Annex C

Port Zoning and Operational Opportunities and Constraints
SALDANHA PHASE 2
SCREENING STUDY
PORT ZONING AND OPERATIONAL OPPORTUNITIES AND CONSTRAINTS

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1. **INTRODUCTION**

In order to ensure that the construction of a new iron ore berth at Port of Saldanha does not impact negatively on the future development potential of the port, four layout options (herein referred to as Locations 1 to 4) have been assessed based on a set of general port planning principles.

A locality map is provided in Figure 1 and the four locations considered provided in Figures 2 to 5.

2. **PORT PLANNING PRINCIPLES**

The current port layout is provided in the following figure.

![Port Layout](source.png)


In compiling the Port Development Framework Plan for the Port of Saldanha, a number of port planning principles were considered. These are as follows:

- Terminal layout
- Terminal location
- Commodity handling
- Development potential
- Status quo limitations
- Retaining flexibility
2.1 Terminal Layout

Ideally, berths should be laid out in such a way that each cargo category (e.g. break-bulk, dry-bulk) is handled at specialised terminals within the port. By consolidating a cargo handling activity to one area, the port is able to optimise land and water space usage (common facilities available to all berths) and reduce equipment requirements (common equipment servicing all berths).

Examples that are specific to an iron ore terminal include:

- The use of a common dredge channel and turning circle.
- The use of common land based access routes.

2.2 Terminal Location

Terminal location refers specifically to site and environmental conditions. These may include geotechnical considerations, wave conditions, wind and currents. On the geotechnical side, deeper areas are naturally suited to larger vessels as dredge requirements are then limited. This is of particular relevance when the area to be dredged could include large volumes of rock and when there is a shortage of disposal sites within close proximity available. In terms of wave conditions, larger vessels are generally able to withstand larger waves. The terminal alignment should take into consideration the dominant wind directions and measures to deal with currents (e.g. breakwater structures) may be required to deal with currents.

In the case of the Port of Saldanha, Small Bay is more protected than Big Bay and therefore has a smaller wave climate. The depths in the port are deepest at the seaward end of the jetty (-23m CD) and become shallower as one approaches land (-15m CD at the break-bulk terminal and -6.5m CD at the General Maintenance Terminal). Currents and wind are not seen as having a major impact on the location of future iron ore berths.

2.3 Commodity Handling

In addition to the commodities currently handled at the port, the port development framework plan makes allowance for other cargo types and port activities to be part of the fully developed port. Containers, ship repair and LNG are a few of the cargo handling facilities / port activities that could be introduced at the port. Due to the fact that compatibility does not exist between all cargo handling facilities / port activities (e.g. the dust from an iron ore facility could impact negatively on a ship repair facility), the location of a berth could negatively impact on potential future development.
2.4 Development Potential

The development potential of a port is influenced by the areas of a port that have as yet not been developed and by the areas which, although developed, no longer serve the purpose for which they were developed.

Areas of the Port of Saldanha which could still be developed include:

- Eastern (Big Bay) side of the causeway between the iron ore berth and the iron ore stockpiles.
- Western (Small Bay) side of the causeway between the iron ore berth and the multi purpose terminal (MPT).
- Western (Small Bay) side of the causeway between the MPT and the iron ore stockpiles.
- Either side of the Mossgas quay.

Areas of the Port of Saldanha which have been developed but are no longer functional are as follows:

- General Maintenance Terminal

2.5 Status Quo Limitations

Future development should be optimized within the context of local constraints and existing development. Cargo handling activities at the port currently include iron ore, liquid-bulk and break-bulk and dry-bulk through the MPT. The iron ore berths require deep water. The liquid bulk has safety related requirements and the MPT requires calm water as well as road and rail connectivity.

The current locations occupied by the various terminals should also be considered. In addition to quay wall and dredging costs, an established terminal may have buildings, equipment and road and rail costs that would need to be taken into consideration. Therefore although relocation of a terminal or port activity is an option, the cost associated with this will typically result in this not being economically favourable.

2.6 Retaining Flexibility

In port planning, flexibility needs to be considered due to inevitable future change. New markets and industry technology may result in significant changes in the demand for capacity for different commodities.

Terminals that consist of a single continuous quay wall will generally provide better flexibility than a terminal that consists of a number of shorter quay walls. This flexibility is most apparent in container
terminals and break-bulk terminals where quayside cranes can be interchanged between berths and
berth lengths can be resized depending on the vessel sizes calling at the terminal. In the case of an iron
ore terminal, it would be easier to resize berths in the future (where vessel sizes could be either bigger
or smaller than present day) if the berths are along one continuous line.

The flexibility of other cargo handling facilities / port activities other than the cargo type being
considered should be taken into consideration. Development immediately alongside an existing
terminal may limit the future development potential of that terminal.

2.7 Early Integration of Environmental and Social Opportunities and Constraints

Conceptual layouts developed at an early stage of the port planning process were assessed at a
workshop held on the 4th of May 2007. The workshop was attended by representatives of Transnet
business units as well as by environmental consultants.

The workshop provided an opportunity for the conceptual layouts to be tested against various
environmental and social opportunities and constraints, as presented in Annexure A-1.

The conceptual layouts were then refined based on the comments received.

3. OPERATIONAL OPPORTUNITIES AND CONSTRAINTS

A number of general port development opportunities and constraints have been identified in the Port
Development Framework Plan.

Some of the constraints include:

- The residential area to the west of the causeway.
- Concerns regarding shoreline stability to the east of the causeway.
- Dust emanating from the iron ore stockpiles.
- The larger wave climate experienced on the Big Bay side of the causeway.
- Possible environmental impact on the Langebaan Lagoon.
- The nutrient rich waters of Saldanha Bay make it an ideal location for mariculture.
- Potentially sensitive environmental areas to the north-east of the iron ore stock piles.
- The lack of suitable dredge disposal sites within close proximity to the port.

Some of the opportunities include:

- Small Bay provides a relatively sheltered area.
- There are areas of deepwater available at the seaward end of the causeway.
• Large amounts of undeveloped land adjacent to the port.
• The ease with which existing developments can be expanded without impacting on other port activities.

In terms of opportunities and constraints that are specific to the various berth locations being considered, these include, but are not limited to, the following:

3.1 Location 1

Location 1 is the area on the Small Bay side of the causeway between the existing iron ore berth and the MPT.

This location could limit the future development potential of the MPT and will result in Oil Pollution Control South Africa (OPCSA) having to relocate.

The dredge requirement at this location is approximately 4.1 million m\(^3\) and the length of revetment required for the reclamation area is approximately 1 300m.

A minor technical issue that will need to be dealt with is how the road and conveyor system cross one another.

A safety issue that should be considered is the additional number of iron ore vessels that will need to pass the oil tanker berth.

This location will provide better protection against wave action than location 2.

3.2 Location 2

Location 2 is the area on the Big Bay side of the causeway between the existing iron ore berth and the iron ore stockpiles.

No impact on the future development of existing port terminals is foreseen and the disruption of existing port operations should be minimal.

The dredge requirement at this location is approximately 6.75 million m\(^3\) and the length of revetment required for the reclamation area is approximately 2 100m.

An environmental concern is the effect that dredging or construction in Big Bay might have on the stability of the beaches to the east of the port.
3.3 Location 3

Location 3 is the existing MPT. The existing MPT will need to be relocated. The existing quay structure would not be suitable for a new iron ore berth due to insufficient depth alongside the quay wall.

The dredge requirement at this location is approximately 7.7 million m$^3$ and the length of revetment required for the reclamation area is approximately 2 200m.

A minor technical issue that will need to be dealt with is how the road and conveyor system cross one another.

As with Location 1, a safety issue that should be considered is the additional number of iron ore vessels that will need to pass the oil tanker berth.

This location will provide better protection against wave action than both location 1 and 2.

3.4 Location 4

Location 4 is the area on the Small Bay side of the causeway between the MPT and the iron ore stockpiles.

This location could limit the future development potential of the MPT.

The dredge requirement at this location is approximately 13.7 million m$^3$ and the length of revetment required for the reclamation area is approximately 2 600m.

A minor technical issue that will need to be dealt with is how the road and conveyor system cross one another.

As with Locations 1 and 3, a safety issue that should be considered is the additional number of iron ore vessels that will need to pass the oil tanker berth.

This location will provide better protection against wave action than any of the other locations.

3.5 Opportunities and Constraints in Relation to Port Planning Principles

The following table provides a summary of how closely each location meets the port planning principles presented in Section 2.
Green indicates a good match.
Yellow indicates an acceptable match.
Orange indicates a poor match.

<table>
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<tr>
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<th>Location 1</th>
<th>Location 2</th>
<th>Location 3</th>
<th>Location 4</th>
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</table>

Based on the preferred site being Location 2, the proposed future layout of the port, as at the year 2020, is provided in the figure below.


4. SUMMARY

The port planning principles provide a foundation upon which the planning of future development within the port can be based. The majority of these principles emphasize the importance of taking
consideration of other cargo handling terminals and port activities when planning for the expansion of a terminal.

In considering the positioning of additional berths, the use of common facilities and infrastructure should be encouraged where possible. The need for a large amount of additional dredging for Location 4 will therefore make this option less appealing.

In considering the site conditions, some sites will be better suited to certain operations / activities than others (e.g. waves and water depth). Location 2, due to being fairly exposed and situated in deep water, is therefore better suited to an iron ore berth than to a break-bulk berth.

In terms of potential future expansion of the port, the natural expansion of the MPT would be to the north and / or to the south of the existing terminal. Location 1 and Location 4 could therefore impact on future expansion.

The need to relocate a terminal will generally incur considerable cost. Location 3 would result in the need to relocate the MPT and is therefore not favourable.

Finally, the flexibility of a terminal to adapt to future changes in the industry it serves is important. Larger or smaller vessels in the future could result in the need for resizing the existing berths. This is easiest to achieve when the berths are all situated in a long continuous line. Location 2 is therefore the preferred option in this case.

Although some of the locations may be cheaper to develop or provide lower downtime, the location that is best suited to meeting the Port Planning Principles is therefore Location 2.
REFERENCES

(PRDW, 2007a) Prestedge Retief Dresner Wijnberg (Pty) Ltd; Port of Saldanha Development Framework Plan; Report No. 491/01/006 Rev 01; December 2007.

(PRDW, 2007b) Prestedge Retief Dresner Wijnberg (Pty) Ltd; Port of Saldanha Iron Ore Berth Location Assessment; Report No. 491/01/003 Rev 01; May 2007.
ANNEXURE A-1
ENVIRONMENTAL AND SOCIAL OPPORTUNITIES AND CONSTRAINTS
ANNEXURE A-1: PORT OF SALDANHA - OPPORTUNITIES AND CONSTRAINTS