10 September 2009

Lincoln Coe
Port Otago Limited
PO Box 8
PORT CHALMERS

Geotechnical Advice "Next Generation" Project –
Interpretation of Geotechnical Data and Quantity Survey

Subsurface investigation for the proposed widening and deepening of the existing shipping channel between Port Chalmers and past Taiaroa Head were undertaken in April and May 2008. The investigation consisted of 37 vibrocore holes and 6 rotary drilled boreholes which were completed at the sections targeted for widening and deepening. The results of the investigation are presented in the "Factual Report of Geotechnical Investigations – Port Otago – Project Next Generation" prepared by Opus International Consultants Ltd (Opus) in August 2008.

Opus has now been engaged by Port Otago Ltd (POL) to assess the distribution and the quantities of the geological units encountered in the sections of the shipping channel to be dredged on the basis of the results of the subsurface investigation.

The scope of work has encompassed the following:

a) Review of POL long section (DWG 11024) to validate accuracy,
b) Review of the POL interpretative plan (DWG 11128) to validate accuracy
c) Interpretation of vibrocores and boreholes to determine material split,
d) Population of spreadsheet for material split,

Documentations

The following documents have been used to assess the distribution of the geological units and to determine the volumes:

- Factual Report of Geotechnical Investigations,
  Port Otago – Project Next Generation, prepared by Opus 2008

Further, following drawings and documents have been provided by POL:

- Channel design plan (DWG 11005)
- Channel design cross sections (DWG 11090 25-03-2009)
- POL interpretative material plan (11024 09-09-2009)
- POL interpretative material plan (11128 09-09-2009)
- Spreadsheet for volume calculations

Review, Assessment and Quantity Survey

Review of the POL long section containing the locations and the results of the vibrocores and boreholes undertaken have been reviewed by comparing the provided data with Opus' data during the site investigation. Each presented subsoil profile as well as the test locations have been reviewed individually.
The determination of the distribution of the subsoil conditions within the area to be dredged has been undertaken by interpolation of the results of the subsoil testing using professional judgment and additional information from maintenance dredging provided by POL. Based on the subsoil model developed the quantities of the soils and rocks encountered have been determined.

a) Review of long section

The drawing attached in Appendix A shows the results of all vibrocores and boreholes, and their locations undertaken during the site investigation. The locations have been mapped with GPS. Opus review of the locations and the results of the vibrocores and the boreholes presented herein concurs with our records presented in the Geotechnical Investigation Report, 2008.

b) Review of interpretive plan

The drawing attached in Appendix B shows the interpolated material split of the soils and rocks encountered. Opus review of this interpretation presented herein concurs with our material split undertaken for this report.

c) Interpretation of vibrocores and boreholes to determine material split

The interpretation is based on the results of the geotechnical site investigation, available information from maintenance dredging and professional judgment. The result of the interpretation of the geotechnical data for the dredging project is presented in the cross sections in Appendix B.

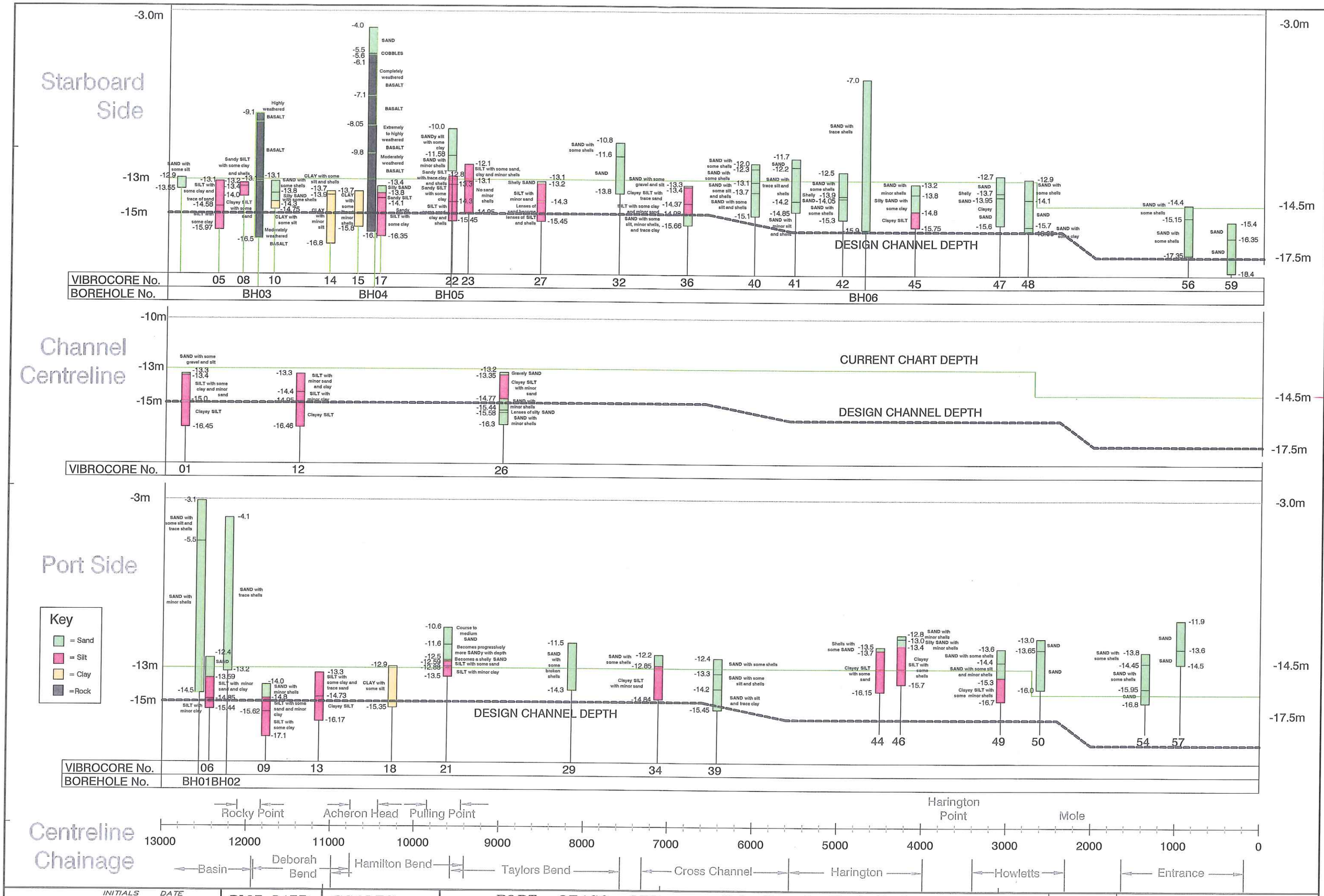
d) Population of spreadsheet for material split

Based on the interpretation of geotechnical data the approximate material split of the geological units for each section is presented in Appendix C.

Markus Hanz
Senior Geotechnical Engineer

Appendix A - Long Section
Appendix B - Interpretation of Material Distribution
Appendix C - Cross Sections: Interpretation of Geotechnical Data
Appendix D - Material Split of Geological Units

APPENDIX A - Long Section



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Project Next Generation
Geotechnical Investigations - Interpretive Long Section

PORT OTAGO LIMITED

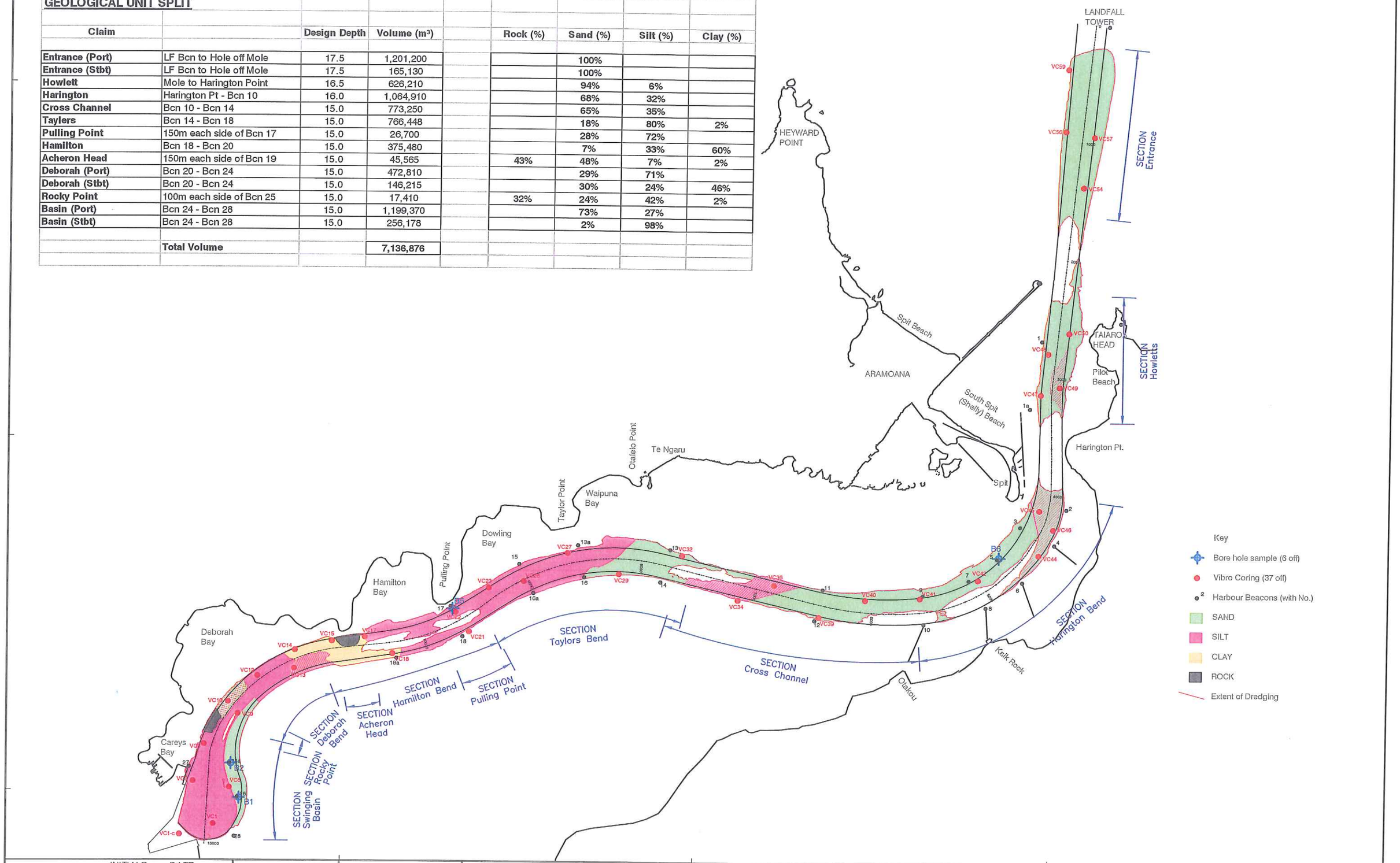
ACAD FILE NAME: project next\11024

DWG No: A1. 11024

APPENDIX B - Interpretation of Material Distribution

GEOLOGICAL UNIT SPLIT

Claim		Design Depth	Volume (m³)	Rock (%)	Sand (%)	Silt (%)	Clay (%)
Entrance (Port)	LF Bcn to Hole off Mole	17.5	1,201,200		100%		
Entrance (Stbt)	LF Bcn to Hole off Mole	17.5	165,130		100%		
Howlett	Mole to Harington Point	16.5	626,210		94%	6%	
Harington	Harington Pt - Bcn 10	16.0	1,064,910		68%	32%	
Cross Channel	Bcn 10 - Bcn 14	15.0	773,250		65%	35%	
Taylers	Bcn 14 - Bcn 18	15.0	766,448		18%	80%	2%
Pulling Point	150m each side of Bcn 17	15.0	26,700		28%	72%	
Hamilton	Bcn 18 - Bcn 20	15.0	375,480		7%	33%	60%
Acheron Head	150m each side of Bcn 19	15.0	45,565	43%	48%	7%	2%
Deborah (Port)	Bcn 20 - Bcn 24	15.0	472,810		29%	71%	
Deborah (Stbt)	Bcn 20 - Bcn 24	15.0	146,215		30%	24%	46%
Rocky Point	100m each side of Bcn 25	15.0	17,410	32%	24%	42%	2%
Basin (Port)	Bcn 24 - Bcn 28	15.0	1,199,370		73%	27%	
Basin (Stbt)	Bcn 24 - Bcn 28	15.0	256,178		2%	98%	
	Total Volume		7,136,876				



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APPROVED:					DWG No: A1. 11128

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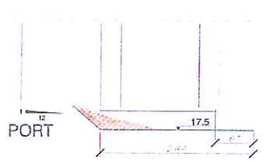
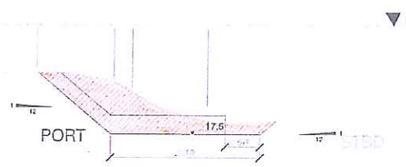
APPENDIX C – Cross Sections: Interpretation of Geotechnical Data

Channel Entrance - Fairway Beacon

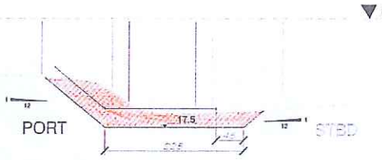


Channel Entrance - 200m From Fairway Beacon



Channel Entrance - 400m From Fairway Beacon

Channel Entrance - 600m From Fairway Beacon



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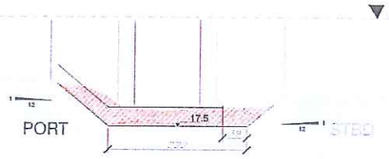
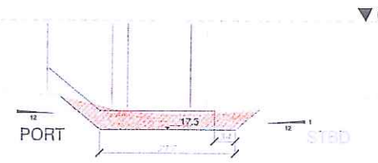


Channel Entrance - 1,000m From Fairway Beacon



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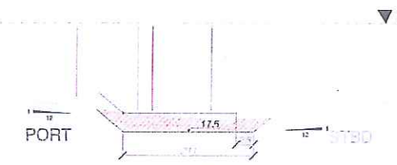
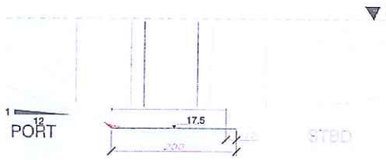


Channel Entrance - 1,400m From Fairway Beacon

Channel Entrance - 1,600m From Fairway Beacon



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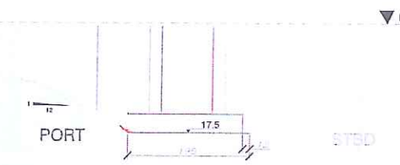
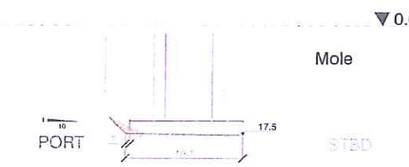
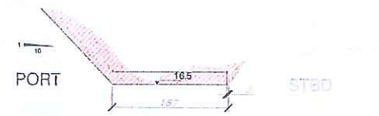


Channel Entrance - 2,000m From Fairway Beacon

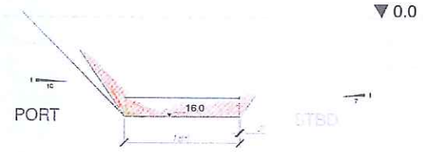


Mole - 2,200m From Fairway Beacon

Howletts - 2,400m From Fairway Beacon

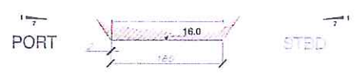


Howletts - 2,600m From Fairway Beacon

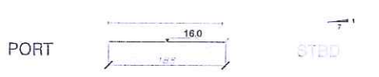


Howletts - 2,800m From Fairway Beacon

Howletts - 3,000m From Fairway Beacon



Howletts - 3,200m From Fairway Beacon



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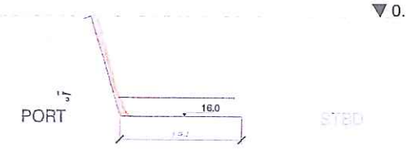

Harington Point - 3,600m From Fairway Beacon

Harington Bend - 3,800m From Fairway Beacon

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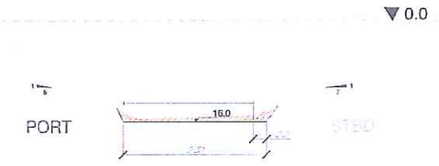

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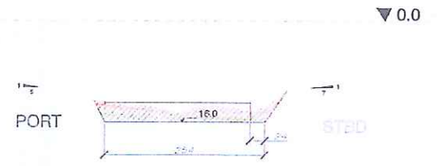
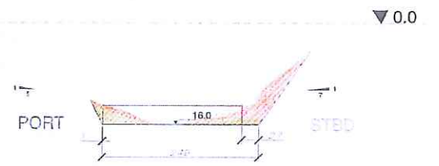


Harington Bend - 4,200m From Fairway Beacon



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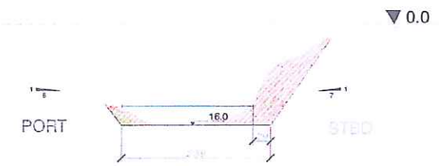

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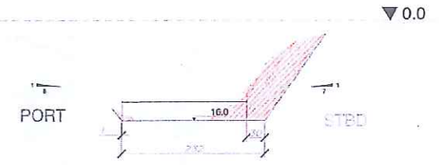

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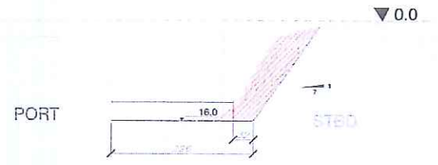

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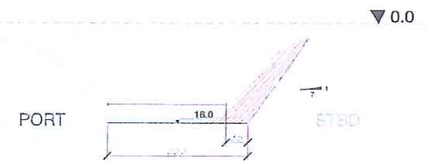
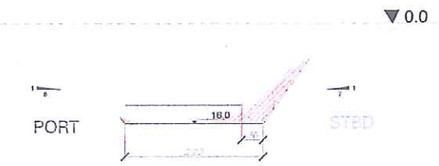


Harington Bend - 5,200m From Fairway Beacon



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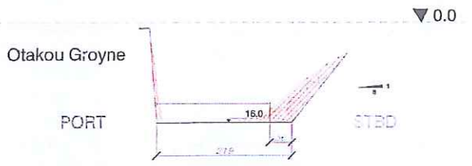

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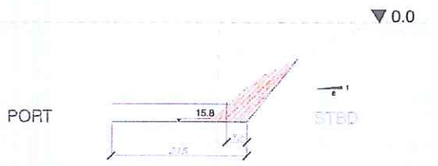

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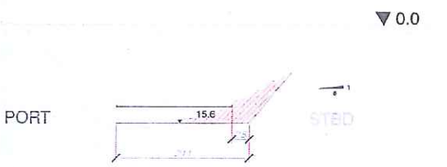

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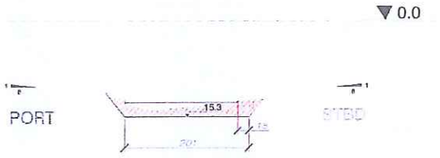

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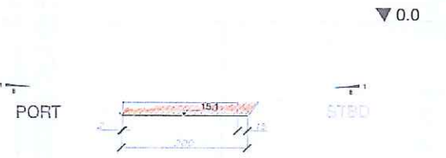

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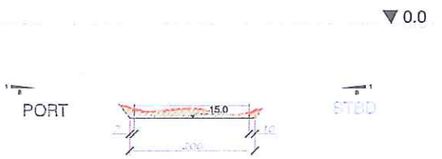

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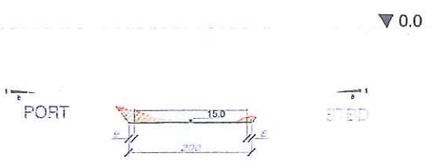

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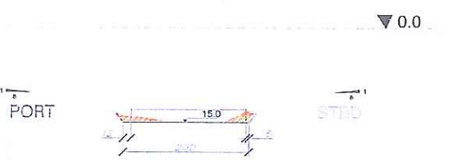

Cross Channel - 7,400m From Fairway Beacon

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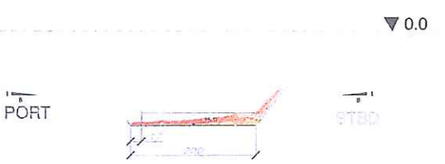

Taylors Bend - 7,800m From Fairway Beacon

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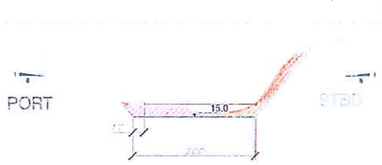
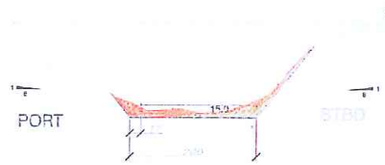
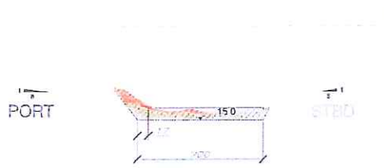


Taylors Bend - 8,000m From Fairway Beacon



Taylors Bend - 8,200m From Fairway Beacon

Taylors Bend - 8,400m From Fairway Beacon



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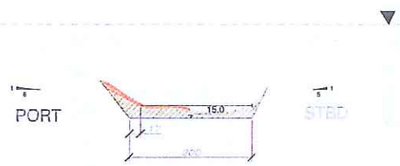
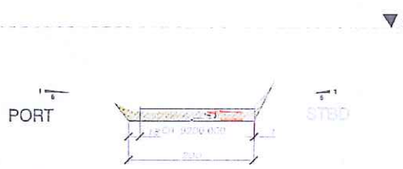
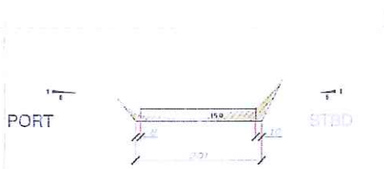


Taylors Bend - 8,800m From Fairway Beacon

Taylors Bend - 9,000m From Fairway Beacon



Taylors Bend - 9,200m From Fairway Beacon



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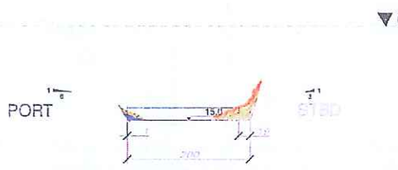
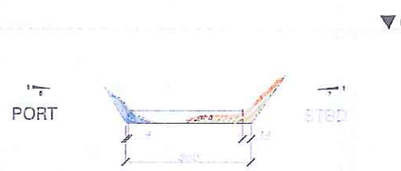
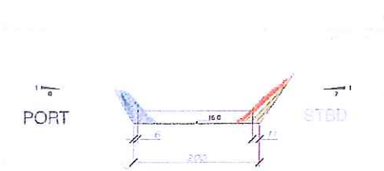


Pulling Point - 9,600m From Fairway Beacon

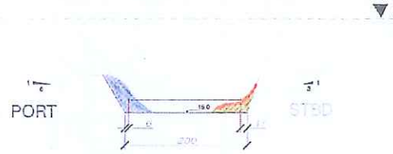
Hamilton Bend - 9,800m From Fairway Beacon



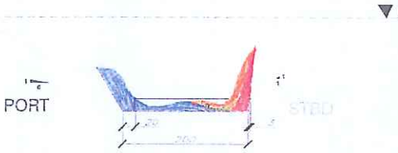
Hamilton Bend - 10,000m From Fairway Beacon



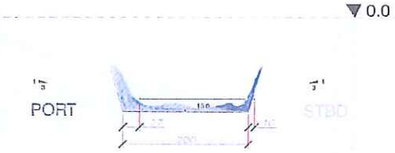
Hamilton Bend - 10,200m From Fairway Beacon



Hamilton Bend - 10,400m From Fairway Beacon

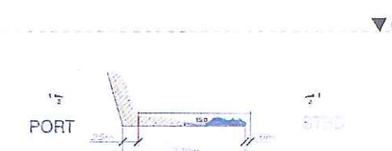


Acheron Head - 10,600m From Fairway Beacon



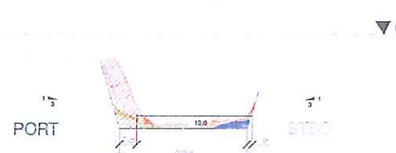
Deborah Bend - 10,800m From Fairway Beacon

Deborah Bend - 11,000m From Fairway Beacon

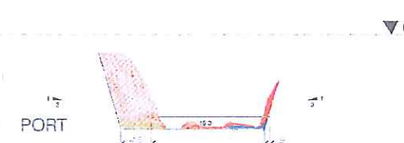


Deborah Bend - 11,200m From Fairway Beacon

Deborah Bend - 11,400m From Fairway Beacon



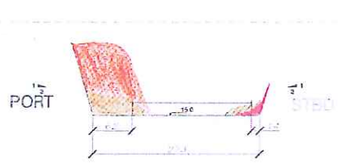
Deborah Bend - 11,600m From Fairway Beacon



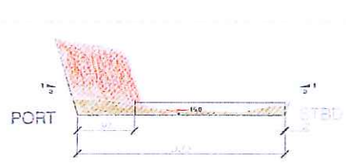
Deborah Bend - 11,800m From Fairway Beacon

	INITIALS	DATE				
DESIGNED:	ACP	25/03/09	PLOT DATE:	SCALES:	PORT OTAGO LTD P.O. Box 8, Port Chalmers, N.Z.	CAD FILE NAME: Project Next \11090
DRAWN:	ACP	25/03/09		1:15,000	Project Next Generation	DWG No. A/ 11090 3
CHECKED:			ISSUE DATE:		Proposed Design Channel - Cross Sections Sheet 3 of 4	
APPROVED:						

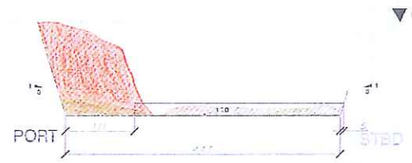
PORT OTAGO LIMITED



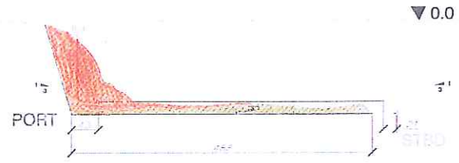
Rocky Point - 12,000m From Fairway Beacon



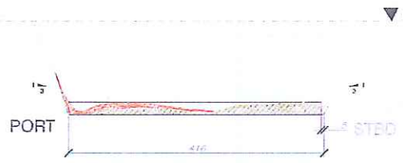
Swinging Basin - 12,200m From Fairway Beacon



Swinging Basin - 12,400m From Fairway Beacon



Swinging Basin - 12,600m From Fairway Beacon



Swinging Basin - 12,800m From Fairway Beacon

	INITIALS	DATE				
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DRAWN:	ACP	26/03/09		1:15,000	Project Next Generation	DWG No. A/ 11090_4
CHECKED:			ISSUE DATE:		Proposed Design Channel - Cross Sections Sheet 4 of 4	
APPROVED:						

APPENDIX D – Material Split of Geological Units

Geological units split in each section

		Design depth	Volume
Entrance (Port)	LF Bcn to Hole off Mole	17.5	817,250
Entrance (Stbt)	LF Bcn to Hole off Mole	17.5	316,920
Howlett	Mole to Harington Point	16.5	584,540
Harington	Harington Pt - Bcn 10	16.5	886,950
Cross Channel	Bcn 10 - Bcn 14	15.5	719,265
Taylers	Bcn 14 - Bcn 18	15.0	773,430
Pulling Point	150m each side of Bcn 17	15.0	25,950
Hamilton	Bcn 18 - Bcn 20	15.0	440,280
Acheron Head	150m each side of Bcn 19	15.0	35,465
Deborah (Port)	Bcn 20 - Bcn 24	15.0	415,230
Deborah (Stbt)	Bcn 20 - Bcn 24	15.0	133,160
Rocky Point	100m each side of Bcn 25	15.0	27,070
Basin (Port)	Bcn 24 - Bcn 28	15.0	1,225,260
Basin (Stbt)	Bcn 24 - Bcn 28	15.0	219,200
		Total Volume	6,619,970

Rock (%)	Sand (%)	Silt (%)	Clay (%)
	100%		
	100%		
	94%	6%	
	68%	32%	
	65%	35%	
	18%	80%	2%
	28%	72%	
	7%	33%	60%
43%	48%	7%	2%
	29%	71%	
	30%	24%	46%
32%	24%	42%	2%
	73%	27%	
	2%	98%	