TRANSNET

BEN SCHOEMAN DOCK DEEPENING ENVIRONMENTAL IMPACT ASSESSMENT

TRAFFIC IMPACT ASSESSMENT

HHO Africa
Infrastructure Engineers
Cape Town

6732
February 2007

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Document Verification

Form QS31-SF8 Rev 1

Job Title	**Transnet**	Project No	**6732**
Document Title	**Ben Schoeman Dock Deepening EIA : Traffic Impact Assessment**	File Reference	**6732**

Revision	Date	Filename			
Draft Report	**November**	**6732 Deep Dock/00 Admin & Doc/Reports & Doc/BSD Deepening TIA Final_30 Nov.doc**			
			Prepared by	Checked by	Approved by
		Name	**Stef Naude**	**Andre Frieslaar**	**John Jones**
		Signature			

Revision	Date	Filename			
Final Report	**December**	**6732 Deep Dock/00 Admin & Doc/Reports & Doc/BSD Deepening TIA Final_5 Dec.doc**			
			Prepared by	Checked by	Approved by
		Name	**Stef Naude**	**John Jones**	**John Jones**
		Signature			

Revision	Date	Filename			
1	8 Febuary 2007	**6732 Deep Dock/00 Admin & Doc/Reports & Doc/BSD Deepening TIA Final_8 Feb07**			
			Prepared by	Checked by	Approved by
		Name	**Stef Naude**	**Stef Naude**	**John Jones**
		Signature			

Document Verification Issue with Report ☐

EXECUTIVE SUMMARY

Transnet appointed SRK Consulting (SRK) via HMG Joint Venture to conduct the Environmental Impact Assessment (EIA) phase of the proposed deepening of the Ben Schoeman Dock (BSD) and alteration of Berths 601 – 604. HHO Africa were appointed as a sub-consultant to SRK to undertake the Traffic Impact Assessment (TIA) of the proposed berth deepening and alteration of berths.

The aim of the specialist study is to assess the impact of the anticipated peak and inter-peak period construction related traffic on the external road network, in particular the Marine Drive/ Paarden Eiland/ Container Road intersection, and adjacent road links. In addition, the the operation and impact of the proposed Contractors yard access on Duncan Road was assessed.

The major findings and recommendations of this report can be summarised as follows :

- The deepening project will take place in two phases, with the first phase of the temporary crane rail construction scheduled for June to October 2007, and the deepening of Berths 601- 604 for April 2008 to May 2011.

- Trip generation for the construction processes were formulated on the basis of an operations model, which assesses the anticipated associated quantities of material to be delivered, and their internal movements in the Port in terms of the number of resultant vehicle trips.

- The traffic assessment estimates the proposed temporary crane rail construction to generate between 34 and 37 vehicle trips during the weekday AM, midday and PM peak hours; while the berth deepening process between 22 and 25 vehicle trips during these hours. The former process generates a higher number of trips than the latter, in spite of the smaller quantities of material involved, due to the restricted time scale allowed for establishing the crane rail.

- A Contractors yard is proposed on Portion 24, Culemborg, to be linked via a temporary gravel road along the rail culvert underneath the N1 Freeway. Pre-cast slabs need to be constructed across the Harbour and Paarden Eiland rail lines, to establish a 4th leg to the Duncan Road/ Elliot Basin intersection. The intersection will have a 4-way stop control.

- Delivery of construction material is assumed would take place during normal working hours, i.e. between 08h00 and 17h00. A peak hourly flow of 20% of daily demand is assumed for analysis purposes, to account for fluctuations during operations, and a contingency factor of 1.3 was used to simulate a “worst case scenario”.

- It has been assumed that all construction related traffic would access the Port via Marine Drive (80% from/to the south; 20% from/to the north), then via Container Road into Duncan Road, and then to the proposed access to the proposed Contractors yard opposite the Eilliot Basin access. No traffic is assumed will access the site via the south (Cape Town CBD).

- All material delivered to the Port would be transported via the Contractors yard, except for the rock supply, to be delivered directly to the construction site. Internal heavy vehicle movements would consist of concrete mixers and heavy vehicles transporting other construction materials between the Contractors yard and the construction area in Ben Schoeman Dock.

- Peak hour flows along Marine Drive are predominantly southbound in the mornings (AM peak hour) and northbound in the afternoons (PM peak hour), although the flows in the opposite (non-peak) direction are significant. High levels of congestion are experienced along Marine Drive during (and increasingly outside) commuter peak periods, which are related to capacity constraints along the N1 Freeway and its links with Marine Drive.

- Traffic flows along Duncan Road have decreased over the past 3 years due to the enforcement of stricter controls at the Port access points.

- The Contractors yard will be least accessible during the weekday AM and PM peak periods, and more accessible during the inter-peak period.

- Vehicles from the Contractors yard will be required to cross the Harbour/ Monte Vista rail line as well as the rail link from Paarden Eiland close to their merging point. Average time intervals between trains on the Harbour line are 40 minutes (day) and 60 minutes (night), and on the Paarden Eiland link 60 minutes (day) and 90 minutes (night).

- Road proposals identified as part of the N1 Corridor upgrading project may be implemented prior to, and in time for World Cup 2010. The preferred location of the Contractors yard is directly impacted by some of the proposals, which are aligned through part of this site. The possible relocation of this yard to another site within the Port area, will not have any consequences for the impact of the berth deepening project on the external road network.

- The berth deepening construction project will result in the marginal deterioration of the performance of the Marine Drive/ Container Road/ Paarden Eiland Road intersection during all peak hours considered, and its effective impact will be negligible. The northbound through movement at the intersection of the N1 ramp onto Marine Drive will continue to operate at similarly low levels of service (LOS F) to the current situation.

- The Duncan Road/ Elliot Basin/ Contractors yard intersection will continue to operate at high levels of service (LOS B) during the weekday AM and inter-peak hours, and at reasonable levels of service (LOS C) during the weekday PM peak hour, with overall intersection delay virtually unchanged.

- The movements of construction traffic along Contractors yard access and trains along the Harbour and Paarden Eiland rail lines will need to be regulated. It is proposed the deployment of a traffic marshal is best suited for this purpose.

- It has been assumed that workers will be transported to the construction site by means of specifically deployed vehicles, either trucks used as part of the on-site vehicle stock, or dedicated vehicles. Should this not be the case, established public transport services to the site could be utilised. In this regard, Esplanade and Woodstock stations are within walking distance from the

Contractors yard (< 800m). Walking distances from these stations to the quayside at berths 601 – 604 are somewhat longer (± 1.5km).

- The impact ratings of the increase in heavy vehicle traffic on the external road network as a result of the construction of the berth deepening project are : (i) consequence : very low to low; and (ii) significance : very low to low. The proposed mitigation measure is to schedule the bulk of arrivals and departures of trucks conveying construction material during the commuter inter-peak period (between 09h00 and 16h00). This will not alter the impact rating.

- The impact ratings of the increase in heavy vehicle traffic along Duncan Road and at its new access to the Contractors yard are : (i) consequence : very low; and (ii) significance : very low.

- The impact ratings of the potential conflict between construction vehicle and train movements at the crossing of the Harbour and Paarden Eiland rail lines are, provided a traffic marshal is appropriately deployed : (i) consequence : very low; and (ii) significance : very low.

- All construction traffic should be routed along higher order roads to (i) minimise structural damage to roads, (ii) minimise stop/start manoeuvres for truck traffic and (iii) minimise noise impacts on residential areas along haul routes.

- Preliminary indications are that the berth deepening and container terminal expansion projects can be implemented simultaneously without any geometric improvements to the external road system, provided haulage of rock only is required for the expansion project (not sand), and appropriate traffic management measures (e.g. restricting certain haulage operations to off-peak periods) are put in place.

This traffic impact assessment has demonstrated that the proposed deepening of the Ben Schoeman Dock will have a minimal impact on the operation of the transport network, both external and internal to the Port.

1.0 INTRODUCTION

1.1 BACKGROUND

Transnet appointed SRK Consulting (SRK) via HMG Joint Venture to conduct the Environmental Impact Assessment (EIA) phase of the proposed deepening of the Ben Schoeman Dock (BSD) and alteration of Berths 601 – 604.

HHO Africa were appointed as a sub-consultant to SRK to undertake the Traffic Impact Assessment (TIA) of the proposed berth deepening and alteration of berths.

1.2 TERMS OF REFERENCE

The aim of the specialist study is to assess the impact of the anticipated peak and inter-peak period construction related traffic on the external road network, in particular the Marine Drive/ Paarden Eiland/ Container Road intersection, and adjacent road links.

In particular, the Terms of Reference (ToR) of the study encompass the following aspects (Refer to Appendix A : Study Proposal) :

- Assess anticipated weekday peak and off peak hour construction traffic demand through consultation with berth deepening consulting engineers (and hazardous waste specialists if disposal of contaminated sediment is required).

- Predict weekday peak and off peak hour traffic flows at the critical Marine Drive intersections in the vicinity of the container terminal for the construction phase, by superimposing the berth deepening construction traffic on the background traffic flows.

- Analysis of the critical Marine Drive intersections in the vicinity of the container terminal during the weekday peak and off peak hours of analysis, for the construction phase, using capacity analysis techniques, and

- Conform to any relevant guidelines for specialist studies issued by the Department of Environmental Affairs and Development Planning (DEA&DP).

In addition, the study should conform to the relevant guidelines for specialist studies issued by the Department of Environmental Affairs and Development Planning (DEA&DP).

Subsequent to the drafting of the initial ToR, HHO Africa were requested to assess the operation and impact of the proposed Contractors yard access on Duncan Road.

It should be noted that the terms of reference for this study does not incorporate the traffic impact assessment of the proposed container terminal expansion, even though this project may take place in conjunction with the berth deepening project. Reference in this report is however made to the central findings to the container

terminal expansion study investigating the impact of the associated construction traffic (Refer to Section 5.5).

It is not proposed that dredge spoil resulting from the berth deepening operations will be disposed of on land. Following scoping, there is no land disposal option for the berth deepening dredge spoil as the material is compliant with the London Convention criteria.

1.3 METHODOLOGY

The traffic impact of the berth deepening construction process has been assessed along Marine Drive and Duncan Road during the weekday AM, midday and PM peak periods, during which times these routes are the busiest, and would therefore present the "worst case" .

A route analysis for construction traffic has been undertaken, and the traffic impact of construction traffic assessed. The traffic impacts have been evaluated in terms of their significance. Mitigating measures have been suggested to minimise the traffic impact of the proposed upgrades to Ben Schoeman Dock.

1.4 COLLECTION OF DATA

1.4.1 Traffic Data

Weekday AM (07h00 – 09h00) and PM (16h00 – 18h00) peak period traffic counts were conducted in October 2006 and the midday (11h00 – 12h00) counts during April 2006 at the following locations on the road network in the vicinity of the container terminal :

- Marine Drive/Container Road/Paarden Eiland Road Intersection
- Marine Drive/N1 Interchange

The results of the above counts are indicated in Figure 2.1.

1.4.2 Transport Planning Data

Planning data for proposed future road proposals that may impact on the Port, has been obtained from the relevant transport authorities and adjacent landowners.

1.4.3 Berth Deepening Construction Operations Data

The final scoping report for the proposed alterations to Berths 601 – 604 and deepening of the Ben Schoeman Dock (Ref 1) was obtained from the SRK website.

Plans indicating the berth deepening operations, load out berths, contractors yard and associated proposed internal access routes, were made available to HHO Africa. The projected quantities of materials to be delivered to the contractors yard to be used during the period of construction, and associated time frames, were also made available (Refer to Appendix B).

2.0 EXISTING TRANSPORT CONTEXT

2.1 INTRODUCTION

This section sets out to describe the transport context of the berth deepening construction project. The existing road network and traffic operational characteristics are described

2.2 EXISTING ROAD NETWORK & TRAFFIC CHARACTERISTICS

2.2.1 Context/ Overview

The Port is primarily served by Duncan Road, Marine Drive and the N1 Freeway.

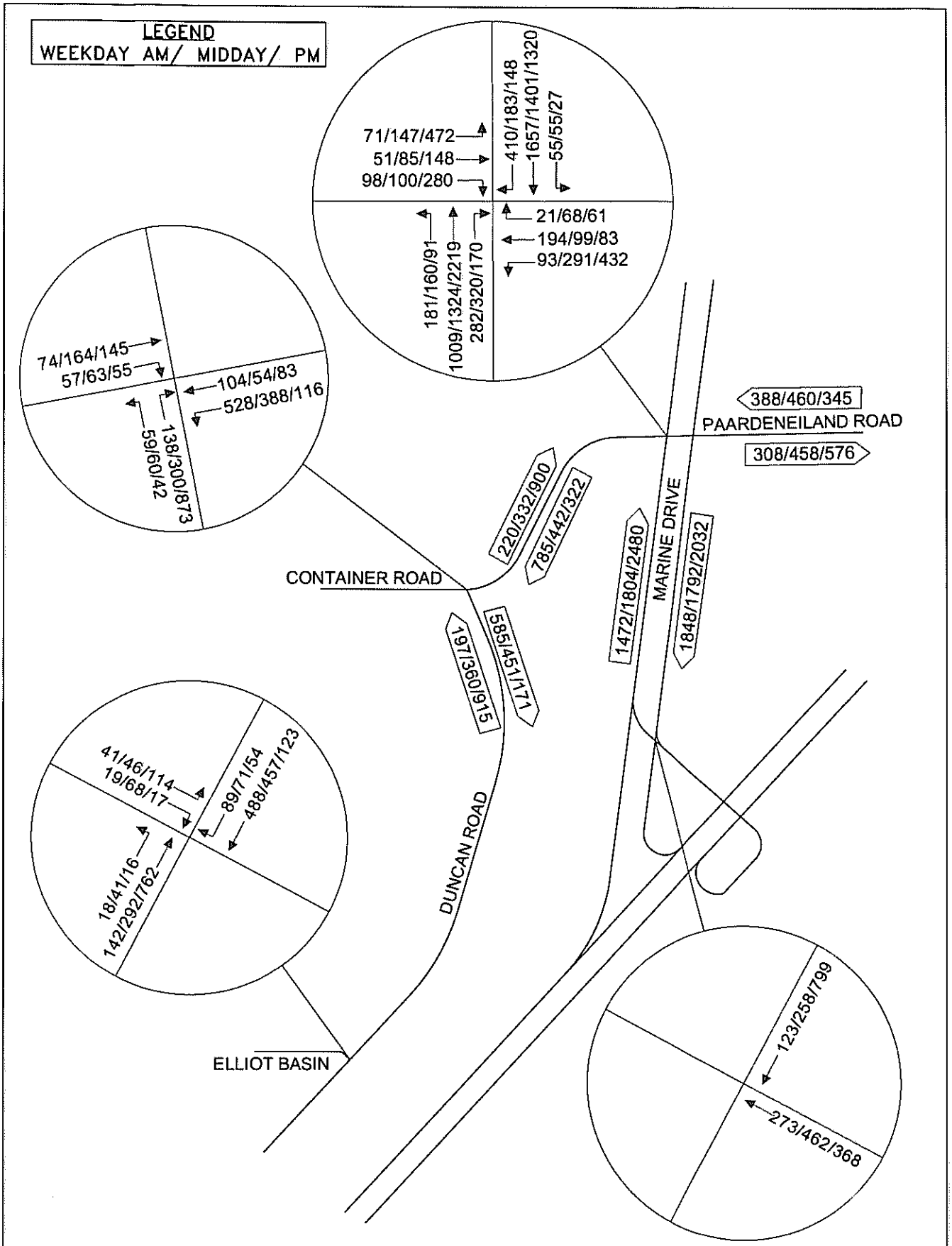
The N1 is a very important Class 1 Freeway facility linking the Central City and Port to the rest of the metropolitan area and the hinterland. In the vicinity of the Port, the N1 carries very high commuter peak period flows and operates under congested conditions in the peak direction of flow, for approximately two hours during each of the weekday commuter peak periods. During the inter-peak period, the route remains busy, carrying business and freight traffic to and from the Port and Central City.

Marine Drive is a very important Class 2 facility linking the Central City and Port to the Milnerton and Table View Areas. The route also links the Port to the important industrial areas of Paarden Eiland, Marconi Beam and Montague Gardens. This route currently operates under congested conditions during the weekday AM and PM peak periods, due to high tidal commuter flows to and from the Central City. The existing single lane onramp, from Marine Drive onto the N1, has been operating at capacity during the weekday AM peak period since 1989 resulting in backup of traffic through the Marine Drive/Paarden Eiland Road intersection.

The current peak period congestion on both the N1 and Marine Drive has had an influence on the scheduling of deliveries to and from the Port as heavy vehicle operators attempt to avoid trucks being caught up in congestion for extended periods.

2.2.2 Link Flow Analysis

The link flow analysis indicates the level of traffic utilisation of roadway capacity, i.e. the proportion of the potential capacity of a road taken up by the traffic demand along it. Existing peak hour two way flows on the road system in the vicinity of the site are indicated in Figure 2.1 and summarised in Table 2.1 overleaf.



EXISTING PEAK HOUR TRAFFIC FLOWS IN THE VICINITY OF THE PORT BERTH DEEPENING

Date 01/12/2006

FIGURE 2.1

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TABLE 2.1 : SUMMARY OF WEEKDAY PEAK HOUR FLOWS ON ADJACENT ROAD LINKS

SECTION OF ROUTE	WEEKDAY PEAK HOURS (veh/hr)								
	AM			Midday (11-12h00)			PM		
	NB[2]	SB[3]	Total	NB	SB	Total	NB	SB	Total
Marine Drive (capacity ± 2 800 veh/hr/ direction)									
North of Container/PE Road[1]	1101	2122	**3223**	1255	1532	**2787**	2752	1495	**4247**
South of Container/PE Road	1472	1848	**3320**	1535	1685	**3220**	2480	2032	**4512**
Duncan Road (capacity ± 1 000 veh/hr/direction)									
South of Container Road	184	395	**579**	326	458	**784**	755	253	**1008**
	EB[4]	**WB[5]**	**Total**	**EB**	**WB**	**Total**	**EB**	**WB**	**Total**
Container Road (capacity ± 2 400 veh/hr/direction)									
West of Marine Drive	220	785	**1005**	332	442	**774**	900	322	**1222**

Notes
1 : Paarden Eiland Road
2: Northbound
3: Southbound
4: Eastbound
5: Westbound

- Marine Drive

Peak hour flows along Marine Drive are predominantly southbound in the mornings (AM peak hour) and northbound in the afternoons (PM peak hour), although the flows in the opposite (non-peak) direction are significant.

During the **weekday AM peak hour**, the southbound flow on Marine Drive, north of Container Road, is approximately 2 100 vehicles per hour (veh/hr). The inability of the Marine Drive interchange to accommodate more than ± 1 850 veh/hr on the Marine Drive on ramp to the City results in queue backup through the Marine Drive/ Container Road/ Paarden Eiland Road intersection, and hence inefficient utilisation of this intersection. Northbound flows on Marine Drive are somewhat lower and unimpeded by traffic congestion.

During the **midday peak hour**, the northbound and southbound flows are approximately 1 250 to 1 550 veh/hr north of Container Road, and approximately 1 550 to 1 700 veh/hr south of Container Road. There is some spare capacity on Marine Drive during this peak hour, which is also broadly reflective of conditions between commuter peak periods (i.e. 09h00 - 16h00). However, increasing levels of congestion have lately been experienced during this period, as congestion extends beyond the normal commuter peak periods. Furthermore, the Marine Drive/ Container Road/ Paarden Eiland Road intersection operates at a high level of service i.e. traffic experiences minimal delays during this peak hour.

During the **PM peak hour**, the northbound flow on Marine Drive is close to 2 500 veh/hr south of Container Road, and ± 2 750 veh/hr north of this road. These flows are approaching capacity conditions and therefore the northbound carriageway can not accommodate significant flow increases. It is also noted that the southbound flow is high, especially south of Container Road (2 000 veh/hr).

- Duncan Road

Peak hour flows on Duncan Road also reflect commuter patterns related to the CBD as this route is used as a "rat-run" for traffic wishing to bypass congestion at the Marine Drive interchange with the N1. It should be noted that these flows are at present considerably lower than in 2003, when a previous survey was done, due to the stricter controls in force at the access points to the Port.

During the weekday AM peak hour, the major southbound flow on Duncan Road is approximately 400 veh/hr, whereas during the weekday PM peak hour, the major northbound flow is approximately 750 veh/hr. Weekday peak hour two-way flows on Duncan Road are less than the capacity of a two lane road of 2 000 veh/hr (two-way flow). The flows during all peak hours considered are significantly lower than the capacity of this facility.

- Summary

In summary, construction related vehicles accessing the Contractors yard will experience the following traffic conditions during a typical working day on the external road network :

- AM peak period (06h30 – 09h00) : high levels of congestion along Marine Drive in the southbound direction; lower levels of congestion in the northbound direction, but significant delays accessing Marine Drive via the N1 Freeway.

- Inter-peak period (09h00 – 16h00) : lower levels of congestion along Marine Drive in north- and southbound directions, although due the occurrence of "peak extension" and general traffic growth, these levels are steadily being raised.

- PM peak period (16h00 – 18h00) : relatively low levels of congestion along Marine Drive in the southbound direction; high levels of congestion in the northbound direction.

From the above, it is clear that the Port, and hence the Contractors yard will be least accessible during the weekday AM and PM peak periods, and more accessible during the inter-peak period.

2.2 EXISTING RAIL OPERATIONS

Freight rail operations relevant to this investigation are as follows :

- Along the Harbour/ Monte Vista rail line, which runs adjacent to Marine Drive and then adjacent to Duncan Road within the Port functional area, and terminates at the Unity Yard. Currently, there are approximately 18 train movements along this line during the day (between 06h00 and 18h00), and 12 at night. This translates into average train headways (time intervals between successive trains) of 40 minutes during the day, and 60 minutes at night.

- Between the Paarden Eiland and Unity Yard along the rail culvert underneath the N1 Freeway. Currently there are approximately 12 train movements along this line during the day, and 8 at night. This translates into average train headways of 60 minutes during the day, and 90 minutes at night.

3.0 BERTH DEEPENING TRAFFIC OPERATIONS MODEL

3.1 INTRODUCTION

A traffic operations model for the berth deepening construction process has been formulated for the purpose of predicting traffic flows for the relevant periods of analysis. An operations model constitutes a breakdown of anticipated processes in terms of an analysis framework chosen for the purpose of understanding particular operations (e.g. traffic) and their potential impact.

The berth deepening process is scheduled to take place during two phases over a four year period between June 2007 and May 2011. The first phase comprises the construction of a temporary crane rail for berths 603 and 604, due for completion in October 2007. The actual berth deepening construction phase will commence in April 2008.

3.2 OPERATIONS MODEL

It has been established that all movements of construction material by truck will take place via Marine Drive, Container Road and Duncan Road, to the Contractors yard proposed on the old *dolos* casting yard on the Culemborg site (Portion 24) to the south of the N1 Freeway (Refer to Figure 3.1). Access to the yard will take place opposite the Elliot Basin access, via the existing rail culvert underneath the N1, which provides a link between the Spoornet commuter and Port rail lines.

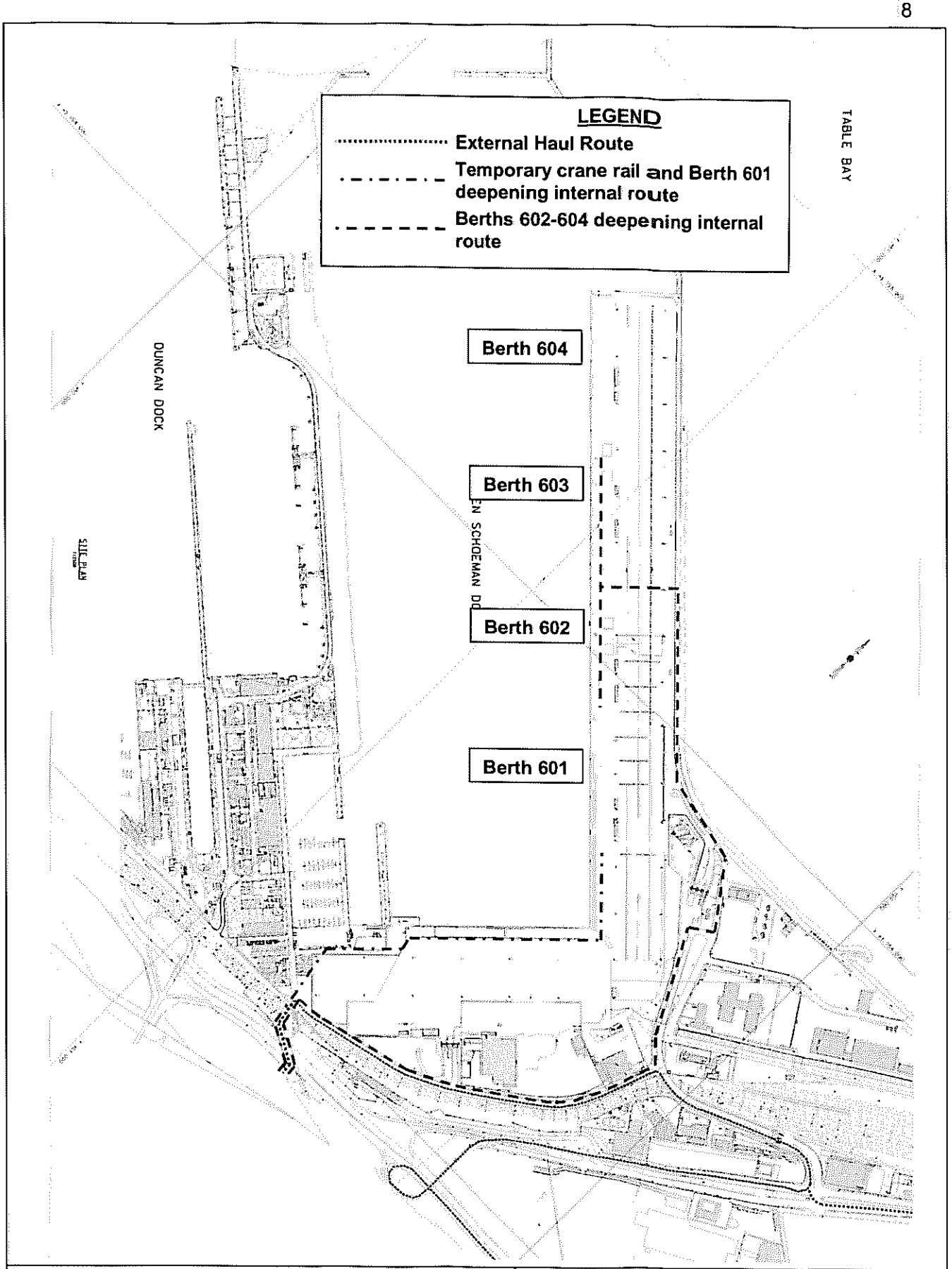
A batching plant will also be erected in the yard, from which concrete mixers will be routed to the construction site via the existing rail culvert and Duncan Road (Refer to Section 4.2).

The purpose of the operations model is to predict the hourly truck movements to and from the Contractors yard for the average construction day and hour. The predicted hourly increase in traffic flows can then be distributed and assigned to the road network to determine the impact of the construction on the adjacent road system, focused on Marine Drive (external), and Duncan Road (internal).

The model requires the following inputs :

- Construction material quantities : As per schedule provided (Refer to Table 3.1 & Appendix B)
- Construction period (days) : As per schedule provided (Refer to Table 3.1 & Appendix B)
- Peak hourly flow : Assumed 20% of daily flow

The output from the model is the predicted hourly distribution of construction truck traffic for a “typical peak day” during the construction period. The model has not been calibrated as there is not a project of a similar nature in operation locally, which could be assessed for comparative purposes. The assumptions used in the model are however reasonably conservative, in that generous contingency factors are used to model peak conditions. In most instances, the traffic flows generated by the construction processes are likely to be less than the modelled flows.



EXTERNAL & INTERNAL BERTH DEEPENING CONSTRUCTION VEHICLE ROUTES	Date 01/12/2006	FIGURE 3.1
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TABLE 3.1 : OPERATIONS MODEL FOR THE DETERMINATION OF HOURLY VEHICLE MOVEMENTS (WEEKDAY AM & PM PEAK HOURS)

Temporary Crane Rail Construction — **Days 102** — **5 June 2007 - 22 October 2007**
(for berths 603 & 604) — **Contingency Factor : 30%**

Items	Units	Quantities		Vehicle Types	Capacity	Daily Vehicles		Move-ment
		Total	Daily		(tonnes)	Average	Peak	
Concrete	m3	9048	88.7	dump trucks	5.5	16.1	**21**	internal
Internal vehicles	-	-	-	-	-	-	**20**	
Total Daily	-	-	-	-	-	-	**41**	
Total Hourly (20%)	-	-	-	-	-	-	**8**	
Cement	Tonnes	3167	31.0	dump trucks	10	3.1	**5**	ext-int
Sand	Tonnes	6876	67.4	dump trucks	10	6.7	**9**	
Stone	Tonnes	10948	107.3	dump trucks	10	10.7	**14**	
Rebar	Tonnes	357	3.5	low bed	-	1	**2**	
Rough and smooth formwork	m2	4000	39.2	low bed	-	1	**2**	
G3 imported material	m3	5800	56.9	dump trucks	10	5.7	**7**	
Remove excavated material	m3	8880	87.1	dump trucks	10	8.7	**11**	
Remove concrete rubble	m3	5040	49.4	dump trucks	10	4.9	**6**	
Daily Total Trucks (external - internal)							**57**	
Daily Operational Vehicles							**50**	
Total Daily					**Trucks**	**Operation**	**107**	
Total Hourly					**12**	**10**	**22**	

Berth Construction — **Days 783** — **9 April 2008 - 20 May 2011**
(of berths 601 - 604) — **Contingency Factor : 30%**

Items	Units	Quantities		Vehicle Types	Capacity	Daily Vehicles		Move-ment
		Total	Daily		(tonnes)	Average	Peak	
Concrete	m3	34010	43.4	concrete mixers	5.5	7.9	**10**	internal
Internal vehicles	-	-	-	-	-	-	**20**	
Daily Total Vehicles (internal)	-	-	-	-	-	-	**30**	
Total Hourly (20%)	-	-	-	-	-	-	**6**	
Cement	Tonnes	11904	15.2	dump trucks	10	1.5	**2**	ext-int
Sand	Tonnes	25848	33.0	dump trucks	10	3.3	**5**	
Stone	Tonnes	41152	52.6	dump trucks	10	5.3	**7**	
Casings to piles	m	4225	5.4	low bed	-	1	**2**	
Rebar	Tonnes	3852	4.9	low bed	10	1	**2**	
Rough and smooth formwork	m2	17415	22.2	low bed	-	1	**2**	
Rock supply - 5 to 20kg	m3	8525	10.9	dump trucks	10	1.1	**2**	
Rock supply - 50 to 200kg	m3	32245	41.2	dump trucks	10	4.1	**6**	
G3 imported material	m3	2880	3.7	dump trucks	10	0.4	**1**	
Daily Total Trucks (external - internal)							**29**	
Daily Operational Vehicles							**50**	
Total Daily					**Trucks**	**Operation**	**79**	
Total Hourly					**6**	**10**	**16**	

Source : Quantities of Materials to be delivered to the Culemborg Site (Refer to Appendix B)

From the table above, the number of construction related vehicles generated during the temporary crane rail construction phase are estimated at 107 vehicles, of which 22 are assumed will be active during the weekday AM and PM peak hours (20%). The corresponding figures during the berth deepening phase are 79 and 16. The estimation of the number of trips associated with these vehicle movements is outlined in Section 4.1.

The following assumptions have been made in the use of the operations model :

- The number of external truck movements destined for the Port would be at a peak during the construction of the temporary crane rail, which will be higher than the movements when the actual berth deepening takes place. This is due to the restricted time scale allowed for establishing the crane rail, in spite of the smaller quantities of material involved.

- A contingency factor of 1.3 to account for peak material delivery days, as it is unlikely that uniform delivery rates could be achieved.

- Delivery of construction material would take place during normal working hours, i.e. between 08h00 and 17h00 (i.e. a 9 hour period). If a uniform arrival rate was to be achieved, this translates into a constant 11% hourly demand of the daily flow. A peak hourly flow of 20% of daily demand is assumed for analysis purposes, to account for fluctuations during operations.

- "Operational vehicles" used by construction site staff would total 10 peak hourly vehicles entering the port area, of which 2 are public transport vehicles (buses or trucks) conveying workers. Of these, 3 vehicles are assumed to exit the port area during the peak hour.

- All material delivered to the Port would be transported via the Contractors yard, except for the rock, assumed to be for the scour protection, will be delivered directly to the construction site.

- Internal heavy vehicle movements would consist of concrete mixers travelling between the Contractors yard and the construction area, and heavy vehicles transporting the materials (e.g. reinforcement, formwork components) between the Contractors yard and the construction area. It is assumed that a notional number of 20 vehicles will travel daily between the Contractors yard and the construction site.

4.0 FUTURE TRAFFIC OPERATIONS

4.1 TRIP GENERATION

Using the operations model, the predicted weekday AM, PM and midday peak hour traffic flows to and from the Contractors yard have been estimated, as set out in Table 4.1 below.

TABLE 4.1 : PREDICTED EXTERNAL HOURLY TRIPS GENERATED DURING CONSTRUCTION PERIODS

PEAK HOUR	CONSTRUCTION PERIOD	EXTERNAL PEAK HOUR VEHICLE TRIPS		
		In[1]	Out[1]	Total[1]
AM	Temp Crane Rail	22 (14)	15 (12)	37 (24)
	Berth Deepening	16 (8)	9 (6)	25 (14)
Midday	Temp Crane Rail	17 (12)	17 (12)	34 (24)
	Berth Deepening	11 (6)	11 (6)	22 (12)
PM	Temp Crane Rail	15 (12)	22 (14)	37 (24)
	Berth Deepening	9 (6)	16 (8)	25 (14)

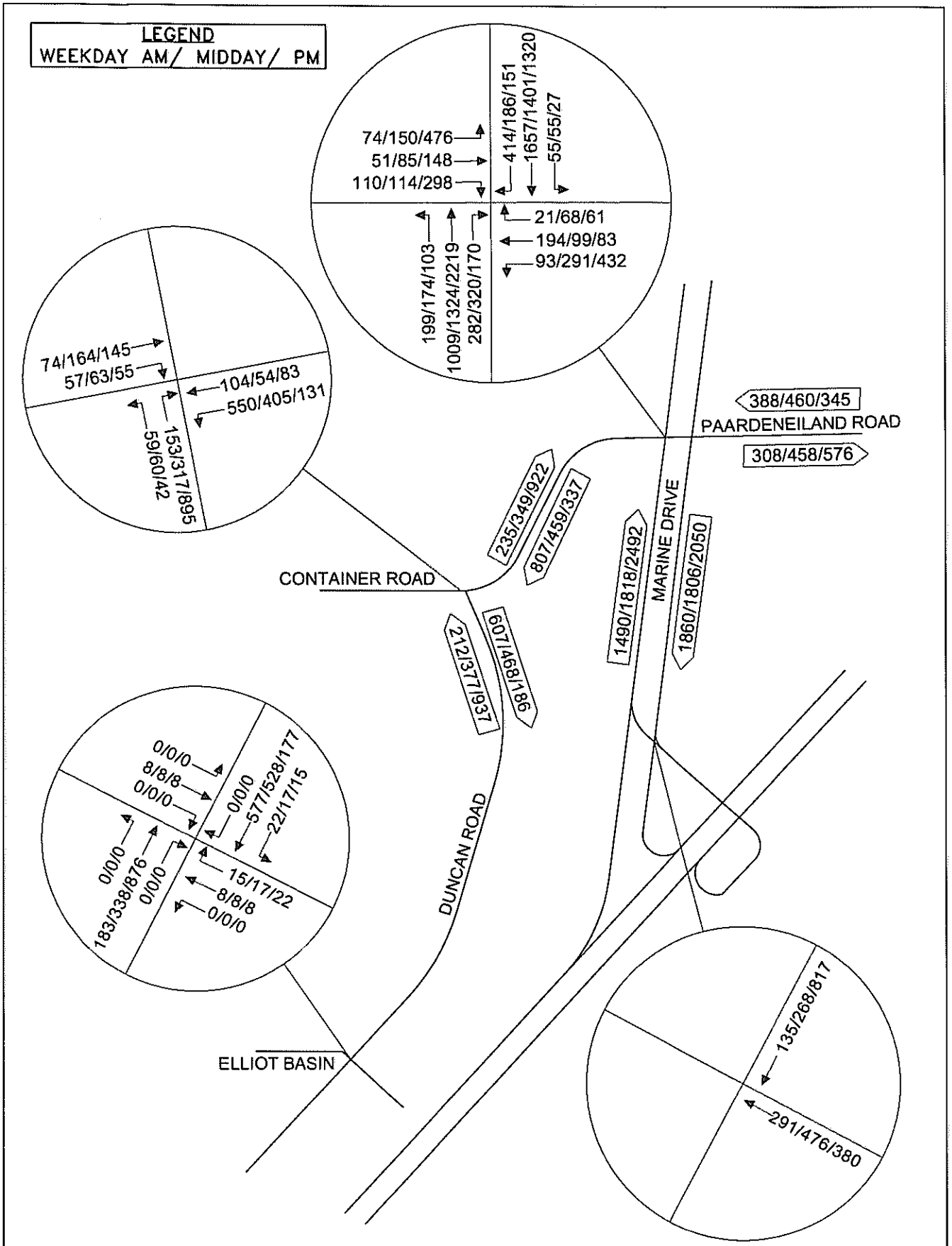
Notes
1 : Total (heavy) vehicle flows (veh/hour).

It has been assumed that construction related vehicle movements will be the same for all three peak hours, and that each such vehicle will perform one trip in and one trip out of the Port area during the peak hour. During the temporary crane rail construction period, 12 (truck) trips in and 12 trips out will be made during each peak hour. During the berth deepening construction period, 6 (truck) trips in and 6 trips out will be made during each peak hour.

The operational vehicle movements will be more variable, in that a greater proportion of vehicles will be arriving and leaving the Port during the AM (10 trips in; 3 trips out) and PM peak hours (3 trips in; 10 trips out) compared with the midday peak hour (5 trips in; 5 trips out). The future peak hour traffic flows at the proposed Contractors yard access, as well as the intersections with the external road network are indicated in Figure 4.1.

4.2 TRIP DISTRIBUTION & ASSIGNMENT

For the purposes of this report, the trip distribution patterns to and from the Contractors yard assume the predominant movement to be along the N1, via Marine Drive Interchange and along Marine Drive (80%), with the remainder from the north



FUTURE PEAK HOUR TRAFFIC FLOWS IN THE VICINITY OF THE PORT BERTH DEEPENING
(TEMPORARY CRANE RAIL CONSTRUCTION)

Date 01/12/2006

FIGURE 4.1

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(20%), also along Marine Drive. All external construction related traffic is therefore routed via the Marine Drive/ Container Road/ Paarden Eiland Road intersection, along Container Road and then Duncan Road towards the Contractors yard. It is assumed that no construction related traffic would access the Contractors yard via the southern section of Duncan Road. This is considered a reasonable assumption in that no construction related traffic is assumed will be routed via any road links through Cape Town CBD.

4.3 FUTURE ROAD PROPOSALS

4.3.1 Proposals External to the Port Area

It has recently been indicated by City of Cape Town officials that some road proposals identified as part of the N1 Corridor upgrading project, may be implemented as part of a package of infrastructure projects in preparation for World Cup 2010. Of relevance to the berth deepening project, in particular the preferred location of the Contractors yard on the dolos casting yard, is that some of the proposals directly impact on this site. These include proposals for a new rotary interchange at Church Street with collector-distributor roads, as well as the proposed N1 busway, which are aligned through part of this site. If these projects are implemented in this time frame, it will have a direct impact on the use of this site as a Contractors yard, which is earmarked to remain in use until May 2011. None of the proposals for Marine Drive have been identified for implementation prior to 2010.

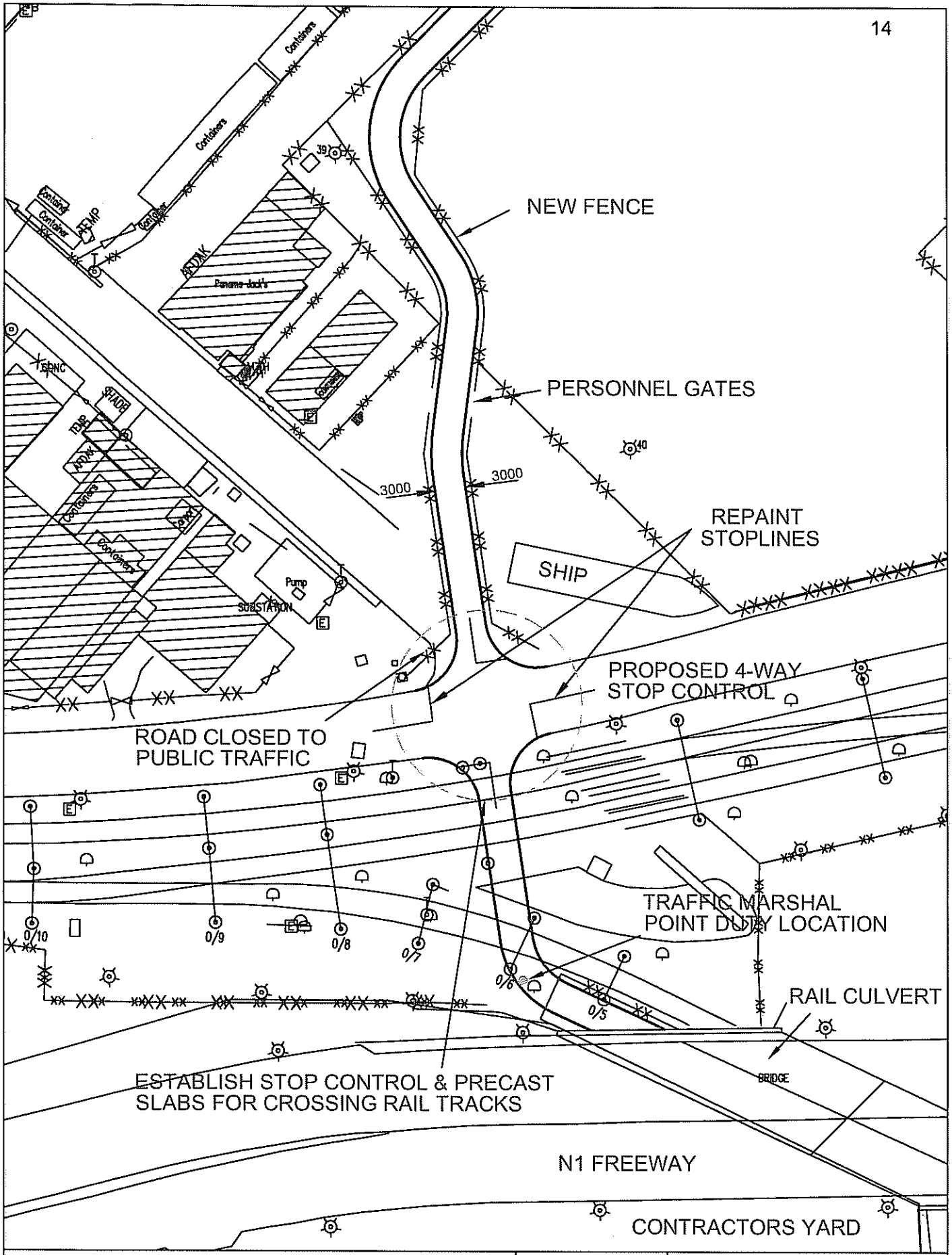
The possible relocation of the Contractors yard to another site within the Port area, will not have any consequences for the impact of the berth deepening project on the external road network. The routing of all construction traffic via Marine Drive and its intersection with Container Road, is independent of internal routing and circulation arrangements.

For the purpose of this report, the operational context within which the berth deepening construction traffic is to function, is assumed to remain essentially similar to the existing situation. Furthermore, the capacity constraints on the external road system during commuter peak periods, notably at Marine Drive interchange, effectively function to regulate the traffic through the Marine Drive/ Container Road intersection.

4.3.2 Proposals Internal to the Port Area

In order to access the Contractors yard on the Culemborg site on the south side of the N1, suitable gravel surfacing will be placed on the existing surfacing to allow for construction vehicles access along the western barrel of the culvert underneath the N1 Freeway (rail line along the eastern barrel only), and pre-cast slabs constructed across the railway lines, to establish a 4th leg to the access to the Duncan Road/ Elliot Basin access intersection. This proposal is depicted in Figure 4.2.

As indicated, the proposed Contractors yard access road traverses the four railway tracks of the Harbour line, as well as the two tracks of the Paarden Eiland rail link. The access road is aligned parallel to the latter two tracks through the rail culvert, before being aligned across these tracks, and then across the Harbour line tracks to the point opposite the Elliot Basin access on Duncan Road. It is proposed to establish a stop line at the approach to the access road intersection with Duncan Road, to create a 4-way stop controlled intersection. The operational impact and implications of this proposal is discussed in Section 5.3.2.



PROPOSED ACCESS TO BERTH DEEPENING CONTRACTORS YARD

SCALE 1:1000

Date 01.12.2006

FIGURE 4.2

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5.0 TRAFFIC IMPACT ASSESSMENT

5.1 INTRODUCTION

There are a number of factors which must be taken into account when assessing the impact of a project of this nature. The most important of these are as follows :

a) Physical characteristics such as :

- Geometric design standard of adjacent road network
- Future transport planning proposals in the vicinity of the site/s
- Site access points and their proximity to nearby intersections
- Sight distance at these access intersections
- On-site circulation

b) Traffic flow characteristics such as the volume of traffic generated by the development, routing of this traffic and the impact the additional trips will have on the performance of the adjacent road network.

5.2 TRAFFIC ASSESSMENT

5.2.1 External Road Network Impact

The impact of traffic generated by the berth deepening construction project, superimposed on existing commuter traffic, has been assessed by analysing the performance of the following two intersections in the vicinity of the container terminal

- Marine Drive/Paarden Eiland/Container Road Signalised Intersection
- Interchange Ramp from N1 to Marine Drive Unsignalised Intersection

The analysis has been carried out using procedures from the 2000 Highway Capacity Manual (Ref 2). A computerised version of the manual, namely HCS2000 (Ref 3) has been used to facilitate the analysis. For the purpose of this assessment, the performance criteria in Table 5.1 below have been used to assess the levels of service (LOS), for signalised and unsignalised intersections respectively.

TABLE 5.1 : LEVEL OF SERVICE INDICATORS FOR INTERSECTIONS

LEVEL OF SERVICE (LOS)	AVERAGE DELAY (seconds/vehicle)	
	Signalised Intersections	Unsignalised Intersections
A	0 – 10	0 – 10
B	10 – 20	10 – 15
C	20 – 35	15 – 25
D	35 – 55	25 – 35
E	55 – 80	35 – 50
F	>80	> 50

The summarised results of the analysis are indicated in Table 5.1.

TABLE 5.1: SUMMARY OF RESULTS OF INTERSECTION ANALYSIS ON EXTERNAL ROAD LINKS (DURING TEMPORARY CRANE RAIL CONSTRUCTION)

INTERSECTION	PEAK HOUR	EXISTING SITUATION (2006)			CONSTRUCTION SCENARIO		
		V/C Ratio[1]	Delay (sec/veh)	LOS	V/C Ratio[1]	Delay (sec/veh)	LOS
Marine Drive/ Paarden Eiland Road/ Container Road	AM	0,71	21,8	C	0,71	21,8	C
	MID	0,66	16,5	B	0,67	16,8	B
	PM	0,79	20,1	C	0,79	20,5	C
Interchange Ramp from N1 to Marine Drive Northbound Through Move	AM	0,38	12,8	B	0,42	13,5	B
	MID	0,82	32,1	D	0,85	36,8	E
	PM	1,00	78,2	F	1,06	95,3	F

Notes
1 : Volume/ Capacity Ratio, indicates proportion of intersection capacity taken up by vehicular demand.

Based on the analysis of intersections, the following findings should be highlighted:

- Marine Drive/Paarden Eiland/Container Road Intersection

  At present, this intersection operates at reasonable levels of service (LOS C) during both the weekday AM and PM peak hours, and at a high level of service (LOS B) during the midday peak hour. The analysis does not truly reflect the operation of this intersection during the AM peak hour due to backup from the city-bound N1 onramp at the Marine Drive interchange. During the PM peak hour, the effective metering of traffic from the N1 due to congestion on the N1, allows it to function at the indicated level of service.

  For the construction scenario, the performance of the intersection will deteriorate only marginally during all peak hours considered. The levels of service will not change and the effective impact on the intersection during both the crane rail and berth deepening construction periods will be negligible.

- Marine Drive/ Northbound Ramp Intersection

  At present, the critical northbound through movement operates at this intersection operates at a high level of service (LOS A) during the weekday AM peak hour, at an acceptable level of service (LOS D) during the midday peak hour, and at a very low level of service (LOS F) during the PM peak hour.

  For the construction scenario, the northbound through movement at the intersection will continue to operate at similar levels of service to the current situation. It should however be noted that delays experienced under congested conditions increase exponentially as demand increases.

  In conclusion, given that 80% of construction related traffic will be routed via this ramp and along Marine Drive, the most appropriate time period to deliver material to

the site is likely to be during the inter-peak commuter period, i.e. after the AM peak period (09h00) and before the PM peak period (16h00).

5.3.2 Internal Road Network Impact

Internal traffic movements comprising mostly heavy vehicles will be scheduled as follows (Refer to Figure 5.1) :

- During the construction of the temporary crane rail, and then the deepening of Berth 601, all internal movements will take place between the Contractors yard via the proposed temporary rail culvert link and the 4th leg to the Elliot Basin intersection, across Duncan Road towards the Ben Schoeman dock. It is noted that the proposed link is aligned across the site currently occupied by a warehouse structure, adjacent to Panama Jacks restaurant, which will need to be disassembled.

- During the deepening of Berths 602 to 604, traffic will have to turn right from the Contractors yard into Duncan Road, then proceed up to Container Road, then turn left towards the container terminal buildings, and routed along the perimeter gravel road alongside the sea edge.

The impact of the proposed 4th leg to the Elliot Basin intersection on Duncan Road has been considered from a traffic operations perspective. Table 5.2 below indicates the summarised results of the analysis.

TABLE 5.2 : SUMMARY OF RESULTS OF DUNCAN ROAD/ ELLIOT BASIN ACCESS/ CONTRACTORS YARD ACCESS INTERSECTION ANALYSIS (DURING TEMPORARY CRANE RAIL CONSTRUCTION)

INTERSECTION	PEAK HOUR	EXISTING			FUTURE		
		V/C Ratio	Delay (veh/hr)	LOS	V/C Ratio	Delay (veh/hr)	LOS
Duncan Road / Elliot Basin/ Contractors Yard							
- WB	AM	0.43	11.8	B	0.45	11.5	B
- EB		0.15	9.0	A	0.14	9.0	A
- NB		N/A	N/A	N/A	0.03	8.6	A
- SB		0.09	8.9	A	0.01	8.9	A
Intersection		**-**	**11.0**	**B**	**-**	**10.8**	**B**
- WB	INTER	0.47	13.1	B	0.45	11.9	B
- EB		0.35	11.1	B	0.28	10.3	B
- NB		N/A	N/A	N/A	0.04	9.3	A
- SB		0.21	10.7	B	0.01	9.3	A
Intersection			**12.1**	**B**	**-**	**11.2**	**B**
- WB	PM	0.20	10.7	B	0.18	10.1	B
- EB		0.72	18.9	C	0.68	18.7	C
- NB		N/A	N/A	N/A	0.06	10.0	B
- SB		0.22	10.6	B	0.01	9.6	A
Intersection		**-**	**16.6**	**C**	**-**	**17.0**	**C**

Notes
1 : Volume/ Capacity Ratio, indicates proportion of intersection capacity taken up by vehicular demand.

At present, this unsignalised three-way stop controlled intersection operates at high levels of service (LOS B) during the weekday AM and inter-peak hours, and at reasonable levels of service (LOS C) during the weekday PM peak hour.

For the construction scenario, a fourth leg will be added to this intersection, which will be four-way stop controlled. The existing traffic that utilise Elliot Road will be rerouted to the west to make use of the alternative access to the yacht club (Alkmaar access). In the future, this intersection will continue to operate at high levels of service (LOS B) during the weekday AM and inter-peak hours, and at reasonable levels of service (LOS C) during the weekday PM peak hour, with overall intersection delay virtually unchanged.

The movement of berth deepening related construction traffic along the proposed link to the Contractors yard will need to be regulated with respect to the train movements along the Harbour and Paarden Eiland rail lines. This will most readily be achieved by the deployment of a traffic marshal, who will need to be in communication with train operators at the central traffic control centre with regard to train movements.

It should be noted that precedent of at grade (level) crossing of the harbour rail lines is well established. The existing major access to the Port at Oswald Pirow operates on the same principle as the proposal above, but accommodates significantly higher traffic flows.

5.3 PUBLIC TRANSPORT

As noted in Section 3.2, it is assumed that workers will be transported to the construction site by means of specifically deployed vehicles, either trucks used as part of the on-site vehicle stock, or dedicated vehicles. Should this not be the case, established public transport services to the site could be utilised. In this regard, Esplanade and Woodstock stations are within walking distance from the contractors yard (< 800m). Walking distances from these stations to the quayside at berths 601 – 604 are somewhat longer (± 1.5km).

5.4 SIGNIFICANCE OF TRAFFIC IMPACT

5.4.1 Introduction

The following possible traffic impacts have been identified by this investigation and has been addressed in this report:

- An increase in heavy vehicle traffic on the external road network as a result of the construction of the berth deepening.
- An increase in traffic along Duncan Road at its intersection with the Elliot Basin access and proposed Contractors yard access.
- Potential conflict between construction related vehicles and train movements along the Harbour and Paarden Eiland rail lines.

These impacts have been assessed in terms of the Specialist Terms of Reference Report, provided by SRK Consulting (Refer to Appendix C). Mitigation measures are suggested where required for minimising the impact of the traffic generated by the proposed berth deepening processes.

5.4.2 Increase in Heavy Vehicle Traffic on the External Road Network

Nature of the Impact : The increased heavy vehicle traffic flows into and out of the Port will result in marginally higher levels of utilisation of intersections and routes in the vicinity of the site (notably along Marine Drive), which are currently unable to absorb traffic growth during peak periods. Port and metropolitan traffic will experience some increased traffic delay during commuter peak periods.

Proposed Mitigation Measure : In order to mitigate the above impact, it is proposed to schedule the bulk of arrivals and departures of trucks conveying construction material during the commuter inter-peak period (between 09h00 and 16h00).

- Temporary Crane Rail

	Extent	*Intensity*	*Duration*	*Consequence*	*Probability*	*Significance*	*Status*	*Confidence*
Without mitigation	Regional 2	Low 1	Short-term 1	**Very Low** 4	Definite	**VERY LOW**	**– ve**	High
With mitigation	Regional 2	Low 1	Short-term 1	**Very Low 4**	Definite	**VERY LOW**	**– ve**	High

- Berth Deepening

	Extent	*Intensity*	*Duration*	*Consequence*	*Probability*	*Significance*	*Status*	*Confidence*
Without mitigation	Regional 2	Low 1	Medium-term 2	**Low** 5	Definite	**LOW**	**– ve**	High
With mitigation	Regional 2	Low 1	Medium-term 2	**Low 5**	Definite	**LOW**	**– ve**	High

It should be noted that implementation of the mitigation measure will not alter the assessment ratings of this impact, but will assist in facilitating movements to and from the Port area.

5.4.3 Increase in Traffic at Duncan Road/ Elliot Basin Access/ Proposed Contractors Yard Access

Nature of the Impact : An increase in traffic and along Duncan Road and at its intersection with the above access points, leading to a marginal increase in travel time delay for vehicles travelling along this route.

Proposed mitigation measure : It is not considered necessary to introduce mitigation measures to address the above impact, given its very low significance. The stop control proposed at the access road approach to Duncan Road is not considered a mitigation measure, as it is an essential component giving effect to this proposal.

- Temporary Crane Rail & Berth Deepening

	Extent	*Intensity*	*Duration*	*Consequence*	*Probability*	*Significance*	*Status*	*Confidence*
Without mitigation	Local 1	Low 1	Medium-term 2	**Very Low** 4	Definite	**VERY LOW**	**– ve**	High
With mitigation	Not Applicable							

5.4.4 Potential Conflict between Construction and Train Movements

Nature of the Impact : The alignment of the proposed Contractors yard access road across the Harbour and Paarden Eiland rail lines, creates a potential conflict point between construction related vehicles and trains. The nature of the impact is such that a traffic marshal will need to be deployed at this point, who will need to be in communication with train operators at the central traffic control centre with regard to train movements.

Proposed mitigation measure : It is not considered necessary to introduce mitigation measures to address the above impact, given its very low significance. The deployment of a traffic marshal is similarly not considered a mitigation measure, as it is also an essential component giving effect to this proposal.

- Temporary Crane Rail & Berth Deepening

	Extent	***Intensity***	***Duration***	***Consequence***	***Probability***	***Significance***	***Status***	***Confidence***
Without mitigation	Local 1	Low 1	Medium-term 2	**Very Low** 4	Definite	**VERY LOW**	**– ve**	High
With mitigation	Not Applicable							

In conclusion, all construction traffic should be routed along higher order roads to (i) minimise structural damage to roads, (ii) minimise stop/start manoeuvres for truck traffic and (iii) minimise noise impacts on residential areas along haul routes. The traffic assessment has assumed that this will be enforced.

5.5 CONSIDERATION OF SIMULTANEOUS IMPACTS

This traffic impact assessment has been confined to the operations of the berth deepening construction project. A previous assessment was undertaken for the impact of the construction of the container terminal expansion (Ref 4). Its central finding was that :

"In addition to the general construction traffic, the haulage of rock can be accommodated on the existing road system without any geometric improvements to the existing road system in the vicinity of the Port. However, should the haulage of sand also be required, measures to minimise delay and manage queue lengths at the Marine Drive off-ramp from the N1 (westbound) intersection (such as the possible temporary signalisation), may have to be considered."

The cumulative impact of the berth deepening and container terminal expansion projects will need to be considered in more detail, if progressing with the reclamation option in parallel with the berth deepening. However the preliminary indications are that these projects can be implemented in parallel without any geometric improvements to the external road system, provided haulage of rock only is required for the expansion project (not sand), and appropriate traffic management measures (e.g. restricting certain haulage operations to off-peak periods) are put in place.

6.0 SUMMARY OF FINDINGS & RECOMMENDATIONS

This report has investigated the proposed deepening of the Ben Schoeman Dock from a traffic operations perspective. The major findings and recommendations of this report can be summarised as follows :

- The deepening project will take place in two phases, with the first phase of the temporary crane rail construction scheduled for June to October 2007, and the deepening of Berths 601- 604 for April 2008 to May 2011.

- Trip generation for the construction processes were formulated on the basis of an operations model, which assesses the anticipated associated quantities of material to be delivered, and their internal movements in the Port in terms of the number of resultant vehicle trips.

- The traffic assessment estimates the proposed temporary crane rail construction to generate between 34 and 37 vehicle trips during the weekday AM, midday and PM peak hours; while the berth deepening process between 22 and 25 vehicle trips during these hours. The former process generates a higher number of trips than the latter, in spite of the smaller quantities of material involved, due to the restricted time scale allowed for establishing the crane rail.

- A Contractors yard is proposed on Portion 24, Culemborg, to be linked via a temporary gravel road along the rail culvert underneath the N1 Freeway. Pre-cast slabs need to be constructed across the Harbour and Paarden Eiland rail lines, to establish a 4th leg to the Duncan Road/ Elliot Basin intersection. The intersection will have a 4-way stop control.

- Delivery of construction material is assumed would take place during normal working hours, i.e. between 08h00 and 17h00. A peak hourly flow of 20% of daily demand is assumed for analysis purposes, to account for fluctuations during operations, and a contingency factor of 1.3 was used to simulate a “worst case scenario”.

- It has been assumed that all construction related traffic would access the Port via Marine Drive (80% from/to the south; 20% from/to the north), then via Container Road into Duncan Road, and then to the proposed access to the proposed Contractors yard opposite the Eilliot Basin access. No traffic is assumed will access the site via the south (Cape Town CBD).

- All material delivered to the Port would be transported via the Contractors yard, except for the rock supply, to be delivered directly to the construction site. Internal heavy vehicle movements would consist of concrete mixers and heavy vehicles transporting other construction materials between the Contractors yard and the construction area in Ben Schoeman Dock.

- Peak hour flows along Marine Drive are predominantly southbound in the mornings (AM peak hour) and northbound in the afternoons (PM peak hour), although the flows in the opposite (non-peak) direction are significant. High levels of congestion are experienced along Marine Drive during (and

increasingly outside) commuter peak periods, which are related to capacity constraints along the N1 Freeway and its links with Marine Drive.

- Traffic flows along Duncan Road have decreased over the past 3 years due to the enforcement of stricter controls at the Port access points.

- The Contractors yard will be least accessible during the weekday AM and PM peak periods, and more accessible during the inter-peak period.

- Vehicles from the Contractors yard will be required to cross the Harbour/ Monte Vista rail line as well as the rail link from Paarden Eiland close to their merging point. Average time intervals between trains on the Harbour line are 40 minutes (day) and 60 minutes (night), and on the Paarden Eiland link 60 minutes (day) and 90 minutes (night).

- Road proposals identified as part of the N1 Corridor upgrading project may be implemented prior to, and in time for World Cup 2010. The preferred location of the Contractors yard is directly impacted by some of the proposals, which are aligned through part of this site. The possible relocation of this yard to another site within the Port area, will not have any consequences for the impact of the berth deepening project on the external road network.

- The berth deepening construction project will result in the marginal deterioration of the performance of the Marine Drive/ Container Road/ Paarden Eiland Road intersection during all peak hours considered, and its effective impact will be negligible. The northbound through movement at the intersection of the N1 ramp onto Marine Drive will continue to operate at similarly low levels of service (LOS F) to the current situation.

- The Duncan Road/ Elliot Basin/ Contractors yard intersection will continue to operate at high levels of service (LOS B) during the weekday AM and inter-peak hours, and at reasonable levels of service (LOS C) during the weekday PM peak hour, with overall intersection delay virtually unchanged.

- The movements of construction traffic along Contractors yard access and trains along the Harbour and Paarden Eiland rail lines will need to be regulated. It is proposed the deployment of a traffic marshal is best suited for this purpose.

- It has been assumed that workers will be transported to the construction site by means of specifically deployed vehicles, either trucks used as part of the on-site vehicle stock, or dedicated vehicles. Should this not be the case, established public transport services to the site could be utilised. In this regard, Esplanade and Woodstock stations are within walking distance from the Contractors yard (< 800m). Walking distances from these stations to the quayside at berths 601 – 604 are somewhat longer (± 1.5km).

- The impact ratings of the increase in heavy vehicle traffic on the external road network as a result of the construction of the berth deepening project are : (i) consequence : very low to low; and (ii) significance : very low to low. The proposed mitigation measure is to schedule the bulk of arrivals and departures of trucks conveying construction material during the commuter inter-peak period (between 09h00 and 16h00). This will not alter the impact rating.

- The impact ratings of the increase in heavy vehicle traffic along Duncan Road and at its new access to the Contractors yard are : (i) consequence : very low; and (ii) significance : very low.

- The impact ratings of the potential conflict between construction vehicle and train movements at the crossing of the Harbour and Paarden Eiland rail lines are, provided a traffic marshal is appropriately deployed : (i) consequence : very low; and (ii) significance : very low.

- All construction traffic should be routed along higher order roads to (i) minimise structural damage to roads, (ii) minimise stop/start manoeuvres for truck traffic and (iii) minimise noise impacts on residential areas along haul routes.

- Preliminary indications are that the berth deepening and container terminal expansion projects can be implemented simultaneously without any geometric improvements to the external road system, provided haulage of rock only is required for the expansion project (not sand), and appropriate traffic management measures (e.g. restricting certain haulage operations to off-peak periods) are put in place.

This traffic impact assessment has demonstrated that the proposed deepening of the Ben Schoeman Dock will have a minimal impact on the operation of the transport network, both external and internal to the Port.

7.0 REFERENCES

1. Shangoni Management Services (Pty) Ltd. (March 2006). *Proposed Alterations to Berths 601, 602, 603 & 604 and Associated Deepening of the Ben Schoeman Dock at the Port of Cape Town*. Prepared for the National Ports Authority (Port of Cape Town). Cape Town.

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APPENDICES

APPENDIX A : STUDY PROPOSAL

APPENDIX B : QUANTITIES OF MATERIAL TO CULEMBORG SITE

APPENDIX C : SPECIALIST TERMS OF REFERENCE REPORT (IMPACT RATING METHODOLOGY)

APPENDIX A

STUDY PROPOSAL

EIA FOR PROPOSED ALTERATIONS TO BERTHS 601 - 604 & DEEPENING OF BEN SCHOEMAN DOCK AT THE PORT OF CAPE TOWN :

REVISED TRAFFIC INPUT

STUDY OUTLINE BY HHO AFRICA INFRASTRUCTURE ENGINEERS

☐ STUDY PURPOSE

- To evaluate the traffic impact of the road-based transport associated with construction activities on traffic movements into and out of the Port and adjacent road system.
- To assess the additional traffic volumes by access routes and vehicle type that will be generated during the construction phase of the proposed activities.

☐ STUDY METHOD

COLLECTION OF DATA

☐ Traffic & Transport Planning Data

- *SEA for the Port of Cape Town : Traffic Report*
- *Container Terminal Expansion : EIA Traffic Report*
- *Traffic flow data on access routes & adjacent road network*

☐ Container Terminal Traffic Data

- *Liaison with berth deepening consulting engineers to establish the anticipated construction traffic demands.*

ASSESSMENT AND ANALYSIS OF TRAFFIC FLOWS

☐ Assessment of anticipated weekday peak and off peak hour construction traffic demand through consultation with berth deepening consulting engineers.

☐ Predicting weekday peak and off peak hour traffic flows at the critical Marine Drive intersections in the vicinity of the container terminal for the construction phase, by superimposing the berth deepening construction traffic on the background traffic flows.

☐ Analysis of the critical Marine Drive intersections in the vicinity of the container terminal during the weekday peak and off peak hours of analysis, for the construction phase, using capacity analysis techniques.

☐ Motivation of any mitigation measures at Marine Drive intersections to accommodate construction traffic flows.

☐ Preparation of technical report for submission to the transport authorities.

☐ STUDY REPORT

- Summary of proposals, analyses, findings, conclusions and recommendations in report format.

APPENDIX B

QUANTITIES OF MATERIAL TO CULEMBORG SITE

The Quantities of materials to be delivered to the Culembork Site over the periods as listed below:

CTCT - Berth Deepening - Quantities

Concrete	m3	34010
Casings to piles	m	4225
Rebar	Tonnes	3852
Rough and smooth formwork	m2	17415
Rock supply - 5 to 20kg	m3	8525
Rock supply - 50 to 200kg	m3	32245
G3 imported material	m3	2880

CTCT - Temp Crane Rail - Quantities

Concrete	m3	9048
Rebar	Tonnes	357
Rough and smooth formwork	m2	4000
G3 imported material	m3	5800
Remove excavated material	m3	8880
Remove concrete rubble	m3	5040

The anticipated material quantities per cubic meter of Concrete are:

Cement:		350	kg
	or	7	50kg pockets
Sand:		760	kg
Stone:		1210	kg

The Quantities of materials to be delivered to the Culembork Site over the periods as listed below:

Berth Construction:			
Item	**Start**	**Finish**	**Days**
Berth 601: Length = 280m	09-Apr-08	17-Mar-09	230
Berth 602: Length = 348m	18-Mar-09	01-Dec-09	185
Berth 603: Length = 281m	02-Dec-09	06-Sep-10	184
Berth 604: Length = 224m	07-Sep-10	20-May-11	184
Temp Crane Rail Construction:			
Item	**Start**	**Finish**	**Days**
Berth 604	05-Jun-07	14-Aug-07	51
Berth 603	13-Aug-07	22-Oct-07	51

The anticipated vehicles to be used for delivery of materials to the Culemborg site is:

Type of Vehicle	Size		
Concrete Mixing Trucks	5 to 6 tonne		
Dump Trucks	5 to 15 tonnes		
Low Bed	Normal - No heavy duty		

APPENDIX C

SPECIALIST TERMS OF REFERENCE REPORT (IMPACT RATING METHODOLOGY)

Annexure 1: Impact Rating Methodology

Impact Assessment Methodology for EIAs - Instructions to Specialists

The significance of all potential impacts that would result from the proposed project is determined in order to assist decision-makers. The significance rating of impacts is considered by decision-makers, as shown below.

- **INSIGNIFICANT**: the potential impact is negligible and **will not** have an influence on the decision regarding the proposed activity.
- **VERY LOW**: the potential impact is very small and **should not** have any meaningful influence on the decision regarding the proposed activity.
- **LOW**: the potential impact **may not** have any meaningful influence on the decision regarding the proposed activity.
- **MEDIUM**: the potential impact **should** influence the decision regarding the proposed activity.
- **HIGH**: the potential impact **will** affect a decision regarding the proposed activity.
- **VERY HIGH**: The proposed activity should only be approved under special circumstances.

The **significance** of an impact is defined as a combination of the **consequence** of the impact occurring and the **probability** that the impact will occur. The significance of each identified impact[1] must be rated according to the methodology set out below:

Step 1 – Determine the **consequence** rating for the impact by **adding** the score for each of the three criteria (A-C) listed below:

Rating	Definition of Rating	Score
A. ***Extent*** *– the area over which the impact will be experienced*		
		0
Local	Confined to project or study area or part thereof (e.g. site)	1
Regional	The region, which may be defined in various ways, e.g. cadastral, catchment, topographic	2
(Inter) national	Nationally or beyond	3
B. ***Intensity*** *– the magnitude or size of the impact*		
None		0
Low	Natural and/or social functions and processes are negligibly altered	1
Medium	Natural and/or social functions and processes continue albeit in a modified way	2
High	Natural and/or social functions or processes are severely altered	3
C. ***Duration*** *– the time frame for which the impact will be experienced*		
None		0
Short-term	Up to 2 years	1
Medium-term	2 to 15 years	2
Long-term	More than 15 years	3

[1] This does not apply to minor impacts which can be logically grouped into a single assessment.

The combined score of these three criteria corresponds to a **Consequence Rating**, as follows:

***Combined Score* (A+B+C)**	0 – 2	3 – 4	5	6	7	8 – 9
Consequence Rating	Not significant	Very low	Low	Medium	High	Very high

Example 1:

Extent	*Intensity*	*Duration*	***Consequence***
Regional 2	Medium 2	Long-term 3	**High** 7

Step 2 – Assess the **probability** of the impact occurring according to the following definitions:

Probability– *the likelihood of the impact occurring*	
Improbable	< 40% chance of occurring
Possible	40% - 70% chance of occurring
Probable	> 70% - 90% chance of occurring
Definite	> 90% chance of occurring

Example 2:

Extent	*Intensity*	*Duration*	***Consequence***	***Probability***
Regional 2	Medium 2	Long-term 3	**High** 7	Probable

Step 3 – Determine the overall **significance** of the impact as a combination of the **consequence** and **probability** ratings, as set out below:

Significance Rating	***Consequence***		***Probability***
Insignificant	Very Low	&	Improbable
	Very Low	&	Possible
Very Low	Very Low	&	Probable
	Very Low	&	Definite
	Low	&	Improbable
	Low	&	Possible
Low	Low	&	Probable
	Low	&	Definite
	Medium	&	Improbable
	Medium	&	Possible
Medium	Medium	&	Probable
	Medium	&	Definite
	High	&	Improbable
	High	&	Possible
High	High	&	Probable
	High	&	Definite
	Very High	&	Improbable
	Very High	&	Possible
Very High	Very High	&	Probable
	Very High	&	Definite

Example 3:

Extent	*Intensity*	*Duration*	***Consequence***	***Probability***	***Significance***
Regional 2	Medium 2	Long-term 3	**High** 7	Probable	**HIGH**

Step 4 – Note the **status** of the impact (i.e. will the effect of the impact be negative or positive?)

Example 4:

Extent	*Intensity*	*Duration*	***Consequence***	***Probability***	***Significance***	***Status***
Regional 2	Medium 2	Long-term 3	**High** 7	Probable	**HIGH**	**– ve**

Step 5 – State your level of **confidence** in the assessment of the impact (high, medium or low).

Depending on the data available, you may feel more confident in the assessment of some impact than others. For example, if you are basing your assessment on extrapolated data, you may reduce the confidence level to low, noting that further groundtruthing is required to improve this.

Example 5:

Extent	*Intensity*	*Duration*	***Consequence***	***Probability***	***Significance***	***Status***	***Confidence***
Regional 2	Medium 2	Long-term 3	**High** 7	Probable	**HIGH**	**– ve**	High

Step 6 – Identify and describe practical **mitigation** measures that can be implemented effectively to reduce the significance of the impact. The impact should be re-assessed following mitigation, by following Steps 1-5 again to demonstrate how the Extent, intensity, duration and/or probability change after implementation of the proposed mitigation measures.

Example 6: A completed impact assessment table

	Extent	***Intensity***	***Duration***	***Consequence***	***Probability***	***Significance***	***Status***	***Confidence***
Without mitigation	Regional 2	Medium 2	Long-term 3	**High** 7	Probable	**HIGH**	**– ve**	High
With mitigation	Local 1	Low 1	Long-term 3	**Low** **5**	Improbable	**VERY LOW**	**– ve**	High

In the report, mitigation measures must be described as either:

- **Essential**: must be implemented and are non negotiable; and
- **Optional**: must be shown to have been considered and sound reasons provided by the MJV if not implemented.

Step 7 – Summarise all impact significance ratings as follows in your executive summary:

Impact	***Consequence***	***Probability***	***Significance***	***Status***	***Confidence***
Impact 1: XXXX	Medium	Improbable	**LOW**	–ve	High
With Mitigation	Low	Improbable	**VERY LOW**		High
Impact 2: XXXX	Very Low	Definite	**VERY LOW**	–ve	Medium
With Mitigation:	*Not applicable*				