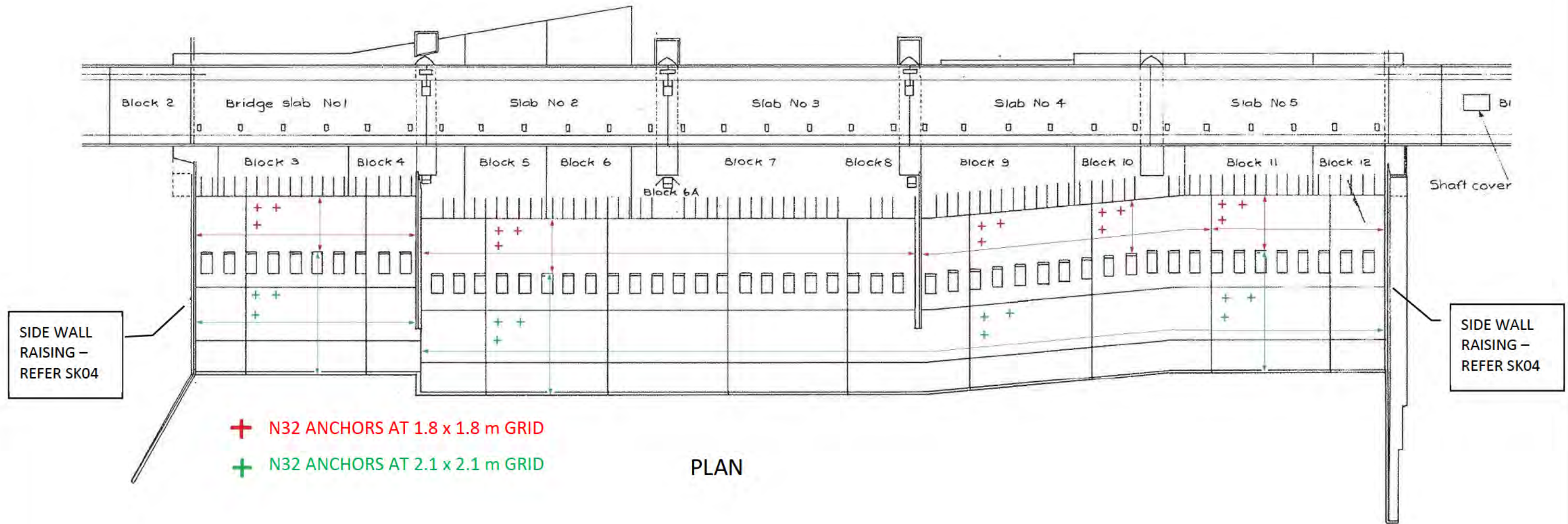
**OPTION 4 – RETROFIT
ANCHORS**

SK02-2

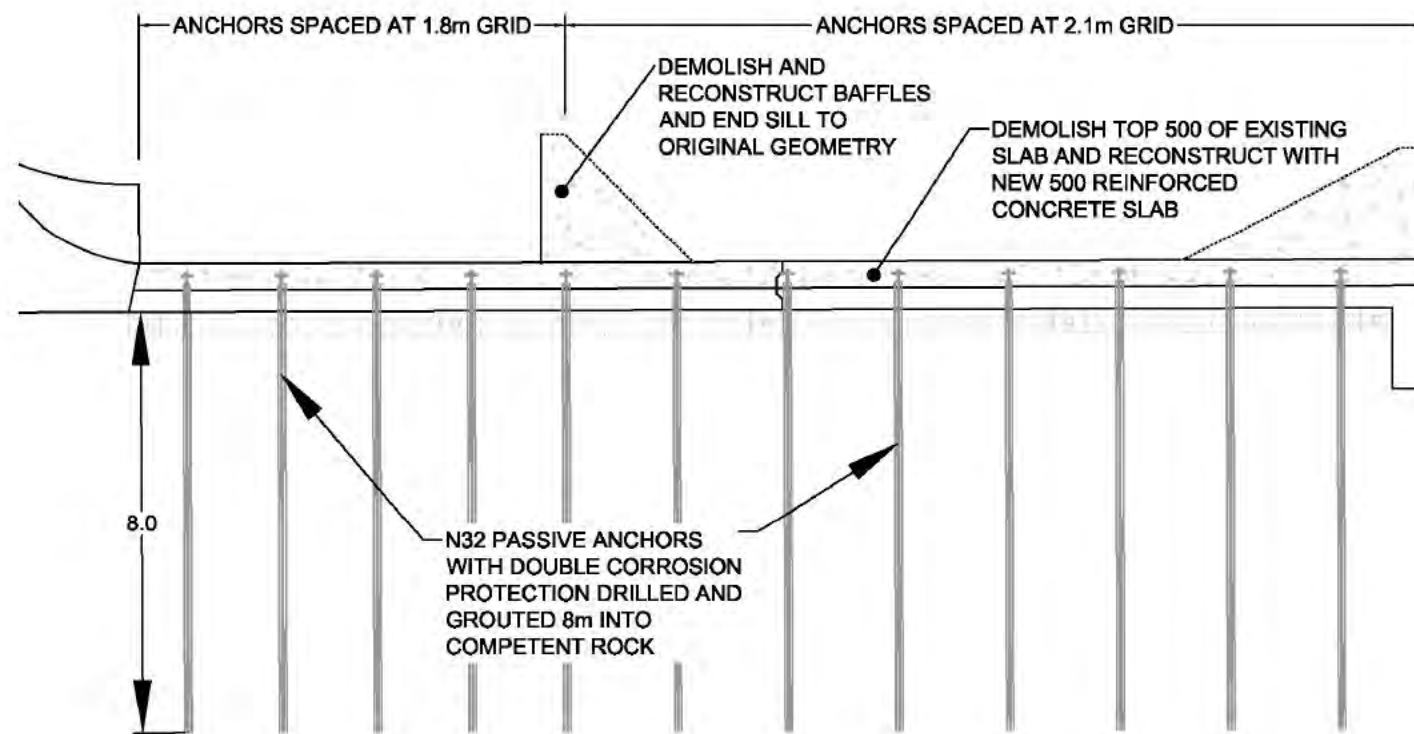
FOR DISCUSSION

REVISION 1

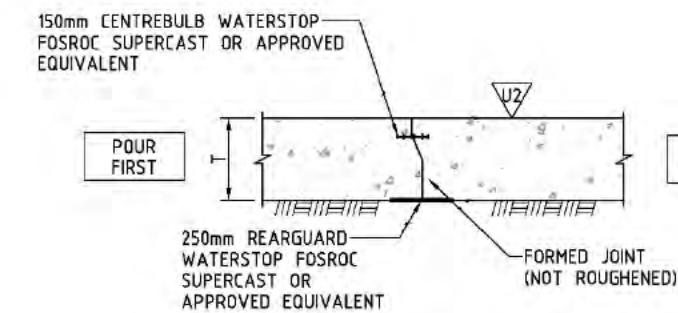
DATE 160921



PLAN

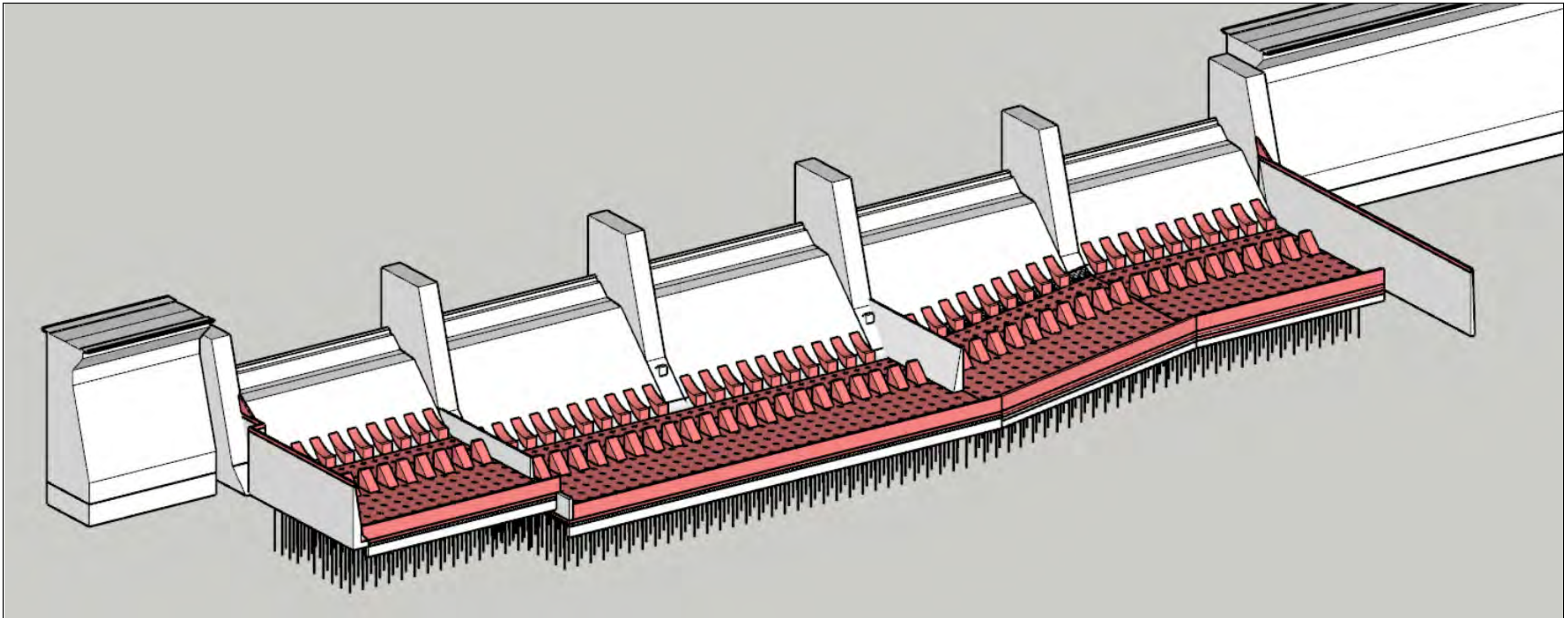



TYPICAL SECTION

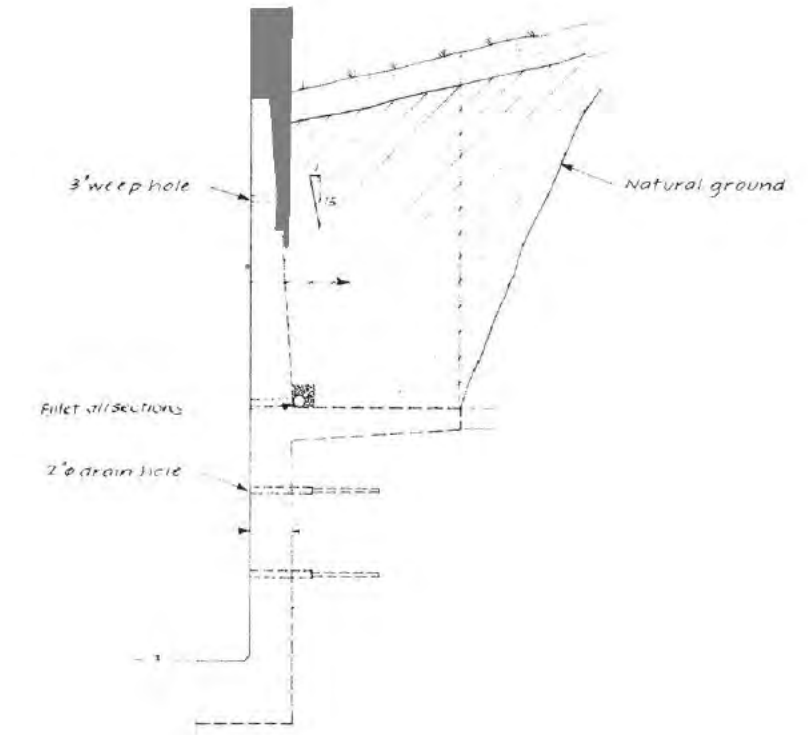
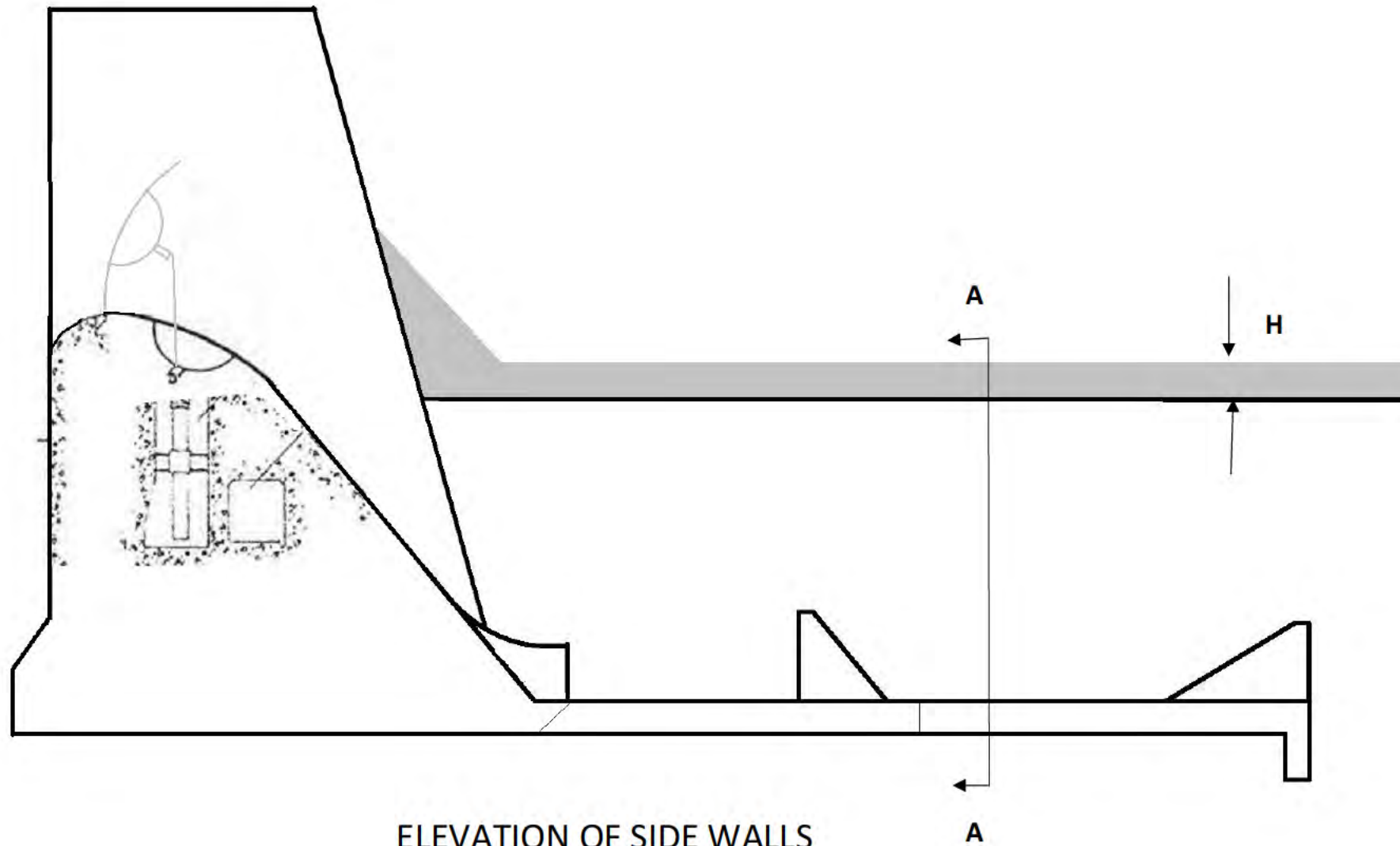


CONTRACTION JOINT

	SCRIVENER DAM STILLING BASIN UPGRADE PROJECT		SK03-1
	OPTION 9 – DEMOLISH AND REBUILD ANCHORED SLAB		FOR DISCUSSION
			REVISION 1
			DATE 160921



	SCRIVENER DAM STILLING BASIN UPGRADE PROJECT		SK03-2
	OPTION 9 – DEMOLISH AND REBUILD ANCHORED SLAB		FOR DISCUSSION
			REVISION 1
			DATE 160921



SECTION A-A



APPROXIMATE EXTENTS OF WALL RAISING

Option	Height of Wall Raising (H) - m	Comments
Option 3	2.2	Allows for 0.5m raising of invert of stilling basin plus containment of 1 in 1,000 AEP flood
Option 4	1.7	To contain 1 in 1000 AEP flood
Option 9	1.7	To contain 1 in 1000 AEP flood



**SCRIVENER DAM STILLING BASIN
UPGRADE PROJECT
SIDE WALL RAISING**

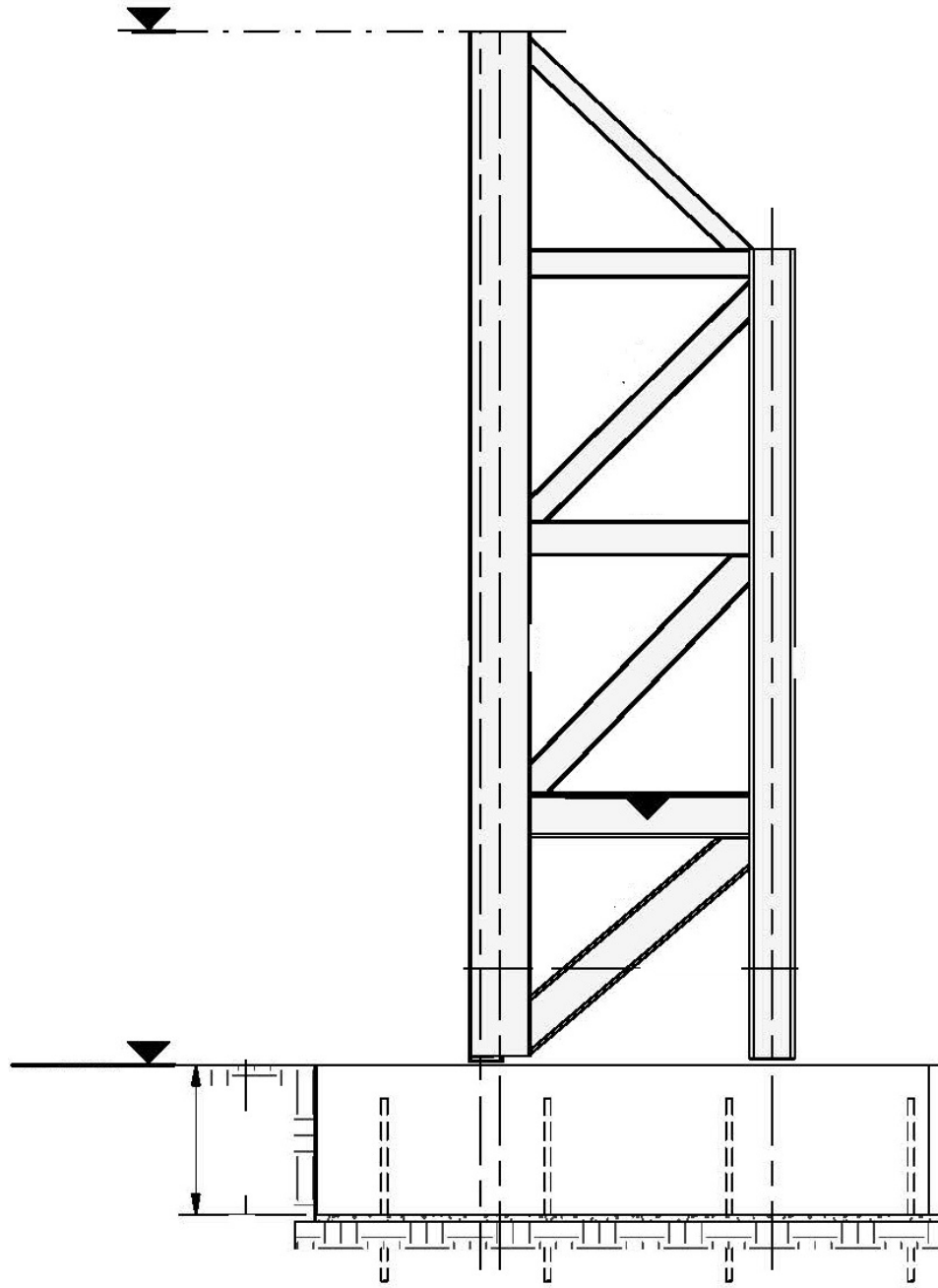
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FOR DISCUSSION

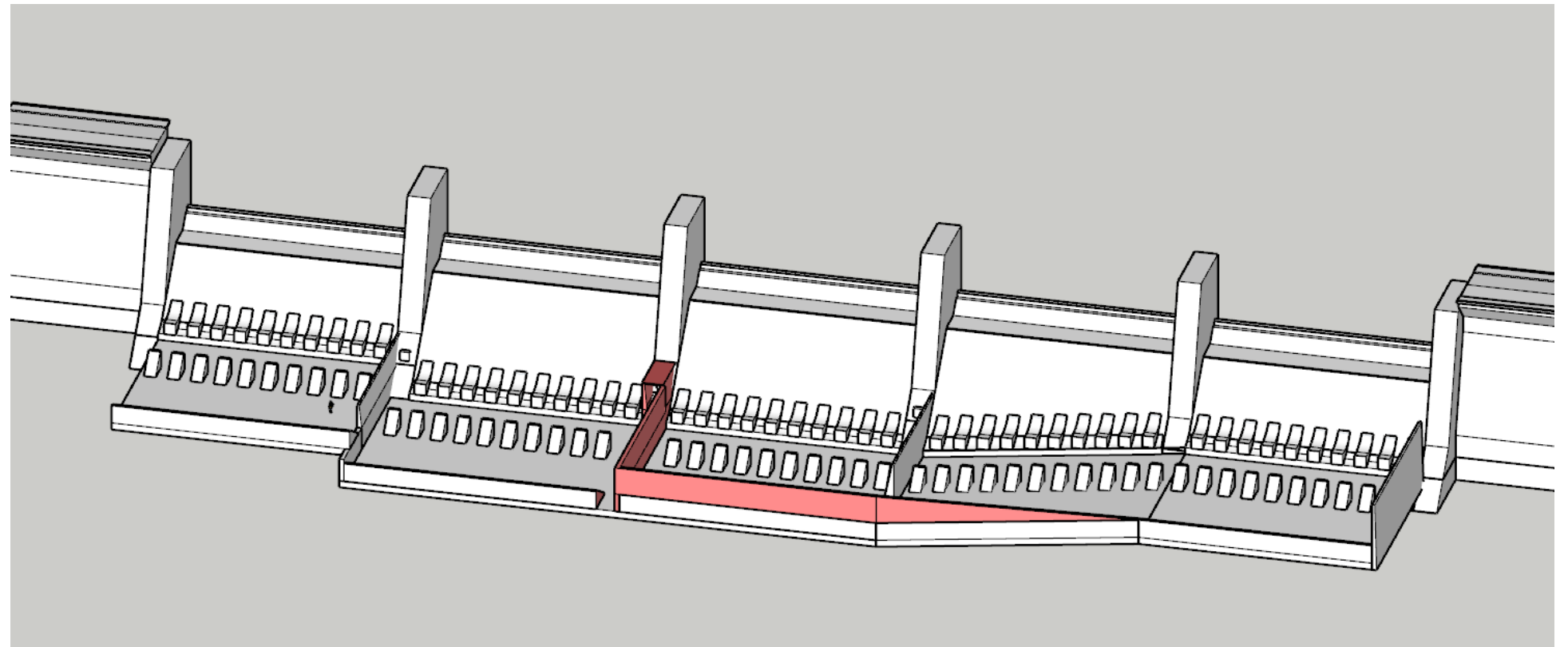
REVISION 1

DATE 160921

c



TYPICAL SECTION – STEEL COFFERDAM



ISOMETRIC VIEW OF COFFERDAM

	SCRIVENER DAM STILLING BASIN UPGRADE PROJECT COFFERDAM	SK05
		FOR DISCUSSION
		REVISION 1
		DATE 160921

Appendix F

Preliminary Construction Program

Page 1

Appendix G

Concept Screening Cost Estimates

Appendix H

Multi-Criteria Assessment

National Capital Authority—Scrivener Dam Dissipator Strengthening project
Submission 1 - Attachment 4

	Criteria	Weighting	Rank	1 Project Costs	2 OPEX	3 Robust & Durable Solution (beyond design criteria)	4 Benefits on Dam Safety	5 Construction simplicity/ complexity	6 Flood Management during Construction	7 Maintenance Requirements	8 Surveillance and Operation	9 Social and Environmental Impacts	10 OH&S Safety
1	Project Costs	7.3%	6	Project Costs	Project Costs	Robust & Durable Solution (beyond design criteria)	Benefits on Dam Safety	Construction simplicity/complexity	Flood Management during Construction	Project Costs	Project Costs	Social and Environmental Impacts	OH&S Safety
2	OPEX	7.3%	6		OPEX	OPEX	Benefits on Dam Safety	Construction simplicity/complexity	Flood Management during Construction	OPEX	OPEX	Social and Environmental Impacts	OH&S Safety
3	Robust & Durable Solution (beyond design criteria)	9%	5			Robust & Durable Solution (beyond design criteria)	Benefits on Dam Safety	Robust & Durable Solution (beyond design criteria)	Robust & Durable Solution (beyond design criteria)	Maintenance Requirements	Robust & Durable Solution (beyond design criteria)	Social and Environmental Impacts	OH&S Safety
4	Benefits on Dam Safety	18%	1				Benefits on Dam Safety	Benefits on Dam Safety	Benefits on Dam Safety	Benefits on Dam Safety	Benefits on Dam Safety	Benefits on Dam Safety	Benefits on Dam Safety
5	Construction simplicity/ complexity	2%	9					Construction simplicity/ complexity	Flood Management during Construction	Maintenance Requirements	Construction simplicity/complexity	Construction simplicity/complexity	OH&S Safety
6	Flood Management during Construction	13%	3						Flood Management during Construction	Flood Management during Construction	Flood Management during Construction	Flood Management during Construction	OH&S Safety
7	Maintenance Requirements	7%	6							Maintenance Requirements	Maintenance Requirements	Social and Environmental Impacts	OH&S Safety
8	Surveillance and Operation	2%	9								Surveillance and Operation	Social and Environmental Impacts	OH&S Safety
9	Social and Environmental Impacts	11%	4									Social and Environmental Impacts	OH&S Safety
10	OH&S Safety	16%	2										OH&S Safety
Count				4	4	5	10	1	7	4	1	6	9
Weighting				7.3%	7.3%	9.1%	18.2%	1.8%	12.7%	7.3%	1.8%	10.9%	16.4%
Ranking				6	6	5	1	9	3	6	9	4	2

			Option 3 Overlay slab with anchors and waterstops			Option 4 Retrofitting Anchors in existing slab, and retrofitting waterstops			Option 9 Partial demolition of existing slab, new anchors and rebuilding to original geometry			Comments
Block	Item	Criteria	Score	Score (visual)	Weighted score	Score	Score (visual)	Weighted score	Score	Score (visual)	Weighted score	
A - Cost	1	Project Costs	5	■■■■■	3.64	7	■■■■■■■	5.09	3	■■■	2.18	Option 3 is the average price. Option 4 is about 50% cheaper. Option 9 is about 40% more expensive Option 3 and 9 likely to have similar operating costs. Concern that Option 4 is not as robust and will therefore require more frequent inspection. Option 3 and 9 considered similar. Option 3 has greater total slab thickness creating greater redundancy against erosion/scour, but Option 9 retains original geoemetry so potentially improves dissipation performance. Option 4 has concerns regarding detail around anchor embedment (corrosion potential?) and does not address existing cracks in slab. All options considered similar. None improve safety of the dam (beyond the inherent stilling basin upgrade) and none reduce the dam safety. Complex details are likely to be required to construction the anchor head in Option 4, so this option is marked slightly less than Option 3. Option 9 requires extensive demolition which will be slow and will require specialised contractors to demolish and deal with environmental impacts. Option 4 will be fast to construct and has less components which could be damaged during a flood. Option 3 is similar to Option 4 but will require concrete surface prep and reo cages which could get damaged in an overtopping event. Option 9 requires partial demolition of slab - there is concern that the remaining slab will not be sufficiently robust to withstand uplift pressures and damage due to an overtopping event. Option 3 and 9 likely to have similar maintenance costs (both have 100 year design life). Option 4 uses existing slab which is already 60 years into its design life - it is likely to require more ongoing maintenance as a result. Option 4 considered to have less impacts than Option 3 as it is likely to be faster and requires less bulk materials. Option 9 is significantly worse than others as it requires extensive demolition which has potential environmental impacts (noise, vibration, dust, construction duration longer etc). Option 3 involves standard process with standard OH&S issues managed through normal processes. Option 4 considered to have slightly improved OH&S risks as there are less construction activities. Option 9 considered to have greater OH&S risks due to additional work activities (demolition, more moving vehicles, longer duration).
	2	OPEX	5	■■■■■	3.64	2	■■	1.45	5	■■■■■	3.64	
B - Technical Merits	3	Robust & Durable Solution (beyond design criteria)	6	■■■■■■	5.45	3	■■■	2.73	6	■■■■■■	5.45	
	4	Benefits on Dam Safety	5	■■■■■	9.09	5	■■■■■	9.09	5	■■■■■	9.09	
C - Construction	5	Construction simplicity/complexity	7	■■■■■■■	1.27	5	■■■■■	0.91	3	■■■	0.55	
	6	Flood Management during Construction	5	■■■■■	6.36	6	■■■■■■	7.64	4	■■■■	5.09	
D - Operation and Maintenance	7	Maintenance Requirements	5	■■■■■	3.64	3	■■■	2.18	5	■■■■■	3.64	
	8	Surveillance and Operation	5	■■■■■	0.91	4	■■■■	0.73	5	■■■■■	0.91	
E - Other Aspects	9	Social and Environmental Impacts	5	■■■■■	5.45	6	■■■■■■	6.55	3	■■■	3.27	
	10	OH&S Safety	5	■■■■■	8.18	6	■■■■■■	9.82	4	■■■■	6.55	

Weighted Total		Total Score	■■■■	48	Total Score	■■■■	46	Total Score	■■■■	40
A - Cost		A - Cost		7	A - Cost		7	A - Cost		6
B - Technical Merits		B - Technical Merits		15	B - Technical Merits		12	B - Technical Merits		15
C - Construction		C - Construction		8	C - Construction		9	C - Construction		6
D - Operation and Maintenance		D - Operation and Maintenance		5	D - Operation and Maintenance		3	D - Operation and Maintenance		5
E - Other Aspects		E - Other Aspects		14	E - Other Aspects		16	E - Other Aspects		10

Appendix I

Preferred Option Workshop Minutes

