IMPACT OF SEDIMENT DISPOSAL ON LOCAL SURF BREAKS

1. Background

The proposed Thyspunt site is situated in close proximity to a number of world class surf breaks; notably Seal Point and Jeffrey's Bay. The continued preservation of these breaks is not only of importance to the surfing community but also has economic significance due to the associated tourism and surf industries which haves subsequently developed in these towns.

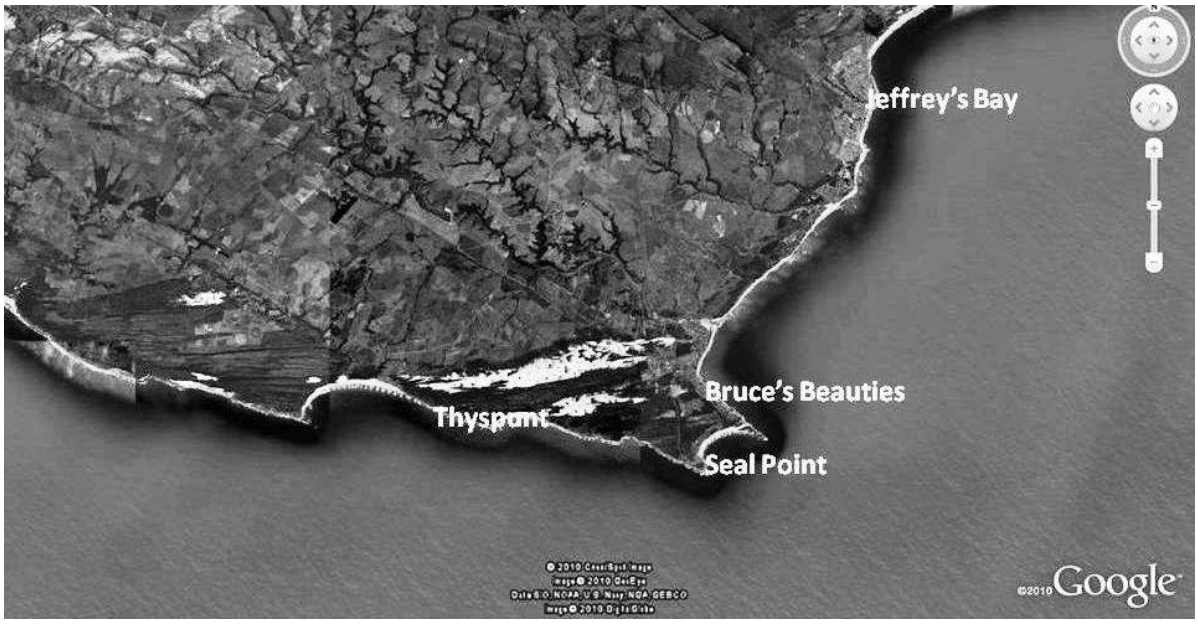
Furthermore breaks in the area have been affected by previous developments along this coastline. The construction of housing and stabilisation of the headland bypass dune field at St Francis has resulted in the disruption of sand movement into St Francis Bay and the subsequent erosion of the beach on the western side of the bay altering previously well known surf breaks, most notably Bruce's Beauties.

As part of the construction of the Nuclear Power Station (NPS) it has been postulated that a large amount of spoil material be disposed of offshore. The effect of the offshore dumping of spoil material on the surf breaks has been raised by a number of I&APs during the public participation process.

Modelling of the movement of the spoil has been undertaken by PRDW to determine the effect on the NPS and the surrounding marine ecology by PRDW (Eskom, 2009). The effects of the spoil disposal on the NPS have been considered in Section 1.3.9 of this report, and impacts to the marine ecology are described in the Marine Ecology Impact Assessment. The full PRDW report is available in Appendix J.

This Appendix therefore considers the impacts of the disposal of spoil to sea on the surf breaks. The location of the surf breaks is indicated in Figure C1.

Figure C1: Location of Seal Point, Bruce's Beauties and Jeffrey's Bay in relation to Thyspunt.



2. Sediment Modelling

Numerical modelling was used to simulate how the discharged sediment is distributed on the seabed and how this sediment moves over time due to wave and current forcing (Eskom 2009). For the proposed nuclear site at Thyspunt two different disposal sites (one relatively deep and relatively shallow site), two different sediment volumes and two sediment discharge rates were modelled.

The results of the modelling at the Thyspunt site indicate that halving the sediment discharge rate significantly reduces the suspended sediment concentrations. Halving the sediment discharge rate does not however reduce the sediment thickness, since the transport of the coarser sediment away from the disposal mound occurs on a much longer time scale than the disposal operation. Moving the sediment disposal to deeper water reduces the transport of the coarser sediment away from the disposal site (due the reduced orbital velocities of the waves). For all alternatives assessed a significant proportion of the disposed sediment remains on the disposal site after 10 years.

The most noteworthy result is the transport of sediment from the shallow disposal site in an easterly direction. The sediment moves rapidly across the reef as a thin sheet (< 5 mm) and then slows down and accumulates in the bay between Seal Point and Cape St Francis. After approximately five years some sediment bypasses Cape St Francis and moves towards St Francis Bay. When assessing the impacts of this sediment, it should be considered that the areas where the sediment is predicted to accumulate are likely to have a naturally sandy seabed. Sediment transport from both the shallow and deep sites is indicated in Figures C2 and C3 respectively.

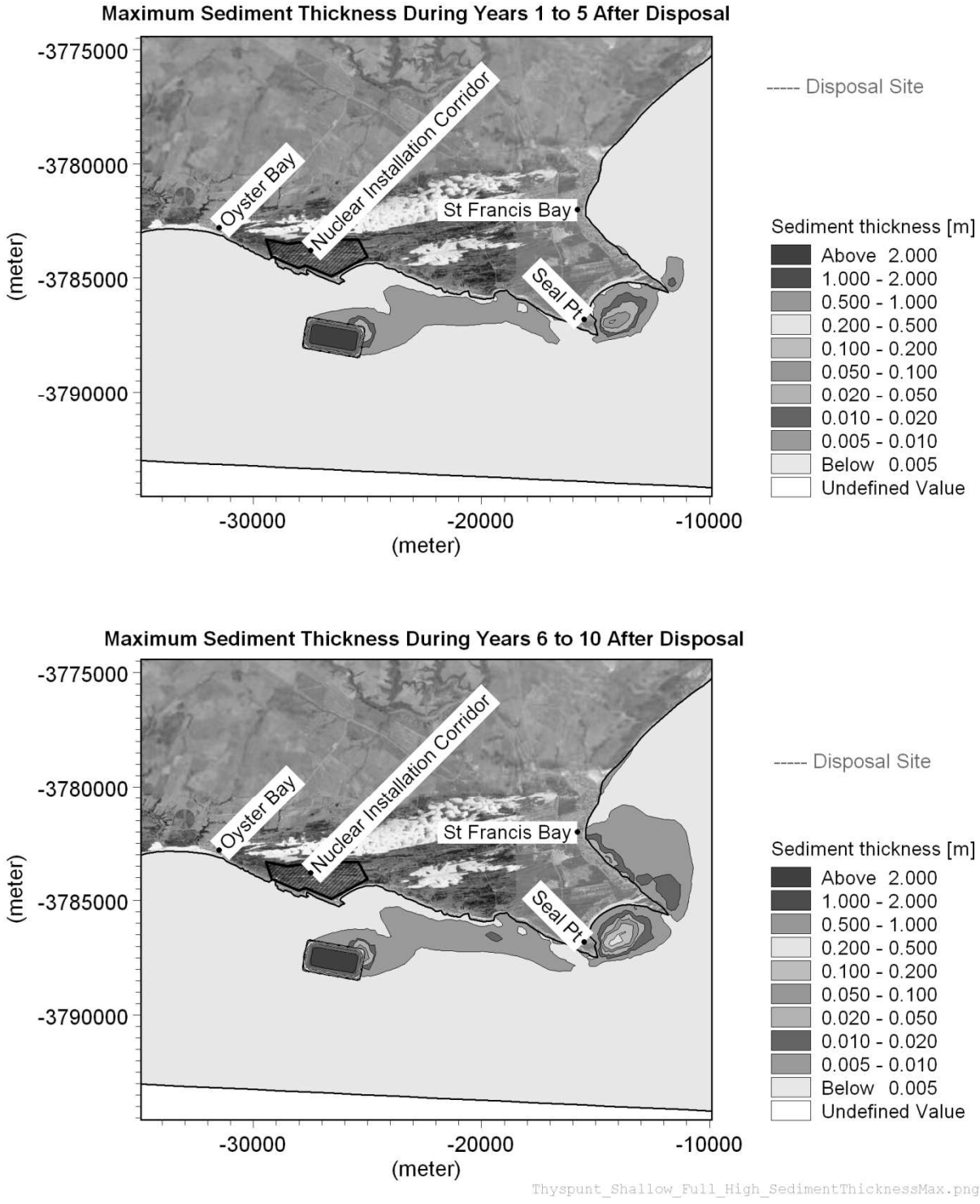


Figure C2: Thyspunt: Maximum sediment thickness for Marine Disposal Alternative 1 (shallow disposal site, full sediment volume, high discharge rate)

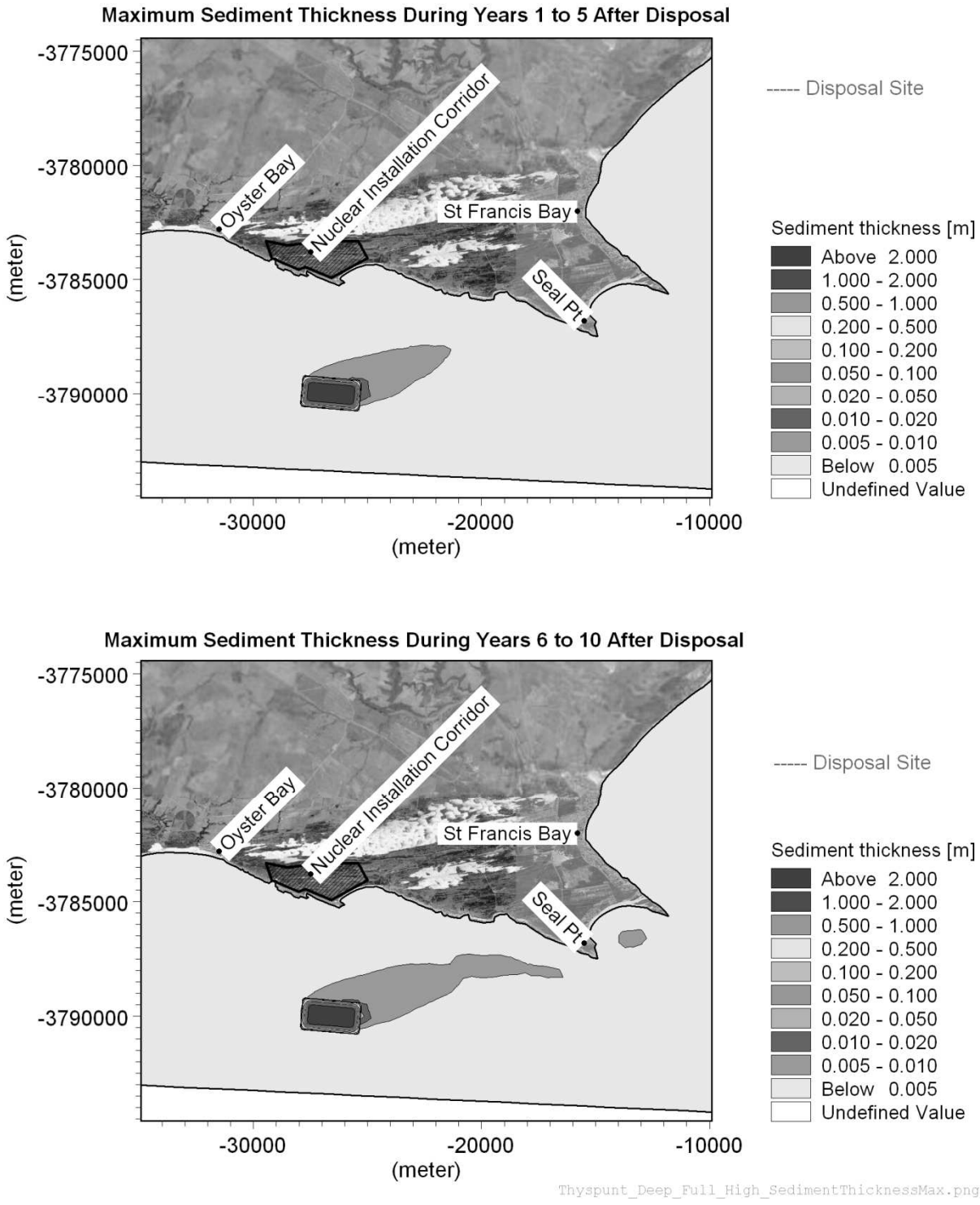


Figure C3: Thyspunt: Maximum sediment thickness for Marine Disposal Alternative 4 (deep disposal site, full sediment volume, high discharge rate)

3. Environmental Assessment

The closest surf break to the Thyspunt site is Seal Point. The results of the numerical modelling indicate that the sediment will not reach Jeffrey's Bay situated 20km further east of Cape St Francis 10 years after the dumping. The environmental assessment in this Appendix therefore focuses on Seal Point and Bruce's Beauties.

3.1 Seal Point

Disposal at Shallow site

The disposal of spoil at the shallow disposal site results in transport of sediment in an easterly direction. The sediment moves rapidly across the reef as a thin sheet (< 5 mm) and then slows down and accumulates in the bay between Seal Point and Cape St Francis. After approximately five years some sediment bypasses Cape St Francis and moves towards St Francis Bay. It should be considered that the areas where the sediment is predicted to accumulate are likely to have a naturally sandy seabed.

Factors that affect the way a wave breaks and subsequently the suitability of a wave for surfing include the topography of the sea floor, swell direction, swell height and period and the tide. An increase in sediment thickness at Seal Point as indicated by the model may alter the topography of the seafloor subsequently changing the way the wave currently breaks. It is considered that marginal increases in sediment will result in a smoothing of the bottom contours resulting in a more consistent peeling wave and therefore may have a positive impact on surf break. However large volumes of sediment have the potential to significantly alter the bottom topography and subsequently significantly alter the break currently experienced at Seal Point (through changing the peel angle or intensity of the breaking wave) Furthermore an assessment of wave quality is subjective as the criteria used determine the quality of the break not only depends on the way the wave breaks (peel angle and intensity) but also the skill level and preference of the person riding the wave. An impact which is likely to result in a change in way the wave currently breaks is therefore considered to be negative.

Disposal at Deep Site

The disposal of spoil at the deep disposal site results in a column of sand between 0.005m and 0.010m thick extending towards Seal Point, with another small portion of spoil settling in the bay (at approximately 10m depth) between Seal Point and Cape St Francis 5 years after the disposal has taken place. The increase in sediment thickness in this bay, whilst significantly less than disposal at the shallow site, may result in an increase in sediment at Seal Point and subsequently changes in the bottom topography. This in turn may affect the manner in which the wave breaks, however to a far less extent than the spoil discharged at the shallow disposal site.

3.2 Bruce's Beauties

Disposal at Shallow site

It is considered that Bruce's Beauties has been negatively affected since development on and stabilisation of the St Francis headland by-pass dunes has significantly reduced the supply of fine grained sand that once abundantly covered the reef. Bruce's Beauties is now considered to be not nearly as good or consistent as when it was first ridden.

The modelling indicated that after approximately five years some sediment bypasses Cape St Francis and moves towards St Francis Bay. The increase in sediment is therefore likely to have a minor, positive effect on the surf at Bruce's Beauties.

Disposal at Deep Site

The modelling indicates that sand migrating from the deep disposal site does not result in an increase sediment thickness in St Francis Bay. Therefore no impact from the deep disposal site on Bruce's Beauties is expected.

4. Impact Assessment Tables

Impact	With/ Without mitigation	Nature	Intensity	Extent	Duration	Impact on irreplaceable resources	Probability	SIGNIFICANCE
Construction Impacts								
Effect of sediment on Seal Point – Shallow Disposal Site	Without Mitigation	Negative*	Medium	Medium	Medium	Medium	Medium	Medium
	With mitigation	n.a.	N/A	N/A	N/A	N/A	N/A	N/A
Effect of sediment dumping on Seal Point - Deep Disposal Site	Without Mitigation	Negative*	Low	Medium	Medium	Medium	Low	Low
	With mitigation	n.a.	N/A	N/A	N/A	N/A	N/A	N/A
Effect of sediment dumping on Bruce's Beauties - Shallow Disposal Site	Without Mitigation	Positive	Low	Medium	Medium	Medium	Low	Low
	With mitigation	n.a.	N/A	N/A	N/A	N/A	N/A	N/A

*Small volumes of sand may smooth bottom topography resulting in a positive impact on the wave. However large volumes of sediment have the potential to significantly alter the bottom topography and subsequently significantly alter the break currently experienced at Seal Point and therefore the impact is considered to be negative. Further details are outlined in Section 3.1

5. Mitigation Measures

Mitigation measures such as halving the disposal rate were considered in the Eskom (2009) report. Whilst this served to reduce the quantity of suspended solids in the water column it did not reduce the sediment thickness, since the transport of the coarser sediment away from the disposal mound occurs on a much longer time scale than the disposal operation. The only effective mitigatory measure to reduce sediment thickness is to reduce the volume of sediment requiring marine disposal through finding alternative disposal methods.

6. Conclusion

Disposal of spoil at the shallow disposal results in an increase in sediment thickness in the bay between Seal Point and Cape St Francis, which has the potential to alter the bottom topography of the break at Seal Point resulting in a change in way the way wave currently breaks. The disposal of spoil at the deep site results in a significantly lower volumes of sediment accumulating further offshore than from the shallow disposal site thus having less impact on the inshore bottom topography and subsequently the waves at Seal Point. As this sediment is transported into St Francis Bay a minor, positive effect on Bruce's Beauties is expected. Due to the potential negative impact to the surf at Seal Point other options for the disposal of spoil should be considered. However, should disposal of spoil to sea be the only feasible option spoil should be disposed of at the deep site.