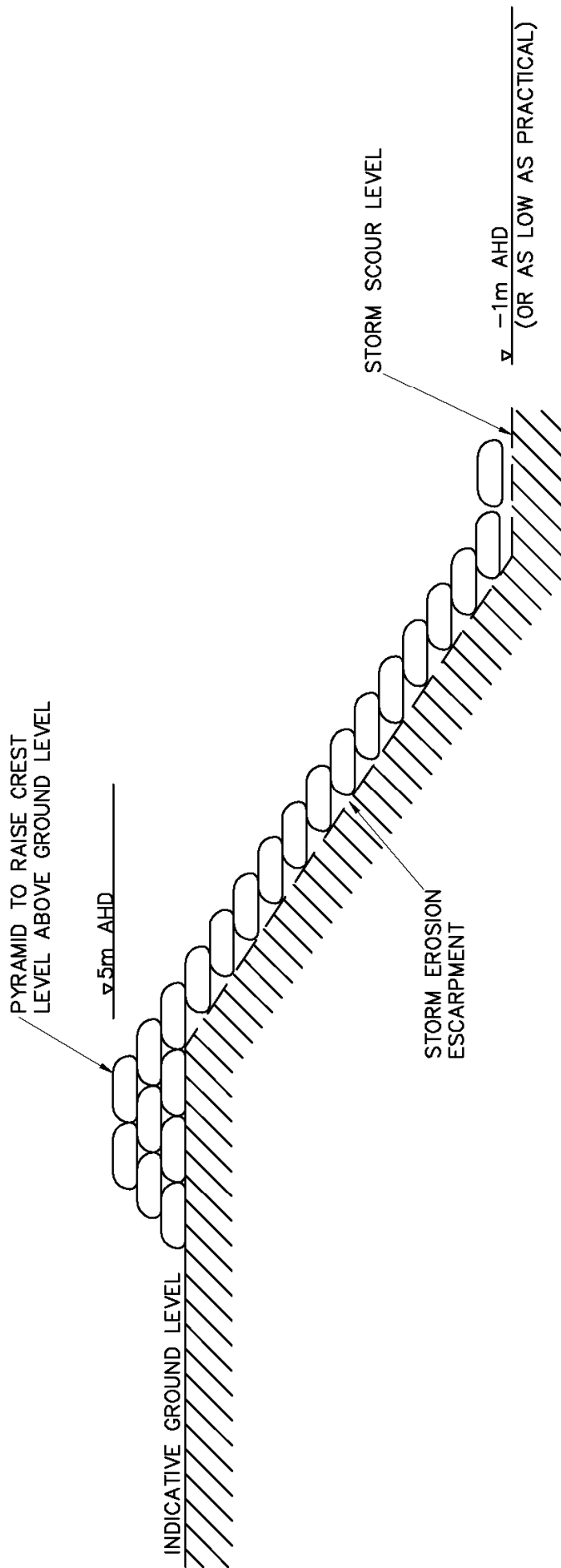


Temporary
Geocontainer
Revetment

Temporary
Geocontainer
Revetment





**SAND FILLED GEOTEXTILE CONTAINER REVETMENT
FOR EMERGENCY PROTECTION WORKS**

Concept Design - Indicative Cost Estimate

Project Name: GTCC CMP 301017-00051

Base date of Cost Estimate - April 2010

DRAFT

Diamond Beach - Emergency protection works (sand trucked in from external source)

Item	Description	Unit	Quantity	Rate	Cost	Source of Rate	Comments
1	Sloped Geobag Revetment						+5 m AHD to - 1 m AHD
1.1	Supply and placement of geobags	No.	2,500	\$ 160.00	\$ 400,000.00	ELCOROCK (2007)	Assume single layer 0.75 m ³ containers with 3 extra at crest & 2 extra at toe & 2 side vandal deterrent.
1.2	Supply sand for geobags (external source)	m ³	2,100	\$ 50.00	\$ 105,000.00	PBP Internal	includes 10% of additional sand for wastage.
			Sub-total		\$ 505,000.00		
			Contingency	30%	\$ 151,500.00		
			Total		\$ 656,500.00		
	Annual Maintenance costs						
1				Lump Sum	\$ 14,717.00		

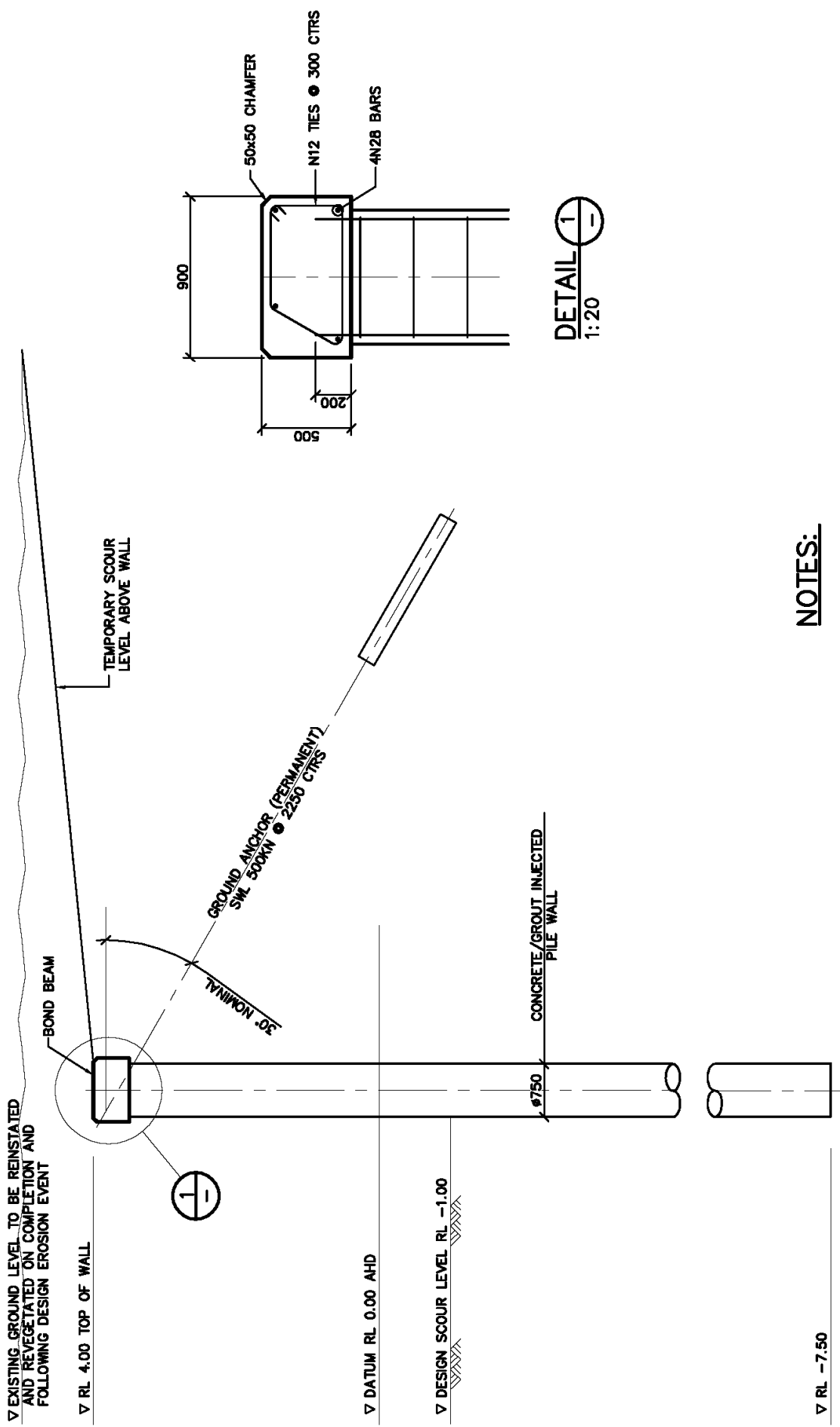
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DETAIL 1
1:20

NOTES:

1. CONCRETE TO BE GRADE 50
2. STEEL BARS IN BOND BEAM TO BE HOT DIP GALVANISED
3. PILES TO BE INSTALLED HARD UP AGAINST EACH OTHER
4. ALL LEVELS TO AHD

TYPICAL BURIED SEAWALL SECTION
1:50

Concept Design - Indicative Cost Estimate

Project Name: GTCC CMP 301010-00051

Base date of Cost Estimate - April 2010

Diamond Beach - Buried Seawall + Nourishment sand from creek

Item	Description	Unit	Quantity	Rate	Cost	Source of Rate	Comments
0	Approvals etc.						
	Approvals/Investigations (REF/EIS)	Item		Lump Sum	\$ 250,000.00	PBP Internal	DRAFT
	Concept/Detail Design	Item		Lump Sum	\$ 50,000.00	PBP Internal	
1	Preliminaries						
1.1	Site establishment	Item		Lump Sum	\$ 30,000.00	PBP Internal	
1.2	Preparation of management plans	Item		Lump Sum	\$ 10,000.00	PBP Internal	
1.3	Deployment of environmental provisions	Item		Lump Sum	\$ 25,000.00	PBP Internal	
2	Contiguous piling						
2.1	Supply & install contiguous piling with weep holes	m ²	5,250	\$ 600.00	\$ 3,150,000.00	PBP Internal	Assume 10.5 m long Φ 750 mm, total length = 500 m
2.2	Temporary protection work against wave & tidal action (if required)	Item		Lump Sum	\$ 200,000.00	PBP Internal	
2.3	Supply and install capping beam	m	500	\$ 1,500.00	\$ 750,000.00	PBP Internal	
2.4	Supply and install ground anchors	No.	225	\$ 16,000.00	\$ 3,600,000.00	PBP Internal	
3	Site disestablishment						
3.1	Site disestablishment	Item		Lump Sum	\$ 25,000.00	PBP Internal	
				Sub-total	\$ 7,790,000.00		
				Contingency	30%		
				Total	\$ 10,127,000.00		
COST AFTER DESIGN STORM (Assume Year 25)							
1	Preliminaries						
1.1	Site establishment	Item		Lump Sum	\$ 30,000.00	PBP Internal	
1.2	Deployment of environmental provisions	Item		Lump Sum	\$ 25,000.00	PBP Internal	
1.3	Mobilisation and demobilisation of dredge	Item		Lump Sum	\$ 100,000.00	PBP Internal	
2	Beach nourishment						
2.1	Dredge sand and stockpile	m ³	100,000	\$ 10.00	\$ 1,000,000.00	PBP Internal	
2.2	Placement of sand to the design profile	m ³	100,000	\$ 10.00	\$ 1,000,000.00	PBP Internal	
3	Site disestablishment						
3.1	Site disestablishment	Item		Lump Sum	\$ 25,000.00	PBP Internal	
				Sub-total	\$ 2,180,000.00		
				Contingency	30%		
				Total	\$ 2,834,000.00		

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Concept Design - Indicative Cost Estimate

Project Name: GTCC CMP 301017-00051

Base date of Cost Estimate - April 2010

Diamond Beach - Buried Seawall + Nourishment sand trucked in

Item	Description	Unit	Quantity	Rate	Cost	Source of Rate	Comments
0	Approvals etc.						
	Approvals/Investigations (REF/EIS)	Item		Lump Sum	\$ 250,000.00	PBP Internal	
	Concept/Detail Design	Item		Lump Sum	\$ 50,000.00	PBP Internal	
1	Preliminaries						
1.1	Site establishment	Item		Lump Sum	\$ 30,000.00	PBP Internal	
1.2	Preparation of management plans	Item		Lump Sum	\$ 10,000.00	PBP Internal	
1.3	Deployment of environmental provisions	Item		Lump Sum	\$ 25,000.00	PBP Internal	
2	Contiguous piling						
2.1	Supply & install contiguous piling with weep holes	m ²	5,250	\$ 600.00	\$ 3,150,000.00	PBP Internal	Assume 10.5 m long Φ 750 mm, total length = 500 m
2.2	Temporary protection work against wave & tidal action (if required)	Item		Lump Sum	\$ 200,000.00	PBP Internal	
2.3	Supply and install capping beam	m	500	\$ 1,500.00	\$ 750,000.00	PBP Internal	
2.4	Supply and install ground anchors	No.	225	\$ 16,000.00	\$ 3,600,000.00	PBP Internal	
3	Site disestablishment						
3.1	Site disestablishment	Item		Lump Sum	\$ 25,000.00	PBP Internal	
			Sub-total		\$ 7,790,000.00		
			Contingency	30%	\$ 2,337,000.00		
			Total		\$ 10,127,000.00		
COST AFTER DESIGN STORM (Assume Year 25)							
1	Preliminaries						
1.1	Site establishment	Item		Lump Sum	\$ 30,000.00	PBP Internal	
1.2	Deployment of environmental provisions	Item		Lump Sum	\$ 25,000.00	PBP Internal	
1.3	Mobilisation and demobilisation of dredge	Item		Lump Sum	\$ -	PBP Internal	
2	Beach nourishment (external source trucked in)						
2.1	Dredge sand and stockpile	m ³	100,000	\$ 40.00	\$ 4,000,000.00	PBP Internal	
2.2	Placement of sand to the design profile	m ³	100,000	\$ 10.00	\$ 1,000,000.00	PBP Internal	
3	Site disestablishment						
3.1	Site disestablishment	Item		Lump Sum	\$ 25,000.00	PBP Internal	
			Sub-total		\$ 5,080,000.00		
			Contingency	30%	\$ 1,524,000.00		
			Total		\$ 6,604,000.00		

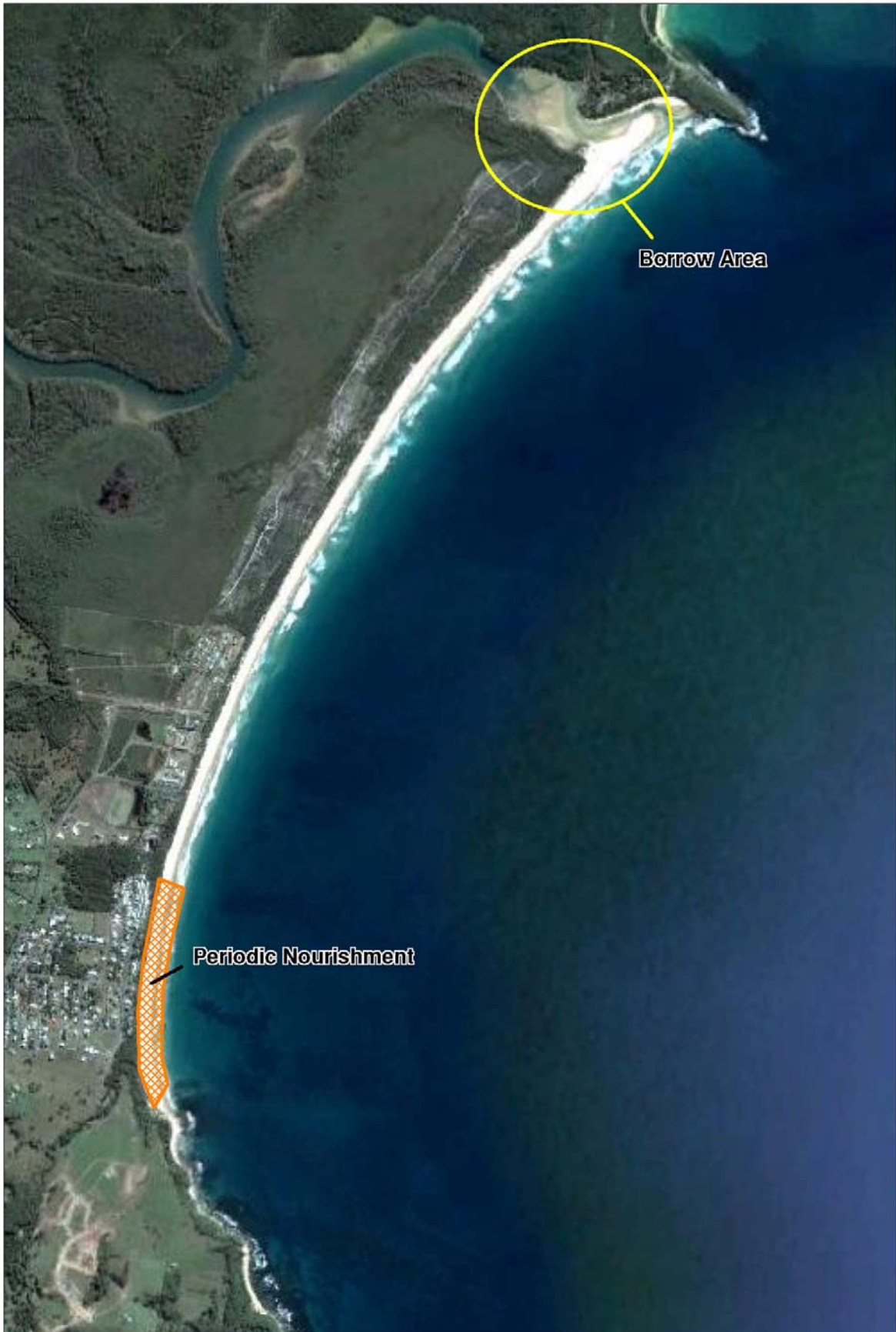
DRAFT

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Diamond Beach Nourishment Volume Calculations

The volume of sand required is dependant on a number of factors summarised below

- the degree of foreshore protection - maintaining the existing immediate coastal hazard line 7.5 m seaward of its current location
- shape and depth of the active beach profile and their relationship to sub-aqueous nourishment volume - at this point in time it is assumed that the borrow material is similar to the native material, and therefore the shape of the active profile after nourishment would be similar to the natural profile. The active profile depth of was estimated as 15 m below AHD (after consideration of commonly adopted best practice methods)
- existence of any restrictions to development of the active profile e.g. reef systems
- the height of the dune systems to be formed - a design height of 4 m AHD was adopted following consideration of existing surrounding crest levels, spatial consistency of dune crest levels, maintenance of visual amenity and capital cost
- the length of beach to be protected – 200 m of nourishment for the southern beach area adjacent to properties at immediate risk. A tapering of the nourishment of 200 m either side of the length of beach to be protected is required. This is to minimise the disturbance to the overall beach plan shape (which would encourage increased sediment loss as a result). The effective length of beach to be nourished is 400 m (i.e. $200 + \frac{1}{2} \times 2 \times 200$)
- the adopted annual sediment loss rate due to natural processes and a rising sea level, and the number of years supply of these losses to be initially placed in the beach system. The Coastal Processes and Hazard Definition Study indicated an average natural recession rate of up to 0.2 m/year at Diamond Beach, and an additional 20 m in 50 years (0.4 m/year) for greenhouse related sea level rise. These values have been adopted for this assessment and 10 years has been adopted as the number of years to be allowed for in the initial nourishment campaign. This equates to 6 m extra beach width that needs to be provided to maintain the immediate hazard line 7.5 m seaward of its current location over the next 10 years

Considering the above, an estimate has been prepared of the total sand nourishment volume to provide the required level of protection and beach amenity, and to meet the next 10 years sediment loss. The volume estimate is summarised below.

a) Volume required to keep immediate hazard line 7.5 m seaward of the current location:

(i)	sub-aerial volume (i.e. above AHD) 4 m (dune height) x 7.5 m (width) x 400 m (effective length)	12,000 m ³
(ii)	sub-aqueous volume (i.e. below AHD) (to 7.5 m depth) 7.5 m x 7.5 m x 400 m	22,500 m ³
	(7.5 m to 15 m depth) 0.5 x 7.5 m x 7.5 m x 400 m	11,250 m ³
	Sub Total for (a)	45,750 m³



b)	Volume to meet 10 years sediment loss:	
(i)	loss due to natural processes (equivalent to 2 m beach width)	
	2/7.5 x Sub Total for (a)	12,200 m ³
(ii)	loss due to sea level rise (equivalent to a 5 m beach width)	
	4/7.5 x Sub Total for (a)	24,400 m ³
	Sub Total for (b)	36,600 m³
	Total for (a) + (b)	82,350 m³

c) maintenance nourishment over 50 years:

To maintain the immediate hazard line seaward of its current location requires a commitment to ongoing maintenance nourishment in perpetuity. Over a 50 year planning period this would amount to massive nourishment campaigns for maintenance every 10 years. The volume required would equal that calculated above for **b)** over four campaigns.

Say 170,000 m³

The total nourishment volume requirement is estimated to be approximately 232,350 m³ over 50 years, allowing for the approximate nature of the nourishment calculations. This volume assumes the borrow sand is similar to the native sand.

Structural Options

For options which include structural protection (e.g. groynes) to arrest longshore sediment transport, it is assumed that maintenance nourishment is only required for sea level rise and offshore loss induced recession. For Diamond Beach this has been assumed to be 70% of the volume (i.e. approximately 105,000 m³ in four campaigns over 50 years).



Concept Design - Indicative Cost Estimate

Project Name: GTCC CMP 301017-00051

Base date of Cost Estimate - April 2010

Diamond Beach - Nourishment sand from creek

Item	Description	Unit	Quantity	Rate	Cost	Source of Rate	Comments
0	Approvals etc.						
	Approvals/Investigations (REF/EIS)	Item		Lump Sum	\$ 250,000.00	PBP Internal	
	Concept/Detail Design	Item		Lump Sum	\$ 50,000.00	PBP Internal	
1	Preliminaries						
1.1	Site establishment	Item		Lump Sum	\$ 30,000.00	PBP Internal	
1.2	Preparation of management plans	Item		Lump Sum	\$ 10,000.00	PBP Internal	
1.3	Deployment of environmental provisions	Item		Lump Sum	\$ 25,000.00	PBP Internal	
1.4	Mobilisation and demobilisation of dredge	Item		Lump Sum	\$ 100,000.00	PBP Internal	
2	Initial Beach Nourishment						
2.1	Dredge sand and stockpile	m ³	85,000	\$ 10.00	\$ 850,000.00	PBP Internal	Placed directly on profile
2.2	Placement of sand to the design profile	m ³	85,000	\$ -	\$ -	PBP Internal	Placed directly on profile
3	Site disestablishment						
3.1	Site disestablishment	Item		Lump Sum	\$ 25,000.00	PBP Internal	
				Sub-total	\$ 1,040,000.00		
				Contingency	30%		
				Total	\$ 1,352,000.00		
COST EVERY 10 YEARS							
1	Preliminaries						
1.1	Site establishment	Item		Lump Sum	\$ 30,000.00	PBP Internal	
1.2	Deployment of environmental provisions	Item		Lump Sum	\$ 25,000.00	PBP Internal	
1.3	Mobilisation and demobilisation of dredge	Item		Lump Sum	\$ 100,000.00	PBP Internal	
2	Beach nourishment						
2.1	Dredge sand and stockpile	m ³	40,000	\$ 10.00	\$ 400,000.00	PBP Internal	Placed directly on profile
2.2	Placement of sand to the design profile	m ³	40,000	\$ -	\$ -	PBP Internal	Placed directly on profile
				Sub-total	\$ 555,000.00		
				Contingency	30%		
				Total	\$ 721,500.00		

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Concept Design - Indicative Cost Estimate

Project Name: GTCC CMP 301017-00051

Base date of Cost Estimate - April 2010

Diamond Beach - Beach Nourishment sand trucked in

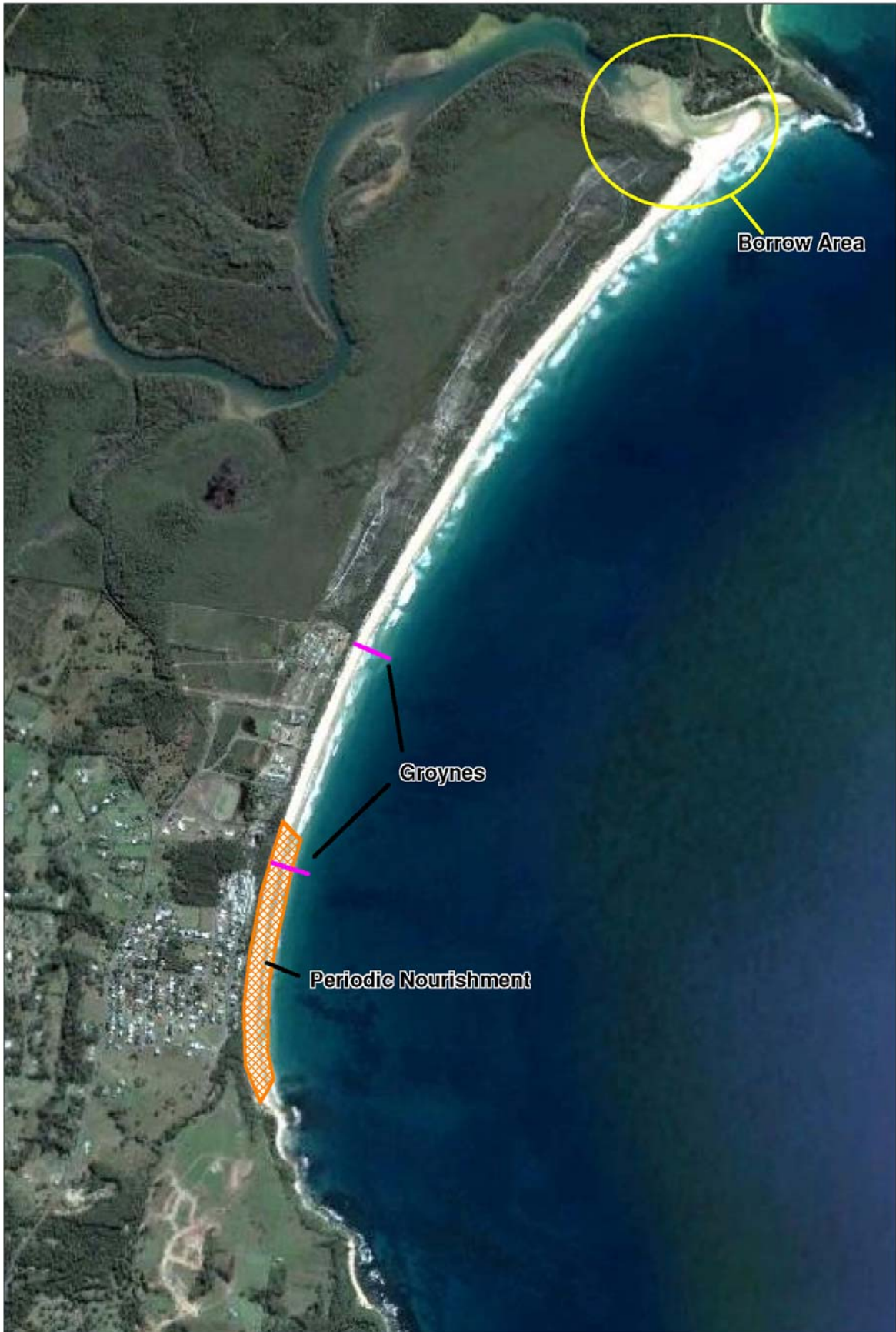
Item	Description	Unit	Quantity	Rate	Cost	Source of Rate	Comments
0	Approvals etc.						
	Approvals/Investigations (REF/EIS)	Item		Lump Sum	\$ 250,000.00	PBP Internal	DRAFT
	Concept/Detail Design	Item		Lump Sum	\$ 50,000.00	PBP Internal	
1	Preliminaries						
1.1	Site establishment	Item		Lump Sum	\$ 30,000.00	PBP Internal	
1.2	Preparation of management plans	Item		Lump Sum	\$ 10,000.00	PBP Internal	
1.3	Deployment of environmental provisions	Item		Lump Sum	\$ 25,000.00	PBP Internal	
1.4	Mobilisation and demobilisation of dredge	Item		Lump Sum	\$ -	PBP Internal	
2	Initial Beach Nourishment (Trucked in)						
2.1	Dredge sand and stockpile	m ³	85,000	\$ 40.00	\$ 3,400,000.00	PBP Internal	
2.2	Placement of sand to the design profile	m ³	85,000	\$ 10.00	\$ 850,000.00	PBP Internal	
3	Site disestablishment						
3.1	Site disestablishment	Item		Lump Sum	\$ 25,000.00	PBP Internal	
				Sub-total	\$ 4,340,000.00		
				Contingency	30%	\$ 1,302,000.00	
				Total	\$ 5,642,000.00		
COST EVERY 10 YEARS							
1	Preliminaries						
1.1	Site establishment	Item		Lump Sum	\$ 30,000.00	PBP Internal	
1.2	Deployment of environmental provisions	Item		Lump Sum	\$ 25,000.00	PBP Internal	
1.3	Mobilisation and demobilisation of dredge	Item		Lump Sum	\$ -	PBP Internal	
2	Beach nourishment (Trucked in)						
2.1	Dredge sand and stockpile	m ³	40,000	\$ 40.00	\$ 1,600,000.00	PBP Internal	
2.2	Placement of sand to the design profile	m ³	40,000	\$ 10.00	\$ 400,000.00	PBP Internal	
				Sub-total	\$ 2,055,000.00		
				Contingency	30%	\$ 616,500.00	
				Total	\$ 2,671,500.00		



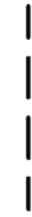

Disclaimer

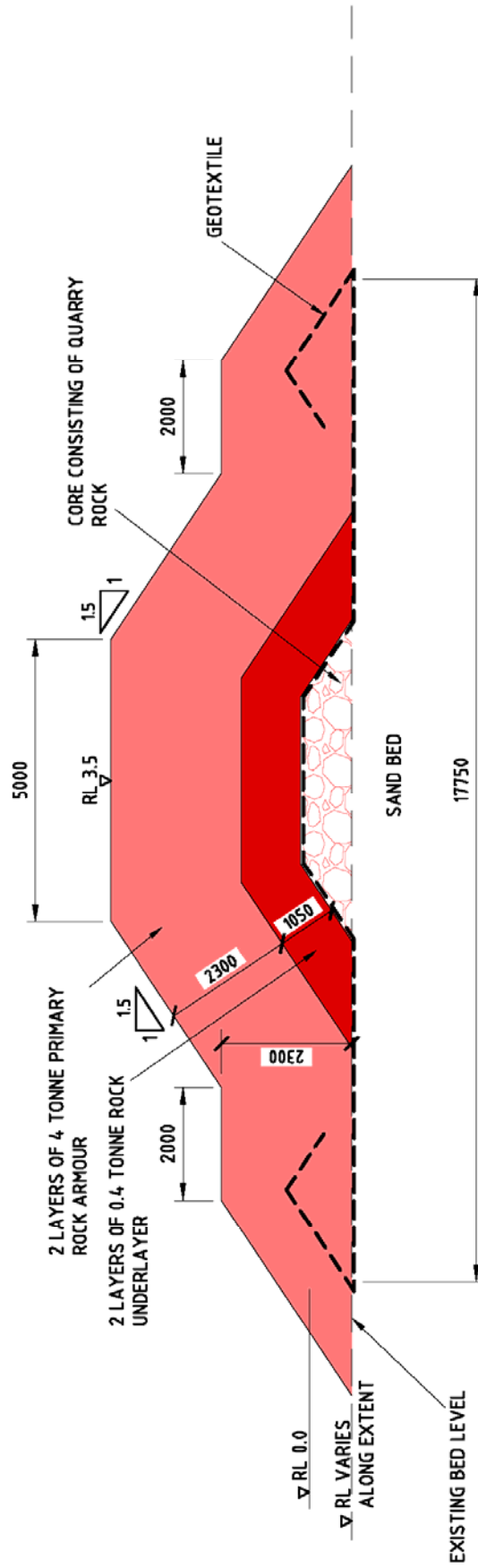
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-  EXTENT OF UNDERLAYER MATERIAL
-  EXTENT OF PRIMARY ARMOUR LAYER
-  GEOTEXTILE FILTER FABRIC
-  EXISTING BED PROFILE



TYPICAL ROCK GROUYNE SECTION
(ALSO USED FOR ENTRANCE STRUCTURES)

Concept Design - Indicative Cost Estimate

Project Name: GTCC CMP 301017-00051

Base date of Cost Estimate - April 2010

Diamond Beach - Groynes + Nourishment sand from creek

Item	Description	Unit	Quantity	Rate	Cost	Source of Rate	Comments
0	Approvals etc.						
	Approvals/Investigations (REF/EIS)	Item		Lump Sum	\$ 300,000.00	PBP Internal	
	Concept/Detail Design	Item		Lump Sum	\$ 50,000.00	PBP Internal	
1	Preliminaries						
1.1	Site establishment	Item		Lump Sum	\$ 30,000.00	PBP Internal	
1.2	Preparation of management plans	Item		Lump Sum	\$ 10,000.00	PBP Internal	
1.3	Deployment of environmental provisions	Item		Lump Sum	\$ 25,000.00	PBP Internal	
1.4	Mobilisation and demobilisation of dredge	Item		Lump Sum	\$ 100,000.00	PBP Internal	
2	Initial Beach Nourishment						
2.1	Dredge sand and stockpile	m ³	85,000	\$ 10.00	\$ 850,000.00	PBP Internal	Sand placed on profile
2.2	Placement of sand to the design profile	m ³	85,000	\$ -	\$ -	PBP Internal	Sand placed on profile
3	Groynes						
3.1	Supply and placement of rock for 2 groynes	t	81,200	\$ 100.00	\$ 8,120,000.00	PBP Internal	Assume 1 in 1.5 slope & 5m crest at structure head.
3.2	Supply and placement of geotextile for 2 groynes	m ²	17,000	\$ 10.00	\$ 170,000.00	PBP Internal	Assumes density 2.65 t/m ³ , 30% porosity & includes 15% for settlement, tolerance + wastage includes 15% for overlap + wastage
3	Site disestablishment						
3.1	Site disestablishment	Item		Lump Sum	\$ 25,000.00	PBP Internal	
			Sub-total		\$ 9,330,000.00		
			Contingency	30%	\$ 2,799,000.00		
			Total		\$ 12,129,000.00		
	COST EVERY 10 YEARS						
	GROYNE MAINTENANCE						
	NOURISHMENT	Item		Lump Sum	\$ 500,000.00	PBP Internal	
1	Preliminaries						
1.1	Site establishment	Item		Lump Sum	\$ 30,000.00	PBP Internal	
1.2	Deployment of environmental provisions	Item		Lump Sum	\$ 25,000.00	PBP Internal	
1.3	Mobilisation and demobilisation of dredge	Item		Lump Sum	\$ 100,000.00	PBP Internal	
2	Beach nourishment						(assumes required for SLR only)
2.1	Dredge sand and stockpile	m ³	30,000	\$ 10.00	\$ 300,000.00	PBP Internal	Sand placed on profile
2.2	Placement of sand to the design profile	m ³	30,000	\$ -	\$ -	PBP Internal	Sand placed on profile
			Sub-total		\$ 955,000.00		
			Contingency	30%	\$ 286,500.00		
			Total		\$ 1,241,500.00		

DRAFT

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Concept Design - Indicative Cost Estimate

Project Name: GTCC CMP 301017-00051

Base date of Cost Estimate - April 2010

Diamond Beach - Groynes + Nourishment sand trucked in

Item	Description	Unit	Quantity	Rate	Cost	Source of Rate	Comments
0	Approvals etc.						
	Approvals/Investigations (REF/EIS)	Item		Lump Sum	\$ 300,000.00	PBP Internal	
	Concept/Detail Design	Item		Lump Sum	\$ 50,000.00	PBP Internal	
1	Preliminaries						
1.1	Site establishment	Item		Lump Sum	\$ 30,000.00	PBP Internal	
1.2	Preparation of management plans	Item		Lump Sum	\$ 10,000.00	PBP Internal	
1.3	Deployment of environmental provisions	Item		Lump Sum	\$ 25,000.00	PBP Internal	
1.4	Mobilisation and demobilisation of dredge	Item		Lump Sum	\$ -	PBP Internal	
2	Initial Beach Nourishment (trucked in)						
2.1	Dredge sand and stockpile	m ³	85,000	\$ 40.00	\$ 3,400,000.00	PBP Internal	
2.2	Placement of sand to the design profile	m ³	85,000	\$ 10.00	\$ 850,000.00	PBP Internal	
3	Groynes						AHD.
							Assume 1 in 1.5 slope & 5m crest at structure head.
3.1	Supply and placement of rock for 2 groynes	t	81,200	\$ 100.00	\$ 8,120,000.00	PBP Internal	Assumes density 2.65 t/m ³ , 30% porosity & includes 15% for settlement, tolerance + wastage
3.2	Supply and placement of geotextile for 2 groynes	m ²	17,000	\$ 10.00	\$ 170,000.00	PBP Internal	includes 15% for overlap + wastage
3	Site disestablishment						
3.1	Site disestablishment	Item		Lump Sum	\$ 25,000.00	PBP Internal	
			Sub-total		\$ 12,630,000.00		
			Contingency	30%	\$ 3,789,000.00		
			Total		\$ 16,419,000.00		
	COST EVERY 10 YEARS						
	GROYNE MAINTENANCE	Item		Lump Sum	\$ 500,000.00	PBP Internal	
	NOURISHMENT						
1	Preliminaries						
1.1	Site establishment	Item		Lump Sum	\$ 30,000.00	PBP Internal	
1.2	Deployment of environmental provisions	Item		Lump Sum	\$ 25,000.00	PBP Internal	
1.3	Mobilisation and demobilisation of dredge	Item		Lump Sum	\$ -	PBP Internal	
2	Beach nourishment (trucked in)						(assumes required for SLR only)
2.1	Dredge sand and stockpile	m ³	30,000	\$ 40.00	\$ 1,200,000.00	PBP Internal	
2.2	Placement of sand to the design profile	m ³	30,000	\$ 10.00	\$ 300,000.00	PBP Internal	
			Sub-total		\$ 2,055,000.00		
			Contingency	30%	\$ 616,500.00		
			Total		\$ 2,671,500.00		

DRAFT

Disclaimer

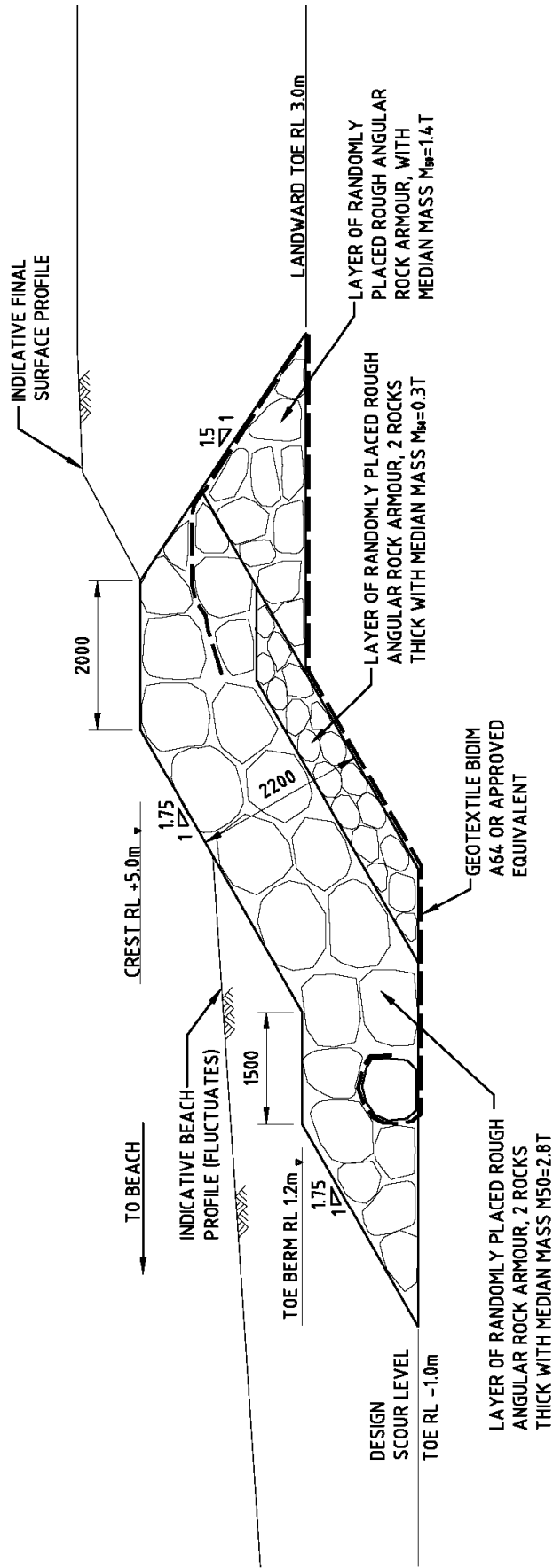
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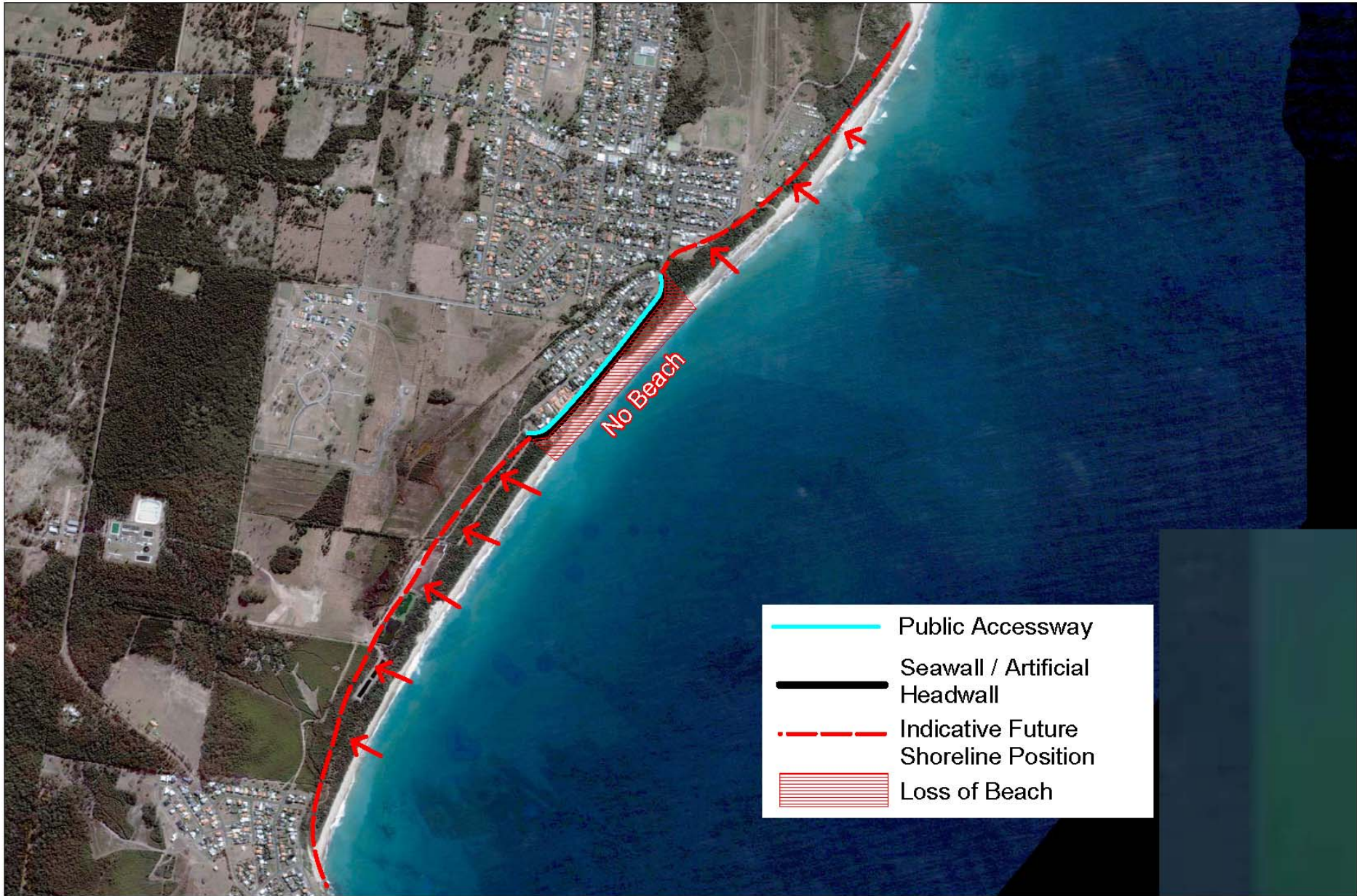
TYPICAL SECTION THROUGH ROCK REVETMENT

SCALE 1:75

NOTES

1. ALL LEVELS ARE TO AUSTRALIAN HEIGHT DATUM (AHD).
2. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE





Concept Design - Indicative Cost Estimate

Project Name: GTCC CMP 301017-00051

Base date of Cost Estimate - April 2010

Old Bar - Sloped Rock Revetment

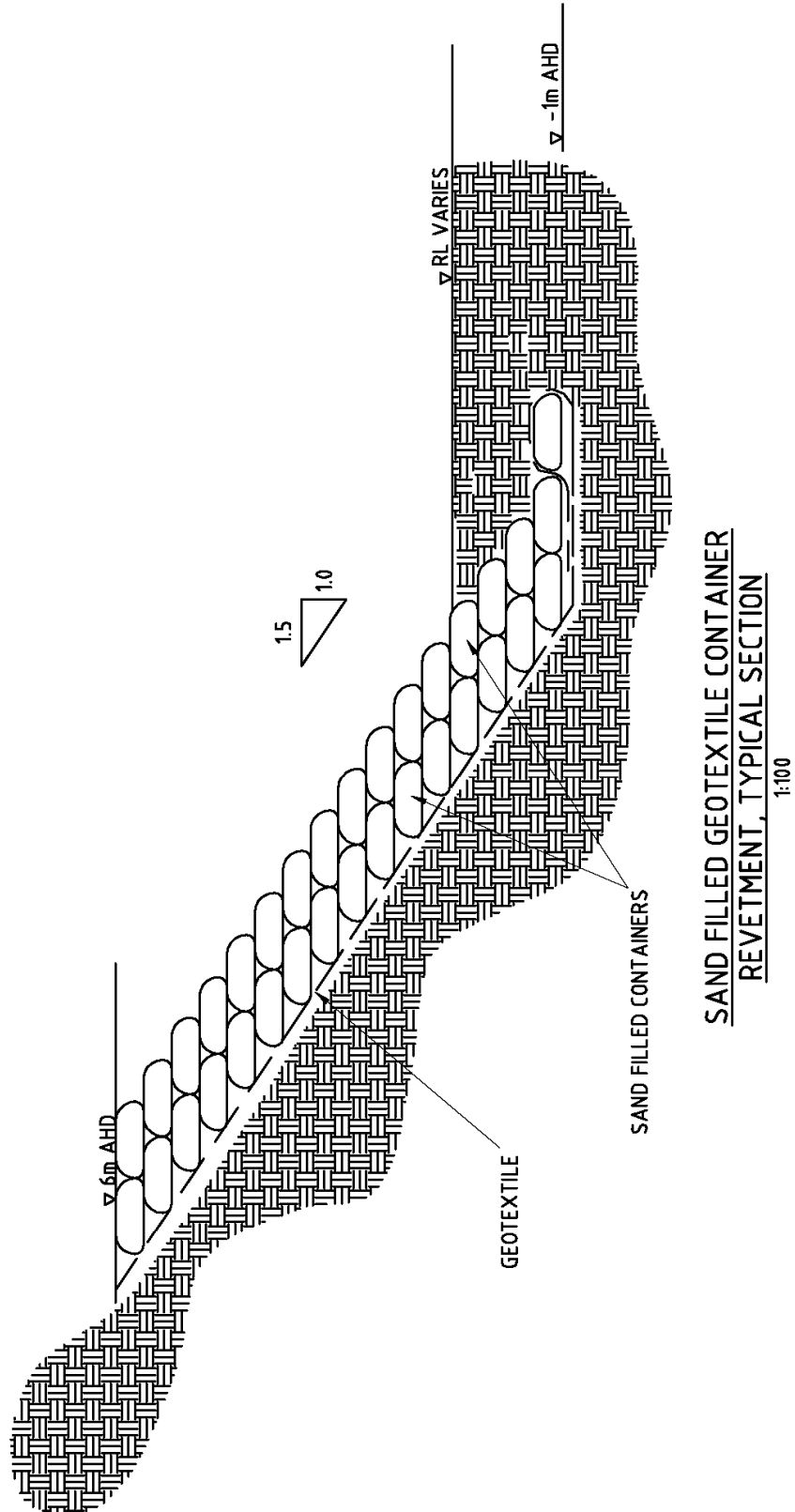
Item	Description	Unit	Quantity	Rate	Cost	Source of Rate	Comments
0	Approvals etc.						
	Approvals/Investigations (REF/EIS)	Item		Lump Sum	\$ 250,000.00	PBP Internal	DRAFT
	Concept/Detail Design	Item		Lump Sum	\$ 50,000.00	PBP Internal	
1	Preliminaries						
1.1	Site establishment	Item		Lump Sum	\$ 30,000.00	PBP Internal	
1.2	Preparation of management plans	Item		Lump Sum	\$ 10,000.00	PBP Internal	
1.3	Deployment of environmental provisions	Item		Lump Sum	\$ 25,000.00	PBP Internal	
2	Sloped Rock Revetment						Assumes density 2.65 t/m ³ , 30% porosity
2.1	Supply and placement of rock	t	70,000	\$ 100.00	\$ 7,000,000.00	PBP Internal	& includes 15% for settlement, tolerance + wastage
2.2	Supply and placement of geotextile	m ²	22,000	\$ 10.00	\$ 220,000.00	PBP Internal	includes 15% for overlap + wastage
3	Site disestablishment						
3.1	Site disestablishment	Item		Lump Sum	\$ 25,000.00	PBP Internal	
			Sub-total		\$ 7,310,000.00		
			Contingency	30%	\$ 2,193,000.00		
			Total		\$ 9,503,000.00		
	COST AT YEAR 25 (Extension of wall)						
1	Preliminaries						
1.1	Site establishment	Item		Lump Sum	\$ 30,000.00	PBP Internal	
1.2	Preparation of management plans	Item		Lump Sum	\$ 10,000.00	PBP Internal	
1.3	Deployment of environmental provisions	Item		Lump Sum	\$ 25,000.00	PBP Internal	
2	Sloped Rock Revetment						Assumes density 2.65 t/m ³ , 30% porosity
2.1	Supply and placement of rock	t	17,000	\$ 100.00	\$ 1,700,000.00	PBP Internal	& includes 15% for settlement, tolerance + wastage
2.2	Supply and placement of geotextile	m ²	5,400	\$ 10.00	\$ 54,000.00	PBP Internal	includes 15% for overlap + wastage
3	Site disestablishment						
3.1	Site disestablishment	Item		Lump Sum	\$ 25,000.00	PBP Internal	
			Sub-total		\$ 1,844,000.00		
			Contingency	30%	\$ 553,200.00		
			Total		\$ 2,397,200.00		
	COST EVERY 5 YEARS						
	Maintenance	Item		Lump Sum	\$ 250,000.00	PBP Internal	
			Sub-total		\$ 250,000.00		
			Contingency	30%	\$ 75,000.00		
			Total		\$ 325,000.00		

Disclaimer

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This cost estimate can NOT be guaranteed as we have no control over Contractor's prices, market forces and competitive bids from tenderers.

This cost estimate excludes GST, design fees, project management fees, and authority approval fees.





Concept Design - Indicative Cost Estimate

Project Name: GTCC CMP 301017-00051

Base date of Cost Estimate - April 2010

Old Bar - Sloped Rock Revetment + Nourishment

Disclaimer

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This cost estimate excludes GST, design fees, project management fees, and authority approval fees.

Item	Description	Unit	Quantity	Rate	Cost	Source of Rate	Comments
0	Approvals etc.						
	Approvals/Investigations (REF/EIS)	Item		Lump Sum	\$ 250,000.00	PBP Internal	
	Concept/Detail Design	Item		Lump Sum	\$ 50,000.00	PBP Internal	
1	Preliminaries						
1.1	Site establishment	Item		Lump Sum	\$ 30,000.00	PBP Internal	
1.2	Preparation of management plans	Item		Lump Sum	\$ 10,000.00	PBP Internal	
1.3	Deployment of environmental provisions	Item		Lump Sum	\$ 25,000.00	PBP Internal	
1.4	Mobilisation and demobilisation of dredge	Item		Lump Sum	\$ 100,000.00	PBP Internal	
2	Sloped Rock Revetment						Assumes density 2.65 t/m ³ , 30% porosity &
2.1	Supply and placement of rock	t	70,000	\$ 100.00	\$ 7,000,000.00	PBP Internal	includes 15% for settlement, tolerance + wastage
2.2	Supply and placement of geotextile	m ²	22,000	\$ 10.00	\$ 220,000.00	PBP Internal	includes 15% for overlap + wastage
3	Initial Beach Nourishment						
3.1	Dredge sand and stockpile	m ³	150,000	\$ 10.00	\$ 1,500,000.00	PBP Internal	
3.2	Placement of sand to the design profile	m ³	150,000	\$ 10.00	\$ 1,500,000.00	PBP Internal	
4	Site disestablishment						
4.1	Site disestablishment	Item		Lump Sum	\$ 25,000.00	PBP Internal	
			Sub-total		\$ 10,410,000.00		
			Contingency	30%	\$ 3,123,000.00		
			Total		\$ 13,533,000.00		
	COST AT YEAR 25 (Extension of wall)						
1	Preliminaries						
1.1	Site establishment	Item		Lump Sum	\$ 30,000.00	PBP Internal	
1.2	Preparation of management plans	Item		Lump Sum	\$ 10,000.00	PBP Internal	
1.3	Deployment of environmental provisions	Item		Lump Sum	\$ 25,000.00	PBP Internal	
2	Sloped Rock Revetment						Assumes density 2.65 t/m ³ , 30% porosity &
2.1	Supply and placement of rock	t	17,000	\$ 100.00	\$ 1,700,000.00	PBP Internal	includes 15% for settlement, tolerance + wastage
2.2	Supply and placement of geotextile	m ²	5,400	\$ 10.00	\$ 54,000.00	PBP Internal	includes 15% for overlap + wastage
3	Site disestablishment						
3.1	Site disestablishment	Item		Lump Sum	\$ 25,000.00	PBP Internal	
			Sub-total		\$ 1,844,000.00		
			Contingency	30%	\$ 553,200.00		
			Total		\$ 2,397,200.00		
	COST EVERY 5 YEARS						
	WALL MAINTENANCE	Item		Lump Sum	\$ 250,000.00	PBP Internal	
	NOURISHMENT						
1	Preliminaries						
1.1	Site establishment	Item		Lump Sum	\$ 30,000.00	PBP Internal	
1.2	Deployment of environmental provisions	Item		Lump Sum	\$ 25,000.00	PBP Internal	
1.3	Mobilisation and demobilisation of dredge	Item		Lump Sum	\$ 100,000.00	PBP Internal	
2	Beach nourishment						
2.1	Dredge sand and stockpile	m ³	150,000	\$ 10.00	\$ 1,500,000.00	PBP Internal	sand placed on profile
2.2	Placement of sand to the design profile	m ³	150,000	\$ -	\$ -	PBP Internal	sand placed on profile
			Sub-total		\$ 1,905,000.00		
			Contingency	30%	\$ 571,500.00		
			Total		\$ 2,476,500.00		

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Old Bar Massive Nourishment Volume Calculations

The volume of sand required is dependent on a number of factors summarised below:

- the degree of foreshore protection – maintaining the existing immediate coastal hazard line seaward of its current location
- shape and depth of the active beach profile and their relationship to sub-aqueous nourishment volume – at this point in time it is assumed that the borrow material is similar to the native material, and therefore the shape of the active profile after nourishment would be similar to the natural profile. The active profile depth of was estimated as 15 m below AHD (after consideration of commonly adopted best practice methods including inspection of detailed bathymetric survey undertaken by DECCW)
- existence of any restrictions to development of the active profile e.g. reef systems – offshore reefs at Old Bar are outside the active profile as defined by the above active profile depth
- the height of the dune systems to be formed – a design height of 5 m AHD was adopted following consideration of existing surrounding crest levels, spatial consistency of dune crest levels, maintenance of visual amenity and capital cost (Note: the average height of the dune along Old Bar Beach is 8 m AHD, however, in an attempt to reduce capital costs of nourishment a lower crest height was adopted which would modify the natural back beach profile but provide adequate foreshore protection)
- the length of beach to be nourished – 4200 m of massive nourishment for the Old Bar embayment
- the adopted annual sediment loss rate due to natural processes and a rising sea level, and the number of years supply of these losses to be initially placed in the beach system. The Coastal Processes and Hazard Definition Study indicated an average natural recession rate of 1 m/year at Old Bar Beach, and an additional 20 m in 50 years (0.4 m/year) for greenhouse related sea level rise. These values have been adopted for this assessment and 10 years has been adopted as the number of years to be allowed for in the initial nourishment campaign. This equates to 14 m extra beach width that needs to be provided to maintain the immediate hazard line seaward of its current location.

Considering the above, an estimate has been prepared of the total sand nourishment volume to the required level of protection and beach amenity, and to meet the next 10 years sediment loss. The volume estimate is summarised below.

a) Volume required to keep immediate hazard line seaward of the current location for 10 years:

(i)	sub-aerial volume (i.e. above AHD) 5 m (dune height) x 15 m (width) x 4200 m (effective length)	294,000 m ³
(ii)	sub-aqueous volume (i.e. below AHD) (to 7.5 m depth) 7.5 m x 14 m x 4200 m	441,000 m ³
	(7.5 m to 15 m depth) 0.5 x 7.5 m x 15 m x 4200 m	220,500 m ³
	Total for (a)	955,500 m³



b) Maintenance nourishment over 50 years:

To maintain the immediate hazard line seaward of its current location requires a commitment to ongoing maintenance nourishment in perpetuity. Over a 50 year planning period this would amount to massive nourishment campaigns for maintenance every 10 years. The volume required would equal five times that calculated above.

Say 5,500,000 m³

Accordingly, the total nourishment volume requirement is estimated to be approximately 5,000,000 m³ over 50 years, allowing for the approximate nature of the nourishment calculations. This volume assumes the borrow sand is similar to the native sand.

Structural Options

For options which include structural protection (e.g. groynes) to arrest longshore sediment transport, it is assumed that maintenance nourishment is only required for sea level rise and offshore loss induced recession. For Old Bar Beach this has been assumed to be $\frac{2}{3}$ of the volume (i.e. approximately 3,503,500 m³ in five campaigns, including the initial campaign of 955,500 m³, over 50 years).

Concept Design - Indicative Cost Estimate

Project Name: GTCC CMP 301017-00051

Base date of Cost Estimate - April 2010

Old Bar - Massive Nourishment

Item	Description	Unit	Quantity	Rate	Cost	Source of Rate	Comments
0	Approvals etc.						
	Approvals/Investigations (REF/EIS)	Item		Lump Sum	\$ 250,000.00	PBP Internal	
	Concept/Detail Design	Item		Lump Sum	\$ 50,000.00	PBP Internal	
1	Preliminaries						
1.1	Site establishment	Item		Lump Sum	\$ 30,000.00	PBP Internal	
1.2	Preparation of management plans	Item		Lump Sum	\$ 10,000.00	PBP Internal	
1.3	Deployment of environmental provisions	Item		Lump Sum	\$ 25,000.00	PBP Internal	
1.4	Mobilisation and demobilisation of dredge	Item		Lump Sum	\$ 100,000.00	PBP Internal	
2	Initial Beach Nourishment						
2.1	Dredge sand and stockpile	m ³	1,000,000	\$ 10.00	\$ 10,000,000.00	PBP Internal	
2.2	Placement of sand to the design profile	m ³	1,000,000	\$ 10.00	\$ 10,000,000.00	PBP Internal	
3	Site disestablishment						
3.1	Site disestablishment	Item		Lump Sum	\$ 25,000.00	PBP Internal	
			Sub-total		\$ 20,190,000.00		
			Contingency	30%	\$ 6,057,000.00		
			Total		\$ 26,247,000.00		
COST EVERY 10 YEARS							
1	Preliminaries						
1.1	Site establishment	Item		Lump Sum	\$ 30,000.00	PBP Internal	
1.2	Deployment of environmental provisions	Item		Lump Sum	\$ 25,000.00	PBP Internal	
1.3	Mobilisation and demobilisation of dredge	Item		Lump Sum	\$ 100,000.00	PBP Internal	
2	Beach nourishment						
2.1	Dredge sand and stockpile	m ³	1,000,000	\$ 10.00	\$ 10,000,000.00	PBP Internal	
2.2	Placement of sand to the design profile	m ³	1,000,000	\$ 10.00	\$ 10,000,000.00	PBP Internal	
3	Site disestablishment						
3.1	Site disestablishment	Item		Lump Sum	\$ 25,000.00	PBP Internal	
			Sub-total		\$ 20,180,000.00		
			Contingency	30%	\$ 6,054,000.00		
			Total		\$ 26,234,000.00		

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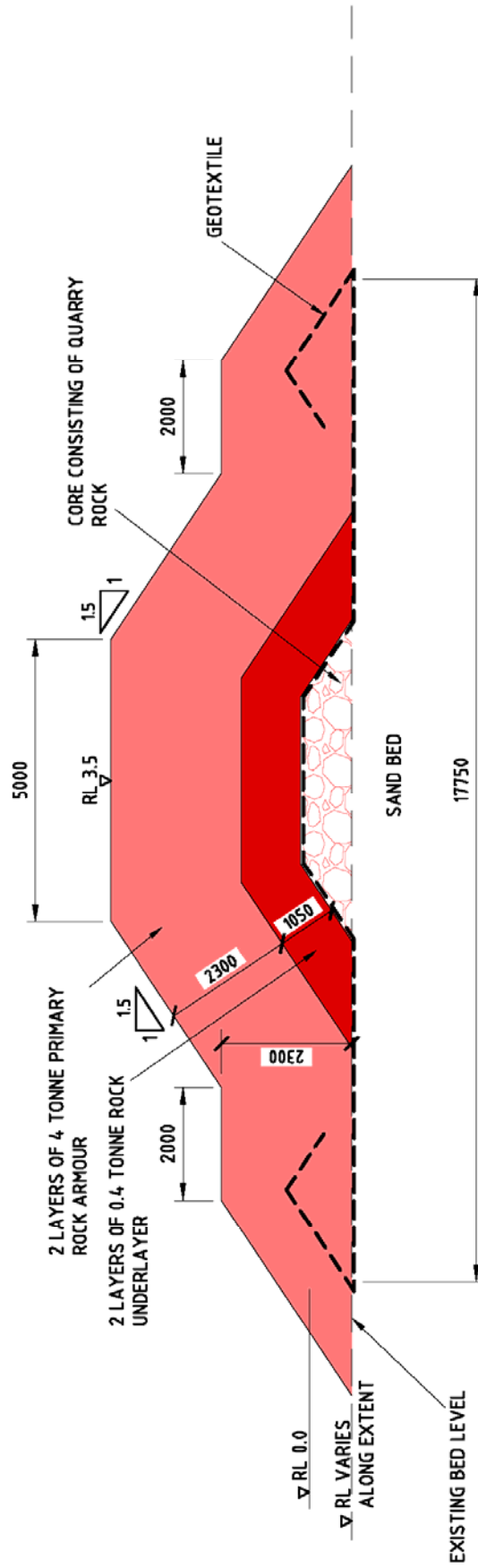
This cost estimate is based on WorleyParsons' experience and judgement as a firm of practising professional engineers familiar with the construction industry.

This cost estimate can NOT be guaranteed as we have no control over Contractor's prices, market forces and competitive bids from tenderers.

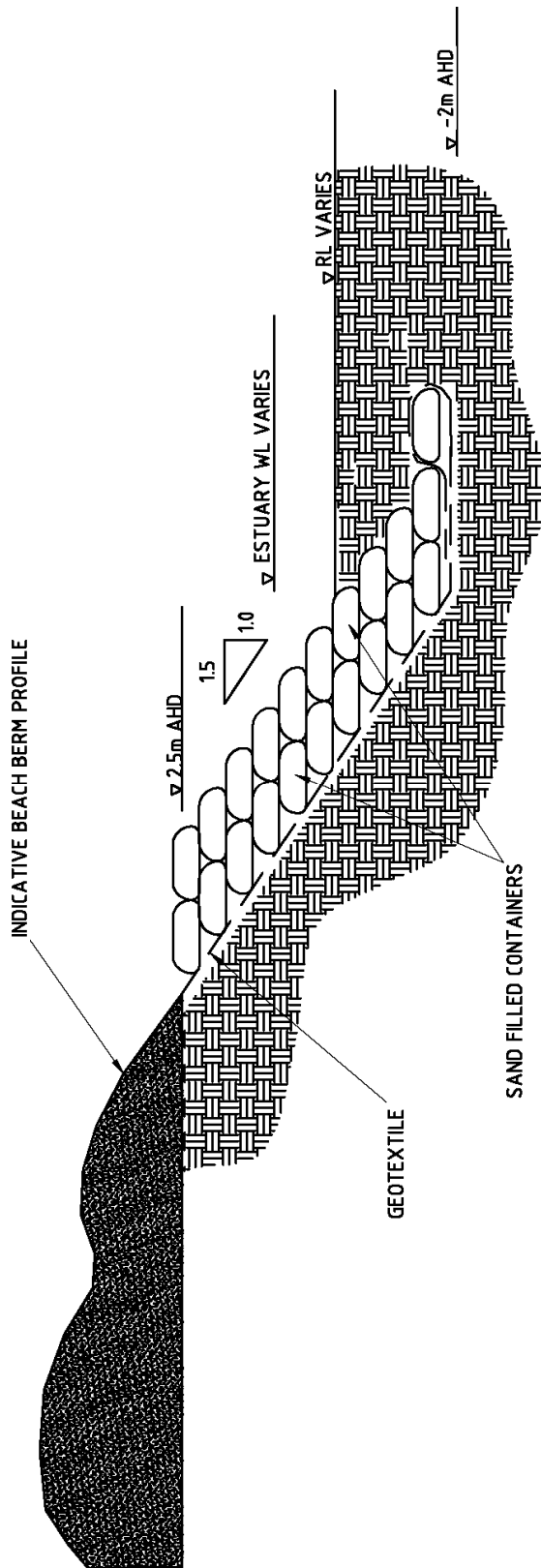
This cost estimate excludes GST, design fees, project management fees, and authority approval fees.



-  EXTENT OF UNDERLAYER MATERIAL
-  EXTENT OF PRIMARY ARMOUR LAYER
-  GEOTEXTILE FILTER FABRIC
-  EXISTING BED PROFILE



TYPICAL ROCK GROUYNE SECTION
(ALSO USED FOR ENTRANCE STRUCTURES)



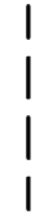



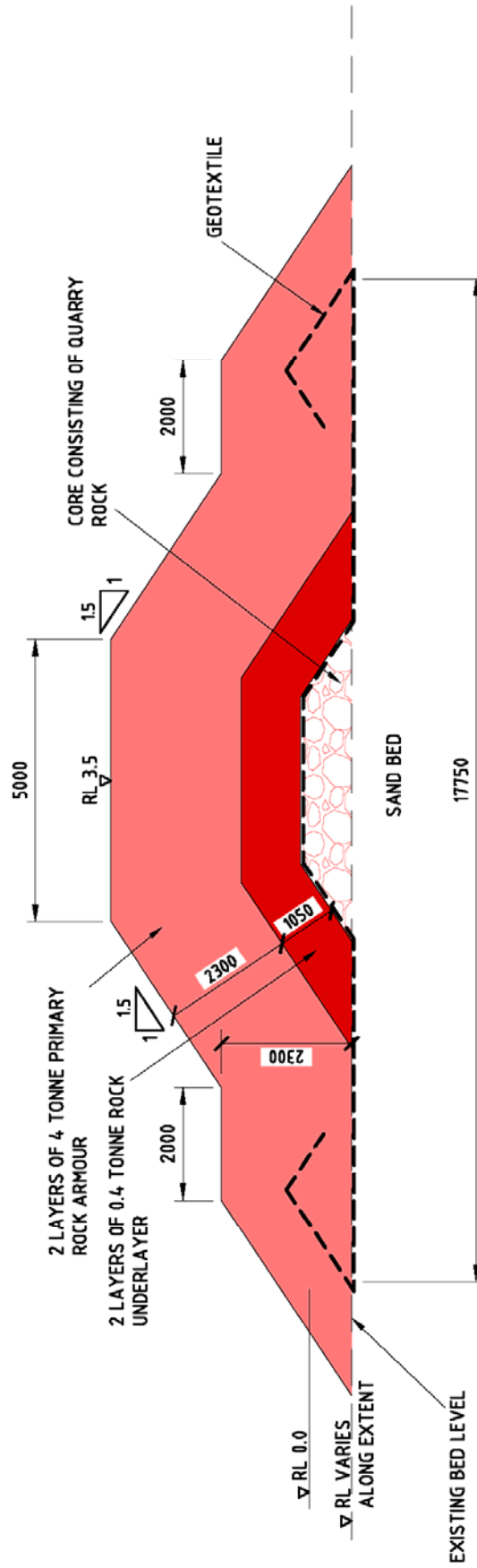
**SAND FILLED GEOTEXTILE CONTAINER
TRAINING WALL, TYPICAL SECTION**
1:100

Concept Design - Indicative Cost Estimate				Disclaimer			
Project Name: GTCC CMP 301017-00051				This cost estimate is based on WorleyParsons' experience and judgement as a firm of practising professional engineers familiar with the construction industry.			
Base date of Cost Estimate - April 2010				This cost estimate can NOT be guaranteed as we have no control over Contractor's prices, market forces and competitive bids from tenderers.			
Old Bar - Farquhar Inlet Entrance Structure + Nourishment				This cost estimate excludes GST, design fees, project management fees, and authority approval fees.			
Item	Description	Unit	Quantity	Rate	Cost	Source of Rate	Comments
0	Approvals etc.						
	Approvals/Investigations (REF/EIS)	Item		Lump Sum	\$ 300,000.00	PBP Internal	
	Concept/Detail Design	Item		Lump Sum	\$ 50,000.00	PBP Internal	
1	Preliminaries						
1.1	Site establishment	Item		Lump Sum	\$ 30,000.00	PBP Internal	
1.2	Preparation of management plans	Item		Lump Sum	\$ 10,000.00	PBP Internal	
1.3	Deployment of environmental provisions	Item		Lump Sum	\$ 25,000.00	PBP Internal	
1.4	Mobilisation and demobilisation of dredge	Item		Lump Sum	\$ 100,000.00	PBP Internal	
2	Breakwaters						
2.1	Supply and construct breakwaters	Item		Lump Sum	\$ 9,000,000.00		capital cost \$9M from Estuary Opening Management Study
3	Estuary Training Wall						
3.1	Supply and placement of geobags	No.	23,438	\$ 400.00	\$ 9,375,200.00	ELCOROCK (2007)	Assume 0.75 m ³ containers and 2 side vandal deterrent
3.2	Dredge sand for geobags	m ³	40,000	\$ 10.00	\$ 400,000.00	PBP Internal	
3.3	Supply and placement of geotextile	m ²	26,000	\$ 7.50	\$ 195,000.00	PBP Internal	includes 15% for overlap + wastage
4	Initial Nourishment						
4.1	Dredge sand and stockpile	m ³	1,000,000	\$ 10.00	\$ 10,000,000.00	PBP Internal	sand placed on profile
4.2	Placement of sand to the design profile	m ³	1,000,000	\$ -	\$ -	PBP Internal	sand placed on profile
5	Site disestablishment						
5.1	Site disestablishment	Item		Lump Sum	\$ 25,000.00	PBP Internal	
			Sub-total		\$ 29,160,200.00		
			Contingency	30%	\$ 8,748,060.00		
			Total		\$ 37,908,260.00		
	COST EVERY 10 YEARS						
	MAINTENANCE OF STRUCTURE	Item		Lump Sum	\$ 500,000.00		
	NOURISHMENT						
1	Preliminaries						
1.1	Site establishment	Item		Lump Sum	\$ 30,000.00	PBP Internal	
1.2	Deployment of environmental provisions	Item		Lump Sum	\$ 25,000.00	PBP Internal	
1.3	Mobilisation and demobilisation of dredge	Item		Lump Sum	\$ 100,000.00	PBP Internal	
2	Beach nourishment						(assumes required for SLR and offshore losses only)
2.1	Dredge sand and stockpile	m ³	640,000	\$ 10.00	\$ 6,400,000.00	PBP Internal	sand placed on profile
2.2	Placement of sand to the design profile	m ³	640,000	\$ -	\$ -	PBP Internal	sand placed on profile
3	Site disestablishment						
3.1	Site disestablishment	Item		Lump Sum	\$ 25,000.00	PBP Internal	
			Sub-total		\$ 7,080,000.00		
			Contingency	30%	\$ 2,124,000.00		
			Total		\$ 9,204,000.00		
	COST AT YEAR 25 (GEOBAGS)						
1	Preliminaries						
1.1	Site establishment	Item		Lump Sum	\$ 30,000.00	PBP Internal	
1.2	Deployment of environmental provisions	Item		Lump Sum	\$ 25,000.00	PBP Internal	
1.3	Mobilisation and demobilisation of dredge	Item		Lump Sum	\$ 100,000.00	PBP Internal	
2	Estuary Training Wall						Assume 0.75 m ³ containers and 2 side vandal deterrent.
2.1	Supply and placement of geobags	No.	7,813	\$ 400.00	\$ 3,125,066.67	ELCOROCK (2007)	Assume one-third of bags require replacement
2.2	Dredge sand for geobags	m ³	13,333	\$ 10.00	\$ 133,333.33	PBP Internal	
2.3	Supply and placement of geotextile	m ²	8,667	\$ 7.50	\$ 65,000.00	PBP Internal	includes 15% for overlap + wastage
3	Site disestablishment						
3.1	Site disestablishment	Item		Lump Sum	\$ 25,000.00	PBP Internal	
			Sub-total		\$ 3,503,400.00		
			Contingency	30%	\$ 1,051,020.00		
			Total		\$ 4,554,420.00		

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-  EXTENT OF UNDERLAYER MATERIAL
-  EXTENT OF PRIMARY ARMOUR LAYER
-  GEOTEXTILE FILTER FABRIC
-  EXISTING BED PROFILE



TYPICAL ROCK GROUYNE SECTION
(ALSO USED FOR ENTRANCE STRUCTURES)



Concept Design - Indicative Cost Estimate

Project Name: GTCC CMP 301017-00051

Base date of Cost Estimate - April 2010

Old Bar - Groyne Field + Nourishment

Item	Description	Unit	Quantity	Rate	Cost	Source of Rate	Comments	
0	Approvals etc.							
	Approvals/Investigations (REF/EIS)	Item		Lump Sum	\$ 300,000.00	PBP Internal	DRAFT	
	Concept/Detail Design	Item		Lump Sum	\$ 50,000.00	PBP Internal		
1	Preliminaries							
1.1	Site establishment	Item		Lump Sum	\$ 30,000.00	PBP Internal		
1.2	Preparation of management plans	Item		Lump Sum	\$ 10,000.00	PBP Internal		
1.3	Deployment of environmental provisions	Item		Lump Sum	\$ 25,000.00	PBP Internal		
1.4	Mobilisation and demobilisation of dredge	Item		Lump Sum	\$ 100,000.00	PBP Internal		
								Assumes 50m of groyne has toe at -5m AHD & 170m has toe sloping uniformly from -5 to -1m AHD.
2	Groynes							Assume 1 in 1.5 slope and 5 m crest at structure head.
2.1	Supply and placement of rock for 4 groynes	t	162,300	\$ 100.00	\$ 16,230,000.00	PBP Internal		Assumes density 2.65 t/m3, 30% porosity & includes 15% for settlement, tolerance + wastage.
2.2	Supply and placement of geotextile for 4 groynes	m ²	34,000	\$ 10.00	\$ 340,000.00	PBP Internal	includes 15% for overlap + wastage	
3	Initial Nourishment							
3.1	Dredge sand and stockpile	m ³	1,000,000	\$ 10.00	\$ 10,000,000.00	PBP Internal	sand placed on profile	
3.2	Placement of sand to the design profile	m ³	1,000,000	\$ -	\$ -	PBP Internal	sand placed on profile	
4	Site disestablishment							
4.1	Site disestablishment	Item		Lump Sum	\$ 25,000.00	PBP Internal		
			Sub-total		\$ 26,760,000.00			
			Contingency	30%	\$ 8,028,000.00			
			Total		\$ 34,788,000.00			
	COST EVERY 10 YEARS							
	GROYNE MAINTENANCE	Item		Lump Sum	\$ 500,000.00	PBP Internal		
	NOURISHMENT							
1	Preliminaries							
1.1	Site establishment	Item		Lump Sum	\$ 30,000.00	PBP Internal		
1.2	Deployment of environmental provisions	Item		Lump Sum	\$ 25,000.00	PBP Internal		
1.3	Mobilisation and demobilisation of dredge	Item		Lump Sum	\$ 100,000.00	PBP Internal		
2	Beach nourishment						(assumes required for SLR and offshore losses only)	
2.1	Dredge sand and stockpile	m ³	640,000	\$ 10.00	\$ 6,400,000.00	PBP Internal	sand placed on profile	
2.2	Placement of sand to the design profile	m ³	640,000	\$ -	\$ -	PBP Internal	sand placed on profile	
3	Site disestablishment							
3.1	Site disestablishment	Item		Lump Sum	\$ 25,000.00	PBP Internal		
			Sub-total		\$ 7,080,000.00			
			Contingency	30%	\$ 2,124,000.00			
			Total		\$ 9,204,000.00			

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Concept Design - Indicative Cost Estimate

Project Name: GTCC CMP 301017-00051

Base date of Cost Estimate - April 2010

Old Bar - Artificial Offshore Reef + Nourishment

Item	Description	Unit	Quantity	Rate	Cost	Source of Rate	Comments
0	Approvals etc.						
	Approvals/Investigations (REF/EIS)	Item		Lump Sum	\$ 300,000.00	PBP Internal	
	Concept/Detail Design	Item		Lump Sum	\$ 150,000.00	PBP Internal	
1	Preliminaries						
1.1	Site establishment	Item		Lump Sum	\$ 30,000.00	PBP Internal	
1.2	Preparation of management plans	Item		Lump Sum	\$ 10,000.00	PBP Internal	
1.3	Deployment of environmental provisions	Item		Lump Sum	\$ 25,000.00	PBP Internal	
1.4	Mobilisation and demobilisation of dredge	Item		Lump Sum	\$ 100,000.00	PBP Internal	
2	Artificial Reef Structure						
2.1	Supply and placement of artificial reef structure	Item		Lump Sum	\$ 5,000,000.00	PBP Internal	based on Narrownneck reef scaled for size
3	Initial Nourishment						
3.1	Dredge sand and stockpile	m ³	1,000,000	\$ 10.00	\$ 10,000,000.00	PBP Internal	
3.2	Placement of sand to the design profile	m ³	1,000,000	\$ -	\$ -	PBP Internal	
4	Site disestablishment						
4.1	Site disestablishment	Item		Lump Sum	\$ 25,000.00	PBP Internal	
			Sub-total		\$ 15,190,000.00		
			Contingency	30%	\$ 4,557,000.00		
			Total		\$ 19,747,000.00		
	COST EVERY 10 YEARS						
	REEF MAINTENANCE	Item		Lump Sum	\$ 500,000.00	PBP Internal	
	NOURISHMENT						
1	Preliminaries						
1.1	Site establishment	Item		Lump Sum	\$ 30,000.00	PBP Internal	
1.2	Deployment of enviornmental provisions	Item		Lump Sum	\$ 25,000.00	PBP Internal	
1.3	Mobilisation and demobilisation of dredge	Item		Lump Sum	\$ 100,000.00	PBP Internal	
2	Beach nourishment						(assumes required for SLR and offshore losses only)
2.1	Dredge sand and stockpile	m ³	640,000	\$ 10.00	\$ 6,400,000.00	PBP Internal	
2.2	Placement of sand to the design profile	m ³	640,000	\$ -	\$ -	PBP Internal	
3	Site disestablishment						
3.1	Site disestablishment	Item		Lump Sum	\$ 25,000.00	PBP Internal	
			Sub-total		\$ 7,080,000.00		
			Contingency	30%	\$ 2,124,000.00		
			Total		\$ 9,204,000.00		

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resources & energy



Net Present Value Analysis

Diamond Beach

Option	Cost 7%	Benefit 7%	Recurring	Capital Cost	B-C	B-C Ratio	Net B-C Ratio
Emergency Response	\$ 1,177,474	\$ 19,851,402	\$ 563,922	\$ 613,551	\$ 18,673,928	16.9	31.4
Property Purchase	\$ 19,851,402	\$ 1,684,959	\$ -	\$ 19,851,402	-\$ 18,166,443	0.1	0.1
Seawall - sand from creek	\$ 14,761,682	\$ 21,536,361	\$ 5,123,923	\$ 9,464,486	\$ 6,774,679	1.5	1.7
Seawall - sand trucked in	\$ 21,443,925	\$ 21,536,361	\$ 11,587,588	\$ 9,464,486	\$ 92,436	1.0	1.1
Nourishment - sand from creek	\$ 4,635,047	\$ 23,221,274	\$ 3,371,495	\$ 1,263,551	\$ 18,586,227	5.0	15.7
Nourishment - sand trucked in	\$ 17,756,542	\$ 23,221,274	\$ 12,483,645	\$ 5,272,897	\$ 5,464,732	1.3	2.0
Groynes - sand from creek	\$ 17,136,916	\$ 24,232,231	\$ 5,801,402	\$ 11,335,514	\$ 7,095,315	1.4	1.6
Groynes - sand trucked in	\$ 27,828,505	\$ 24,232,231	\$ 12,483,645	\$ 15,344,860	-\$ 3,596,274	0.9	0.8



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resources & energy



Old Bar

Option	Cost 7%	Benefit 7%	Recurring	Capital Cost	B-C	B-C Ratio	Net B-C
Retreat	\$ 9,883,699	\$ 4,380,829	\$ -	\$ 9,883,699	-\$ 5,502,870	0.4	0.4
Property Purchase	\$ 21,856,105	\$ 4,380,829	\$ 0.00	\$ 21,856,105	-\$ 17,475,276	0.2	0.2
Revetment	\$ 16,495,514	\$ 22,047,049	\$ 3,037,383	\$ 13,458,131	\$ 5,551,535	1.3	1.4
Revetment + nourishment	\$ 40,551,589	\$ 24,978,851	\$ 23,144,860	\$ 17,406,729	-\$ 15,572,737	0.6	0.1
Nourishment	\$ 147,118,692	\$ 36,009,640	\$ 122,588,785	\$ 24,529,907	-\$ 111,109,051	0.2	-3.5
Entrance structure + nourishment	\$ 78,348,692	\$ 36,009,640	\$ 42,920,411	\$ 35,428,280	-\$ 42,339,051	0.5	-0.2
Groyne field + nourishment	\$ 66,919,626	\$ 36,009,640	\$ 34,407,477	\$ 32,512,150	-\$ 30,909,986	0.5	0.0
Offshore reef + nourishment	\$ 52,862,617	\$ 36,009,640	\$ 34,407,477	\$ 18,455,140	-\$ 16,852,977	0.7	0.1

minus Net Benefit-Cost means maintenance cost is higher than capital cost.