# 8 Evaluation and Recommendations

This chapter provides an integrated evaluation of the potential impact of the proposed deepening of the Ben Schoeman dock and associated upgrades to Berths 601 – 604. The principal findings of the specialist studies and Environmental Impact Assessment are presented in this chapter, followed by a discussion of the key factors which DEAT will have to consider in order to take a decision leading to a sustainable outcome. Mitigation measures, which this assessment assumes will be implemented, have been copied for ease of reference directly from Chapter 7.

## 8.1 Evaluation

The evaluation is undertaken in the context of:

- the information provided to date;
- the assumptions made for this Draft EIR;
- the recommended essential mitigation measures which it is assumed will be effectively implemented;
- the assessments provided by the specialists; and
- the practicality of the recommendations for mitigation.
- This evaluation aims to provide answers to a series of key questions posed as objectives at the outset of this report, which are repeated here:
- Identify and assess significant impacts associated with the proposed deepening of Ben Schoeman Dock and associated upgrades to Berths 601, 602, 603 and 604;
- Indicate whether the two possible sites at depths of ~40 m and ~70 m respectively, are environmentally acceptable locations for the disposal of dredge spoil;
- Formulate mitigation measures to minimise impacts and enhance benefits; and
- Produce a Final Environmental Impact Report (EIR) which will help DEAT to decide whether (and under what conditions) to authorise the proposed berth deepening project.

The evaluation and the basis for the subsequent discussion are represented concisely in Table 8-1 below. This table indicates the significance of each impact, associated with the overall project, in the case of disposal of dredge spoil at each of the two dredge spoil disposal sites identified as alternatives. Where impacts are not related with dredge spoil disposal, the same impact rating has been provided in the case of each of the two alternatives.

Impact ratings provided in the table assume the implementation of all essential mitigation measures, but not of optional mitigation measures.

**Table 8-1: Impact rating summary for the proposed upgrades to berths and associated deepening of Ben Schoeman Dock**

| Potential Impact | Status | Impact Significance (with mitigation) | | Key Mitigation Measures / Recommendations |
|---|---|---|---|---|
| Marine Impacts | | | | |
| Impacts of dredging activities on the harbour environment | | | | |
| Removal of biological communities in dredge areas | -ve | Very Low | | No mitigation required |
| Impact of sediment plumes in dredge area on organisms in the harbour | -ve | Very Low | | No mitigation required |
| Impacts of settlement of suspended sediment and changes in sediment characteristics on sediment biota | -ve | Very Low | | No mitigation required |
| Importation of alien species into dredge area by dredgers | -ve | Low | | Apply both the NPA Ballast Water Management Plan and the relevant ballast water management protocols stipulated in the IMO International Convention for the Control and Management of Ship's Ballast Water and Sediments and verify implementation. |
| Impacts on dredge spoil disposal sites and surrounds | | | | |
| | | **Dredge disposal site 1** | **Dredge disposal site 2** | |
| Effects of sediment deposition on benthic macrofauna | -ve | Very Low | Medium | Ensure that sediments are discharged in thin layers where possible. |
| Alteration of benthic biological communities through toxins in dredge spoil | -ve | Very Low | Low | No feasible mitigation available |
| Effects of turbidity from dredge spoil disposal on habitats surrounding disposal site | -ve | Insignificant | Medium | No feasible mitigation available |
| Effects of sediment plumes on water quality and biota in Table Mountain National Park MPA | -ve | Insignificant | Low | No feasible mitigation available |
| Introduction of alien species to dredge disposal sites | -ve | Medium | Medium | Apply both the NPA Ballast Water Management Plan and the relevant ballast water management protocols stipulated in the IMO International Convention for the Control and Management of Ship's Ballast Water and Sediments and verify implementation. |
| Effects of turbidity resulting from dredge spoil disposal on endangered coastal seabirds (specifically the African Penguin) | -ve | Low | Low | Ensure there is no chronic build up of turbidity in the area of the dredge disposal site through allowing sufficient time for turbidity to subside between dump events. |
| Potential erosion of the shoreline as a result of disposal of dredge material | -ve | No impact | Insignificant | No mitigation required |
| Impacts on existing uses in Table Bay | | | | |
| Deposition of sediments in existing dredge areas and/or navigation channels | -ve | Low | | No feasible mitigation available |

| Potential Impact | Status | Impact Significance (with mitigation) | Key Mitigation Measures / Recommendations |
|---|---|---|---|
| Interference with existing shipping operations | -ve | Very Low | No feasible mitigation available |
| Noise, Shock and Vibration Impacts | | | |
| Potential increase in noise levels | -ve | Very Low | Implement normal noise control measures during construction. |
| Impacts of shock and vibration from blasting and construction | -ve | Very Low | Lure seabirds and marine mammals out of the harbour prior to blasting.<br>Provide prior notification of blasting to people in areas surrounding the site.<br>Design and carry out blasting operations with due regard to good blasting practice. |
| Traffic Impacts | | | |
| Increase in heavy vehicle traffic on external road network | -ve | Low | Where possible schedule bulk arrivals and departures of trucks carrying construction materials outside peak commuter periods. |
| Increase in heavy vehicle traffic on internal road network | -ve | Very Low | No mitigation required |
| Potential conflict between construction and train movements | -ve | Very Low | Deploy a traffic marshal at crossing of contractor's yard access road with harbour and Paarden Eiland rail lines to communicate with train and signal operators at the central traffic control centre. |
| Visual Impacts | | | |
| Visual impacts of dredging and sediment plumes | -ve | Very Low | No mitigation required |
| Visual impacts of berth deck construction activities | -ve | Very Low | Implement good housekeeping during construction to reduce visual impacts of construction activities and at contractor's yard. |
| Visual impacts of new crane installations | -ve | Low | Consider painting cranes a colour that will be least visible against the skyline (blue/grey) taking due consideration of safety implications. |
| Impacts on Marine Archaeology | | | |
| Disturbance of archaeological material that may occur in Ben Schoeman Dock | -ve | Low | Ensure all archaeological material encountered can be recorded, recovered and stored.<br>Appoint a maritime archaeologist to monitor and advise on archaeological finds.<br>Obtain necessary permits and licenses prior to removal of archaeological material. |

Relevant observations with regard to the overall **impact ratings**, assuming mitigation measures are effectively implemented, are:

- The predicted *very low impacts* of dredging activities *on the biological communities within the harbour*, due to the previous disturbance in this area and generally low levels of species diversity. The impact of the introduction of alien species by ballast water in dredge equipment is rated as *low*, provided that ballast water is suitably managed;
- The predicted *very low impacts* of the disposal of dredge spoil *on the biological communities and habitats at **Site 1*** due to the limited dispersion of sediments from this deeper site as well as the large amount of similar habitat in Table Bay. The impacts of dredge spoil disposal *at **Site 2*** will have *low to medium impacts* due to dispersion of sediments over a larger area (including into the TMNP Marine Protected Area) due to increased wave effects at this shallower site, as well as the fact that the extent of similar habitat in Table Bay may be limited. At both sites, the introduction of alien species as a result of ballast water from dredgers and hopper barges would have a *medium impact* due to the fact that in the case of this occurring, indigenous species would be obliterated by natural processes of competition, predation etc and impacts may thus be long term;
- The predicted *insignificant impacts* of the disposal of dredge spoil at either of the two potential dredge disposal sites *on the stability of the shoreline in Table Bay*, due to the distance of both of these sites from the sandy beaches which would potentially be impacted;
- The predicted *low to very low impacts* on *existing activities in the area*, including existing shipping activities, maintenance of navigation channels as well as the intake of water of suitable quality to feed the Two Oceans Aquarium (assuming water quality is suitably monitored and mitigated) ;
- The predicted *very low noise and vibration impacts* associated with blasting, dredging and construction activities based on levels of noise generated and existing relatively high ambient noise levels which serve to mask predicted noise-generating activities;
- The predicted *low to very low impacts of traffic* related with construction activities on the internal and external road networks primarily due to the low volumes of traffic generated by the project as well as existing high background traffic levels;
- The predicted *very low visual impact* of the dredging and construction activities, and *low visual impact* of the new cranes, due to the fact that these impacts will occur in the context of a working harbour and the high Visual Absorption Capacity of the surrounding area ;
- The predicted *low impact on archaeological material* that may occur in the basin, due to likely disturbance by previous dredging activities, provided that allowance is made for monitoring and recording of any material that is found.

## 8.2 Environmental Suitability of Alternative Dredge Disposal Sites

Salient observations related to environmental suitability of each of the two alternative dredge spoil disposal sites are:

- The following impacts are not related to the choice of disposal site:
  - Impacts on the harbour environment as a result of dredging activities;
  - Noise and vibration impacts associated with blasting and construction activities;
  - Visual impacts associated with construction activities; and
  - Traffic Impacts;
- Both sites are considered environmentally suitable for the disposal of dredge spoil from a *marine ecology* point of view, provided mitigation measures are effectively implemented. *Site 1 is, however, the preferred site from a marine ecology* perspective as the majority of impacts assessed are higher at Site 2.
- Both sites are considered environmentally suitable for the disposal of dredge spoil from a *shoreline stability* point of view. Although a minor impact (considered insignificant) may occur as a result of disposal at Site 2, no impact on shoreline stability is anticipated in the case of disposal at Site 1. *Site 1 is thus marginally preferred from a shoreline stability perspective*;
- Both sites are considered environmentally suitable for the disposal of dredge spoil. In terms of deposition of sediment in navigation channels, this impact - despite being negligible - will be greater at Site 2 due to its proximity to the port entrance and greater resuspension of dredge spoil from the shallower site. In terms of shipping traffic, Site 2 would be closer to the more congested area near the entrance to the port, and *Site 1 is thus the marginally preferred site in terms of impacts on existing uses in Table Bay*;
- Both sites are considered environmentally suitable for the disposal of dredge spoil from a *visual impact* perspective. Although the surface sediment plume associated with disposal at Site 2 is larger and slightly more persistent in the worst case scenario, due to the distance from the shore and the temporary nature of the impact, the impact is considered equal at either of the sites, and *both sites are equally suitable, i.e. neither is preferred from a visual perspective*; and
- Both sites are considered environmentally suitable for the disposal of dredge spoil from a *maritime archaeology* point of view. Although the potential disturbance of archaeological material is linked to dredging activities, disposal of dredge spoil at Site 2, the shallower of the two sites, would facilitate recovery of any such material at a later stage if required. *Site 2 is thus the preferred site from a maritime archaeology perspective*.

## 8.3 Principal Findings and Key Decision Making Factors

The EIA has shown that the environmental impacts associated with the proposed deepening of the Ben Schoeman Dock, and associated upgrades to berths 601, 602, 603 and 604 are in most cases small enough (i.e. rated as insignificant to low) that they are unlikely to have any meaningful influence on a decision regarding the proposed activity. Impacts rated as having medium significance, which should thus influence the decision regarding the proposed project include:

- Effects of sediment deposition on benthic macrofauna at the disposal site, in the case of disposal of dredge spoil at Site 2;
- Effects of turbidity on habitats surrounding the disposal site, in the case of disposal of dredge spoil at Site 2; and
- The potential introduction of alien species to the selected dredge disposal sites by dredgers and/or hopper barges.

The proposed deepening and upgrades of Ben Schoeman Dock, including the disposal of dredge spoil at either of the two potential disposal sites will entail so-called triple bottom line costs, i.e. social, environmental and economic costs.

Of the two potential dredge disposal sites assessed as alternatives in this report, Site 1, situated further offshore and thus in deeper water than Site 2, is considered more favourable than Site 2 in terms of marine impacts, although Site 2 would facilitate recovery of marine archaeological material that may be deposited during dredge disposal at a lower cost. In contrast to this, the financial costs of disposing of dredge spoil at the site further offshore will be higher, due to the additional distance, and thus increased traveling times associated with disposal at this site. Initial estimates however indicate that the increased costs associated with disposal at Site 1 would be marginal, with an increase of approximately 10% to the overall dredge costs, compared to disposal at Site 2.

Clearly the "mix" of costs across the triple bottom line is different for each site. The challenge (for DEAT) is to take a decision which is sustainable in the long term and which will probably entail tradeoffs between social, environmental and economic costs and impacts. The tradeoffs are implicit in the report, which assesses environmental impacts and compares the sites as well as the nuances associated with each impact and site. SRK believes it will be instructive to reduce the decision factors to the key points which DEAT should consider. These points - social, environmental and economic – constitute the principal findings of the EIA, assuming that the recommended mitigation measures will be effectively implemented, and are as follows:

1. As part of a programme for improving the efficiency of the Port of Cape Town, Transnet proposes to undertake the following activities:
   - Deepen the Ben Schoeman Dock ;
   - Conduct upgrades to berths 601, 602, 603 and 604; and
   - Replacing four of the existing (Demag) cranes with larger Panamax cranes, with the long term intention to increase the number of cranes serving the Dock depending on demand.
2. These upgrades are necessary to accommodate larger container vessels that have a greater draught (i.e. require a greater basin depth) and beam (i.e. width);
3. The deepening of the Ben Schoeman dock will involve the dredging of approximately 1,230,000 $m^3$ of rock and sediment from the basin and will require a small amount of blasting;
4. A number of options for disposal of dredge material were considered during the scoping phase of the project, but were eliminated due to the potential environmental impacts associated with them. Rather, more expensive disposal of dredge spoil at a deepwater site is proposed in order to eliminate or reduce a number of impacts typically associated with disposal nearer shore;

5. Two potential dredge spoil sites - Site 1 and Site 2 - situated approximately 13 km (at a depth of ~65 - 70m) and approximately 9 km from the port (at a depth of ~ 40m) respectively, were identified;

6. In terms of the Dumping at Sea Control Act 73 of 1980, Transnet is required to obtain a permit (from DEAT) to dispose of dredge spoil at sea. In terms of the London Convention of 1972 and the 1996 Protocol (on the Prevention of Marine Pollution by Dumping of Wastes and other Matter):

   - The dredge material must be fully characterised and if beneficial uses of the dredge material cannot be identified, a suitable site for disposal needs to be identified and characterised; and
   - Potential impacts need to be assessed to inform a dredge disposal permit application.

7. Dredge material (i.e. sediment in the Ben Schoeman basin) was characterised and trace metal concentration of the sediments to be dredged were found to fall within the "special care" category in terms of the London Convention, implying that they are suitable for disposal at sea, although care must be taken in ensuring that impacts are minimised. Sediment in the basin which fall in the "prohibition" category are located outside the area to be dredged;

8. Both of the disposal sites were characterised, prior to the impacts on the site being assessed. Details of the studies undertaken to identify and characterise the two alternative sites were discussed with DEAT Marine and Coastal Management, with whom contact has been maintained throughout the EIA;

9. Most activities and impacts associated with the project are short term in duration;

10. Assessment of impacts on the marine environment have been addressed in this EIA, which along with other specialist studies have aimed to assess the overall impacts of the proposed development and determine the suitability of each of the two potential dredge disposal sites;

11. The majority of the potential impacts on marine ecology were found to be of low significance. The potential introduction of alien species to the selected dredge disposal site is, however, considered to be of medium significance. However this should be viewed in the context of other shipping traffic entering the bay, which could result in a similar effect (although possibly not specifically at the dredge disposal site). Nevertheless, the consequences of the introduction of alien species can be serious if they become invasive;

12. The effects of the disposal of dredge spoil on the ecology and habitats at and surrounding dredge spoil Site 2, including possible effects in the Table Mountain National Park MPA and the Robben Island exclusion zone, were found to be higher than for Site 1, although not to such a degree that Site 2 would be considered "fatally flawed";

13. Impacts of dredge spoil disposal on shoreline stability are considered negligible provided that the requirements are met in terms of dredge dumping, namely that the dredge material is evenly distributed over the dredge disposal site so as not to cause significant "mounds" of dredge spoil that may start to influence long period waves and consequently shoreline stability;

14. Due to the "instantaneous dumping" method proposed, localized mounds of material (expected to have peak elevations of 0.6 to 0.7m) may be created. This would not result in shoreline stability effects at Site 1, although in terms of the precautionary principle limited wave modeling may be required to confirm potential effects in the case of Site 2 being selected;

15. Although sedimentation of previously dredged areas and navigation channels are not expected to be significant, the significance and extent of this sedimentation over an extended period of time is difficult to assess. The confidence of this assessment is thus medium to low. Use of the deeper site (Site 1) would best mitigate this, as sedimentation risks are minimized;

16. Interference with existing shipping traffic will occur both within the harbour and during dredge disposal activities, although these risks can be readily managed and reduced to acceptable levels;

17. Although potential impacts on water quality in the harbour were initially of potential concern due to the location of the sea water intake point for the Two Oceans Aquarium in the Victoria and Alfred basin, negotiations are underway with this organisation regarding the monitoring of water quality and suitable mitigation put in place to allow for the aquarium to run on a closed system, or receive a water supply from an alternative sources;

18. Noise and blasting impacts would not be linked to the disposal of dredge spoil and thus have no bearing on the selection of the most suitable dredge disposal site. Based on the estimations of the noise during the construction phase, the following main conclusions can be drawn:

    - During construction the noise impact will be area-specific and will last for approximately three years;
    - The 70 dBA daytime guideline for industrial districts will not be exceeded outside the site boundary. The same applies to the 60 dBA night-time guideline;
    - The constructions at the BSD will have a negligible additional effect on the existing noise levels in the nearby residential areas, i.e. significantly less than an increase of 1 dBA;
    - The community in the closest residential area of Woodstock is expected to have no observed reaction since the noise increase will not be noticeable. The same applies to Zonnebloem and Woodbridge Island; and
    - Continuous monitoring and optimisation of blasting will ensure compliance with accepted vibration limits at sensitive receptors and buildings.

19. Construction traffic associated with the delivery of materials during the construction phase of the project is expected to have minor impacts on the current traffic on the external access routes, as well as between the construction site and the Contractors Yard, situated at the Culemborg site;

20. As both alternative dredge spoil sites are situated offshore, traffic impacts will have no bearing on the selection of the most suitable dredge disposal site;

21. The proposed activities associated with the deepening of Ben Schoeman Dock and the new gantry cranes are considered to be highly consistent with current activities and congruent with activities associated with a working harbour. Sediment plumes will often be similar to those occurring naturally and will only be visible for very short duration;

22. Although sediment plumes will be larger and more persistent at the shallower of the two sites, the significance of the visual impacts is considered to be very low in both cases and the visual impact should thus have no bearing on the selection of the most suitable waste disposal site;

23. The fact that the basin has been subjected to extensive dredging and blasting in the past has already resulted in destruction of a significant part of the underwater cultural resource. For this

reason, preference should be given to further development of this basin, as opposed to similar proposed developments; and

24. Disposal of dredge spoil at the shallower of the two sites (Site 2) would facilitate future recovery of any material of archaeological or cultural value that may be disturbed during dredging of the basin. It should be noted that either of the two sites would allow for this, although the associated costs would be higher for the deeper site.

SRK believes that sufficient information is available for DEAT to take a decision. If DEAT accepts that the proposed upgrades to the Ben Schoeman Dock are required in order to accommodate new generation vessels, ultimately DEAT must decide which of the two sites evaluated would be most suitable (environmentally) for the disposal of dredge spoil, or if either site would be considered suitable.

SRK believes that the specialist studies have shown clearly that the proposed upgrades to the Ben Schoeman Dock, as well as the disposal of dredge spoil at either of the two disposal sites considered, would be environmentally acceptable, assuming the recommended mitigation measures are implemented.

## 8.4 Recommendations

### 8.4.1 General Recommendations

If DEAT approves the proposed deepening and upgrades to the Ben Schoeman Dock, a condition of approval should be that the recommendations and **essential** mitigation measures presented below are effectively implemented by Transnet.

The general recommendations are to:

- Commit to and effectively implement the **essential** mitigation measures listed in this EIR;
- Consider implementing the optional mitigation measures listed in this EIR;
- Formulate and implement an Environmental Management Plan (EMP) for the construction and operational[33] phase of the project (if approved), incorporating:
  - methods to mitigate environmental impacts during construction; and
  - assigned responsibilities for the implementation of the EMP;
- Apply for the necessary permit for the disposal of dredge spoil at sea from DEAT, prior to such disposal taking place;
- Apply for the necessary permits from SAHRA in the case of material of cultural value being encountered;
- Formulate or make known a mechanism to receive and address complaints
- Continue to keep local stakeholders informed of future plans in this regard.

[33] The NPA Environmental Management System (EMS) will also be applicable to the operational phase of the project.

### 8.4.2 Specific Recommendations and Mitigation Measures

It is assumed that the following essential mitigation measures, designed to manage impacts associated with the proposed deepening of the Ben Schoeman Dock, and upgrades to Berth 601-604 will be implemented if the proposed project is approved. The mitigation measures listed below are applicable in the case of disposal of dredge spoil at either of the two alternative disposal site.[34]

Optional mitigation measures, which would further assist in reducing the environmental impacts associated with the proposed development, but the implementation of which cannot be guaranteed (and have thus not been considered in the assessment of the significance of environmental impacts) have also been listed. These mitigation measures should be considered by Transnet, who should have suitable motivation if not implemented.

**Potential Marine Impacts**

Essential mitigation measures:

1. Apply the relevant ballast water management protocols stipulated in the IMO International Convention for the Control and Management of Ship's Ballast Water and Sediments as well as NPA requirements for ballast water management, with verification of application; and
2. Dispose of dredged material in such a way that an average mound elevation of 0.3m is achieved in order to prevent unexpected wave refraction effects occurring, particularly at Site 2.
3. Include specifications of turbidity levels not to be exceeded at the entrance/exit to Ben Schoeman Dock in the Environmental Management Plan and Dredge Tender documents. Recommended levels are likely to range from 80 to 100mg/l, but will need to be both reasonable and sufficiently conservative to mitigate specific predicted environmental impacts. It is best left to the dredge operators to select appropriate mitigation measures to meet these specifications, rather than specifying these in the Environmental Management Plan. The EMP should however make allowance for monitoring of these levels.

Optional mitigation measures include:

1. Lure seals, marine mammals and marine birds out of Ben Schoeman Dock to sea during blasting periods.
2. Should a Cutter Suction Dredging be chosen undertake dredging during summer rather than winter;
3. Ensure that sediments are deposited in thin layers when discharged at the sediment disposal site, in an attempt to achieve a fairly even sediment distribution, rather than mounds, to reduce mortality of benthos;
4. Prevent the chronic build up of turbidity in the area of the dredge disposal site through allowing sufficient time for turbidity to disperse between dump events, thus reducing impacts on penguin populations foraging in the area;
5. Dispose of dredge spoil at Site 1 rather than Site 2;

[34] Where mitigation measures recommended in specialist studies have not been considered practical, SRK has amended these in the EIR.

6. In the case of Site 2 being selected as the dredge disposal site, undertake a limited wave modelling study for this site, to confirm the effect of uneven dumping on the wave climate is sufficiently limited to prevent changes in shoreline stability;

7. Reassess the potential impacts on the marine environment in the case of dredge technology, nature of operations or durations being significantly different to those assessed in the specialist study (based on current project description provided in Chapter 3);

8. Confirm the potential remobilization of toxins with additional (more comprehensive) elutriation analyses of the sediments targeted to be dredged, prior to dredging;

9. If possible, find a beneficial use for rock to be removed from the basin;

10. Obtain an appropriate environmental baseline for the potential impacts from dredging operations (e.g. water quality at the Two Oceans Aquarium intake). The baseline should specifically be obtained for "indicator" trace metals (copper and zinc) and suspended sediments (and possibly nutrient, particularly ammonium levels). These quantities are to be appropriately monitored at the Two Oceans Aquarium during the dredging operations.

11. In the case of water quality at the intake point not being suitable for use by the aquarium **and** attributable to dredging or dredge disposal activities, the implementation of mitigation measures (e.g. running of a closed system, or obtaining seawater from elsewhere) should be considered.

Optional **monitoring** with respect to marine impacts include:

1. Utilise survey data gained on the candidate dump sites to track changes associated with dredge spoil dumping over a realistic time span to show rates of benthos recovery and provide information on dumped dredge spoil behaviour. Opportunities for this have not been created in the past and the baseline data set will be an invaluable tool in understanding the effects and implications of the marine disposal of dredge spoil on South Africa's inner continental shelf.

2. Undertake further simulation modeling analyses of the life cycles and distributions of dredge spoil dump site surface layer turbidity plumes throughout the various phases of the dredging programme. In terms of the possible effects on African Penguins foraging in Table Bay, this may lead to mitigation solutions based on timing of the various phases of dredging and spoil dumping. Although the evaluation of the predicted effects on penguins yielded a low significance rating, public perceptions merit serious attention being given to efforts to ameliorate any possible impacts.

3. Monitor beneficial use areas of the V&A waterfront such as filter performance levels at the Two Oceans Aquarium and through real time monitoring (instrumented buoy and telecommunication system) located near the entrance to the harbour. The buoy system would also allow real time control of the dredging operations in terms of limiting exceedances of critical suspended sediment concentrations such as those envisaged in EMBECON (2004).

4. Operate a mussel watch programme (through DEAT/MCM) that incorporates sampling points around the Port of Cape Town. Sampling intervals in this programme are six months. During the dredging period it is recommended that monthly coverage is requested to show short term effects, if any, of remobilised contaminants in filter feeders. This monitoring can be augmented by suspension of mussels adjacent to the selected dredge spoil dump site to confirm that released or remobilised contaminants are below any level of concern.

5. Utilise the monitoring of the proposed dredging operation, together with supplementary measurements, to better constrain uncertainties in the model predictions. In particular, measurements supporting the more accurate specification of critical shear stresses of deposition, critical shear stresses of erosion and re-suspension rates at the seabed, should be taken.

**Potential Noise, Shock and Vibration Impacts**

No essential mitigation measures are required to reduce the noise and blasting impacts associated with the project.

Optional mitigation measures:

1. Maintain construction equipment and ensure that silencer systems function efficiently at all times;
2. Position stockpiled materials so as to provide screening and reduce noise from specific construction operations beyond the site boundaries;
3. Notify occupants of surrounding areas, as well as divers of proposed blasting activities at predetermined times on stated days;
4. Carefully design the blasting regime to reduce the levels of ground borne vibration;
5. Design and carry out blasting operations with due regard to good blasting practice. This would include:
   - Calculating the charge size and timing delay to keep ground vibration levels below pre-determined acceptable values;
   - Correct stemming of blast holes to reduce noise and vibration generation and improve blasting efficiency.
   - Monitoring of ground vibration and human response by an independent third party entity to ensure that agreed levels are in fact acceptable to the occupants of surrounding areas and are being adhered to, and to modify the blasting design if required to reduce impacts.
6. Undertake a set of test blasts prior to the start of the main blasting operations, in order to determine the two site-specific coefficients which would allow for the calculation of the actual peak particle velocity at sensitive buildings, so that levels can be controlled by competent blast design.

Optional **monitoring** of noise would include:

1. Undertake biannual noise monitoring along the site's boundaries during the construction period in order to ensure conformity with the regulations and indicate relevant corrective measures to be implemented. The measurements should be performed in accordance with procedures stipulated in the South African National Standard (SANS) Code of Practice: SANS 10103:2004.

**Potential Traffic Impacts**

Essential mitigation measures:

1. Schedule the bulk of arrivals and departures of truck conveying construction material during the commuter inter-peak period (between 09h00 and 16h00);

2. Implement a stop control at the contractor's yard access road approach to Duncan Road; and
3. Deploy a traffic marshal at the crossing of the access road from the Contractors yard with the Harbour and Paarden Eiland rail lines. The traffic marshal is to maintain communication with the train operators at the central traffic control centre with regard to train movements.

**Potential Visual Impacts**

No Essential mitigation measures are required to reduce the visual impacts associated with the project.

Optional mitigation measures:

1. Consider the visual impacts of sediment plumes in selection of the most suitable dredge method.
2. Limit the area used for construction activities including the associated storage of waste, materials and equipment;
3. Ensure that rubble and waste material are removed regularly from the site;
4. Store construction equipment and material in an orderly manner on a designated site;
5. Unless considered a safety risk, paint cranes a colour that will be least visible against the skyline (grey/blue); and
6. Monitor and react to complaints about plumes generated by project activities. .

**Potential Archaeological Impacts**

Essential mitigation measures:

1. Where applicable, take the recommendations of the Maritime Archaeologist into account when planning and conducting blasting and dredge operations to minimize impacts on the potential cultural resource;
2. Inform both NPA and SAHRA of the exact location and extent of the dredge disposal site;
3. Ensure that all contractors and subcontractors are made aware of the potential existence of underwater heritage resources, and instructed on the correct procedure for preserving the integrity thereof. Also instruct sub-contractors to monitor dredging activities (through visual inspection of at least part of the dredge material brought to the surface before being deposited at the disposal site, where possible) for any cultural material that may be uncovered. In the case of material being uncovered, a qualified archaeologist is to be notified immediately and the material secured and kept for inspection;
4. Ensure that monitoring is particularly vigilant during dredging of the area from Berth 603 westwards;
5. Formally inform SAHRA in writing of the planned development;
6. Retain a suitably qualified archaeologist as a consultant for the duration of the dredging operations to provide advice to the Contractor as and when required. This person may have to: liaise with SAHRA and the client / dredger operators; pay *ad hoc* site visits to monitor blasting and dredging activities; secure the necessary licences and permits from the Controller of

Customs and Excise and the SAHRA; and render assistance should any cultural material be dredged up;

7. Provide assistance should the maritime archaeologist deem it necessary to undertake an underwater survey and/or remove material. This may include support from NPA divers and others;
8. Make provisions for essential mitigating activities related to underwater cultural material that may be recovered. This would include:
   - making funds available for monitoring activities to be undertaken by the project's maritime archaeologist if required;
   - funding for potential limited underwater fieldwork if required;
   - funding for the basic preservation and documentation of dredged up material if required; and
   - allocation of a suitable area where recovered material may be temporarily stored and treated if required; and
9. Allow for any valuable material recovered during dredging to be adequately stored and preserved. Excavation and recovery can only be done after a licence from the Department of Customs and Excise has been issued and a permit from the SAHRA has been obtained.

Optional mitigation measures are:

1. Where practicable and cost effective, preferably make use of a backhoe dredger, which allows for visual monitoring of the dredge spoil before it is removed. This is especially the case in the archaeologically sensitive area from berth 603 towards the entrance channel; and
2. Preferably dispose of dredge spoil in an area that will allow future recovery of heritage resources. It should be noted that either of the proposed dredge disposal sites would allow for this, although the associated costs would be higher for a deeper site.