# KENYA PORTS AUTHORITY



# REVIEW AND UPDATE OF PORT MASTER PLAN STUDY OF THE PORT OF MOMBASA INCLUDING DEVELOPMENT OF FREE TRADE ZONE

## FINAL REPORT


***Submitted by:***

**M.A. CONSULTING GROUP**

***in association with:***

**MAXCAD CONSULTING ENGINEERS**

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**M.A. Consulting Group**

5th October, 2009



The Managing Director
Kenya Ports Authority
P.O. Box 95009
Mombasa

**Attn: Mr. Gichiri Ndua**
**Corporate Services Manager**

Dear Sir,

**Re: Review and Update of Port Master Plan Study of the Port of Mombasa Including Development of Free Trade Zone: Final Report**

In accordance with the provisions of our Contract, we are pleased to submit herewith our Final Report on the above mentioned assignment. The report is in one original and two copies as hard copies, and one CD of a soft copy.

We wish to thank you for the opportunity to work with you on this important assignment and to record our great appreciation for the support given to us by your staff and management throughout the period of the study.

Kindly acknowledge receipt.

Yours Faithfully,
**M.A. Consulting Group**

Ngure Mwaniki
Study Project Director

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# REVIEW AND UPDATE OF PORT MASTER PLAN STUDY OF THE PORT OF MOMBASA INCLUDING DEVELOPMENT OF FREE TRADE ZONE

## FINAL REPORT

## TABLE OF CONTENTS

# LIST OF TABLES

## LIST OF FIGURES

# EXECUTIVE SUMMARY

## 1. Introduction

This report updates the 2004 Mombasa Port Master Plan prepared by Royal Haskoning. Since 2004 there have been several changes which require the Master Plan to be updated. These include:

- Pronouncement of Vision 2030 by the Government
- Faster than expected traffic growth.
- The decision to build a new Japanese-funded container terminal at Kipevu West, with a capacity of 1.1m TEU p.a. The first phase of this development was expected to become operational in 2013, but it is now unlikely to be opened before 2015.
- The decision to dredge the channel to -15.0m CD as far as to the new container terminal, allowing container ships of up to 4,500 TEU to use the port.
- The Government's intention to construct a Free Trade Zone on the other side of the creek at Dongo Kundu. A feasibility study is underway for a new by-pass to the south west of Mombasa which would link Dongo Kundu to Mombasa Island, opening up a whole new area for port and industrial development which was not accessible at the time of the 2004 Master Plan. KPA should liaise closely with The Government on this study and other road improvements that may be planned in the vicinity of the port.

Although KPA is making progress with the modernization of its infrastructure, it still faces major challenges:

- The principal problem continues to be the shortage of storage space for containers. Most Kenyan import containers are now stored and cleared at private off-dock CFS depots, although containers for the transit countries are still handled within the port. Without significant short-term investments, the problem is going to get considerably worse until the Kipevu West terminal opens. Even then, the new terminal will provide only temporary relief, as large numbers of containers will continue to be handled across the existing container berths.
- KPA now expects the date for the opening of Kipevu West container terminal to slip back from 2013 to 2015. With the main existing container terminal at berths 16-18 already 85% occupied, this will raise major problems for accommodating container traffic over the next six years. It is recommended that both the construction of berth 19 and the concessioning of berths 11-14 are ***fast-tracked***.
- There is still generally enough quay line for the handling of dry bulks and general cargo, although handling rates for some commodities remain disappointing. However the open storage space behind Berths 1 to 10 is very congested because of the large number of containers stacked there, and some of the infrastructure is in poor condition and in need of repair.

- The failure of the national railway system to provide an adequate service for the transfer of cargo to and from the port has resulted in a large increase in truck movements and vehicle circulation and parking.
- Continuing failure to resolve inland storage and pipeline constraints has resulted in high berth utilization rates at the two oil jetties. These are now so high that any stoppage due to an accident could seriously disrupt oil supplies to Kenya and neighbouring countries. The proposal in the 2004 Port Master Plan to transfer all flammable cargoes from Shimanzi Oil Terminal (SOT) to Kipevu Oil Terminal (KOT) for safety reasons has not been implemented. The extension to the KOT proposed in the 2004 Master Plan – which would have significantly increased the port's liquid bulk capacity - is no longer possible because of the construction of Kipevu West container terminal.

Strong traffic growth and improvements to the business environment have increased private sector interest in the development of new port facilities, as demonstrated by:

- African Gas & Oil Company Ltd. have a licence to construct a new single buoy mooring in Port Reitz for LPG and (possibly) compressed natural gas imports.
- Interest in installing bulk handling equipment for grain and fertilisers
- Shipping line interest in developing Berths 12-14 as a privately-operated container terminal.
- A proposal by Tiomin to build a new berth for titanium ore exports.

Although institutional issues are not included in the Terms of Reference for this study, the private sector proposals listed above could – if they went ahead – have a significant effect on the requirements and timing of KPA investments.

The Terms of Reference require the Consultants' view of port development to be long-term and visionary, reflecting the ambitious targets of the Vision 2030 economic growth strategy and the Government's plans for major infrastructure investments at Dongo Kundu and Lamu. However these undertakings are likely to affect the second phase of the Master Plan (2015-30) rather than the capital expenditure plans for the period up to 2015, which the Terms of Reference require us to consider in more detail.

Mombasa's traffic growth rates over the next 2-3 years are likely to be subdued by the global recession, whilst Dongo Kundu Free Port cannot be built until the Mombasa southern by-pass is in place; this is unlikely to be completed before 2015. At Lamu, the road improvements needed to support a new multi-purpose port are already reasonably advanced, but an inter-governmental agreement with Sudan for the construction of a new oil pipeline will be required before work can be started on the tanker berths.

Because of these unavoidable lead-times, and the current economic climate, the detailed engineering proposals for the period up to 2015 do not include any projects arising from the Government's longer term vision. We have been careful, however, to consider their implications for the current round of projects when assigning space within the existing port limits.

## 2. Traffic Forecasts

In 2007 Mombasa handled around 16m tons of traffic, of which 13.3m tons was imports and 2.0m tons exports. The remainder was miscellaneous items like transshipment cargo, bunkers and the weight of empty containers.

Just over 35% of all cargo was containerized, with the port's container throughput reaching 585,000 TEU. The most important non-containerised cargoes were bulk imports of petroleum (4.80m tons), vegetable oils (0.64m tons), clinker (1.08m tons), wheat (0.86m tons), fertilizers (0.28m tons) and coal (0.18m tons).

Kenyan trade accounted for 70% of Mombasa's traffic in 2007, with transit traffic accounting for 27% and transhipment 3%. Over three quarters of its transit traffic was for Uganda, with Rwanda, Tanzania and DR Congo each accounting for a further 6%.

Between 2002-7 the average cargo growth rate was 8% p.a. Container traffic increased by 11% p.a. in terms of TEUs (14% p.a. in tonnage), the major dry bulks by 20% p.a., and liquid bulks by 5% p.a. However there was decline in general cargo volumes of around 2% p.a. in spite of the strong growth in imports of iron & steel and vehicles.

The total tonnage handled by Mombasa in 2007 was 10% higher than forecast by the 2004 Port Master Plan. The extra growth affected most types of cargo, but was particularly serious for container traffic which was 23% higher than predicted. Only break bulk cargo volumes were significantly below their expected level.

The traffic forecasts for the Revised Port Master Plan have been based on a spreadsheet model which relates port throughput to GDP growth, using income elasticities derived from past statistics and interviews with key stakeholders. For the larger commodities they also take into account changes in local production and consumption patterns, and any other factors that could significantly influence the future demand for port facilities.

The traffic forecasts included in the Interim Report were based on Vision 2030 GDP growth assumptions (10% p.a. from 2012-20). After discussions with KPA about the amount of physical infrastructure that would be required to support the Vision 2030 growth rates, and the risk that these will not be achieved because of the global recession, a more modest GDP growth rate of 7% p.a. between 2012-20 was agreed for port planning purposes and is referred to in this report as the "base case". This is still slightly above the GDP rates that have been achieved in the recent past.

A summary of the "base case" traffic forecasts is given in Table 1.

**Table 1: Summary of Base Case Traffic Forecasts ('000 tons)**

| | 2007 | 2013 | 2018 | 2023 | 2028 |
|---|---|---|---|---|---|
| **EXISTING CARGOES** | | | | | |
| **Imports** | | | | | |
| Liquid bulks | | | | | |
| Petroleum | 4,798 | 5,080 | 5,482 | 6,080 | 8,212 |
| Vegetable oils | 676 | 932 | 1,277 | 1,727 | 2,442 |
| Total | 5,474 | 6,012 | 6,759 | 7,807 | 10,654 |
| Dry bulks | | | | | |
| Clinker | 1,051 | 1,692 | 2,433 | 3,433 | 5,136 |
| Wheat | 858 | 1,245 | 1,717 | 2,312 | 3,118 |
| Fertilizers | 383 | 402 | 423 | 443 | 466 |
| Coal | 176 | 283 | 408 | 575 | 860 |
| Other | 328 | 381 | 330 | 380 | 585 |
| Total | 2,796 | 4,003 | 5,311 | 7,143 | 10,165 |
| Break bulk (exc vehicles) | | | | | |
| Iron & steel | 621 | 856 | 1,176 | 1,591 | 2,250 |
| Other | 255 | 280 | 330 | 390 | 450 |
| Total | 876 | 1,136 | 1,506 | 1,981 | 2,700 |
| **Exports** | | | | | |
| Liquid bulks | 167 | 81 | 44 | 24 | 10 |
| Dry bulks | | | | | |
| Soda ash | 77 | 180 | 267 | 299 | 299 |
| Other | 128 | 62 | 34 | 19 | 8 |
| Total | 205 | 242 | 301 | 318 | 307 |
| EXISTING NON-UNITISED[a] | 9,518 | 11,474 | 13,921 | 17,273 | 23,836 |
| EXISTING UNITISED[a] | | | | | |
| Containers ('000 TEU) | 585 | 1,002 | 1,544 | 2,199 | 3,284 |
| Vehicles ('000 units) | 74 | 137 | 214 | 291 | 411 |
| **NEW CARGOES** | | | | | |
| Power station coal | 0 | 1,000 | 1,000 | 1,000 | 1,000 |
| Titanium ore | 0 | 0 | 440 | 440 | 440 |
| Compressed natural gas | - | 50m cu ft/day | | | |

Note: (a) imports + exports

## 3. Port Infrastructure and Operations

During the course of the study the Consultants have prepared an up-to-date base map of the port, and carried out a visual inspection of the port infrastructure, noting areas where major repairs are urgently required. The results are shown on Drawings 2009/02 to 2009/04 in Annex A.

They have also analysed port operations on a ship-by-ship basis for 2007 to identify exactly where in the port different types of dry cargo are handled, and the gross handling rates being achieved for each type of cargo, including idle time and delays. Unfortunately this type of information is not available for liquid bulks.

The results show that handling rates for most cargoes are below the international norm. This is partly due to poor layout and space shortages within the port, and partly due to existing working practices. The analysis of future berth requirements assumes that handling rates will increase over time as a result of better management and supervision. Larger ship and cargo sizes and more modern ships' cranes should also increase berth productivity.

The key handling rate assumptions used to calculate future berth requirements are shown in Table 2. These figures are before the investments recommended in the Revised Port Master Plan.

**Table 2: Cargo Handling Rate Assumptions**

| Cargo | Existing handling rate (gross) | Increasing to |
|---|---|---|
| **Liquid bulks** | | |
| Petroleum KOT | 14,000 tons/day | 17,000 tons per day (2012) |
| SOT | 5,000 tons/day | |
| Vegetable oils | 5,000 tons/day | |
| **Dry bulks** | | |
| Clinker | 7,750 tons/day | 10,000 tons/day (2014), 15,000 tons/day (2018) |
| Wheat | 7,000 tons/day | 8,250 tons/day (2013) |
| Fertilizer | 2,000 tons/day | 3,000 tons/day (2013) |
| Coal | 2,000 tons/day | 3,000 tons/day (2013) |
| Other dry bulks | | |
| Imports | 4,000 tons/day | 6,000 tons/day (2015) |
| Exports | 2,000 tons/day | |
| **Break bulk** | | |
| Iron & steel | 2,800 tons/day | 4,000 tons/day (2015) |
| Other conventional | 1,200 tons/day | |
| **Unitised** | | |
| Containers | | |
| B12-14 | 12 lifts per crane hour | 14 lifts per crane hour (2011) |
| B16-18 | 10 lifts per crane hour | 18 lifts per crane hour (2012) |
| Messina RoRo | 450 TEU/ day | 750 TEU/ per day (2014) |
| Vehicles | 1,000 units/day | 1,200 units/day (2012) |

## 4. Future Shortfall in Port Capacity

There is likely to be a serious shortfall of container handling capacity prior to the opening of the new Kipevu West container terminal. The problem is primarily lack of back up space rather than lack of quay length.

We estimate that there will be a shortfall of around 3,200 TEU of ground slots by 2012 assuming that containers are stacked on average three high. This is likely to reduce cargo handling rates, resulting in a large backlog of vessels waiting for a berth.

After the Kipevu West terminal becomes operational there will be a temporary surplus of groundslots, but the Kipevu West terminal is likely to be full by 2020, when additional capacity will be needed. A further 1,100m of quay with around 400-500m of back-up space will then be required to meet the growth in container traffic up to 2030.

For dry bulks and general cargo there is currently a surplus of around 800m of berth length on Mbaraki Wharf and Berths 1 to 10. However Mbaraki Wharf does not have enough capacity to handle all of the dirty bulks traffic, some of which will have to use Berths 1-10.

If clinker, coal and fertilisers are handled over Berths 1 to 10, additional berth length will not be required until about 2022. This could be provided at Berth 11 or by the development of a bulk berth on Dongo Kundu. The latter could be developed jointly by KPA and the Ministry of Energy, which is considering building a new coal jetty for a proposed power station at Dongo Kundu

If there is no development at Dongo Kundu and Berth 11 is not used for general cargo, there will be a berth shortfall for dry bulks and general cargo of about 815 m by the end of the study period (2030). The unmet demand can be accommodated by developing one or more bulk berths and a vehicle import berth at Dongo Kundu.

These are the dates by which additional facilities are required to accommodate organic traffic growth. The traffic forecasts do not take into account any additional traffic that might be generated by the Free Trade Zone at Dongo Kundu, and the Master Plan does not include the construction of additional berths at Dongo Kundu to kick-start the Free Trade Zone development.

It is difficult to come to a conclusion about the need for additional oil berths because the inadequacy of operational data. Berth occupancy rates at KOT and SOT are higher than would normally be acceptable (78% and 62.5% in 2008) because pumping rates are well below the international norm, and a lot of time is lost moving ships on and off the berth whilst they are discharging. With such high berth occupancy rates the import of crude oil and petroleum products for Kenya and other neighbouring countries is very vulnerable to stoppages if there is an accident at either of the existing terminals.

Many of the problems arise because of inland storage and pipeline constraints, which the oil companies are beginning to tackle. There is therefore scope for a significant improvement in handling rates, which would defer the need for additional berth construction. The removal of slow moving LPG traffic to a separate buoy mooring would also help to reduce berth occupancy rates, whilst the construction of an oil refinery in Uganda using locally-produced crude oil would give Kenya an alternative source of imports which does not require port facilities.

The scope and timing of such improvements is still highly uncertain, and their impact on berth utilization rates unknown. Because security of oil supplies is so important, it is essential that a proper study of oil berth operations (including inland distribution constraints) is carried out in the immediate future.

## 5. Port Master Plan Proposals

Projects to be included in the Revised Port Master Plan have been divided into two groups : short-term (for completion by 2013) and long-term (projects which may be started in the next five years but will not be completed until after 2013, and longer term developments up to the end of the planning period in 2030.

The deepening of the channel to -15.0m CD and the construction of Kipevu West container terminal have been taken as firm commitments, and are not discussed in detail in the Port Master Plan. The other major projects are listed below.

Minor projects already included in KPA's capital expenditure programme (including assets replacements) have been taken into account in the financial evaluation of the Port Master Plan, but are not discussed elsewhere.

## 5.1 Short-Term Proposals

The short term proposals – listed from the seaward end of the port inwards - include:

- Investigation of further improvements to the entrance channel and the channel within the port, to determine if it would be possible to accommodate container ships of 6,000+ TEU capacity.
- Transfer of most of the dirty dry bulk operations to Mbaraki Wharf, combined with the construction of wider access bridges and dredging of the wharf to -12.5m CD. Extension of Mbaraki Wharf to create a third berth is not recommended, as a better site for dirty bulks will be available at Dongo Kundu by the time it is needed.
- Repairs to buildings in the Dockyard which are needed for safety reasons.
- Clearing of all of the old buildings from Area G apart from Shed D, and conversion of the area into two separate open storage areas, one for vehicles and the other for containers. The vehicle compound should be paved and fenced, with its own security system. Paving of the storage area for containers is not required, as this use will last only until the Kipevu West terminal is open.

  After that, consideration should be given to the erection of a prestigious building for trade-related services which takes advantage of the area's proximity to the city centre. This part of the port can be made accessible to the public without putting port security at risk, and developed for commercial uses.
- Improvements in handling efficiency on general cargo Berths 1-10. The berths are expected to remain largely in their existing uses, but around 7 ha of paving are in need of repair to improve cargo handling speeds. The need to retain all of the transit sheds should be reviewed, as open storage space for containers and subsequently vehicles would be more useful.
- At Berth 4 GBHL is proposing to install a third grain unloader once there is sufficient demand. Alternatively a second grain operator could be allowed to install unloading equipment at Berth 5, with an elevated conveyor to off-dock silos running on piles along the steep slope to the landward side of the back port road. Both of these proposals would be privately-funded.
- At Berth 9 Magadi Soda is proposing to upgrade its loading equipment for soda ash. As handling rates for this commodity are very low, this will increase the capacity of the berth.
- Transfer of LPG from Shimanzi Oil Terminal to a new two-buoy mooring to be built at Port Reitz by the African Gas and Oil Company Ltd. This may also handle compressed natural gas – a new cargo - although it is not yet clear whether the mooring will have enough capacity to accommodate both types of cargo.
- Extension of Berth 14 to join Berth 16, rearrangement of the stackyard area behind Berths 11-15, and improvements to the traffic circulation pattern. This provides an extra 206m of quay and 300 TEU of additional groundslots. In terms of increasing the port's container capacity it does not represent such good value for money as the construction of Berth 19 as the quay is extremely narrow and unsuitable for ship-to-shore gantry cranes.

The project could be attractive to a private operator if KPA were prepared to give the operator complete control over the operation of Berths 12-15 and allow them to become more closely integrated with off-dock CFS operations. The level of private sector interest is likely to depend on KPA's proposals for private sector participation at the Kipevu West terminal.

- Construction of Berth 19, rearrangement of the stackyard area behind Berths 16-19, and improvements to the traffic circulation pattern. This provides an extra 160m of quay and 2,050 TEU of additional groundslots, and will allow a further three ship to shore gantries to be installed in addition to the four in use now.

  Because the project provides a large amount of additional storage space, it is likely to improve the productivity of the main container terminal (Berths 16-18) as well as providing additional capacity in its own right. This is because the main problem in container handling is lack of yard space rather than lack of berth length.

- The conclusions in respect of Berths 11-19 cannot be confirmed because of the poor quality and inconsistency of the base maps which are available for this part of the port. A proper topographical survey of the whole area is needed prior to the start of design work.

- Enlargement of Gate 19 to provide three additional check-out booths, and widening of the truck waiting area near the gate to avoid long queues of vehicles impeding other port operations.

- Widening of the road behind Berths 16-19 to provide for a dual carriageway connecting the existing terminals to Kipevu West and beyond to the proposed southern by-pass west of the airport.

- A study of the need for new hydrocarbon berths (LPG, compressed natural gas and petroleum products). KPA's statistics in respect of liquid bulk operations are far from satisfactory, and the design of an improved data collection system should be included in the study.

- In addition the movement of tankers, container vessels and bunker vessels in the vicinity of KOT should be studied to ensure that these manoeuvres can be carried out safely.

  If productivity improvements at KOT cannot be achieved quickly, a new oil berth will be needed in the short-term. With significant productivity improvements, completion of the proposed LPG berth, and better operational planning the need for a new oil berth could be deferred for several years.

  Two alternative sites are available for the new oil berth, one at the western end of Dongo Kundu and the other to the west of Kipevu West container terminal, which provides room for the container terminal to expand. The location of these sites is shown in Figure 2.

- Upgrading of the incoming power supply to 33kV and provision of a second power line from Kenya Power & Lighting Co.'s Makande sub-station to a new 33/11kV substation near KPA's substation K. Both projects are required to improve the stability of power supplies.

- Other power-related improvements include the purchase of three new generators to provide back-up power to communications equipment, and the use of monopole floodlights to enhance port security, reduce space loss in the container stackyards, and improve port efficiency at night

- Construction of a new water pipeline from Changamwe reservoir to two new 3,000 $m^3$ reinforced concrete water tanks at Kipevu Hill. This should help to overcome persistent water shortages within the port.
- Upgrading of the sewage system with three new septic tanks and a biological treatment works, to comply with NEMA standards.
- Resolution of legal problems preventing the use of a privately-owned incinerator for bilge disposal, and purchase of various small items of equipment for dust suppression purposes. Facilities for dealing with other environmental problems such as oil spill pollution appear adequate.
- Fishing boats should be allowed to continue to use their present facilities.

The short-term proposals are shown in Figure 1, which also includes the deepening of Berths 1 to 5 (classed as a long-term project). Their estimated cost, together with the two committed projects, is shown in Table 3.

**Figure 1: Short Term Port Master Plan Proposals**

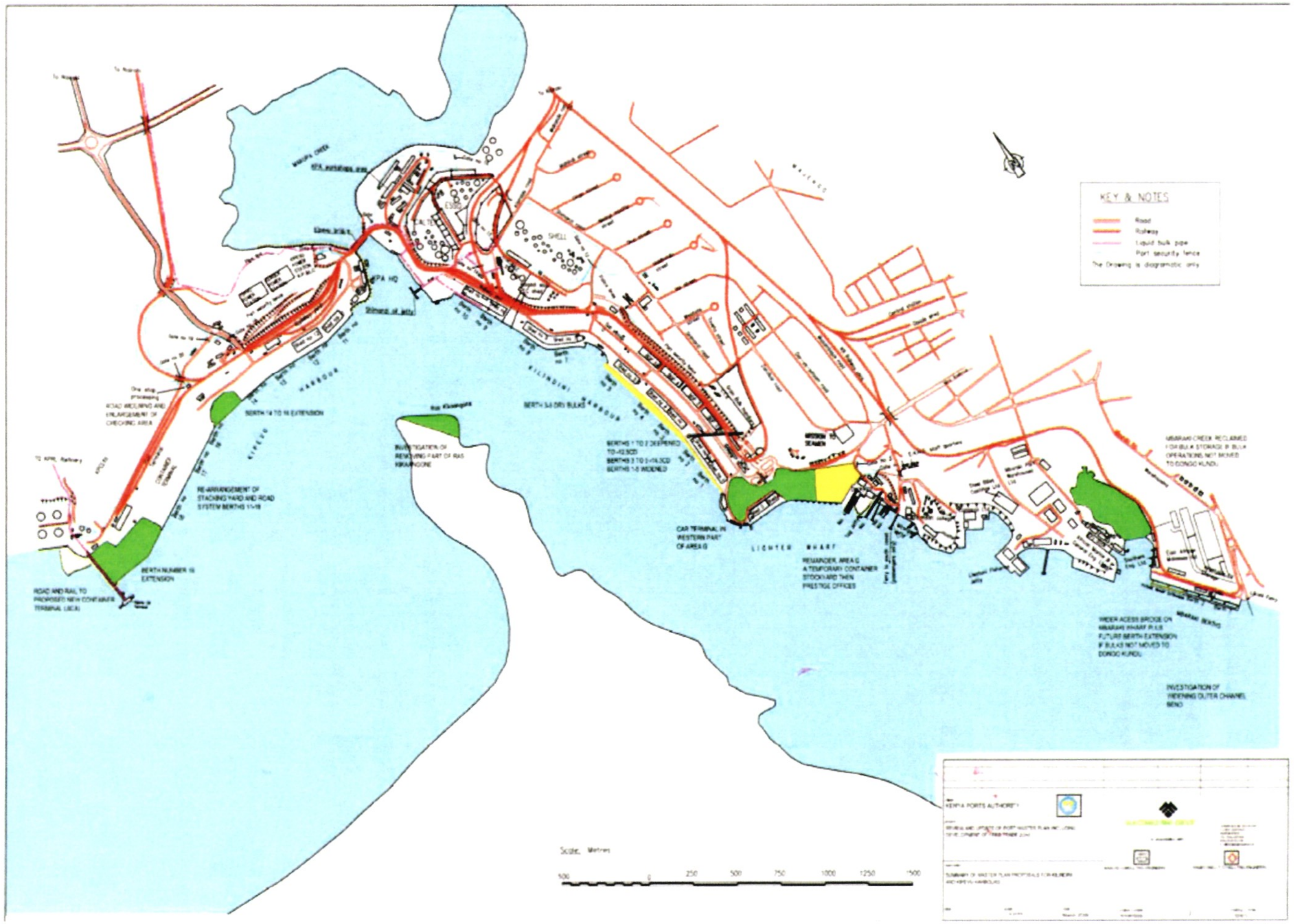


**Table 3: Capital Costs of Short Term Port Master Plan**

| | KShs. m |
|---|---|
| **Committed projects** | |
| Channel dredging to -15.0m CD | 7,000[a] |
| Kipevu West container terminal | 20,000 |
| | |
| **New projects** | |
| Mbaraki access bridges & wharf deepening | 105 |
| Dockyard building repairs | 3 |
| Area G paving | 349 |
| Berths 1-10 paving repairs | 357 |
| | |
| Berth 14 extension | 1,534 |
| Rearrangement of B11-15 container yard | |
| Civil works | 800 |
| Mechanical equipment | 2,090 |
| | |
| Berth 19 | 3,144 |
| Rearrangement of B 16-19 container yard | |
| Civil works | 300 |
| Mechanical equipment | 2,605 |
| | |
| Improvement of Gate 19 and widening of road to KOT | 534 |
| | |
| New oil berth, including loading arm & pipework to shore | 2,900 |
| New oil berth, pipework along the shore | 1,009 |
| LPG berth | private finance |
| | |
| Utilities | 576 |
| Dust suppression equipment | 50 |
| **Total** | **43,356** |

Note: (a) Capital dredging is a Ministry of Transport responsibility.

## 5.2 Long-Term Proposals

The short-term proposals are concerned mainly with improvements to existing infrastructure. The long-term proposals expand the port further westwards into the Port Reitz area, and across to the other side of the creek at Dongo Kundu. They include:

- Construction of another 1,100m of container berths, either as an extension of the 1.1m TEU p.a. container terminal to be built at Kipevu West or as a new container terminal at Dongo Kundu.

  The base case traffic forecasts suggest that the first phase of this expansion will be needed by 2021, but construction at Dongo Kundu could be undertaken earlier to kick-start the development of the Free Trade Zone.

- Construction of a common user terminal for dirty bulks at Dongo Kundu, capable of handling Panamax size vessels. Discussions should be held with the Ministry of Energy about integrating this proposal with its plans for a coal jetty for a new power station at Dongo Kundu.

The common user facility will not be needed for capacity reasons until around 2022, but could be timed to coincide with the opening of the new road to Dongo Kundu when this occurs if joint development of the power station coal jetty and the common user bulk terminal was the most economic solution.

- Deepening of Berths 1-5 at the existing port to allow the use of larger grain and RoRo ships. This would also allow general cargo ships to carry larger consignments of steel, and would be of benefit to the dirty dry bulks ( clinker, coal and fertilizers) until the new facility at Dongo Kundu was built. Berths 1-2 would be deepened to -12.5m CD, and berths 3-5 to -14.5m CD.

  Although these cargoes would benefit from immediate berth deepening, the project has not been included in the short-term plan because of the potential disruption to port operations when the port is short of space and the management pre-occupied with finding additional space for containers. Site investigations and design work should be carried out over the next four years, but construction should not be started until port congestion has been relieved by the opening of Kipevu West Terminal.

- Development of a car import terminal at Dongo Kundu by 2023. This could be undertaken earlier if there were private sector interest in building a modern terminal with value-added services linked to the distribution of imported vehicles.
- Construction of a new cruise terminal close to the proposed southern by-pass connecting Dongo Kundu to the north shore of Port Reitz. Although KPA intends to convert the buildings on Berth 1 into a cruise terminal, the site is far from ideal. It should be regarded as no more than a temporary, low cost solution until a proper cruise terminal can be built.
- The proposal by Tiomin Kenya Ltd to build a privately-funded berth for mineral exports 500 metres west of the Likoni Ferry on the south side of Kilindini Harbour. Because of the economic recession it is unclear whether this project will go ahead, but if it does, it can be fitted quite easily into the Port Master Plan.
- Further widening of the entrance channel to allow container ships of 6,000+ TEU and large bulk carriers to enter the port. This is unlikely to be required before 2020, and the need for it should be assessed closer to the time, assuming that studies included in the Short Term Master Plan show it to be technically feasible.

The location of the long-term Master Plan projects is shown in Figure 2 overleaf. Because the projects are less well defined than those in the short-term Master Plan, and relatively little is known about ground conditions in the Port Reitz area, this part of the Master Plan has not been costed.

Most of the projects will require Environmental Impact Assessments (EIAs) before they can go ahead. Very little information is available about environmental conditions in the Port Reitz area where most of the longer-term projects are located. To overcome this problem, we recommend that KPA commissions a comprehensive environmental survey of the area, to provide a common data base for the EIAs required for individual projects. The survey could be extended to provide environmental data for the planning of Dongo Kundu Free Trade Zone.

### *Lamu*

The governments of Kenya and Qatar have held talks on financing Lamu in the recent years, and a construction cost of Sh273 billion port has been aired. Qatar and Kenya have also discussed funds for the construction of a road from Lamu to Garsen.

The role of the Lamu and its impact on Mombasa's traffic cannot be quantified before decisions are made on the cargoes to be targeted by the new port and the facilities to be built (berths and inland transport links). But its impact is likely to be limited. Lamu is further for the economic heartland of Kenya around Nairobi.

Furthermore,

- Lamu will take a long time to build;
- It will take even longer to attract traffic;
- It is not well located to compete with Mombasa for traffic in and around Nairobi; and
- Lamu is better placed to target traffic to the north, in Ethiopia and South Sudan, where Mombasa has little involvement.

A key point, however, is that any threat to Mombasa' traffic would lie well in the future, and the KPA would have sufficient time to adjust the Mombasa Master Plan if any such threat arose.

## 6. Free Trade Zone

The establishment of Free Trade Zones (FTZ) is one of 97 flagship projects to be implemented under Vision 2030, Kenya's economic policy blueprint for meeting long-term development goals. The Government is committed to allocating substantial budgetary resources over the next five years for the development of free ports in partnership with the private sector, and the most important project is located on KPA land at Dongo Kundu.

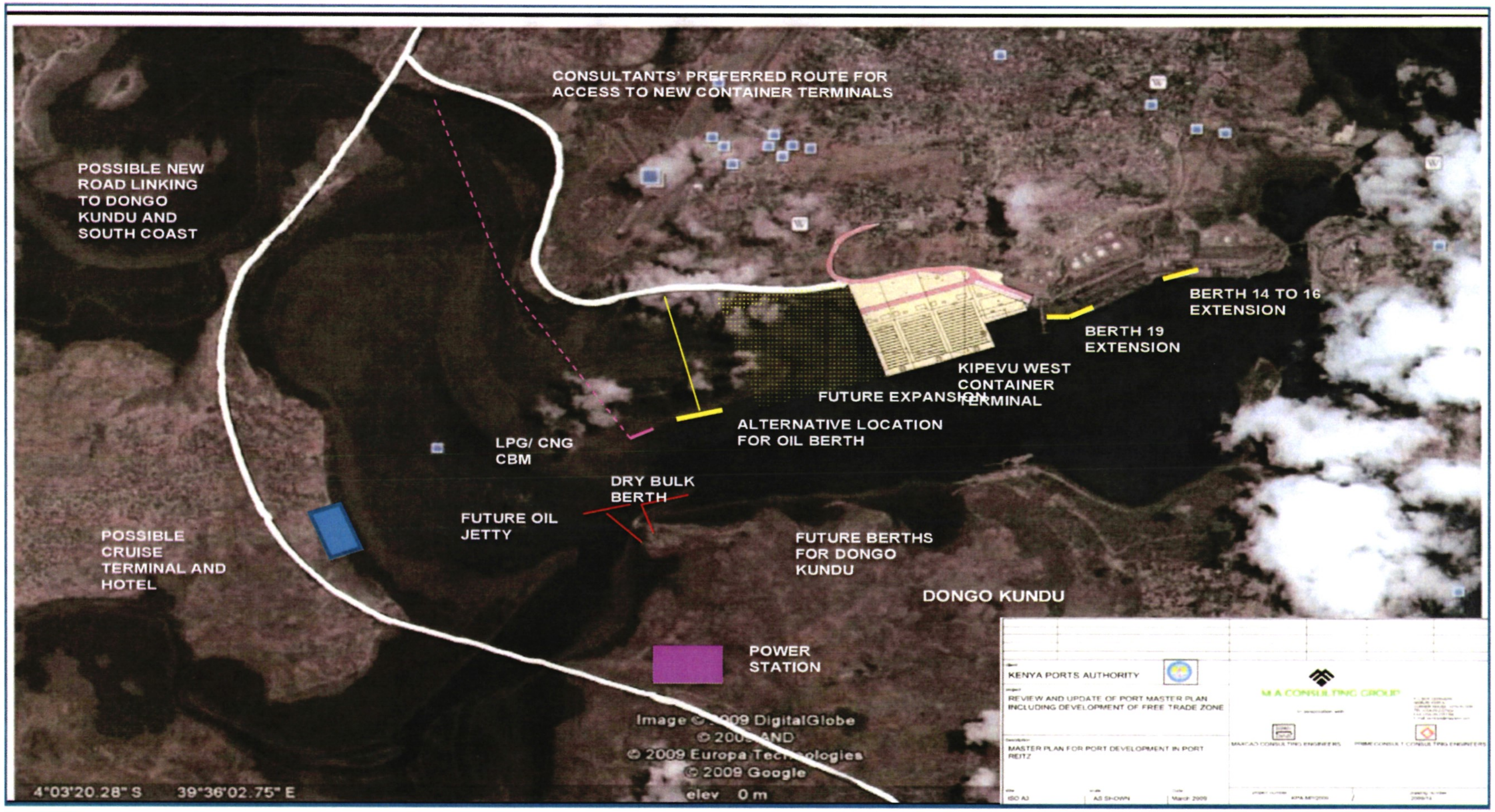
The 2004 Port Master Plan (PMP) recommended the development of a small Free Trade Zone in Area G of the port, but the project failed to take off because of lack of interest from private operators. This is not surprising as Area G is small and expansion of the Free Trade Zone would have been constrained by the general scarcity of land in the port. The idea of a Free Trade Zone in Area G has now been abandoned in favour of a much larger development at Dongo Kundu.

When fully developed the Dongo Kundu Free Trade Zone is expected to comprise 6,200 individual sites housing 10,000 business units and facilities for warehousing, light industry and processing. There will also be a residential area.

Plans are underway to address the inaccessibility of the area through the development of a new bypass to the south of Mombasa Island with a bridge from Miritini Station. The bypass will open up the South Coast, promote tourism and improve road connections to Tanzania

Because the long-term Port Master Plan is closely interlinked with development plans for Dongo Kundu, KPA should be actively engaged in the formulation of Free Trade Zone policies and programmes. KPA should protect its interests by providing technical advice on all developments affecting the port, and by ensuring that it is properly equipped to fulfill any obligations relating to the development of Dongo Kundu that the Ministry of Transport may cascade onto it.

**Figure 2 Long term Port Master Plan Proposals**



## 7. Economic Evaluation

The economic evaluation reviews the case for four groups of projects included in the Port Master Plan:

- Mbaraki Wharf access bridges, plus wharf deepening and extension.
- Berth 14 extension, including rearrangement of the container yard behind Berths 12-14.
- Berth 19 construction, including rearrangement of the container yard behind Berths 16-18.
- Deepening of Berths 1 to 5.

The dredging of the channel to -15.0m CD and the construction of Kipevu West container terminal have been treated as committed projects which require no further evaluation work. Other projects have not been evaluated because they are too small, lack the necessary data, or are likely to be privately financed

**Mbaraki Wharf.** The construction of new access bridges to Mbaraki Wharf would allow ships to discharge bulk imports directly into the trucks taking them inland. At present, the wharf is only accessible to trucks of up to 7 tons, requiring the cargo to be dumped and reloaded into larger trucks nearby. The avoidance of double handling would result in an economic rate of return (EIRR) of between 8-13%, depending on the extent to which dirty bulks are relocated after the opening of the proposed bulk terminal at Dongo Kundu.

Providing there are no environmental constraints, Dongo Kundu is likely to be a much better location for dirty bulks than Mbaraki Wharf. Because Mbaraki, together with Berths 1-10, can provide enough capacity for dirty bulks up to 2022, the extension will not be needed until well after the option of Dongo Kundu becomes available. Extension of Mbaraki Wharf is therefore not recommended. However it should be deepened to -12.5m CD as this can be done at very low cost (Kshs. 16,400,000).

**Container terminal expansion schemes.** The Berth 14 and Berth 19 schemes are to some extent alternatives. Both are intended to provide a short-term boost to KPA's container handling capacity prior to the opening of Kipevu West, although the rapid forecast growth of traffic means that they will also handle substantial amounts of traffic after 2013.

The Berth 19 group of projects provides better value for money than the Berth 14 group. Although it costs 35% more, it could provide up to 65% more additional capacity.

This is because Berth 19 includes a large additional stackyard area which can be used to increase the productivity of Berths 16-18, adding to the capacity created at Berth 19. As noted earlier it is the back-up area rather than the quay length at Mombasa which is the principal constraint on terminal throughput. However the Berth 19 stackyard area alone will not be sufficient to support the throughput of three additional quay cranes, and the full benefits of the project will only be obtained with some parallel expansion of CFS storage space or a reduction in container dwell times.

The Berth 19 group of projects provides a single straight quay line, which allows the installation of three high speed ship-to-shore gantry cranes (SSGs), whereas Berths 12-15 are likely to be equipped with slower mobile harbour cranes (MHCs) because of the structural weakness of the quay, the narrowness of the back-up area, and changes in direction of the quay line. As a result cargo handling speeds at Berths 12-15 will be only slightly higher than those achievable with ships' gear.

**Table 4: Comparison of Alternative Schemes for Short Term Increases in Container Capacity**

| | **Berth 14 extension plus rearrangement of the Berths 11-15 stackyard** | **Berth 19 plus rearrangement of the Berths 16-19 stackyard** |
|---|---|---|
| Additional berth length<br>Additional groundslots<br>Additional quay cranes | 206m<br>300 TEU[a]<br>3 MHCs | 160m<br>1,890 TEU[b]<br>3 SSGs |
| **Capital cost (KShs. m)**<br>Civil works<br>Mechanical equipment | <br>2,344<br>2,090 | <br>3,444<br>2,605 |
| Total | 4,434 | 6,049 |
| Increase in capacity ('000 TEU p.a.) | 120 | 200[c] |

Note: (a) of which 162 TEU are obtained on Berth 16 by extending the RTG runs
(b) excludes additional Berth 16 groundslots created by the formation of Berth 15
(c) providing additional off-dock slots can be made available to support the quay capacity increase arising from the SSGs

The figures shown in Table 4 need to be checked once a proper topographical survey of the area between Berth 11 and Kipevu Oil Terminal has been carried out, as there are inconsistencies between the various drawings supplied to us by KPA which could have a significant effect on these conclusions.

The principal benefits of both schemes are:

- Faster container handling rates due to increased amounts of mechanical equipment per ship and a reduction in yard congestion arising from increased space.
- Savings in ship waiting time due to the increased number of berths.
- Reduction in the proportion of containers having to be transferred to off-dock CFS facilities. This avoids double handling costs and increases the storage revenues accruing to KPA.

For the Berth 19 projects these benefits, offset by a small increase in operating costs, produce an economic rate of return (EIRR) of 33%. This assumes no development at Berths 11-15.

The EIRR for the Berth 14 group of projects depends on whether it is undertaken by KPA or a private operator, and on how the traffic splits between the two terminals (Berths 11-15 and Berths 16-19) both before and after the opening of Kipevu West. In the absence of private management it is likely to be well below the EIRR for Berth 19.

**Deepening of Berths 1 to 5.** The deepening of Berths 1 to 5 will benefit four groups of ships: grain ships (which could increase from 25,000 to 60,000dwt), Messina RoRo ships, bulk carriers bringing clinker, coal and fertilizers, and general cargo ships carrying steel.

An initial review of the benefits suggests that the project is worth further investigation. However it is not urgently needed, and is unlikely to be carried out for practical reasons before 2015, when the transfer of container traffic to Kipevu West will relieve pressure on the general cargo berths.

## 8. Financial Evaluation

A simple financial model of KPA has been constructed to assess whether it will have the financial resources needed to fund all of the projects included in the Port Master Plan, plus other capital projects listed in KPA's three year capital expenditure programme, and minor projects such as routine asset replacement.

The model assumes that the Kipevu West container terminal will be wholly funded by a KShs. 20bn loan from JBIC, and that the Ministry of Transport will fund the dredging of the channel to -15.0m CD as far as Port Reitz. It also allows for dividend payments to Government (15% of post-tax profits), and extraordinary contributions to KPA's Pension Fund to shore up the present deficit.

The results indicate that KPA should have enough cash to be able to fund all of the investments in the Port Master Plan provided it can obtain supplier credit for the mechanical equipment needed for Berths 11 to 15 and Berths 16 to 19 (Kshs 4.8bn). There is a sizeable net cash outflow in 2010-11, the peak years for construction of the short-term Port Master Plan projects, but KPA's opening cash balance (around KShs. 2.3bn) and accrued profits should be more than enough to fund this.

If supplier credit cannot be obtained for all of the mechanical equipment KPA's cash balance is likely to become negative, making it necessary to raise loans from other sources. Its ability to do this will be affected by the size of the JBIC loan relative to its balance sheet, even after the planned revaluation of its assets.

If KPA is unable to obtain supplier credit and/or other commercial loans on acceptable terms, it should consider the use of private funding for the redevelopment of Berths 12-15, most probably in the form of a 20 year BOT concession. We recommend that KPA tests the market for private finance later this year, before finalising funding arrangements for the remainder of the Port Master Plan. If the request for proposals is left any later, it will not be possible to complete the project soon enough to obtain congestion relief in the two years prior to the opening of Kipevu West (2012-13).

If KPA cannot fully fund the Berth 14 group of projects itself, and has difficulty obtaining external funding quickly, consideration should be given to dropping these projects from the Port Master Plan. An update on the status and capacity of Kipevu West should be obtained before reaching this decision.

**Conclusions & Recommendations** KPA should have enough cash to be able to fund all of the investments in the Port Master Plan assuming that it can obtain supplier credit for the mechanical equipment. There is a sizeable net cash outflow in 2010-11, the peak years for construction of the short-term Port Master Plan projects, but the large opening balance and accrued profits should be more than enough to fund this.

## 9. Recommended Action Plan

The recommended Action Plan comprises a mixture of projects, studies, private finance initiatives and KPA internal decisions, all of which will contribute to long-term development of the port. They are summarized for the existing port area in Table 5, and for the new Port Reitz/ Dongo Kundu area in Table 6.

**Table 5 Recommended Actions in the Existing Port Area**

| Facility | Actions | Cost (KShs. m) | Timing |
|---|---|---|---|
| **Existing Port** | | | |
| Channel | Implement capital dredging to -15.0m CD | 7,000 | 2010-11 |
| | Technical study of widening and removal of bends to allow larger vessels to use the port | Study | 2010-12 |
| Mbaraki Wharf | New access bridges + dredging to -12.5m | 105 | 2010-11 |
| | Review GBHL scheme for bulk unloaders | Private finance | 2009 |
| Dockyard | Repairs | 3 | 2009-10 |
| Area G | Vehicle parking (paved ) & container storage (unpaved) | 350 | 2010 |
| | Redevelop eastern end of site for commercial use once no longer needed for containers | Uncosted | After 2013 |
| Berths 1-10 | Repair paving | 357 | 2010 |
| | Investigate need for berth deepening | Study | 2011-12 |
| | Review need for transit sheds | KPA in-house | 2009 |
| | New soda ash conveyors at Berth 9 | Private finance | 2010-11 |
| | Deepening of Berths 1-5 | 3,835 | 2014-16 |
| Shimanzi Oil Terminal | Monitor progress of LPG berth & transfer all LPG cargoes when complete | KPA in-house | 2009-10 |
| | Review long-term role of SOT, and safety need to transfer other flammable cargoes | KPA in-house | 2009-11 |
| Berth 11-14 | Extend Berth 14 to join Berth 16 | 1534 | 2011 |
| | Rearrange stackyard behind Berths 11-15 | 800 | 2011 |
| | Purchase of mechanical equipment | 2090 | 2011 |
| Berth 16-18 | Extend Berth 18 to create Berth 19 | 3,144 | 2010-11 |
| | Rearrange stackyard behind Berths 16-19 | 300 | 2011 |
| | Purchase of mechanical equipment | 2,605 | 2011 |
| Gate 19 access | Three additional exit booths, road widening & parking | 534 | 2010-11 |
| Kipevu Oil Terminal | Study of terminal operations, productivity improvements, and need for new oil berth | Study | 2009 |
| | New oil berth | 3,909 | Uncertain |
| Utilities | New power line and upgrading of existing line to 33kV | 255 | 2010-12 |
| | | 143 | 2010-12 |
| | Back-up generators and security lighting | | |
| | New water pipe and water storage tanks | 143 | 2010-12 |
| | Sewage treatment | 35 | 2010-12 |
| Environment | Dust suppression equipment | 50 | 2010-12 |
| Corporate | Accurate topographic survey of area from Berth 11 to Kipevu Oil Terminal | Study | 2009 |
| | Improvements to collection & analysis of port operations statistics, particularly liquid bulks | KPA in-house | 2009 |

**Table 6 Recommended Actions in the Port Reitz/Dongo Kundu Area**

1

| Facility | Actions | Cost (KShs. m) | Timing |
|---|---|---|---|
| **Port Reitz/ Dongo Kundu** | | | |
| Kipevu West container terminal | Implement construction programme Consider different road access route along coastline | 20,000 | 2009-16 |
| Additional container berths (1,100m) | Select preferred location (Kipevu West or Dongo Kundu) | Uncosted | 2021-26 |
| Coal jetty )<br>Dry bulk terminal ) | Coordinate plans with Ministry of Energy to develop joint common user facility | Uncosted | 2013-16 |
| LPG mooring | Review location, and establish if SBM can provide enough capacity for CNG | Private finance | 2009-10 |
| Car import terminal | Liaise with FTZ Authority, and review opportunities for private finance | Uncosted | 2021 |
| Cruise terminal | Reserve site and test market for private finance | Uncosted | 2015 |
| Tiomin berth | Monitor status | Private finance | Uncertain |
| Corporate | Participate actively in the development of Dongo Kundu Free Trade Zone | KPA in-house | 2009 on |
| Lamu | Monitor the Government's plans for developing a port at Lamu and take these into account when planning further development in Port Reitz | KPA in house | 2010 on |

## 10. The Role of the Port in Vision 2030

The recommendations of the Master Plan have been aligned with the Government's "Kenya, Vision 2030" which was unveiled in 2007 - particularly in the following respects:

- The original traffic forecasts presented in the interim Report were based on the economic growth rates incorporated in Vision 2030 (although they were subsequently adjusted downwards after discussion with the KPA).
- The Master Plan recommends a programme of infrastructure investment to handle the traffic which has been forecast on the modified version of Vision 2030 growth rates.
- It emphasizes the need to operate the port efficiently, supporting the transformation of Mombasa into a landlord port. This is particularly important for containers, for which new facilities are now urgently required.

The main reference to the role of Mombasa in Vision 2030 is to the need for additional infrastructure to position Kenya as "the most efficient transport hub for the east and central African region." This aim has been supported in the Master Plan by plans to build or expand container handling facilities in four areas – Kipevu West, Berths 11-14, Berth 19 and later at Dongo Kundu. The majority of the trade of Kenya and the East African transit countries in terms of value is carried in containers.

The principal investment identified in Vision 2030 is the dredging of the channel at Mombasa to 14.5 metres, to remove the risk of the port being served only by feeders. This has been incorporated in the Master Plan, with the additional suggestion of straightening the channel to take longer ships.

Two other port projects are listed in a companion document to Vision 2030, the "Vision 2030 Summary of Key Investment Opportunities in Kenya". They are the development of a free trade area under the Kenya Ports Authority's jurisdiction on 3,000 acres of land at *Dongo Kundu*; and the construction of a second port at *Lamu*.

***Dongo Kundu.*** The role of Dongo Kundu is covered extensively in this report and the proposed developments for the area are summarised in Table 9.2 in Chapter 9. It is also recommended that KPA should participate actively in the development of Dongo Kundu Free Trade Zone.

***Lamu.*** Vision 2030 envisages Lamu mainly as a transit port for countries to the north, i.e. Ethiopia, Somalia and South Sudan, and as a vehicle to stimulate economic development in the region. There are also prospects for oil discoveries near Lamu, a refinery; and for cruise traffic.

The role of the Lamu and its impact on Mombasa's traffic, however, cannot be quantified before decisions are made on the cargoes to be targeted by the new port and the facilities to be built (berths and inland transport links). Any threat to Mombasa' traffic will lie well in the future, and gestation period for the design, construction and traffic build up at the new port would give KPA sufficient time to adjust the Mombasa Master Plan if any such threat arose.

# CHAPTER ONE: INTRODUCTION

The purpose of this report is to revise the Port Master Plan for Mombasa prepared by Royal Haskoning in 2004. This provided a comprehensive review of the port's development opportunities, and a detailed and thorough analysis of its constraints. However there have been a number of significant changes since then in respect of traffic trends, operational performance and committed investments, which have made it necessary to conduct this review.

## 1.1 Principal Changes Since the 2004 Port Master Plan

Since 2004 Kenya has experienced strong economic growth, which has resulted in cargo volumes growing faster than expected. The total tonnage handled by Mombasa in 2007 was 10% higher than forecast by the previous Port Master Plan. The extra growth has been spread across most types of cargo. Dry bulk throughput in 2007 was 9% higher than expected, liquid bulks 10% higher, and containerised cargo 23% higher. Only break bulk cargo volumes for 2007 fell well below the level expected (-26%).

Higher than expected growth was experienced for almost all commodities, the principal exceptions being exports of cement, fluorspar and petroleum. In addition, titanium ore exports (400,000 tons p.a.), which were expected to begin in 2007, have not yet materialised.

In terms of port operations, the principal problem continues to be the shortage of storage space for containers. Most Kenyan import containers are now stored and cleared at private off-dock CFS depots, although containers for the transit countries are still handled entirely within the port.

Capacity shortages at the main container terminal (Berths 16-18) resulted in it handling only 60% of the port's container traffic in 2007. Berths 13-14 are now used mainly for container handling, although they have no quay cranes and very limited storage space. Some containers are also handled across the general cargo berths, and much of the open storage space behind them is now occupied by containers.

A second significant change has been the failure of the railway system to provide an adequate service for the transfer of cargo to and from the port, which has resulted in a large increase in truck movements and problems with vehicle circulation and parking.

There is still generally enough quay line for the handling of dry bulks and general cargo, although handling rates for some commodities remain disappointing. However the open storage space behind Berths 1 to 10 is very congested, with a large number of containers stacked there and restricted space for general cargo and traffic circulation.

In respect of liquid bulks, continuing failure to resolve inland storage and pipeline constraints has resulted in high berth utilization rates at the two oil jetties. The proposal in the 2004 Port Master Plan to transfer all flammable cargoes from Shimanzi Oil Terminal to Kipevu Oil Terminal for safety reasons – which would also have increased the port's liquid bulk capacity - has not been implemented.

One of the major issues in the 2004 Port Master Plan was the best location for additional container berths. This has now been resolved with the decision to build a new container terminal to be known as the Kipevu West Container Terminal immediately to the west of the Kipevu Oil Terminal. This will have a capacity of 1.1m TEU, and was to have been opened in phases between 2013-6. Since the submission of the Draft Final Report the opening date has been put back to 2015.

To support the new container terminal and improve access for larger bulk carriers, KPA plans to dredge the channel to -15m CD as far as Port Reitz; this will allow container ships of up to 4,500 TEU to use the port. The channel outside of the port entrance will be dredged to -17.0m CD.

Once the Kipevu West container terminal is operational, more space will become available at the general cargo berths for the handling of dry bulks and other rapidly-growing cargoes such as vehicles and iron & steel. However the port faces six critical years before then in which it will have insufficient space to accommodate the forecast growth in container traffic, unless a satisfactory short-term investment plan is developed to bridge the gap.

Another important change since the 2004 Port Master Plan has been the Government's interest in developing a Free Trade Zone at Dongo Kundu. This – combined with the construction of a new by-pass to the south west of Mombasa – would open up a whole new area for longer term port development. A feasibility study for the development of Dongo Kundu is to be commissioned shortly by the Ministry of Transport.

The Dongo Kundu site provides a large area of land for industrial development, and does away with the need to include a Free Trade Zone within the existing port. The 2004 Port Master Plan designated Area G of the port as a Free Trade Zone, in spite of its small size and limited potential; this land now becomes available for other port-related uses.

The last major change since 2004 has been increased private sector interest in the development of new port facilities. This includes:

- African Gas & Oil Company Ltd has a licence to construct a new single buoy mooring in Port Reitz for LPG and (possibly) compressed natural gas imports, for which a license agreement was signed in September 2007;

- Interest in installing bulk handling equipment for grain and fertilisers

- Shipping line interest in developing Berths 12-14 as a privately-operated container terminal.

- A proposal by Tiomin to build a new berth for titanium ore exports. This project has been dormant for the last four years, but could be revived as a result of interest expressed by the Chinese company Jinchuan Group Limited in the second half of 2008.

Although institutional issues are not included in the Terms of Reference for this study, the proposals listed above could – if they went ahead – have a significant effect on the physical shape of the port. Comments have therefore been made on the technical and economic characteristics of each proposal, in so far as these are known, without undertaking specific feasibility studies.

### 1.2 Terms of Reference

The scope of work covers the following key issues:

- Collection of the data required for traffic forecasting purposes for Kenya and eight transit countries;
- Review of previous studies;
- Research into economic trends affecting port service demand;
- Review of planning information;
- Review of shipping line strategies;
- Analysis of Mombasa's potential as a transshipment hub;
- Preparation of an investment plan and marketing strategy;
- Review of recommendations of the existing Master Plan in the light of new developments;
- Development of a Free Trade Zone.

### 1.3 Work Programme

The study has been undertaken by M.A. Consulting Group, in association with Maxcad Consulting Engineers and PrimeConsult Engineers.

Work commenced on 3 November 2008, and an Interim Report was submitted on 4 January 2009. This covered the traffic forecasts, the condition of the existing infrastructure, major projects initiated since the 2004 Port Master Plan, outline proposals for the revised Port Master Plan, and the status of the Free Trade Zone.

The Interim Report was discussed with KPA on 10 February 2009, and a number of amendments suggested which have been incorporated into the present report. Since then, the work programme has focused on the analysis of port operations, more detailed development of the engineering proposals, the economic evaluation of major investment projects, and the impact of the proposed Port Master Plan on KPA's financial position.

This Final Report has been issued after receiving comments from KPA and the Stakeholders

### 1.4 Report Structure

The report contains nine main chapters dealing with:

Chapter 2 Traffic Forecasts

Chapter 3 Existing Infrastructure

Chapter 4 Port Operations

Chapter 5 Updated Master Plan Proposals

| | |
|---|---|
| Chapter 6 | Free Trade Zone |
| Chapter 7 | Economic Evaluation |
| Chapter 8 | Financial Evaluation |
| Chapter 9 | Recommended Actions |

A more concise version of the Revised Port Master Plan is presented in the Executive Summary, which has been issued as a separate document.

# CHAPTER TWO: TRAFFIC FORECASTS

The forecasts have been based on:

- Statistical trends in the main cargo volumes handled at Mombasa, as recorded in KPA statistics.
- Analysis of local markets, in particular trends in production, consumption, imports and exports, as recorded in national statistics.
- Identification of the ratios of the growth of imports to that of GDP – i.e. the income elasticities of demand for the products. In most cases this has been based on trends over the last five years, but where traffic has been volatile from year to year, three year averages have been used to smooth out the trends.
- Discussions with the main importers and exporters, to obtain and incorporate their views on factors that may alter recent trends. In most cases, international experience shows that income elasticities of demand taper off over time.
- Changes in local production that would compete with imports.
- Government polices affecting consumption.
- Competition from other ports

The initial draft of the forecasts was presented in an Interim Report submitted in January 2009. The findings were discussed with KPA at meetings on the 10th and 11$^{th}$ of February 2009 and various modifications were agreed. These modifications have been incorporated in the Draft Final forecasts. In particular, it was agreed that three sets of forecasts should be presented, based on the following assumptions:

1. A high forecast, the "Vision 2030 Forecast", based on the GDP growth rate of 10% p.a. which is targeted in Vision 2030.
2. A "Base Case Forecast", based on a GDP growth rate of 7% p.a. It is this forecast that is used as the main basis for the engineering proposals in the Master Plan.
3. A "Low Forecast" based on the GDP growth rate of 5.5%

In all cases growth is assumed to be at lower rates than those quoted above in the period up to 2012, in view of the financial problems in the world economy and the need to build up to the assumed growth rates.

The GDP growth rates assumed for Uganda are 6.5% p.a. in the high case, 5% in the base case and 4% in the low case.

The calculations are included in a model which will be made available to the KPA. This could be used by KPA staff to review the traffic forecasts every 2-3 years.

## 2.1 Overview of Port Traffic

The port of Mombasa handled 15,962,000 tonnes of cargo in 2007.

The main cargoes handled were petroleum, clinker, cereals, iron and steel, tea, rice, sugar, soda ash, vehicles, fertilisers and coffee. Details are shown in Table 2.1.

Over 84% of the traffic[1] was inbound in 2007, up from 82% in 2003. Kenya's exports, such as tea, coffee and horticultural products, are generally of high value rather than high volume.

In terms of handling methods, containers accounted for 37% of the total, liquid bulks for 36% and dry bulks for 19%. Conventional traffic, which has been declining with containerisation, accounted for only 8% of the total in 2007 (see Table 2.2).

**Table 2.1: Mombasa Cargo by Main Commodity, 2007**

| | '000 tonnes | Share (%) |
|---|---|---|
| **Imports** | | |
| Liquid bulks | 5,474 | 36% |
| Clinker | 1,080 | 7% |
| Wheat in bulk | 858 | 6% |
| Iron & steel | 621 | 4% |
| Rice | 328 | 2% |
| Sugar | 372 | 2% |
| Chemicals and insecticides | 308 | 2% |
| Vehicles | 287 | 2% |
| Fertilisers in bulk | 280 | 2% |
| Fertilisers not in bulk | 103 | 1% |
| Coal | 176 | 1% |
| Others [a] | 3,383 | 22% |
| **Total Imports** | **13,270** | **87%** |
| **Exports** | | |
| Tea | 464 | 3% |
| Coffee | 235 | 2% |
| Soda Ash in bulk | 77 | 1% |
| Soda Ash not in bulk | 309 | 2% |
| Bulk liquids | 167 | 1% |
| Others | 696 | 5% |
| **Total Exports** | **1,948** | **13%** |
| **Total exc Transhipment** | **15,218** | **100%** |
| Transhipment | 426 | |
| **GRAND TOTAL** | **15,962** | |
| *of which* | | |
| **Containers (000 tonnes)** | **5,695** | **37%** |
| **Containers (000 TEU)** | **585** | |

Note: (a) Much of it containerised
Source: Kenya Ports Authority, Annual Review and Bulletin of Statistics.

[1] Excluding 426,000 tonnes of transhipment cargoes in containers

**Table 2.2: Mombasa Cargo by Handling Method, 2007**

| | '000 tonnes | Share (%) |
|---|---|---|
| Containerised Cargo | 5,695 | 37% |
| Liquid Bulk | 5,641 | 36% |
| Dry Bulk | 2,927 | 19% |
| Conventional Cargo | 1,273 | 8% |
| **Total exc Transhipment[a]** | **15,536** | **100%** |
| Transhipment | 426 | |
| **GRAND TOTAL** | **15,962** | |

Note: (a) Including transit traffic, but excluding transhipment of other countries' containers, which accounted for 3% of Mombasa's total traffic
Source: Kenya Ports Authority, Annual Review and Bulletin of Statistics.

KPA's traffic statistics by handling method are slightly different from those by commodity. In this report the statistics by commodity will be taken to be the best measure of traffic volumes.

Kenyan domestic imports and exports accounted for only 70% of Mombasa's traffic in 2007, with transit traffic accounting for 27% and transhipment of containers accounting for another 3%.

**Table 2.3: Breakdown of Mombasa Cargo into Kenyan, Transit and Transhipment Traffic, 2007**

| Type | '000 tonnes | Share (%) |
|---|---|---|
| Kenyan imports and exports | 11,113 | 70% |
| Transit | 4,423 | 27% |
| Transhipment | 426 | 3% |
| **Total** | **15,964** | **100%** |

Source: Kenya Ports Authority, Annual Review and Bulletin of Statistics

The transit traffic is mainly to and from Uganda, which accounted for 77% of the total in 2007. Three other countries – Rwanda, the Democratic Republic of the Congo and Tanzania - accounted for 6% each.

**Table 2.4: Transit Traffic by Country, 2007**

| Transit country | '000 tonnes | Share (%) |
|---|---|---|
| Uganda | 3,399 | 77% |
| Rwanda | 287 | 6% |
| DR Congo | 257 | 6% |
| Tanzania | 249 | 6% |
| Sudan | 145 | 3% |
| Burundi | 52 | 2% |
| Somalia | 33 | 1% |
| Others | 1 | 0% |
| **Total** | **4,423** | **100%** |

Source: Kenya Ports Authority, Annual Review and Bulletin of Statistics

Over 90% of the transit traffic is imported, with only 381,000 tonnes of exports from all seven transit countries combined in 2007.

The growth of cargo at Mombasa has been erratic in the past. There were declines in 1995, 1997, 1998 and 2002; and, in general, growth was low in the ten years up to 2002. But growth has been strong since 2003, averaging 8% p.a.

If transshipment is excluded, Mombasa's growth rate rises to 9% p.a., and if petroleum is excluded it rises to 11% p.a. from 2003 to 2007.

The growth rates of the main cargoes are shown in Table 2.5.

**Table 2.5: Growth of Mombasa Cargo by Commodity, 2003-2007 ('000 tonnes)**

| | 2003 | 2004 | 2005 | 2006 | 2007 | Average Growth 2003-2007 (% p.a.) |
|---|---|---|---|---|---|---|
| **Imports** | | | | | | |
| Liquid bulks | 4,491 | 4,596 | 4,918 | 5,403 | 5,474 | 5% |
| Clinker | 139 | 164 | 430 | 520 | 1,080 | 67% |
| Wheat in bulk | 585 | 543 | 911 | 948 | 858 | 10% |
| Iron & steel | 219 | 515 | 435 | 593 | 621 | 30% |
| Rice | 296 | 297 | 311 | 311 | 328 | 3% |
| Sugar | 237 | 207 | 246 | 289 | 372 | 12% |
| Chemicals, insecticides | 73 | 169 | 199 | 266 | 308 | 43% |
| Vehicles | 74 | 86 | 164 | 202 | 287 | 40% |
| Fertilisers in bulk | 343 | 363 | 385 | 337 | 280 | -5% |
| Fertilisers not in bulk | 27 | 140 | 89 | 160 | 103 | 40% |
| Coal | 82 | 177 | 137 | 167 | 176 | 21% |
| Others[a] | 2,578 | 2,718 | 2,617 | 2,913 | 3,383 | 7% |
| **Total: Imports** | **9,144** | **9,975** | **10,842** | **12,109** | **13,270** | **10%** |
| **Exports** | | | | | | |
| Tea | 376 | 406 | 405 | 402 | 464 | 5% |
| Coffee | 188 | 180 | 170 | 195 | 235 | 6% |
| Soda Ash in bulk | 173 | 92 | 116 | 112 | 77 | -18% |
| Soda Ash not in bulk | 148 | 185 | 217 | 200 | 309 | 20% |
| Bulk liquids | 271 | 246 | 174 | 132 | 167 | -11% |
| Others | 584 | 726 | 713 | 774 | 696 | 4% |
| **Total: Exports** | **1,740** | **1,835** | **1,795** | **1,815** | **1,948** | **3%** |
| **Total exc transhipment** | **10,884** | **11,810** | **12,637** | **13,924** | **15,218** | **9%** |
| Transhipment | 605 | 409 | 303 | 318 | 426 | -8% |
| **GRAND TOTAL** | **11,489** | **12,219** | **12,940** | **14,242** | **15,644** | **8%** |
| *Of which* | | | | | | |
| Total exc petroleum | 6,927 | 7,765 | 8,317 | 9,190 | 10,420 | 11% |
| Transit | 2,452 | 2,890 | 3,536 | 3,807 | 4,423 | 16% |

Source: Kenya Ports Authority, Annual Review and Bulletin of Statistics

The growth rates by main handling methods are shown in Table 2.6. The trends are in line with those in most ports in the developing world. The container traffic is increasing fastest, by 14% p.a. in terms of tonnage (although only 11% p.a. in terms of TEU); conventional traffic has been declining by 2% p.a.; dry bulks are increasing rapidly; and petroleum is increasing at a more modest rate.

**Table 2.6: Growth of Mombasa Cargo by Handling Method, 2003-2007 ('000 tonnes)**

| | 2003 | 2004 | 2005 | 2006 | 2007 | Average Growth 2003-2007 (% p.a.) |
|---|---|---|---|---|---|---|
| **Imports** | | | | | | |
| Containerised | 2,228 | 2,599 | 2,645 | 2,970 | 3,761 | 14%[a] |
| Conventional | 1,209 | 1,236 | 1,009 | 1,129 | 1,105 | -2% |
| Dry Bulk | 1,404 | 1,588 | 2,128 | 2,344 | 2,722 | 18% |
| Liquid Bulk | 4,491 | 4,595 | 4,918 | 5,403 | 5,474 | 5% |
| **Total imports** | **9,332** | **10,018** | **10,700** | **11,846** | **13,062** | **9%** |
| **Exports** | | | | | | |
| Containerised | 1,135 | 1,669 | 1,680 | 1,625 | 1,934 | 14% |
| Conventional | 208 | 198 | 139 | 185 | 168 | -5% |
| Dry Bulk | 380 | 381 | 286 | 313 | 205 | -14% |
| Liquid Bulk | 271 | 246 | 173 | 132 | 167 | -11% |
| **Total exports** | **1,994** | **2,494** | **2,278** | **2,255** | **2,474** | **6%[b]** |
| **IMPORTS + EXPORTS** | | | | | | |
| Containerised | 3,363 | 4,268 | 4,325 | 4,595 | 5,695 | **14% (a)** |
| Conventional | 1,417 | 1,434 | 1,148 | 1,314 | 1,273 | **-3%** |
| Dry Bulk | 1,784 | 1,969 | 2,414 | 2,657 | 2,927 | **13%** |
| Liquid Bulk | 4,762 | 4,841 | 5,091 | 5,535 | 5,641 | **4%** |
| **TOTAL** | **11,326** | **12,512** | **12,978** | **14,101** | **15,536** | **8%** |
| **Transhipment** | 605 | 409 | 303 | 318 | 426 | **-8%** |
| **TOTAL** | **11,931** | **12,921** | **13,281** | **14,419** | **15,962** | **8%** |

Note: (a) The growth rate for container traffic in terms of TEUs was 11% p.a.
(b) The growth rate for exports is higher than in Table 2.5 because of the inclusion of tare weights for empty containers
Source: Kenya Ports Authority, Annual Review and Bulletin of Statistics.

Ten years ago transit traffic amounted to only one million tonnes. In 2007, however, it had risen to 4.4 million tonnes, with a growth rate of 16% p.a. over the last five years. The growth rate for the main transit traffic, to and from Uganda, was also 16% p.a.

**Table 2.7: Growth of Transit Traffic 2003-2007 ('000 tonnes)**

| | 2003 | 2004 | 2005 | 2006 | 2007 | Average Growth 2003-2007 (% p.a.) |
|---|---|---|---|---|---|---|
| Uganda | 1,893 | 2,210 | 2,680 | 2,822 | 3,399 | 16% |
| Rwanda | 177 | 202 | 219 | 253 | 287 | 13% |
| DR Congo | 72 | 107 | 134 | 226 | 257 | 37% |
| Tanzania | 182 | 229 | 281 | 270 | 249 | 8% |
| Sudan | 75 | 67 | 147 | 138 | 145 | 18% |
| Burundi | 4 | 20 | 29 | 67 | 52 | 90% |
| Somalia | 49 | 52 | 43 | 30 | 33 | -9% |
| Others | 0 | 3 | 3 | 1 | 1 | 35% |
| **TOTAL** | **2,452** | **2,890** | **3,536** | **3,807** | **4,423** | **16%** |

Source: Kenya Ports Authority statistics

Transhipment traffic, which is limited to containers to/from neighboring islands, has fallen at an average rate of 8% p.a. in the period 2003-2007.

### *2.1.1 Shipping Line Strategies*

The main scheduled shipping services calling at Mombasa are container services.

Mombasa's container services have undergone two marked changes in recent years. First, the Far East has replaced Europe as the main source of Kenya's imports; and, secondly, Kenya (and also Tanzania) is now served mainly by feeders rather than direct calls. The feeders come mainly from the transshipment hubs of Salalah, Jeddah and Durban. The only line to offer a direct service to Mombasa, from the Far East, is PIL.

Other important features of the existing shipping patterns are that:

- The ship sizes used by all lines are relatively small by international standards, with a maximum capacity of about 1700 TEU.
- Transhipment is limited to a few small islands, and is declining.

The lines do not intend to alter these patterns in the short to medium term. That is to say:

- None of the lines which are currently using feeders intend to introduce direct calls at present.
- Although some lines would prefer to use larger ships (say, around 2500 TEU), they have encountered problems when they tried to bring ships over about 1700 TEU into Mombasa.
- There is no realistic possibility of Mombasa becoming a major transhipment hub until the new container port is constructed. The preconditions for attracting transhipment traffic are high container handling speeds, reliable turnround times, low tariffs, few delays and a minimum of bureaucracy; and Mombasa does not rate highly on any of these criteria at present. As stated above, Mombasa has effectively been downgraded from a direct call port to a feeder port in recent years. In fact the only line running direct services from the Far East, PIL has recently found it increasingly difficult to serve Mombasa and Dar es

Salaam, because the delays there undermine their schedules. Consequently, even PIL has started to feed Dar es Salaam from Singapore.

The construction of the new container port, however, will open up new possibilities. It will offer a water depth of 15 metres and an additional base load capacity approaching 1 million TEU; and if it also has an experienced international terminal operator it should be able to achieve the standards necessary to attract at least some transshipment – i.e. increases in handling speeds of 50-100%, much lower tariffs and minimal bureaucracy.

The new terminal should result in the following changes:

- Attraction of bigger ships. In the longer term, and on the assumption that the new terminal is efficient, ships sizes are likely to increase to around 4,500 TEU by 2015, and 6,000 TEU by 2020-2025 (there are many such ships which will be cascaded down off the main trunk routes as the new 12,000 TEU ships are introduced). However, there is the complication that if Dar es Salaam does not dredge as deep as Mombasa then the ships deployed may be smaller. At present it seems unlikely that Dar es Salaam will be dredged beyond -12.0m CD, but a feasibility study is about to begin a new deepwater port at Bagamoyo which would have a depth of -14.0 CD at the first container berths; these are unlikely to be completed before 2016.
- Attraction of additional transshipment traffic, but only to a limited extent. There never have been very significant volumes of transhipment in the region, the only successful transhipment operations being further south, where Port Louis and Durban have each transshipped around 200,000 TEU p.a., consisting mainly of a mixture of Indian Ocean Island feeders and longer distance relay operations. The main reason for the low level of transhipment from East African ports is there are few ports to feed. In particular, the three countries served by Mombasa – the Seychelles, Comoros and Zanzibar – handle less than 100,000 TEU p.a.

There is also the possibility that if Dar es Salaam does not increase its draft- and/or port development at a new location outside of Dar es Salaam is delayed - then the new Mombasa terminal could be used as a hub for Dar es Salaam.

In brief, the shipping lines are not planning significant changes in their strategies or operating patterns in the next few years, but major changes are likely after the construction of the new terminal. The nature of these changes will be dependent on the performance of the new terminal relative to that of competing ports in the region.

***Bulk Carriers and Conventional Vessels.***

The dry and liquid bulk cargoes do not move on scheduled services. The ships are chartered by the cargo owners – consignors or consignees. There are therefore no scheduled services or shipping line strategies. The same applies to c*onventional cargoes*.

The sizes of ships, however, will increase steadily in line with traffic.

### *2.1.2 The Role of the Port in Vision 2030*

In 2007, the Government of Kenya unveiled its "Kenya, Vision 2030" with the aim of raising the annual growth rate of 10 per cent over the next 25 years - allowing Kenya to rival the Asian Tigers. The Master Plan has been aligned with the spirit of Vision 2030, particularly in the following respects:

- The original traffic forecasts presented in the interim Report were based on the economic growth rates incorporated in Vision 2030 (although they were subsequently adjusted downwards after discussion with the KPA).
- The Master Plan recommends a programme of infrastructure investment to handle the traffic which has been forecast on the modified version of Vision 2030 growth rate.
- It emphasizes the need to operate the port efficiently, supporting the transformation of Mombasa into a landlord port. This is particularly important for containers, for which new facilities are now urgently required.

The main reference to the port of Mombasa in Vision 2030 is to the need for additional transport infrastructure to position Kenya as "the most efficient transport hub for the east and central African region." This aim has been supported in the Master Plan by an emphasis on the need to build more container handling facilities. The majority of Kenya's international trade is carried in containers.

The only specific investment identified in the main Vision 2030 document, however, is the dredging of the channel at Mombasa to 14.5 metres, to remove the risk of the port being served only by feeders (which has already happened in the container trades). This has been incorporated in the Master Plan, with the additional suggestion of straightening the channel to accommodate longer ships.

Two other port projects are listed in a companion document to Vision 2030, the "Vision 2030 Summary of Key Investment Opportunities in Kenya". They are the development of a free trade area under the Kenya Ports Authority's jurisdiction on 3,000 acres of land at *Dongo Kundu*; and the construction of a second port at *Lamu*.

#### *Dongo Kundu*

The role of Dongo Kundu is covered extensively in this report and the proposed developments for the area are summarised in Table 9.2 in Chapter 9. They include a terminal for a 300 MW power station on Dongo Kundu, new container berths (1,100m), a dry bulk terminal, an LPG mooring, a car import terminal, a cruise terminal and a terminal for Tiomin berth. It is also recommended that KPA should participate actively in the development of Dongo Kundu Free Trade Zone.

#### *Lamu*

Lamu was identified as an alternative port for Kenya as long ago as 1975. The project was revived in 2006 and is now scheduled for construction.

Vision 2030 envisages Lamu mainly as a transit port for countries to the north, i.e. Ethiopia, Somalia and South Sudan. In particular, Southern Sudan requires imports for its ongoing reconstruction after decades of civil war with the North; and Ethiopia is landlocked, using Djibouti for its seaborne trade. Lamu would require railway lines and roads to connect it to its main catchment area. The port would also be a free port.

Another objective of Lamu would be the stimulation of economic development in the region, as there is little economic activity in the hinterland of Lamu at present. The use of ports to open up regions for development has been called the "Japanese approach." Its principle is "build a port and the traffic will come." The approach can be successful, but, if so, it usually takes time For example, neither the port of Coega in South Africa and Gwadar in Pakistan – both built since 2000 – have yet attracted traffic.

There are also prospects for oil discoveries near Lamu, and possibly a refinery; and for cruise traffic.

The main physical advantage of Lamu is its depth of 18 metres, which is well above the depth at Mombasa. But the need for deep water is questionable. First, large container ships will not go there, as the local traffic is minimal, and there is little transhipment in that area. Unlike the ports of Djibouti and Salalah, Lamu is not located on the container trunk routes. Secondly, oil does not need deep water as it can use SBMs.

It has also been suggested that Lamu port would help to decongest Mombasa port, where it has been claimed that delays in offloading cargo have at times raised the cost of doing business, especially for importers. However, the Master Plan has concluded that there are several areas in which Mombasa can expand its container terminals.

The governments of Kenya and Qatar have held talks on financing Lamu in the recent years, and a construction cost of Sh273 billion port has been aired. Qatar and Kenya have also discussed funds for the construction of a road from Lamu to Garsen.

The role of the Lamu and its impact on Mombasa's traffic cannot be quantified before decisions are made on the cargoes to be targeted by the new port and the facilities to be built (berths and inland transport links). But its impact is likely to be limited. Lamu is further for the economic heartland of Kenya around Nairobi and has no roads or railways to the areas generating most of the traffic.

In brief,

- Lamu will take along time to build;
- It will take even longer to attract traffic;
- It is not well located to compete with Mombasa for traffic in and around Nairobi; and
- Lamu is better placed to target traffic to the north, in Ethiopia and South Sudan, where Mombasa has little involvement.

A key point, however, is that any threat to Mombasa' traffic would lie well in the future, and the KPA would have sufficient time to adjust the Mombasa Master Plan if any such threat arose.

## 2.2 Regional Economies

### *2.2.1 Kenya*

In the 1970s Kenya was regarded as the African country with the greatest prospects of economic success. But the economy languished during the two decades of the Moi government when corruption and failure to carry out economic reforms led to suspension of funds from the World Bank and IMF, and terrorist threats reduced tourism. In the seven years before the change of government (1996-2002) GDP growth averaged only 1.8% p.a.

The election of a new government in 2002 was followed by the revival of strong growth, as a result of polices focusing on privatisation, deregulation and other structural reforms, leading to a stable macroeconomic environment, improved business confidence and strong growth in international trade. GDP growth rose steadily from 5% to 7% p.a. in the period 2003-2007, while export growth averaged 8% and import growth averaged 14.5% p.a. These trends were assisted by population growth of just under 3% p.a.

**Table 2.8: Growth Rates of Kenya's GDP, Imports and Exports, 2003-2007 (%)**

| | 2004 | 2005 | 2006 | 2007 | Average growth 2003-2007 (% p.a.) |
|---|---|---|---|---|---|
| GDP | 5.1 | 5.8 | 6.4 | 7.0 | 6.1 |
| Imports | 12.3 | 15 | 18.2 | 12.7 | 14.5 |
| Exports | 12.8 | 9.7 | 3.4 | 6.0 | 8.0 |

Source: Economist Intelligence Unit

Other positive developments in 2007 included:

- An improvement in the balance of payments, with a surplus of 63 billion shillings compared with 44 billion shillings in 2006. This was achieved despite a deficit in visible trade via an increase in revenues from tourism and increased private remittances from abroad. Also the capital and financial accounts showed a surplus as a result of long term capital inflow.
- Strong growth in manufacturing, which in Kenya is based mainly on agricultural goods. Notable increases in 2007 included a rise in tea production from 310,000 tonnes in 2006 to 370,000 tonnes; a rise in coffee production from 48,000 tonnes to 53,000 tonnes; and increase in the value of horticultural exports, especially cut flowers, by over 50%.
- An increase in new vehicle registration by an extraordinary 61%.
- An increase in mobile telephone subscribers of 55%
- An increase of tourism revenues by 16%, with international arrivals up by 13%, partly due to marketing in the Middle East.
- Strong growth in the construction industry.

There were several setbacks in 2008. Corruption and feuding within the government has remained a problem, and civil disruption in the early part of the year, exacerbated by bad weather, led to tea production falling by 35%, coffee production falling by 18%, sugar cane falling by 4%, overseas visitors falling by about half and GDP by 1.3% in first quarter. Now, despite a rapid recovery in exports and tourism, there are threats of a major world economic downturn. Whereas the world economy expanded at over 5% p.a. in 2006 and 2007, serious problems have arisen in 2008.

But a peace agreement has now been signed in Kenya and at present there appears to be a reasonable degree of harmony within the coalition government. Despite the setbacks the Government still expects GDP growth to be around 4.5% in 2008, and the Economic Intelligence Unit forecasts exports rising by 4% and imports by 9% in 2008. They also forecast that although the current account deficit will rise to 5.3% of GDP in 2008, due to a fall in tourism revenues, it will improve to 4.3% in 2009.

It is notable that the economies of the East African region as a whole have finally made a breakthrough, with growth in sub-Saharan African averaging almost 6% p.a. in 2006 and 2007, although this is partly oil-related, especially in Angola.

Against this background of economic revival, the government intends to build further on the growth achieved since 2002. More specifically, the government's "Vision 2030" (June 2008) aims to raise GDP growth to 10% by 2012, and to sustain that growth rate until 2030, with investment of US$25 billion in key sectors, including telecoms, power and transport, and further reforms and de-licencing. It also targets the achievement of Millennium Development goals by 2015. The plan is based on "three pillars" – economic, social and political (governance). In the intervening years between 2008 and 2012 the government's "First Medium Term Plan (2008-2012)" targets GDP growth of 7.9-8.7% in 2009-10.

The Kenyan economy will inevitably be affected by the world economic downturn that started to gather momentum in 2008, but it should be less exposed than some others, having little dependence on financial services, car production and the manufacture of electronic goods. Past records suggest that worldwide tea and coffee consumption are not greatly affected by recessions. Tourism, however, is likely to suffer.

The growth rates to be adopted as foundations for the traffic forecasts were discussed with KPA after the submission of the Interim Report at meetings in February 2009 and it was agreed that the following scenarios would be presented:

- A "High Forecast", the "Vision 2030 Forecast", based on a GDP growth rate of 10% p.a. which is targeted in Vision 2030.
- A "Base Case Forecast", based on a GDP growth rate of 7% p.a. It is this forecast that is used as the main basis for the engineering proposals in the Master Plan.
- A "Low Forecast" based on a GDP growth rate of 5.5%

### *2.2.2 Uganda*

Uganda's economy has also been growing strongly in the last five years, with GDP growth averaging 6% p.a., exports rising by 9.6% and imports by 13.4% p.a. in the period 2003-2007.

**Table 2.9: Growth of Uganda's GDP, Imports and Exports, 2003-2007 (%)**

| | 2004 | 2005 | 2006 | 2007 | Average growth 2003-2007 (% p.a.) |
|---|---|---|---|---|---|
| GDP | 5.5 | 6.6 | 5.8 | 6.0 | 6.0 |
| Imports | 5.1 | 20.2 | 14.0 | 14.2 | 13.4 |
| Exports | 6.2 | 4.4 | 12.8 | 14.8 | 9.6 |

Source: Economist Intelligence Unit

Uganda's main export, coffee, increased by almost 50% in value over the nine months to July 2008, reportedly as a result of good weather and improved management. Coffee and tea account for about one third of Uganda's export revenues.

The Ugandan economy, however, still faces problems. Reforms have been slow, and the annual World Bank report puts Uganda in only 111$^{th}$ place for "ease of doing business", behind Kenya in 82nd place, but ahead of Tanzania which was 127$^{th}$. There is also a need to defuse growing regional pressures, especially in the Kingdom of Buganda, and improve infrastructure. Furthermore, the costs of being landlocked are increasing: the cost of transporting a 20' container from Mombasa reportedly increased from $1,408 to $1,612 in August 2008.

Nevertheless, the IMF gave the Ugandan economy a positive assessment in its 3$^{rd}$ review under the Policy Support Instrument in July 2008. There have been encouraging oil exploration results at Lake Albert, with Tullow Oil and Heritage Oil making new finds, and the construction of a small refinery at Hoima has reportedly been given the go ahead. This will stimulate the construction industry, whilst expansion of telecoms and the financial services industry will boost the service sector, and strong demand in neighbouring countries will boost Ugandan exports.

In mid 2008 the EIU forecast export growth to be robust in 2009-2010, with GDP growth of 6.9% in 2009 and 6.8% in 2010. But the recent downturn in the world economy makes these forecasts seem optimistic.

**Table 2.10: EIU Growth Forecast of Uganda's GDP, Imports and Exports, 2007-2010 (%)**

| | 2008 | 2009 | 2010 | Average growth 2007-2010 (% p.a.) |
|---|---|---|---|---|
| GDP | 6.4 | 6.9 | 6.8 | 6.6 |
| Imports | 8.0 | 10.2 | 10.2 | 9.5 |
| Exports | 7.0 | 9.0 | 8.0 | 8.0 |

Source: Economist Intelligence Unit

Uganda's GDP growth rate for the forecasting period will be assumed to average 6.5% p.a. for the "high case", 5% for the base case and 4% for the low case.

### *2.2.3 Rwanda*

The economy of Rwanda, which accounts for around 2% of Mombasa's cargo traffic, has also been growing strongly in the last five years. Its GDP growth averaged 5.3% p.a., exports rose by 5.3% and imports by 9.6% p.a. in the period 2003-2007.

**Table 2.11: Growth of Rwanda's GDP, Imports and Exports, 2003-2007 (%)**

| | 2004 | 2005 | 2006 | 2007 | Average growth 2003-2007 (% p.a.) |
|---|---|---|---|---|---|
| GDP | 4.0 | 6.0 | 5.3 | 6.0 | 5.3 |
| Imports | 5.4 | 10.1 | 16.5 | 6.5 | 9.6 |
| Exports | 10.9 | -2.2 | 8.5 | 3.8 | 5.3 |

Source: Economist Intelligence Unit

The government is pursuing market oriented reforms in the tea and coffee sectors, including the sale of 35% of Pfunda tea estate to UK's LAB International; and there are also plans to sell other tea estates. Also, bids have been invited for a third mobile telephone operator and a fixed line phone operator, with foreign companies showing interest. However, the economy suffers from the problems of poor infrastructure and a weak agricultural sector.

Rwanda's GDP is forecast by the EIU to increase by 6.0% in 2008 and 6.5% in 2009; and exports are forecast to increase by 6.9% p.a.

### *2.2.4 Tanzania*

The Tanzanian economy has been growing strongly in the period 2003-2007, with GDP growth averaging 7.3% p.a., export growth averaging 8.8% and import growth averaging 17.6% p.a.

**Table 2.12: Growth of Tanzania's GDP, Imports and Exports, 2003-2007 (%)**

| | 2004 | 2005 | 2006 | 2007 | Average growth 2003-2007 (% p.a.) |
|---|---|---|---|---|---|
| GDP | 7.8 | 7.4 | 6.7 | 7.1 | 7.3 |
| Imports | 9.6 | 34.2 | 10.3 | 16.3 | 17.6 |
| Exports | 8.3 | 13.5 | -3.3 | 16.8 | 8.8 |

Source: Economist Intelligence Unit

The most recent (late 2008) reviews by the EIU note that there is robust activity in the construction and mining industries and also the manufacturing sector; and Amine (an Irish/UK company) recently announced another commercially viable gas field at Mililani North 1. But although the government is continuing to pursue market-oriented reforms and improvements in infrastructure, progress is slow and there has been some backtracking on privatisation. Also, the current account deficit is forecast to remain high, at 13% of GNP in 2008 despite donor inflows. Donor assistance is likely to provide 40% of government revenues for the foreseeable future

Despite these difficulties, the EIU forecasts economic growth to remain strong, with GDP growth forecast at just under 7% in 2008-9.

**Table 2.13: EIU Growth Forecast for Tanzania's GDP, Imports and Exports, 2008 & 2009 (%)**

| | 2008 | 2009 |
|---|---|---|
| GDP | 7.1 | 6.9 |
| Imports | 15.2 | 11.8 |
| Exports | 13.0 | 9.6 |

Source: Economist Intelligence Unit

### *2.2.5 Democratic Republic of the Congo (DRC)*

The DRC was the location of a bitter war in the 1990s which left the country devastated. But the economy has grown strongly in the period 2003-2007, with GDP growth averaging 6.6% p.a., export growth averaging 17.5% and import growth averaging 19.4% p.a.

**Table 2.14: Growth of the DRC's GDP, Imports and Exports, 2003-2007 (%)**

| | 2004 | 2005 | 2006 | 2007 | Average growth 2003-2007 (% p.a.) |
|---|---|---|---|---|---|
| GDP | 6.6 | 6.5 | 6.4 | 7.0 | 6.6 |
| Imports | 17.2 | 41.1 | 12.4 | 7.0 | 19.4 |
| Exports | 35.3 | 14.2 | 13.5 | 7.0 | 17.5 |

Source: Economist Intelligence Unit

Although agriculture accounts for 75% of the labour force and 40% of GDP, the DRC's export revenues are dominated by minerals. In 2007 base metals accounted for 48% of exports, diamonds for 26% and crude oil for 19%, and further development should be guaranteed by the government's recently signed US$9 billion agreement with China to exchange new and upgraded infrastructure for minerals. Against this background the EIU forecasts GDP growth of 8-9% p.a. in 2008-2009.

**Table 2.15: EIU Growth Forecasts for DRC GDP, Imports and Exports 2008 & 2009 (%)**

| | 2008 | 2009 |
|---|---|---|
| GDP | 8.0 | 9.0 |
| Imports | 10.9 | 6.7 |
| Exports | 15.3 | 13.8 |

Source: Economist Intelligence Unit

### *2.2.6 Burundi*

Burundi's growth has been less impressive than that of the other East African countries. The economy is still recovering from a civil war that lasted for over a decade, and it expanded only modestly in the period 2003-2007, with GDP growth averaging 3.7% p.a., export growth averaging 10.9% and import growth averaging 21.3% p.a. Burundi's main export is coffee, which accounts for over 70% of total export revenues.

**Table 2.16: Growth of Burundi's GDP, Imports and Exports, 2003-2007 (%)**

| | 2004 | 2005 | 2006 | 2007 | Average growth 2003-2007 (% p.a.) |
|---|---|---|---|---|---|
| GDP | 0.9 | 5.1 | 3.6 | 5.2 | 3.7 |
| Imports | 33.5 | 13.8 | 13.0 | 24.7 | 21.3 |
| Exports | 18.2 | 3.5 | -10.9 | 33.0 | 10.9 |

Source: Economist Intelligence Unit

There has been some progress in structural reform, including the sale of three state owned companies (Hotel Source de Nil, National Office of Telecommunication and Societe Sucriere du Moso) to the Libyan Arab Investment Company, and there are plans for the sale of shares in other state companies.

The EIU expects the return to peace to boost economic growth, with donor financed capital playing an important role. The fact that Bujumbura is a regional trading hub should help, and export earnings should rise with higher output of coffee and tea. Also, imports should rise due to donor-funded infrastructure investment, whilst accession to the EAC will lower tariffs on imports for regional goods, especially from Kenya

Against this background, GDP growth is forecast to increase to 6% in 2009 and 5.5% in 2010 from 5.2% in 2008.

## 2.3 Prospects for Individual Commodities & Cargo Types

This section looks at the prospects for each of the major commodities moving through the port:

*Liquid bulks:*
- Petroleum
- LPG
- CNG
- Edible oils and other bulk liquids

*Dry bulks:*
- Wheat & other cereals
- Fertilizers
- Clinker
- Soda ash
- Coal
- Titanium

*General cargo:*
- Vehicles
- Iron & steel
- Rice[a]
- Sugar[a]
- Tea[a]

*Containers*

*Other non-containerised cargoes*

Note: (a) now largely containerised

### *2.3.1 Petroleum*

Just over 4.7 million tonnes of petroleum were imported via the port of Mombasa in 2007, consisting of:

- 1.6 million tonnes of crude oil for Kenya Petroleum Refineries Ltd, which operates the only oil refinery in Kenya. It is in fact the only significant refinery in the region. There are none in Uganda, Rwanda or Burundi; there are only very small plants in Zambia and Sudan; and although there was one in Tanzania, it closed down ten years ago. The Mombasa refinery has an effective capacity of about 1.6 million tonnes per year at present. Its original capacity when it was built in the early 1970s was 4 million tonnes, but various processes have been allowed to fall into disrepair.
- Two million tonnes of finished petroleum products for domestic consumption in Kenya.
- Just over a million tonnes of petroleum products for the "transit countries", with 0.8 million tonnes going to Uganda and the rest to Rwanda, Burundi and DRC.

These imports account for a large part of the regional market, with the exceptions of Tanzania, Zambia and Malawi, all of which are served mainly by Dar es Salaam.

**Table 2.17: Regional Demand for Petroleum Products 2007**

| Country | million tonnes | Mombasa's Share |
|---|---|---|
| Kenya | 3.4 | Almost all |
| Uganda | 0.8 | Almost all |
| Rwanda | 0.2 | Majority |
| Burundi | 0.1 | Minority |
| Eastern DRC | 0.2 | Majority |
| Tanzania | 1.8 | None |
| Zambia | 1.1 | None |
| Malawi | 0.6 | None |
| Southern Sudan | 0.1 | Minority |

Source: Oil Company

The main products used in Kenya are, in descending order of volumes, diesel oil, aviation fuel, fuel oil (which Kenyan power stations tend to use in preference to coal), gasoline and kerosene.

The main trends in demand for petroleum in Kenya and the region required some investigation because the various statistics published by the government's Economic Survey, the Kenya Revenue Authority, the Ministry of Energy and the KPA are not fully consistent. A partial explanation for the discrepancy lies in the holding of stocks, but it nevertheless seems unlikely that the Ministry of Energy's estimate of growth of total Kenyan demand of over 10% p.a. is correct. It is certainly inconsistent with both KPA statistics and the oil industry's recent worldwide experience, which suggest that petroleum consumption increases at a lower rate than GDP – a guideline that is accepted by the main oil company operating in Kenya.

The best guide to recent trends in demand is considered to be that shown in Table 2.18 below. It suggests that growth in total use of petroleum in Mombasa's hinterland over the last five years has been 4.9% p.a., with crude oil consumption increasing by 2.7% p.a. and finished products increasing by 6.2% p.a.

**Table 2.18: Consumption of Mombasa's Petroleum Imports, inc Crude Oil and Finished Products ('000 tonnes)**

| | 2003 | 2004 | 2005 | 2006 | 2007 | Average growth 2003-2007 (% p.a.) |
|---|---|---|---|---|---|---|
| Petroleum imports[a] | 3,957 | 4,045 | 4,320 | 4,734 | 4,798 | 4.9% |
| *of which* | | | | | | |
| Crude oil used by Refinery[b] | 1,492 | 1,702 | 1,645 | 1,651 | 1,663 | 2.7% |
| Petroleum products imported for Kenya and transit countries | 2,465 | 2,343 | 2,675 | 3,083 | 3,135 | 6.2% |

Sources: (a) KPA
(b) Kenya Petroleum Refineries Ltd

The flows of crude and products in the future are likely to be affected by two refinery projects in Kenya and Uganda.

Firstly, in Kenya, the rehabilitation of Mombasa's Kenya Petroleum Refineries plant, whose output has been falling further behind demand? This has been under consideration for many years; but a decision has now been made to "debottleneck" some of the production units and restore its capacity to around 3.5 million tonnes p.a. The refinery's management plans to have this in place by 2011-12, although some observers are skeptical, arguing that several oil companies have declined to become involved and that whatever the investment, imported products would be better and cheaper.

Secondly, Mombasa's refinery and imported petroleum products are likely to face competition in future from Uganda. Modest volumes of oil have been discovered in Uganda, and Tullow Oil (Irish) and Heritage Oil (Canadian) have reported encouraging exploration results in the Lake Albert Rift Valley basin. As a result, the construction of a small Ugandan refinery at Hoima has now been given the go ahead. The crude oil, however, is reported to be of poor quality with a high fuel oil content and low pour point, in contrast to the Mombasa refinery which uses light to medium crudes of good quality from the Gulf. The Uganda refinery will apparently be a "topping plant". Nevertheless, it may eventually produce enough for the land-locked countries. Consequently, Mombasa may lose a large part of its transit traffic which accounts for about 25% of its total volumes.

Furthermore, it is assumed that petroleum consumption will continue to increase at a slower rate than GDP. This principle is broadly consistent with:

- Recent trends in Kenya and the transit countries, where total oil consumption - about one fifth of which is transit traffic, mainly to Uganda - increased by 4.9% p.a., compared with 6% GDP growth in the period 2003-2007. The ratio of growth of oil demand to GDP growth was 0.8. Government policy on petroleum is to encourage energy efficiency and promote alternative fuels such as biomass; but government statements emphasize that cost is still the dominant criterion. Government departments have made minor economies such as phasing out government vehicles with large engines. But in general it is market forces – in particular, reduced fuel consumption in periods of high prices and continuing measures to reduce fuel costs in the private sector – that have kept growth rates for petroleum consumption slightly below that of GDP in the last five years.

- World wide trends in petroleum consumption. Over the last decade world petroleum consumption has increased at around 1.75% p.a., which is about half of the world GDP growth rate.
- The assumptions accepted by the operators of the Mombasa refinery.

On this basis the ratio of petroleum consumption growth to GDP growth is assumed to fall from 0.8 at present to 0.6 in 2015 and remain at that level. This is slightly higher than the world average, as car ownership and truck usage is increasing rapidly in Kenya.

The other main assumptions are that the Mombasa refinery will be expanded to produce 3.5 million tonnes p.a. by 2012 and the Ugandan refinery will start operations at 1.0 million tonnes p.a. in 2013, rising to 3.0 million tonnes by 2020. On this basis, petroleum traffic at Mombasa is forecast as follows.

**Table 2.19: Forecast of Petroleum Traffic at Mombasa (000 tonnes)**

| | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 |
|---|---|---|---|---|---|---|---|---|---|
| Kenyan GDP Growth (%) | 7 | 2.5 | 5.53 | 6.09 | 6.3 | 7 | 7 | 7 | 7 |
| Ratio of petroleum demand to GDP 2003-2007 | | | 0.81 | | | | | | |
| Forecast ratio of petroleum demand to GDP | 0.80 | 0.78 | 0.75 | 0.73 | 0.70 | 0.68 | 0.65 | 0.63 | 0.60 |
| | | | | | | | | | |
| Demand for petroleum from existing customers | 4,798 | 4,891 | 5,094 | 5,319 | 5,553 | 5,816 | 6,080 | 6,346 | 6,613 |
| *of which:* | | | | | | | | | |
| Crude for Mombasa Refinery | 1,663 | 1,600 | 1,600 | 1,600 | 2,500 | 3,500 | 3,500 | 3,500 | 3,500 |
| Finished Products | 3,135 | 3,291 | 3,494 | 3,719 | 3,053 | 2,316 | 2,580 | 2,846 | 3,113 |
| Minus Ugandan Refinery | 0 | 0 | 0 | 0 | 0 | 0 | 1000 | 1000 | 1000 |
| Products via Mombasa | **3,135** | **3,291** | **3,494** | **3,719** | **3,053** | **2,316** | **1,580** | **1,846** | **2,113** |
| | | | | | | | | | |
| **Summary of Mombasa Imports** | | | | | | | | | |
| Crude Oil | 1,663 | 1,600 | 1,600 | 1,600 | 2,500 | 3,500 | 3,500 | 3,500 | 3,500 |
| Products | 3,135 | 3,291 | 3,494 | 3,719 | 3,053 | 2,316 | 1,580 | 1,846 | 2,113 |
| **TOTAL** | **4,798** | **4,891** | **5,094** | **5,319** | **5,553** | **5,816** | **5,080** | **5,346** | **5,613** |
| Growth (% p.a.) | | 1.9% | 4.1% | 4.4% | 4.4% | 4.7% | -12.6% | 5.2% | 5.0% |

| | 2016 | 2017 | 2018 | 2019 | 2020 | | 2025 | | 2030 |
|---|---|---|---|---|---|---|---|---|---|
| Kenyan GDP Growth (%) | 7 | 7 | 7 | 7 | 7 | | 4.9 | | 4.9 |
| Ratio of petroleum demand to GDP 2003-2007 | | | | | | | | | |
| Forecast ratio of petroleum demand to GDP | 0.60 | 0.60 | 0.60 | 0.60 | 0.60 | | 0.60 | | 0.60 |
| | | | | | | | | | |
| Demand for petroleum from existing customers | 6,891 | 7,180 | 7,482 | 7,796 | 8,123 | | 9,700 | | 11,212 |
| *of which:* | | | | | | | | | |
| Crude for Mombasa Refinery | 3,500 | 3,500 | 3,500 | 3,500 | 3,500 | | 3,500 | | 3,500 |
| Finished Products | 3,391 | 3,680 | 3,982 | 4,296 | 4,623 | | 6,200 | | 7,712 |
| Minus Ugandan Refinery | 2000 | 2000 | 2000 | 2000 | 3000 | | 3000 | | 3000 |
| Products via Mombasa | **1,391** | **1,680** | **1,982** | **2,296** | **1,623** | | **3,200** | | **4,712** |
| | | | | | | | | | |
| **Summary of Mombasa Imports** | | | | | | | | | |
| Crude Oil | 3,500 | 3,500 | 3,500 | 3,500 | 3,500 | | 3,500 | | 3,500 |
| Products | 1,391 | 1,680 | 1,982 | 2,296 | 1,623 | | 3,200 | | 4,712 |
| **TOTAL** | **4,891** | **5,180** | **5,482** | **5,796** | **5,123** | | **6,700** | | **8,212** |
| Growth | -12.9% | 5.9% | 5.8% | 5.7% | -11.6% | | 4.3% | | 4.1% |

Source: Consultants' estimates

### *2.3.2 LPG*

The port of Mombasa handles only 80,000 tonnes p.a. of LPG, but a new privately-financed berth is being built to handle it. Kenyan demand has been increasing rapidly, at 17% p.a. (see Table 2.20) as LPG has been replacing charcoal for residential heating and cooking.

**Table 2.20: LPG Consumption in Kenya, 2003-2007 (000 tonnes)**

| | 2003 | 2004 | 2005 | 2006 | 2007 | Average growth 2003-2007 (% p.a.) |
|---|---|---|---|---|---|---|
| '000 tons | 41 | 42 | 49 | 65 | 77 | 17% |

Source: Kenya Statistical Abstract 2008, based on Ministry of Energy statistics

The rapid growth, however, will taper off as households move from LPG canisters to electricity and other forms of energy, and it will be assumed, perhaps conservatively that future growth will fall in line with GDP growth – i.e. 7% pa. in the base case.

On this basis imports of LPG are assumed to increase as follows:

**Table 2.21: Forecast of LPG Consumption in Kenya, '(000 tonnes)**

| | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 |
|---|---|---|---|---|---|---|---|---|---|
| '000 tons | 77 | 79 | 83 | 88 | 94 | 101 | 108 | 115 | 123 |

| | 2016 | 2017 | 2018 | 2019 | 2020 | | 2025 | | 2030 |
|---|---|---|---|---|---|---|---|---|---|
| '000 tons | 132 | 141 | 151 | 161 | 173 | | 231 | | 294 |

Source: Consultants' estimates

The concession agreement for the LPG terminal is for a 33 year "design, build, maintain and operate" contract, with an option for extension by mutual agreement. It comprises a buoy mooring and tank storage sufficient for one ship load. The project is to be developed in three phases:

| **Phase** | **Ship size** | **Terminal capacity ('000 ton p.a.)** |
|---|---|---|
| A | 6,000dwt | 120 |
| B | 12,000 dwt | 240 |
| C | 27,000dwt | 500 |

Traffic of two ships per month is envisaged, with the 27,000dwt ships (LOA 200m, draft 11.0m).

### *2.3.3 Compressed Natural Gas*

There are advanced plans to import compressed natural gas from Mnazi Bay in southern Tanzania. The gas has been discovered by the Artumas Group (Canadian) and the export project is being arranged by a joint venture between Artumas and Trans CNG, which is a partnership between Overseas Shipping Group which has a fleet of 105 ships and Transcanada which specialises in natural gas handling.

The gas field in Tanzania's south east region of Mtwara has reserves of about 2 trillion cubic feet, and the intention is to deliver 50 million cubic feet per day to run a 250 MW power station in Kenya. The gas supply would be equivalent to about 800,000 tonnes of coal per year.

The operations are scheduled to start within three years. The group already has permission to export from the Tanzanian government, and is hoping for a 15 year contract with the Ministry of Energy in Kenya to sell the compressed natural gas to a State-run Kenyan power station. The objective would be to reduce energy costs by replacing liquid fuels.

The joint venture is currently looking for land for a dedicated berth, and has identified a site to the west of the proposed Port Reitz container terminal. They are also looking for local organisations to run the operations in Kenya, two possibilities being the Kenya Pipeline Company and Kenya Petroleum Refineries.

The technology of the project is new. It has been devised to circumvent the problem that although natural gas should be able to offer lower costs than other fuels, it can usually be transported economically only in pipelines or in large LNG carriers. In this case the gas is insufficient for an LNG carrier and too far away for a pipeline to be viable for the volumes under consideration. There is no standard off-the-shelf solution for this transport requirement.

The proposed solution is a shuttle shipping service, described as a “floating pipeline” because it produces a daily flow of gas. It would require one berth which would be occupied by a daily ship for almost 24 hours each day. The 380 nautical mile route would be served by four ships (draft 5.5 m, LOA 106 m), with one in each port and two making the sea voyage. Its economics work only for short distances and low volumes. The transport facilities will also need storage to deal with problems of bunching in this high occupancy system.

The traffic volumes are assumed to remain constant at 50 million cubic feet per day.

### *2.3.4 Edible Oils and Other Bulk Liquid Imports*

The port handled 686,000 tonnes of edible oils and other bulk liquids in 2007. About 435,000 tonnes of this traffic consisted of vegetable oil for Kenya according to the Customs and Excise Department, and 175,000 tonnes was destined for Uganda, according to KPA statistics. The remainder included some chemicals and other liquids.

The imports are not subject to licences or quotas, as there is no significant Kenyan edible oil production to require protection.

The main importer is Bidco Oil Refineries.

The edible oils are transported inland by truck, even to Uganda. Although rail should be economic over these distances, it is not considered sufficiently reliable.

The growth rate for edible oil and other bulk liquids imports via Mombasa averaged 6% p.a. during the period 2003-2007.

**Table 2.22: Mombasa Imports of Edible Oil and Other Bulk Liquids (‘000 tonnes)**

| | 2003 | 2004 | 2005 | 2006 | 2007 | Average growth 2003-2007 (% p.a.) |
|---|---|---|---|---|---|---|
| ‘000 tonnes | 534 | 551 | 598 | 669 | 676 | 6% |

Source: KPA statistics

The growth rate for imports at Mombasa is the same that that of Kenyan vegetable oil imports as recorded by the Kenyan Customs and Excise Department, see Table 12.2.

**Table 2.23: Kenyan Vegetable Oil Imports ('000 tonnes)**

| | 2003 | 2004 | 2005 | 2006 | 2007 | Average growth 2003-2007 (% p.a.) |
|---|---|---|---|---|---|---|
| '000 tonnes | 339 | 178 | 387 | 469 | 435 | 6% |

Source: Statistical Abstract 2008, quoting Customs and Excise Department

The growth rate of 6% p.a. for edible oil has been the same as that of GDP in the five years up to 2007, and the main importers confirmed that they expect this relationship to be maintained in the future. On that basis Mombasa's edible oil and other liquid traffic is forecast as in Table 2.24.

**Table 2.24: Forecast of Edible Oils and Other Liquid Bulks ('000 tonnes)**

| | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 |
|---|---|---|---|---|---|---|---|---|---|
| Kenyan GDP Growth (%) | 7 | 2.5 | 5.53 | 6.09 | 6.3 | 7 | 7 | 7 | 7 |
| Ratio of edible oil demand to GDP 2003-2007 | | 1.00 | | | | | | | |
| Forecast ratio of edible oil demand to GDP growth | | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 |
| Imports via Mombasa | | | | | | | | | |
| for Kenya | 501 | 514 | 542 | 575 | 611 | 654 | 700 | 749 | 801 |
| for Uganda | 175 | 182 | 191 | 200 | 210 | 221 | 232 | 244 | 256 |
| **TOTAL** | **676** | **695** | **733** | **775** | **822** | **875** | **932** | **992** | **1,057** |
| Growth | | 2.8% | 5.4% | 5.8% | 6.0% | 6.5% | 6.5% | 6.5% | 6.5% |

| | 2016 | 2017 | 2018 | 2019 | 2020 | | 2025 | | 2030 |
|---|---|---|---|---|---|---|---|---|---|
| Kenyan GDP Growth (%) | 7 | 7 | 7 | 7 | 7 | | 4.9 | | 4.9 |
| Ratio of edible oil demand to GDP 2003-2007 | | | | | | | | | |
| Forecast ratio of Edible Oil demand to GDP growth | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | | 1.0 | | 1.0 |
| Imports via Mombasa | | | | | | | | | |
| for Kenya | 857 | 917 | 981 | 1,050 | 1,124 | | 1,505 | | 1,912 |
| for Uganda | 268 | 282 | 296 | 311 | 326 | | 417 | | 532 |
| **TOTAL** | **1,126** | **1,199** | **1,277** | **1,361** | **1,450** | | **1,921** | | **2,443** |
| Growth | 6.5% | 6.5% | 6.5% | 6.5% | 6.5% | | 4.9% | | 4.9% |

Source: Consultants' estimates

### *2.3.5 Wheat and Other Cereals*

The port of Mombasa has been handling almost a million tonnes p.a. of wheat in recent years. Almost 90% of the total was handled at the bulk terminal operated by Grain Bulk Handlers Ltd in 2007 (see Table 2.25). The rest, consisting mainly of shipments from the World Food Programme, is bagged on the conventional quays.

**Table 2.25: Bulk Wheat Imports at Grain Bulk Handlers Ltd Terminal, 2003-2007 ('000 tonnes)**

| | 2003 | 2004 | 2005 | 2006 | 2007 | Average growth 2003-2007 (% p.a.) |
|---|---|---|---|---|---|---|
| Wheat | 585 | 543 | 911 | 948 | 858 | 10% |

Source: KPA statistics

About 96% of the bulk wheat over the last five years was for commercial users and 4% was relief cargo.

**Table 2.26: Commercial v Relief Imports of Wheat, 2003-2007 ('000 tonnes)**

| | 2003 | 2004 | 2005 | 2006 | 2007 | Average growth 2003-2007 (% p.a.) |
|---|---|---|---|---|---|---|
| Commercial | 502 | 501 | 858 | 874 | 821 | 13% |
| Relief | 10 | 19 | 43 | 41 | 31 | 33% |
| Total GBHL | 512 | 520 | 901 | 915 | 852 | 14% |

Note: (a) There is some discrepancy between GBHL and KPA statistics in earlier years, but they are similar in later years.
Source: GBHL

The imported wheat is used mostly by flour millers, many of whom are based in Mombasa. It is hard wheat, which millers prefer for making flour. Wheat is also grown in Kenya, mainly in the Rift Valley, but it accounts for only a small percentage of total demand. Also it is soft wheat which is much less suitable for flour-making than the imported hard wheat. Local wheat production is reported by the Economic Survey 2008 at around 100,000 tonnes, although reliable sources suggest that it is often closer to 250,000 tonnes. The local wheat production is not irrigated, so that the volumes produced are dependent on the weather.

The wheat imported via Mombasa is not only for Kenya. In 2007, only 550,000 tonnes of the 858,000 tonnes of the imported bulk wheat went to Kenya, with 270,000 tonnes going to Uganda and a small volume to South Sudan.

The main trends in wheat demand in recent years have been as follows:

- There was a sharp increase in 2005 due to the opening of new flour mills in Uganda, where eating habits have been changing with a switch away from plantains to wheat- based products. Also Mombasa won some of Bakhressa's wheat traffic from Dar es Salaam.
- There was a decline in Kenyan imports early in 2008 when the civil disturbances disrupted truck services to Nairobi and Uganda. Grain supplies were also limited, with the result that stocks were severely depleted by August 2008. However, Russian and Argentine wheat is now becoming more available, and Australian wheat may be imported for the first time in several years. Kenya is likely to end up importing about 750,000 tonnes in 2008, not all via the bulk terminal.
- The government is currently importing large volumes of wheat, supposedly to renew strategic reserves but in practice the grain is being sold to millers. Consequently an additional 350,000 tonnes will have to be imported in 2009.

The overall trend, however, has been high growth over the last ten years. Because volumes fluctuate from year to year with the impact of weather on harvests, three year averages are a better basis for estimating growth than comparisons of single years. On this basis the growth rates in bulk wheat imports have been as follows:

Last ten years 1997-9 to 2005-7 12% p.a.
Last five years 2000-2 to 2005-7 9% p.a.

**Table 2.27: Wheat Imports via Mombasa 1997-2007 ('000 tonnes)**

| | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| '000 tonnes | 449 | 487 | 201 | 577 | 673 | 519 | 585 | 543 | 911 | 948 | 858 |

Source : Kenya Ports Authority, Annual Review(s) and Bulletin(s) of Statistics

Against this background, the assumptions made for forecasts of bulk wheat are as follows:

- The ratio of the growth of Kenyan wheat consumption to GDP growth will taper off gradually from the average of the last five years (1.65) as follows:
  2007-10 1.3
  2011 -15 1.1
  2016-25 1.0
  2026-30 0.8

  These assumptions are consistent with the conclusions that (a) Kenyan cereals consumption would reach 13-14 million tonnes by 2030, which is about two thirds of the UK's current cereals consumption of 20 million tonnes[2], and that (b) wheat's share of Kenyan cereals consumption would have risen from about 20-25% at present to 30% by 2030, with maize still accounting for the majority of Kenya's cereals consumption.
- Ugandan consumption will follow similar trends.
- Local soft wheat production will have little impact on the imports of hard wheat.

On this basis, bulk wheat imports are forecast as shown in Table 2.28.

[2] Kenya's population in 2030 is expected to be similar to the UK's today

**Table 2.28: Forecast Imports of Bulk Wheat via Mombasa ('000 tonnes)**

| | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 |
|---|---|---|---|---|---|---|---|---|---|
| Kenyan GDP Growth (%) | 7 | 2.5 | 5.53 | 6.09 | 6.3 | 7 | 7 | 7 | 7 |
| Ratio of wheat demand to GDP 2003-2007 | | | 1.65 | | | | | | |
| Forecast ratio of wheat demand to GDP growth | | 1.4 | 1.3 | 1.2 | 1.1 | 1.1 | 1.1 | 1.1 | 1.1 |
| Wheat in Bulk | | | | | | | | | |
| for Kenya | 580 | 600 | 643 | 690 | 738 | 795 | 856 | 922 | 993 |
| for Uganda | 278 | 293 | 312 | 331 | 349 | 368 | 388 | 410 | 432 |
| **TOTAL** | **858** | **893** | **955** | **1,021** | **1,087** | **1,163** | **1,245** | **1,332** | **1,426** |
| Growth | | 4.1% | 7.0% | 6.9% | 6.5% | 7.0% | 7.0% | 7.0% | 7.0% |

| | 2016 | 2017 | 2018 | 2019 | 2020 | | 2025 | | 2030 |
|---|---|---|---|---|---|---|---|---|---|
| Kenyan GDP Growth (%) | 7 | 7 | 7 | 7 | 7 | | 4.9 | | 4.9 |
| Ratio of wheat demand to GDP 2003-2007 | | | | | | | | | |
| Forecast ratio of wheat demand to GDP growth | 1 | 1 | 1 | 1 | 1 | | 1 | | 0.8 |
| Wheat in Bulk | | | | | | | | | |
| for Kenya | 1,063 | 1,137 | 1,217 | 1,302 | 1,393 | | 1,866 | | 2,262 |
| for Uganda | 454 | 477 | 500 | 525 | 552 | | 704 | | 857 |
| **TOTAL** | **1,517** | **1,614** | **1,717** | **1,828** | **1,945** | | **2,570** | | **3,118** |
| Growth | 6.4% | 6.4% | 6.4% | 6.4% | 6.4% | | 4.9% | | 3.9% |

Source: Consultants' estimates

### *2.3.6 Fertilizers*

There is no fertiliser production in Kenya. Consequently, all of Kenya's requirements have to be imported. The port of Mombasa handled 383,000 tonnes of fertilisers in 2007, almost all of it for Kenya. KPA statistics show minimal movement of fertiliser into Uganda (6,000 tonnes in 2007).

Agriculture is the mainstay of the Kenyan economy, the main crops being maize and sugar for domestic use, and tea, coffee and horticultural products for export. The main fertiliser requirements are for DAP, Urea, CAN and NPK (especially. for flower growing around Nairobi); and the main importers are Yara (formerly Norsk Hydro), Mea, the Kenyan Tea Development Board and about seven other organisations, each with less than 10% of the market.

Kenya, however, has good soil and rainfall and consequently does not use as much fertilisers as most countries with similar production levels. The growth rate of fertiliser imports at Mombasa has averaged only 1% p.a. in the five years up to 2007.

**Table 2.29: Fertiliser Imports via Mombasa 1997-2007 ('000 tonnes)**

| | 2003 | 2004 | 2005 | 2006 | 2007 | Average growth 2003-2007 (% p.a.) |
|---|---|---|---|---|---|---|
| Fertilisers in bulk | 343 | 363 | 385 | 337 | 280 | -5% |
| Fertilisers not in bulk | 27 | 140 | 89 | 160 | 103 | 40% |
| Total | 370 | 503 | 474 | 497 | 383 | 1% |

Source: KPA statistics

Customs and Excise figures for Kenyan consumption show even lower growth than that of imports via Mombasa.

**Table 2.30: Fertiliser Imports for Kenyan Consumption 2003-2007 ('000 tonnes)**

| | 2003 | 2004 | 2005 | 2006 | 2007 | Average growth 2003-007 (% p.a.) |
|---|---|---|---|---|---|---|
| '000 tonnes | 385 | 522 | 436 | 479 | 345 | -3% |

Source: Economic Survey 2008

The government's "Summary of Key Investment Opportunities in Kenya" has invited investment in a fertiliser manufacturing and blending plant in Mombasa to make DAP, CAN and NPK fertilisers to serve local demand. But fertiliser importers question the viability of such a plant given the absence of the necessary raw materials – potash, phosphate and nitrogen/ammonia – and the relatively static demand.

The main distributors of fertilisers do not expect an acceleration of growth in fertilizer consumption, even if the rapid increases in prices ease. They emphasize that the recent low growth rate has not been caused by the licences, quotas and tariffs that are imposed on other industries (e.g. the sugar industry). This is because fertilizer imports and sales are determined in the market.

On this basis, fertiliser imports are forecast to continue increasing at a rate 0.1 times that of GDP growth, as in the period 2003-2007.

**Table 2.31: Forecast of Fertiliser Imports via Mombasa ('000 tonnes)**

| | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 |
|---|---|---|---|---|---|---|---|---|---|
| Kenyan GDP Growth (%) | | 2.5 | 5.5 | 6.1 | 6.3 | 7.0 | 7.0 | 7.0 | 7.0 |
| Ratio of fertiliser demand to GDP 2003-2007 | | | | 0.14 | | | | | |
| Forecast ratio of fertiliser demand to GDP growth | | 0.14 | 0.14 | 0.14 | 0.14 | 0.14 | 0.14 | 0.14 | 0.14 |
| Imports via Mombasa (in tonnes) | | | | | | | | | |
| for Kenya | 377 | 378 | 381 | 385 | 388 | 392 | 396 | 400 | 404 |
| for Uganda | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 |
| **TOTAL** | 383 | 384 | 387 | 391 | 394 | 398 | 402 | 406 | 410 |

| | 2016 | 2017 | 2018 | 2019 | 2020 | | 2025 | | 2030 |
|---|---|---|---|---|---|---|---|---|---|
| Kenyan GDP Growth (%) | 7.0 | 7.0 | 7.0 | 7.0 | 7.0 | | 4.9 | | 4.9 |
| Ratio of fertiliser demand to GDP 2003-2007 | | | | | | | | | |
| Forecast ratio of fertiliser demand to GDP growth | 0.14 | 0.14 | 0.14 | 0.14 | 0.14 | | 0.14 | | 0.14 |
| Imports via Mombasa (in tonnes) | | | | | | | | | |
| for Kenya | 408 | 412 | 416 | 420 | 424 | | 443 | | 459 |
| for Uganda | 6 | 6 | 6 | 7 | 7 | | 7 | | 7 |
| **TOTAL** | 414 | 418 | 423 | 427 | 431 | | 450 | | 466 |

Source: Consultants' estimates

### *2.3.7 Clinker*

The port of Mombasa handled 1.080 million tonnes of clinker imports in 2007, of which 469,000 tonnes were destined for Uganda. The clinker is imported for the manufacture of cement at the Bamburi cement plant in Mombasa and at cement plants in Uganda. The production of one tonne of cement requires 0.6 tonnes of clinker, 0.15 tonnes of gypsum and 0.1 tonne of coal.

Imports of clinker have risen very rapidly in the last five years, the growth rate averaging 67% p.a. The reason for the high growth rate growth is that domestic supplies of clinker produced from local limestone were sufficient for local cement production in the past; but as demand for cement has risen rapidly it has been necessary to bring in large volumes of clinker from abroad.

**Table 2.32: Imports of Clinker via Mombasa 2003-2007 ('000 tonnes)**

| | 2003 | 2004 | 2005 | 2006 | 2007 | Average growth 2003-2007 (% p.a.) |
|---|---|---|---|---|---|---|
| '000 tonnes | 139 | 164 | 430 | 520 | 1,080 | 67% |

Source: KPA statistics

The clinker is used in Kenya and Uganda by cement plants which have a capacity of 4.4 million tonnes at present, but committed expansion plans will raise this to 6.9 million tonnes by 2010. Details of the plants are shown in Table 2.33. As shown, the dominant plant is the

Bamburi Cement Group plant in Mombasa. At present Bamburi controls 59% of the local market and 56% of the East African market. Bamburi is in turn owned by Lafarge which bought it in 1992. The original owners were Cementia (Switzerland) and Blue Circle (UK).

**Table 2.33: Cement Plant Capacity in Kenya and Uganda (million tonnes)**

| | Current | Planned |
|---|---|---|
| KENYA | | |
| Bamburi Cement Group, Mombasa | 2.3 | 3.0 (in 2009) |
| Athi River Mining (ARM) | 0.3 | 0.8 |
| East African Portland Cement (EAPC) | 0.7 | 1.4 (in 2009) |
| *Total* | *3.3* | *5.2 (in 2009)* |
| UGANDA | | |
| Tororo | 0.75 | 0.75 |
| Hima (Bamburi) | 0.35 | 0.95 |
| *Total* | *1.10* | *1.70* |
| **GRAND TOTAL** | **4.4[a]** | **6.9** |

Note: (a) There are also three cement plants serving the East African region in Tanzania. Some of these plants are expanding and new firms are entering the market. In addition Rwanda produces cement at Cimerwa (capacity 150,000 tonnes, with plans to increase to 0.6 million tonnes)

Source: Press reports (various)

The Kenyan and Ugandan plants produced about 3.3 million tonnes in 2007, the clinker requirement for which was about 2.02 million tonnes

The growth of cement consumption in Kenya and Uganda combined averaged 13% in the five years up to 2007. The demand has been boosted by a construction boom in infrastructure and private housing, and also rebuilding in Sudan after 20 years of war.

The growth of cement demand is affected by political decisions, in particular, government expenditure on large projects including roads; but current investment plans by international cement companies demonstrate confidence in strong growth. Several expansions to Kenyan and Ugandan cement plants are already committed, and further investments are also being considered by new entrants including Catic (Chinese) and Indian and Middle Eastern interests. In addition ARM hopes to boost capacity with a grinding plant in Athi River, although they are being blocked by Bamburi on environmental grounds; and Tororo intends to build a plant in Kenya. The new investors are reportedly attracted by the high profits available in the Kenyan market.

**Table 2.34: Kenyan and Ugandan Cement Production and Requirements for Clinker ('000 tonnes)**

| | 2003 | 2004 | 2005 | 2006 | 2007 | Average growth 2003-2007 (% p.a.) |
|---|---|---|---|---|---|---|
| | | | | | | |
| Kenyan Cement production (a) | 1,649 | 1,873 | 2,123 | 2,405 | 2,615 | 12% |
| Kenyan Cement consumption (b) | 1,274 | 1,479 | 1,675 | 1,765 | 2,060 | 13% |
| Exports of cement to Uganda(a) | 232 | 245 | 333 | 398 | 463 | 19% |
| Exports of cement to Tanzania (a) | 3 | 5 | 4 | 33 | 51 | |
| | | | | | | |
| Ugandan cement production (c) | 507 | 559 | 650 | 700 | 750 | 10% |
| Ugandan cement consumption | 739 | 804 | 983 | 1,098 | 1,213 | 13% |
| | | | | | | |
| **Total cement consumption** | **2,013** | **2,283** | **2,658** | **2,863** | **3,273** | **13%** |
| | | | | | | |
| Clinker Required for Kenyan production(d) | 989 | 1,124 | 1,274 | 1,443 | 1,569 | 12% |
| Clinker Required for Ugandan production (d) | 304 | 335 | 390 | 420 | 450 (f) | 10% |
| **Total clinker required** | **1,294** | **1,459** | **1,664** | **1,863** | **2,019** | **12%** |
| | | | | | | |
| Clinker imported (e) | 139 | 164 | 430 | 520 | 1,080 | 67% |
| Clinker supplied locally | 1,155 | 1,295 | 1,234 | 1,343 | 939 | -5% |

Sources: (a) Statistical Abstract 2008
(b) Economic Survey 2008
(c) Index Mundi up to 2005, assumptions for 2006-7
(d) Consultants' estimates, based on 0.6 tonnes of clinker per tone of cement
(e) The actual quantity of clinker imported into Uganda in 2007 was slightly higher, 469,000 tonnes

Future clinker imports are forecast in Table 2.35 on the following assumptions:

- Kenyan cement production will continue to increase at approximately twice the level of GDP growth, as in the last five years. The ratio of cement consumption to GDP growth, however, will gradually tail off until cement consumption and GDP are increasing at the same rate after 2015.
- Ugandan cement production will continue to increase with GDP growth (forecast at 6.5% p.a.) and the same ratio of cement consumption to GDP growth as in Kenya.
- 0.6 tonnes of clinker will be required per tonne of cement.
- Local clinker production will increase in response to rising demand. New limestone reserves have been identified at Kanziku and Mathima, and the Bamburi Group is reported to be prospecting for more limestone to make clinker for inland plants. Also ARM is planning to use local limestone. It is not possible to forecast local clinker production with confidence, but it is assumed to respond to demand by increasing at the same rate as the demand for cement.

**Table 2.35: Forecast Imports of Clinker via Mombasa (million tonnes)**

| | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 |
|---|---|---|---|---|---|---|---|---|---|
| Kenyan GDP Growth (%) | | 2.5 | 5.5 | 6.1 | 6.3 | 7.0 | 7.0 | 7.0 | 7.0 |
| Ratio of Kenyan cement demand to GDP 2003-2007 | 2.3 | | | | | | | | |
| Forecast ratio of cement consumption to GDP(a) | 2 | 1.8 | 1.6 | 1.4 | 1.2 | 1.2 | 1.2 | 1.1 | 1.0 |
| | | | | | | | | | |
| Kenyan cement production | 2.60 | 2.74 | 3.01 | 3.30 | 3.58 | 3.92 | 4.29 | 4.66 | 5.03 |
| Ugandan cement production (b) | 0.75 | 0.80 | 0.87 | 0.93 | 0.98 | 1.04 | 1.10 | 1.16 | 1.22 |
| Total cement production | 3.35 | 3.54 | 3.88 | 4.23 | 4.56 | 4.96 | 5.39 | 5.83 | 6.26 |
| | | | | | | | | | |
| Clinker requirement (c) | 2.01 | 2.13 | 2.33 | 2.54 | 2.74 | 2.98 | 3.23 | 3.50 | 3.75 |
| Minus local clinker | 0.96 | 1.01 | 1.11 | 1.21 | 1.31 | 1.42 | 1.54 | 1.67 | 1.79 |
| **Total clinker imports** | **1.05** | **1.11** | **1.22** | **1.33** | **1.43** | **1.56** | **1.69** | **1.83** | **1.96** |
| Growth | | 5.8% | 9.4% | 9.0% | 8.0% | 8.7% | 8.7% | 8.0% | 7.4% |

| | 2016 | 2017 | 2018 | 2019 | 2020 | | 2025 | | 2030 |
|---|---|---|---|---|---|---|---|---|---|
| Kenyan GDP Growth (%) | 7.0 | 7.0 | 7.0 | 7.0 | 7.0 | | 4.9 | | 4.9 |
| Ratio of Kenyan cement demand to GDP 2003-2007 | | | | | | | | | |
| Forecast ratio of cement consumption to GDP(a) | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | | 1.0 | | 1.0 |
| | | | | | | | | | |
| Kenyan cement production | 5.44 | 5.87 | 6.34 | 6.85 | 7.40 | | 10.38 | | 13.83 |
| Ugandan cement production (b) | 1.28 | 1.35 | 1.42 | 1.49 | 1.56 | | 1.99 | | 2.54 |
| Total cement production | 6.72 | 7.22 | 7.76 | 8.33 | 8.96 | | 12.37 | | 16.37 |
| | | | | | | | | | |
| Clinker requirement (c) | 4.03 | 4.33 | 4.65 | 5.00 | 5.37 | | 7.42 | | 9.82 |
| minus local clinker | 1.92 | 2.07 | 2.22 | 2.39 | 2.56 | | 3.54 | | 4.69 |
| **Total clinker imports** | **2.11** | **2.26** | **2.43** | **2.61** | **2.81** | | **3.88** | | **5.14** |
| Growth | 7.4% | 7.4% | 7.4% | 7.5% | 7.5% | | 5.8% | | 5.8% |

Notes: (a) Kenyan cement production is forecast to increase with GDP growth and the ratio of cement consumption to GDP growth as shown above
(b) Ugandan cement production forecast to increase with GDP growth (6.5% p.a.) and the ratio of cement consumption to GDP growth as shown above
(c) 0.6 tonnes of clinker are required per tonne of cement

Source: Consultants' estimates

### *2.3.8 Soda Ash*

Mombasa handled 386,000 tonnes of soda ash exports in 2007. It is produced at a single plant, operated by Magadi Soda Company, 120 km south west of Nairobi. The company was originally owned by Imperial Chemical Industries but was bought by Tata in 2005.

The soda ash is used mainly for glass for bottles, with a small part used for detergents and industrial chemicals. It is transported to Mombasa by rail. Part of the line was built by Magadi Soda Company, and all the locomotives and wagons were originally theirs although they are now run by the Rift Valley Railways.

Almost all of the soda ash is exported, its main markets being in South Africa, South East Asia, the Indian sub-continent and the Middle East. Beyond these regions Magadi Soda faces competition mainly from US and Chinese exports. Only about 3% of the soda ash production is consumed within Kenya.

In the early part of the decade over 50% of shipments were in small bulk carriers until their charter costs rose to very high levels as a result of the Chinese economic boom. By 2007 80% of the soda ash was exported in containers, in one tonne bags. This takes advantage of the large numbers of empty containers which need to be re-positioned back to the source countries for imports, and low outward freight rates for container traffic.

In mid-2008 the shipping bubble burst, and bulk carrier charter rates fell dramatically. Container freight rates are also falling as a result of surplus demand. Magadi Soda wishes to keep its options open in respect of its future transport arrangements, and so is considering upgrading its bulk handling facilities whilst at the same time continuing to use containers where appropriate.

The exports have been increasing steadily, with an average growth rate of 5% p.a. in the period 2003-2007.

**Table 2.36: Soda Ash Exports 1997-2007 ('000 tonnes)**

| | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | Average growth 2003-2007 (% p.a.) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Soda Ash in bulk** | 158 | 131 | 150 | 131 | 141 | 155 | 173 | 92 | 116 | 112 | 77 | -18% |
| **Soda Ash not in bulk** | 104 | 80 | 62 | 100 | 106 | 141 | 148 | 185 | 217 | 200 | 309 | 20% |
| **TOTAL** | 262 | 211 | 212 | 231 | 247 | 296 | 321 | 277 | 333 | 312 | 386 | 5% |

Source: KPA statistics

The source of the soda ash, the Magadi lake, is inexhaustible, as the product regenerates itself.

At present production is just over 400,000 tonnes, but the capacity is currently being raised to 600,000 tonnes. It was hoped to achieve this production level in 2008, but so far they have added only about 50,000 tonnes p.a. to output.

In the longer term, the company has plans to increase capacity to 1.2 million tonnes by 2012 and 2.0 million tonnes by 2015. But given the slow build up towards their existing capacity of 600,000 tonnes, and following discussions with the company, it was concluded that a more realistic assumption would be 600,000 tonnes in 2010 and 1.1 million tonnes by 2015.

**Table 2.37: Forecast Soda Ash Exports ('000 tonnes)**

| | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 |
|---|---|---|---|---|---|---|---|---|---|
| Growth rate for Soda Ash exports, 2003-2007 | 5% | | | | | | | | |
| | | | | | | | | | |
| Forecast Growth Rate | | 18.5% | 15.6% | 13.5% | 16.7% | 14.3% | 12.5% | 11.1% | 10.0% |
| Soda Ash Exports | 386 | 457 | 529 | 600 | 700 | 800 | 900 | 1,000 | 1100 |

| | 2016 | 2017 | 2018 | 2019 | 2020 | | 2025 | | 2030 |
|---|---|---|---|---|---|---|---|---|---|
| Growth rate for Soda Ash exports, 2003-2007 | 5% | | | | | | | | |
| | | | | | | | | | |
| Forecast Growth Rate | 1,180 | 1,260 | 1,340 | 1,420 | 1500 | | 1,500 | | 1,500 |
| Soda Ash Exports | 7.3% | 6.8% | 6.3% | 6.0% | 5.6% | | 0.0% | | 0.0% |

Source: Consultants' estimates

For the purposes of the traffic forecasts we have assumed that the container shipping lines, having attracted soda ash, will continue to set tariffs for outbound containers low enough to retain their current share of the traffic, i.e. about 80%.

### *2.3.9 Coal*

*Coal for cement*

At present coal traffic via Mombasa is limited to about 150,000 tonnes for Bamburi's cement production. It is handled mainly at Mbaraki Wharf. The volumes has been erratic in recent years (see Table 2.5); but future imports will be assumed to increase at the same rate as cement production, see section 2.3.7 – reaching 329,000 tonnes by 2015; 471,000 tonnes by 2020; 650,000 tonnes by 2025; and 860,000 tonnes by 2030.

*Coal for Power Generation*

Coal imports, however, are likely to rise to much higher levels, as the Ministry of Energy plans to grant a licence for a 300 MW coal fired power station to be built at Dongo Kundu. This will require 0.9-1.2 million tonnes p.a. of coal.

The import terminal is likely to be built beside the power station, to avoid contact with KPA's other cargoes and also to keep air pollution away from the existing port. The Ministry of Energy has looked at three sites and favours Kaya Mtonge. The only significant role for KPA would be to extend the dredged 15 metre channel for the new Port Reitz container terminal for another 200 metres to the Dongo Kundu coal terminal. The ship capacity envisaged is Handymax (typically 45,000 DWT, but up to 60,000 DWT).

The Ministry of Energy will need to build additional power stations in the medium-long term. Kenya has only 1100 MW of power station capacity and intends to expand capacity to about 1700 MW in the next five years. The long term target is 8000 MW by 2030. These additional stations could use imported coal. But local rather than imported coal is a possibility. The government has contracted out the work of establishing the extent of the recently discovered reserves and their commercial viability; this will be completed by mid-2009. The Ministry of Energy is also considering CNG from Tanzania for power generation.

An investor has already made a proposal for Dongo Kundu, in a Joint Venture with a Kenyan company, and feasibility studies are under way.

### *2.3.10 Titanium Ore*

Tiomin, a Canadian company, plans to export 450,000 tonnes p.a. of titanium/ilmenite, zircon and rutile from a site south of Mombasa. The project has been subject to delays, with problems over the resettlement of the local population, but Tiomin reports that it has now been completed and all compensation dues paid. The majority of licenses and permits are also in place. There are some final steps to complete, but they are well advanced.

Tiomin is also concluding negotiations with Jinchuan Group of China for a Joint Venture in which Jinchaun will be responsible for financing and constructing the project. The main destinations are expected to be China and Europe, and Tiomin expects the earliest date for the start of production to be April 2011.

The terminal will probably be built outside the port of Mombasa. Tiomin has already secured title to 4 acres of land in Likoni for the construction of its own dedicated export terminal. The site is immediately adjacent to and to the west of the Kenya Ferry Service facilities.

The design ship size is 30,000-40,000 DWT, the proposed ship loading speed 1,000 tonnes per hour; and the trucks to be used for transport from the mine will have a payload of 36 tonnes.

### 2.3.11 *Vehicles*

Although there is some vehicle assembly in Kenya, almost all vehicles are imported, either new or second hand. The port handled 74,000 vehicles weighing 287,000 tonnes in 2007. Approximately 58% of the vehicles are for Kenya and 42% are for Uganda and other transit countries

The growth rate over the last five years has been exceptionally high at 14% p.a. in terms of numbers of vehicles imported, and even higher in terms of weight. This is partly explained by the fact that imports of trucks have risen faster than imports of cars. The ratio of growth in the numbers of vehicles imported to GDP growth was 2.3 in the five year period up to 2007.

**Table 2.38: Imports of Vehicles at Mombasa**

| | 2003 | 2004 | 2005 | 2006 | 2007 | Average growth 2003-2007 (% p.a.) |
|---|---|---|---|---|---|---|
| Units | 43,474 | 54,854 | 67,102 | 65,348 | 73,818 | 14% |
| '000 tonnes | 74 | 86 | 164 | 202 | 287 | 40% |
| Average weight (tonnes) | 1.70 | 1.57 | 2.44 | 3.09 | 3.89 | |

Source: KPA statistics

Kenyan vehicle registration statistics show even faster growth, averaging 21% p.a. in the period 2003-2007. The higher growth of registrations relative to imports may be partly explained by growth of local assembly.

The vehicles for local assembly come in CKD (completely knocked down) form in containers to be assembled, particularly by General Motors and AVA (Associated Vehicle Assemblers) who specialise in Mitsubishi, Scania, Tata and Toyota vehicles. However, local assembly can only be a partial explanation of the discrepancy between the KPA's import statistics and the Kenya Revenue Authority's registration figures, as the Economic Survey 2008 shows that only 6,700 vehicles were assembled in Kenya in 2007.

**Table 2.39: Registration of Vehicles in Kenya[a] ('000)**

| | 2003 | 2004 | 2005 | 2006 | 2007 | Average growth 2003-2007 (% p.a.) |
|---|---|---|---|---|---|---|
| Saloon cars | 9,709 | 12,628 | 14,219 | 14,829 | 17,893 | 17% |
| Station wagons | 8,032 | 8,863 | 10,158 | 12,631 | 24,115 | 32% |
| Pick ups, panel vans | 6,819 | 7,042 | 6,308 | 6,721 | 9,470 | 9% |
| Trucks | 2,069 | 2,461 | 3,113 | 3,610 | 6,329 | 32% |
| Buses and coaches | 667 | 872 | 885 | 856 | 2,006* | 32% |
| Mini buses | 2,854 | 4,405 | 4,076 | 3,714 | 4,252 | 10% |
| Others | 1,534 | 2,075 | 3,135 | 4,206 | 4,966 | 34% |
| **TOTAL** | **31,684** | **38,346** | **41,894** | **46,567** | **69,031** | **21%** |

Note: (a) The figure for buses and coaches in 2007 seems high, but could be explained in terms of reaction to the failure of the rail privatisation. Growth might reverse if the railways improve.

Sources: KPA and Economic Survey 2008

Growth of vehicle imports is likely to remain high in the medium term for several reasons, including the construction of more roads, the affluence which will accompany the GDP growth targeted in Vision 2030, and the relatively low level of local assembly in East Africa. The local automotive industry does not expect Kenyan assembly or production to take over from imports for many years.

However, in the long term, international experience shows that the ratio of the growth in demand for vehicles to that of GDP will tail off; and as demand grows to high levels some local production of vehicles is likely. On this basis, vehicle imports are forecast to increase at over double the rate of GDP growth for the next few years, but with a gradual tapering off the ratio as shown in Table 2.40:

**Table 2.40: Forecast of Vehicle Imports via Mombasa ('000 tonnes)**

| | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 |
|---|---|---|---|---|---|---|---|---|---|
| Kenyan GDP Growth (%) | | 2.5 | 5.5 | 6.1 | 6.3 | 7.0 | 7.0 | 7.0 | 7.0 |
| Ratio of vehicle demand to GDP 2003-2007: 2.33 (in numbers of units; higher in tonnes) | | | | | | | | | |
| Forecast ratio of Vehicle demand to GDP growth | | 2.30 | 2.20 | 2.10 | 2.00 | 1.90 | 1.80 | 1.70 | 1.60 |
| **Imports via Mombasa ('000 tonnes)** | | | | | | | | | |
| for Kenya | 166 | 176 | 197 | 223 | 251 | 284 | 320 | 358 | 398 |
| for Uganda | 121 | 131 | 146 | 161 | 177 | 194 | 211 | 229 | 248 |
| **TOTAL** | **287** | **307** | **343** | **384** | **428** | **478** | **531** | **587** | **646** |

| | 2016 | 2017 | 2018 | 2019 | 2020 | | 2025 | | 2030 |
|---|---|---|---|---|---|---|---|---|---|
| Kenyan GDP Growth (%) | 7.0 | 7.0 | 7.0 | 7.0 | 7.0 | | 4.9 | | 4.9 |
| | | | | | | | | | |
| Forecast ratio of Vehicle demand to GDP growth | 1.50 | 1.40 | 1.30 | 1.20 | 1.10 | | 1.00 | | 1.00 |
| **Imports via Mombasa ('000 tonnes)** | | | | | | | | | |
| for Kenya | 440 | 483 | 527 | 571 | 615 | | 824 | | 1,047 |
| for Uganda | 266 | 285 | 303 | 321 | 339 | | 433 | | 552 |
| **TOTAL** | **706** | **768** | **830** | **893** | **954** | | **1,257** | | **1,599** |

Source: Consultants' estimates

### *2.3.11 Iron & Steel*

The port of Mombasa handled 621,000 tonnes of iron and steel in 2007. Approximately three quarters was for Kenya and one quarter for Uganda.

All Kenya's steel requirements have to be imported, as there is no iron and steel plant in the country, and there are no plans to build one, as Kenya has no iron ore, a limited water supply and expensive power. Steel imports will therefore continue.

The imports come in the form of coils, billets, sheet steel and plates, and are processed mainly at three rolling mills owned by Mabati Rolling Mills, Kenya United Steel Company and Standard Rolling Mills.

The volumes imported have been erratic, as shown in Table 2.41. The growth rate over the last five years, 2003-2007 averaged 30% p.a., but this figure reflects the fact that imports in 2003 were unusually low. A better guide to the underlying growth rate can be obtained from a comparison of three year averages, which smooth out the short term fluctuations, for 1997-1999 and 2005-2007. The growth rate on this basis was 8% p.a. The ratio of the growth of steel imports to GDP growth during the decade was very high, at 2.2.

**Table 2.41: Steel Imports via Mombasa 1997-2007('000 tonnes)**

| | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| '000 tonnes | 277 | 147 | 450 | 352 | 285 | 360 | 219[a] | 515 | 435 | 593 | 621 |

Note: (a) The sharp fall in steel imports in 2003 was reportedly caused by high prices, the negative effect of a drought on the economy, and the change in government.
Source: KPA statistics

In recent years, the underlying growth rate has settled at lower levels, with Kenyan import statistics based on two year averages showing a growth rate of 5% p.a. between 2002-2003 and 2006-2007. This growth rate was almost the same as GDP growth during that period.

**Table 2.42: Kenyan Steel Imports 2002-2007 ('000 tonnes)**

| | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | Growth 2002-3 to 2006-7 (% p.a.)[a] |
|---|---|---|---|---|---|---|---|
| '000 tonnes | 454 | 391 | 479 | 436 | 473 | 543 | 5% |

Note: (a) Based on two-year averages
Source: Statistical Abstract 2008, based on Customs and Excise Department statistics

The management of the main rolling mills regard the construction industry as by far the most important determinant of steel demand in Kenya, with demand for machinery and manufactures in second place. They also emphasise that construction activity is heavily affected by government policies on infrastructure investment, especially in roads. On balance, their view is that the average annual growth in steel demand and therefore imports, is likely to continue to fluctuate around a level close to that of GDP, as has been the case on the last five years. On this basis steel traffic is forecast as shown in Table 2.43.

**Table 2.43: Forecast of Steel Traffic at Mombasa ('000 tonnes)**

| | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 |
|---|---|---|---|---|---|---|---|---|---|
| Kenyan GDP Growth (%) | 7.0 | 2.5 | 5.53 | 6.09 | 6.3 | 7 | 7 | 7 | 7 |
| Ratio of Kenyan steel demand to GDP 2002/3 to 2006/7 | 1.0 | 2.2 | | | | | | | |
| Forecast ratio of steel demand to GDP growth | | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Imports via Mombasa (a) | | | | | | | | | |
| for Kenya | 468 | 480 | 506 | 537 | 571 | 611 | 654 | 699 | 748 |
| for Uganda | 153 | 159 | 167 | 175 | 184 | 193 | 203 | 213 | 224 |
| **TOTAL** | 621 | **639** | **673** | **712** | **755** | **804** | **856** | **912** | **972** |
| Growth | | 2.8% | 5.4% | 5.8% | 6.0% | 6.5% | 6.5% | 6.5% | 6.5% |

| | 2016 | 2017 | 2018 | 2019 | 2020 | | 2025 | | 2030 |
|---|---|---|---|---|---|---|---|---|---|
| Kenyan GDP Growth (%) | 7 | 7 | 7 | 7 | 7 | | 4.9 | | 4.9 |
| Ratio of Kenyan steel demand to GDP 2002/3 to 2006/7[a] | | | | | | | | | |
| Forecast ratio of steel demand to GDP growth | 1 | 1 | 1 | 1 | 1 | | 1 | | 1 |
| Imports via Mombasa[b] | | | | | | | | | |
| for Kenya | 801 | 857 | 917 | 981 | 1,050 | | 1,406 | | 1,786 |
| for Uganda | 235 | 246 | 259 | 272 | 285 | | 364 | | 465 |
| **TOTAL** | **1,035** | **1,103** | **1,176** | **1,253** | **1,335** | | **1,770** | | **2,250** |
| Growth | 6.5% | 6.5% | 6.6% | 6.6% | 6.6% | | 4.9% | | 4.9% |

Notes: (a) All iron and steel is imported. There is no steel mill in Kenya.
Source: Consultants' estimates

### *2.3.12 Rice*

Mombasa handled 328,000 tonnes of imported rice in 2007. Of the total, the majority was for Kenyan consumption, with only 13% (43,000 tonnes) for Uganda.

Rice is a much less important cereal in Kenya than maize or wheat - rice consumption being only 0.4 million tonnes p.a. compared with one million tonnes of wheat and three million tonnes of maize. Almost all Kenya's rice is imported, as local production is small, averaging about 50,000 tonnes p.a. The growth of imports has been low, averaging 3% p.a. in the period 2003-2007.

**Table 2.44: Rice Imports via Mombasa ('000 tonnes)**

| | 2003 | 2004 | 2005 | 2006 | 2007 | Average growth 2003-2007 (% p.a.) |
|---|---|---|---|---|---|---|
| '000 tonnes | 296 | 297 | 311 | 311 | 328 | 3% |

Source: KPA statistics

Customs and Excise figures for Kenyan rice consumption also show relatively low growth although higher than that of imports via Mombasa.

**Table 2.45: Rice Imports for Kenyan Consumption ('000 tonnes)**

| | 2003 | 2004 | 2005 | 2006 | 2007 | Average growth 2003-2007 (% p.a.) |
|---|---|---|---|---|---|---|
| '000 tonnes | 213 | 223 | 228 | 259 | 259 | 5% |

Source: Customs and Excise figures quoted in the Economic Survey 2008

Rice imports are forecast to continue increasing at a rate about half of that of GDP growth, as in the period 2003-2007.

**Table 2.46: Forecast of Rice Imports ('000 tonnes)**

| | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 |
|---|---|---|---|---|---|---|---|---|---|
| Kenyan GDP Growth (%) | 7.0 | 2.5 | 5.5 | 6.1 | 6.3 | 7.0 | 7.0 | 7.0 | 7.0 |
| Ratio of rice demand to GDP 2003-2007 | 0.43 | | | | | | | | |
| Forecast ratio of Rice demand to GDP growth | | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 |
| Imports via Mombasa | | | | | | | | | |
| for Kenya | 285 | 289 | 297 | 306 | 315 | 326 | 338 | 349 | 362 |
| for Uganda | 43 | 44 | 45 | 46 | 47 | 48 | 50 | 51 | 52 |
| **TOTAL** | 328 | 332 | 341 | 352 | 362 | 375 | 387 | 400 | 414 |

| | 2016 | 2017 | 2018 | 2019 | 2020 | | 2025 | | 2030 |
|---|---|---|---|---|---|---|---|---|---|
| Kenyan GDP Growth (%) | 7.0 | 7.0 | 7.0 | 7.0 | 7.0 | | 4.9 | | 4.9 |
| Ratio of rice demand to GDP 2003-2007 | | | | | | | | | |
| Forecast ratio of Rice demand to GDP growth | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | | 0.5 | | 0.5 |
| Imports via Mombasa | | | | | | | | | |
| for Kenya | 374 | 387 | 401 | 415 | 430 | | 498 | | 562 |
| for Uganda | 53 | 55 | 56 | 58 | 59 | | 67 | | 75 |
| **TOTAL** | 428 | 442 | 457 | 473 | 489 | | 565 | | 638 |

Source: Consultants' estimates

### *2.3.14 Sugar*

The port of Mombasa handled 372, 000 tonnes of sugar imports in 2007. Of the total 62% (230,000 tonnes) was for Kenya and 26% (98,000 tonnes) was for Uganda. About 73% of the imports were containerized in 2007.

The relatively low tonnage for Kenya is explained by the fact that most sugar consumed in Kenya is manufactured from local Kenyan sugar cane. Kenyan sugar production fluctuates around an average of approximately 500,000 tonnes p.a. In general, it is used for domestic needs, while industrial users rely on imports.

**Table 2.47: Kenyan Sugar Production, Imports and Exports ('000 tonnes)**

| | 2003 | 2004 | 2005 | 2006 | 2007 | Average growth 2003-2007 (% p.a.) |
|---|---|---|---|---|---|---|
| Production | 449 | 517 | 488 | 476 | 520 | 4% |
| Imports | 182 | 164 | 167 | 166 | 230* | 6% |
| Total Consumption | 620 | 669 | 633 | 628 | 730 | 4% |
| Exports | 11 | 12 | 22 | 14 | 20 | 16% |

Source: Economic Survey 2008

The local sugar industry is heavily protected, because it would be unlikely to survive if fully exposed to competition from other African sugar producers such as Mauritius, South Africa and Sudan. Factories in Kenya use almost twice as much cane to produce a tonne of sugar than the international average of 8 tonnes, partly because the smallholder land tenure system limits the adoption of new technology. Also many sugar companies have limited crushing capacity.

The industry, however, is important to Kenya as it reportedly supports 5 million people, or about 16% of the entire Kenyan population, and cane growing is a major source of income to over 150,000 sharecroppers. Consequently, the Common Market for East and Southern Africa (COMESA) in 2004 allowed Kenya to impose a four-year restriction on duty-free sugar imports into the Kenyan market from other COMESA country members, in order to allow the troubled Kenyan sugar industry time to undertake reforms that would enable it to compete with other sugar manufacturing countries.

The sugar importers have to face time-consuming bureaucratic procedures. Under rules published in 2008 by the Agriculture Minister, they have to obtain permits from the Kenya Sugar Board for each consignment of sugar they import, and to show a release order from the Kenya Sugar Board to be allowed to take the sugar out of the port of Mombasa after the consignment has been physically inspected and verified by both the Sugar Board and the Kenya Revenue Authority.

Despite these problems there has been steady growth of imports over the last ten years. Because volumes fluctuate erratically from year to year, three year averages are a better basis for estimating growth than comparisons of single years; and on that basis the growth rate for the last five years 2001-3 to 2005-7 was 9% p.a.

**Table 2.48: Sugar Imports via Mombasa 1997-2007 ('000 tonnes)**

| | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| '000 tonnes | 56 | 119 | 20 | 108 | 258 | 143 | 237 | 207 | 246 | 289 | 372 |

Source: KPA statistics

The assumptions made for forecasting future imports are as follows:

- The industry will gradually be liberalised and restrictions on imports removed.
- The growth of Kenya sugar consumption will increase from 0.7 times the GDP growth rate to 1.0 as the restrictions on supply are relaxed.

- The local industry will make modest improvements in efficiency and continue to expand production at 4% p.a. as over the last five years.
- Almost all the Kenyan production will be used locally, with just under 5% exported.
- The majority of the growth in consumption, however, will be supplied by imports.

On this basis, sugar consumption and imports are forecast as shown in Table 2.49.

**Table 2.49: Forecast of Sugar Consumption and Imports ('000 tonnes)**

| | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 |
|---|---|---|---|---|---|---|---|---|---|
| Kenyan GDP Growth (%) | | 2.5 | 5.5 | 6.1 | 6.3 | 7.0 | 7.0 | 7.0 | 7.0 |
| Ratio of Kenyan sugar consumption to GDP 2003-07 | | 0.7 (a) | | | | | | | |
| Ratio of sugar imports to GDP 2003-2007 | | 2.0 | | | | | | | |
| Growth of Kenyan sugar production 2003-2007 | | 4.0% | | | | | | | |
| Forecast ratio of Kenyan sugar consumption to GDP | | 0.7 | 0.8 | 0.9 | 1 | 1 | 1 | 1 | 1 |
| Kenyan sugar consumption | 730 | 743 | 776 | 818 | 870 | 931 | 996 | 1,065 | 1,140 |
| Kenyan sugar production | 520 | 541 | 562 | 585 | 608 | 633 | 658 | 684 | 712 |
| Exports | 20 | 21 | 22 | 22 | 23 | 24 | 25 | 26 | 27 |
| Imports for Kenyan consumption | 230 | 223 | 235 | 256 | 285 | 322 | 363 | 407 | 456 |
| | | | | | | | | | |
| Imports for Uganda and other transit countries | 142 | 147 | 155 | 163 | 171 | 179 | 188 | 198 | 207 |
| **Total Imports via Mombasa** | **372** | **370** | **390** | **418** | **455** | **501** | **551** | **605** | **663** |
| Growth | | -0.5% | 5.2% | 7.3% | 8.9% | 10.1% | 9.9% | 9.8% | 9.6% |

**Table 2.49 (cont)**

| | 2016 | 2017 | 2018 | 2019 | 2020 | | 2025 | | 2030 |
|---|---|---|---|---|---|---|---|---|---|
| Kenyan GDP Growth (%) | 7.0 | 7.0 | 7.0 | 7.0 | 7.0 | | 4.9 | | 4.9 |
| Ratio of Kenyan sugar consumption to GDP 2003-07 | | | | | | | | | |
| Ratio of sugar imports to GDP 2003-2007 | | | | | | | | | |
| Growth of Kenyan sugar production 2003-2007 | | | | | | | | | |
| Forecast ratio of Kenyan sugar consumption to GDP | 1 | 1 | 1 | 1 | 1 | | 1 | | 1 |
| **Kenyan sugar consumption** | 1,220 | 1,305 | 1,397 | 1,494 | 1,599 | | 2,142 | | 2,720 |
| Kenyan sugar production | 740 | 770 | 801 | 833 | 866 | | 1,053 | | 1,282 |
| Exports | 28 | 30 | 31 | 32 | 33 | | 41 | | 49 |
| Imports for Kenyan consumption | 508 | 565 | 627 | 694 | 766 | | 1,129 | | 1,488 |
| | | | | | | | | | |
| Imports for Uganda and other transit countries | 218 | 229 | 240 | 252 | 265 | | 338 | | 431 |
| **Total Imports via Mombasa** | **726** | **794** | **867** | **946** | **1,031** | | **1,467** | | **1,919** |
| Growth | 9.5% | 9.3% | 9.2% | 9.1% | 9.0% | | 5.6% | | 5.5% |

Note: (a) Sugar consumption has been restricted by limitations on import licences and slow growth of local production.

Source: Consultants' estimates

### *2.3.15 Tea*

Tea is Kenya's top foreign exchange generating commodity, and the volumes exported via Mombasa are supplemented by tea from Uganda, Rwanda and other countries in the region which are sold at its tea auction, which is the second largest tea auction in the world.

The port of Mombasa handled 464,000 tonnes of tea exports in 2007. It is all carried in containers.

Tea exports via Mombasa have increased at 5% p.a. in the period 2003-2007.

**Table 2.50: Tea Exports via Mombasa Port ('000 tonnes)**

| | 2003 | 2004 | 2005 | 2006 | 2007 | Average growth 2003-2007 (% p.a.) |
|---|---|---|---|---|---|---|
| '000 tonnes | 376 | 406 | 405 | 402 | 464 | 5% |

Source: KPA statistics

Kenyan tea exports increased at an even faster rate, 9% p.a., according to the Economic Survey 2008.

**Table 2.51: Kenyan Tea Exports ('000 tonnes)**

| | 2003 | 2004 | 2005 | 2006 | 2007 | Average growth 2003-2007 (% p.a.) |
|---|---|---|---|---|---|---|
| '000 tonnes | 262 | 275 | 341 | 318 | 370 | 9.0% |

Source: Economic Survey 2008

Kenya has made steady progress to become the world's top tea exporter, and it is unlikely that tea consumption in export markets will be affected to a great extent by the expected recession. On this basis it's exports will be assumed to continue to increase at the recent growth rate of 5% p.a.

**Table 2.52: Tea Exports via Mombasa ('000 tonnes)**

| | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 |
|---|---|---|---|---|---|---|---|---|---|
| TOTAL | 464 | 487 | 512 | 537 | 564 | 592 | 622 | 653 | 686 |
| Growth | | 5.0% | 5.0% | 5.0% | 5.0% | 5.0% | 5.0% | 5.0% | 5.0% |

| | 2016 | 2017 | 2018 | 2019 | 2020 | | 2025 | | 2030 |
|---|---|---|---|---|---|---|---|---|---|
| TOTAL | 720 | 756 | 794 | 833 | 875 | | 1,117 | | 1,425 |
| Growth | 5.0% | 5.0% | 5.0% | 5.0% | 5.0% | | 5.0% | | 5.0% |

Source: Consultants' estimates

### *2.3.16 Copper*

Although it has been used in the past, Mombasa has not been used for significant volumes of Zambian copper exports for many years. The copper currently moves via Dar es Salaam and Durban, and the exporters are currently considering using the rehabilitated Benguela railway for future eastbound exports. Given that Zambia part- owns the Tazara railway to Dar es Salaam, whose performance is now slowly improving, and that the sea freight rates and ships used at Dar would be the same as Mombasa, it would seem optimistic to expect Mombasa to be able to attract this cargo except during periods when port congestion levels are much higher at Dar and Durban than at Mombasa.

### *2.3.17 Containers*

The port of Mombasa handled 586,000 TEU[3] of containers in 2007.

Of the total container traffic, 61% (355,000 TEU) consisted of Kenyan imports and exports, 33% was transit traffic and 6% was transhipment traffic, mainly to/from the Seychelles, Zanzibar and the Comoros Islands.

[3] A TEU is a twenty foot equivalent, which is the standard measure for container traffic in ports. Almost all containers are either 20' or 40' long, and a 40' container counts as two TEU.

**Table 2.53: Mombasa Container Traffic, 2007**

| | '000 TEU (a) | Percentage |
|---|---|---|
| Kenyan Imports and Exports | 355 | 61% |
| Transit | 195(b) | 33% |
| Transhipment | 36 | 6% |
| **TOTAL** | **586** | **100%** |

Note:
(a) The ratio of TEU to boxes is 1.34
(b) Including empties outbound.
Source: KPA statistics

The dominant leg at the port of Mombasa is the inbound leg, with 62% of outbound containers leaving Mombasa empty.

The main container shipping services calling at Mombasa are run by the world's top two container shipping lines, Maersk and MSC. The other main lines include PIL (Singapore), Emirates Lines, Zim , CMA and CGM.

Mombasa's container services have undergone two marked changes in recent years. Ten years ago the main service was the Beacon consortium's service from Europe, which made direct calls at Mombasa, along with Dar es Salaam which was the most southerly port on its route. The two main changes are that the Far East has replaced Europe as the main source of Kenya's imports, and that Kenya and Tanzania are now served mainly by feeders rather than direct calls. These have used several different transhipment hubs in the recent past including Salalah, Jeddah and Durban. PIL is the only line to offer a direct service to Mombasa, from the Far East .

**Table 2.54: Origins and Destinations of Kenya's International Trade 2007**

| | Imports | | Exports | |
|---|---|---|---|---|
| | Ksh. billion | % | Ksh. billion | % |
| W Europe | 130 | 21% | 77 | 28% |
| Far East | 204 | 34%[a] | 32 | 12% |
| Middle East | 130 | 21%[b] | 14 | 5% |
| America | 55 | 9% | 20 | 7% |
| Africa | 72 | 12% | 124 | 45% |
| Others | 14 | 2% | 7 | 3% |
| **TOTAL** | **605** | **100%** | **274** | **100%** |

Notes: (a) Of which India accounted for 9%
(b) Of which UAE accounted for 15%
Source: Economic Survey 2008

The growth rate for Kenyan import and export containers averaged 11% p.a. in the five years up to 2007 in terms of TEUs, while transit traffic increased even faster, at 19% p.a.. The loss of transhipment traffic to neighbouring islands, however, reduced the overall growth rate to 11% p.a.

The growth rate of total container traffic in terms of tonnage carried rather than TEUs, however, was 14% p.a., and was the same for imports and exports.

**Table 2.55: Growth of Mombasa Container Traffic, 2003-2007**

| | 2003 | 2004 | 2005 | 2006 | 2007 | Average growth 2003-2007 (% p.a.) |
|---|---|---|---|---|---|---|
| **('000 TEU)** | | | | | | |
| National | 233 | 279 | 284 | 298 | 355 | 11% |
| Transit | 98 | 125 | 126 | 150 | 195 | 19% |
| Transhipment | 50 | 34 | 27 | 31 | 36 | -8% |
| **TOTAL** | **381** | **438** | **437** | **479** | **586** | **11%** |
| | | | | | | |
| **Total ('000 tonnes) (a)** | **3,363** | **4,268** | **4,325** | **4,595** | **5,695** | **14%** |

(a) This figure includes the tare weight of containers according to the KPA
Source: KPA statistics

The growth rate of 14% p.a. by weight is in line with that of Kenya's imports by value over the period 2003-2007, which also averaged 14% p.a. in terms of US dollars. The ratio of the growth of Kenya's national container traffic to that of Kenyan imports (in terms of US$) has therefore been close to 1.0 over the last five years, and the ratio of Kenyan national container traffic growth to that of GDP has been 2.3 in tonnes and 1.9 in TEU. These ratios are similar to those of many countries at similar stages of development, including India, Pakistan and Vietnam.

Kenya's national container traffic has been forecast on the assumption that the ratio of container traffic growth to GDP will decline slowly from the existing ratios of 1.9-2.3. The steady decline of the ratio is almost universal in other countries. On this basis the Kenyan national container forecasts are as shown in Table 2.59 at the end of this section.

The dominant leg will continue to be the inbound leg, with many containers leaving Mombasa empty (30% of total container traffic consisted of empties, almost all on the outbound leg, in 2007). But Vision 2030 nevertheless envisages exports rising rapidly. Although it is unnecessary for the value of Kenyan exports to increase to the level of import values, as the country's trade imbalance will be offset by increasing revenues from tourism, remittances from abroad, and inward investment, Vision 2030 states that economic growth should be export-led.

It notes that 65% of Kenya's exports are agricultural goods, which grew by 8% p.a. in the period 2000-5, and it emphasizes that the government plans to "skip the smokestacks associated with rapid industrialization and move up the value chain". It also notes that Kenya is already exporting chemicals, processed food, textiles and footwear.

The growth of exports is to be strengthened by the development of nine Industrial Parks for SMEs (Small and Medium Enterprises) and Special Economic Zones. The two main SEZs will be at Mombasa and Kisumu near the Ugandan border. The Mombasa SEZ will specialize in chemicals, cement and metals for regional inland markets.

### *Transit Traffic*

Mombasa handled 194,000 teu of transit traffic in 2007, including empties. Just over 72% of the transit traffic, equivalent to 24% of total Mombasa container traffic, was to and from Uganda. The other countries' shares of total Mombasa traffic were small, the largest being Tanzania, with a 3% share.

**Table 2.56: Transit Container Traffic 2003-2007 ('000 TEU, laden boxes only)**

| | 2003 | 2004 | 2005 | 2006 | 2007 | Average growth 2003-2007 (% p.a.) |
|---|---|---|---|---|---|---|
| **IMPORTS** | | | | | | |
| Uganda | 35,766 | 44,677 | 42,827 | 51,748 | 70,188 | 18% |
| Tanzania | 5,440 | 7,481 | 8,379 | 7,973 | 9,829 | 16% |
| DR Congo | 3,736 | 5,084 | 5,276 | 5,952 | 6,389 | 14% |
| Sudan | 266 | 531 | 1,113 | 1,443 | 5,578 | 114% |
| Rwanda | 2,929 | 3,224 | 2,584 | 3,470 | 4,462 | 11% |
| Somalia | 738 | 1,356 | 2,467 | 4,111 | 753 | 1% |
| Burundi | 116 | 264 | 143 | 236 | 176 | 11% |
| Others | 45 | 35 | 37 | 17 | 29 | -10% |
| **Total** | **49,036** | **62,652** | **62,826** | **74,950** | **97,404** | **19%** |
| **EXPORTS** | | | | | | |
| Uganda | 13,870 | 13,714 | 16,056 | 14,099 | 16,939 | 5% |
| D R Congo | 967 | 1,338 | 1,334 | 1,427 | 1,857 | 18% |
| Tanzania | 1,569 | 2,284 | 2,867 | 1,732 | 1,562 | 0% |
| Rwanda | 719 | 1,200 | 1,297 | 1,416 | 1,280 | 16% |
| Burundi | 112 | 35 | 26 | 68 | 159 | 9% |
| Sudan | 36 | 201 | 332 | 456 | 38 | 1% |
| Somalia | | | | | | |
| Others | 40 | 57 | 33 | 14 | 55 | 8% |
| **Total** | **17,313** | **18,829** | **21,945** | **19,212** | **21,890** | **6%** |
| **IMPORTS+ EXPORTS** | | | | | | |
| Uganda | 49,636 | 58,391 | 58,883 | 65,847 | 87,127 | 15% |
| Tanzania | 7,009 | 9,765 | 11,246 | 9,705 | 11,391 | 13% |
| DRC | 4,703 | 6,422 | 6,610 | 7,379 | 8,246 | 15% |
| Sudan | 302 | 732 | 1,445 | 1,899 | 5,616 | 108% |
| Rwanda | 3,648 | 4,424 | 3,881 | 4,886 | 5,742 | 12% |
| Somalia | 738 | 1,356 | 2,467 | 4,111 | 753 | 1% |
| Burundi | 228 | 299 | 169 | 304 | 335 | 10% |
| Others | 85 | 92 | 70 | 31 | 84 | 0% |
| **TOTAL : laden boxes** | **66,349** | **81,481** | **84,771** | **94,162** | **119,294** | **16%** |
| **TOTAL including empties** | **98,072** | **125,304** | **125,652** | **149,900** | **194,808** | **19%** |

Source: KPA statistics

The ratio of the growth of Uganda's national container traffic to that of Uganda's imports in terms of US$ has averaged 1.8 over the last five years, and the ratio of Uganda's national container traffic growth to that of GDP has been 3.0.

Uganda's container traffic has been forecast on the assumption that the ratio of container traffic growth to GDP growth will decline slowly from the existing ratio of 3.0. The traffic in the other transit counties, which is minor, will be assumed to increase in line with Uganda's. On this basis the transit container forecasts are as shown in Table 2.59 at the end of this section.

***Transhipment***

Transhipment traffic has never been high at Mombasa. It reached a peak of just under 50,000 TEU (i.e. 25,000 TEU handled twice) in 2003, which was equivalent to 13% of total container traffic. But by 2007 it had fallen to 36,000 TEU, equivalent to only 6% of the total.

In 2008 the transhipment volumes are likely to fall even further, as Mombasa's container terminal management has been discouraging transhipment since July because the terminal is highly congested, with an occupancy of around 85%.

There is no realistic possibility of Mombasa becoming a successful transhipment port until the new Port Reitz terminal is constructed. In fact, Mombasa has been demoted from a direct call port to a feeder port itself in recent years. Only PIL is running direct services from the Far East, the dominant source of imports, and even PIL has found it difficult to serve Mombasa and Dar es Salaam, as delays at East African ports undermine their ability to keep to schedule. Consequently, PIL has started to feed Dar es Salaam from Singapore.

The essential qualifications for attracting transhipment traffic are low tariffs, high container handling speeds, minimal delays and absence of bureaucracy; and Mombasa does not qualify on any of these criteria at present.

First, its tariffs are very high by international standards. The tariff for a 20' container is US$150 for the double move involved in transhipment, compared with Colombo's US$70; and Mombasa is also much more expensive for transhipment than Dar es Salaam and Port Louis.

**Table 2.57: Container Handling Charges for Transhipment**

| | US$ per 20' Container (laden) |
|---|---|
| KPA | 160 |
| Dar es Salaam | 90 |
| Mauritius | 56[a] |

Note: (a) Before discounting
Source: Published tariffs

Secondly, Mombasa's container handling speeds are low, at around 14 moves per crane hour according to KPA staff, compared with Port Louis's 20 per hour and Dar's current rates of 18 moves per hour (20-25 moves per hour before congestion reduced productivity in the last two years). Reasonably efficient ports elsewhere in the world achieve about 25 moves per hour, with premier league ports reaching 30-35 moves per hour.

Although it is possible that Mombasa's productivity at berths 16-18 could be increased in the near future with the purchase of additional cargo handling equipment and technological advancements in automation, these improvements are likely to be modest when compared with the step change in Mombasa's competitiveness which should come with the opening of the JICA terminal around 2013.

At that point productivity increases should have a major impact, via much faster handling speeds, lower dwell times and the attraction of deeper draft ships with size economies. This should improve Mombasa's competitiveness for transit trade (although it will have little effect on Kenyan trade which is more or less captive).

However, it should be pointed out that Mombasa's competitors, especially Dar es Salaam, may also make similar improvements. Two points require emphasis – one negative and one positive. On the negative side, Dar is currently operating under the handicap of being highly congested, and the removal of this congestion will enhance Dar's competitiveness relative to Mombasa. But on the positive side for Mombasa, Dar has already privatized container operations, while Mombasa has yet to do so. Mombasa should therefore receive a boost to its competitiveness if/when it does so.

Thirdly, customs impose unnecessary paperwork on transhipment containers. And, fourthly, waiting times for berths are already high and will rise steadily until the new terminal is constructed.

With the new terminal transhipment prospects will improve, as it will offer:

- A water depth of 15 metres.
- Baseload traffic approaching 1 million TEU, more than at any other port between Djibouti and Durban.
- Possibly an experienced international terminal operator.

Further preconditions for attracting transhipment would be:

- A productivity increase of 50-100%, which would probably require a private operator.
- Much lower tariffs, possibly 50% low current levels.
- Lower berth occupancy rates, which will be impossible before the new container terminal is finished.
- Customs involvement in transhipment and all unnecessary documentation removed.

Even if these conditions were fulfilled there would still be limitations on Mombasa's ability to attract transhipment traffic. There never has been very significant container transhipment from the region, even when Dar es Salaam emerged as the first reasonably efficient port in the area, and (before that) there were direct calls by major shipping lines.

The only successful transhipment operations in the region have been further south, where Port Louis and Durban have each transhipped around 200,000 TEU p.a., consisting of Indian Ocean Island feeders and longer distance relay operations.

The fundamental reason why there has been little transhipment from East African ports is there are few places to feed. The approximate volumes handled at the ports in the region, excluding Durban to the south and Djibouti to the north, are as follows:

**Table 2.58: Container Traffic Volumes in the East African Region**

| Port | '000 TEU p.a. |
|---|---|
| Mombasa | 585 |
| Dar es Salaam | 350 |
| Port Louis | 400(a) |
| Reunion | 250 |
| Mozambique | 150 |
| Madagascar | 120 |
| Seychelles | 35 |
| Comoros | 30 |
| Zanzibar | n.a.(b) |

Notes: (a) Half of this traffic is transhipment
(b) Unknown, but likely to be below that of Seychelles and Comoros
Source: Consultants' estimates

The total volumes handled at the three countries served by Mombasa – the Seychelles, Comoros and Zanzibar - are under 100,000 TEU p.a. Mombasa's share of this traffic peaked at a quarter in 2003. It is not possible to forecast how much more of this market it could attract, as it will depend on the new terminal's efficiency, tariffs, freedom from delays and absence of red tape relative to those of competing terminals. But even if Mombasa's share were to double, it would not attract large revenues, as transhipment is not usually very remunerative. The tariffs that have to be applied to attract the traffic are often well below tariffs for national imports and exports.

To summarise, although Mombasa will have the major advantage of the highest base load of national cargo and may possibly be the only port with deep water, the fact remains that there are few places to feed. There is not an established transhipment market to break into.

Drawing together the conclusions of the previous sections, container traffic is forecast in Table 2.59.

**Table 2.59: Forecast of Container Traffic at Mombasa**

| | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 |
|---|---|---|---|---|---|---|---|---|---|
| **KENYA** | | | | | | | | | |
| GDP Growth (%) | 7 | 2.5 | 5.53 | 6.09 | 6.3 | 7 | 7 | 7 | 7 |
| Ratio of container traffic to GDP 2003-2007 (by weight) | | 2.3 in weight | 1.9 in TEU | | | | | | |
| Forecast ratio of container traffic to GDP growth | | 1.9 | 1.85 | 1.8 | 1.75 | 1.7 | 1.65 | 1.6 | 1.55 |
| Forecast Traffic ('000 TEU) | 355 | 372 | 410 | 455 | 505 | 565 | 630 | 701 | 777 |
| | | | | | | | | | |
| **UGANDA AND OTHERS** | | | | | | | | | |
| GDP Growth (%) | | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| Ratio of container traffic to GDP 2003-2007 | 3.1 | | | | | | | | |
| Forecast ratio of container traffic to GDP growth | | 2.5 | 2.3 | 2.1 | 1.9 | 1.8 | 1.7 | 1.6 | 1.5 |
| Forecast Traffic ('000 TEU) | 195 | 219 | 245 | 270 | 296 | 323 | 350 | 378 | 406 |
| | | | | | | | | | |
| **TRANSHIPMENT (a)** | 36 | 33 | 31 | 28 | 26 | 24 | 22 | 20 | 19 |
| **TOTAL ('000 TEU)** | 586 | 624 | 685 | 753 | 827 | 912 | 1,002 | 1,099 | 1,202 |
| Growth | | 6.6% | 9.7% | 10.0% | 9.8% | 10.2% | 10.0% | 9.7% | 9.4% |

| | 2016 | 2017 | 2018 | 2019 | 2020 | | 2025 | | 2030 |
|---|---|---|---|---|---|---|---|---|---|
| **KENYA** | | | | | | | | | |
| GDP Growth (%) | 7 | 7 | 7 | 7 | 7 | | 4.9 | | 4.9 |
| Ratio of container traffic to GDP 2003-2007 | | | | | | | | | |
| Forecast ratio of container traffic to GDP growth | 1.5 | 1.45 | 1.4 | 1.35 | 1.3 | | 1.2 | | 1.2 |
| Forecast Traffic (000 TEU) | 859 | 946 | 1038 | 1137 | 1240 | | 1762 | | 2345 |
| | | | | | | | | | |
| **UGANDA AND OTHERS** | | | | | | | | | |
| GDP Growth (%) | 5 | 5 | 5 | 5 | 5 | | 5 | | 5 |
| Ratio of container traffic to GDP 2003-2007 | | | | | | | | | |
| Forecast ratio of container traffic to GDP growth | 1.4 | 1.3 | 1.2 | 1.1 | 1.1 | | 1.1 | | 1.1 |
| Forecast Traffic ('000 TEU) | 435 | 463 | 491 | 518 | 546 | | 714 | | 933 |
| | | | | | | | | | |
| **TRANSHIPMENT (a)** | 17 | 16 | 15 | 13 | 12 | | 8 | | 5 |
| **TOTAL ('000 TEU)** | 1,311 | 1,425 | 1,544 | 1,668 | 1,799 | | 2,485 | | 3,284 |
| Growth | 9.0% | 8.7% | 8.4% | 8.0% | 7.8% | | 5.7% | | 5.7% |

Note: (a) The transhipment forecast is based only on recent trends. Transhipment will decline until the new terminal is built, and will then depend on the new terminal's efficiency and tariffs relative to competing terminals. Figures include two moves across the quay for each container transhipped.

Source: Consultants' estimates

In 2007 the average TEU/box ratio was 1.34. This is likely to increase gradually by 0.01 p.a. as the proportion of 40ft boxes in the container fleet mix moves towards the international norm.

The % of empties in the period 2003-2007 was:

| | |
|---|---|
| 2004 | 29% |
| 2005 | 29% |
| 2006 | 32% |
| 2007 | 30% |

The proportion of empties in future will depend on changes in the imbalance between full import and export boxes. As the base case forecast assumes relatively strong export growth, there is unlikely to be any further increase in the proportion of empty containers, which will fluctuate around 30% in the future.

### *2.3.18 Other Cargoes*

The remaining cargoes which have not been discussed above are:

#### *Inbound*

Conventional Cargoes. The remaining conventional general cargoes (excluding iron and steel) consisted of 255,000 tonnes of bagged and miscellaneous cargoes, often in small ships and also project cargo and unwieldy items. Conventional cargoes are declining at most ports worldwide, and Mombasa is not an exception. Conventional cargoes, excluding steel, have declined by 16% p.a. over the period 2003-2007. However, this decline is unlikely to continue, as there will always be a base load of imports of project cargo, machinery, equipment and other items of unusual size or shape that cannot be containerized. For this reason it is assumed that the inbound conventional cargo will bottom out at 250,000 tonnes in 2010 and then rise slowly by 10,000 tonnes p.a. thereafter.

Dry Bulks. The remaining dry bulks - mainly cereals, bauxite, iron ore, gypsum and salt - amounted to only 328,000 tonnes[4]. If cereals are excluded the remaining dry bulk cargoes amounted to only 193,000 tonnes in 2007. Their growth rate averaged 2.5% p.a. in the period 2003-2007, and the traffic will be assumed to continue to grow at this rate.

#### *Outbound*

Dry Bulks. The port handled 205,000 tonnes of minor dry bulk exports in 2007. They consisted of 77,000 tonnes of soda ash (20% of total soda ash exports, the rest being exported in containers) and 128,000 tonnes of cement, fluorspar, etc. KPA statistics show that the dry bulk exports excluding soda ash declined by 11% p.a. in the period 2003-2007, and they will be assumed to decline at this rate. The soda ash exports in bulk, however, are forecast to increase, retaining their 20% share of total soda ash exports (see section 2.3.8)

Liquid Bulks. Mombasa handled 167,000 tonnes of liquid exports in 2007. They declined at 11% p.a. in the period 2003-2007.

These relatively small volumes of traffic have been assumed to continue to increase (or decrease) at the same rates as over the last five years.

[4] Or 504,000 tonnes if coal is included.

## 2.4 Summary of Traffic Forecasts

The Base Case forecasts of the preceding chapters are drawn together and summarised in Table 2.60. It also shows the assumptions on annual GDP growth, which is 7% for most of the period - i.e. 3% lower than the 10% targeted in the Government's "Vision 2030" strategy. It is this forecast which is used as the basis for the proposed investment programme.

In addition, two further sets of forecasts are shown.

A "high case" forecast, the "Vision 2030 Forecast", which assumes that the Vision 2030 GDP target is achieved is presented in Table 2.61. They can be used to ascertain how much *earlier* the investment programme identified for the Base Case would be required if the "Vision 2030" GDP growth rate of 10% is achieved.

The "low case" forecast, shown in Table 2.62, serves a rather different purpose, which is to test the financial robustness of the proposed investment plan should economic growth occur much more slowly than predicted by the government. The GDP growth rate on which the low forecast is based is 5.5%.

Which of the forecasts is the most realistic will depend to some extent on competition from other ports in the region, and on how pro-actively KPA markets Mombasa port. A review of these issues is included in Annex C.

**Table 2.60: Summary of Base Case Forecasts ('000 tonnes)**

| | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 |
|---|---|---|---|---|---|---|---|---|---|
| Kenyan GDP Growth | 7 | 2.5 | 5.53 | 6.09 | 6.3 | 7.0 | 7.0 | 7.0 | 7.0 |
| Ugandan GDP Growth | | 3.8 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 |
| **EXISTING CARGOES** | | | | | | | | | |
| **Imports** | | | | | | | | | |
| Petroleum(a) | 4,798 | 4,891 | 5,094 | 5,319 | 5,553 | 5,816 | 5,080 | 5,346 | 5,613 |
| Clinker | 1,051 | 1,112 | 1,217 | 1,326 | 1,432 | 1,556 | 1,692 | 1,828 | 1,963 |
| Wheat in bulk | 858 | 893 | 955 | 1,021 | 1,087 | 1,163 | 1,245 | 1,332 | 1,426 |
| Iron & steel | 621 | 639 | 673 | 712 | 755 | 804 | 856 | 912 | 972 |
| Edible oil & other bulk liquids | 676 | 695 | 733 | 775 | 822 | 875 | 932 | 992 | 1,057 |
| Sugar | 372 | 370 | 390 | 418 | 455 | 501 | 551 | 605 | 663 |
| Rice | 328 | 332 | 341 | 352 | 362 | 375 | 387 | 400 | 414 |
| Vehicles | 287 | 307 | 343 | 384 | 428 | 478 | 531 | 587 | 646 |
| Fertilisers | 383 | 384 | 387 | 391 | 394 | 398 | 402 | 406 | 410 |
| Coal | 176 | 186 | 204 | 222 | 240 | 261 | 283 | 306 | 329 |
| Others, Containerised | 3,137 | 3,343 | 3,667 | 4,032 | 4,426 | 4,880 | 5,366 | 5,884 | 6,435 |
| *of which Containerised Sugar* | *272* | *370* | *390* | *418* | *455* | *501* | *551* | *605* | *663* |
| *Containerised Rice* | *315* | *332* | *341* | *352* | *362* | *375* | *387* | *400* | *414* |
| Other conventional | 255 | 253 | 251 | 250 | 260 | 270 | 280 | 290 | 300 |
| Other dry bulk | 328 | 336 | 345 | 354 | 363 | 372 | 381 | 391 | 401 |
| **TOTAL : EXISTING IMPORTS** | **13,270** | **13,743** | **14,601** | **15,556** | **16,578** | **17,749** | **17,987** | **19,281** | **20,627** |
| **Exports** | | | | | | | | | |
| Containerised cargo | 1,653 | 1,761 | 1,932 | 2,125 | 2,332 | 2,571 | 2,827 | 3,101 | 3,391 |
| *of which – Tea* | *464* | *487* | *512* | *537* | *564* | *592* | *622* | *653* | *686* |
| *- Soda Ash* | *309* | *366* | *423* | *480* | *560* | *640* | *720* | *801* | *881* |
| Soda ash in bulk | 77 | 91 | 105 | 120 | 140 | 160 | 180 | 199 | 219 |
| Other dry bulks | 128 | 114 | 101 | 89 | 79 | 70 | 62 | 55 | 49 |
| Other liquid bulks | 167 | 148 | 131 | 116 | 103 | 91 | 81 | 72 | 63 |
| **TOTAL : EXISTING EXPORTS** | 1,948 | 2,023 | 2,164 | 2,330 | 2,515 | 2,733 | 2,971 | 3,227 | 3,503 |
| **TOTAL : IMPORT + EXPORTS** | **15,218** | **15,765** | **16,765** | **17,886** | **19,092** | **20,481** | **20,958** | **22,508** | **24,131** |
| *Growth.* | | *3.6%* | *6.3%* | *6.7%* | *6.7%* | *7.3%* | *2.3%* | *7.4%* | *7.2%* |
| TOTAL IMPORT + EXPORTS minus liquid bulks | *9,744* | *10,179* | *10,938* | *11,792* | *12,718* | *13,791* | *14,946* | *16,170* | *17,461* |
| *Growth, excluding liquid bulks.* | | *4.5%* | *7.5%* | *7.8%* | *7.8%* | *8.4%* | *8.4%* | *8.2%* | *8.0%* |
| **TRANSHIPMENT (b)** | 426 | 392 | 361 | 333 | 307 | 283 | 260 | 240 | 221 |
| **NEW CARGOES** | | | | | | | | | |
| Coal for 300 MW power station | 0 | 0 | 0 | 0 | 0 | 1,000 | 1,000 | 1,000 | 1,000 |
| Titanium exports | | | | | | | | | |
| Compressed Natural Gas | 0 | 0 | 0 | 50 million cu ft per day -----> | | | | | |
| | | | | | | | | | |
| **TOTAL INC NEW CARGOES (c)** | **15,644** | **16,158** | **17,126** | **18,219** | **19,399** | **22,204** | **22,658** | **24,188** | **25,791** |
| | | | | | | | | | |
| **CONTAINERS** | | | | | | | | | |
| Containers ('000 tonnes) | 5,216 | 5,496 | 5,961 | 6,490 | 7,066 | 7,734 | 8,454 | 9,225 | 10,046 |
| Containers ('000 TEU) | 586 | 624 | 685 | 753 | 827 | 912 | 1,002 | 1,099 | 1,202 |
| | | *6.6%* | *9.7%* | *10.0%* | *9.8%* | *10.2%* | *10.0%* | *9.7%* | *9.4%* |
| Vehicles in '000 units | 74 | 79 | 88 | 99 | 110 | 123 | 137 | 151 | 166 |

Notes: (a) Includes LPG
(b) Transhipment will decline until the new container terminal is built and will then depend on its efficiency and tariffs relative to competing terminals. The figures shown include two moves across the quay for each container transhipped.
(c) Excludes CNG

Source: Consultants' estimates

**Table 2.60 (cont)**
**Summary of Base Case Forecasts ('000 tonnes)**

| | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 |
|---|---|---|---|---|---|---|---|---|---|
| Kenyan GDP Growth | 7.0 | 7.0 | 7.0 | 7.0 | 7.0 | 6.3 | 6.3 | 6.3 | 6.3 |
| Ugandan GDP Growth | | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 |
| **EXISTING CARGOES** | | | | | | | | | |
| **Imports** | | | | | | | | | |
| Petroleum(a) | 4,891 | 5,180 | 5,482 | 5,796 | 5,123 | 5,430 | 5,749 | 6,080 | 6,423 |
| Clinker | 2,108 | 2,265 | 2,433 | 2,615 | 2,810 | 3,004 | 3,211 | 3,433 | 3,671 |
| Wheat in bulk | 1,517 | 1,614 | 1,717 | 1,828 | 1,945 | 2,060 | 2,183 | 2,312 | 2,450 |
| Iron & steel | 1,035 | 1,103 | 1,176 | 1,253 | 1,335 | 1,415 | 1,501 | 1,591 | 1,687 |
| Edible oil & other bulk liquids | 1,126 | 1,199 | 1,277 | 1,361 | 1,450 | 1,537 | 1,629 | 1,727 | 1,831 |
| Sugar | 726 | 794 | 867 | 946 | 1,031 | 1,112 | 1,198 | 1,291 | 1,389 |
| Rice | 428 | 442 | 457 | 473 | 489 | 504 | 519 | 535 | 551 |
| Vehicles | 706 | 768 | 830 | 893 | 954 | 1,010 | 1,069 | 1,132 | 1,198 |
| Fertilisers | 414 | 418 | 423 | 427 | 431 | 435 | 439 | 443 | 447 |
| Coal | 353 | 379 | 408 | 438 | 471 | 503 | 538 | 575 | 615 |
| Others, Containerised | 7,016 | 7,626 | 8,265 | 8,928 | 9,629 | 10,307 | 11,013 | 11,770 | 12,581 |
| *of which Containerised Sugar* | *726* | *794* | *867* | *946* | *1,031* | *1,112* | *1,198* | *1,291* | *1,389* |
| *Containerised Rice* | *428* | *442* | *457* | *473* | *489* | *504* | *519* | *535* | *551* |
| Other conventional | 310 | 320 | 330 | 340 | 350 | 360 | 370 | 380 | 390 |
| Other dry bulk | 411 | 422 | 433 | 444 | 455 | 467 | 479 | 491 | 503 |
| **TOTAL : EXISTING IMPORTS** | **21,041** | **22,531** | **24,097** | **25,740** | **26,472** | **28,144** | **29,897** | **31,759** | **33,736** |
| **Exports** | | | | | | | | | |
| Containerised cargo | 3,697 | 4,019 | 4,355 | 4,705 | 5,074 | 5,431 | 5,803 | 6,202 | 6,630 |
| *of which – Tea* | *720* | *756* | *794* | *833* | *875* | *919* | *965* | *1,013* | *1,063* |
| *- Soda Ash* | *945* | *1,009* | *1,073* | *1,137* | *1,201* | *1,201* | *1,201* | *1,201* | *1,201* |
| Soda ash in bulk | 235 | 251 | 267 | 283 | 299 | 299 | 299 | 299 | 299 |
| Other dry bulks | 43 | 38 | 34 | 30 | 27 | 24 | 21 | 19 | 17 |
| Other liquid bulks | 56 | 50 | 44 | 39 | 35 | 31 | 27 | 24 | 21 |
| **TOTAL : EXISTING EXPORTS** | 3,797 | 4,107 | 4,433 | 4,774 | 5,135 | 5,486 | 5,852 | 6,245 | 6,668 |
| **TOTAL : IMPORT + EXPORTS** | **24,838** | **26,638** | **28,530** | **30,514** | **31,608** | **33,630** | **35,749** | **38,004** | **40,404** |
| *Growth.* | *2.9%* | *7.2%* | *7.1%* | *7.0%* | *3.6%* | *6.4%* | *6.3%* | *6.3%* | *6.3%* |
| TOTAL IMPORT + EXPORTS minus liquid bulks | *18,822* | *20,259* | *21,771* | *23,357* | *25,035* | *26,662* | *28,371* | *30,197* | *32,150* |
| *Growth, excluding liquid bulks.* | *7.8%* | *7.6%* | *7.5%* | *7.3%* | *7.2%* | *6.5%* | *6.4%* | *6.4%* | *6.5%* |
| **TRANSHIPMENT (b)** | 203 | 187 | 173 | 159 | 146 | 135 | 124 | 114 | 105 |
| **NEW CARGOES** | | | | | | | | | |
| Coal for 300 MW power station | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 |
| Titanium exports | 440 | 440 | 440 | 440 | 440 | 440 | 440 | 440 | 440 |
| Compressed Natural Gas | | | | 50 million cu ft per day -----> | | | | | |
| | | | | | | | | | |
| **TOTAL INC NEW CARGOES (c)** | **26,481** | **28,265** | **30,143** | **32,113** | **33,194** | **35,204** | **37,313** | **39,559** | **41,949** |
| | | | | | | | | | |
| **CONTAINERS** | | | | | | | | | |
| Containers ('000 tonnes) | 10,916 | 11,833 | 12,792 | 13,792 | 14,849 | 15,873 | 16,941 | 18,087 | 19,316 |
| Containers ('000 TEU) | 1,311 | 1,425 | 1,544 | 1,668 | 1,799 | 1,925 | 2,057 | 2,199 | 2,350 |
| | *9.0%* | *8.7%* | *8.4%* | *8.0%* | *7.8%* | *7.0%* | *6.9%* | *6.9%* | *6.9%* |
| Vehicles in '000 units | 182 | 197 | 214 | 230 | 245 | 260 | 275 | 291 | 308 |

**Table 2.60 (cont)**
**Summary of Base Case Forecasts ('000 tonnes)**

| | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | | | |
|---|---|---|---|---|---|---|---|---|---|
| Kenyan GDP Growth | 4.9 | 4.9 | 4.9 | 4.9 | 4.9 | 4.9 | | | |
| Ugandan GDP Growth | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | | | |
| **EXISTING CARGOES** | | | | | | | | | |
| **Imports** | | | | | | | | | |
| Petroleum(a) | 6,700 | 6,985 | 7,279 | 7,581 | 7,892 | 8,212 | | | |
| Clinker | 3,882 | 4,106 | 4,342 | 4,592 | 4,856 | 5,136 | | | |
| Wheat in bulk | 2,570 | 2,672 | 2,777 | 2,886 | 3,000 | 3,118 | | | |
| Iron & steel | 1,770 | 1,857 | 1,948 | 2,044 | 2,145 | 2,250 | | | |
| Edible oil & other bulk liquids | 1,921 | 2,016 | 2,115 | 2,219 | 2,329 | 2,443 | | | |
| Sugar | 1,467 | 1,548 | 1,634 | 1,724 | 1,819 | 1,919 | | | |
| Rice | 565 | 579 | 593 | 608 | 622 | 638 | | | |
| Vehicles | 1,257 | 1,319 | 1,384 | 1,452 | 1,524 | 1,599 | | | |
| Fertilisers | 450 | 453 | 456 | 459 | 463 | 466 | | | |
| Coal | 650 | 688 | 727 | 769 | 813 | 860 | | | |
| Others, Containerised | 13,301 | 14,062 | 14,868 | 15,721 | 16,624 | 17,579 | | | |
| *of which Containerised Sugar* | *1,467* | *1,548* | *1,634* | *1,724* | *1,819* | *1,919* | | | |
| *Containerised Rice* | *565* | *579* | *593* | *608* | *622* | *638* | | | |
| Other conventional | 400 | 410 | 420 | 430 | 440 | 450 | | | |
| Other dry bulk | 516 | 529 | 543 | 557 | 571 | 585 | | | |
| **TOTAL : EXISTING IMPORTS** | **35,449** | **37,223** | **39,086** | **41,042** | **43,097** | **45,256** | | | |
| **Exports** | | | | | | | | | |
| Containerised cargo | 7,009 | 7,410 | 7,835 | 8,284 | 8,760 | 9,263 | | | |
| *of which – Tea* | *1,117* | *1,173* | *1,231* | *1,293* | *1,357* | *1,425* | | | |
| *- Soda Ash* | *1,201* | *1,201* | *1,201* | *1,201* | *1,201* | *1,201* | | | |
| Soda ash in bulk | 299 | 299 | 299 | 299 | 299 | 299 | | | |
| Other dry bulks | 15 | 13 | 12 | 10 | 9 | 8 | | | |
| Other liquid bulks | 19 | 17 | 15 | 13 | 12 | 10 | | | |
| **TOTAL : EXISTING EXPORTS** | **7,042** | **7,440** | **7,861** | **8,308** | **8,780** | **9,281** | | | |
| **TOTAL : IMPORT + EXPORTS** | **42,491** | **44,663** | **46,947** | **49,350** | **51,878** | **54,538** | | | |
| *Growth.* | *5.2%* | *5.1%* | *5.1%* | *5.1%* | *5.1%* | *5.1%* | | | |
| TOTAL IMPORT + EXPORTS minus liquid bulks | *33,870* | *35,662* | *37,553* | *39,550* | *41,658* | *43,882* | | | |
| *Growth, excluding liquid bulks.* | *5.4%* | *5.3%* | *5.3%* | *5.3%* | *5.3%* | *5.3%* | | | |
| **TRANSHIPMENT (b)** | 97 | 89 | 82 | 76 | 70 | 64 | | | |
| **NEW CARGOES** | | | | | | | | | |
| Coal for 300 MW power station | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | | | |
| Titanium exports | 440 | 440 | 440 | 440 | 440 | 440 | | | |
| Compressed Natural Gas | | | | 50 million cu ft per day -----> | | | | | |
| | | | | | | | | | |
| **TOTAL INC NEW CARGOES (c)** | **44,028** | **46,192** | **48,469** | **50,866** | **53,388** | **56,042** | | | |
| | | | | | | | | | |
| **CONTAINERS** | | | | | | | | | |
| Containers ('000 tonnes) | 20,407 | 21,562 | 22,785 | 24,081 | 25,454 | 26,907 | | | |
| Containers ('000 TEU) | 2,485 | 2,627 | 2,777 | 2,937 | 3,105 | 3,284 | | | |
| | *5.7%* | *5.7%* | *5.7%* | *5.7%* | *5.7%* | *5.7%* | | | |
| Vehicles in '000 units | 323 | 339 | 356 | 374 | 392 | 411 | | | |

**Table 2.61: Summary of Vision 2030 Forecasts ( the "High Case" Forecast) ('000 tonnes)**

| | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 |
|---|---|---|---|---|---|---|---|---|---|
| Kenyan GDP Growth | 7.0 | 2.5 | 7.9 | 8.7 | 9.0 | 10.0 | 10.0 | 10.0 | 10.0 |
| Ugandan GDP Growth | | 5.0 | 6.5 | 6.5 | 6.5 | 6.5 | 6.5 | 6.5 | 6.5 |
| **EXISTING CARGOES** | | | | | | | | | |
| **Imports** | | | | | | | | | |
| Petroleum(a) | 4,798 | 4,891 | 5,181 | 5,508 | 5,855 | 6,250 | 5,656 | 6,072 | 6,496 |
| Clinker | 1,051 | 1,112 | 1,250 | 1,398 | 1,546 | 1,725 | 1,926 | 2,135 | 2,348 |
| Wheat in bulk | 858 | 893 | 974 | 1,062 | 1,152 | 1,260 | 1,378 | 1,509 | 1,652 |
| Iron & steel | 621 | 639 | 684 | 738 | 797 | 868 | 945 | 1,029 | 1,121 |
| Edible oil & other bulk liquids | 676 | 695 | 745 | 803 | 867 | 943 | 1,026 | 1,117 | 1,217 |
| Sugar | 372 | 370 | 404 | 452 | 514 | 592 | 679 | 775 | 882 |
| Rice | 328 | 332 | 345 | 359 | 374 | 392 | 410 | 429 | 450 |
| Vehicles | 287 | 307 | 352 | 405 | 465 | 537 | 616 | 703 | 797 |
| Fertilisers | 383 | 384 | 389 | 393 | 399 | 404 | 410 | 416 | 422 |
| Coal | 176 | 186 | 209 | 234 | 259 | 289 | 323 | 358 | 393 |
| Others, Containerised | 3,137 | 3,343 | 3,755 | 4,236 | 4,778 | 5,429 | 6,155 | 6,962 | 7,854 |
| *of which Containerised Sugar* | *272* | *370* | *404* | *452* | *514* | *592* | *679* | *775* | *882* |
| *Containerised Rice* | *315* | *332* | *345* | *359* | *374* | *392* | *410* | *429* | *450* |
| Other conventional | 255 | 253 | 251 | 250 | 260 | 270 | 280 | 290 | 300 |
| Other dry bulk | 328 | 336 | 345 | 354 | 363 | 372 | 381 | 391 | 401 |
| **TOTAL : EXISTING IMPORTS** | **13,270** | **13,743** | **14,883** | **16,191** | **17,628** | **19,330** | **20,186** | **22,186** | **24,333** |
| **Exports** | | | | | | | | | |
| Containerised cargo | 1,653 | 1,761 | 1,978 | 2,232 | 2,518 | 2,861 | 3,243 | 3,668 | 4,138 |
| *of which – Tea* | *464* | *487* | *512* | *537* | *564* | *592* | *622* | *653* | *686* |
| *- Soda Ash* | *309* | *366* | *423* | *480* | *560* | *640* | *720* | *801* | *881* |
| Soda ash in bulk | 77 | 91 | 105 | 120 | 140 | 160 | 180 | 199 | 219 |
| Other dry bulks | 128 | 114 | 101 | 89 | 79 | 70 | 62 | 55 | 49 |
| Other liquid bulks | 167 | 148 | 131 | 116 | 103 | 91 | 81 | 72 | 63 |
| **TOTAL : EXISTING EXPORTS** | 1,948 | 2,023 | 2,210 | 2,438 | 2,700 | 3,022 | 3,386 | 3,795 | 4,251 |
| **TOTAL : IMPORT + EXPORTS** | **15,218** | **15,765** | **17,093** | **18,629** | **20,328** | **22,352** | **23,572** | **25,981** | **28,584** |
| *Growth.* | | *3.6%* | *8.4%* | *9.0%* | *9.1%* | *10.0%* | *5.5%* | *10.2%* | *10.0%* |
| TOTAL IMPORT + EXPORTS minus liquid bulks | *9,744* | *10,179* | *11,168* | *12,319* | *13,606* | *15,159* | *16,890* | *18,792* | *20,871* |
| *Growth, excluding liquid bulks.* | | *4.5%* | *9.7%* | *10.3%* | *10.5%* | *11.4%* | *11.4%* | *11.3%* | *11.1%* |
| **TRANSHIPMENT (b)** | 426 | 392 | 361 | 333 | 307 | 283 | 260 | 240 | 221 |
| **NEW CARGOES** | | | | | | | | | |
| Coal for 300 MW power station | 0 | 0 | 0 | 0 | 0 | 1,000 | 1,000 | 1,000 | 1,000 |
| Titanium exports | 0 | 0 | 0 | 0 | 0 | 440 | 440 | 440 | 440 |
| Compressed Natural Gas | | | | 50 million cu ft per day -----> | | | | | |
| | | | | | | | | | |
| **TOTAL INC NEW CARGOES (c)** | **15,644** | **16,158** | **17,455** | **18,962** | **20,634** | **24,074** | **25,272** | **27,661** | **30,244** |
| | | | | | | | | | |
| **CONTAINERS** | | | | | | | | | |
| Containers ('000 tonnes) | 5,216 | 5,496 | 6,094 | 6,802 | 7,602 | 8,572 | 9,659 | 10,870 | 12,213 |
| Containers ('000 TEU) | 586 | 624 | 701 | 791 | 892 | 1,014 | 1,150 | 1,300 | 1,467 |
| | | *6.6%* | *12.3%* | *12.8%* | *12.8%* | *13.6%* | *13.4%* | *13.1%* | *12.8%* |
| Vehicles in '000 units | 74 | 79 | 91 | 104 | 120 | 138 | 158 | 181 | 205 |

(cont)

**Table 2.61 (cont)**
**Summary of Vision 2030 Forecasts ( the "High Case" Forecast)**

| | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 |
|---|---|---|---|---|---|---|---|---|---|
| Kenyan GDP Growth | 10.0 | 10.0 | 10.0 | 10.0 | 10.0 | 9.0 | 9.0 | 9.0 | 9.0 |
| Ugandan GDP Growth | 6.5 | 6.5 | 6.5 | 6.5 | 6.5 | 6.5 | 6.5 | 6.5 | 6.5 |
| **EXISTING CARGOES** | | | | | | | | | |
| **Imports** | | | | | | | | | |
| Petroleum(a) | 5,946 | 6,423 | 6,928 | 7,464 | 7,032 | 7,573 | 8,144 | 8,746 | 9,380 |
| Clinker | 2,583 | 2,843 | 3,131 | 3,448 | 3,800 | 4,155 | 4,545 | 4,972 | 5,441 |
| Wheat in bulk | 1,796 | 1,952 | 2,124 | 2,311 | 2,516 | 2,720 | 2,942 | 3,182 | 3,443 |
| Iron & steel | 1,222 | 1,333 | 1,454 | 1,586 | 1,731 | 1,876 | 2,033 | 2,203 | 2,388 |
| Edible oil & other bulk liquids | 1,326 | 1,445 | 1,575 | 1,718 | 1,874 | 2,030 | 2,199 | 2,383 | 2,582 |
| Sugar | 1,001 | 1,133 | 1,279 | 1,441 | 1,621 | 1,798 | 1,992 | 2,204 | 2,437 |
| Rice | 471 | 493 | 516 | 541 | 566 | 591 | 616 | 643 | 670 |
| Vehicles | 898 | 1,005 | 1,117 | 1,233 | 1,351 | 1,459 | 1,576 | 1,703 | 1,841 |
| Fertilisers | 428 | 434 | 440 | 446 | 452 | 458 | 464 | 470 | 476 |
| Coal | 433 | 476 | 524 | 577 | 636 | 696 | 761 | 833 | 911 |
| Others, Containerised | 8,835 | 9,909 | 11,079 | 12,348 | 13,730 | 15,094 | 16,549 | 18,154 | 19,923 |
| *of which Containerised Sugar* | *1,001* | *1,133* | *1,279* | *1,441* | *1,621* | *1,798* | *1,992* | *2,204* | *2,437* |
| *Containerised Rice* | *471* | *493* | *516* | *541* | *566* | *591* | *616* | *643* | *670* |
| Other conventional | 310 | 320 | 330 | 340 | 350 | 360 | 370 | 380 | 390 |
| Other dry bulk | 411 | 422 | 433 | 444 | 455 | 467 | 479 | 491 | 503 |
| **TOTAL : EXISTING IMPORTS** | **25,659** | **28,188** | **30,931** | **33,898** | **36,116** | **39,277** | **42,670** | **46,364** | **50,386** |
| **Exports** | | | | | | | | | |
| Containerised cargo | 4,655 | 5,221 | 5,838 | 6,507 | 7,235 | 7,954 | 8,721 | 9,566 | 10,498 |
| *of which – Tea* | *720* | *756* | *794* | *833* | *875* | *919* | *965* | *1,013* | *1,063* |
| *- Soda Ash* | *945* | *1,009* | *1,073* | *1,137* | *1,201* | *1,201* | *1,201* | *1,201* | *1,201* |
| Soda ash in bulk | 235 | 251 | 267 | 283 | 299 | 299 | 299 | 299 | 299 |
| Other dry bulks | 43 | 38 | 34 | 30 | 27 | 24 | 21 | 19 | 17 |
| Other liquid bulks | 56 | 50 | 44 | 39 | 35 | 31 | 27 | 24 | 21 |
| **TOTAL : EXISTING EXPORTS** | 4,755 | 5,310 | 5,916 | 6,576 | 7,297 | 8,008 | 8,769 | 9,609 | 10,536 |
| **TOTAL : IMPORT + EXPORTS** | **30,414** | **33,498** | **36,847** | **40,474** | **43,412** | **47,285** | **51,439** | **55,972** | **60,922** |
| *Growth.* | *6.4%* | *10.1%* | *10.0%* | *9.8%* | *7.3%* | *8.9%* | *8.8%* | *8.8%* | *8.8%* |
| TOTAL IMPORT + EXPORTS minus liquid bulks | *23,142* | *25,630* | *28,344* | *31,292* | *34,506* | *37,682* | *41,096* | *44,844* | *48,960* |
| *Growth, excluding liquid bulks.* | *10.9%* | *10.7%* | *10.6%* | *10.4%* | *10.3%* | *9.2%* | *9.1%* | *9.1%* | *9.2%* |
| **TRANSHIPMENT (b)** | 203 | 187 | 173 | 159 | 146 | 135 | 124 | 114 | 105 |
| **NEW CARGOES** | | | | | | | | | |
| Coal for 300 MW power station | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 |
| Titanium exports | 440 | 440 | 440 | 440 | 440 | 440 | 440 | 440 | 440 |
| Compressed Natural Gas | | | | 50 million cu ft per day -----> | | | | | |
| | | | | | | | | | |
| **TOTAL INC NEW CARGOES (c)** | **32,058** | **35,125** | **38,460** | **42,073** | **44,999** | **48,860** | **53,003** | **57,527** | **62,468** |
| | | | | | | | | | |
| **CONTAINERS** | | | | | | | | | |
| Containers ('000 tonnes) | 13,693 | 15,318 | 17,090 | 19,014 | 21,112 | 23,183 | 25,394 | 27,834 | 30,526 |
| Containers ('000 TEU) | 1,650 | 1,851 | 2,070 | 2,307 | 2,565 | 2,820 | 3,091 | 3,391 | 3,722 |
| | *12.5%* | *12.2%* | *11.8%* | *11.5%* | *11.2%* | *9.9%* | *9.6%* | *9.7%* | *9.7%* |
| Vehicles in '000 units | 231 | 259 | 287 | 317 | 348 | 375 | 405 | 438 | 474 |

(cont)

**Table 2.61 (cont)**
**Summary of Vision 2030 Forecasts ( the "High Case" Forecast)**

| | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | | | |
|---|---|---|---|---|---|---|---|---|---|
| Kenyan GDP Growth | 7.0 | 7.0 | 7.0 | 7.0 | 7.0 | 7.0 | | | |
| Ugandan GDP Growth | 6.5 | 6.5 | 6.5 | 6.5 | 6.5 | 6.5 | | | |
| **EXISTING CARGOES** | | | | | | | | | |
| **Imports** | | | | | | | | | |
| Petroleum(a) | 9,900 | 10,442 | 11,007 | 11,595 | 12,208 | 12,847 | | | |
| Clinker | 5,859 | 6,309 | 6,794 | 7,317 | 7,880 | 8,488 | | | |
| Wheat in bulk | 3,671 | 3,865 | 4,070 | 4,286 | 4,513 | 4,753 | | | |
| Iron & steel | 2,548 | 2,719 | 2,902 | 3,097 | 3,306 | 3,528 | | | |
| Edible oil & other bulk liquids | 2,755 | 2,939 | 3,136 | 3,346 | 3,571 | 3,811 | | | |
| Sugar | 2,631 | 2,839 | 3,062 | 3,301 | 3,559 | 3,835 | | | |
| Rice | 693 | 717 | 741 | 766 | 792 | 819 | | | |
| Vehicles | 1,962 | 2,090 | 2,227 | 2,374 | 2,530 | 2,697 | | | |
| Fertilisers | 481 | 485 | 490 | 495 | 500 | 505 | | | |
| Coal | 981 | 1,056 | 1,138 | 1,225 | 1,320 | 1,421 | | | |
| Others, Containerised | 21,483 | 23,170 | 24,993 | 26,963 | 29,092 | 31,393 | | | |
| *of which Containerised Sugar* | *2,631* | *2,839* | *3,062* | *3,301* | *3,559* | *3,835* | | | |
| *Containerised Rice* | *693* | *717* | *741* | *766* | *792* | *819* | | | |
| Other conventional | 400 | 410 | 420 | 430 | 440 | 450 | | | |
| Other dry bulk | 516 | 529 | 543 | 557 | 571 | 585 | | | |
| **TOTAL : EXISTING IMPORTS** | **53,879** | **57,571** | **61,522** | **65,752** | **70,281** | **75,132** | | | |
| **Exports** | | | | | | | | | |
| Containerised cargo | 11,320 | 12,209 | 13,170 | 14,208 | 15,329 | 16,542 | | | |
| *of which – Tea* | *1,117* | *1,173* | *1,231* | *1,293* | *1,357* | *1,425* | | | |
| *- Soda Ash* | *1,201* | *1,201* | *1,201* | *1,201* | *1,201* | *1,201* | | | |
| Soda ash in bulk | 299 | 299 | 299 | 299 | 299 | 299 | | | |
| Other dry bulks | 15 | 13 | 12 | 10 | 9 | 8 | | | |
| Other liquid bulks | 19 | 17 | 15 | 13 | 12 | 10 | | | |
| **TOTAL : EXISTING EXPORTS** | 11,354 | 12,239 | 13,196 | 14,231 | 15,350 | 16,560 | | | |
| **TOTAL : IMPORT + EXPORTS** | **65,233** | **69,810** | **74,718** | **79,983** | **85,631** | **91,692** | | | |
| *Growth.* | *7.1%* | *7.0%* | *7.0%* | *7.0%* | *7.1%* | *7.1%* | | | |
| TOTAL IMPORT + EXPORTS minus liquid bulks | *52,578* | *56,429* | *60,575* | *65,041* | *69,852* | *75,035* | | | |
| *Growth, excluding liquid bulks.* | *7.4%* | *7.3%* | *7.3%* | *7.4%* | *7.4%* | *7.4%* | | | |
| **TRANSHIPMENT (b)** | 97 | 89 | 82 | 76 | 70 | 64 | | | |
| **NEW CARGOES** | | | | | | | | | |
| Coal for 300 MW power station | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | | | |
| Titanium exports | 440 | 440 | 440 | 440 | 440 | 440 | | | |
| Compressed Natural Gas | | | | 50 million cu ft per day | | | -----> | | |
| | | | | | | | | | |
| **TOTAL INC NEW CARGOES (c)** | **66,770** | **71,339** | **76,240** | **81,499** | **87,141** | **93,197** | | | |
| | | | | | | | | | |
| **CONTAINERS** | | | | | | | | | |
| Containers ('000 tonnes) | 32,901 | 35,468 | 38,245 | 41,246 | 44,491 | 47,999 | | | |
| Containers ('000 TEU) | 4,013 | 4,328 | 4,669 | 5,037 | 5,434 | 5,864 | | | |
| | *7.8%* | *7.9%* | *7.9%* | *7.9%* | *7.9%* | *7.9%* | | | |
| Vehicles in '000 units | 505 | 538 | 573 | 611 | 651 | 694 | | | |

**Table 2.62 Summary of Low Forecasts ('000 tonnes)**

| | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 |
|---|---|---|---|---|---|---|---|---|---|
| Kenyan GDP Growth | 7.0 | 2.5 | 4.3 | 4.8 | 5.0 | 5.5 | 5.5 | 5.5 | 5.5 |
| Ugandan GDP Growth | | 3.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 |
| **EXISTING CARGOES** | | | | | | | | | |
| **Imports** | | | | | | | | | |
| Petroleum(a) | 4,798 | 4,891 | 5,050 | 5,226 | 5,407 | 5,607 | 4,808 | 5,007 | 5,206 |
| Clinker | 1,051 | 1,111 | 1,197 | 1,285 | 1,370 | 1,468 | 1,572 | 1,676 | 1,778 |
| Wheat in bulk | 858 | 892 | 943 | 996 | 1,048 | 1,108 | 1,171 | 1,238 | 1,308 |
| Iron & steel | 621 | 638 | 666 | 697 | 731 | 770 | 810 | 853 | 897 |
| Edible oil & other bulk liquids | 676 | 695 | 725 | 759 | 796 | 838 | 882 | 928 | 976 |
| Sugar | 372 | 370 | 381 | 400 | 424 | 455 | 487 | 521 | 558 |
| Rice | 328 | 332 | 340 | 348 | 356 | 366 | 375 | 386 | 396 |
| Vehicles | 287 | 306 | 336 | 369 | 404 | 443 | 483 | 525 | 568 |
| Fertilisers | 383 | 384 | 387 | 389 | 392 | 395 | 398 | 401 | 405 |
| Coal | 176 | 186 | 200 | 215 | 229 | 246 | 263 | 281 | 298 |
| Others, Containerised | 3,137 | 3,343 | 3,610 | 3,905 | 4,217 | 4,568 | 4,937 | 5,323 | 5,725 |
| *of which Containerised Sugar* | *272* | *370* | *381* | *400* | *424* | *455* | *487* | *521* | *558* |
| *Containerised Rice* | *315* | *332* | *340* | *348* | *356* | *366* | *375* | *386* | *396* |
| Other conventional | 255 | 253 | 251 | 250 | 260 | 270 | 280 | 290 | 300 |
| Other dry bulk | 328 | 336 | 345 | 354 | 363 | 372 | 381 | 391 | 401 |
| **TOTAL : EXISTING IMPORTS** | **13,270** | **13,736** | **14,431** | **15,193** | **15,997** | **16,904** | **16,848** | **17,820** | **18,816** |
| **Exports** | | | | | | | | | |
| Containerised cargo | 1,653 | 1,761 | 1,902 | 2,058 | 2,222 | 2,407 | 2,601 | 2,805 | 3,017 |
| *of which – Tea* | *464* | *487* | *512* | *537* | *564* | *592* | *622* | *653* | *686* |
| *- Soda Ash* | *309* | *366* | *423* | *480* | *560* | *640* | *720* | *801* | *881* |
| Soda ash in bulk | 77 | 91 | 105 | 120 | 140 | 160 | 180 | 199 | 219 |
| Other dry bulks | 128 | 114 | 101 | 89 | 79 | 70 | 62 | 55 | 49 |
| Other liquid bulks | 167 | 148 | 131 | 116 | 103 | 91 | 81 | 72 | 63 |
| **TOTAL : EXISTING EXPORTS** | 1,948 | 2,023 | 2,134 | 2,263 | 2,404 | 2,568 | 2,744 | 2,932 | 3,129 |
| **TOTAL : IMPORT + EXPORTS** | **15,218** | **15,759** | **16,565** | **17,456** | **18,401** | **19,472** | **19,593** | **20,752** | **21,945** |
| *Growth.* | | *3.6%* | *5.1%* | *5.4%* | *5.4%* | *5.8%* | *0.6%* | *5.9%* | *5.8%* |
| TOTAL IMPORT + EXPORTS minus liquid bulks | *9,744* | *10,174* | *10,790* | *11,471* | *12,199* | *13,027* | *13,904* | *14,817* | *15,763* |
| *Growth, excluding liquid bulks.* | | *4.4%* | *6.1%* | *6.3%* | *6.3%* | *6.8%* | *6.7%* | *6.6%* | *6.4%* |
| **TRANSHIPMENT (b)** | 426 | 392 | 361 | 333 | 307 | 283 | 260 | 240 | 221 |
| **NEW CARGOES** | | | | | | | | | |
| Coal for 300 MW power station | 0 | 0 | 0 | 0 | 0 | 1,000 | 1,000 | 1,000 | 1,000 |
| Titanium exports | 0 | 0 | 0 | 0 | 0 | 440 | 440 | 440 | 440 |
| Compressed Natural Gas | | | | 50 million cu ft per day -----> | | | | | |
| | | | | | | | | | |
| **TOTAL INC NEW CARGOES (c)** | **15,644** | **16,151** | **16,927** | **17,789** | **18,708** | **21,195** | **21,293** | **22,432** | **23,606** |
| | | | | | | | | | |
| **CONTAINERS** | | | | | | | | | |
| Containers ('000 tonnes) | 5,216 | 5,496 | 5,874 | 6,296 | 6,745 | 7,257 | 7,799 | 8,368 | 8,962 |
| Containers ('000 TEU) | 586 | 624 | 674 | 729 | 788 | 853 | 922 | 994 | 1,069 |
| | | *6.6%* | *8.0%* | *8.2%* | *8.0%* | *8.3%* | *8.1%* | *7.8%* | *7.6%* |
| Vehicles in '000 units | 74 | 79 | 86 | 95 | 104 | 114 | 124 | 135 | 146 |

(cont)

**Table 2.62 (cont)**
**Summary of Low Forecasts ('000 tonnes)**

| | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 |
|---|---|---|---|---|---|---|---|---|---|
| Kenyan GDP Growth | 5.5 | 5.5 | 5.5 | 5.5 | 5.5 | 5.5 | 5.5 | 5.5 | 5.5 |
| Ugandan GDP Growth | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 |
| **EXISTING CARGOES** | | | | | | | | | |
| **Imports** | | | | | | | | | |
| Petroleum(a) | 4,410 | 4,622 | 4,841 | 5,066 | 4,299 | 4,516 | 4,739 | 4,969 | 5,206 |
| Clinker | 1,886 | 2,001 | 2,123 | 2,253 | 2,391 | 2,526 | 2,670 | 2,821 | 2,982 |
| Wheat in bulk | 1,376 | 1,448 | 1,523 | 1,602 | 1,685 | 1,766 | 1,851 | 1,940 | 2,034 |
| Iron & steel | 945 | 994 | 1,047 | 1,102 | 1,160 | 1,216 | 1,275 | 1,337 | 1,401 |
| Edible oil & other bulk liquids | 1,028 | 1,082 | 1,138 | 1,198 | 1,261 | 1,322 | 1,386 | 1,453 | 1,524 |
| Sugar | 597 | 638 | 682 | 729 | 779 | 824 | 872 | 923 | 976 |
| Rice | 407 | 417 | 429 | 440 | 452 | 463 | 474 | 486 | 498 |
| Vehicles | 611 | 655 | 698 | 741 | 783 | 820 | 859 | 900 | 943 |
| Fertilisers | 408 | 411 | 414 | 417 | 421 | 424 | 427 | 430 | 433 |
| Coal | 316 | 335 | 356 | 377 | 400 | 423 | 447 | 472 | 499 |
| Others, Containerised | 6,141 | 6,570 | 7,010 | 7,458 | 7,924 | 8,372 | 8,833 | 9,321 | 9,837 |
| *of which Containerised Sugar* | *597* | *638* | *682* | *729* | *779* | *824* | *872* | *923* | *976* |
| *Containerised Rice* | *407* | *417* | *429* | *440* | *452* | *463* | *474* | *486* | *498* |
| Other conventional | 310 | 320 | 330 | 340 | 350 | 360 | 370 | 380 | 390 |
| Other dry bulk | 411 | 422 | 433 | 444 | 455 | 467 | 479 | 491 | 503 |
| **TOTAL : EXISTING IMPORTS** | **18,846** | **19,916** | **21,023** | **22,168** | **22,360** | **23,500** | **24,682** | **25,923** | **27,225** |
| **Exports** | | | | | | | | | |
| Containerised cargo | 3,236 | 3,462 | 3,694 | 3,930 | 4,176 | 4,412 | 4,654 | 4,911 | 5,183 |
| *of which – Tea* | *720* | *756* | *794* | *833* | *875* | *919* | *965* | *1,013* | *1,063* |
| *- Soda Ash* | *945* | *1,009* | *1,073* | *1,137* | *1,201* | *1,201* | *1,201* | *1,201* | *1,201* |
| Soda ash in bulk | 235 | 251 | 267 | 283 | 299 | 299 | 299 | 299 | 299 |
| Other dry bulks | 43 | 38 | 34 | 30 | 27 | 24 | 21 | 19 | 17 |
| Other liquid bulks | 56 | 50 | 44 | 39 | 35 | 31 | 27 | 24 | 21 |
| **TOTAL : EXISTING EXPORTS** | 3,336 | 3,550 | 3,772 | 3,999 | 4,237 | 4,466 | 4,703 | 4,954 | 5,221 |
| **TOTAL : IMPORT + EXPORTS** | **22,182** | **23,466** | **24,795** | **26,167** | **26,597** | **27,966** | **29,385** | **30,878** | **32,447** |
| *Growth.* | *1.1%* | *5.8%* | *5.7%* | *5.5%* | *1.6%* | *5.1%* | *5.1%* | *5.1%* | *5.1%* |
| TOTAL IMPORT + EXPORTS minus liquid bulks | *16,744* | *17,762* | *18,816* | *19,903* | *21,036* | *22,127* | *23,260* | *24,455* | *25,717* |
| *Growth, excluding liquid bulks.* | *6.2%* | *6.1%* | *5.9%* | *5.8%* | *5.7%* | *5.2%* | *5.1%* | *5.1%* | *5.2%* |
| **TRANSHIPMENT (b)** | 203 | 187 | 173 | 159 | 146 | 135 | 124 | 114 | 105 |
| **NEW CARGOES** | | | | | | | | | |
| Coal for 300 MW power station | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 |
| Titanium exports | 440 | 440 | 440 | 440 | 440 | 440 | 440 | 440 | 440 |
| Compressed Natural Gas | | | | 50 million cu ft per day -----> | | | | | |
| | | | | | | | | | |
| **TOTAL INC NEW CARGOES (c)** | **23,825** | **25,093** | **26,408** | **27,766** | **28,183** | **29,541** | **30,950** | **32,432** | **33,992** |
| | | | | | | | | | |
| **CONTAINERS** | | | | | | | | | |
| Containers ('000 tonnes) | 9,581 | 10,219 | 10,876 | 11,547 | 12,246 | 12,919 | 13,612 | 14,347 | 15,125 |
| Containers ('000 TEU) | 1,147 | 1,227 | 1,309 | 1,393 | 1,480 | 1,564 | 1,650 | 1,741 | 1,838 |
| | *7.3%* | *7.0%* | *6.7%* | *6.4%* | *6.3%* | *5.7%* | *5.5%* | *5.5%* | *5.5%* |
| Vehicles in '000 units | 157 | 168 | 180 | 191 | 201 | 211 | 221 | 232 | 243 |

(cont)

**Table 2.62 (cont)**
**Summary of Low Forecasts ('000 tonnes)**

| | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | | | |
|---|---|---|---|---|---|---|---|---|---|
| Kenyan GDP Growth | 5.5 | 5.5 | 5.5 | 5.5 | 5.5 | 5.5 | | | |
| Ugandan GDP Growth | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | | | |
| **EXISTING CARGOES** | | | | | | | | | |
| **Imports** | | | | | | | | | |
| Petroleum(a) | 5,396 | 5,590 | 5,788 | 5,991 | 6,199 | 6,411 | | | |
| Clinker | 3,125 | 3,274 | 3,431 | 3,595 | 3,767 | 3,947 | | | |
| Wheat in bulk | 2,116 | 2,184 | 2,255 | 2,328 | 2,404 | 2,481 | | | |
| Iron & steel | 1,457 | 1,516 | 1,576 | 1,639 | 1,705 | 1,773 | | | |
| Edible oil & other bulk liquids | 1,585 | 1,648 | 1,714 | 1,783 | 1,854 | 1,929 | | | |
| Sugar | 1,014 | 1,053 | 1,095 | 1,137 | 1,182 | 1,228 | | | |
| Rice | 508 | 518 | 528 | 538 | 549 | 560 | | | |
| Vehicles | 982 | 1,022 | 1,064 | 1,108 | 1,153 | 1,201 | | | |
| Fertilisers | 435 | 437 | 440 | 442 | 445 | 447 | | | |
| Coal | 523 | 548 | 575 | 602 | 631 | 661 | | | |
| Others, Containerised | 10,296 | 10,777 | 11,282 | 11,811 | 12,365 | 12,946 | | | |
| *of which Containerised Sugar* | *1,014* | *1,053* | *1,095* | *1,137* | *1,182* | *1,228* | | | |
| *Containerised Rice* | *508* | *518* | *528* | *538* | *549* | *560* | | | |
| Other conventional | 400 | 410 | 420 | 430 | 440 | 450 | | | |
| Other dry bulk | 516 | 529 | 543 | 557 | 571 | 585 | | | |
| **TOTAL : EXISTING IMPORTS** | **28,352** | **29,507** | **30,710** | **31,962** | **33,264** | **34,620** | | | |
| **Exports** | | | | | | | | | |
| Containerised cargo | 5,425 | 5,679 | 5,945 | 6,224 | 6,516 | 6,822 | | | |
| *of which – Tea* | *1,117* | *1,173* | *1,231* | *1,293* | *1,357* | *1,425* | | | |
| *- Soda Ash* | *1,201* | *1,201* | *1,201* | *1,201* | *1,201* | *1,201* | | | |
| Soda ash in bulk | 299 | 299 | 299 | 299 | 299 | 299 | | | |
| Other dry bulks | 15 | 13 | 12 | 10 | 9 | 8 | | | |
| Other liquid bulks | 19 | 17 | 15 | 13 | 12 | 10 | | | |
| **TOTAL : EXISTING EXPORTS** | 5,459 | 5,709 | 5,971 | 6,247 | 6,536 | 6,840 | | | |
| **TOTAL : IMPORT + EXPORTS** | **33,811** | **35,216** | **36,681** | **38,209** | **39,801** | **41,460** | | | |
| *Growth.* | *4.2%* | *4.2%* | *4.2%* | *4.2%* | *4.2%* | *4.2%* | | | |
| TOTAL IMPORT + EXPORTS minus liquid bulks | *26,830* | *27,978* | *29,179* | *30,435* | *31,748* | *33,120* | | | |
| *Growth, excluding liquid bulks.* | *4.3%* | *4.3%* | *4.3%* | *4.3%* | *4.3%* | *4.3%* | | | |
| **TRANSHIPMENT (b)** | 97 | 89 | 82 | 76 | 70 | 64 | | | |
| **NEW CARGOES** | | | | | | | | | |
| Coal for 300 MW power station | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | | | |
| Titanium exports | 440 | 440 | 440 | 440 | 440 | 440 | | | |
| Compressed Natural Gas | | | | 50 million cu ft per day -----> | | | | | |
| | | | | | | | | | |
| **TOTAL INC NEW CARGOES (c)** | **35,348** | **36,746** | **38,204** | **39,725** | **41,311** | **42,965** | | | |
| | | | | | | | | | |
| **CONTAINERS** | | | | | | | | | |
| Containers ('000 tonnes) | 15,818 | 16,546 | 17,309 | 18,110 | 18,951 | 19,833 | | | |
| Containers ('000 TEU) | 1,923 | 2,013 | 2,108 | 2,206 | 2,310 | 2,418 | | | |
| | *4.7%* | *4.7%* | *4.7%* | *4.7%* | *4.7%* | *4.7%* | | | |
| Vehicles in '000 units | 253 | 263 | 274 | 285 | 297 | 309 | | | |

# CHAPTER THREE: EXISTING PORT INFRASTRUCTURE

This chapter provides a brief overview of the existing facilities at the port of Mombasa. The layout of the port is shown in Drawing 2009-1.

## 3.1 Nautical Access

Ships entering Mombasa Harbour have to navigate the S bend between Ras Serani and Ras Mzime. The pilots board the vessels about 2-3 miles out and at the time of boarding the ships need to be making about 7 to 10 knots. There is a northerly set which runs throughout the year, and it becomes strong with the onset of the south-west monsoon. If vessels go too slowly they will be pushed too far north in the channel. Having negotiated the bend, vessels have to slow down for the ferries, which run constantly across the channel.

Due to the restrictions imposed by the S bends and the charted depth of the channel, the maximum allowable length of vessel that can enter the Port at present is a tanker 259 m long, with a draft of 13.25 m and carrying 80,000 tonnes of crude/product. Pilots board such vessels in day time, 1.5 hours before high water. This also applies to partially loaded larger tankers not exceeding 110,000 DWT loaded to a maximum draft of 12.5 m. The present nominal depth in the outer channel is 13.77 m below chart datum as was the case in June 2008.

KPA proposes to dredge the entrance channel and the channel within the port to a depth of -15.0 m CD as far as the new Kipevu West container terminal in Port Reitz (not yet built). This work was scheduled to start in 2009 but has been delayed. The 2004 Masterplan recommended that the outer channel should be dredged to -17.5 m CD, but this has not been accepted, as based on experience it is not considered to be necessary.

Simulations have been carried out in Japan to determine the maximum size of container ship that can safely navigate the bends, assuming there is sufficient water depth. The maximum was found to be a 4,500 TEU capacity vessel 294 m long, but in strong winds it was difficult in the simulation runs to maintain the vessel's track within the channel. At its narrowest point the channel is less than 300 m wide. The conclusion from the simulation was that this size of vessel could only be brought in at slack water (2 hours before high water of at low water) and with wind speeds less than 15 m/sec.

The size of ships which can be accommodated at the anchorages has not changed since 2004, and is shown in Table 3.1.

**Table 3.1: Mombasa Anchorages**

| Buoy | Maximum length LOA (m) | Available depth below CD (m) |
|---|---|---|
| K1 | 176.6 | 7.00 |
| K2 | 213.3 | 7.00 |
| K3 | 240.0 | 7.92 |
| K4 | 167.6 | 9.14 |
| M1 | 304.7 | 13.41 |
| M2 | 182.0 | 13.41 |
| M3 | 228.5 | 13.41 |
| M4 | 213.3 | 13.41 |
| M5 | 350.0 | 9.45 |

Source: KPA

## 3.2 Mbaraki Wharf

Mbaraki Wharf is an island structure 325m long connected to the land by access bridges. It is normally two berths with a depth alongside of -11.0 m CD, and provides a common user facility for solid and liquid bulks, although Bamburi Cement – one of the main users – has been licensed to carry out its own operations and has been given priority use of one of the berths and an area of land behind for stockpiling purposes.

**Figure 3.1: Mbaraki wharf**

Bamburi Cement imports the following commodities over the wharf:

- Coal
- Clinker
- Gypsum
- Iron Ore
- Bauxite
- Bulk cement

The wharf is also used for fertilizer imports, fluorspar exports, molasses and edible oils.

The bulk cement is handled by a pneumatic loading system and stored in three silos immediately behind the wharf. All the other materials are discharged using ships' grabs into hoppers which load small trucks of 7 tonne payload capacity due to the tight curves between the wharf and the access bridges.

These trucks dump the material in an open area behind the wharf. The material is then loaded onto large trucks (approx 20 tonne payload) by front end loaders for road haulage inland. This double handling operation creates dust and Bamburi has recently constructed a large steel framework covered with fine netting which covers the double handling operation in an attempt to reduce the dispersion of the dust.

In view of the double handling and the dust problem, Bamburi has opened negotiations with KPA to have the wharf improved so that large trucks can be used on the wharf, thus avoiding the need for double handling.

Bulk fluorspar is exported over the wharf, being loaded by conveyor and shiploader from a stockpile which is partially on a plot leased by the exporter. The fluorspar comes from a mine approximately 1000 km inland. Transport was by rail but due to the deterioration of the rail service it is now hauled the 1000 km by truck.

Bulk molasses and edible oils are imported through pipework on the wharf by East African Molasses Company Ltd and East African Storage Company Ltd respectively. Their storage tanks are on the hill behind the wharf.

It would be possible to extend the wharf in a northerly direction by 200m but there would be a very limited land area behind this extension.

### 3.3 Dockyard

There are seven slipways, all of which are operational. Slipways No 5 and 6 have been refurbished within the last two years and the lower ends of the rails on the other five slipways are in need of attention. Slipways 1 -3 are for the small boats, No 4 has a capacity of 600 tonnes and Nos 5, 6 and 7 have capacities of 125 tonnes.

The dockyard currently maintains the following KPA vessels

- 4 tugs
- 6 pilot boats

- 5 mooring boats
- 1 pollution control boat
- Pontoons
- 1 waste barge

Most of the buildings are in very poor condition, and some date back to 1908. In two cases (machine shop and cover over slipways 5, 6, and 7) there could be a collapse at any time which might cause serious injury. Some remedial action should be taken to strengthen the buildings.

### 3.4 Lighter Wharf/ Area G

This part of the Port includes the area from the dockyard to the main entrance gate and Berth 1 and is referred to as Area G. Apart from the large transit shed known as Shed D, the buildings and wharves in this area have not been changed since 2004, and they continue to deteriorate.

**Figure 3.2: View of Area G from the main port approach road**

Most of the open area between Berth 1 and the Dockyard is used for the storage of imported cars, vans and trucks. Some of the vehicles have been impounded there for many years because the importers have not been able to pay the required duty on them. Other vehicles are stored temporarily for a few hours or days until they are taken to off-dock compounds or delivered to their owners. There is little order in the way the vehicles are parked and the surface is very poor and uneven.

Buildings that have been condemned as unsafe include the Arson Shed, and Shed A and several of the smaller buildings. Some modifications have been made recently to Shed D so that it can be used by the Pollution Control Department for offices and for storage of equipment and chemicals.

A well planned facility for the Harbour Master and pilots has been constructed on the promontory to the north of the lighter wharf, including a control tower and a jetty for mooring pilot and line boats.
The area between the lighter wharf and the main port entrance has several small buildings, rail tracks and areas of asphalt paving or bare earth. The whole area is in need of clearing to maximise its potential as a usable port storage area or an area that can be leased for an income for the KPA. The KPA has commenced disposing of the impounded vehicles.

### 3.5 Berths 1-6

The use of these berths continues as in 2004, with Berths 1 and 2 being used for a variety of traffic including passenger vessels, cruise liners and RoRo vessels carrying containers on trailers.

**Figure 3.3: Car carrier berthed at Berth 1 and 2**

The RoRo container operation is carried out by Messina Line who have 1700 TEU capacity RoRo vessels with 12 m wide quarter ramps. The Messina Line containers are stacked in a designated area between the wharf transit sheds and those at the back of the port area adjacent to the port road. In future Messina Line would like to use 2,200 TEU capacity vessels with a draft of 10.8 m.

Berth 3 is used by Grain Bulk Handlers Limited, with two 300 tonnes per hour dry bulk unloaders and a conveyor belt system up to the silos on the hill behind the port boundary.

GBHL has extended the booms on their unloaders by 4 m so that they can reach into the holds of larger vessels. They can now handle vessels up to partially laden 60,000 DWT bulk carriers, which are berthed at high tide, providing sufficient cargo can be discharged to ensure the vessel does not ground.

**Figure 3.4: Mobile grain unloaders on Berth 3**

**Figure 3.5: Mobile grain bagging plant**

Berth 4 is used for general cargo and Berth 5 is used by a mixture of general cargo vessels and RoRo vessels bringing vehicles and containers on trailers.

The remainder of the area behind Berths 1-5 is used for storage of containers that have been handled over Berths 11-18, due to the lack of space behind those berths. In addition, imported steel coils and structural sections are stacked behind Shed 5

Little use is made of the transit sheds on the wharf and Shed 1 is to be converted into a cruise liner terminal.

There are four 15 tonne capacity rail mounted dock cranes allocated to Berth 4 and Berth 5 has two 5 tonne capacity cranes

The length of frontage designated as Berth 6 remains a sloping revetment as there is a drainage outfall in that area. The land behind is used for stacking containers and imported rolled steel sections.

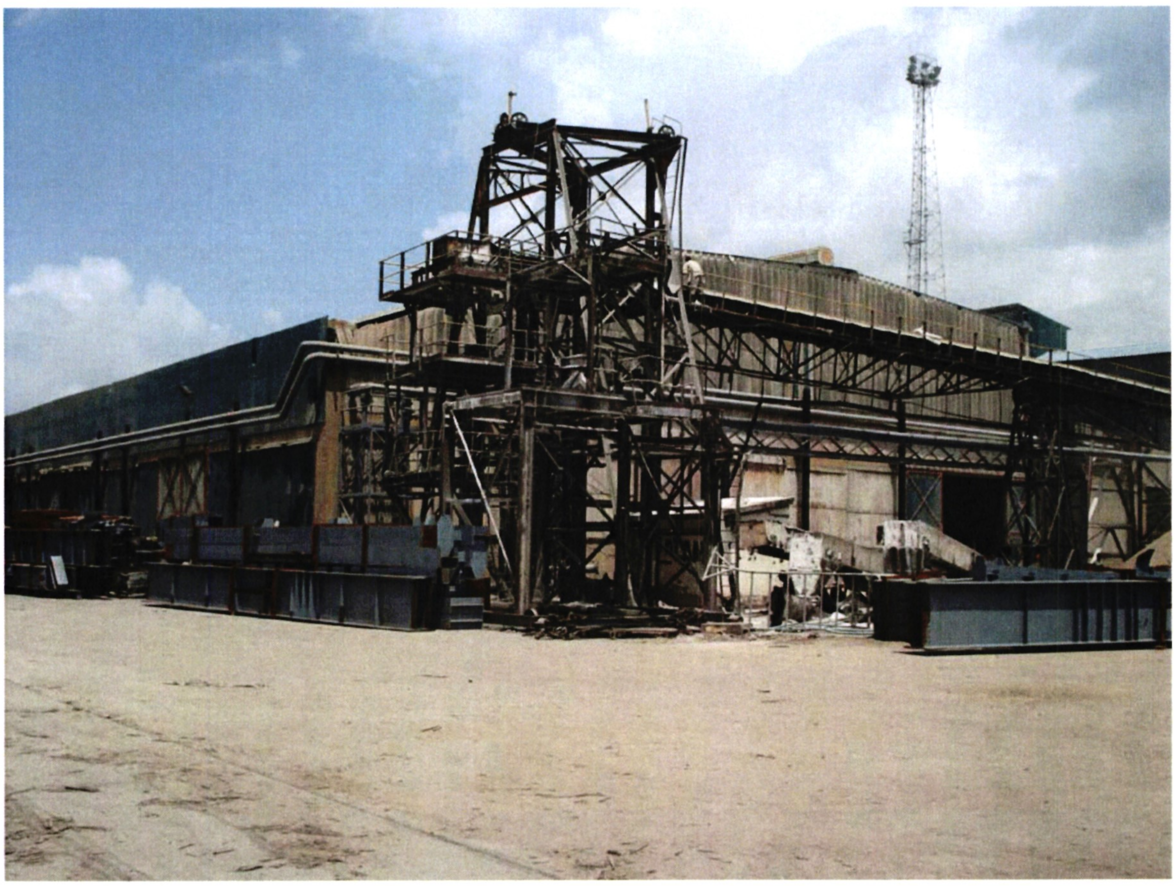
## 3.6 Berths 7-10

Berths 7-10 continue to be used for general cargo. All the deck between the quay line and the transit sheds along Berths 7-9 has been replaced and the replacement of the Berth 10 deck is almost complete. The design loading of 30 kN/ sq m and type of deck construction (deck beams spanning 18.9 metres) for the replacement deck is the same as the original design.

Berths 7 and 8 are equipped with four 7 tonne capacity cranes, and have pipework for supplying bunkers or receiving imports of fuel. There are manifolds below deck level to which standpipes can be attached during the loading operation.

Berth 9 is equipped with two conveyors for exporting bulk soda ash from Magadi Soda, whose depot is situated on the hill outside the port boundary. The two conveyors discharge into two fixed hoppers which then feed onto two loading conveyors which are supported by dockside cranes during the loading operations and are detached after loading is complete. This system is old and the two conveyors achieve a total of only 1,500 tonnes per ship day provided there are no delays due to rain.

**Figure 3.6: Magadi Soda conveyors on Berth 9**



The conveyors also support pipelines for importation of bulk liquid oils to East Africa Storage Co Ltd. These pipelines extend onto Berth 10, which is mostly used for the importation of the bulk liquids.

The large rail marshalling yard behind Berths 9 and 10 continues to be used by Kenya/Rift Valley Railways.

### 3.7 Shimanzi Oil Terminal

This terminal continues to be used for importation of a wide range of bulk liquids such as solvents, chemicals, edible oils and LPG, and the export of refined products. Fuels are also loaded onto barges for bunkering.

There is concern about the handling of LPG and other white flammable liquids at the terminal, especially as it is close to the Headquarters Building. There was a proposal to transfer handling these products to the Kipevu Oil Terminal but this has not happened yet. But a scheme has been developed for importing LPG through underwater pipelines at the western end of Port Reitz. African Gas & Oil Company Ltd has a concession for a period of 33 years and is now proceeding with developing its proposals for the project.

**Figure 3.7: Shimanzi Oil Terminal**

### 3.8 Headquarters Area

A new access road has been constructed from the main port road to allow vehicles to reach the Berth 11 area without the need to go over the bridge that leads to the Headquarters Building.

The barge-mounted power station moored immediately adjacent to Kipevu Bridge and operated by Westmont Power (Kenya) Ltd has been removed.

The original Kipevu Power Station and the power stations operated by Kengen and Tsavo Power Co Ltd remain in operation.

### 3.9 Berths 11-15

Berth 11 is used for general cargoes, dry bulk and containers and RoRo. All cargoes are handled by ships' gear. The transit shed on Berth 11 remains in use for bagged and other cargoes and is also used by Customs for scanning containers and complete stripping out of containers.

The paving behind the transit shed has been replaced by concrete paving but the large marshalling yard which has 7 tracks and occupies so much open storage behind Berths 11 and 12 remains in use.

Berth 12 is used for general cargoes and containers. The transit shed next to the berth has been demolished and re-paving of the area is in progress. This will improve the open storage area for container stacking. The paving has been designed for the loads from reachstackers.

Berths 13 and 14 are used almost entirely for containers, which are loaded and discharged using ship's gear as there are no crane beams and rails for ship to shore gantries. The open storage area behind the berths is in the process of being re-surfaced.

The length of waterfront referred to as Berth 15 is similar to Berth 6 and has only a sloping revetment due to the presence of a drainage outlet.

The "One Stop" document processing centre for Kenya Revenue Authority, Kenya Ports Authority and the Police offices is situated at the rear just outside the terminal boundary fence. The adjacent container stackyard is equipped with three RTGs stacking 6 containers wide and 1 over 5 high.

### 3.10 Berths 16-18

These three berths and the area behind them are referred to as the Container Terminal of the Port of Mombasa. At present there are 4 ship-to-shore gantries and 12 RTGs in the stackyard. At the back of the terminal there is a rail terminal with two RMGs. A further 2 ship-to-shore gantries and 10 RTGs have been ordered.

There are maintenance workshops and offices in a building at the western end of the terminal.

The stackyard is laid out with five blocks of container stacks each with six containers wide and a stacking capability of 1 over 5 boxes high. There is a further four containers-wide block under the RMGs of the rail terminal.

**Figure 3.8: Mombasa Container Terminal**

## 3.11 Kipevu Oil Terminal

There has been no change to this terminal since the 2004 Port Master Plan was prepared, and no facilities for importing LPG have yet been installed. Crude oil is imported for the Mombasa Refinery of Kenya Petroleum Refineries Ltd. There are also substantial amounts of refined products that can be transferred inland by the Kenya Pipeline Co Ltd or alternatively pumped into storage at other locations in Mombasa.

There is a plan to increase the rate at which the products are pumped inland and this should increase the maximum capacity of the terminal as the storage tanks will be drawn down faster after each delivery from the tankers. It is understood that the implementation of the plan is in hand.

**Figure 3.9: Kipevu Oil Terminal**

### 3.12 Road Access

Road and rail access to Mbaraki Wharf remains the same as at the time of the 2004 Port Master Plan. Road access is via the public roads and there is a single line rail link from the marshalling yard near Mombasa station. The Bamburi Cement Co trucks are routed along the western industrialised part of Mombasa to avoid going through the centre of town.

There has been no change to the Main Port Entrance since the 2004 Port Master Plan. The gate, which is referred to as Gates 9 and 10, has 8 lanes two for entry and 6 for exit. Vehicles waiting to exit the port have to queue along the main port road, as there is insufficient waiting area beside the gate.

The Shimanzi Gate, also called Gate No 12, is located behind Berth 7. There is a steep incline leading up to the gate from the internal port circulation road and there have been accidents with container lorries having brake failure and running backwards down the hill. It has now been closed to outward truck traffic.

The Kipevu gates are also referred to as Gates 18 and 19. Gate 18 is the main entry/exit point from Kipevu Road, with two lanes in and two lanes out-Gate 19 is strictly an exit gate from the container terminal, and includes the Kenya Revenue Authority container scanning facility. There is also a car park for agents and visitors to the One Stop document processing building. The length of road available queuing between the main container yard and Gate 18 is rather limited.

## 3.13 Rail Operations

There is rail access into the port at the Main Port Entrance, which is used infrequently, and at Gate 20 behind Berth 15 which is the main access for trains. The system of rail lines within the port is the same as described in the 2004 Port Master Plan.

The rail tracks within the port boundary are the responsibility of KPA, which also maintains the tracks. The operation of the railway within the port is the responsibility of the Kenya/Rift Valley Railways (KRVR). The decision on where the rail wagons shall be loaded or discharged is taken by KPA.

The service provided by the Railways is reported to have deteriorated since privatisation. One of the problems is the haulage capacity of the locomotives.

The main wagon marshalling yard within the port is behind Berths 11 and 12. The number of tracks there has been reduced from 12 to 8 after negotiations between KPA and KRVR. "Down" trains arrive and terminate in this marshalling yard and are divided into sections, depending on the berth destination of the cargoes.

Most "Up" trains leaving the port are also marshalled behind Berths 11 and 12 yard. The maximum train length is 40 wagons (2,400 ft or 732 m). A container wagon can typically hold three TEU, depending on the mix of 20ft and 40ft boxes, resulting in a maximum train capacity of 120 TEU.

It is a safety requirement of the Railway that the heaviest wagons shall be next to the locomotive, and this is a cause of some of the rearranging and shunting of the wagons.
According to the KRVR, some of the container trains that are loaded behind Berths 16- 18 do not take account of this safety requirement and this causes delays whilst the wagons are rearranged. KPA's view is that KRVR do not inform them of the capacity of the wagons they provide, so they cannot arrange the loading properly. It is reported that it takes 6 to 8 hours to load a container train behind Berths 16-18.

Trains which include oil wagons are marshalled in the yard behind Berths 9 and 10. Due to the steep gradient up to the oil tank farms behind the port, oil wagons for these trains can be hauled up or down only four wagons at a time, increasing the time required to prepare a train for departure.

KRVR's current target is to dispatch eight trains per day from the port (four container trains and four oil/ general cargo trains) but at present only four trains per day are dispatched.

Some containers are scanned before being loaded onto the wagons. The decision on which container to scan is taken by Customs and this is carried out in Shed 11.

There is an extensive network of tracks behind Berths 1 to 5 and KRVR states that it would be possible to rationalise the use of these tracks to improve the area that can be used for container stacking.

There are four tracks in the rail terminal behind Berths 16 to 18 and one of these can be used to by-pass the rail terminal for access to the proposed Japanese container terminal in Port Reitz, west of the Kipevu Oil Terminal.

KRVR state that it will not be necessary to extend the marshalling yard behind Berths 11 and 12 to handle the increased number of trains that would be generated by the increased container throughput.

### 3.14 Condition of the Port Infrastructure

A "walk over" survey of the condition of the port infrastructure was carried out to identify any significant matters that would require attention in the next few years and might affect the future planning of the port. The results of the survey are shown on Drawings 2009-2, 3 and 4. Matters requiring attention have been included in the Short Term Plans in Chapter 5.

**Table 3.2: Summary of Berth Lengths and Depths**

| Berth | Usage | Equipment | Length (m) | Design depth - m below CD |
|---|---|---|---|---|
| Mbaraki Wharf | Bulk import of coal, clinker,gypsum,iron ore, bauxite,cement<br><br>Edible oils & molasses<br><br>Export of bagged cement & fluorspar | Traveling dry bulk loader<br><br>Pneumatic unloader<br><br>Pipework | 313 | 11.0 |
| Berth 1 | Cruise liners, passengers, RoRo,naval vessels | | Nominal 181m (Berths 1-5 = 905 m) | 10.06 |
| Berth 2 | Cruise liners, passengers, RoRo, naval vessels | | 181 | 10.06 |
| Berth 3 | Bulk grain | 2 x300 tonnes/hr unloaders plus conveyor system | 181 | 10.06 |
| Berth 4 | General cargo | | 181 | 10.06 |
| Berth 5 | General cargo, RoRo, steel | | 181 | 10.06 |
| Berth 6 | No berth | | | |
| Berth 7 | General cargo | | Nominal 197.5m (Berths 7-8 = 395 m) | 10.06 |
| Berth 8 | General cargo | | 197.5m | 10.6 |
| Berth 9 | General cargo | Overhead conveyors for soda ash | Nominal 204.5 m Berths 9-10 = 409 m | 10.6 |
| Berth 10 | General cargo | | Nominal 204.5 m | 10.6 |
| Berth 11 | General cargo, dry bulks, RoRo, containers | | Nominal 184 m Berths 11 to 14 = 736 m | 10.6 |
| Berth 12 | General cargo, containers | | Nominal 184 m | 10.6 |
| Berth 13 | Containers | | Nominal 184 m | 10.6 |
| Berth 14 | Containers | 3 RTGs on Berths 14-15 | Nominal 184 m | 10.6 |
| Berth 15 | No berth | | | |
| Berth 16 | Containers | 4 SSG, 9 RTGs & 2 RMGs (rail terminal) on Berths 16-18 | Nominal 183 m (Berths 16-17) = 366 m. | 12.2 (currently 11.96) |
| Berth 17 | Containers | | 183 m | 12.2 (currently 11.96 |
| Berth 18 | Containers | | 228 m | 12.2 m |
| Shimanzi Oil Terminal | Oil products, LPG | | Dolphin berth – max length approx 150 m | 9.76 |
| Kipevu Oil Terminal | Crude oil, oil products | | Dolphin berth – max approx 260 m | 13.41 |

Source: Consultants' discussions with KPA

### 3.15 Environmental Management

The main environmental problem caused by existing port operations is the dust nuisance associated with the handling of dirty dry bulks, particularly at Mbaraki Wharf.

Oil spillage at the port is handled by OSMAG (Oil Spillage Mutual Assistance Group). This is a well equipped and trained group consisting of all stakeholders within the oil industry (KPA, Oil Marketers, KPC, Kenya Maritime Authority, etc). They regularly carry out drills and training and have adequate equipment for this work.

Bilge clean up is currently managed manually and the product used for commercial purposes. This does not comply with NEMA procedures which require that such material is safely handled using incineration. A facility for this (East African Environment Management Company) was developed in Mombasa but has not been operational for some time due to legal and logistical issues. The facility's incineration facilities would have provided an acceptable method of bilge disposal.

# CHAPTER FOUR: PORT OPERATIONS

Due to strong traffic growth over the last four years the port of Mombasa has become congested, particularly for containers. This section reviews recent port operating statistics to identify exactly where the bottlenecks are occurring, and what can be done to relieve them.

## 4.1 Overview

Operational statistics show a very high berth occupancy for the three container terminal berths, and a moderately high (and increasing) berth occupancy for the 15 conventional cargo. This is partly due to the overspill of container traffic onto the conventional berths, in particular Berths 13-14.

The problems associated with high berth occupancies came to a head in July –September 2008, when teething problems with a new computer system caused long delays. Because 2008 has in many respects been an atypical year, we have based the operational analysis largely on 2007 data.

**Table 4.1: Berth Occupancy Rates and Ship Waiting Times**

| | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 |
|---|---|---|---|---|---|---|
| **Berth occupancy** | | | | | | |
| Container terminal (B16-18) | 82.6% | 87.3% | 71.9% | 81.0% | 85.1% | 87.6% |
| Conventional berths | 38.5% | 33.6% | 39.2% | 43.8% | 40.0% | 52.6% |
| **Average ship waiting time (days)** | 1.77 | 1.34 | 1.61 | 1.49 | 1.73 | n.a |

Source: KPA Statistical Bulletin 2007 (updated to 2008)

On top of the consistently high annual berth occupancies are imposed seasonal variations in traffic, which has given rise to occupancy rates of over 95% in some months at the container terminal, and monthly rates of over 60% at the conventional berths.

**Figure 4.1 Monthly Variations in Berth Occupancy Rates (%)**

Source: KPA Bulletin of Statistics 2007, Tables 11 & 12

Very little operational data is available for the two oil terminals; this is a data shortage which needs to be rectified in the near future in order to establish the need for additional oil berths.

A summary of port operations in 2007 is given in Table 4.2 overleaf. Tables 4.2 (A) and 4.2 (B) show information provided by KPA on berth occupancy, container volumes and the percentage share of these volumes between berths.

## Table 4.2: Summary of Port Operations in 2007

**No of ships**

| | Mbaraki | B1 | B2 | B3 | B4 | B5 | B7 | B8 | B9 | B10 | B11 | B12 | B13-14 | B16-18 | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Containers (boxes) | | 8 | 1 | 4 | 6 | 14 | | 2 | 6 | 6 | 35 | 6 | 214 | 483 | 785 |
| Messina (units) | | 37 | 1 | | | 6 | | | | | | | | | 44 |
| Vehicles (units) | | 65 | 9 | 13 | 4 | 25 | 4 | 1 | 6 | 12 | 1 | 2 | 1 | | 143 |
| Cruise ships | | 33 | 3 | | 1 | 1 | | | | | | | | | 38 |
| Grain | | | | 36 | | 2 | 1 | | | 1 | | | | | 40 |
| Soda ash | | | | | | | | | 15 | | | | | | 15 |
| Fertilizers | | | | | | | 3 | | 3 | 3 | 5 | 1 | 2 | | 17 |
| Clinker | 15 | | | | | | 1 | | | 10 | 3 | | 3 | | 32 |
| Coal | 6 | | | | | 7 | 1 | | 1 | 1 | | | | | 16 |
| Other dry bulks | 2 | | 2 | | | 1 | | | | | 1 | | | | 6 |
| General cargo | | 4 | | 6 | 16 | 51 | 27 | 23 | 19 | 26 | 40 | 64 | | | 276 |
| Total | 23 | 147 | 16 | 59 | 27 | 107 | 37 | 26 | 50 | 59 | 85 | 73 | 220 | 483 | 1412 |

**Cargo (tons unless otherwise specified)[a]**

| | Mbaraki | B1 | B2 | B3 | B4 | B5 | B7 | B8 | B9 | B10 | B11 | B12 | B13-14 | B16-18 | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Containers (boxes)[b] | | 2,053 | 124 | 512 | 2,243 | 5,193 | | 75 | 1,267 | 1,480 | 10,223 | 3,084 | 145,061 | 262,605 | 433,920 |
| Messina (units) | | 19,575 | 639 | | | 3,760 | | | | | | | | | 23,974 |
| Vehicles (units) | | 81,208 | 10,285 | 17,208 | 928 | 29,560 | 1,745 | 941 | 7,489 | 10,804 | 608 | 1,743 | 1,709 | | 164,228 |
| Cruise ships | | | | | | | | | | | | | | | 0 |
| Grain | | | | 909,220 | | 31,593 | 6,724 | | | 5,247 | | | | | 952,784 |
| Soda ash | | | | | | | | | 68,841 | | | | | | 68,841 |
| Fertilizers | | | | | | | 40,193 | | 2,323 | 33,527 | 156,869 | 10,940 | 13,435 | | 257,287 |
| Clinker | 483,371 | | | | | | 33,820 | | | 313,576 | 55,110 | | 94,065 | | 979,942 |
| Coal | 139,289 | | | | | 30,943 | 5,592 | | 2,330 | 25,109 | | | | | 203,263 |
| Other dry bulks | 59,608 | | 48,918 | | | 25,750 | | | | | 30 | | | | 134,306 |
| General cargo | | 8,486 | | 57,341 | 32,342 | 329,098 | 182,598 | 80,007 | 89,423 | 130,556 | 46,822 | 35,110 | | | 991,783 |
| Total | 682,268 | 111,322 | 59,966 | 984,281 | 35,513 | 455,897 | 270,672 | 81,023 | 171,673 | 520,299 | 269,662 | 50,877 | 254,270 | 262,605 | 4,210,328 |

**Ship time at berth (hours)[c]**

| | Mbaraki | B1 | B2 | B3 | B4 | B5 | B7 | B8 | B9 | B10 | B11 | B12 | B13-14 | B16-18 | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Containers | | 308 | 33 | 144 | 330 | 749 | | 41 | 283 | 115 | 1,474 | 208 | 12,631 | 21,642 | 37,958 |
| Messina | | 1,107 | 28 | | | 158 | | | | | | | | | 1,293 |
| Vehicles | | 948 | 131 | 221 | 69 | 614 | 70 | 24 | 168 | 178 | 7 | 11 | 36 | | 2,477 |
| Cruise ships | | 539 | 56 | | 11 | 33 | | | | | | | | | 639 |
| Grain | | | | 2,953 | | 268 | 76 | | | 42 | | | | | 3,339 |
| Soda ash | | | | | | | | | 2,292 | | | | | | 2,292 |
| Fertilizers | | | | | | | 438 | | 217 | 322 | 1,379 | 64 | 205 | | 2,625 |
| Clinker | 1,480 | | | | | | 83 | | | 896 | 322 | | 261 | | 3,042 |
| Coal | 678 | | | | | 555 | 105 | | 66 | 116 | | | | | 1,520 |
| Other dry bulks | 363 | | 312 | | | 81 | | | | | 101 | | | | 857 |
| General cargo | | 173 | | 782 | 793 | 3,327 | 2,226 | 2,475 | 1,929 | 1,780 | 2,307 | 3,913 | | | 19,705 |
| Total | 2,521 | 3,075 | 560 | 4,100 | 1,203 | 5,785 | 2,998 | 2,540 | 4,955 | 3,449 | 5,590 | 4,196 | 13,133 | 21,642 | 75,747 |
| Berth utilisation (%) | 15.7% | 35.1% | 6.4% | 46.8% | 13.7% | 66.0% | 34.2% | 29.0% | 56.6% | 39.4% | 63.8% | 47.9% | 75.0% | 82.4% | |

Notes: (a) there are some small discrepancies with the cargo statistics in Chapter 2 due to incomplete records. Figures for grain,soda ash, fertilizers, cliker and coal refer to bulk cargoes only
(b) container numbers outside of B13-18 are only given in tons, andhave been converted to boxes by dividing by 10. Messina units are a mixture of cars and vehicles
(c) figures exclude vegetable oils, which add significantly to berth utilisation rates at Mbaraki and Berths 9-10

**Table 4.2 (cont)**

**Berth productivity (tons per ship-hour unless otherwise specified)**

| | Mbaraki | B1 | B2 | B3 | B4 | B5 | B7 | B8 | B9 | B10 | B11 | B12 | B13-14 | B16-18 | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Containers (boxes/hour) | | 7 | 4 | 4 | 7 | 7 | | 2 | 4 | 13 | 7 | 15 | 11 | 12 | 11 |
| Messina (units/hour) | | 18 | 23 | | | 24 | | | | | | | | | 19 |
| Vehicles (units/hour) | | 86 | 79 | 78 | 13 | 48 | 25 | 39 | 45 | 61 | 87 | 158 | 47 | | 66 |
| Cruise ships | | n.a | n.a | | n.a | n.a | | | | | | | | | 0 |
| Grain | | | | 308 | | 118 | 88 | | | 125 | | | | | 285 |
| Soda ash | | | | | | | | | 30 | | | | | | 30 |
| Fertilizers | | | | | | | 92 | | 11 | 104 | 114 | 171 | 66 | | 98 |
| Clinker | 327 | | | | | | 407 | | | 350 | 171 | | 360 | | 322 |
| Coal | 205 | | | | | 56 | | | | | | | | | 134 |
| Other dry bulks | 164 | | 157 | | | 318 | | | | | 0 | | | | 157 |
| General cargo | | 49 | | 73 | 41 | 99 | 82 | 32 | 46 | 73 | 20 | 9 | | | 50 |

**Average cargo size (tons unless otherwise specified)**

| | Mbaraki | B1 | B2 | B3 | B4 | B5 | B7 | B8 | B9 | B10 | B11 | B12 | B13-14 | B16-18 | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Containers (boxes/ship) | | 257 | 124 | 128 | 374 | 371 | | 38 | 211 | 247 | 292 | 514 | 678 | 544 | 553 |
| Messina (units/ship) | | 529 | 639 | | | 627 | | | | | | | | | 545 |
| Vehicles (units/ship) | | 1,249 | 1,143 | 1,324 | 232 | 1,182 | 436 | 941 | 1,248 | 900 | 608 | 872 | 1,709 | | 1,148 |
| Cruise ships | | 0 | 0 | | 0 | 0 | | | | | | | | | 0 |
| Grain | | | | 25,256 | | 15,797 | 6,724 | | | 5,247 | | | | | 23,820 |
| Soda ash | | | | | | | | | 4,589 | | | | | | 4,589 |
| Fertilizers | | | | | | | 13,398 | | 774 | 11,176 | 31,374 | 10,940 | 6,718 | | 15,135 |
| Clinker | 32,225 | | | | | | 33,820 | | | 31,358 | 18,370 | | 31,355 | | 30,623 |
| Coal | 23,215 | | | | | 4,420 | | | | | | | | | 12,704 |
| Other dry bulks | 29,804 | | 24,459 | | | 25,750 | | | | | 30 | | | | 22,384 |
| General cargo | | 2,122 | | 9,557 | 2,021 | 6,453 | 6,763 | 3,479 | 4,706 | 5,021 | 1,171 | 549 | | | 3,593 |

Source: KPA operations statistics

**Table 4.2 (A) Berth Occupancy**

| | 2004 | 2005 | 2006 | 2007 | 2008 | Remarks |
|---|---|---|---|---|---|---|
| General Cargo | 33.6 | 39.2 | 43.8 | 40.0 | 52.4 | Acceptable level |
| MCT | 87.3 | 73.9 | 81.0 | 85.1 | 89.2 | (Red Flag) at saturation levels |
| SOT | 52.6 | 63.4 | 60.2 | 64.6 | 62.5 | Tending towards saturation |
| KOT | 52.8 | 65.5 | 81.7 | 78.2 | 78.0 | Red Flag |
| Mbaraki Wharf | 57.2 | 65.9 | 74.3 | 66.2 | 56.2 | Tending towards saturation |

**Table 4.2 (B) Container Traffic (TEUs) and percentage share between berths**

| BERTH | 2004 | 2005 | 2006 | 2007 | 2008 |
|---|---|---|---|---|---|
| Berth 1 to 10 | 41,045 | 45,833 | 33,929 | 29,909 | 37,734 |
| Berth 11 to14 | 47,978 | 84,484 | 88,537 | 172,951 | 205,197 |
| Berth 16 to 18 | 349,574 | 306,354 | 356,889 | 382,507 | 372,802 |
| TOTAL | 438,597 | 436,671 | 479,355 | 585,367 | 615,733 |

**Percentage Share**

| BERTH | 2004 | 2005 | 2006 | 2007 | 2008 |
|---|---|---|---|---|---|
| Berth 1 to 10 | 9.4 | 10.5 | 7.1 | 5.1 | 6.1 |
| Berth 11 to14 | 10.9 | 19.3 | 18.5 | 29.5 | 33.3 |
| Berth 16 to 18 | 79.7 | 70.2 | 74.5 | 65.3 | 60.5 |
| TOTAL | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |

### 4.2 Containers

In 2008 the container terminal (Berths 16-18) accounted for only 60% of container throughput. Berths 13-154 accounted for another 33%, whilst the remainder was dispersed throughout the port.

A significant number of containers are brought in by Messina Lines at Berth 1, and stored in a dedicated stacking area behind Berths 1 to 3. Messina operates a RoRo service, and its cargoes include a significant numbers of vehicles and some project cargo. Its container traffic is not recorded separately in KPA's operating statistics.

The container terminal handles mainly ungeared ships, and Berths 13-14 smaller geared feeder ships, principally for Maersk. In 2007 Berths 13-14 handled slightly smaller ships than Berths 16-18, with average lengths of 160m and 170m respectively, but had a higher box exchange per ship (678 compared with 544 boxes).

**Table 4.3: Key Operational Parameters for Berths 13-14 and Berths 16-18, 2007**

| | Berths 13-14 | Berths 16-18 |
|---|---|---|
| Berth length (m) | 368 | 594 |
| Average ship length (m) | 160 | 170 |
| Effective number of berths[a] | 2.0 | 3.1 |
| Ships per week | 4.2 | 9.2 |
| Box exchange per ship (TEUs) | 678 | 544 |
| Lifts per ship-hour | 11.5 | 12.1 |
| Occupancy (%)[b] | 70.0% | 79.9% |
| Service time (days) | 2.34 | 1.83 |
| Waiting time (days/ship) | 0.37 | 0.81 |

Note: (a) quay length divided by average ship length + 20m berthing gap
(b) figures differ slightly from those in Table 4.1, which may include ship's time at other berths

Although Berths 16-18 are equipped with four quay cranes, average gross handling rates per ship hour were only slightly higher than at Berths 13-14, at 12.1 boxes and 11.5 boxes per ship-hour respectively. Many of the ships at berths 13-14 use two cranes (their own) whereas when the container terminal is operating at close to capacity only one of the three berths can offer the use of two quay cranes. The shipping line also plays a larger role in the operation of Berths 13-14, enabling it to clear containers from the port more quickly.

Container handling rates at the general cargo berths are much slower (4-7 lifts per hour) with the exception of Berths 10 and 12, which have been achieving handling rates of 13 and 15 lifts per ship-hour respectively. Containers arriving at the general cargo berths are stored on the nearest available empty space, using reach stackers or forklift trucks. Stacking heights are low, resulting in an inefficient use of space and a shortage of open storage space for other types of cargo.

Because Mombasa is served mainly by feeder ships operating on seven-day rotations from nearby hub ports such as Salalah and Jeddah, the arrival pattern of ships is fairly well-scheduled. As a result, vessel waiting times are between a quarter and a half of those that would be expected with a random ship arrival pattern.

Both sets of berths appear to have adequate quay space for the number and size of vessels which they are handling. The main problem at the container terminal is lack of storage space. This is even more of a problem at Berths 13-14, where it is compounded by the lack of quayside cranes.

The container terminal is very narrow, with an average width behind the quay of only about 240m. This limits the number of containers which can be stored on it at any one time to about 8,400 TEUs with three high stacking. As a result, most of the domestic boxes apart from those railed to KPA's ICDs at Nairobi and Kisumu are transferred to privately owned off-dock CFS depots. These effectively function as an extension of the main container yard, and are responsible for Customs clearance of most domestic import boxes.

There are currently six off-dock CFS facilities, offering the following amounts of storage space:

| | TEUs |
|---|---|
| Mombasa Container Terminal (MCT) | 3,000 |
| Consolbase | 3,000 |
| Compact Freight Systems | 1,200 |
| Interpel | 850 |
| Mitchell Cotts | 1,000 |
| Portside | 500 |

MCT and Consolbase have 3,000 TEU of storage space each, and have been in operation for a long time. The other facilities have been approved since in October 2008, and are only just coming into full operation. MCT, Consolbase and Compact handle only containers, whereas Interpel, Mitchell Cotts and Portside handle a mixture of containers, cars and general cargo.

There are several more CFS applications in the pipeline, from Makupa, Boss, Kencolt, Awanad Logistics Great Lakes Ports Ltd, Mara Shabba Ltd and Multiple Hauliers.

Off-dock CFS depots are licensed by Kenya Revenue Authority (KRA), and must have a minimum area of five acres, offices. Licenses are for one year, renewable indefinitely. Because of the proliferation of CFS depots, KPA has set up a pre-qualification process which companies must pass through before receiving "nominated CFS" status; this authorizes them to receive boxes which are sent out of the terminal by KPA for storage purposes.

KPA sends most of its incoming domestic boxes to nominated CFS depots in full shiploads. The selection of yards for individual shiploads of containers depends partly on how much space each one has available, together with the size of the arriving shipload, and is done by the KPA Container Terminal Manager's Department.

At the beginning of 2009 KPA was sending all domestic import boxes to a nominated CFS, except for:

- Class 1 and 5 hazardous materials, which were all unloaded by direct discharge onto trucks and cleared immediately.
- All containers going by rail to the Nairobi and Kisumu ICDs
- A fairly small number of boxes whose consignees had made prior arrangements with the shipping lines for delivery to a non-nominated CFS.
- Approximately one ship per week which was allowed to store all of its boxes in the KPA terminal. The selection is made in advance of the ship arrival and depends on how much space is available in the KPA terminal and the individual CFS depots. KPA tries to ensure that the shipping lines take their turn.

All transit country containers stay on the KPA terminal. This results in fairly long average dwell times, as transit country import boxes get 15 days free storage time compared with 7 days for domestic imports. Terminal productivity would probably be increased, and transport costs reduced, if transit containers rather than domestic containers were transferred to the off-dock depots.

Before the container terminal became seriously congested in mid-2007, average dwell times for transit boxes were 14.8 days compared with 12.5 days for Kenyan import boxes. Just under half of the dwell time was required to pay port charges and clear the boxes, whilst the other half was spent waiting for the consignee to take delivery of the cargo.

**Table 4.4: Average Dwell Times Jan-June 2007 by Destination**

| Destination | Containers | Dwell time (days) | | |
|---|---|---|---|---|
| | | Total | Landing to Billing | Billing to Delivery |
| Kenya | 57,826 | 12.5 | 5.4 | 7.0 |
| **Transit countries** | | | | |
| Uganda | 18,951 | 15.0 | 6.9 | 8.2 |
| Tanzania | 2,303 | 11.5 | 5.7 | 5.8 |
| DR Congo | 1,997 | 12.6 | 6.2 | 6.5 |
| Sudan | 2,029 | 19.2 | 11.7 | 7.5 |
| Rwanda | 1,600 | 12.9 | 3.2 | 9.7 |
| Somalia | 161 | 10.5 | 1.3 | 9.2 |
| Burundi | 68 | 25.1 | 16.2 | 8.9 |
| Other | 4 | 72.8 | 41.8 | 31.0 |
| **Transit average** | **27,113** | [illegible] | **6.9** | **7.9** |
| Total/average | 84,939 | 13.2 | 5.9 | 7.3 |

Source: KPA Statistics Department

Since then, there has been a reduction in the free time allowance for domestic containers, and a policy of moving them out of the terminal to the off-dock CFS depots as quickly as possible. Records are no longer kept of the length of time between discharge of Kenyan boxes and their delivery to the consignee, as the release of containers is now the responsibility of the off-dock depot operators.

In addition, there are no recent records of the length of time boxes stay on the KPA terminal, as this module of the container tracking software is not yet working. In December 2008 the average dwell time for imports boxes (domestic and transit combined) was estimated to be around 11 days. This suggest that although domestic boxes are now moving off the terminal much faster, the dwell time for transit boxes has probably increased.

The average dwell time on the terminal for export boxes is 3-4 days, and empty boxes have even shorter dwell times. Almost all come either directly to the ship's side from off-dock depots, or from the CFS sheds in the port where LCL's are stripped.

Almost all containers destined for nominated CFS depots are stored in the stack first, and collected by the CFS at its convenience. The boxes normally spend 3-4 days in the KPA container terminal stack before being moved. For the purposes of calculating free storage time the CFS depots are treated as an extension of the container terminal

The CFS depots are responsible for moving the boxes and have their own truck fleets. MCT and Consolbase have around 35 trucks each, and Compact 15 trucks. Transfer costs are recovered through re-marshalling charges of US$ 100/150 per 20/40ft box, but only containers whose combined stay in the KPA terminal and CFS exceeds the free time allowance are liable for these charges. The CFS operators also receive the storage charges on boxes whose combined stay exceeds the free time allowance, and charges for moving boxes for Customs inspection purposes..

Customs inspect 100% of consignments, but do not inspect 100% of each consignment (one consignment may comprise several boxes). The inspection takes place at the CFS depot rather than the container terminal, and may involve either a scanner or the physical opening of the box.

KPA has a fixed scanner near Gate 19, and is installing a second fixed scanner for exports later this year. It also has a mobile scanner (not operations) at the in-port CFS. Most of the nominated off-dock CFS depots have scanners, although this is not yet a licensing requirement.

Precise information on yard inventories is not available but there are known to be around 500 containers in the port which have been there for longer than 3 months. Long stay boxes are usually moved out of the container terminal to other areas of the port, but these are now also full.

Although Customs can gazette its intent to auction long stay boxes after they have been in the port for more than 21 days, in practice this is rarely done. Even if notice was served, it would be difficult for practical reasons to get the boxes out of the port in less than three months from their arrival date. In addition, some of the boxes which have been auctioned have failed to reach their reserve price, which is set deliberately high to allow full recovery of the duty owing on the cargo, and have remained in the port after the auction.

### 4.3 Vehicles

The split between trucks and cars was 12%:88% in 2007. Just under 60% of vehicle imports were for the domestic market, the remainder for the transit countries. The latter often take a long time to clear.

Vehicles are discharged at most of the general cargo berths. Because the vessels stay in port for a relatively short time – on average 17 hours – they can be slotted in wherever a space is available without causing other ships to have to wait. Because most of the cars are driven straight out of the port to privately-run bonded storage depots, there is a strong preference for berths close to the main port gate. Berth 1 accounted for almost 50% of vehicle imports in 2007, and Berths 2-3 and Berth 5 for a further 35%. Berth 10, which has some open storage space behind it, was also reasonably well used

The car carriers are quite large, discharging around 1,150 vehicles per ship at an average rate of 66 vehicles per ship-hour. This is a low rate by international standards, where discharge rates of around 200 vehicles per ship-hour are common, but is explained by the distance between the berths and off-dock depots. Some buffer storage areas are available within the port, but these are generally too small to accommodate a full shipload of vehicles.

Most of the cars which remain in the port are long-stay cars with problems associated with them. Many have been in the port for months, and failure to clear them is reducing the space available for the container storage.

Mombasa handles very little RoRo TIR traffic. RoRo container operations are carried out by Messina Line using 1700 TEU vessels with 12 m wide quarter ramps. The containers are discharged on MAFI trailers to a dedicated stacking area between the transit sheds and the sheds adjacent to the port road. Messina Line would like to increase the size of ship used to 2,200 TEU capacity vessels with a draft of 10.8 m

### 4.4 Cruise Ships

Mombasa has many natural attractions, and is within easy reach of Kenya's famous game parks. As a result it should be a natural magnet for cruise lines. In 2007, however, it attracted only 38 cruise ship calls, of which 29 were by the small local cruise ship *Royal Star* (112m LOA, 5,069GT). International cruise ship calls were strongly peaked, with 6 of the 9 calls occurring in February or March. These could not all be accommodated at Berth 1, causing some calls to spill over to Berths 2, 4 and 5.

The main reason for using Berth 1 for cruise ships is that it is close to the main port gate and the centre of town, and on the fringes of the main cargo handling area of the port. It is also close to some buildings of historic interest which are capable of renovation.

In the longer term, however, the berth is unsuitable for cruise ships because it lacks the necessary space for coach parking, and is in an area of the port which is shabby in appearance. In view of the importance of tourism to the national economy, consideration should be given to investing in a custom-built facility away from the main working area of the port, preferably at a site closer to the airport.

The cruise ships, like the car carriers, have a relatively fast turn-round time of around 17 hours.

### 4.5 Grain

Around 95% of bulk grain is normally handled at Berth 3, where 2 x 300 tons per hour pneumatic discharge units have been installed, linked by fixed conveyors to off-dock silos operated by Grain Bulk Handlers Ltd.

The remainder of the bulk grain is discharged by grab into hoppers, mainly at Berths 5, 7 and 10. Sometimes the hoppers are linked to mobile quayside bagging plants, sometimes they transfer the grain directly into trucks. The pneumatic unloaders work almost three times as fast as the grabs, with average gross discharge rates of 308 and 113 tons per hour respectively in 2007.

The World Food Programme imports some grain in containers and bags. The amounts vary from year to year, but are small relative to the bulk grain traffic..

The average consignment size for bulk grain in 2007 was around 25,000 tons, with most of it arriving on handy-max size ships. The largest consignment size to date has been 45,000 tons arriving on an 80,000dwt ship part-laden. GBHL would like to be able to handle ships of up to 60,000dwt fully laden, but this would require the deepening of Berth 3, which would seriously disrupt grain handling operations unless a second grain berth was developed first.

In 2007 ship arrivals were fairly evenly dispersed throughout the year, and almost all of the bulk grain ships which wished to use Berth 3 could do so. The average berth occupancy was 38% and there was no evidence of any significant queuing

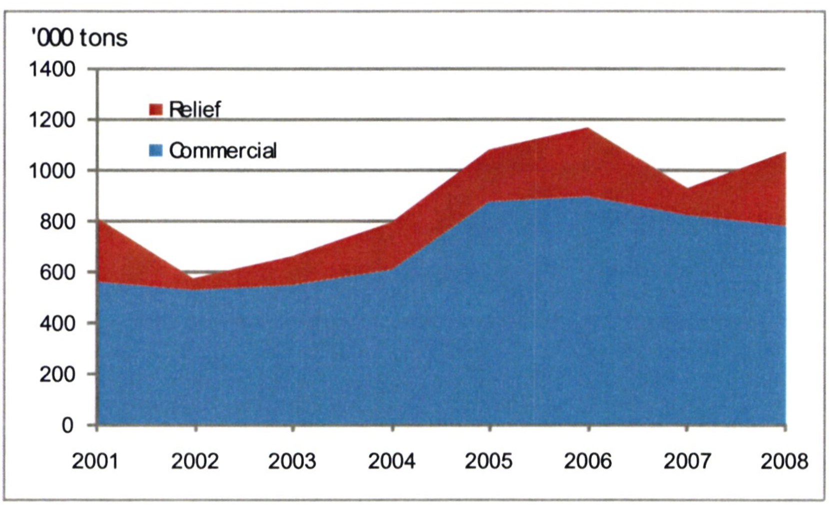
In 2008 the amount of bulk grain was 19% higher than that handled in 2007 (1.18m tons compared with 0.99m tons) and the arrival pattern of the ships was more bunched, with over half of the grain arriving in the last four months of the year. Almost a third of the grain ships arriving in this period had to use other general cargo berths, resulting in much slower handling rates. However there was still relatively little queuing due to the margin of spare capacity available at other berths.

Although GBHL has wayleave rights to Berths 3 and 4, its conveyors currently reach only as far as Berth 3. Once its throughput reaches 1.5m tons p.a. GBHL intends to buy a third unloader with a rated handling speed of 600 tons per hour, and extend the conveyor belt to Berth 4, changing its layout and upgrading its capacity to allow two ships to be handled simultaneously. This would increase the capacity of the two berths to 3.0m tons p.a., compared with GBHL's 2008 throughput of just under 1.0m tons

GBHL is already investing in extra elevators, cross-overs, bagging trains and trucks. This investment has been brought forward because of the bunching of ship arrivals in the last quarter of 2008.

Peaking will continue to be a problem in the grain trade, in part because of the importance of relief cargoes, which fluctuate from year to year. So the installation of pneumatic discharge equipment at a second berth would be a distinct advantage, as it would allow the port to handle two bulk grain ships at the same time. Whether the second berth should be developed by GBHL or one of its competitors is a controversial issue which is explored in more detail in Chapter 6.

**Figure 4.2: Annual Variations in Bulk Grain Imports 2001-8 ('000 tons)**




Source: GBHL

### 4.6 Soda Ash

Soda ash travels in bulk and in big bags in containers. The bulk exports move entirely across Berth 9 using two fixed conveyors from private off-dock storage facilities just beyond the port boundary. These discharge into two fixed hoppers which feed onto two loading conveyors supported by dockside cranes during the loading operations; the cranes are detached after loading is complete.

The bulk soda ash travels in small consignments of around 4,500 tons per ship, and is sensitive to rain damage. The loading rate is so low, averaging only 30 tons per hour (700 tons per day) in 2007, even though the conveyor system is designed to handle 1,500 tons per day. As a result, soda ash ships occupied Berth 9 for more than 25% of the time.

The corrosive nature of soda ash imposes restrictions on the other cargoes which can be handled at the berth. It has not been possible to make much use of Berth 9 for other low value dirty cargoes such as coal, clinker and fertilizers because of the lack of open storage space behind the berth, and the narrowness of the apron in front of the transit shed, which is easily congested by trucks queuing for direct delivery of other bulk cargoes.

In 2007 around 80% of the 386,000 tons of exports were containerized, reflecting the mid-year peak in peak bulk carrier charter rates and the low freight rates being offered for cargo that would fill otherwise empty outbound containers.

In future exports are expected to increase in two stages to around 1.1m tons p.a. This will change the economics of the way soda ash is shipped, and is likely to result in a substantial increase in bulk exports from their previous peak of 175,000 tons (2002) to perhaps as much as 800-900,000 tons p.a. To deal with this Magadi Soda is planning to install higher capacity loading equipment at Berth 9 as part of its expansion programme.

### 4.7 Fertilizers

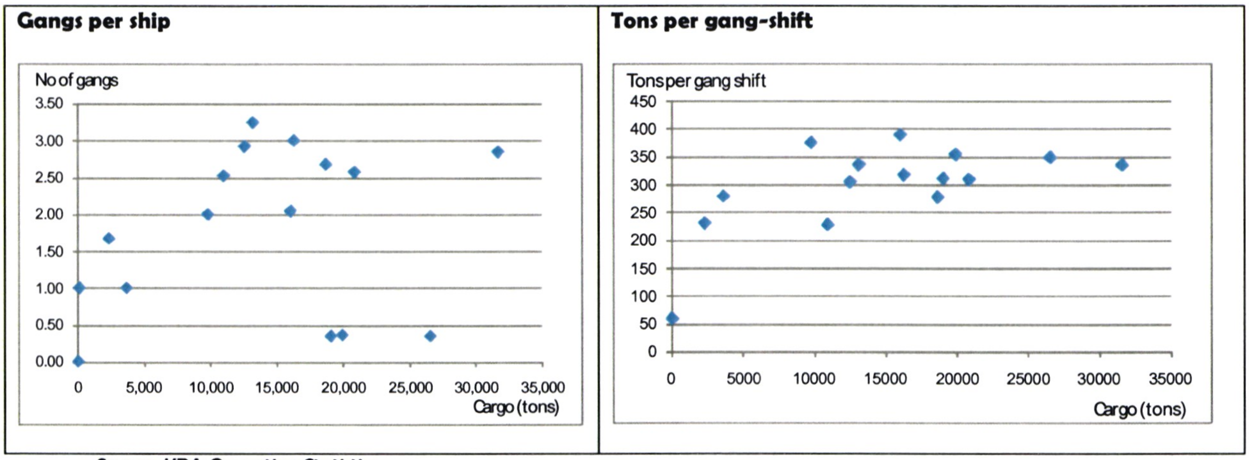
In 2007 around 60% of fertilizers were handled at Berth 11, with much of the remainder using Berth 7 or Berth 10. In most cases the cargo is discharged directly to waiting trucks,

| | *% of 2007 fertilizer traffic* |
|---|---|
| Berth 11 | 61% |
| Berth 7 | 16% |
| Berth 10 | 13% |
| Berth 13-14 | 5% |
| Berth 12 | 5% |
| Total | 100% |

The average cargo size was around 15,000 tons per ship, and the average handling rate just under 100 tons per ship-hour. The main difference between ships is in the number of gangs employed. Because the ships are relatively small, most employ between two and three gangs; those employing fewer gangs – which are not necessarily the smallest ships – are the main contributors to the low average handling rate.

There is also some variation in handling rates per gang, which does not seem to vary with ship size. This may reflect the nature of the cargo and weather conditions at the time of discharge, but could also be related to the efficiency with which the supply of trucks is organized. Handling rates for most ships are between 280-350 tons per gang-shift (40-50 tons per gang-hour).

**Figure 4.3: Handling Rates for Bulk Fertilizers in 2007**




Source: KPA Operating Statistics

### 4.8 Clinker

Clinker is handled mainly at Mbaraki Wharf and Berth 10, with smaller amounts going across Berths 13-14, Berth 11 and Berth 7. Berths 13-14 are now being used almost full time for container traffic, and will not be available for clinker traffic in future.

| | *% of 2007 clinker traffic* |
|---|---|
| Mbaraki Wharf | 49% |
| Berth 10 | 32% |
| Berth 13-14 | 10% |
| Berth 11 | 6% |
| Berth 7 | 3% |
| Total | 100% |

The clinker is discharged into hoppers by grabs fitted to the ships' cranes or quay cranes, as available, and is fed through the hoppers into waiting trucks. At Mbaraki Wharf the tight curves between the island jetty and the access bridges limit the size of truck which can be used to around 7 tons, making it necessary to dump the clinker on the ground nearby and re-load it into larger trucks for the journey to the cement factory.

Berth productivity is more than three times that of fertilizers. This is largely because the average cargo size is twice as large (30,000 tons per ship compared with 15,000 tons per ship), allowing the use of more gangs per ship and larger grabs. There is very little variation in handling rates between berths.

**Table 4.5: Comparison of Berth Productivity for Clinker and Fertilizers in 2007**

| | Clinker | Fertilizer |
|---|---|---|
| Gangs per ship | 3.7 | 1.7 |
| Tons per gang-shift | 630 | 320 |
| Tons per ship hour at berth | 322 | 98 |

Source: KPA Operating Statistics

### 4.9 Coal

In 2007 coal was handled mainly at Mbaraki Wharf, with use of Berths 5 and 10 when space was not available.

| | *% of 2007 clinker traffic* |
|---|---|
| Mbaraki Wharf | 69% |
| Berth 5 | 15% |
| Berth 10 | 12% |
| Berth 7 | 3% |
| Berth 9 | 1% |
| Total | 100% |

The amount of coal traffic is still relatively small – around 200,000 tons p.a. - and the average consignment size is only 12,700 tons. As a result, the average handling rate (134 tons per ship-hour) is more like that for fertilizers rather than clinker.

### 4.10 Other Dry Bulks

Other dry bulks comprise salt, gypsum, bauxite imports, and fluorspar and cement exports. The imports (193,000 tons) are slightly under-recorded in KPA's operations statistics, whilst the exports are not separately identified. Because of low traffic volumes and small consignment sizes, some of this traffic has probably been recorded as general cargo in the operations statistics.

Imports are split fairly evenly between Mbaraki Wharf and Berth 5, whilst exports move mainly across Mbaraki Wharf. Imports are discharged by grabs into waiting vehicles. The average consignment size is around 20,000 tons, and handling rates broadly similar to those being achieved for coal and fertilizers.

Cement exports are stored in three silos immediately behind the wharf, and loaded pneumatically. The fluorspar uses a shiploader fed by a conveyor from a stockpile close to the berth. The stockpile is covered with tarpaulins, but still generates a lot of dust

### 4.11 General Cargo

General cargo activities are widely dispersed. Berth 5 is heavily used for steel, whilst bagged cargo is discharged as close to the transit sheds as possible. Other cargoes are fitted in wherever space is available.

| | *% of break bulk traffic Jan-June 2007* |
|---|---|
| Berth 5 | 33% |
| Berth 7 | 18% |
| Berth 10 | 13% |
| Berth 9 | 9% |
| Berth 8 | 8% |
| Berth 3 | 6% |
| Berth 11 | 5% |
| Berth 13-14 | 4% |
| Berth 4 | 3% |
| Berth 1 | 1% |
| Total | 100% |

Steel moves in the largest parcel sizes and has the fastest handling rates, in part because the larger ships are able to use more gangs than other types of cargo. Bagged cargoes also use around three gangs per ship, but handling rates are much slower because of smaller sling sizes.

**Table 4.6: Key Operational Parameters for Break Bulk Cargo, January-June 2007**

| Cargo type | No. of ships | Cargo ('000 tons) | Av cargo size (tons per ship) | Average gangs per ship | Productivity (tons per gang shift) |
|---|---|---|---|---|---|
| Steel | 21 | 201.2 | 10,050 | 3.2 | 295 |
| Bagged[a] | 24 | 158.0 | 6,580 | 3.0 | 127 |
| Fish | 6 | 0.5. | 85 | 1.2 | 34 |
| Others | 91 | 212.2 | 2,330 | 1.0 | 253 |
| Total | 142 | 571.9 | 4,025 | 1.9 | 205 |

Note: (a) Includes relief cargo
Source: KPA operations statistics

Fish is handled only in small quantities at present, mainly at Berths 10-11, but handling rates are low and the vessels spend a relatively long time in port.

Other types of general cargo include project cargo, transport equipment, and miscellaneous foodstuffs and consumables. Handling rates are surprisingly high, perhaps because of the use of additional private labour, which is unrecorded.

## 4.12 Liquid Bulks

Very little data is available about the handling of liquid bulks. In future KPA should collect monthly Operations Statistics on the same basis as those for dry cargo.

The Marine Returns for 2007 show a total of 285 tankers entering the port. Of these around 150 handling crude oil and petroleum products used the two main oil jetties (KOT and SOT), whilst the others handling mainly vegetable oil used Mbaraki Wharf and Berths 9-10.

**Table 4.7: Tankers Entering Mombasa in 2007**

| | Mbaraki | B9 | B10[b] | KOT | SOT | Other[c] | Total |
|---|---|---|---|---|---|---|---|
| No of ships | 22 | 10 | 14 | 116 | 34 | 89 | 285 |
| Cargo ( '000 tons)[a] | 194 | 292 | | 4,424 | 649 | - | 5,559 |
| Hours in port | 2,923 | 636 | 866 | 9,014 | 3,793 | 7,430 | 24,662 |
| Cargo per ship | 8,836 | 12,158 | | 38,140 | 19,077 | - | 19,505 |
| Tons per hour in port | 67 | 194 | | 491 | 171 | - | 225 |
| Berth occupancy (%) | 16.7% | 7.3% | 9.9% | 102.9% | 43.3% | n.a | n.a |

Note: (a) distribution of 2007 cargoes between berths has been based on figures for Oct-Dec 2008
(b) B10 was under repair in Oct-Dec 2008, so figures for B9 and B10 have been merged
(c) areas of the port which do not handle cargo, of which the most important are Mtongwe (49 ships) and Amgeco ship repair yard (15 ships)

Source: KPA Marine Returns 2007
KPA Oil Vessel Statistics Oct-Dec 2008

A detailed breakdown of the liquid bulks moving through the port in the last quarter of 2008 is given in Table 4.7. These statistics have just begun to be collected, and are not available for 2007.

**Table 4.8: Distribution of Liquid Bulk Cargoes, Last Quarter 2008 ('000 tons)**

| | SOT | KOT | Mbaraki | B9 | Total |
|---|---|---|---|---|---|
| Crude oil | | 408 | | | 408 |
| White oils | 80 | 392 | | | 472 |
| Jet fuel/kerosene | 4 | 37 | | | 41 |
| Gas oil | 48 | 214 | 3 | | 265 |
| Fuel oil | 20 | 30 | | | 50 |
| Asphalt | | | 3 | | 3 |
| Chemicals | 5 | | | | 5 |
| Vegetable oils | 8 | | 53 | 90 | 151 |
| Total | 165 | 1,081 | 59 | 90 | 1,395 |

Source: KPA Statistics Department

Crude oil moves only across KOT, with two ships a month carrying around 80,000 tons each.

Around 75% of petroleum products also move across KOT, with SOT providing and overspill facility. SOT also handles other liquid bulk products such as chemicals and small quantities of vegetable oils.

Petroleum products come much smaller ships than crude oil. White oils have an average cargo size of 15,000 tons, and gasoil- which is imported in smaller quantities – has an average cargo size of around 10,000 tons.

Berth 9 and Mbaraki Wharf are the main import points for vegetable oils, each having a group of storage tanks nearby. Mbaraki Wharf handles mainly imports for Kenya, and Berth 9 imports for Uganda. The average cargo size is around 12,500 tons.

No records of ship handling rates are kept for bulk liquids. The figures shown in Table 4.6, which are based on time in port rather than time at the berth, have been used to calculate berth occupancy rates for Mbaraki Wharf and Berths 9-10, even though they probably include substantial amounts of idle time at the berth and some waiting time. Actual handling rates could easily be as high as 250-300 tons per ship-hour at berth.

Gross handling rates for liquid bulks at KOT and SOT can be calculated by working backwards from their berth occupancy rates; unfortunately separate berth occupancy figures are not kept for tankers using Mbaraki Wharf or Berths 9-10.

Petroleum traffic in 2008 amounted to 5.078m tons, broken down as follows:

| | | *M tons* |
|---|---|---|
| Imports: | Crude oil | 1.613 |
| | Petroleum products[a] | 3.200 |
| | LPG | 0.075 |
| Exports | Petroleum products | 0.122 |
| | Bunkers | 0.068 |
| Total | | 5.078 |

Note: (a) estimate based on 11 months data

KPR have advised us that the traffic split between KOT and SOT in 2008 was roughly 75:25, which is equivalent to throughputs of 3.8m tons and 1.3m tons respectively.

In 2008 the berth occupancy rates were 78.0% for KOT and 62.5% for SOT. Combined with the traffic figures quoted above,this is equivalent to a handling rate of 555 tons per hour

(13,250 tons per day) at KOT, and 240 tons per hour (5,700 tons per day) at SOT. The handling rates combined with the berth occupancy rates suggest that oil tankers spend quite long periods waiting for a berth, perhaps as much as 0.75 days per vessel. Waiting times are likely to be longer at KOT, which has been designed to handle larger vessels, than at SOT where non-petroleum ships can be moved to other berths in the event of congestion.

The handling rates at KOT and SOT are extremely low by international standards. Because the power of ships pumps increases broadly in line with vessel size, the international norm is around one day at berth for all sizes of oil tanker. This includes preparation for discharge and the time needed to complete the paperwork. UNCTAD guidelines indicate that a typical discharge rate for a 60,000dwt tanker would be around 5,650 tons per hour, allowing it to be discharged in under 12 hours. This is roughly ten times the current discharge rate being achieved at KOT.

Discussions with KPR suggest that the actual pumping rates at KOT are around 3,350 tons per hour for 80,000dwt crude carriers, and 1,700 tons per hour for products carriers. The discharge time for products carriers is dependent on the condition of the vessel, which affects the pumping pressure, whether they can use the multiple manifolds available at KOT, and the security of the connections.

There is a large amount of idle time, caused by:

- Switching vessels on and off the berth
- Moving large tankers off the berth when there is insufficient tank storage on shore to take a full load, Tankers often have to wait whilst oil is pumped up-country.
- Interruptions due to the loading of bunker barges, when tankers have to be moved off and then brought alongside again.
- Long discharge time for LPG vessels.

Although there are some things which KPA can do to improve handling rates, the main requirement is for improvement of the shore-side infrastructure : storage capacity and inland pipelines. The interests of many different oil companies are involved, so it has been difficult and time consuming to agree on future investment needs.

Some action is now being taken to increase tank storage capacity and improve the up-country pipeline, but we understand that this will only expand shoreside capacity by around 20%. The effect on tanker handling rates is likely to be fairly small, and may gradually disappear as cargo volumes continue to grow.

There has been relatively little change in oil tanker dimensions over the past 25 years. Without a major change in government policy towards domestic oil refining, it is reasonable to use the dimensions of the tankers currently calling at Mombasa as the basis for jetty design. These are as follows:

**Table 4.9: Dimensions of Tankers Calling at Mombasa in 2007**

| Length (m) | KOT | SOT | Total | |
|---|---|---|---|---|
| Under `100 | - | 13 | 13 | |
| 100-124 | 3 | - | 3 | |
| 125-149 | - | 2 | 2 | |
| 150-174 | 3 | 8 | 11 | |
| 175-199 | 66 | 10 | 76 | |
| 200-224 | - | - | - | |
| 225-249 | 48 | - | 48 | |
| 250+ | 1 | - | 1 | |
| Total | 121 | 33 | 154 | Typical |
| GT'000 | | | | draft (m) |
| Under `10 | 4 | 14 | 18 | 8.0 |
| 10-20 | 4 | 10 | 14 | 10.0 |
| 20-30 | 63 | 7 | 70 | 11.5 |
| 30-40 | 8 | 1 | 9 | 12.0 |
| 40-50 | 25 | 1 | 26 | 12.8 |
| 50-60 | 17 | - | 17 | 13.5 |
| Total | 121 | 33 | 154 | |

## 4.13 Future Changes in Ship Numbers, Sizes and Types

In 2007 the total number of ships calling at the port was 1,811, of which 1,502 were cargo or passenger ships, and 309 barges, tugs, fishing vessels, yachts, naval vessels and "others". Of the total, 1,608 ships were dry cargo ships recorded in the port operations statistics, or tankers shown as proceeding to the oil terminals or other berths within the port.

**Table 4.10 Ship Numbers in 2007**

| Ship type | No. of ships |
|---|---|
| Tanker | 291 |
| Dry bulk carrier | 120 |
| Container | 597 |
| RoRo | 103 |
| Car carrier | 81 |
| General cargo | 250 |
| Passengers | 60 |
| Total : commercial | 1,502 |
| Others | 309 |
| Total : all types | 1,608 |

Source: KPA Bulletin of Statistics 2007

The forecast of future ship numbers has been derived directly from the cargo forecasts in Chapter 2, after making allowance for a gradual increase in ship and cargo sizes in the "Do Nothing" situation, and a significant increase in the size of certain categories of ship after port facilities are built to accommodate them. The most likely timing of the new facilities that are likely to impact on ship and cargo sizes is discussed in Chapter 5.

As noted in Section 2.1.2, a significant increase in container ship sizes can be expected over the next 20 years as traffic volumes grow, direct services from the Far East replace feeder services from Salalah, Jeddah and Dubai, and ships in the 2,500-6,000 TEU size range begin to filter down from the main east-west routes to smaller markets such as East Africa.

Size increases for other types of ship are likely to be concentrated on:

- Grain ships, where the average size could increase from 25-30,000dwt to 50-60,000dwt.
- Coal ships, where ship sizes are likely to increase to between 40-70,000dwt, depending on whether the coal is coming from South Africa or more distant supply sources such as Australia.
- Clinker ships, which could increase in size up to an average of 40,000dwt.
- Messina RoRo ships, which expected to increase in capacity from 1,700 TEU to 2,100 TEU.
- Steel ships, where the average size could increase from 30,000dwt to 35,000 dwt, with the maximum size remaining constant at around 40,000dwt.

The number of ships has been forecast by increasing the number of ships in each category shown in Table 4.10 by the growth in cargo volumes derived from Table 2.60, then deflating the resulting number by a factor linked to the increase in average cargo size. The data in Table 4.10 has been disaggregated as follows:

| *Ship type* | *Sub-categories* |
|---|---|
| Tankers | Petroleum, vegetable oils, compressed natural gas |
| Dry bulks | Wheat, clinker, coal, fertilizers, titanium ore, other dry bulks |
| General cargo | Iron & steel, others |

The critical assumptions are as follows:

- No increase in average cargo size for petroleum or vegetable oils. Compressed gas is assumed to be delivered to the port on the basis of daily calls by small, highly specialized tankers operating a shuttle service from Mtwara (Tanzania).
- Significant increases in cargo size for wheat, clinker, coal, and fertilizers in the four years following the deepening of Berths 1-5 (2014-18), then no further change. Average cargo sizes for other dry bulks are assumed to remain unchanged.
- Coal for the proposed power station at Dongo Kundu is assumed to travel in average consignments of 50,000 tons, resulting in 20 additional ship calls p.a. by Panamax sized vessels.
- Titanium ore is assumed to be exported in consignments of 20,000 tons, resulting in an additional 22 ship calls p.a. of handy-max sized bulk carriers.
- Container box exchanges for RoRo ships are assumed to increase at 3% p.a. up to the opening of Kipevu West in 2013, then at 6% p.a. from 2013-16 as lines respond to the improved facilities. The main increase in average cargo size (10% p.a.), is likely to occur around 2017-19 when new container facilities become available in Tanzania. This is because most shipping lines operate joint services to Mombasa and Dar es Salaam, with ship sizes constrained by the port with the least satisfactory infrastructure. From 2020 onwards, the assumed increase in average cargo size reverts to 3% p.a. The outcome of these assumptions is an increase in average box exchange per ship (cargo in + out) from 940 TEU in 2007 to 3,050 TEU in 2030.
- Container box exchanges for RoRo ships are assumed to increase pro rata to traffic, with larger ships being introduced when necessary to maintain existing service frequencies. This is because of the small number of companies involved, and the commitment of the largest (Messina) to a fixed weekly service.

- The average consignment size for car carriers is assumed to increase at 3% p.a.
- Iron & steel cargo sizes are assumed to increase at an average rate of 1% p.a. except in 2014-17 when they increase by a total of 12% in response to the proposed deepening of Berths 1-5.
- General cargo consignment sizes are assumed to increase at 1% p.a. throughout the forecast period.

A slightly different approach has been taken for passenger ships and "others" whose numbers are assumed to increase at 5% and 2% p.a. respectively.

Based on these assumptions, the forecast of ship numbers is as shown in Table 4.11.

**Table 4.11 Forecast Ship Calls at Mombasa**

| | 2007 | 2010 | 2015 | 2020 | 2025 | 2030 |
|---|---|---|---|---|---|---|
| Tankers | 291 | 672 | 708 | 719 | 833 | 949 |
| Bulk carriers | 120 | 140 | 199 | 218 | 272 | 332 |
| Containers | 597 | 700 | 873 | 869 | 1,009 | 1,032 |
| RoRo | 103 | 103 | 103 | 103 | 103 | 103 |
| Car carriers | 81 | 99 | 143 | 181 | 205 | 224 |
| General cargo | 250 | 244 | 283 | 322 | 363 | 400 |
| Passengers | 60 | 69 | 89 | 113 | 144 | 184 |
| Other | 309 | 328 | 362 | 400 | 441 | 487 |
| Total | 1,811 | 2,356 | 2,760 | 2,925 | 3,371 | 3,712 |

Source: Consultants' estimate

# CHAPTER FIVE: UPDATED MASTERPLAN PROPOSALS FOR THE PORT OF MOMBASA

This section compares the capacity of existing port facilities with the Base Case forecast traffic to assess the need for additional berths and storage areas, then groups the new facilities required into short-term (to 2013) and long-term (to 2030) investment programmes

## 5.1 Demand for Additional Port Facilities

The demand for berths and back-up areas has been analysed using the cargo forecasts presented in Chapter 2 and cargo handling rates derived from the port's statistics. The results of this analysis are shown in the tables in Appendix B1 for dry bulk and general cargo, Appendix B2 for containers and Appendix B3 for hydrocarbons. The spreadsheet from which these tables are taken will be provided separately so that the KPA can regularly update its requirements using the latest cargo handling rates. The requirements for cargoes not handled at KPA wharves are considered separately.

### *5.1.1 Dry Bulk and General Cargo*

We have generally used a maximum berth occupancy of 70% to determine when new facilities are needed, but in the spreadsheet we have used different berth occupancies for some individual cargoes where this is necessary due to the nature of the cargo and restrictions on the number of berths at which they can be handled. For example we have used a maximum berth occupancy of 60% for wheat which currently has to be imported mainly over Berth 3 due to the location of the conveyors.

The analysis is very sensitive to the assumptions made about future cargo handling rates, which are summarised in Table 5.1. Existing handling rates are low by international standards, and it is reasonable to expect them to increase over time as a result of better management and supervision. Larger ship and cargo sizes and more modern ships' cranes should also increase productivity.

As a result, this report provides only general guidance on the timing and extent of future berth requirements, and the assumptions used in the analysis should be compared with actual cargo handling rates nearer the time that the additional investment is required.

Ideally, all general cargo should be handled over Berths 1 to 10 plus Mbaraki Wharf, allowing Berth 11 to be made available for containers. However once the Kipevu West container terminal comes into operation there will initially be less demand for Berths 11 to 15 and the container stacking areas behind them, so Berth 11 could revert to being used for dry bulks and general cargo.

**Table 5.1: Cargo Handling Rate Assumptions for Mbaraki Wharf and Berths 1-10**

| Cargo | Existing handling rate (gross) | Increasing to |
|---|---|---|
| Wheat | 7,000 tons/day | 8,250 tons/day (2013) |
| Clinker | 7,750 tons/day | 10,000 tons/day (2014), 15,000 tons/day (2018) |
| Coal | 2,000 tons/day | 3,000 tons/day (2013) |
| Fertilizer | 2,000 tons/day | 3,000 tons/day (2013) |
| Other dry bulks | | |
| Imports | 4,000 tons/day | 6,000 tons/day (2015) |
| Exports | 2,000 tons/day | |
| Edible oils | 5,000 tons/day | |
| Messina RoRo | 450 TEU/ day | 750 TEU/ per day (2014) |
| Vehicles | 1,000 units/day | 1,200 units/day (2012) |
| Iron & steel | 2,800 tons/day | |
| Other conventional | 1,200 tons/day | 1,500 tons/day (2015) |

Source: Consultants' estimates

The results of the analysis can be summarised as follows:

- In 2009 there will be a surplus of general cargo berth length on Mbaraki Wharf and Berths 1 to 10 of approximately 800 m.
- If all clinker and coal is handled only at Mbaraki, the berth will reach 70% utilisation in about 2010.
- If clinker, coal and fertilisers cannot be handled over Berths 1 to 10, construction of a new bulk berth would have to be commenced immediately.
- If clinker, coal and fertilisers can be handled over Berths 1 to 10, additional berth length will not be required until about 2022. This could be provided at Berth 11 or by the development of a bulk berth on Dongo Kundu.
- This analysis does not take into account imports of around 1.0 million tonnes p.a. of coal for the power station which the Ministry of Energy is proposing to construct at Dongo Kundu. It is assumed that this will be provided with a separate jetty which may be funded as part of the power station project, or integrated into a common user bulk facility to be developed jointly with KPA.
- An additional wheat berth is unlikely to be required until about 2019.
- If no new berths are built and Berth 11 is not used for general cargo, there will be a berth shortfall for conventional cargo of about 815 m by the end of the study period (2030). The unmet demand can be accommodated by developing one or more bulk berths and a vehicle import berth at Dongo Kundu, and by using Berth 11. The possibility of other dry bulks sharing the coal jetty at Dongo Kundu should be discussed with the Ministry of Energy.

### *5.1.2 Containers*

A similar analysis has been carried out on the demand for container berths and stackyards, except for the demand for berths and stacking areas for RoRo containers which has been dealt with in section 5.1 above.

For containers, the situation is complicated by the shortage of stackyard capacity within the port. Until the Kipevu West Container Terminal comes into operation, container handling capacity is limited by stackyard capacity rather than berths or quay cranes. It is evident that without urgent action to increase the number of TEU slots available in the port, it will not be possible to handle all of the forecast throughput without excessive stack heights and loss of efficiency.

The analysis assumes that at Berths 12-14 three mobile harbour or ships' cranes are available with an average productivity per crane of 12 lifts per hour increasing to 14 lifts per hour by 2011. At Berths 16-18 the number of ship-to-shore gantry cranes is assumed to increase from 4 to 6 in 2010, with the average productivity per crane increasing from around 10 to 18 lifts per hour by 2012. Relatively little is known about the layout and likely cargo handling rates at the new container terminal at Kipevu West, so we have simply assumed capacities of 450,000 TEU p.a. for 2012-4, 850,000 TEU p.a. in 2015 and 1.1m TEU p.a. from 2016 onwards.

The analysis is shown in full in Annex B. The following points should be noted:

- We estimate that an additional 4,400 TEU slots will be required in 2010, and that by 2012 the shortfall will rise to about 9,600 TEU slots, With three high stacking behind Berths 12 to 14 and Berths16 to 18, this is equivalent to 3,200 TEU of ground slots.
- The Kipevu West Container terminal will be full by about 2020 and additional capacity will be required in 2021.,
- If the Kipevu West Container Terminal is extended in phases by an additional 1,100m the additional capacity will be full by about 2030.
- If the Government of Kenya decides to develop a new port at Lamu, the timing of any extensions to the container berths in Mombasa will have to be reviewed in the light of a confirmed development plan for Lamu.

### *5.1.3 Oil Berths*

The current berth occupancy at the Kipevu Oil Terminal is about 78%. Pumping rates are slow for various reasons (see section 4.12), and a great deal of time is lost moving ships on and off the berth whilst they are discharging. The berth occupancy rate at Shimanzi Oil Terminal is lower at around 62.5%, but handling rates are even slower than at Kipevu.

At KOT handling rates have been assumed to increase from 14,000 tons per day to 17,000 tons per day by 2012, as a result of improvements currently being made to inland storage and distribution. At SOT they have been assumed to remain close to their present level of just over 5,000 tons per day gross, although the removal of LPG to a planned private mooring buoy could increase this significantly.

The analysis in Annex B suggests that at KOT berth occupancy rates are likely to fluctuate between 70-80% until 2023, as the growth in demand is accommodated by the development of refinery capacity in Uganda and the improvement in cargo handling rates. After 2023, the need for another oil berth appears unavoidable. However it may be needed much sooner than this if Kenya continues to be wholly dependent on oil imports from overseas.

With such high berth occupancy rates the import of crude oil and petroleum products for Kenya and other neighbouring countries is very vulnerable to stoppages if there is an accident at either of the existing terminals.

### *5.1.4 Summary of proposals*

Based on the analysis of the existing facilities and operations, our proposals for the revised Master Plan for the port of Mombasa are divided into two phases:

Short term proposals where the planning and design should be started in 2009 or 2010, and the work completed by 2012:

- Investigation of improvements to the entrance channel and the channel within the port.
- Transfer of most of the dirty dry bulk operations to Mbaraki Wharf.
- Improvements in handling efficiency on the general cargo berths.
- Provision of additional container berth length and stackyard capacity (TEU slots).
- Improved movement and handling of trucks.
- Review of the need for new hydrocarbons berths (LPG, compressed natural gas and petroleum products).

Long term proposals for new construction that may be commenced within the next 5 years but will not come into operation until 2013 or beyond, and longer term developments up to the end of the planning period in 2030. These cover:

- Containers.
- "Dirty" bulk cargoes.
- Deepening of Berths 1-5.
- Vehicles & RoRo containers.
- Channel improvements to accommodate larger vessels.

It is assumed that two existing major projects which are already at an advanced stage – the Kipevu West container terminal and dredging of the channel to -15.0m CD as far as Kipevu West – will go ahead as planned

The other short-term and long-term proposals are discussed in Sections 5.2 and 5.3 respectively.

## 5.2 Short Term Proposals

These are described in sequence from the seaward end of the port, rather than in order of priority.

### *5.2.1 Entrance Channel Improvements*

KPA intends to award a contract to dredge the shipping channel to a depth of -15.0 m CD up to the location of the proposed container terminal in Port Reitz, referred to in this report as the Kipevu West container terminal. In the portion of the channel outside Mombasa Island the channel will be dredged to -17.0 m to allow for squat, rolling and pitching of the vessels as they approach the S bend near the ferry crossing.

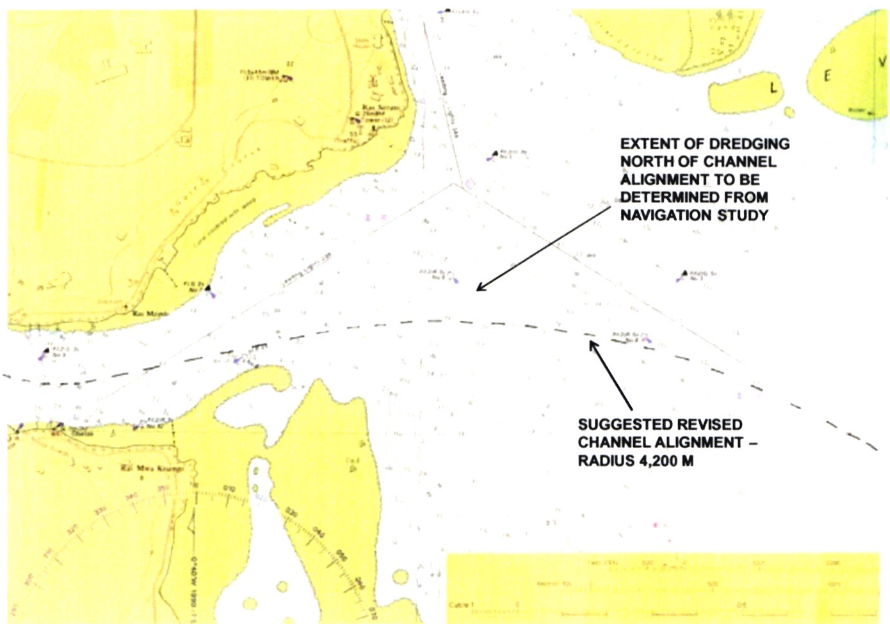
Simulation studies arranged by KPA have shown that with the northerly current which exists immediately south of Mombasa Island, the existing channel alignment dredged to -15.0 m CD, and a southerly wind, the maximum size of container vessel that can enter the port is a 4,500 TEU capacity ship. The studies indicate that larger vessels will be pushed in a northerly direction and will not be able to turn sufficiently to pass between Ras Mzimba on Mombasa Island and Likoni on the south shore of the channel.

These studies also indicate that vessels larger than 4,500 TEU will have difficulty in turning the bend around Ras Kikgaangoni in Port Kilindini when a southerly wind is blowing.

It is therefore recommended that KPA should carry out further simulations to assess if larger vessels up to 6,000 to 6,500 TEU capacity can enter and leave the port if the bends in the channel are dredged to allow a larger radius of curvature of the bends. The investigation should be carried out on the assumption that other vessels will not use the channel at the same time.

Figure 5.1 below shows a suggested improvement to the outer approach shipping channel south of Mombasa Island The bend radius has been calculated using the recommendations in the PIANC report "The Design of Approach Channels".

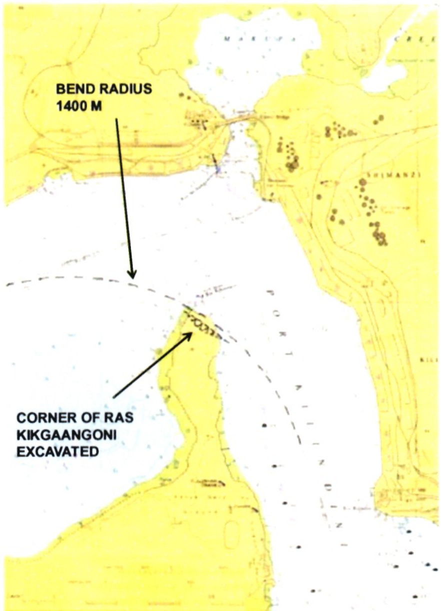
**Figure 5.1: Suggested Improvement to the Outer Entrance Channel**




For the outer channel it is recommended that, for the initial runs of the simulation, it should be assumed that the entire area between the proposed new channel alignment and the existing one is of sufficient depth to allow the design vessel to drift in a north-easterly direction under the influence of the current and the wind. If it is established that the vessel can turn sufficiently to enter the channel past the ferry within this area, further runs can be carried out to refine the amount of dredging that is needed for the safe passage of the design vessel into Kilindini Harbour.

Figure 5.2 shows our suggestion for improving the bend between Port Kilindini and Port Reitz by removing the end of the promontory Ras Kikgaangoni. The preliminary simulations should be carried out using the bend radius as shown. If this radius does not allow the vessel to turn sufficiently it should be modified until a satisfactory turn can be achieved.

**Figure 5.2 Suggested Improvement to the Bend between Port Kilindini and Kipevu Harbour**




Having carried out these simulations a decision can be taken on the practicality and costs of the required dredging and the likelihood of it being acceptable on environmental grounds. An upper limit can then be placed on the size of vessel that will be able to enter the port in the longer term, which will inform decisions about the split of future port facilities between Mombasa and other locations, for example Lamu.

It is not suggested that any additional dredging work should be undertaken now, as it will be some time before ship sizes exceed the dimensions of the proposed -15m CD channel. However the exercise will provide valuable information for the long-term planning of port facilities in Kenya.

### *5.2.2 Mbaraki Wharf*

Mbaraki Wharf is a common user facility, used principally by Bamburi Cement for the import of clinker, iron ore and coal and by East African Molasses for the import of edible oils. Bulk fluorspar is exported via a conveyor and travelling shiploader from a stockpile adjacent to the Bamburi Cement property.

It is proposed to make Mbaraki Wharf the preferred facility for dirty bulk cargoes such as clinker, coal, iron ore, fertilizers, although the berth does not have the capacity to handle all of these dirty cargoes.

Four proposals for improving its performance have been examined, involving:

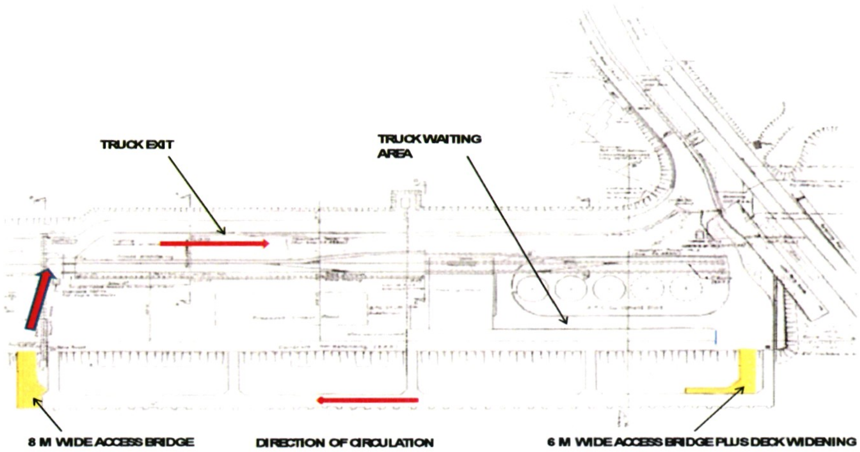
- New access bridges.
- Dust supression measures.
- Berth deepening to -12.5m CD.
- Extension of the wharf by 220m to create a third berth.

***New access bridges.*** At present only trucks with a carrying capacity of 7 tonnes can drive on and off the wharf due to the narrow access bridges and lack of turning space. The importing of bulk cargoes over Mbaraki Wharf is very inefficient as the 7 tonne trucks have to dump their loads onto the paved area behind the wharf so that the material can be picked up by front end loaders and loaded onto larger articulated trucks for transport inland.

**Figure 5.3: Mbaraki Wharf : 7 tonne Capacity Trucks being Loaded with Coal**

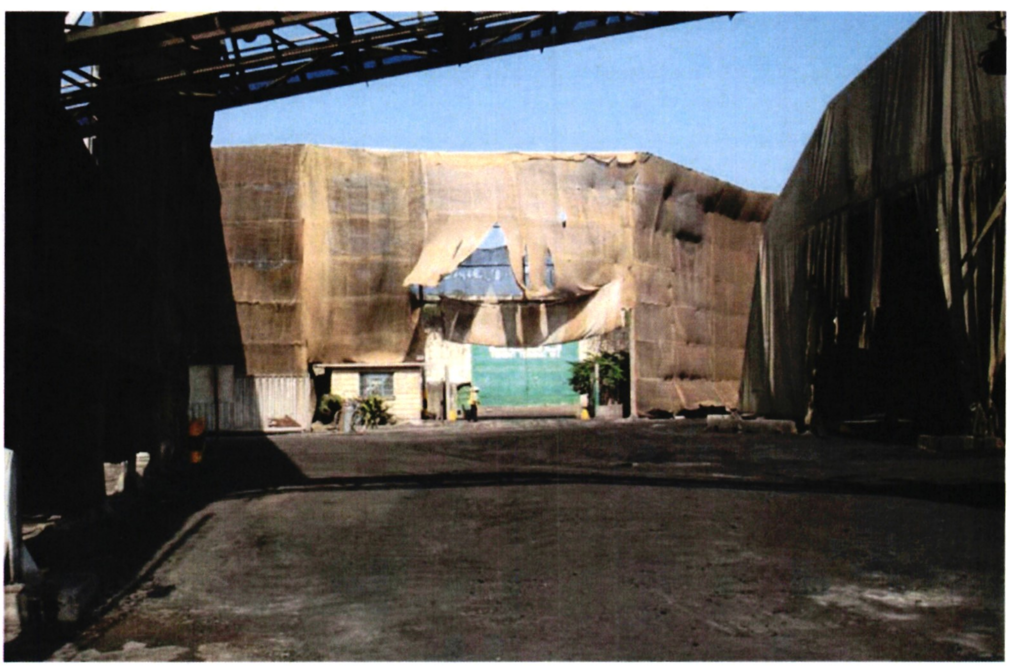
It is therefore proposed that new access bridges should be built next to the existing bridges so that articulated trucks can drive onto the wharf for direct loading, as shown in Figure 5.4. It is understood from KPA that the wharf has adequate strength to support the articulated trucks and that it is only the narrow access bridges that prevent the larger trucks from driving onto the wharf now.

**Figure 5.4: Mbaraki Wharf : Proposal for Wider Access Bridges**




***Dust suppression.*** The double-handling operation generates a lot of dust which blows into the residential area inland from the wharf. Bamburi Cement has erected some dust screens to reduce the dust nuisance but these are subject to wind damage and consequently are not very effective.

**Figure 5.5 Mbaraki Wharf : Dust Screens**



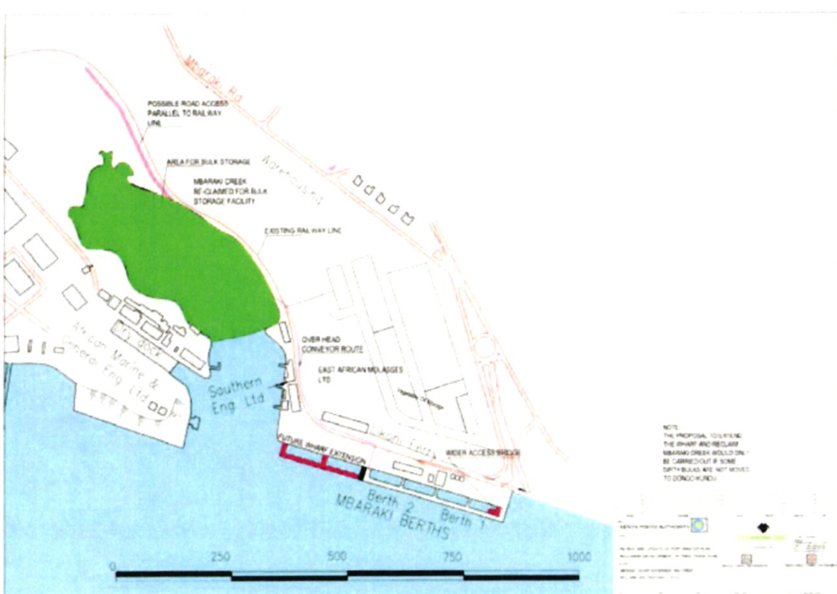
The best way of controlling the dust nuisance is by strictly enforcing higher operational standards. When discharging ships, the grabs should be lowered into the hoppers to minimize the dispersion of dust. If necessary the edges of the hoppers should be raised to allow the grabs to be discharged within a screened space. And if bulk cargoes continue to be stored in open areas just off the wharf KPA should insist on the dust protection screens being repaired when damaged.

***Berth deepening.*** We propose to deepen the wharf to -12.5 m CD, to allow the use of larger vessels. The drawings of the wharf indicate that possibly 50% of the wharf is already deeper than the notified minimum depth and the piles appear to have been driven deep enough to allow the whole of the wharf to be dredged to -12.5 m CD. This should be done at the same time as construction of the access bridges, and will be a relatively low cost item (approximately KShs. 16,300,000).

***Berth extension.*** The berth occupancy at Mbaraki Wharf in 2007 is estimated to have been around 30%, but clinker imports alone are expected to increase by almost 490% by 2030. The key question is whether an extension to Mbaraki Wharf is needed to accommodate the additional demand for dirty bulks, or whether there is enough spare capacity at the general cargo berths to continue handling them there until the (much better) option of a new bulk terminal at Dongo Kundu becomes available.

If development at Dongo Kundu does not go ahead, Mbaraki Wharf could be extended by about 220 metres as shown in Figure 5.6 and Annex A Drawing 2009/06, with part of Mbaraki Creek reclaimed to provide storage space for bulk cargoes. An overhead conveyor would be required to transport the materials to the reclaimed creek and this could follow the railway line, subject to agreement with Kenya Railways. KPA will therefore have to ensure that this possibility is kept open by not allowing other development to take place in the creek until it is certain whether developments at Dongo Kundu will include bulk cargo handling facilities.

**Figure 5.6 Proposal for Extension of Mbaraki Wharf**



Our analysis of future berth requirements demonstrates that additional berth length will not be needed for dirty bulks until around 2022, assuming that they can also be handled over Berths 1 to 10. However if road access to Dongo Kundu is constructed within the next five years and the proposed power station at Dongo Kundu is built, KPA could – subject to the outcome of discussions with the Ministry of Energy - decide to build a common-user bulk berth to handle power station coal, clinker and coal for other users. This would free Mbaraki Wharf to handle fertiliser and vegetable oil imports, fluorspar exports and minor dry bulk cargoes.

***Conclusions.*** The economic evaluation in Chapter 7 supports short-term improvements to Mbaraki Wharf, but suggests that in the longer-term new facilities for dirty dry bulks should be built at Dongo Kundu, The extension to Mbaraki Wharf will only become necessary if far-reaching proposals for the development of the Dongo Kundu area as a whole do not go ahead.

The capital cost of the recommended scheme - building two new access bridges and dredging the wharf to -12.5m - is estimated to be KShs. 106m.

KPA has a key role to play in coordinating the plans of the various users of Mbaraki Wharf, to maximise its productivity and minimise potential land use conflicts. Licensing agreements similar to the one with Bamburi Cement may be required for other major users to provide the security of tenure needed to support private investment. These should be kept as flexible as possible, and take into account the interests of all potential users of the wharf.

### *5.2.3 Dockyard*

The dockyard has sufficient slipways to maintain the port's fleet of pilot boats, workboats and the environmental clean-up vessel. However there are some buildings that are in need of urgent repair, namely the machine shop and the cover over slipways 5, 6, and 7. There is a danger that either of these structures could collapse and cause injury to KPA personnel.

The KPA capital expenditure plan makes provision for purchasing a small floating dock for the Dockyard. If this purchase does go ahead space will have to be found to moor it where there is access for a mobile crane to service the floating dock.

### *5.2.4 Area G*

The import of cars, trucks and buses is forecast to rise by 85% in the four years up to 2013, and by 554% over the study period to 2030 The handling of vehicle imports already causes congestion on the open storage areas between Berths 1 and 5 and it is therefore proposed that the western part of Area G should be converted into a vehicle handling compound where the vehicles can be parked immediately after being discharged until they are cleared form the port.

There is also a severe shortage of stacking area for containers and it is proposed that the eastern part of Area G is converted to a temporary empty container storage facility. These proposals are illustrated in Figure 5.7, and in Drawing 2009/07 in Annex A.

The first step is to clear the whole area of impounded cars and demolish the old buildings including Shed A, Transit Shed, Arcon Shed, old fire station etc except for Shed D which has recently been renovated for use as a depot for the storage and maintenance of environmental protection equipment.

The vehicle handling compound should be paved so that the vehicles are not damaged by uneven ground and stones thrown up by their movement. It should be fenced with a controlled gate and fitted with CCTV so that the vehicles are secure. The pavement quality should be suitable for the loads from the imported trucks.

The layout shown in Drawing 2009/07 provides parking for 770 cars and vans, 106 trucks and 11 buses. The area is intended for buffer storage only, and will accommodate most of the vehicles from an average shipment providing that they are cleared quickly. If a particular shipment has few trucks, the truck bays can be used for cars and vans.

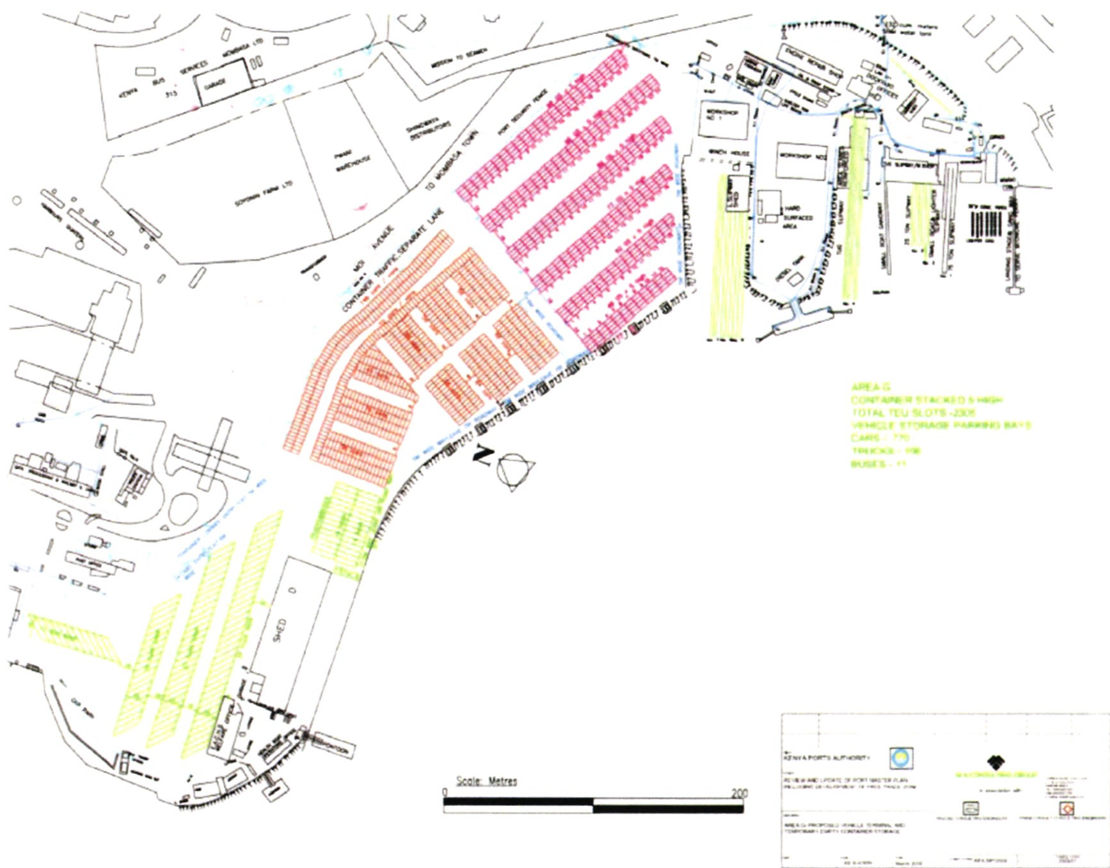
The RoRo vessels carrying the vehicles should use Berths 1 and 2 whenever possible to shorten the travel distance from the ship to the vehicle compound.

In the longer term a larger area will be required for vehicle imports; this is dealt with in Section 5.3.

The temporary container storage compound should be levelled, but asphalt surfacing should not be necessary as it is envisaged that this compound will be needed only up to 2015, when the first phase of the new container terminal in Port Reitz is due to come into operation. The container compound should have its own access, separated from the fenced vehicle compound.

The cost of our short-term proposals for Area G (vehicle parking and container storage) is estimated to be approximately KShs. 350m.

**Figure 5.7 Proposals for Vehicle and Container Storage in Area G**



Once more container stacking area becomes available at the container berths and containers have been removed from the south-eastern part of Area G, the site could be enhanced by a prestigious building for trade-related services which takes advantage of its proximity to the city centre and provides a better public image of the port. This part of the port can be made accessible to the public without putting port security at risk, and commercial uses would create a cleaner environment in the area close to the proposed cruise terminal (Berth 1).

The buildings might include:

- Modern offices with good communications facilities for the many small companies which require almost daily access to the port (forwarding & clearing agents, shipping agents, cargo surveyors, ships' chandlers etc).

- Consolidation of Customs facilities with those of other statutory authorities to provide a one-stop shop for customers seeking to clear cargo from the port. This would supplement the existing "one stop shop" behind Berth 15, which we understand deals mainly with the clearance of container traffic.

#### *5.2.5 Berths 1 to 10*

It is proposed to keep these berths generally in their current use.

Berth 1 should be used for RoRo vessels and cruise liners. The conversion of Shed 1 into a cruise terminal should go ahead on a low cost basis, as the long-term best solution is to build a terminal at the western end of Port Reitz, where it would have direct access to the proposed road connecting Dongo Kundu to the road system on the north side of Port Reitz.

Berth 3 should continue to be used by GBHL, with the conveyors extended to Berth 4 in line with demand.

Berth 5 should be used for RoRo vessels and conventional cargoes such as steel. It could also be used for the development of a second grain terminal if so required. Drawing 2009/09 in Annex A shows a possible route for an overhead conveyor which could transport the grain from the berth to storage silos located outside the port boundary, near the GBHL land. Any additional unloading and conveying equipment required for grain is assumed to be privately financed.

Berths 7 to 10 should remain in their current use (general cargo including steel, plus bulk exports, bulk liquid imports and imported dirty bulks that cannot be handled at Mbaraki Wharf).

At Berth 9 Magadi Soda intends to install higher capacity conveyors in future when production increases. This is a firm proposal, in spite of the recent (possibly temporary) switch of soda ash exports to containers in response to high bulk carrier charter rates in early 2008.

There are several areas of paving that are in need of repair to improve the productivity of the berths. A particular example of this is the paving between Sheds 4 and 5, where poor surfacing and small buildings restrict the discharge of vehicles from RoRo vessels. The open storage areas would also benefit from the removal of all scrap equipment such as cranes and steelwork, and old containers. Areas that require resurfacing in the short term are:

- Between sheds 4 and 5.
- Behind Berth 6.
- Behind sheds 7 and 8.

The estimated cost for 7ha of new paving is KShs. 357m.

#### *5.2.6 Berth Transit Sheds*

The transit sheds immediately behind the berths are not all fully utilized and parts of some sheds appear to be leased out on a short-term basis. Some of the sheds have been refurbished.

It is recommended that KPA should review its policy on the use of these sheds so that some of the sheds can be demolished to create more open space behind the berths. This can be used for short-term vehicle storage once the new container terminal removes the pressure for using the area for container storage.

#### *5.2.7 Shimanzi Oil Terminal*

LPG shipments should be transferred to the new African Gas and Oil Co. facility at Port Reitz when this is completed. In the longer term some of the other flammable products should be transferred for safety reasons to Kipevu Oil Terminal (if there is sufficient capacity) or an additional oil terminal when this is constructed.

#### *5.2.8 Container Handling up to the opening of the Kipevu West Container terminal*

The projected increase in container volumes up to the opening of the new Kipevu West container terminal Port Reitz is the most significant challenge faced by the port of Mombasa. Our proposals for the next four years therefore concentrate on dealing with this challenge. They consist of the following:

- Extending the line of Berth 14 to join up with a small extension to Berth 16.
- Extending Berth 18 by 160 m and reclaiming behind and beyond this extension to abut the access causeway to the Kipevu Oil Terminal.
- Rearranging the container yards and roads behind Berths 11 to 18.
- Widening the exit gate checking area at Gate 19 and the road behind the Berths 16 to 18 stackyard and on to connect with the new container terminal in Port Reitz.
- Extending the rail tracks to connect to the new container terminal.

Details of our proposals are shown on Drawings 2009/10 and 2009/11 in Annex A. However these drawings should be treated only as indicative of what can be done as there is a severe lack of accurate topographical survey information and there appear to be discrepancies between the various pieces of information available from KPA. It is strongly recommended that the KPA should arrange for a detailed and accurate topographical survey to be carried out covering the whole of the KPA property between the Head Office and the western end of the Kipevu Oil Terminal tank farm.

It should be noted that the proposal to extend berth 14 to "fill in" the area known as Berth 15 allows an increase in the stackyard capacity for berths 11 to 15 and also the stackyard behind Berth 16, as the Berth 16 RTG stacks can be increased in length towards berth 15.

The drawings have been prepared on the basis that the container terminal continues to be operated by the KPA. If one of the areas such as Berths 11 to 14/15 were to be leased to an external operator on a concession basis it would be necessary to amend the in and out gate arrangements for that part of the terminal. This could be done by widening the space between the container stacks behind Berths 12 to 14 and Berths 16 to 18, although this would however require some of the TEU slots to be sacrificed.

When the Draft Final Report was submitted the opening of Kipevu West Terminal was programmed for 2013 but this date has now slipped to 2015. This will increase the pressure on KPA to carry out the recommended works and to improve container handling speeds and to reduce dwell times. As a temporary measure more use will have to be made of the off-dock storage areas.

***Extension of Berth 14***

The extension of Berth 14 to join up with Berth 16 lies in the area known as "Berth 15", where there is a discharge from a drainage culvert. The drawings appear to show that if the berthing line on Berth 14 is extended in a straight line it will meet a short extension of Berth 16, creating a straight Berth 14/15 of approximately 390 m. This will provide useful additional berth length and more stackyard space behind. It will also allow the road system to be rearranged as shown on the drawings.

The whole of the area between Berths 14 and 16 should be constructed of a concrete deck on piles and the deck should be designed to take the loads from large harbour mobile cranes such as the Liebherr LHM 400. The piles at the front of the wharf should be designed to allow for some over-dredging which can act as a silt trap from the drainage culvert.

The estimated cost of this work is about Ksh 1,534,000,000.

***Extension of Berth 18***

"Berth 19" is already at the design stage, and the additional container stacking area that it will provide is urgently needed. We agree that the berth extension should be 160 m even though this brings the vessels close to the "Restricted Area" around the Kipevu Oil Terminal shown on UK Admiralty Chart No 666. By extending the berth by 160 m the overall straight berthing length will be about 760 m, thus creating three 220 m berths which can accommodate container vessels up to around 2,000 TEU capacity.

We estimate that the cost of this project will be about Ksh 3,144,000,000. This is based on the assumption that the reclamation material can be obtained using the dredging equipment that is carrying out the main channel dredging contract, bringing the sand in from an offshore source as a back-load after dumping the channel dredgings at sea.

***Rearrangement of Berths 11 to 15 Container Yard***

It is proposed that road access to the stackyards for Berths 11 to 15 and Berths 16 to 19 should be along the back of the terminal, next to the railway, rather than through the centre of the terminal as at present.

In the stackyard for Berths 11 to 15 we propose 6 +1 wide RTGs stacking 1 over 5, plus a specially fabricated wide-span gantry spanning 13 rows of containers plus internal roadways. The layout is shown in Annex A Drawing 2009/10, and has been designed to maximize the use that can be made of the relatively narrow stackyard area. The new arrangement will provide approximately 1,550 TEU ground slots and a total capacity of 4,650 TEU if containers are stacked on average three high.

Although intended to serve primarily Berths 12-15, the stackyard would also be available in the short-term for the storage of any containers handled over Berth 11 using ships' gear. Once the pressure on container handling space is relieved by Kipevu West, Berth 11 is likely to be used mainly for dry bulks and general cargo.

Changes to the vehicle circulation pattern within the stackyard would also improve efficiency. Trucks entering the port through Gate 18 or coming from the direction of the general cargo berths should all proceed to the western end of the stackyard, where a wide area has been left between the Berths 11-15 stackyard and the Berths 16-18 stackyard to facilitate vehicle circulation.

Vehicles collecting and delivering containers would drive through the stack in a one way flow from west to east. On leaving the stack they would either queue at the junction with the internal road until they are called forward to exit gate number 18 for checking before leaving the port, or proceed directly to the main port entrance at the eastern end of the port.

The approximate cost of the civil works involved in rearranging the Berths 11-15 container yard is KShs. 800m. The requirements for additional mechanical equipment are summarised in Table 5.2.

**Table 5.2 Additional Mechanical Equipment Required for Berths 11-15**

| | No. of units | Cost per unit KShs. m | Total cost KShs. m |
|---|---|---|---|
| Mobile harbour cranes | 3 | 300 | 900 |
| Widespan RTGs | 2 | 200 | 400 |
| Conventional RTGs | 6 | 100 | 600 |
| Reachstacker | 1 | 70 | 70 |
| Tractor trailers | 12 | 10 | 120 |
| **Total** | | | **2,090** |

***Rearrangement of Berths 16 to 19 Container Yard***

We propose that the existing stackyard behind Berths 16 to 19 is rearranged by adopting a "back to back" arrangement of the RTGs. With this arrangement there is a truck lane within each RTG span plus a "through" lane between alternate RTGs. By this means we believe that there can be six lines of RTGs between the quay and the rear of the terminal. This conclusion should be checked once an accurate topographical survey is available of the whole of the area between Berths 11 and 19.

The estimated number of ground slots in this arrangement is 4,854 TEU, providing a total capacity with three-high stacking of 14,562 TEU. We also recommend that taller lighting masts (45 m high) are adopted as this will reduce the intrusion of the lighting columns in the stackyard

The proposed arrangement of the terminal is shown on Drawing 2009/11 in Annex A. It should be carried out in stages once the area behind Berth 19 has been reclaimed and brought into operation.

The traffic circulation pattern has been based on trucks collecting or delivering containers entering the terminal at the eastern end and travelling through it in a westerly direction, leaving the terminal near the existing workshop building. Internal movement vehicles (yard tractors) will travel along the quay in an easterly direction and then turn and drive through the container stacks in a westerly direction.

Equipment and damaged/leaking containers can be parked/ stacked at the rear of the terminal on the western side of the workshops.

The proposed widening of the access road past the workshops towards the new Kipevu West Container terminal means that some of the buildings on the western side of the workshops will have to be demolished and rebuilt if necessary further away from the road alignment.

The drawing shows a width of about 10 m between the side of the workshops and the nearest RTG stack, which should be sufficient if the entry to the workshops is moved to the sides of the building. This dimension should be checked once a full topographical survey becomes available.

The estimated cost of this civil works required for the terminal rearrangement is KShs. 300m. The requirements for additional mechanical equipment are summarised in Table 5.3.

**Table 5.3: Additional Mechanical Equipment Required for Berths 16-19**

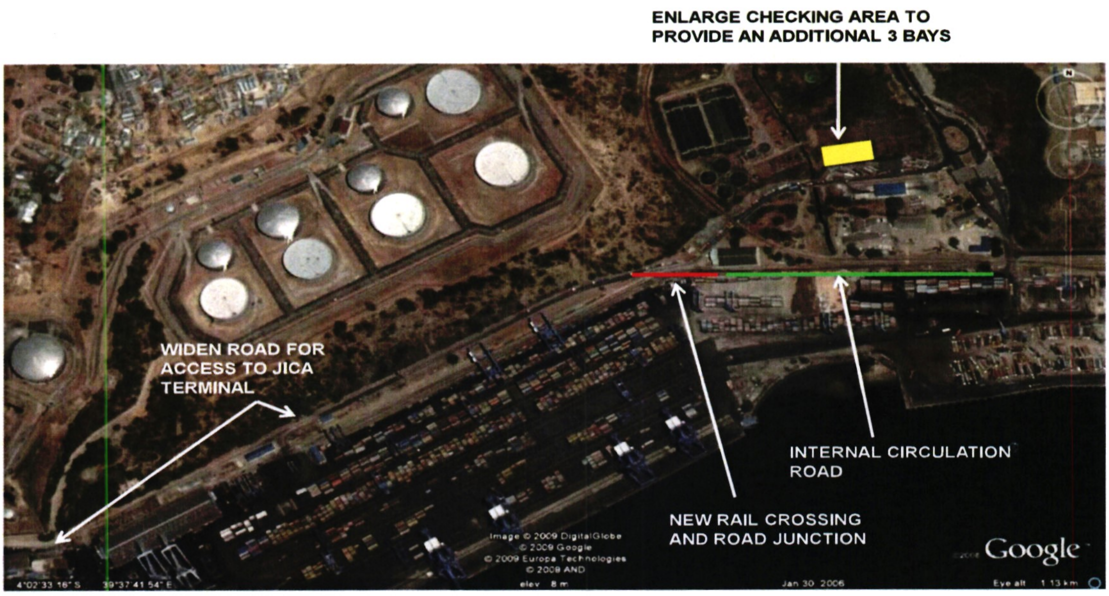
| | No. of units | Cost per unit KShs. m | Total cost KShs. m |
|---|---|---|---|
| SSGs | 3 | 600 | 1,800 |
| RTGs | 6 | 100 | 600 |
| Reach stackers | 1 | 70 | 70 |
| Tractors | 15 | 9 | 135 |
| **Total** | | | **2,605** |

### *5.2.9 Improvement of Checking Facilities at Gate 19 and Road Widening*

Long queues develop on the road leading up to the checking facilities at Gate 19, causing delays in clearing trucks from the terminal. We recommend that KPA investigates the possibility of widening the waiting area near Gate 19 so that an additional three checking booths could be built to speed up the clearance of the trucks. This is illustrated on the Google aerial photograph in Figure 5.8. It would mean purchasing some land from the adjoining power station and possibly re-building some of the structures that would have to be demolished to provide the extra space.

We also recommend that the road behind the Berths 16 to 19 is widened to provide a through-route between the Kipevu West container terminal and the remainder of the port. Based on the aerial photographs it looks as if it might be necessary cut into the hill side, but this needs to be checked after a topographical survey becomes available. An internal traffic circulation road can then be created via a crossing over the railway to join up with the road that is proposed at the back of the rearranged container terminal behind Berths 12 to 15. This proposal is illustrated on the photograph below.

**Figure 5.8 Enlargement of the Checking Area at Gate 19 and Roadworks Behind Berths 12 to 19**




### *5.2.10 Kipevu Oil Terminal*

***Berth Occupancy and Productivity***

The current berth occupancy rate at the Kipevu Oil Terminal is 78%, which is too high for a single berth. As explained in Section 4.12, the high occupancy is due to the slow average pumping rate, which is due in turn to the switching vessels on and off the berth during discharge, insufficient tank storage on-shore, loading bunker barges, and long discharge times for LPG tankers.

We believe that there are a number of issues that need to be dealt with relating to the on-shore operations such as increasing the tank storage, increasing up-country pumping rates and dealing with the distribution pipework to the various importers. Some of these issues are already being tackled. Assessing the need for an additional berth requires a detailed investigation that is not within the scope of this Master Plan Review, but should be undertaken as soon as possible. It should include the following:

- Detailed recording of all ship movements on and off the berth, including reasons for switching vessels.

- Quantities of different types of product actually pumped, including pumping rates.
- Inventory of tank storage, pipe sizes and pumping capacity including the ownership of different facilities
- Documentation procedures, including the time taken for each type of tanker and the causes of any particularly long delays.
- Discussion with operations staff on the reasons for low productivity and the ways in which this can be improved
- Preparation of outline proposals for improving productivity, including physical changes and changes to operating and documentation procedures.

If no improvement is made in productivity, the berth will not be able to handle all the forecast cargo by 2012 as the occupancy would theoretically be about 96.6%. Improvements in productivity are therefore essential if Kenya is not to suffer fuel shortages.

Assuming that the proposed study produces recommendations that would increase gross productivity by 20%, the berth occupancy in 2012 would still be 80%. After that, berth utilisation rates become dependent on when and if and when the proposed refinery un Uganda begins operating.

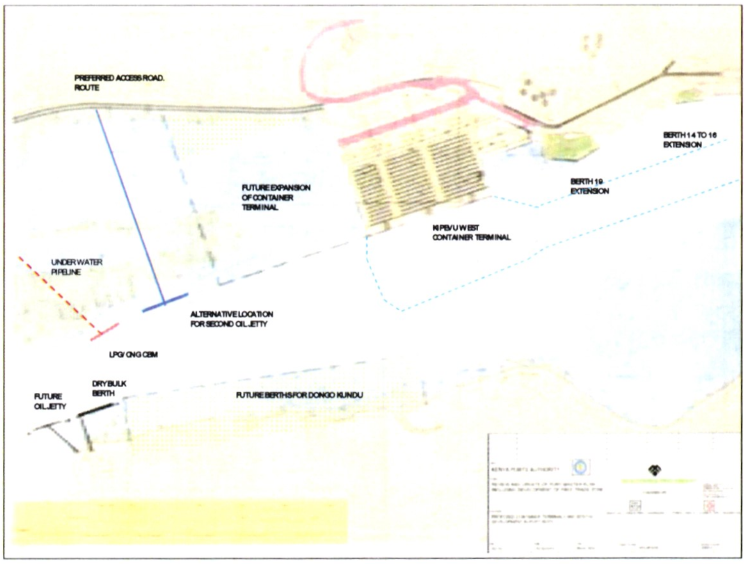
The spreadsheet in Annex B showing KOT berth occupancy rates suggests that with a gross handling rate of just under 17,000 tons per day KOT should have enough capacity to meet demand until around 2017. However this conclusion is extremely sensitive to the handling rate assumptions.

In addition to the high berth occupancy rates there is also the issue of security of supply, as an accident at the terminal would cut off supplies to Kenya and neighbouring countries.

***Location of an Additional Oil Berth***

Drawing 2009/12 in Annex A shows two alternative proposals for the position of an additional oil berth in Port Reitz. The first option is to place it at the western end of Dongo Kundu, adjacent to the proposed dirty dry bulks berth. This would have the advantage of keeping the jetty and the tank farm away from the remainder of Dongo Kundu and would not interfere with the expansion of other port facilities.

**Figure 5.9: Location of New Oil and LPG Berths**




The disadvantage of this location is that pipelines would be required to take crude and products across Port Reitz, either under the water or round the edge of the land, with one or two water crossings.

The alternative location is to the west of an expanded Kipevu West container terminal. We estimate that the expanded terminal will be full around 2030, subject to the actual productivities and dwell times achieved by that date. If this location is chosen for the oil berth, future expansion of container handling will have to be located on Dongo Kundu.

A third alternative would have been to locate the new oil terminal next to the existing Kipevu Oil Terminal and move the Kipevu West container terminal further west. However as the engineering for the terminal is already underway and funding has been negotiated on the basis of the current location, placing the new oil berth next to KOT is probably no longer viable.

Our recommendation therefore is that a study of operations at KOT should be carried out as soon as possible so that some short term improvements can be made. Investigations should also be started into alternative sites for a new oil jetty to determine which one should be developed, assuming that Dongo Kundu is connected by road to the north shore of Port Reitz in the reasonably near future.

***Safety of ship handling***

It is strongly recommended that the handling of vessels in the vicinity of the KOT is investigated in a simulation study to ensure that oil tankers and container vessels can be handled safely. Operational procedures should be developed and implemented as a result of the study.

### 5.2.11 LPG and CNG Berths

A proposal for an LPG fore and aft buoy mooring possibly also handling compressed natural gas (CNG) is being developed by African Gas & Oil Company Ltd, on the basis of a licence awarded to that company. At the moment this is at the planning stage, and it still to be confirmed that a single facility can handle both products as it we understand the CNG will be delivered daily in relatively small vessels. If the scheme can be implemented within the next two years it will relieve some of the pressure on the Shimanzi and Kipevu oil terminals. However the timing of the development is still uncertain.

The proposed location for the LPG mooring buoys at the western end of Port Reitz is very close to the site proposed for the coal jetty for Dongo Kundu power station, which will be more difficult to move. Our recommendation is that the LPG buoys be located to the east of the proposed dry bulk berth as shown in Figure 5.9 and Drawing 2009/12 in Annex A.

### 5.2.12 Utilities

Further upgrading of KPA's networks for power, water, sewerage and telecommunications is needed to improve the quality and reliability of existing services, and comply with national and international standards.

#### Power Supply

The current power demand at the port stands at 5 MVA. Discussions with KPA engineers suggest that power demand in the port will grow at 9% p.a. over the next 5 years, reaching 8 MVA by 2013. In the longer term, a GDP growth rate of 7% p.a. would generate an increase in the demand for power within the port of the order of 4% p.a.

The electrical distribution system has recently been rehabilitated, and the cables and switchgear are therefore in good condition. However the port still experiences power supply interruptions that affect productivity, especially at the container terminal. It is not practical to provide standby generators for an installation of this size; the alternative is to have a more stable incoming supply from KPLC.

Currently, KPA is supplied through two feeder lines at 11kV. One feeder originates from Kipevu and is able to carry the entire electrical load of the port. The other feeder comes through the dock yard area; this cannot meet total port power requirements resulting in load shedding.

KPA has plans to upgrade the incoming supply to 33kV and has budgeted Ksh.150 million for this. It has also been suggested that KPA sets up its own 5 MVA power station. However this is not considered viable in view of the capital investment and technical skills required.

To achieve a more stable power supply KPA should carry out the planned upgrading to 33kV. However it also needs a second power line with the capacity to supply the entire port load through a ring arrangement with a high redundancy factor.

The new line should built before the existing supply is upgraded, to give the port more flexibility and protect power supplies against disruption during the upgrading work.

The cost of the new power supply line from Kenya Power & Lighting Co.'s Makande sub-station to a new 33/11kV substation near KPA's substation K (next to the fire station) is estimated to be KSh 130m. This includes:

- Laying approximately 1.14 km of 33 Kv underground power cable terminating at the new 33/11kV substation. The budget cost at current Kenya Power & Lighting prices is KSh 35m.
- Establishing a 2x4MVA, 33/11 Kv substation, with a provision for future installation of 1x4MVA transformer. The budget cost (excluding the 4 MVA transformer) is KSh 95m.

The cost of upgrading the existing power line from Kenya Power & Lighting Co.'s Kipevu sub-station to 33 Kv is estimated to be KSh 125m. This includes:

- Laying approximately 1.1 Km 33 Kv underground power cable from the Kipevu sub-station to a new 33/11kV substation established near sub-station M (within the main KPA office block). The budget cost at current Kenya Power & Lighting prices is KSh 35m.
- Establishing a 2x 4MVA, 33/11 Kv substation, with a provision for future installation of 1x4MVA transformer. The budget cost of this (excluding the 4 MVA transformer) is KSh 90m.

***Water Supply***

Daily water demand for port use is in the region of 250 $m^3$ per day, with an additional 1,000 $m^3$ per day required for water sales to ships organized mainly by private companies. At present the port experiences a perennial water shortage for both purposes.

KPA has recently improved the reticulation system and is in the process of improving storage facilities. However it is doubtful that this will solve the problem as the amount of water supplied by MOWASCO is not adequate.

MOWASCO currently faces a daily water demand from Mombasa town and its environs of around 250,000 $m^3$, of which it is only able to supply 50,000 $m^3$, and demand from customers outside of the port is growing rapidly.

To deal with the problem of water shortages we recommend:

- Improvement of the water intake system.
- Provision of water storage facilities.
- Use of sea water for fire fighting purposes.

Improvements to the water intake system involve laying a 2 Km x 300 mm diameter GMS line from the water utility company's Changamwe water reservoirs direct to KPA's Kipevu Hill reservoir. However the reliability of supplies will be sorely dependent on investment by the utility company, which has the potential to upgrade its water intake from the Mzima springs from 50,000 $m^3$ to 160,000 $m^3$ per day. The cost of the new pipeline is estimated to be KSh 63m.

The existing water storage facilities within the port are negligible and there is urgent need to provide suitable storage to cater for current and future requirements. It is recommended that KPA construct two 3,000 $m^3$ reinforced concrete water tanks at Kipevu Hill. These will act as its main reservoir and supply secondary storage facilities within the port. The cost of the new tanks is estimated to be KSh 80m.

The water shortage means that the fire fighting hydrants are not reliable. Although improvements to water supplies will reduce the scale of this problem, a better solution would be to reduce the demand for fresh water by using sea water in the fire hydrant system, flushing with fresh water whenever it is used.

The Interim Report suggested that KPA should explores alternative sources of water by drilling boreholes to supplement the water supply, but also noted that this water was likely to be hard and would require further treatment to make it potable. This option has now been investigated and found to be non-viable.

***Sewage Disposal***

The port does not have a suitable sewage disposal system and raw sewage is discharged directly into the ocean. There is no sewage treatment system in the port, and existing sewage disposal does not conform to NEMA requirements

As the port aspires to meet world class standards, a better sewage disposal system is required. Foul effluent from individual building blocks should be passed though a suitable treatment system comprising conventional septic tanks and biological treatment plants. The effluent resulting from this process can then be either discharged directly into the ocean or recycled into the buildings and used for flushing toilets, reducing the demand of fresh water.

The proposed system comprises septic tanks serving three separate areas:

- The main KPA office block and adjacent buildings.
- Sheds and offices between Berths 5-10.
- Fire station and adjacent buildings.

The cost of the tanks and associated pumping systems is estimated to be KSh 4.5m. In addition, it is recommended that a biological treatment plant costing approximately KSh 30m should be installed.

***Communications***

The port is well served by a communication infrastructure with connectivity to the outside world through fiber optic cables. The LAN utilizes wireless and copper cables. However a number of outside stations like the gates do not have adequate power back-up systems, and these are critical for port operations.

With the implementation of QWATOS and 24hour working, it necessary to minimise outage of all the systems dealing with cargo clearance by providing standby power supplies. It is therefore recommended that three generators be procured and installed at the following locations:

- 350 kVA diesel generator at Substation M to serve the office block (KSh 5.5m)
- 500kVA diesel generator near Gate 10 to serve the gate, floodlighting and nearby offices (KSh 12m)

- 300kVA diesel generator near Gate 12 to serve the gate, floodlighting and nearby offices (KSh 5m)

The total cost of these standby power supplies is KSh. 22.5m. This is a priority project and should be implemented within the next financial year.

***Security Lighting***

The port is already implementing 24 hour working and the need for adequate lighting cannot be over emphasized.

KPA has already installed four monopole floodlights on pilot basis between Berths 11 -14, and is planning to install two similar floodlights between Berths 1-2. This is expected to become an on-going project until the whole of the waterfront is well-lit.

The total of fifteen monopole masts is required to cover the whole area, including the container terminal. The cost is estimated to be KSh 6m per mast including floodlights.

### *5.2.13 Summary of Short Term Development Programme*

The capital costs of the short-term development plan are shown summarised in Table 5.4 and the recommended timetable in Figure 5.10.

They include two major projects which have been treated as already committed: the dredging of the channel to -15m CD, and the construction of the Kipevu West Container Terminal.

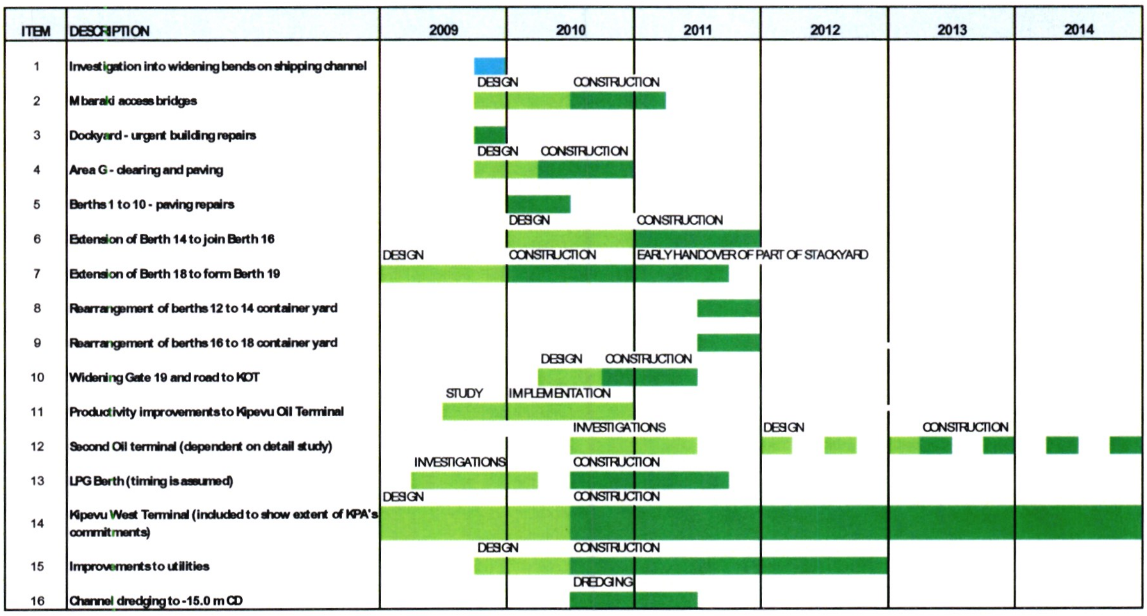
The capital cost estimates exclude a number of smaller investments which are already included in KPA's capital expenditure plan. These are discussed in Chapter 8

**Table 5.4 Capital Cost Estimates: Major Components of Short Term Plan**

| | KShs. m |
|---|---|
| **Committed projects** | |
| Channel dredging to -15.0m CD | 7,000[a] |
| Kipevu West container terminal | 20,000 |
| | |
| **New projects** | |
| Mbaraki access bridges & wharf deepening | 105 |
| Dockyard building repairs | 3 |
| Area G paving | 349 |
| Berths 1-10 paving repairs | 357 |
| | |
| Berth 14 extension civil works | 1,534 |
| Rearrangement of B11-15 container yard | |
| Civil works | 800 |
| Mechanical equipment | 2,090 |
| | |
| Berth 19 civil works | 3,144 |
| Rearrangement of B 16-19 container yard | |
| Civil works | 300 |
| Mechanical equipment | 2,605 |
| | |
| Improvement of Gate 19 and widening of road to KOT | 534 |
| | |
| New oil berth, including loading arm & pipework to shore | 2,900 |
| New oil berth pipework along shore | 1,009 |
| LPG berth | private finance |
| | |
| Utilities | 576 |
| Dust suppression equipment | 50 |
| **Total** | **43,356** |

Note: (a) Capital dredging is a Ministry of Transport responsibility, and will probably be grant-funded. However KPA may have to provide bridging finance if it wishes to expedite the work

**Figure 5.10 Short Term Development Programme**




## 5.3 Long term developments

Most of the long term Master Plan proposals are shown in Figure 5.11 and Annex A Drawing 2009/14. They continue the general westward movement of new port facilities into the Port Reitz area.

### *5.3.1 Containers*

#### *Kipevu West*

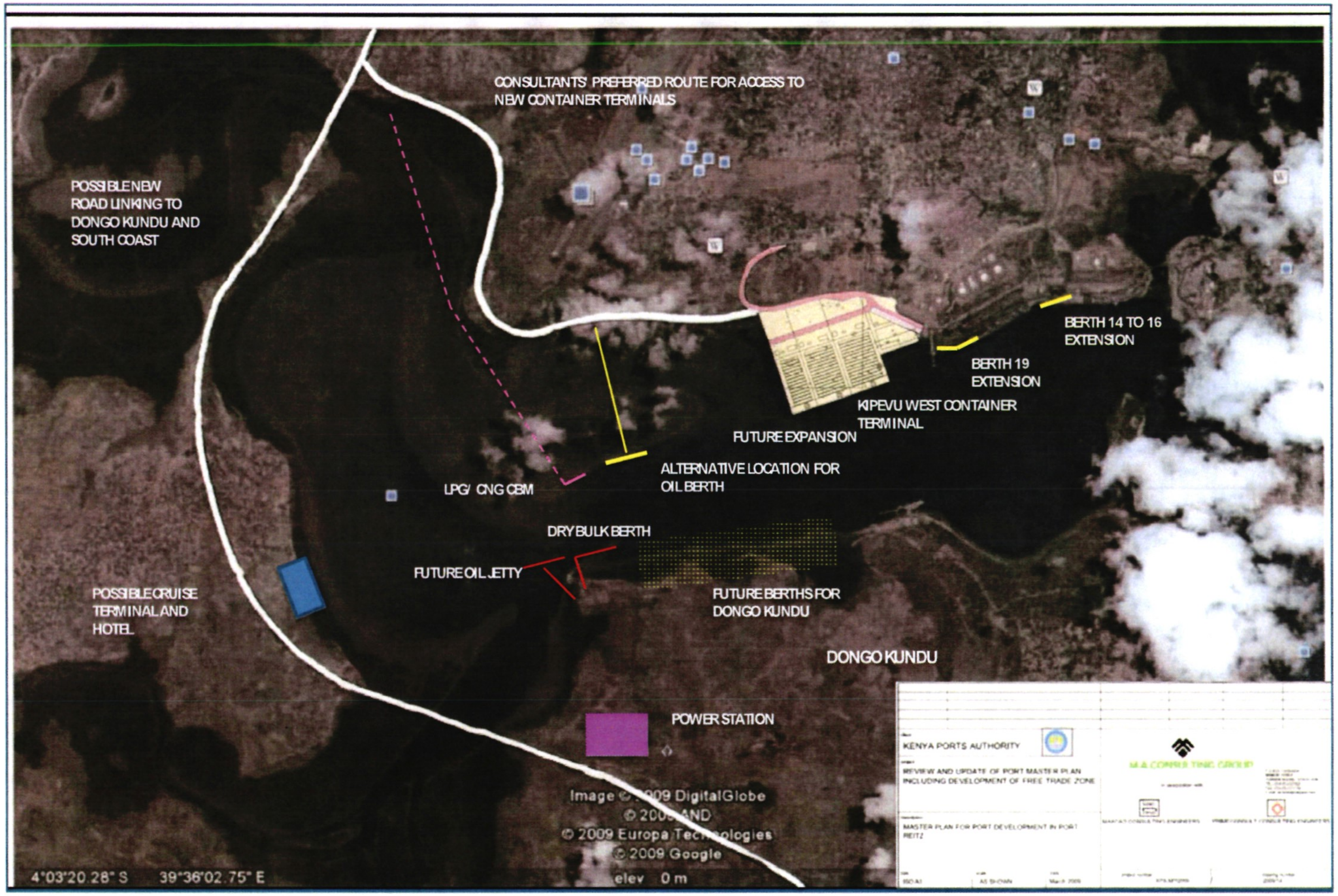
The Kipevu West container terminal design and construction has been included in Figure 5.10 (short term development plan) because it is a current commitment. However it can also be regarded as a long term project as construction will continue until 2016 and possibly beyond.

We understand that an agreement has been signed between KPA and the Japanese Government for this project, and we have therefore taken the size and location of the terminal as fixed.

The Kipevu West terminal as planned will provide 900 m of berths with a depth of -15.0 m CD and one berth at right angles to the main berth with a length of 190 m and a depth of -12.0 m CD. The planned annual capacity is 1,100,000 TEU. In our "base case" forecast we estimate that this capacity will be fully utilised by about 2021, after which additional berth length and back-up area will be required.

The access road to the terminal as currently planned uses a route up the hillside behind the terminal to join the airport road. In our opinion a better solution would be for a new access road to be built along the foreshore going west then rising to join the route of the southern bypass that is intended to link Dongo Kundu to the northern side of Port Reitz. This would prevent traffic joining the already congested airport road, and would route heavy vehicles north-west of the built-up area. The proposed route is shown on Drawing 2009/14.

**Figure 5.11 Long Term Port Master Plan Proposals**



***Subsequent Expansion Up To 2030***

We estimate that a further 1,100 metres of container berth will be required by 2027 to provide enough capacity to meet demand in 2030. We propose that the additional capacity is built in three phases as an extension to the Kipevu West terminal, as shown on Figure 5.11 and Drawing 2009/12 in Annex A.

**Table 5.5 Container Terminal Expansion Requirements After 2020**

| Phase | Design/ procurement | Construction | Operational | Capacity |
|---|---|---|---|---|
| Phase 1 300 m | Mid 2018 to mid 2019 | Mid 2019 to end 2020 | 2021 | 375,000 TEU |
| Phase 300m | Mid 2021 to mid 2022 | Mid 2022 to end 2023 | 2024 | 375,000 TEU |
| Phase 3 500m | Early 2024 to early 2025 | Early 2025 to end 2026 | 2027 | 625,000 TEU |

The actual timing should be reviewed nearer the time, as it will depend on the productivity of the equipment provided on the quay and in the stackyard. Dwell times will also have an impact on the amount of paving that has to be provided. It may also be preferable to do the development in two or even one phase, depending on the anticipated mobilisation costs for the separate phases.

Alternatively the extra berths could be constructed on Dongo Kundu. This decision does not have to be taken until 2016-17, just before the start of design, when the situation regarding the needs of the Free Trade Zone can be better assessed.

***Container Terminal Expansion Beyond 2030***

The proposed 1,100 m extension will provide sufficient capacity until about 2030. Further expansion could then be in the form of another 500 m immediately adjacent to the first 1,100 m extension if the new oil jetty is not built there, or on Dongo Kundu where there is sufficient space for approximately 2,100 metres of berth.

### *5.3.2 Dry Bulks*

Our long-term recommendation for the handling of dirty dry bulks such as coal, clinker and iron ore is that it should all be done at a common user berth on the western end of Dongo Kundu, as shown on drawings 2009/12 and 2009/14. Approximately 1.0 million tonnes p.a. of coal will be required for the proposed power station, whilst imports of clinker are forecast to rise from 1m tonnes in 2008 to 2 million tonnes p.a. in 2015 and 5 million tonnes p.a. by 2030. There would also be smaller amounts of other dry bulks.

A single bulk berth with grab unloading equipment and possibly screw unloaders for the clinker could handle 5 million tonnes per annum, so this would be adequate for the forecast cargoes, assuming that Mbaraki Wharf continues in operation.

The berth would be connected to the power station by a conveyor and there could also be a conveyor to a clinker stockpile.

The berth should be designed to accommodate Panamax sized bulk carriers with an overall length of 230 m, beam of 32.3 m and draft of 14.5 m. The deadweight would be in the region of 82,500 tonnes.

To provide for flexibility in the size and type of vessels handled the berth should have a solid deck (as opposed to a skeletal structure) so that trucks could run onto the wharf for direct discharge. The overall length of the berth would be in the region of 250 m with bow and stern mooring dolphins.

The timing of construction is dependent on the power station and the timing of the proposed southern by-pass to connect Dongo Kundu to the north shore of Port Reitz. We estimate that this link will not be in place until 2013 at the earliest, so construction of the berth is likely to be 2013-15 at the earliest.

### *5.3.3 Deepening of Berths 1 to 5*

The cost of importing grain would be reduced if Panamax size bulk carriers could be used; these would require a water depth of 14.5 m. Larger freight RoRo vessels could also use the berths if they were deepened; these would require a depth of 12.5 m.

We therefore recommend that Berths 1 to 2 are deepened to -12.5 m CD and Berths 3 to 5 to -14.5 m CD. The economic justification for this is discussed in Chapter 7. Whilst there could be immediate benefits for the import of grains if the berths were deepened in the near future, we consider that the most important issue facing the KPA in the next 4-5 years is the lack of container handling capacity. The work required to provide this capacity, plus the Kipevu West terminal itself, will absorb a lot of the KPA's funds and engineering capability. The berth deepening programme would also disrupt operations at Berths 1-5 at a time when the port is very short of space.

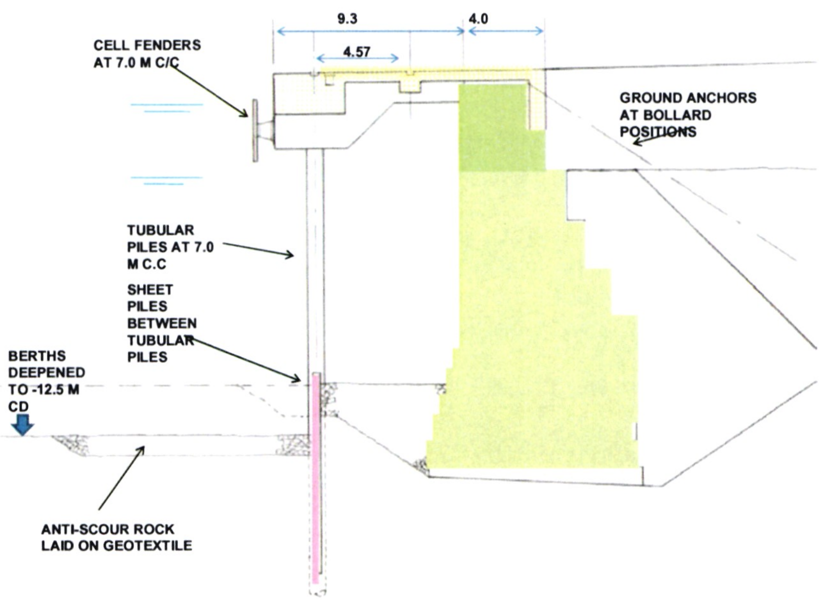
We therefore propose that the investigations and design work for the berth deepening should be carried out over the next four years but that the physical construction work should not start until 2013. Construction would probably take 3 years.

The quay walls on Berths 1 to 5 consist of large precast concrete blocks founded on a crushed rock foundation and topped with an in-situ capping beam. There is a crushed rock blanket in front of the quay, and the natural ground slopes gently downwards from the design depth of – 10.06 m CD for the first 20 to 30 m and then drops more steeply towards the -20 m CD contour.

There are changes of direction in the quay wall between Berths 2 and 3 and between Berths 4 and 5. We propose that when the berths are deepened the new quay should be straight for Berth 1 and 2, with a single change of direction for Berths 3 to 5. This is shown in Drawing 2009/08 in Annex A. It will result in the working area on Berths 1 and 2 being widened by 9.3 m, with Berths 3 to 5 having an additional 20 to 40 m of working area.

Our suggestion for the design of the deepening for Berths 1 and 2 is shown in Figure 5.12 below. This consists of a tubular piled deck with sheet piles driven to a top level of -9.5 CD to retain the ground in front of the existing blockwork. Part of the capping beam would be removed and the new deck cast on top of the remainder of the capping beam together behind the existing wall. Ground anchors would be provided at bollard positions. The cost of deepening Berths 1 to 2 to -12.5 CD is estimated to be KShs. 771m.

**Figure 5.12 Proposed Deepening of Berths 1 to 2**




The design for Berths 3 to 5 would be similar, with an additional two or three rows of piles and omission of the underwater sheet piles in the central part of the berth length where the bed level has dropped to -14.5 m. Extra ground anchors would be provided for the wider deck and larger fenders would be provided to accommodate the Panamax vessels. A full investigation of the ground conditions will be necessary to determine the detailed design of the scheme.

The cost of deepening Berths 3-5 to -14.5m CD is estimated to be KShs. 3,064m.

### *5.3.4 Vehicles and RoRo containers*

The number of imported vehicles is forecast to rise from 74,000 in 2007 to about 411,000 (an average of 1,126 per day) in 2030. This will require a large number of calls by the car carriers and a lot of space to handle the vehicles. In the long term this opens up the opportunity for a car import terminal on Dongo Kundu. In the medium term space will have to be provided behind Berths 1 to 5 to accommodate those vehicles that cannot be stored in the vehicle compound in Area G.

Assuming the number of RoRo containers grows at the same rate as the LoLo containers, approximately 3,300 TEU of slots will be required by 2030. There are approximately 1,800 TEU of ground slots behind Berths 1 to 7, which are currently shared between the RoRo containers (300 TEU ground slots) and containers that have been handled over Berths 11 to 18.

Once the Kipevu West container terminal comes on stream, there will be no need for Berths 11 to 18 to utilise the slots behind Berths 1 to 7, although some use may be made of the space if a private container handler takes over the operation of Berths 11 to 14/15.

The RoRo containers could all be accommodated on about 1,000 TEU of ground slots if RTG stacking were introduced, which would leave a little less than half of the area currently occupied by containers for the storage of vehicles and conventional cargoes such as steel.

In addition it is recommended that the KPA reviews the use that is required for the transit sheds immediately next to the berths to determine which sheds can be demolished to provide additional open storage space.

We estimate that when Berths 11 to 18 have ceased to use the open area behind Berths 1 to 5, transit sheds 2, 3 and 4 have been demolished, and Berths 3 to 5 have been widened, there will be sufficient space for a compound for approximately 1900 cars or vans. Coupled with Area G the total spaces provided for cars/vans would be about 2,670 plus 106 trucks and 11 buses. This would provide storage for about 2 days in 2030 and 3-4 days in 2020, according to the Base Case forecasts.

However based on our analysis of berth length requirements, we estimate that there will be a need to move some of the car operations to Dongo Kundu by about 2023. This would provide the opportunity for a private organisation to develop a vehicle compound and valetting centre. This means that planning and design should be commenced in 2020, with construction taking place in 2021 and 2022.

### *5.3.5 New Cruise Terminal*

A study carried out for the KPA on the development of a cruise liner terminal recommended a site at the western end of Port Reitz. This would be close to the proposed southern by-pass connecting Dongo Kundu to the north shore of Port Reitz.

We endorse this proposal, as the use of Berth 1 for cruise liners will not be satisfactory in the longer term due to the interruption to other port operations, and the need for large parking areas for the buses used to transport cruise passengers to the game parks and other places of interest.

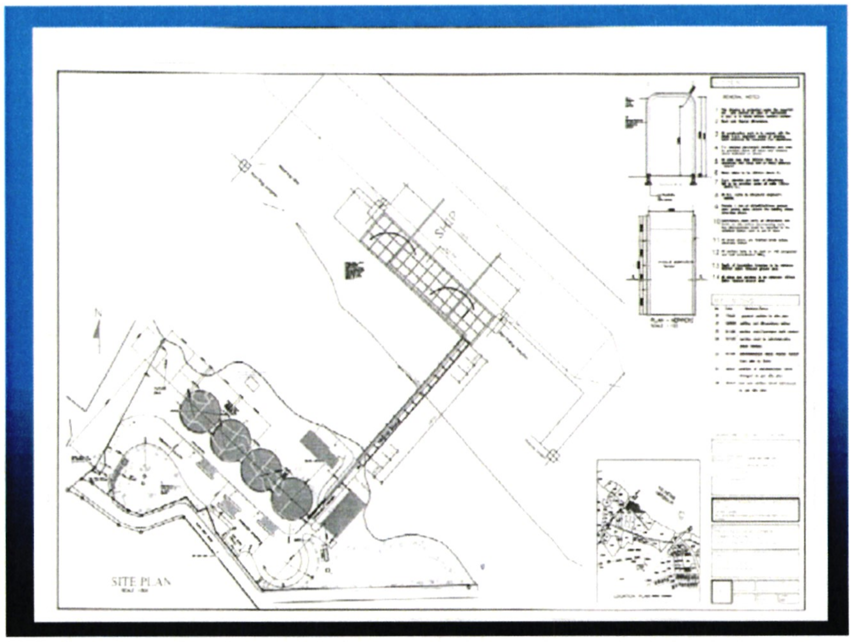
An approximate location for the terminal is indicated on Drawing 2009/14 but a more detailed study it required to define its exact location. The timing of this development is dependent on the by-pass construction and the development of the cruise liner market. It could also be a suitable project for private finance.

### *5.3.6 Tiomin Berth*

Tiomin Kenya Limited proposes to develop a mineral export facility on the south side of Kilindini Harbour some 500 metres west of the Likoni Ferry. It is intended to export ilmenite, rutile and zircon in ships of up to 30,000 dwt over a purpose built wharf.

Tiomin plans to have an annual throughput of 450,000 tonnes and a shipping frequency of 3 to 4 calls per month. As the development is to be privately funded, it does not have any impact on KPA activities apart from a small increase in vessel movements. The proposed facility is illustrated in Figure 5.9 below

**Figure 5.13 Mineral Export Berth Proposed by Tiomin Kenya Ltd**




### *5.3.7 Widening of Entrance Channel Bends*

If the study proposed in the short term plan demonstrates that it would be possible to bring container vessels larger than 4,500 TEU capacity safely into the port, there may be a demand from shipping companies to carry out some widening of the entrance channel bends. The timing of this is uncertain but it could be required around 2020 to 2021.

### *5.3.8 Environmental Impact*

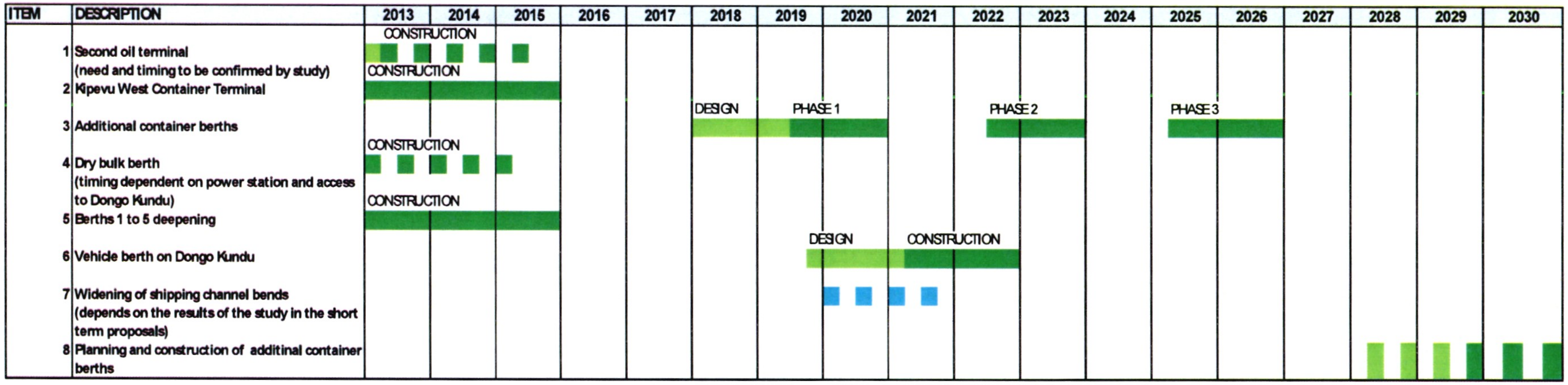
We have been unable to find much information about environmental conditions in the Port Reitz area, where most of the longer-term projects will be located. To overcome this problem, we recommend that KPA commissions a comprehensive environmental survey of the area.

This will provide a common data base for the Environmental Impact Assessments required for each project, reducing the time and cost required. If extended far enough inland, it could also make a significant contribution to the planning of Dongo Kundu Free Trade Zone.

### *5.3.9 Long Term Development Programme*

The timing of the long term proposals is shown in Figure 5.14. Capital cost estimates cannot be given at this stage as several of the projects are located in areas of the harbour whose ground conditions are still unknown

**Figure 5.14 Long Term Development Programme**



## 5.4 Road developments

The planning of road developments is outside the Terms of Reference for this study. However, the following paragraphs on the Proposed Mombasa bypass, Access road to KPA from the bypass and improvement of town roads are included for information.

The road improvement programme has two components, firstly a proposed Mombasa Western bypass which forms a section of the Northern Corridor Transport Improvement Project, commencing near Miritini Township (west of Moi International Airport) on the central mainland, passing near the proposed Dongo Kundu port on the south mainland, and ending around Ngombeni on the A14 coast road south of Likoni.

The second component of the road improvement programme and supplementing the proposed bypass are roads on the north mainland and Mombasa Island that are proposed for widening and improvement.

Improvements to the following roads are included in the study:

1. The access road to Moi International Airport (2.5km).
2. The access road to Port Reitz Hospital (Old Airport Road) (2.3km).
3. Mombasa Island Western Relief Road, which includes Mbaraki Road (960m), Mnazi Road (130m), Archbishop Makarios Road (1060m), Mwakilingo Street(420m), and a 4 lane bridge over the railway connecting to Lumumba Road.

The other road in the Phase 1 study network will be an access road approximately 5 km long from the proposed new KPA container terminal to the project bypass road . It will meet the projected bypass near the abandoned Mkupe explosives jetty.

These proposals are shown in Figures 5.15 to 5.17 below.

The proposed access road from the Western Bypass to the Kipevu West Container terminal is the same as the Consultants' preferred access route and is endorsed. (Figure 5.15)

The improvements from Changamwe Roundabout will also help with the inland distribution of trucks and the local improvements behind Port Kilindini will also help with traffic behind the port boundary. (Figures 5.16, 5.17).

The KPA will have to negotiate with the Ministry of Roads for classified Roads and Mombasa Municipal Council for unclassified roads where there are small areas of land that will have to be acquired for the roads project. Overall the projects should be a benefit to KPA.

**Figure 5.15 Proposed Western Bypass**

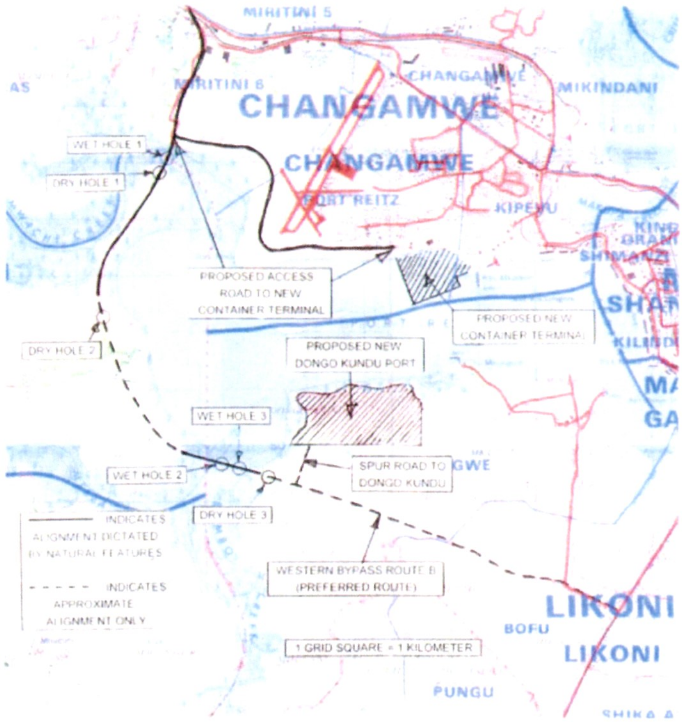



**Figure 5.16 Improvements near Changamwe**

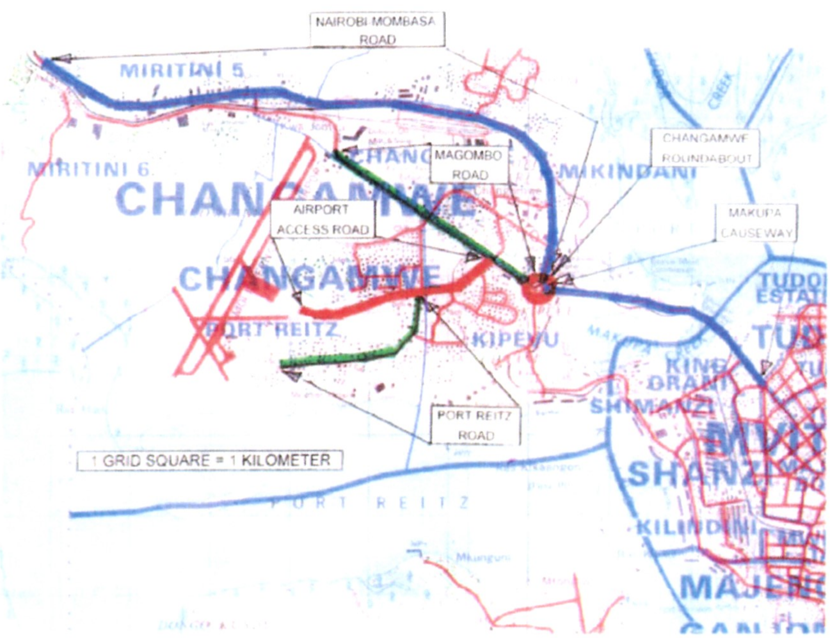
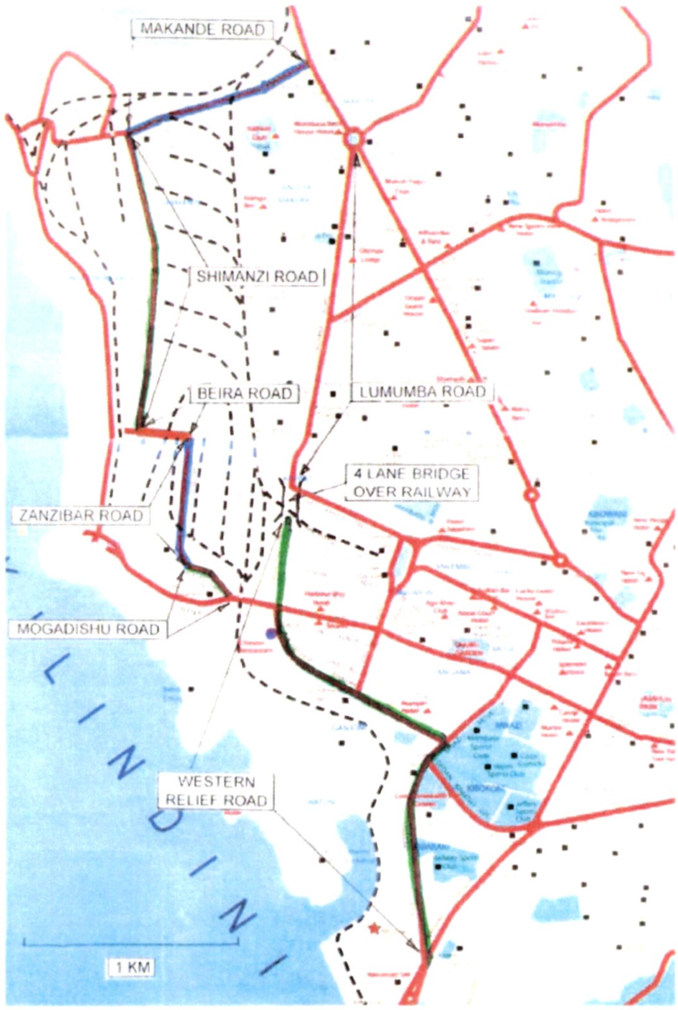


**Figure 5.17 Improvements behind Port Kilindini**



# CHAPTER SIX: FREE TRADE ZONE

## 6.1 Introduction

The Vision 2030 identifies the establishment of Free Trade Zones (FTZ) among the 97 flagship projects that are linked to key priorities to be implemented over the Vision period with the goal of achieving the desired economic growth. It is in this respect that Vision 2030 and the Medium Term Plan (2008-2012) provide for the development of a new port and a free trade zone in Lamu and dredging and deepening of Mombasa Port under infrastructure programmes; and the development of a free trade zone in Mombasa under international trade programmes.

Vision 2030 is Kenya's economic policy blueprint that provides broad goals and objectives for long-term development. The policies outlined in the Vision are translated to projects and programmes in the form of rolling five year Medium Term Plans (MTP), the first of which is the 2008/2012 Plan. The Vision policies, projects and programmes are assigned to specific government ministries, departments and other public agencies for implementation. These institutions in turn prepare strategic plans and commit to implement the projects by signing performance contracts with relevant authorities. In this regard, all government economic policies and development projects and programmes are required to be aligned to the Vision 2030.

In the context of the recent dynamics in the world trading system the Government of Kenya considers FTZs as important for promoting trade and development; and especially for creating alternative markets for Kenya's exports and strengthening trade facilitation. The Vision thus gives high priority to rehabilitation and expansion of infrastructure- the ports and related facilities, roads, railways and utilities as a means of promoting the development of FTZs. Specific examples include the dredging of Mombasa Port channel and development of a free trade zone in Dongo Kundu near the port.

The development of FTZs is traditionally catalyzed by the availability of low cost serviced land; security of power and water supplies; and, good access to national and international transport networks. Of importance also is the availability of an extensive range of common user services such as ICT, training, security of persons and property and assistance with research and development and marketing. The main driver for the establishment of FTZs has however been the location near existing modern ports with first class facilities.

Establishment of a FTZ in Kenya would encounter several challenges. The most critical is absence of a regulatory and legal framework to govern the establishment and operations of FTZs. The other is shortage of space and facilities within the port of Mombasa that may limit the ability of the port to compete with the more successful FTZs in the Gulf. The recent improvements in cargo tracking and auditing and the ease with which goods can now be moved between the port and bonded warehouses mean that it is no longer necessary for FTZs to be located within the port boundary. However, the absence of a regulatory regime means that it would be difficult to introduce FTZs in areas that are not enclosed and specifically designated for the purpose.

The 2004 Port Master Plan (PMP) reviewed the background and the possibility of introduction of Free Trade Zone concept in Kenya, and put forward proposals for the development of a small Free Trade Zone in Section G of the port, adjacent to Berth 1. However, attempts by KPA to implement the recommendations of the PMP, by calling on private operators to develop the FTZ did not attract any response.

This section revisits the issue of development of FTZs in Kenya and reviews the likely causes for the failure to develop the G Section into a free zone. This will lead to an evaluation of the central role of a free trade zone in the Vision 2030 development plan. This will include an analysis of the suitability of Dongo Kundu and any other area within the port for the development of a free trade zone.

## 6.2 Free Trade Zones

### *6.2.1 Background*

The success of FTZ in other countries, especially in the Gulf region lies behind the current interest in the concept in Kenya. The other motivation is both the success and decline in the importance of export processing zones in generating employment and exports. A mixture of publicly and privately operated EPZs has been licensed by the Export Processing Zone Authority (EPZA) since 1990. In total EPZs employ over 34,000 people, and have a turnover of KShs. 23bn, out of which over 95% is exports. In 2007 EPZ firms imported goods worth KShs. 12.6bn, and purchased KShs. 3.3bn of goods from local suppliers. Together the EPZs account for around 2% of Kenyan GDP, 9% of Kenyan exports, and 14% of Kenyan manufacturing employment. The significance of EPZs in the economy has ebbed in the last few years, with declines in both employment and investments and stagnation in exports.

Initially the sector's exports mainly went to the regional markets; but the introduction of USA African Growth Opportunity Act (AGOA) led to a surge in EPZ exports and employment. Under a relatively short period over 70% of EPZ exports went to the USA market. This contribution has been eroded over the years by trade liberalization of the trade regime that has reduced fiscal incentives necessary to attract new investments in EPZs. Moreover, with the coming into force of the EAC Customs Union EPZ products can no longer enjoy duty free access to the EAC market even though most the firms in the scheme were initially established to serve this market. The current government policy is to establish new products and new markets for EPZ products and introduction of new policies and programmes to promote exports and resultant job creation. For example, the under the Vision 2030, the Athi River Export Processing Zone is to be converted into business process outsourcing and multimedia technology parks.

The EPZA licenses several different types of EPZ. Some have been privately developed by individual companies for their own exclusive use, in order to obtain the tax advantages and other incentives which come with exporting over 80% of their production. The majority have been built by commercial property developers who lease industrial buildings to exporters. The EPZA itself has developed two EPZs; one at Athi River not far from Nairobi and the other at Kipevu in Mombasa. Because of the importance of port access, over half of the EPZs (as shown in Table 1) are located in Mombasa.

**Table 6.1: Number of EPZ Establishments in 2008**

| Ownership | | No. of EPZs in 2008 | No. Located in Mombasa |
|---|---|---|---|
| Private | self-occupied | 10 | 2 |
| | commercial leased | 18 | 12 |
| | mixed | 2 | 1 |
| | undeveloped[5] | 1 | 1 |
| Public | | 2 | 1 |
| Total | | 31 | 17 |

The existing EPZs vary considerably in their performance in terms levels employment, investment, gross sales and value addition. Some are more successful than others, for example the EPZA site close to the port in Mombasa has been rather slow to develop, attracting only five companies (in textiles, metals and plastics) since its designation in 1996. This also underlines the reasons behind the recent interest in FTZs. The importance of free trade zones in economic development in other countries is also behind Kenya's determination to promote the sector.

### *6.2.2 The Concept*

Free trade zones are locations set aside to carry out economic activities outside customs territories to serve both local and third markets. The zones are therefore areas that are physically or administratively outside of national customs territory where unrestricted trade with the rest of the world is permitted. These arrangements are mushrooming around the world as means of facilitating regional and international trade. The leading FTZs in terms of employment and value of exports are Cakung in Indonesia, Mauritius where the whole country has been converted to a Freeport, Jebel Ail in Dubai and Subic Bay in the Philippines.

The legal status of activities in FTZs is not dissimilar to those that face activities under bonded warehouses. Bonded warehouses have mainly been used to store raw materials that are then removed for use after duties are paid where necessary; or in some cases used in EPZs or exported to third countries duty free. Similarly firms in the free trade zones are allowed to import and store goods free of duty until such time as the goods are sold and removed from the FTZ; only then would duty become payable if the goods are sold in the domestic market. However the companies located in the FTZ are allowed to carry out simple processing of the goods whilst they were still in bond. Such activities would include packing, sorting, labelling, testing, cleaning and grading, and would not involve complex assembly or manufacturing. Moreover, goods from FTZs can be re-exported without payment of duties or being subjected to other customs regulations and controls.

The above activities would be highly controlled by the EAC Customs Management Act because splitting up and recombining of imported inputs during the manufacturing process would make it difficult for the Revenue Authority to track the duty payable on individual components at the time of sale. The use of domestically-produced inputs during manufacturing would further complicate cargo tracking and the auditing of duty payments. To address this problem for manufacturers of goods for export, EAC CMA requires the manufacturer seeking duty remission to maintain separate books for locally sourced goods,

[5] This site is likely to be occupied soon.

imported goods and imported goods received from another manufacturer. This arrangement could apply to goods processed or produced in FTZs.

### *6.2.3 The G-section*

The 2004 port master plan (PMP) identified the G section as the likely site to develop a FTZ. This area was previously used as a special container facility dedicated to handling and storage of Zambian copper exports. It is currently used as storage for imported cars, but also contains some sheds. It is important to state that the 2004 PMP did not recommend the establishment of an EPZ type FTZ model requiring companies in the zone to meet export targets. This was because the area available for an FTZ at the Section was considered small and expansion is constraint by the scarcity of land in the port.

The 2004 PMP concluded that a FTZ could be established at the G-section with a throughput of around 22,000 TEU p.a. by 2010 and 37,000 TEU p.a. by 2020. However, at the original proposed 7 ha the PMP envisaged that the FTZ could handle around 4,000 TEU p.a., but would fill up as soon as it opened. It was therefore suggested that to achieve the predicted traffic the section would have to be expanded to 18.4ha by 2020.

The 2004 PMP proposed several scenarios for developing the G-section. It was recommended that the development of the section be left to the private sector, with the Free Trade Zone Authority simply acting as the landlord. It was suggested that the sheds be retained, as they were in reasonable condition and could be rehabilitated by private developers. It was further proposed that the EACHS building be rehabilitated for use by Customs, the FTZ Authority and other statutory bodies such as providers of health and veterinary services, and the Bureau of Standards. The PMP recommended that the FTZ Authority could subdivide the remaining area of the section into 1-2 ha plots and lease them out to private companies to erect buildings for their own use, common user warehousing or leasing to third parties. The last recommendation was established not to be cost effective.

A successful developing of a FTZ at the G-section would require substantially larger space than the current available land area in the Section that is a maximum of 12 hectares. Although the area has 3.0 hectares of covered space and 0.2 hectares occupied by buildings, this would not be sufficient for displaying and storage of transit goods that would be required to maximise berth productivity. On the other hand, the conversion of the area for long-term warehousing, manufacturing and distribution would require building of additional quays.

All these indicate that the G-section is not suitable for a FTZ and should be considered for other uses. Other trade-related facilities which could be incorporated into the redevelopment of the area include:

- Modern offices with good communications facilities for the many small companies which require almost daily access to the port (forwarding & clearing agents, shipping agents, cargo surveyors, ships' chandlers etc).
- Consolidation of Customs facilities with those of other statutory authorities to provide a one-stop shop for customers seeking to clear cargo from the port. Such a building could also house support services such as banks, notaries and secretarial services providers.

- Accommodation for official representatives and commercial companies from the transit countries, and Indian Ocean islands which tranship much of their trade through Mombasa.
- Showrooms for imports and exports, combined with trade facilitation and marketing services.

The G-section is quite close to the city centre, and could be made easily accessible to the public without putting port security at risk. It is thus a good location for activities at the interface between transport and trade, where the port interacts with the wider business community. The construction of a prestigious building at this point, designed to serve the interest of international and EAC trade would do much to improve the public image of the port. The current consideration by KPA to redevelop the area for commercial waterfront facilities that would include shops, restaurants, hotels, offices and residential properties targeting cruise tourists would fit in this proposition.

At the same time we recognise the potential of the site. There is undoubtedly some demand for the types of premises envisaged in the 2004 PMP, although tenants would need to be carefully selected to ensure that they make maximum use of its waterfront location, and generate identifiable economic benefits. While G-section has a clear transport cost advantages as the location for an FTZ, the opportunity cost of land may be high compared with other sites in Mombasa. G-section will also be unable to capture the economies of scale and scope that would be available at larger sites elsewhere.

## 6.3 Location of FTZ in Mombasa

### *6.3.1 Reclaimed Land*

During discussions with port management, the consultants broached the option of the land adjacent to the new Japanese-funded container terminal in Berths 20-23 being reclaimed for the purpose of developing a FTZ. The attractiveness of this option is that the available space is larger than that in the G-section; and especially since it is unlikely that the access road to Dongo Kundu will be ready before 2015. It estimated that compared to the proposed development of FTZ in Dongo Kundu, it would take 3-5 fewer years to develop this area.
However, investment in this area, like in the G-section would be constrained by availability of space. An even more binding constraint is poor accessibility. The road planned to serve the container terminal is considered inadequate and did not take into account the establishment of a FTZ. Moreover, it is widely believed that the road is inadequate for the terminal itself.

The development of a FTZ in this area would be a temporary measure to the development in a more suitable location. This would have to be weighed against the likelihood of having to abandon it sooner or later for a better located FTZ.

### *6.3.2 Dongo Kundu*

Dong Kundu is located in the southwest of the Port of Mombasa, where KPA owns 3000 acres of land. The 2004 Port Master Plan did not consider Dongo Kundu as a location for a FTZ even though it has been under consideration since 1984; and despite the fact that KPA essentially acquired land there in 1978 for expansion of the port. The establishment of a FTZ in the area was proposed by Van Houten reports of 1984 and 1989 and was considered by the Pacific Consultants International study of 2005 and the JPIC/JIC SAPROF study of 2006.

Compared to the other two proposed locations, Dongo Kundu is the most suitable, primarily because substantial land already exists and other developments have been planned for the area. The proposed projects include: the coal jetty and a coal-fired power station that is not yet to be built; container and cruise terminals; public wharves; two mineral berths; a grain berth; and, an industrial park. The zone will comprise 6,200 sites, a residential park and 10000 business units. Other facilities will be developed to cater for warehousing, light industries and processing. It is expected that the zone will promote value added industrial and commercial activities and generate employment and technology transfer. It will also increase traffic for the port.

The immediate handicap to the development of the FTZ is inaccessibility to the area and the likelihood that container berths required to service the FTZ may not be developed before 2020. Plans are however underway to develop a fixed sea crossing bypass to the south with a bridge/causeway combination from Miritini Station to the Dongo Kundu mainland. The bypass will open up the South Coast, promote tourism and improve road connection to Tanzania.

The Ministry of Transport is coordinating the development of Dongo Kundu and has commissioned a study on the establishment of a FTZ in Dongo Kundu that is expected to be completed by October 2009. Based on the findings of the feasibility study, the greater part of the project is expected to be accomplished by 2012, a dateline that is nothing short of unrealistic.

The Vision 2030 specifies that the project is to be developed under the public private partnership model (PPP) at a cost of Kshs. 500 billion. In this regard, GOK has taken steps to provide appropriate environment for implementation of the FTZ. The Cabinet recently approved a memorandum that will lead to development a policy and legal and institutional framework for implementing PPP. The development of a PPP bill is underway.

The development of the FTZ through PPP would fit the modern management practiced worldwide that separates port ownership from operations. Under this management structure KPA would be responsible for: dredging harbour basins and channels; construction of breakwaters; building of locks; provision of navigational and safety facilities; long term planning; and environmental compliance. The operations and development of berths and terminals will be provided commercially through private investments under Build Operate and Transfer (BOT) concession. We were informed by port authorities that BOT can be accommodated by KPA Act, but a PPP policy and legal framework would improve the credibility of the concessions.

One of the Vision flagship projects for opening up Dongo Kundu is the dredging and deepening of Mombasa port to 15 metres to allow post-Panama vessels to access the port. The 2008/2012 MTP assigns the dredging of the port to the Ministry of Transport and KPA, and is to be fully funded by GOK at a cost of Kshs. 7 billion over the plan period. Apart from the private sector, the public sector entities that have been designated to contribute to the development of Dongo Kundu are five ministries of Finance, Transport, Roads, Industrialization and Trade; KPA and Kenya Revenue Authority. These institutions are also

expected to collaborate in reducing the cost of doing business by implementing policies and reforms that facilitate trade.
In an endeavour to promote trade, the Vision's goal is "to bring Dubai to Kenya" by establishing a duty free zone to serve the Eastern Africa region. The MTP of the Ministry of Trade has in this respect committed to allocate substantial budgetary resources over the next five years for the development a free port in Dongo Kundu. The Ministry of Transport is initially funding a study to recommend on the viability; appropriate and institutional frameworks; and, at least three investment models for the FTZ. There is also an ongoing preliminary study by the Ministry of Public Works, funded by the World Bank, on a road by-pass that would go through the area.

### 6.4 Institutional Arrangements

The 2004 PMP examined three different organisational models for the Free Trade Zone, namely:

- Management by KPA.
- Management by KPA with day-to-day operations outsourced to a private contractor.
- Private sector operation.

Perhaps surprisingly, the analysis did not consider EPZA type operations or the establishment of a separate public sector Free Trade Zone Authority. The PMP recommended that KPA develop the basic "public sector" infrastructure for the zone and put together a project team within KPA which would manage the Free Trade Zone in partnership with a professional management firm. While this is permitted by Regulations 12 (2) (n) and (p) of the KPA Act the PMP did not specify how the partnership would have been set up.

The Vision 2030 identifies PPP as the institutional arrangement under which the Dongo Kundu FTZ is to be developed. In this arrangement the government will develop the necessary infrastructure: road and rail links to the area, dredging of the channel and provision of power supply. It is also expected the local authority will provide other services, such as sanitation and sewerage, water, street lighting and social services.

The Ports Authority as the owners of the land could consider getting involved in the form of joint venture, using the land as contribution to equity. KPA could be involved in the development of the berths and must ensure that the planning and development of the FTZ is integrated with port operations. As already suggested enactment of a PPP policy and legal framework would put such joint investment by the public and private sector in a firm foundation.

The relevance of PPP is supported by the interest shown by the private sector on the project. At least one private developer has submitted a proposal to develop free trade zones in three sites in Mombasa: Mbaraki, Makupa and Dongo Kundu. The developer proposes to construct 14 berths, oil and container terminals, a trading zone and industrial parks in Dongo Kundu. Although this is clearly an overly ambitious proposal it is indicative of the possibilities of private sector involvement in PPPs.

It has also been proposed that to fully maximize the contribution of the public and private sector in the development of FTZ, the whole Mombasa Island could be declared as a FTZ. This is most appropriate for island countries, but in the absence a regulatory framework the proposal would difficult to implement in Kenya.

### 6.5 Legal Framework

Whilst the EPZ Act and the section of the Customs and Excise Act relating to bonded warehouses cover some of the requirements of a Free Trade Zone, both impose restrictions which are not normally present in Free Trade Zones. These include the payment of duty and other taxes immediately goods are removed from containers and a 2.5% surcharge of EPZ goods sold in the domestic market. This raises the cost of doing business for firms obtaining raw materials from bonded warehouses and has contributed to the decline of bonded warehousing.

The *Protocol on the Establishment of the East African Customs Union (Freeport Operations) Regulations (Annex VIII)* and the EAC Customs Management Regulations of 2006 and 2008 introduced a legal framework for FTZs. The Protocol allows Free Trade Zone operators to be licensed by the relevant national authority for a maximum period of 12 months. The Protocol also specifies where the free ports may be established and allows for the appointment of a Free Port Authority in Partner States to manage FTZs.

However, the Regulations impose a number of restrictions which make it questionable whether the advantages of operating from a Free Trade Zone justify the additional expense and bureaucracy. For example, while licenses would probably be renewed semi-automatically, lack of security of tenure could act as a significant disincentive to private investment. The conditions imposed on the construction of buildings in Free Trade Zones are also more onerous than those applying at normal commercial sites[6].

The Free Trade Zone also offers fairly limited fiscal advantages for goods proceeding to the transit countries. Containerised and conventional cargoes for the transit countries are allowed to proceed without payment of duty, but security bond must be executed that will only be cancelled upon proof of exportation of the cargo. These conditions apply to all the countries of the Community. The advantage of operating from a FTZ is that goods can be worked, including simple processing and manufacturing and exported without payment of duty.

Companies operating in Free Trade Zones are required to maintain special computerised registers showing the fiscal status of all goods bought and sold, and may be required to provide Customs with information for monitoring purposes on the flow of goods between the Free Trade Zone and the port. In addition, the licensee is expected to submit to the Free Trade Zone authority a monthly return listing:

- All goods received or re-exported.
- The stock of goods held on site.
- Waste stock, and plans its disposal.
- Losses through evaporation, processing, damage, spillage; leakage or other causes.

In exchange companies in the Free Trade Zone receive the following main advantages:

[6] For example the plans have to be approved by the FTZ Authority, the licensee is not allowed to make any claims against the Authority for reimbursement of costs if the license is revoked, and is liable for demolition costs

- Exemption from duty on all goods consumed within the Free Trade Zone, including machinery and equipment.
- Exemption from duty on imported inputs for all goods which are subsequently re-exported, in the same way as applies to EPZs.
- Postponement of duty on imported goods sold on to the Kenyan market until they leave the FTZ.
- Ability to provide value added services such as groupage and cargo customisation; these are likely to be of particular value for cargo flows to smaller destinations such as Rwanda and Burundi (transit traffic) and the Seychelles and Comoros Islands (transhipment traffic). Such services would be difficult to provide at the container terminal without disrupting other activities; and cannot be undertaken at commercial CFS depots without payment of duty.

To move goods from the Free Trade Zone to Kenyan Customs territory import declaration forms have to be submitted in the normal way. Once the goods have been valued and the duty payment agreed, a separate application must be made for permission to remove goods from the Free Trade Zone, specifying in advance the date of their removal. Moreover, retail trade is allowed only with explicit written authorisation from the Free Trade Zone Authority.

The operations of FTZs are also to be regulated by the yet to be concluded EAC/EU EPAs (Article 40). The agreement requires the parties to ensure that:

- Originating goods passing through a FTZ are not substituted for non-originating goods or undergo any handling other than to prevent deterioration.
- Originating products imported into a FTZ that meet the rules of origin are issued with export certificates (EUR.1) after undergoing treatment or processing to guarantee that the new products comply with the rules of origin.

It is without doubt that the East African Community Customs Union Protocol and Customs Management Act provide the necessary instruments to regulate FTZ operations. These instruments are yet to be used to promote FTZs in the region. One of the constraints is the missing nexus between regional and domestic legal provisions on the issue. It is therefore important that national policies and legal provisions that are likely to impact on the operations of FTZs are reviewed and harmonized. Perhaps more important would the development of a regional policy and regulatory framework for free trade zones that would harmonize the development and operations of FTZs.

## 6.6 Conclusion

Although supported by a survey of local businessmen, the underlying business model for the FTZ used in the 2004 PMP appears weak. The main concerns with respect to the development of a FTZ in the G-section are that:

- The EAC Protocol imposes restrictive licensing conditions, whilst the fiscal advantages of an FTZ location are relatively small except in certain niche markets. This may result in a low take-up rate for premises and land, unless they are competitively priced.

- The economic benefits of the FTZ are likely to be small. The permitted activities will not generate many jobs or much local value added, although they would enhance the port's attractiveness for transhipment and transit traffic.
- The financial rate of return to KPA is likely to be low, and higher value uses can probably be found for the site.
- The port is severely short of space and assigning much-needed land to an FTZ could reduce its efficiency and operational flexibility, as well as restricting its longer-term development options.
- The institutional arrangements, including changes to Customs procedures - are likely to be complicated and time-consuming to work out, and may not be justified by the scale of operations envisaged.

It is our review that in the long term Dongo Kundu would be a better site for a FTZ than the G-section and the proposed infill near the second container terminal. The choice between Dongo Kundu and the site next to the 2nd container terminal has to take into account the Government's commitment to development of free trade zones. These include the formulation and implementation of time bound policies, projects and programmes supportive of FTZs; allocation of resources to develop infrastructure in and around Dongo Kundu; and the setting up of institutional structure(s) to regulate and implement FTZs. If indeed Dongo Kundu FTZ could be in place by 2015, then resources that could be used to develop the area near the 2nd container terminal for the same purpose could be directed to other purposes. In any event it is worthwhile for KPA to consider all the possible options that the land in this area could be utilised.

Going forward, it is recommended that KPA as a major stakeholder in Dongo Kundu should be fully engaged and contribute to Government's activities on the formulation of policies and programmes related to the development of a FTZ in the area. This is important for the protection of KPA's interest; for KPA to provide technical advice on developments that involve or may affect port operations; and to fulfill performance contracting obligations on Dongo Kundu that the Ministry of Transport may to cascade to it as a major parastatal in the Ministry. In fully engaging in the process KPA will unsure promotion of appropriate policies on port matters.

# CHAPTER SEVEN: ECONOMIC EVALUATION

This Chapter evaluates three of the short-term proposals listed in Chapter 5:

- Mbaraki Wharf access bridges, wharf deepening and wharf extension.
- Berth 14 extension, including rearrangement of the container yard behind Berths 12-14.
- Berth 19, including rearrangement of the container yard behind Berths 16-18.

It also evaluates the deepening of Berths 1 to 5, although this has been included in the long term plan because of the difficulty of implementing it at the same time as the other projects.

The construction of the Kipevu West container terminal has been included in the Master Plan without any further evaluation because it is already a committed project

The widening of the approach channel to the port has not been evaluated because of the difficulty of simulating accident risks. In addition it is likely to be financed by the Ministry of Transport rather than KPA.

The other projects in the Master Plan have not been evaluated because they are too small, lack the necessary data, or are likely to be privately financed,

## 7.1 Mbaraki Wharf

The projects to be evaluated for Mbaraki Wharf are:

- Construction of two new access bridges so that large articulated trucks can be loaded from the ship directly.
- The need for a third berth.

The cost of deepening the berth to -12.5m is estimated to be only KShs. 11,200,000, and will be recovered through the use of larger ships. Any new mechanical handling equipment is likely to be privately funded. The benefits of the dust supression equipment will be environmental rather than economic.

***Construction of New Access Bridges***

The capital cost of the project is estimated to be KShs. 105m, which includes dredging the berth to -12.5m. The amount of traffic likely to benefit from the new access bridges is estimated to be around 630,000 tons in 2007, increasing to around 1.5m tons p.a. when the wharf reaches full capacity working.

The main benefit is avoidance of the need to reload the cargo from 7 tons trucks into much larger ones with a 20-25 ton payload. With a weighted average discharge rate of 280 tons per ship-hour, around 12 men will be needed to enable the truck transfers to keep up with the working speed of the ship. Double handling costs, including labour, land, equipment maintenance, depreciation, insurance and fuel, are estimated to be around KShs. 9.50 per ton.

This suggests that the saving in double handling costs would be around KShs. 6.0m p.a. at 2007 traffic volumes, increasing to around KShs. 14.2m p.a. when the wharf is working at full capacity.

The Internal Rate of Return assuming that the savings increase in line with expected traffic across the wharf up to 2019 and then remain constant until 2030 is 13%. If a new dry bulk facility is opened at Dongo Kundu in 2022 and Mbaraki Wharf is no longer used for clinker and coal, the Internal Rate of Return would fall to 8%.

***Need for Wharf Extension***

With two berths, the utilisation of Mbaraki Wharf in 2007 (including vegetable oils) is estimated to have been around 30%. Assuming that there is no significant improvement in handling rates and the traffic mix remains much as at present the capacity of the existing wharf is estimated to be around 2.15m tons. This is insufficient to handle all of the forecast dirty bulks traffic and Mbaraki's share of vegetable oils.

**Table 7.1 Base Case Forecast for Cargoes which could use Mbaraki Wharf ('000 tons)**

| | 2007 | 2010 | 2015 | 2020 | 2025 | 2030 |
|---|---|---|---|---|---|---|
| **Imports** | | | | | | |
| Clinker | 1,051 | 1,326 | 1,963 | 2,810 | 3,882 | 5,136 |
| Vegetable oil[a] | 225 | 258 | 352 | 483 | 640 | 814 |
| Fertilisers | 383 | 391 | 410 | 431 | 450 | 466 |
| Coal | 176 | 222 | 329 | 471 | 650 | 860 |
| Other Dry Bulk | 328 | 387 | 511 | 674 | 889 | 1,172 |
| **Exports** | | 0 | 0 | 0 | 0 | 0 |
| Other Dry Bulk | 205 | 129 | 60 | 28 | 13 | 6 |
| **Total** | **2,368** | **2,714** | **3,624** | **4,896** | **6,524** | **8,454** |

Note (a) one third of vegetable oil imports. The remainder is assumed to use Berths 9-10

Source: Consultants' estimates

It is therefore necessary to consider the capacity of the other conventional berths, and the extent to which they can accommodate the future growth in dirty bulks. The analysis for the period up to 2013, when the new container terminal is assumed to open, has been based on the following assumptions:

- Berths 1-2 are dedicated to passengers and vehicles
- Berth 3 is dedicated to grain
- Berth 9 is reserved for soda ash for 35% of the time, and is also – along with Berth 10 - the main alternative to Mbaraki for the handling of vegetable oils.
- Berths 11-12 are required for container handling, and are not available for bulks or general cargo.

The allocation of cargoes in 2015– the most critical year for the port – has been based partly on the assignment of cargoes in 2007 and partly on the physical suitability of the various berths for different types of cargo. It assumes that there would be a natural preference for using Mbaraki for dirty bulks, but that some cargoes of this type would be handled at other berths because of peaking in the ship arrivals pattern.

The results, suggest that Mbaraki Wharf and the conventional berths combined will still have plenty of spare capacity in 2015, leading to the conclusion that a third berth at Mbaraki Wharf is not required in the short term.

This conclusion is conditional on the assumption that sufficient additional capacity for container handling can be provided in the short-term, allowing container traffic to be largely removed from Berths 1-10.

In the longer term there will come a point at which the port has insufficient capacity for handling these cargoes. In the base case forecasts this is likely to occur around 2019 if Berths 11-12 continue to be used for containers, and in 2023 is they are released for use by dry bulks and general cargo.

At this point there is a choice between developing a third berth at Mbaraki Wharf, or building a completely new dry bulk terminal at Dongo Kundu, probably in association with the coal jetty for the proposed new power station.

We strongly recommend that any new dry bulk facilities are built at Dongo Kundu rather than the existing port:

- Dongo Kundu will have deeper water, allowing the use of larger bulk carriers. This is likely to result in a substantial saving in ocean freight rates.
- Dongo Kundu will have more land available for stockpiles, and the space to built modern storage facilities.
- There are strong environmental advantages in locating dirty bulk cargoes away from the centre of Mombasa, including the minimisation of dust nuisance and a reduction in truck movements through the urban area.
- The existence of bulk handling facilities at Dongo Kundu will increase the attractiveness of the Free Trade Zone

These advantages are so self-evident that it has not been considered necessary to quantify the benefits. The construction date lies well ahead in the future, and the project is ill-defined and dependent on the Ministry of Energy's plans for the power station. It should be revisited regularly as demand for bulk handling increases and plans for the Dongo Kundu area become clearer.

### 7.2 Berth 14 Extension

The project comprises extension of the quay line of Berth 14 to its junction with Berth 16, infilling of the area behind the new quay wall, and rationalisation of the land area behind Berths 11 to 15 to produce a more efficient layout.

It increases the available quay length for container ships by an estimated 206 metres (one berth) and the number of ground slots by approximately 300 TEU. However 162 TEU of the additional groundslots created lie behind Berth 16, and depend on an easterly extension of the Berth 16 RTG runs.

Our initial calculations suggest that the upgrading/expansion of Berths 11-15 does not provide such good value for money as the construction of Berth 19 and rearrangement of Berths 16-18.

The cost of the civil works is less than for Berth 19 (KShs. 2,344m compared with KShs. 3,444m), but the additional land area is smaller and less useable for container storage. It provides only 300 TEU of additional groundslots at Berths 11 to 15 compared with 2,051 TEU of additional groundslots at Berths 16 to 19.

In addition, because of their narrowness and shape Berths 11 to15 cannot accommodate as much mechanical equipment as the main container terminal. Berths 12 to14 are not strong enough to support SSGs, and would not get full value from them because of the limited back-up area available. So the most likely solution is to install three mobile harbour cranes, which will be slower than SSGs, achieving only 14-15 lifts per ship-hour compared with a 23 lifts per ship-hour for the SSG's in the main container terminal.

The use of mobile harbour cranes would speed up ship handling for the smaller feeder vessels which at present use only one ship's crane. However the improvement would be relatively small for the larger feeder ships which are able to use two ships' cranes as an alternative to one mobile harbour crane (or one mobile harbour crane plus one ship's crane)

The capital costs of the mechanical equipment required for Berths 11 to 15 are lower than that provided for the Berth 19 extension (KShs. 2,090m compared with KShs. 2,605m) but the increase in terminal capacity would be very much smaller at only 120,000 TEU p.a. compared with over 200,000 TEU p.a. for Berth 19 and the rearranged Berths 16 to 18.

The economic case for developing a fully-equipped container terminal at Berths 11 to 15 is weak, especially as the Berth 19 extension should provide enough additional capacity to meet the growth in demand until the opening of Kipevu West, assuming there is a modest increase in off-dock CFS storage space and/or some reduction in dwell times.

One of the main reasons for considering it has been the interest expressed in private sector development through a BOT scheme. For private investors, and particularly for shipping lines, additional benefits would arise from the organisational changes they could make to increase handling rates if they were given unfettered control over operations. This is not reflected in the analysis above.

The restricted back-up area will remain a constraint on both ship handling rates and terminal capacity, but by making judicious investments and forging close links with one or more of the CFS depots a private operator could significantly increase terminal productivity and reduce costs, including transfer costs to the CFS depot.

The level of interest in a private sector BOT scheme at Berths 11 to 15 is likely to depend on whether or not KPA intends to lease Kipevu West to a private operator. If it does, interest in Berths 11 to 15 will become more muted.

However an economic evaluation undertaken from a private sector perspective could well produce significantly better results than the previous analysis suggests. If KPA is interested in obtaining private investment it should pursue this option further.

## 7.3 Berth 19

The construction of Berth 19 would increase the length of the container terminal from 594m to 754m, and the number of ground slots in the main container terminal from 2,803 TEU to 4,854 TEU (including 162 TEU of groundslots resulting from infilling of Berth 15).

This effectively extends the container terminal from three to four berths. Because the increase in groundslots (73%) is greater than the increase in quay length (27%), the project will make more back-up space available for the existing berths, which in turn is likely to increase crane productivity.

The additional quay length will allow up to three additional SSGs to be installed, beyond the four that are in operation now. The additional ground area is sufficient to support a further 6 RTGs in addition to the 18 RTGs that are in operation now. However the additional area does not provide sufficient groundslots to allow the additional SSGs to work at 100% of their normal speed unless there is some increase in off-dock storage space and/or a reduction in dwell times. It has not been possible to assess the effect of this on ship handling rates, as the relationship between back-up area and crane productivity is complex and poorly understood.

### *Capital and Operating Costs*

Including the rearrangement of Berths 16 to 18, the cost of the civil works is estimated at KShs. 3,144m and the capital costs of the mechanical equipment (including minor items) at KShs. 2,605m.

Annual maintenance costs (materials and spare parts only) have been taken as 1% of the cost of the civil works, and 5% of the capital costs of the mechanical equipment.

Other increases in operating costs would be fairly small, assuming that the port handles the same container throughput with and without Berth 19. As noted in Section 8.2.2, KPA has surplus labour, and should be able provide the majority of the additional staff from within its existing labour force. The increase in fuel and power costs would also be fairly small, as the increase in the amount of equipment would be offset by a reduction in average operating hours.

An additional KShs. 30m p.a. has been allowed for other increases in operating expenditures, bringing the total increase in operating costs (including labour and repairs & maintenance) to around KShs. 200m p.a.

### *Project Benefits*

The principal benefits of the berth extension are:

- Faster container handling rates due to increased amounts of equipment per ship and the reduction in yard congestion arising from increased space.

- Savings in ship waiting time due to the increased number of berths.
- Reduction in the proportion of containers having to be transferred to off-dock CFS facilities. This avoids double handling costs and increases the storage revenues accruing to KPA.

***Faster container handling rates***

The increase in berth length would allow the number of SSGs per ship to be increased from 1.33 (4/3 berths) to 1.75 (7/4 berths). It would be possible to install another two cranes on the existing quay (Berths 16 to 18) but they would be spaced quite closely together and would not have enough back up space to allow them to operate efficiently.

The average number of groundslots per berth increases by 25% from 934 TEU to 1,213 TEU, resulting in a reduction in the number of wasted lifts required to access containers, and shorter delay times waiting for a slot in the stack to become available.

We estimate that these two effects could increase handling rates (lifts per ship-hour) by around 45%.

In 2007 the average gross handling rate was 12 lifts per ship-hour at berth. This was low because of the replacement programme for mechanical equipment, which caused some disruption to terminal operations. With the new equipment which has already been installed, it is reasonable to expect a handling rate of around 16 lifts per ship hour at berth. With the additional equipment and space, the rate should rise to around 23 lifts per ship-hour.

The saving in ships' time at berth arising from improved handling rates has been estimated by splitting the forecast traffic between Berths 11 to14, Berth 16 to 19 and Kipevu West pro rata to their capacities, after deducting 4% from the total for Messina RoRo containers.

The assumed capacities are 290,000 TEU p.a. for Berths 11 to 14, 525,000 TEU p.a. for Berths 16 to 18, and 175,000 TEU p.a. for Berth 19. The Kipevu West container terminal is expected to open in three phases, with a capacity of 450,000 TEU p.a. in 2015-16, 850,000 TEU p.a. in 2017 and 1.1m TEU p.a. from 2018 onwards.

The savings in ships' handling time have been based on an average ship size of 1,400 TEU, and a ship cost of US$ 13,000 per day in port. Although ship sizes are forecast to rise well above this level, the relatively short berth lengths available at the existing container terminal mean that it will continue to handle fairly small ships, with the larger ones going to Kipevu West.

The savings in ships' time arising from faster handling rates fluctuate between KSh180-300m p.a., depending on the traffic split between MCT and Kipevu West. They are highest in the period immediately prior to the opening of Kipevu West, fall sharply as traffic is transferred to the new terminal, then rise again as traffic volumes at both terminals increase. The savings have been capped from 2022 onwards, when the existing container terminals and Kipevu West reach full capacity working and new facilities are required elsewhere.

### *Saving in Ships' Waiting Time*

The saving in ships' time spent waiting for a berth has been estimated using a standard queuing model. The critical time is 20011-12, when ships' waiting time costs could rise to as much as KShs. 3.6bn p.a. if steps are not taken to improve crane handling rates and provide an extra berth.

With a fourth berth at MCT waiting times for container ships fall to around 80 ship days p.a. in 2012, which is an acceptable level equivalent to an average of around 4.0 hours per ship. The waiting time costs for this level of queuing would be around KShs. 85m p.a.

The expected savings in ship handling time and waiting times are summarised in Table 7.2.

**Table 7.2 Expected Savings in Ship Handling and Waiting times (KShs. m)**

| | 2011 | 2012 | 2013 | 2014 | 2015 | 2020 | 2022 on |
|---|---|---|---|---|---|---|---|
| Handling time | 279 | 303 | 329 | 356 | 301 | 228 | 257 |
| Waiting time | 1,832 | 3,486 | 4,862 | 5,844 | 3,414 | 382 | 829 |
| **Total** | **2,111** | **3,789** | **5,190** | **6,200** | **3,715** | **610** | **1,087** |

### *Reduced Use of Off-Dock Depots*

With an assumed dwell time of 7 days for domestic import containers, three high stacking and 75% stack occupancy the additional 2,051 TEU of ground slots provided by Berth 19 allows an additional 240,000 TEU (172,000 boxes) p.a. to be stored on the terminal without having to be moved to off-dock depots.

Using the current remarshalling charges of US$ 100/150 per 20ft/40ft box as a proxy for the transport and double handling costs, the potential savings could be as high as KShs. 1.5bn p.a.

This is assumed to last only until 2015-8, when the opening of phased opening of Kipevu West rapidly resolves the current shortage of on-dock storage space.

### *Summary and Sensitivity Test*

The project evaluation assumes that the construction work is carried out in 2010-11, the mechanical equipment is purchased in 2011, and the berth becomes operational in the third quarter of 2011. It has been based on a discounted cash flow analysis of project capital and operating costs, and annual savings in ships' time and container remarshalling costs up to 2028, and assumes that extra container capacity – in addition to Kipevu West – is brought on stream in 2022, perhaps at Dongo Kundu.

On the basis of these fairly optimistic assumptions, the project shows an internal rate of return of 116%. This is high because of the chronic congestion that is likely to result if nothing is done to provide additional container handling capacity prior to the opening of Kipevu West, which now looks like being two years later than originally anticipated .

Most of the benefits accrue in 2011-15. To assess the minimum rate of return on the project we have assumed:

- Berth 19 does not become operational until 2013.
- Some relief to vessel queuing prior to 2015 can be obtained by increased use of the general cargo berths. Vessel waiting time costs in the "do nothing" situation between 2010-15 have been reduced by a half.
- The split of cargo between MCT and Kipevu West is tilted in favour of the latter because of its superior facilities.
- The resource costs of transferring containers to the off-dock depots are only half of remarshalling charges.

Even in this worst case scenario the project achieves an IRR of 23%. The project therefore appears to be fairly robust, and worth undertaking.

## 7.4 Deepening of Berths 1 to 5

There are four groups of ships which are likely to benefit from the deepening of Berths 1 to 5:

- Grain ships, where importers would like to increase fully-laden ship sizes from 25-25,000dwt to up to 60,000dwt.
- RoRo ships, where Messina would like to increase the capacity of their ships from 1,700 TEU to 2,200 TEU, with a draft of 10.8m. Berths 1 to 2, which Messina uses at present, has a design depth of only 10.06m.
- Dirty dry bulks. By 2013 around 45% of these cargoes will have to use the conventional berths because of capacity shortages at Mbaraki Wharf.
- Ships carrying steel, which are sometimes heavily laden.

The evaluation of the berth deepening proposals is handicapped by the absence of statistics on ship arrival drafts. The Marine Returns show only GRT and vessel length, whilst the monthly Operations Draft is focused on port operations (cargo size, number of gang shifts worked etc) and does not include ship dimensions.

An estimate of the scope for increasing ship size is given in Table 7.3. It shows the number of ship calls in 2007, and the reduced number of ship calls that could accommodate the same amount of traffic if the potential increase in ship sizes was made possible by berth deepening.

**Table 7.3 Scope for Increasing Ship Size**

| | Number of ships in 2007 | Existing size | | Potential size | | Potential no. of ships p.a. |
|---|---|---|---|---|---|---|
| | | Average | Maximum | Average | Maximum | |
| Grain | 40 | 25,000dwt | 40,000dwt | 50,000dwt | 60,000dwt | 20 |
| Messina | 44[a] | 1,700 TEU | | 2,200 TEU | | 66 |
| Dirty bulks[b] | 71 | 40,000dwt | 60,000dwt | 40,000dwt | 60,000dwt | 58 |
| Steel | 12[c] | 30,000dwt | 40,000dwt | 35,000dwt | 40,000dwt | 9 |

Note: (a) weekly service with gaps caused by late running and periodic drydockings
(b) at present ships are part laden. With deeper berths, ship sizes are likely to remain broadly similar, but cargo sizes will increase significantly

(c) estimated number of ships discharging more than 15,000 tons of steel, which would benefit from berth deepening

### *Grain*

An increase in maximum ship size from 35,000 to 60,000dwt, and average cargo size from 25,000 tons to 50,000 tons, would reduce the number of ships required from 40 to 20 (2007 traffic volumes), resulting in potential freight rate savings of around US$ 2.6m p.a.

### *Messina*

Messina's proposed 30% increase in ship size would enable it to maintain a weekly service schedule and still accommodate the growth in traffic. If the berth is not deepened, Messina would be faced with either a loss in market share or the need to put in additional ships, perhaps extending its service in the first instance from one ship per week to three ships per fortnight.

Its strategy will depend to some extent on what happens at Dar es Salaam, its other main port of call; this has five general cargo berths with a design depth of -9.0m CD, and two with -10.0m CD. The cost of increasing service frequency rather than ship size is likely to be of the order of US$7 m p.a.

Given the global recession and the spare capacity available on Messina's existing ships, this saving is not likely to accrue immediately. However it could represent a saving by 2015, the target completion date for berth deepening.

The alternative would be to give Messina ships an extra 0.6m of water by transferring their operations to Berths 11 to 12, which are likely to be gradually converted into container berths prior to the completion of the Kipevu West container terminal. The main question is whether there is enough back-up space to support the low stacking density favoured by Messina.

### *Dirty bulks*

In 2007 the distribution of dirty bulk cargoes (coal, fertilizers, clinker and other bulk minerals) was closely linked to the water depths available at different berths.

**Table 7.4 Distribution of Dirty Bulk Cargoes in 2007**

| Berths | Water depth (m) | Max ship size (GT)[a] | % of cargo tonnage |
|---|---|---|---|
| Mbaraki | 11.0 | 15,000 | 43% |
| Berths 1-7 | 10.0 | 10,000 | 12% |
| Berths 8-10 | 10.6 | 12,500 | 24% |
| Berths 11-14 | 10.6 | 12,500 | 21% |

Note: (a) fully laden, allowing 0.5m for underkeel clearance

The transfer of Berths 11-14 to container handling will increase the pressure to provide more deepwater berth space elsewhere in the port, at least until the opening of the new container terminal.

However analysis of ship and cargo sizes shows that there is a potential demand for water depths of up to 14.0m, significantly more than that provided at Mbaraki Wharf.

Of the 71 "dirty" bulk carriers recorded in Table 4.2, 60% were larger than 15,000 GT. These accounted for 63% of coal imports, 97% of clinker imports, 62% of fertilizer imports and 90% of other minerals. The size distribution of the ships above 15,000GT was as follows:

| *GT* | *Draft (m)[a]* | *No of ships* | *%* |
|---|---|---|---|
| 15-20,000 | 10.7 | 10 | 23% |
| 20-25,000 | 11.5 | 8 | 19% |
| 25-30,000 | 12.3 | 18 | 42% |
| 30-35,000 | 12.8 | 7 | 16% |
| Total | | 43 | 100% |

Note: (a) typical fully-laden draft, before allowance for underkeel clearance

These ships were generally travelling part laden. To make an estimate of the "lost" carrying capacity, we have converted the GT of each ship into dwt using a dwt/GT ratio of 1.9, and deducted 2,500-3,500 tons for fuel and stores, depending on ship size. The potential carrying capacity can then be compared with the cargo actually carried. The results suggest that the ships which are too large to be accommodated at Mbaraki Wharf are on average carrying only 70% of their potential cargo.

Based on an assumed one-way voyage time of 15 days, a long-run handy-max charter rate of US$ 18,000 per day, and a fuel consumption rate of 70 tons per day @ US$ 300 per ton, a 30% reduction in the number of voyages due to larger cargo sizes would produce an annual saving of the order of US$ 7.5m p.a.

***Steel***

Table 4.5 identifies 21 ships calling at Mombasa in the first six months of 2007 to discharge steel. Of these, six had cargoes of between 15-25,000 tons and were loaded to the point at which they were probably encountering draft restrictions.

Based on the Marine Returns for individual ships, and a dwt/GT ratio of 1.5, the average size of this group of ships was 30,000dwt and the average cargo size 20,000 tons. All of the other ships were significantly smaller, and would be unlikely to benefit from berth deepening.

The main effect of berth deepening for the large steel ships would be to increase their average cargo capacity from 20,000 tons to 30,000 tons. The increase in cargo size is based on two assumptions:

- More of the ships would bring full rather than part cargoes. This could potentially increase the average cargo size from 20,000 tons to 25,000 tons.
- The smaller "large" ships would increase in size from 25,000dwt to 30,000dwt, although the maximum ship size would probably remain constant at around 40,000dwt.

Most of the large steel ships come from Asia, with a long-run average charter cost of around US$ 10 per ton of steel imported. The use of larger ships with full rather than part cargoes is likely to result in a saving of around US$ 2.50 per ton, or US$ 0.7m p.a. at 2007 traffic volumes.

***Proposed Depth of Water***

The analysis of ship size suggests that it would be advantageous for the port to have three dry bulk berths with water depths of -14.5m CD, and two multi-purpose berths with depths of -12.5m CD. However this conclusion requires further verification should the berth deepening project go ahead because of the poor quality of existing data.

Of the -14.5m berths, 1-2 would be for grain. One of these would be Berth 3 because of the investment already made in silos and fixed conveyor systems, although it would be difficult to deepen Berth 3 until an alternative grain berth was available because of the disruption to grain handling operations. The other -14.5m berths would be for dirty bulks and steel

***Effect of Timing on Location***

It has not been possible to form a view on the feasibility of building new dry bulk berths at Dongo Kundu, as the proposals for the power station, coal jetty and FTZ are not sufficiently well-developed. The practicality of building a proper dry bulk terminal there will depend on spreading the additional dredging costs over a number of users, and on the way in which the FTZ infrastructure is to be financed.

## 7.5 Conclusions

Of the four projects reviewed in this section, the one which is most urgently needed is Berth 19, combined with the rearrangement of Berths 16-18.

The new access bridges and berth deepening at Mbaraki Wharf also appear to be worth undertaking. The outcome of discussions with the Ministry of Energy on the construction of a common user dirty bulks berth at Dongo Kundu could also influence this decision. In addition to the economic return, the ability of large trucks to access Mbaraki Wharf will significantly reduce the dust nuisance caused by the dumping of bulk cargoes just off the wharf for truck transfer purposes.

The deepening of Berths 1 to 5 also seems a worthwhile project, but is not urgently needed.

The extension of Berth 14 and the rearrangement of the stacking area behind Berths 12 to 14 is not a cost-effective use of public funds, but could be attractive to a private investor seeking greater control over its operations.

# CHAPTER EIGHT: FINANCIAL EVALUATION

This chapter reviews KPA's ability to finance the recommended short-term investment programme, and looks in more general terms at how its longer term investments could be financed. It does this by building a simple model of KPA's future financial position based on the 2009-10 budget.

## 8.1 Capital Expenditure Programme

### *Consultants' Proposals*

The proposed capital expenditure programme arising from Phase 1 of the Master Plan (2009-2014) is shown in Table 8.1. This also includes the deepening of Berths 1-5, a short-term project which for practical reasons cannot be carried out until after 2015.

Longer term investments such as the new coal jetty at Dongo Kundu and the expansion of the new container terminal beyond Berth 23 have not been costed, as there is still considerable uncertainty about their specification, timing and funding.

**Table 8.1 Proposed Short-Term Capital Expenditure Programme (KSh m)[a]**

| Location | Item | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | Total |
|---|---|---|---|---|---|---|---|---|---|
| **Committed projects** | | | | | | | | | |
| Channel deepening | Dredging to -15.0mCD | 3,500 | 3,500 | | | | | | 7,000 |
| Kipevu West | Container terminal | 3,000 | 3,000 | 3,750 | 4,000 | 750 | 2,750 | 2,750 | 20,000 |
| **Proposed projects** | | | | | | | | | |
| Mbaraki Wharf | Access bridges + dredging | 70 | 35 | | | | | | 105 |
| Dockyard | Repairs | 3 | | | | | | | 3 |
| Area G | Paving | 349 | | | | | | | 349 |
| Berths 1-10 | Repairs | 357 | | | | | | | 357 |
| Berths 11-15 | Civil works | | 2,334 | | | | | | 2,334 |
| | Mechanical equipmnt | | 2,090 | | | | | | 2,090 |
| Berths 16-19 | Civil works | 1,572 | 1,872 | | | | | | 3,444 |
| | Mechanical equipmnt | | 2,605 | | | | | | 2,605 |
| Gate 19 + roads | Widening | 250 | 284 | | | | | | 534 |
| New oil berth | Berth, loading arm & piping to shore | | | | 300 | 2,600 | | | 2,900 |
| | Shoreline piping | | | | | 1,009 | | | 1,009 |
| Utilities | Power, water and sewerage | 208 | 208 | 210 | | | | | 626 |
| Berths 1-2 | Deepening to -12.5m CD | | | | | | | 771 | 771 |
| Berths 3-5 | Deepening to -14.5m CD | | | | | 1,532 | 1,532 | | 3,064 |
| Total | | 9,309 | 15,928 | 3,960 | 4,300 | 5,891 | 4,282 | 3,521 | 47,191 |

Note: (a) Excludes all privately funded projects
Source: Chapter 5

The capital expenditure programme is likely to be rather irregular, peaking in 2011 when the immediate need to provide more container handling capacity at Berths 11-15 and Berths 16-19 overlaps with the longer-term plan to develop a new container terminal at Kipevu West. Although intuitively these projects look like alternatives, some additional capacity will be required at the existing berths to ensure that the port does not run out of container handling capacity whilst Kipevu West is still under construction.

### *KPA Capital Expenditure Plan*

We have identified minor items of capital expenditure, asset replacement needs, and on-going projects not included in the Port Master Plan by examining KPA's existing capital expenditure programme, as funding for all of these extra items must also included in the financial model.

The capital expenditure plan put to the KPA Board by KPA's Financial Controller in January 2009 is shown in Table 8.2. It includes a wide range of smaller projects outside the scope of the Port Master Plan, mainly related to the rehabilitation and replacement of existing assets, as well as a number of projects which are included in the Port Master Plan.

**Table 8.2 KPA Capital Expenditure Programme 2008-9 to 2010-11 (KSh m)**

| Items | 2008-9 | 2009-10 | 2010-11 | Unspecified[b] | Total |
|---|---|---|---|---|---|
| Marine engineering | - | 907 | 100 | 100 | 1,107 |
| Civil engineering | 3,563 | 1,073 | 650 | 30,818 | 36,104 |
| Terminal equipment | - | 201 | 20 | 2,470 | 2,691 |
| Other mechanical equipment | 123 | 222 | 65 | 374 | 784 |
| Electrical & mechanical | 48 | 737 | 90 | 1,322 | 2,197 |
| Bandari College | - | 36 | - | - | 36 |
| Total | 3,734 | 3,176 | 925 | 35,084 | 42,919 |
| *of which included in Table 8.1* | *55* | *410* | *215* | *32,880* | *33,435* |
| Net additional expenditure[a] | 3,679 | 2,766 | 710 | 2,204 | 9,484 |

Note: (a) Excludes items already in the Port Master Plan short term capital expenditure programme
(b) May include some expenditures before 2008-9

Source; KPA Finance Department

We have gone through KPA's capital expenditure plan on a line-by-line basis to identify items which are already included in the Port Master Plan proposals listed in Chapter 5. The remaining items have been divided into two groups:

- Major projects costing over KSh 100m, for which the assumed timing is shown in Table 8.3.
- Minor items. These include expenditures such as, office refurbishment, repairs to internal roads and rail tracks, equipment replacement, and the purchase of small items of additional equipment.

**Table 8.3 KPA Capital Expenditure: Major Items Not Included in the Port Master Plan Estimates**

| | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | Total |
|---|---|---|---|---|---|---|---|---|
| Refurbishment of portal cranes | 40 | 65 | 25 | | | | | 130 |
| IT | 150 | 240 | 500 | 500 | 222 | | | 1,612 |
| Floating dock | | | 200 | | | | | 200 |
| Pilot boat | | 823 | | | | | | 823 |
| Berth 7-10 repairs[a] | 160 | | | | | | | 160 |
| Refendering of Mbaraki Wharf | 108 | | | | | | | 108 |
| Berths 16-18 corrosion protection | 250 | 250 | 273 | | | | | 773 |
| Rehabilitation of cruise ship berth | 70 | 210 | | | | | | 280 |
| 2 Reachstackers | | 140 | | | | | | 280 |
| Total | 778 | 1,728 | 998 | 500 | 222 | 0 | 0 | 4,366 |

Note(a) most of this work has already been completed

Source: KPA Finance Department

On average the minor items amount to around KSh 1,000m p.a of capital expenditure, of which two thirds is assumed to relate to asset replacement, and one third to new items of infrastructure and equipment. This "routine" capital expenditure is likely to continue for the whole of the evaluation period.

## 8.2 Past Financial Performance of KPA

KPA is a profitable organisation with a strong operational cash flow but large on-going investment needs. It also faces other financial challenges linked to its excessively large workforce and pension fund deficit.

Several changes have occurred in the presentation of KPA's annual accounts which make it difficult and time consuming to produce a long time series of key performance indicators on a consistent basis. There were significant changes to the revenue and cost categories between 2005-6 and 2006-7. A new tariff structure was introduced in February 2008, whose full effects will only be seen in the 2008-9 accounts. And an asset revaluation is planned for 2009 which will have a major impact on the balance sheet.

Nevertheless some important conclusions can be drawn from KPA's past financial statements, which are summarised in Tables 8.4, 8.5 and 8.6:

- Revenues have remained fairly stable in spite of substantial traffic growth. This has been largely due to the appreciation of the KShs. against the US$, the tariff currency, up to 2007. Over the last year however the KShs. has fallen in value against the US$ by almost 20%. If this new position is sustained, it will result in future KShs. revenues being significantly higher than expected.
- Costs have remained fairly stable due to a reduction in financing costs which has more than offset the 38% increase in payroll costs over the last three years. Depreciation costs have changed relatively little, whilst materials & supplies costs fell temporarily after 2004-5 due to capital expenditure on new equipment (and spare parts) covered by warranty agreements.
- Around 20-30% of the inward cash flow has been used to service past debts, with dividend payments to government taking a further 5% on average. Past debts have been largely repaid, but new ones are about to start.
- There is a significant pension fund deficit. Over the past three years 20-30% of the inward cash flow has been used to meet pensions liabilities.
- Only 30-40% of the inward cash flow has been available for direct funding of new investment, which may have acted as a constraint on the development of the port. This has recently been offset by the receipt of government grants, which in the last two years have been significantly larger than dividend payments to government.

**Table 8.4: Profit & Loss Account (KShs. m)**

| | 2007-8 | 2006-7 | 2005-6 |
|---|---|---|---|
| Revenues | 13,890 | 13,187 | 12,774 |
| Costs | 12,437 | 10,563 | 9,654 |
| Pre-tax profits | 1,453 | 2,624 | 3,120 |
| Corporation tax | 509 | 1,180 | 1,074 |
| Post tax profits | 944 | 1,444 | 2,046 |

Source: KPA Annual Financial Statements

**Table 8.5: Cash Flow (KShs. m)**

| | 2007-8 | 2006-7 | 2005-6 |
|---|---|---|---|
| **Cash in** | | | |
| Pre-tax profits | 1,453 | 2,624 | 3,120 |
| Depreciation | 1,694 | 2,179 | 1,979 |
| Interest income | (101) | (132) | (150) |
| Interest expenses | 119 | 228 | 265 |
| Write-offs | 1,125 | - | 306 |
| Loss on sale of assets | 7 | - | - |
| Foreign exchange gains | 21 | 169 | (96) |
| Net cash from operations | 4,318 | 5,068 | 5,424 |
| **Cash out** | | | |
| Working capital movements | 1,042 | (720) | 348 |
| Tax | (1,229) | (352) | (1,486) |
| Pensions | (1,044) | (1,557) | (444) |
| Investing activities | (2,379) | (1,231 | (2,460) |
| Financial activities | | | |
| Loan repayments | (931) | (1,232) | (1,578) |
| Dividends | (218) | (317) | (405) |
| Interest payments | (119) | (228) | (265) |
| Dredging grants | 300 | 503 | - |
| Total | (4,578) | (5,124) | (6,290) |
| Net increase in cash | -260 | -56 | -866 |
| Cash at beginning of year | 2,339 | 2,395 | 3,261 |
| Cash at end of year | 2,079 | 2,339 | 2,395 |

Source: KPA Annual Financial Statements

**Table 8.6: Balance Sheet at 30 June (KShs. m)**

| | 2008 | 2007 |
|---|---|---|
| **Long-term assets** | | |
| Land & buildings | 5,615 | 5,665 |
| Plant & equipment | 13,144 | 13,502 |
| Other investments | 1,218 | 1,338 |
| Total | 19,977 | 20,505 |
| **Current assets** | | |
| Debtors | 2,193 | 2,353 |
| Stocks | 242 | 392 |
| Short-term investments | 598 | 1,395 |
| Cash | 1,481 | 944 |
| Other | 199 | 78 |
| Total | 4,713 | 5,162 |
| **Current liabilities** | | |
| Creditors | 1,940 | 1,217 |
| Pensions (current) | 1,131 | 1,131 |
| Short-term debt | 881 | 905 |
| Proposed dividend | 78 | 218 |
| Tax | - | 98 |
| Total | 4,030 | 3,569 |
| **Long-term liabilities** | | |
| Debt | 90 | 997 |
| Deferred tax | 459 | 526 |
| Pensions | 6,200 | 3,752 |
| Grant | 803 | 503 |
| General reserve | -2,652 | 560 |
| Capital reserve | 15,760 | 15,760 |
| Total | 20,660 | 22,098 |
| Total assets & liabilities | 24,690 | 25,667 |

Source: KPA Annual Financial Statements

## 8.3 Current Financial Policies

The main financial policies underlying the financial model are described below. The model is in KShs. and assumes constant 2009 prices and an exchange rate of US$ 1.00 = KShs. 72. The base year figures for calendar years 2009 and 2010 have been derived from the 2009-10 budget, adjusted for differences in traffic.

### *Labour*

KPA has surplus staff, and is likely to implement a voluntary early retirement scheme targeted on employees over 50. This will reduce payroll costs but increase pensions liabilities.

The number of permanent staff is expected to fall by 15% from 4,060 in 2007-8 to 3,468 in 2009-10 but the compensating growth in contract staff will increase total staff numbers by 5% from 5,609 to 5,917.

Staff numbers are unlikely to increase again, at least in the medium term, as most of the traffic growth and new projects can be staffed from within the existing workforce. However there will be a switch back from contract staff to permanent workers as the latter are less expensive once end-of contract gratuities etc are taken into account.

Wages are renegotiated every two years. The next increase – to be negotiated in July 2009 for implementation in January 2010 – is likely to be around 20% compared with the underlying inflation rate of 27%.

### *Materials & stores*

Expenditure on materials and stores varies considerably from year to year due to the inclusion in the budget of items for major repairs and minor capital projects.

KPA is currently tackling a maintenance backlog and building up its stock of spares, so the figures included in the 2009-10 budget are not representative. On the advice of KPA Finance Department a figure for routine expenditure of KShs. 1.5bn p.a. has been adopted, of which KShs. 0.7bn represents 2009-10 expenditure on fuel and lubricants.

### *Depreciation*

The depreciation periods used as the basis for KPA's accounts are shown in Table 8.7. The fixed asset values included in Table 8.6 are stated at cost or their value in 1994, whichever is most recent, less accumulated depreciation.

**Table 8.7 KPA Depreciation Policies**

| Assets | Depreciation period (years) |
|---|---|
| Dredging, quays, buildings, roads, rail tracks | 40 |
| Cranes, tugs | 20 |
| Pilot boats, telecoms equipment | 10 |
| Forklift trucks, tractors, vehicles, | 5 |
| IT software and equipment | 3 |

Source: KPA Audited Financial Statement 2006-7

KPA intends to revalue its land and property assets by June 2009, and its equipment by June 2010. It is expected that the total value of KPA's assets will be increased by a factor of 2.09 from KShs. 20.4bn at the end of 2008 to KShs. 42.7bn; this will have a parallel effect on depreciation costs.

The revaluation will have most effect on depreciation costs for land & buildings, which are generally older than plant & equipment and depreciate more slowly, resulting in fewer fully depreciated assets.

It is KPA's intention to revalue its assets every 3-5 years from now on. As the model is in constant prices, it takes into account the effects of the first revaluation, but not subsequent ones.

### *Debt repayments*

KPA's main outstanding debt has been a KShs. 5bn loan for plant and equipment taken out in 2004, which will be repaid in July 2009. This will leave KPA largely debt-free apart from the new obligations mentioned earlier, and any debt required to finance the new Port Master Plan.

***Government grants***

Government grants are available only for dredging, which is a Ministry of Transport responsibility. All other capital expenditures must be paid from internal cash flow or borrowings.

***Pensions***

The Pensions Fund has a large deficit, and KPA has been making remedial payments of KShs. 87m per month in an attempt to close the gap, in addition to the normal contributions of Ksh 43m per month included in payroll costs. Payments to pensioners are said to be running at around KShs. 437m per month

After the asset revaluation later this year approximately KShs. 10bn of assets (land and buildings) will be transferred from KPA's balance sheet into the Pension Fund, to reduce the deficit. However even this will not be enough, and further remedial contributions KShs. 1.044bn p.a. will be made over the next seven years, starting in 2009-10.

***Dividends***

Dividend policy is set out in KPA's performance contract with government. Dividend payments are currently set at 15% of post tax profits.

***Taxation***

The standard rate of corporation tax in Kenya is 30%, but KPA has been paying an effective rate of around 38% due to the high level of taxable profits, and disallowance of some of its costs relating to Pension Fund contributions.

## 8.4 Funding of Major Projects in KPA's Existing Capital Expenditure Programme

Of the proposed KSh 42.9bn expenditure shown in Table 8.2, around KSh 29.6bn is intended to be externally financed through loans, grants and supplier credit. The most important single item is Kipevu West container terminal (KSh 20.0bn), which is to be largely funded by a Yen 26,711m (KShs. 16.9bn) loan from the Japan Bank for International Cooperation (JBIC). The remainder of the external finance is mainly for dredging (KShs. 7.0bn) and container terminal equipment (KShs. 3.4bn).

The JBIC loan has a 12 year drawdown period starting in February 2009. It is for 30 years plus a 10 year grace period at a fixed interest rate of 0.2% p.a. The loan is assumed to be repaid in 30 equal annual installments, starting in Year 11, with only the interest payable during the grace period. In spite of the concessionary terms, the size of this loan will severely restrict KPA's ability to borrow to fund any other investments, as the amount is likely to be equivalent to around one third of KPA's assets after the 2009 revaluation.

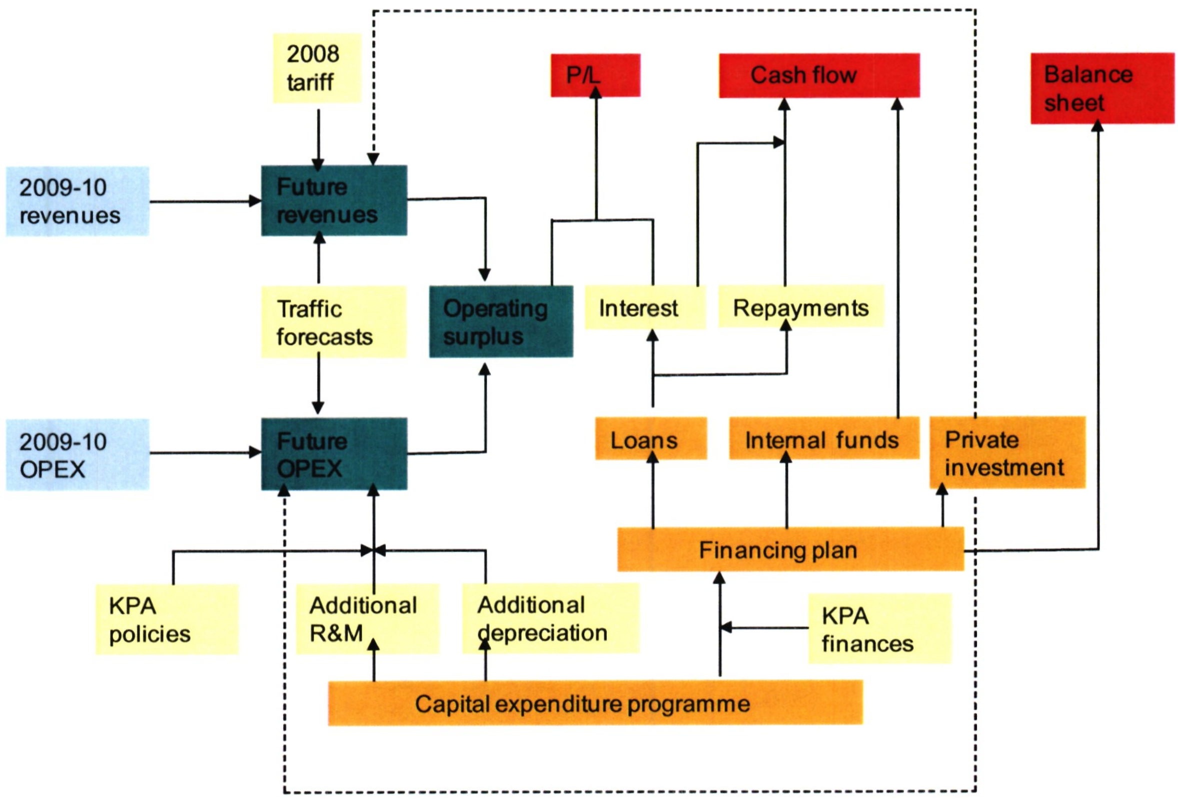
The capital dredging programme (KShs. 7.0bn) is likely to be grant-funded by the Ministry of Transport using a mixture of budgetary support and donor funding.

Supplier credit for the container terminal equipment (KShs. 2.6bn) would be on more commercial terms. It has been assumed that it would be loan finance with a five year repayment period at 5% p.a. interest.

## 8.5 Modelling of Future Financial Performance

The financial evaluation has been based on a traffic-driven financial model of KPA's various operations, carried out in constant 2009 prices. The structure of the model is shown in Figure 8.1.

**Figure 8.1: Structure of the Financial Model**




### *8.5.1 Revenue*

The revenue forecasts have been prepared by taking KPA's budget estimate of revenues for 2009-10, which are broken down by tariff heading rather than cargo type, and projecting them pro rata to the relevant cargo tonnages. They exclude new traffics (compressed natural gas, power station coal, and titanium ore exports) that are likely to use new, privately funded facilities.

The revenue estimates for 2009-10 are shown in Table 8.8. It was not been possible to compare them with revenues for the preceding years because of major changes in the structure of the tariff which were introduced in February 2008. In aggregate the 2009-10 budget shows an increase in revenue of 7% above the 2008-9 budget, and 24% above the revenues in the last audited accounts (2007-8).

In practice the increase in revenue in 2009-10 may be higher than expected because of currency devaluation. The budget is based on a relatively conservative exchange rate assumption of US$ 1.00 = KSh 72. By March 2008 this had increased to KSh80/US$ 1.00, potentially increasing KSh revenues by around 11%. This effect has not been taken into account in the financial model.

On the basis of the traffic forecasts in Chapter 2, revenues are expected to increase at an average rate of 6.5% p.a in constant prices between now and 2028. The average growth rate in the short term (2009-2015) is slightly higher at just under 8% p.a

**Table 8.8 Revenue Forecast (KSh m, constant prices)**

| | 2009-10 budget | 2013 | 2018 | 2023 | 2028 |
|---|---|---|---|---|---|
| Marine | 1,777 | 2,339 | 3,110 | 4,089 | 5,271 |
| Conventional cargo | 6,135 | 7,624 | 10,047 | 13,155 | 16,696 |
| Containers | 8,532 | 12,306 | 18,635 | 26,115 | 34,352 |
| Naironi ICD | 329 | 482 | 743 | 1,060 | 1,417 |
| Kisumu ICD | 7 | 11 | 16 | 23 | 31 |
| Miscellaneous income | 484 | 545 | 632 | 733 | 849 |
| GRAND TOTAL | 17,264 | 23,307 | 33,183 | 45,175 | 58,616 |

### *8.5.2 Operating Costs*

The operating cost forecast is shown in Table 8.9. Like the revenue forecast, the base year figures have been derived from the 2009-10 budget, but with some regrouping of items to separate fixed and variable costs more clearly.

**Labour** costs include direct wage costs, regular pensions contributions, indirect personnel costs such as social security and health care, and training. The main problem lies in identifying a reasonable base year figure for the forecasts, as KShs. costs have escalated sharply over the last 18 months:

| | | *Labour costs (KShs. m)* |
|---|---|---|
| 2007-8 | actual | 6,675 |
| 2008-9 | approved budget | 6,539 |
| 2008-9 | actual (first 6 months x 2) | 7,465 |
| 2009-10 | budget | 8,686 |

Employment costs for 2009 have been taken as the average of the actual for the first 6 months of 2008-9 and 50% of the budget for 2009-10. The figure for 2010 has been taken as 5% higher and remains constant until 2020 apart from a small increase of around 10% spread over the period 2015-8 when the Kipevu West container terminal comes into operation. All other increases in labour requirements during this period are assumed to be met from within the existing labour force.

The base case model assumes that the new terminal will be operated by KPA and will not be concessioned to a private operator.

By 2020 all of the existing labour surplus will have been absorbed, as the forecast traffic increases by 60% and the labour force by only 10%. The dramatic rise in labour productivity which this implies is an ambitious target, but one which should be achievable because of the concentration of traffic growth in the more mechanized cargoes (oil, dry bulks and containers). It will, however, require continuous reshuffling and retraining of the labour force to ensure that it has the necessary skills.

After 2020, the labour force is assumed to start growing again, at half the rate of the increase in cargo.

**Fuel & power.** Expenditure on fuel is dependent on three main factors: fuel consumption, fuel prices and the KShs./US$ exchange rate.

| | | ***Expenditure on fuel (KSh m)*** | ***Expenditure on power (KSh m)*** |
|---|---|---|---|
| 2006-7 | actual | 333 | 123 |
| 2007-8 | actual | 428 | 162 |
| 2008-9 | approved budget | 410 | 136 |
| 2008-9 | actual (first 6 months x 2) | 382 | 202 |
| 2009-10 | budget | 441 | 189 |

Because fuel expenditure is dependent on factors outside of KPA's control, and is likely to be affected by the recent depreciation of the KSh, we have used the 2009-10 budget figure for the 2009 base year estimate, and assumed that 20% of this expenditure is fixed and 80% variable with traffic.

Expenditure on power has followed a similar pattern to fuel. The 2009-10 budget figure has also been used as the 2009 base, but in this case 40% of expenditure is assumed to be fixed (for lighting, air conditioning, reefer points etc) and only 60% variable with traffic.

**Other utilities'** costs (water supply, telecommunications and municipal rates) are assumed to remain constant throughout the evaluation period.

**Spare parts and materials.** On the advice of KPA Finance Department a base year expenditure of KShs. 800m has been assumed (excluding fuel). This represents the spare parts needed for routine maintenance of existing infrastructure and equipment, plus consumables such as tyres and cleaning materials.

To this constant base year figure has been added the additional expenditure required to support the new assets included in the Port Master Plan. The labour required for repair & maintenance purposes is assumed to be drawn largely from the existing workforce, with some outsourcing of specialist work.

| | ***Annual spares & materials as % of CAPEX*** |
|---|---|
| Mechanical equipment | 7.5% |
| Roads, paving, buildings & utilities | 3.0% |
| Quay walls & civil structures | 1.0% |

It is assumed that the deepening of the port entrance channel would not give rise to any additional maintenance dredging costs.

**Administration** includes legal services and public relations, which are shown as separate headings in the 2009-10 budget. Administration costs (which exclude labour) are likely to increase significantly in future as the port becomes more modern and outward looking. Areas in which significant cost increases can be expected include:

- Marketing: for example increased representation of KPA in the transit countries.
- Legal services: for example concessioning and regulation of port users.
- Engineering consultancy: for example the development of Lamu port and new port infrastructure at Dongo Kundu.
- IT services: for example improved container tracking services, and the development of a port community network.

Much of the increase is likely to occur in short-term (up to 2015), when expenditures have been assumed to increase at 10% p.a. This is faster than GDP growth because of the amount of "catch up" expenditure involved. After 2015, expenditure has been assumed to mirror GDP growth.

A summary of the expected increase in operating costs is shown in Table 8.9. It is slower than the growth in revenues, averaging just under 3% p.a. in constant prices up to 2028.

**Table 8.9 Operating Cost Forecast (KShs. m)**

| | 2009-10 budget | 2013 | 2018 | 2023 | 2028 |
|---|---|---|---|---|---|
| Labour | 8,686 | 8,826 | 9,327 | 10,203 | 11,603 |
| Fuel | 447 | 560 | 715 | 912 | 1,150 |
| Power | 189 | 225 | 274 | 337 | 412 |
| Other utilities | 131 | 131 | 131 | 131 | 131 |
| Spare parts & materials | 1,090 | 1,687 | 2,024 | 2,029 | 2,034 |
| Administration | 942 | 1,379 | 2,044 | 2,811 | 3,619 |
| Total: operating costs | 11,485 | 12,809 | 14,516 | 16,424 | 18,950 |

Source: Consultants' estimate

As a result, there is a steady rise in the operating surplus. Although this is partly offset by an increase in depreciation and financing charges, the net effect is expected be a healthy growth in profits.

The main issue is not the profitability of the proposed investments, but how they are to be financed.

### *8.5.3 Project Finance*

It is not within the scope of the Port Master Plan to recommend a financing plan for the proposed investments. The purpose of this section is simply to check that all of the projects can be funded, from either KPA's internal cash flow or debt, and to provide an "order of magnitude" estimate of the level of indebtedness that may have to be incurred in order to implement the programme.

This has been done by preparing profit & loss and cash flow forecasts which assume in the first instance that there is no further debt finance beyond the JBIC loan for Kipevu West, and the use of supplier credit for the funding of mechanical equipment. The channel dredging is assumed to be funded by a matching grant from the Ministry of Transport, with all other capital expenditure coming from KPA's internal cash flow.

The results up to 2015 are shown in Tables 8.10 and 8.11. They show that with an opening cash balance in 2009 of KShs. 2.3bn (the average of the figures for 2008-9 and 2009-10) KPA should have enough cash to be able to fund all of the investments in the Port Master Plan assuming that it can obtain supplier credit for the mechanical equipment. There is a sizeable net cash outflow in 2010-11, the peak years for construction of the short-term Port Master Plan projects, but the large opening balance and accrued profits should be more than enough to fund this.

**Table 8.10 Profit & Loss Forecast 2009-15 (Ksh m)**

| | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 |
|---|---|---|---|---|---|---|---|
| Revenues | 17,264 | 18,486 | 19,948 | 21,803 | 23,307 | 25,105 | 27,010 |
| Operating costs | 10,585 | 11,265 | 11,855 | 12,089 | 12,809 | 13,047 | 13,689 |
| Operating surplus | 6,680 | 7,220 | 8,094 | 9,714 | 10,499 | 12,058 | 13,320 |
| Depreciation | 2,000 | 2,209 | 2,729 | 2,828 | 3,040 | 3,149 | 3,269 |
| Interest | 1 | 6 | 19 | 260 | 220 | 173 | 130 |
| Pre tax profit | 4,679 | 5,005 | 5,345 | 6,626 | 7,239 | 8,737 | 9,921 |
| Tax | 1,404 | 1,501 | 1,604 | 1,988 | 2,172 | 2,621 | 2,976 |
| Post-tax profit | 3,275 | 3,503 | 3,742 | 4,638 | 5,068 | 6,116 | 6,945 |

Source: Consultants' estimate

**Table 8.11 Cash Flow Forecast 2008-15 (KShs. m)**

| | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 |
|---|---|---|---|---|---|---|---|
| **Inward flow of funds** | | | | | | | |
| Post tax profit | 3,275 | 3,503 | 3,742 | 4,638 | 5,068 | 6,116 | 6,945 |
| Depreciation | 2,000 | 2,209 | 2,729 | 2,828 | 3,040 | 3,149 | 3,269 |
| Borrowing | | 3,140 | 7,695 | 3,750 | 4,000 | 750 | 2,750 |
| MOT grant for capital dredging | | 3,500 | 3,500 | | | | |
| Total inward flow of funds | 5,275 | 12,353 | 17,666 | 11,216 | 12,107 | 10,015 | 12,964 |
| **Outward flow of funds** | | | | | | | |
| Dividends | 364 | 491 | 526 | 561 | 696 | 760 | 917 |
| Pension Fund top-up | 1,044 | 1,044 | 1,044 | 1,044 | 1,044 | 1,044 | 1,044 |
| Debt repayment | 7 | 0 | 28 | 967 | 967 | 967 | 967 |
| Capital expenditure | 1,778 | 12,037 | 17,926 | 5,460 | 5,522 | 6,891 | 5,282 |
| Total outward flow of funds | 3,193 | 13,572 | 19,524 | 8,032 | 8,229 | 9,662 | 8,210 |
| Net inwards cash flow | 2,082 | -1,219 | -1,858 | 3,184 | 3,879 | 352 | 4,754 |
| Cash at start of year | 2,300 | 4,382 | 3,162 | 1,305 | 4,489 | 8,367 | 8,720 |
| Cash at end of year | 4,382 | 3,162 | 1,305 | 4,489 | 8,367 | 8,720 | 13,474 |

Source: Consultants' estimate

This strong financial position is largely a result of the favourable terms of the JBIC loan for Kipevu West, which has an interest rate of only 0.2% p.a. and does not require any repayments before 2019. By that time most of the remainder of the Port Master Plan will have been built, and retained earnings should be much higher than they are today due to strong traffic growth and low marginal operating costs. If Kipevu West had been financed on normal commercial loan terms the situation would be very different.

We have also looked at the cash flow situation after 2015, when funding will be required for at least four major longer-term projects not shown in Tables 8.1: the Dongo Kundu dry bulk terminal (to be built some time after 2015), the new cruise terminal (also after 2015), additional container berths (2019 onwards) and the Dongo Kundu car import terminal (2021). This period will also be affected by repayments of the JBIC loan, amounting to KShs. 665m p.a.

Although detailed cash flow forecasts cannot be prepared beyond 2015 without capital cost estimates for the long-term investment programme, the items which can be projected forward indicate that KPA's cash flow should be strong enough to fund this part of the Port Master Plan too.

The conclusion relating to the funding of the Short-Term Port Master Plan is dependent on the assumption that supplier credit will be available for all mechanical equipment apart from that already covered by the JBIC loan for Kipevu West. The amount of supplier credit included in Table 8.11 is KShs. 4,835m. This is highly concentrated in 2011 when the Berths 11 to 15 and Berths 16 to 19 expansion projects become operational.

If supplier credit is not available for this equipment, KPA will not be able to fund the whole of it from internal cash flow, as shown by the negative cash balance for 2011 in Table 8.12. Internal funding would be possible if the expenditure were to be spread over three years (2011-3) instead of being concentrated in 2011, but this would completely invalidate the rationale of the two projects, which is to provide additional container handling capacity until Kipevu West becomes available.

**Table 8.12 Cash Flow Forecast Without Supplier Credit for Mechanical Equipment (KShs. m)**

| | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 |
|---|---|---|---|---|---|---|---|
| **Inward flow of funds** | | | | | | | |
| Post tax profit | 3,275 | 3,503 | 3,747 | 4,806 | 5,202 | 6,216 | 7,012 |
| Depreciation | 2,000 | 2,209 | 2,729 | 2,828 | 3,040 | 3,149 | 3,269 |
| Borrowing | | 3,000 | 3,000 | 3,750 | 4,000 | 750 | 2,750 |
| MOT grant for capital dredging | | 3,500 | 3,500 | | | | |
| Total inward flow of funds | 5,275 | 12,213 | 12,976 | 11,384 | 12,242 | 10,115 | 13,031 |
| **Outward flow of funds** | | | | | | | |
| Dividends | 364 | 491 | 526 | 562 | 721 | 780 | 932 |
| Pension Fund top-up | 1,044 | 1,044 | 1,044 | 1,044 | 1,044 | 1,044 | 1,044 |
| Debt repayment | 7 | 0 | 0 | 0 | 0 | 0 | 0 |
| Capital expenditure | 1,778 | 12,037 | 17,926 | 5,460 | 5,522 | 6,891 | 5,282 |
| Total outward flow of funds | 3,193 | 13,572 | 19,496 | 7,066 | 7,287 | 8,715 | 7,258 |
| Net inwards cash flow | 2,082 | -1,359 | -6,520 | 4,318 | 4,955 | 1,400 | 5,773 |
| Cash at start of year | 2,300 | 4,382 | 3,022 | -3,497 | 821 | 5,776 | 7,176 |
| Cash at end of year | 4,382 | 3,022 | -3,497 | 821 | 5,776 | 7,176 | 12,948 |

Source: Consultants' estimate

This raises the question of how difficult it will be to obtain supplier credit for the mechanical equipment component of the Short Term Port Master Plan, or commercial loan finance for any other part of it. The answer will depend on two major considerations: KPA's level of indebtedness, and the world economic climate in 2011.

As noted earlier, KPA should be clear of all outstanding past debts by end July 2009, before beginning to draw down the large JBIC loan. The ratio of debt to shareholder funds will then depend on the asset revaluation to be completed by June 2010, and the proposed transfer of some of these assets to the KPA Pension Fund.

The net effect of the asset revaluation is difficult to assess at the present point in time, but the fact that the KShs. 20bn JBIC loan is roughly the same size as KPA's balance sheet for 30 June 2008 (shown in Table 8.6) suggests that even with the asset revaluation the outstanding debt could well account for 30-40% of the value of KPA's net assets. This could make a conservative lender nervous about providing additional funding in the present economic climate, although the extended repayment terms of the JBIC loan and the fact that KPA is a public body with government backing should be enough to secure additional credit.

The difficulty KPA faces in funding the expansion of two existing container handling areas (Berths 11 to 15 and Berths 16 to 19) in addition to Kipevu West, plus the fact that only one of these projects is likely to be needed to meet the shortfall in container capacity up to 2013, suggests that the Berth 11 to 15 project should only go ahead if an alternative source of finance can be found.

As noted in Section 7.2, the extension of Berth 14 and re-arrangement of the stackyard for Berths 11 to15 does not provide such good value for money as the construction of Berth 19 and the rearrangement of the stackyard for Berths 16 to19 if both schemes are undertaken as public sector projects within public sector operating constraints.

However the development of Berths 11 to 15 could be still be attractive to a private operator not facing the same constraints as KPA, as there is considerable scope for improving productivity, increasing capacity and reducing costs, particularly if the facility can be operated jointly with a private off-dock CFS.

The recommended solution is to test the market for private finance by inviting proposals later this year for the redevelopment of Berths 12 to 15 on the basis of a 20 year concession (Berth 11 has been excluded because it is likely to be required for non-container use after 2013). If any of the proposals appear promising they should be followed-up immediately to ensure that the additional capacity is in place by end-2011; if not, the redevelopment of Berths 11-15 should be omitted from the Port Master Plan.

# CHAPTER NINE: RECOMMENDED ACTIONS

A Port Master Plan is a continually evolving document which needs to be adapted as new opportunities and challenges arise. This one charts the general shift of port activities westwards into the Port Reitz area, and acknowledges the still largely unknown impact which the Dongo Kundu Free Trade Zone is likely to have on the future shape of the port. It is also demonstrates quite clearly that the next five years will be a period of unprecedented construction activity as the port expands to absorb the rapid growth in trade and accommodate larger ships.

Some of the projects discussed in this Report will proceed directly to implementation, but others need more detailed feasibility studies. Our work has also revealed various gaps in KPA's information base which need to be rectified in order to provide a sounder platform for future port planning.

Therefore, our final recommendations comprise a mixture of projects, studies, private finance initiatives and KPA internal decisions, all of which will contribute to long-term development of the port. They are summarized for the existing port area in Table 9.1, starting from the seaward end of the port, and for the new Port Reitz/ Dongo Kundu area in Table 9.2

It should be noted that KPA now expects the date for the opening of Kipevu West container terminal to slip back from 2013 to 2015. With the main existing container terminal at berths 16-18 already 85% occupied, this will raise major problems for accommodating container traffic over the next six years. It is recommended that both the construction of berth 19 and the concessioning of berths 11-14 are ***fast-tracked***.

### Table 9.1 Recommended Actions in the Existing Port Area

| Facility | Actions | Cost (KShs. m) | Timing |
|---|---|---|---|
| **Existing Port** | | | |
| Channel | Implement capital dredging to -15.0m CD | 7,000 | 2010-11 |
| | Technical study of widening and removal of bends to allow larger vessels to use the port | Study | 2010-12 |
| Mbaraki Wharf | New access bridges + dredging to -12.5m | 105 | 2010-11 |
| Dockyard | Repairs | 3 | 2009-10 |
| Area G | Vehicle parking (paved ) & container storage (unpaved) | 350 | 2010 |
| | Redevelop eastern end of site for commercial use once no longer needed for containers | Uncosted | After 2015 |
| Berths 1-10 | Repair paving | 357 | 2010 |
| | Investigate need for berth deepening | Study | 2011-12 |
| | Review need for transit sheds | KPA in-house | 2009 |
| | New soda ash conveyors at Berth 9 | Private finance | 2010-11 |
| | Deepening of Berths 1-5 | 3,835 | 2014-16 |
| Shimanzi Oil Terminal | Monitor progress of LPG berth & transfer all LPG cargoes when complete | KPA in-house | 2009-10 |
| | Review long-term role of SOT, and safety need to transfer other flammable cargoes | KPA in-house | 2009-11 |
| Berth 11-14 | Extend Berth 14 to join Berth 16 | 1534[a] | 2011 |
| | Rearrange stackyard behind Berths 11-15 | 800[a] | 2011 |
| | Purchase of mechanical equipment | 2090[a] | 2011 |
| Berth 16-18 | Extend Berth 18 to create Berth 19 | 3,144 | 2010-11 |
| | Rearrange stackyard behind Berths 16-19 | 300 | 2011 |
| | Purchase of mechanical equipment | 2,605 | 2011 |
| Gate 19 access | Three additional exit booths, road widening & parking | 534 | 2010-11 |
| Kipevu Oil Terminal | Study of terminal operations, productivity improvements, and need for new oil berth | Study | 2009 |
| | New oil berth | 3,909 | Uncertain |
| | Carry out ship manoeuvring study | Study | 2009 |
| Utilities | New power line and upgrading of existing line to 33kV | 255 | 2010-12 |
| | Back-up generators and security lighting | 143 | 2010-12 |
| | New water pipe and water storage tanks | 143 | 2010-12 |
| | Sewage treatment | 35 | 2010-12 |
| Environment | Dust supression equipment | 50 | 2010-12 |
| Corporate | Accurate topographic survey of area from Berth 11 to Kipevu Oil Terminal | Study | 2009 |
| | Improvements to collection & analysis of port operations statistics, particularly liquid bulks | KPA in-house | 2009 |

**Table 9.2 Recommended Actions in the Port Reitz/Dongo Kundu Area**

| Facility | Actions | Cost (KShs. m) | Timing |
|---|---|---|---|
| **Port Reitz/ Dongo Kundu** | | | |
| Kipevu West container terminal | Implement construction programme Consider different road access route along coastline | 20,000 | 2009-16 |
| Additional container berths (1,100m) | Select preferred location (Kipevu West or Dongo Kundu) | Uncosted | 2021-26 |
| Coal jetty )<br>Dry bulk terminal ) | Coordinate plans with Ministry of Energy to develop joint common user facility | Uncosted | 2013-16 |
| LPG mooring | Review location, and establish if SBM can provide enough capacity for CNG | Private finance | 2009-10 |
| Car import terminal | Liaise with FTZ Authority, and review opportunities for private finance | Uncosted | 2021 |
| Cruise terminal | Reserve site and test market for private finance | Uncosted | 2015 |
| Tiomin berth | Monitor status | Private finance | Uncertain |
| Corporate<br><br>Lamu | Participate actively in the development of Dongo Kundu Free Trade Zone<br>Monitor the Government's plans for developing a port at Lamu and take these into account when planning further development in Port Reitz | KPA in-house<br><br>KPA in house | 2009 on<br><br>2010 on |

# ANNEXES

A) Drawings

B) Planning Berth and Stackyard Requirements

C) Marketing Strategy and Competition from other Ports

D) Rail

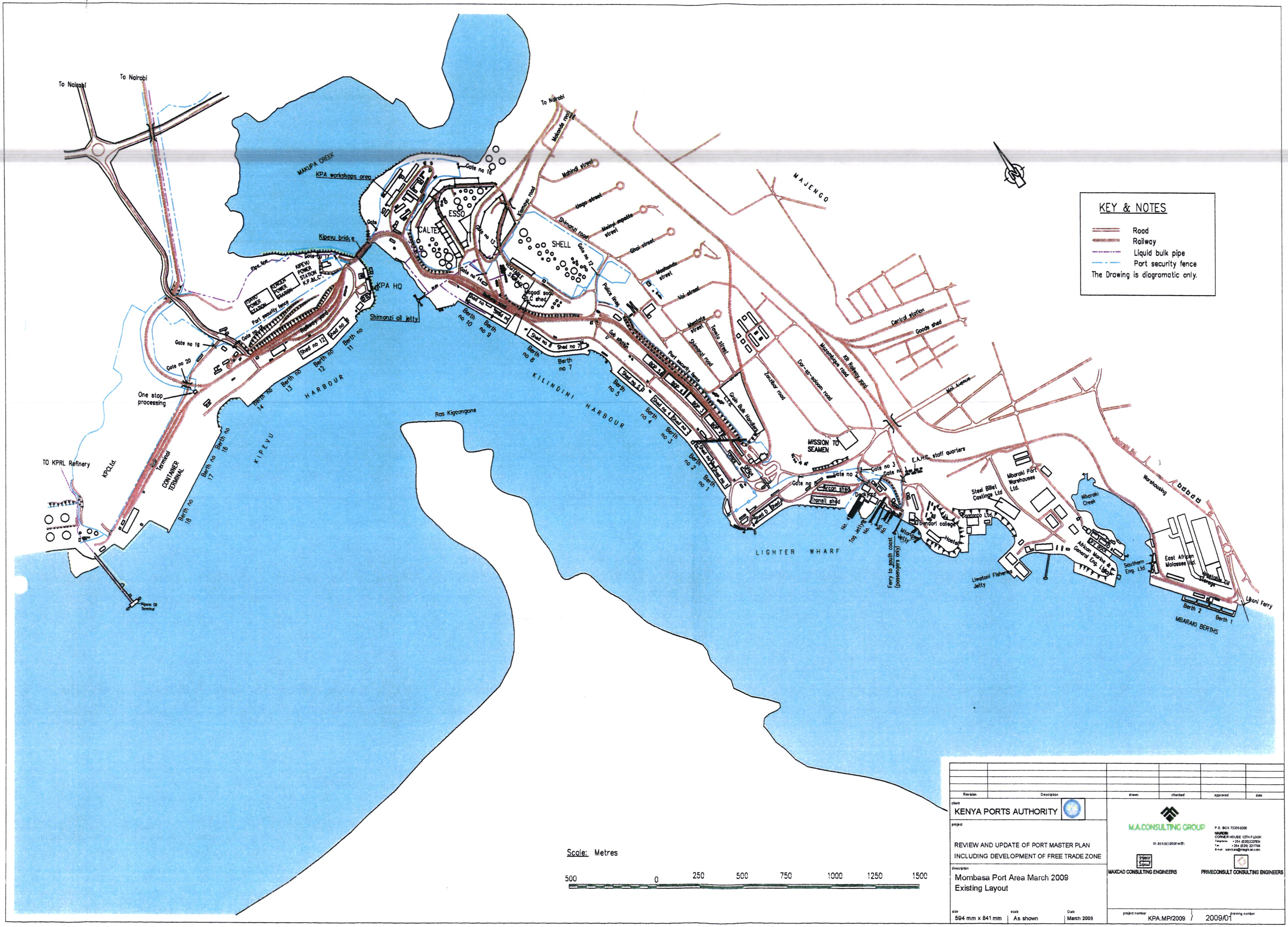
E) People/ Organisations Consulted

F) Terms of Reference

# ANNEX A:

# DRAWINGS

## LIST OF DRAWINGS




| Revision | Description | drawn | checked | approved | date |
|---|---|---|---|---|---|

client: KENYA PORTS AUTHORITY

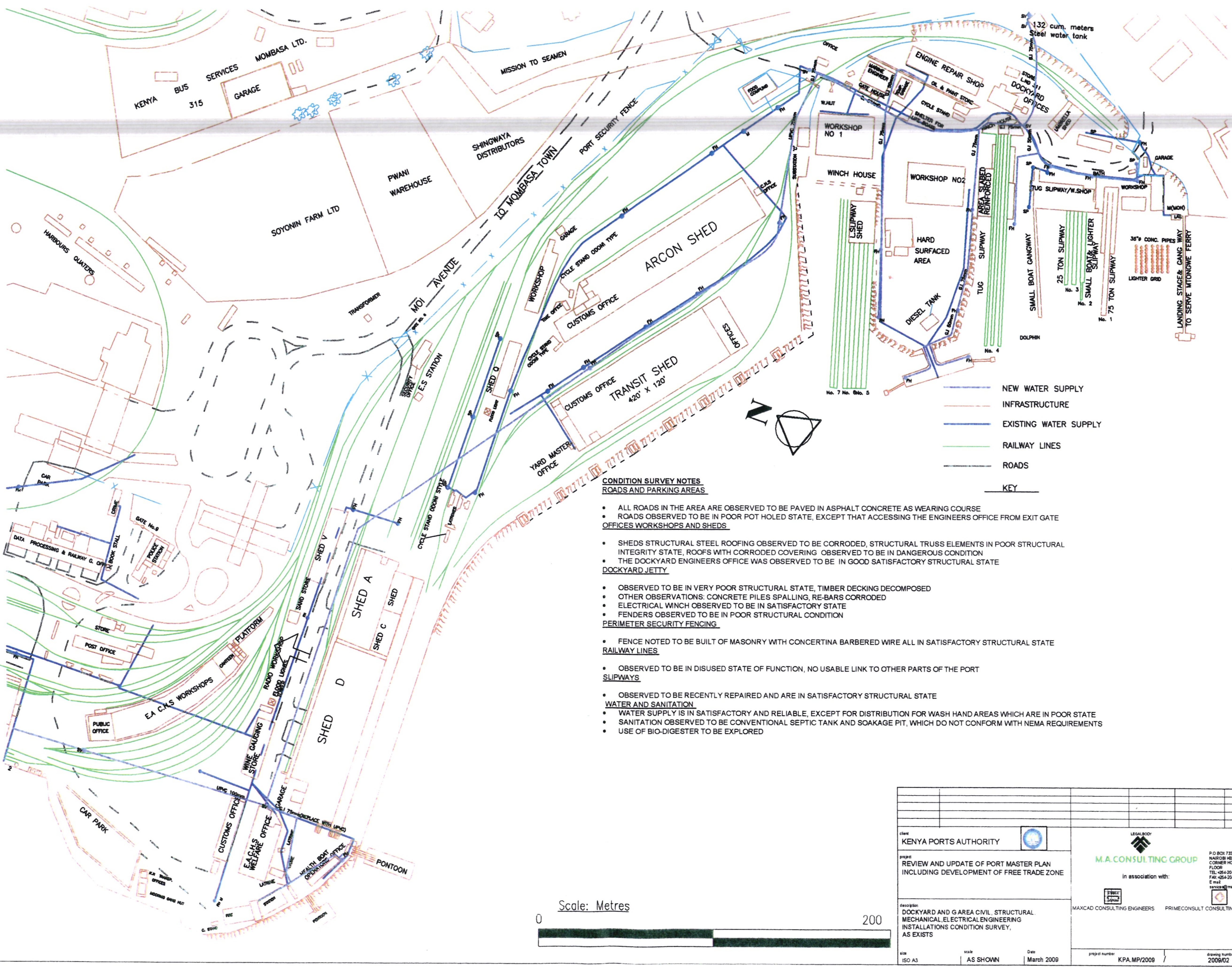
project: REVIEW AND UPDATE OF PORT MASTER PLAN INCLUDING DEVELOPMENT OF FREE TRADE ZONE

description: Mombasa Port Area March 2009 Existing Layout

size: 594 mm x 841 mm | scale: As shown | Date: March 2009

M.A.CONSULTING GROUP
P.O. BOX 72335-00200
NAIROBI
CORNER HOUSE 12TH FLOOR
in association with
MAXCAD CONSULTING ENGINEERS
PRIMECONSULT CONSULTING ENGINEERS

project number: KPA.MP/2009 / drawing number: 2009/01




**CONDITION SURVEY NOTES**

**ROADS AND PARKING AREAS**

- ALL ROADS IN THE AREA ARE OBSERVED TO BE PAVED IN ASPHALT CONCRETE AS WEARING COURSE
- ROADS OBSERVED TO BE IN POOR POT HOLED STATE, EXCEPT THAT ACCESSING THE ENGINEERS OFFICE FROM EXIT GATE

**OFFICES WORKSHOPS AND SHEDS**

- SHEDS STRUCTURAL STEEL ROOFING OBSERVED TO BE CORRODED, STRUCTURAL TRUSS ELEMENTS IN POOR STRUCTURAL INTEGRITY STATE, ROOFS WITH CORRODED COVERING OBSERVED TO BE IN DANGEROUS CONDITION
- THE DOCKYARD ENGINEERS OFFICE WAS OBSERVED TO BE IN GOOD SATISFACTORY STRUCTURAL STATE

**DOCKYARD JETTY**

- OBSERVED TO BE IN VERY POOR STRUCTURAL STATE, TIMBER DECKING DECOMPOSED
- OTHER OBSERVATIONS: CONCRETE PILES SPALLING, RE-BARS CORRODED
- ELECTRICAL WINCH OBSERVED TO BE IN SATISFACTORY STATE
- FENDERS OBSERVED TO BE IN POOR STRUCTURAL CONDITION

**PERIMETER SECURITY FENCING**

- FENCE NOTED TO BE BUILT OF MASONRY WITH CONCERTINA BARBERED WIRE ALL IN SATISFACTORY STRUCTURAL STATE

**RAILWAY LINES**

- OBSERVED TO BE IN DISUSED STATE OF FUNCTION, NO USABLE LINK TO OTHER PARTS OF THE PORT

**SLIPWAYS**

- OBSERVED TO BE RECENTLY REPAIRED AND ARE IN SATISFACTORY STRUCTURAL STATE

**WATER AND SANITATION**

- WATER SUPPLY IS IN SATISFACTORY AND RELIABLE, EXCEPT FOR DISTRIBUTION FOR WASH HAND AREAS WHICH ARE IN POOR STATE
- SANITATION OBSERVED TO BE CONVENTIONAL SEPTIC TANK AND SOAKAGE PIT, WHICH DO NOT CONFORM WITH NEMA REQUIREMENTS
- USE OF BIO-DIGESTER TO BE EXPLORED

Scale: Metres

0 200

client: KENYA PORTS AUTHORITY

project: REVIEW AND UPDATE OF PORT MASTER PLAN INCLUDING DEVELOPMENT OF FREE TRADE ZONE

description: DOCKYARD AND G AREA CIVIL, STRUCTURAL MECHANICAL,ELECTRICAL ENGINEERING INSTALLATIONS CONDITION SURVEY, AS EXISTS

| size | scale | Date |
|---|---|---|
| ISO A3 | AS SHOWN | March 2009 |


LEGAL BODY

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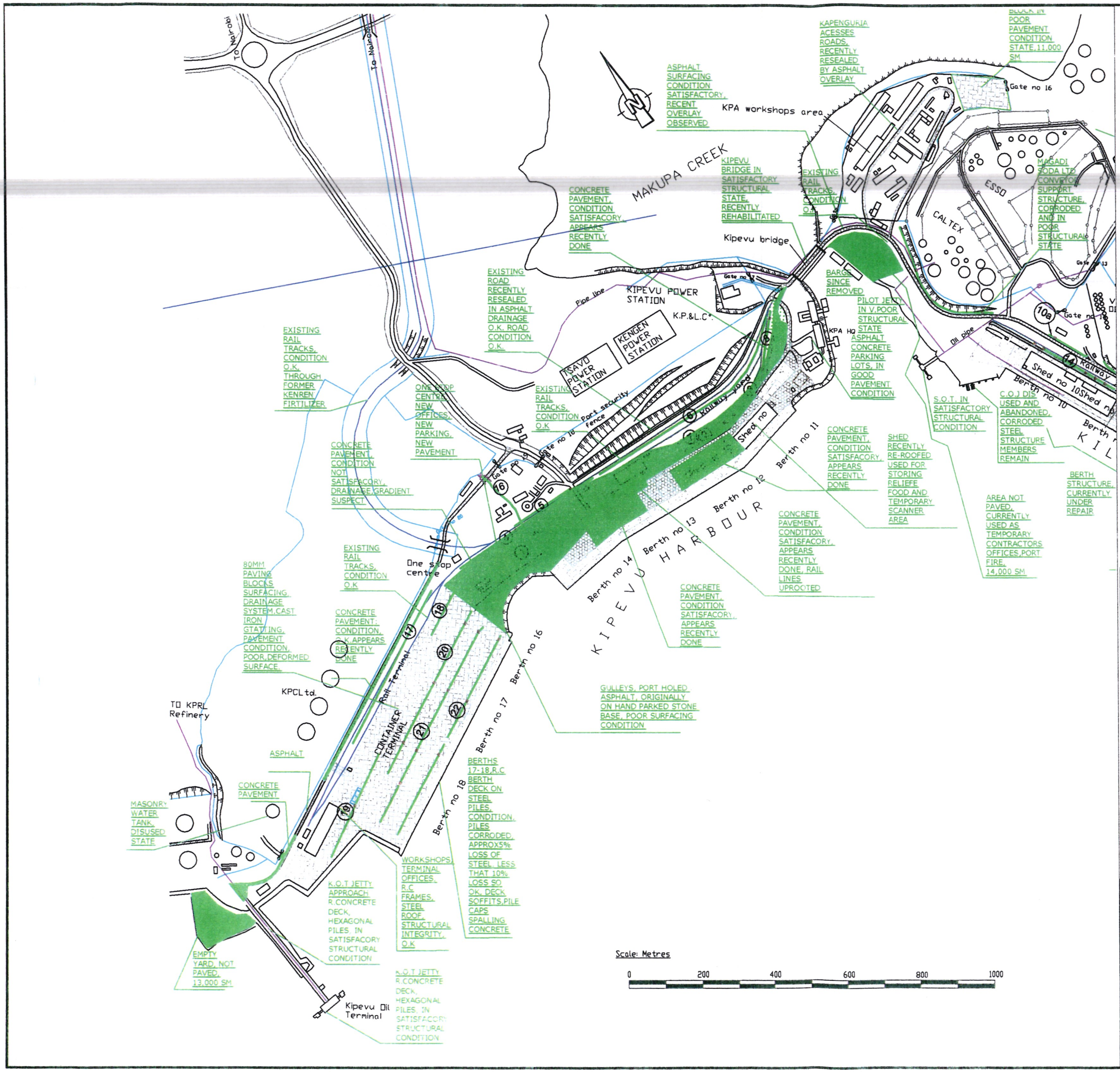
PRIMECONSULT CONSULTING ENGINEERS


project number: KPA.MP/2009

drawing number: 2009/02




**KEY & NOTES**

- Road
- Railway
- Liquid bulk pipe
- Port security fence
- Asphalt Pavement
- Concrete pavement
- Unpaved area
- Area with Paved with concrete block paving
- Area with grass
- Manhole
- Drain with No. on
- Font Colour, Paving required to improve productivity

The Drawing is diagrammatic only.

| | |
|---|---|
| client | KENYA PORTS AUTHORITY |
| project | REVIEW AND UPDATE OF PORT MASTER PLAN INCLUDING DEVELOPMENT OF FREE TRADE ZONE |
| description | CIVIL, STRUCTURAL, MECHANICAL,ELECTRICAL ENGINEERING INSTALLATIONS CONDITION SURVEY, AS EXISTS, BERTH NUMBER 8 TO KIPEVU OIL TERMINAL |
| size | ISO A3 |
| scale | AS SHOWN |
| Date | March 2009 |
| project number | KPA.MP/2009 / |
| drawing number | 2009/04 |

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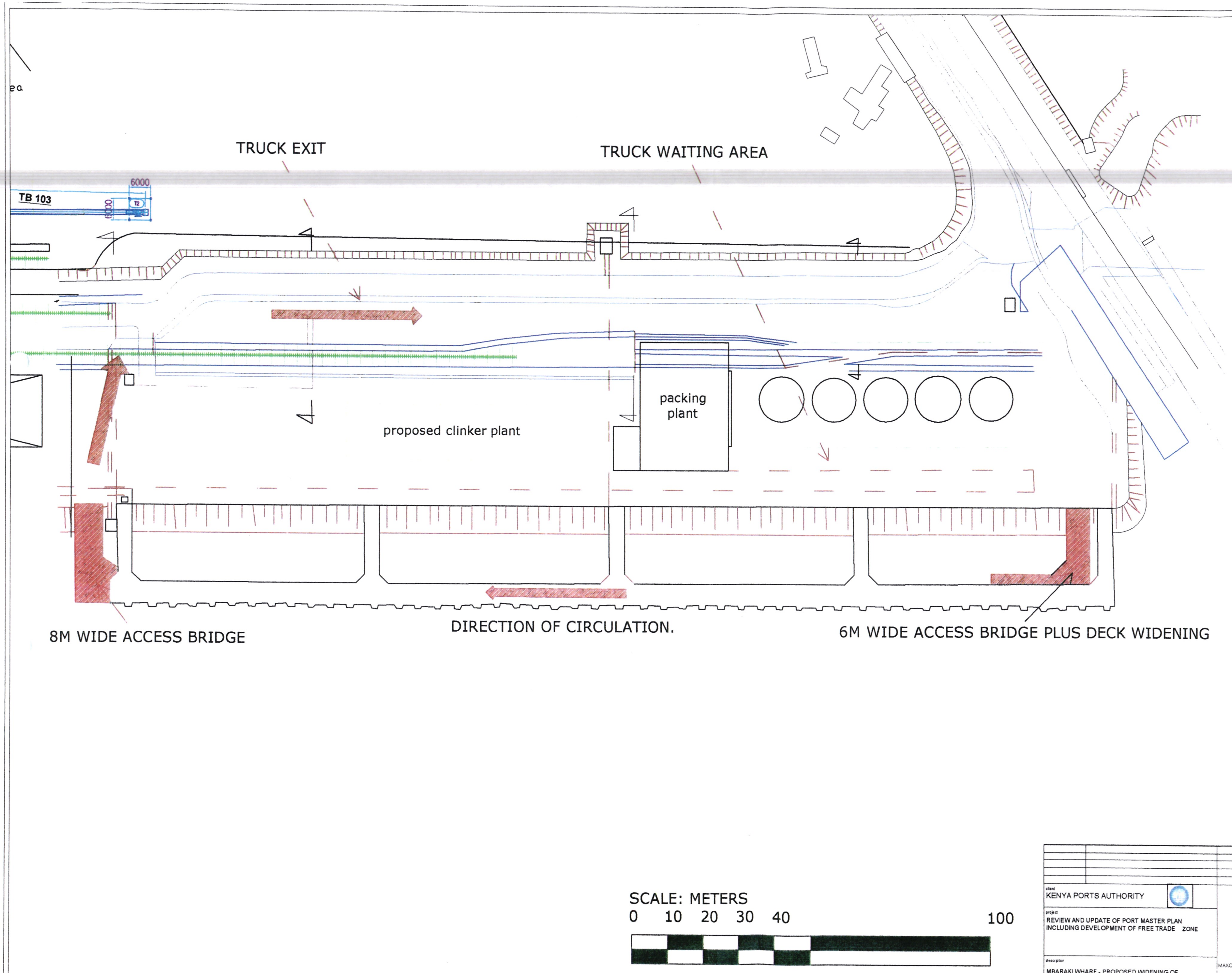
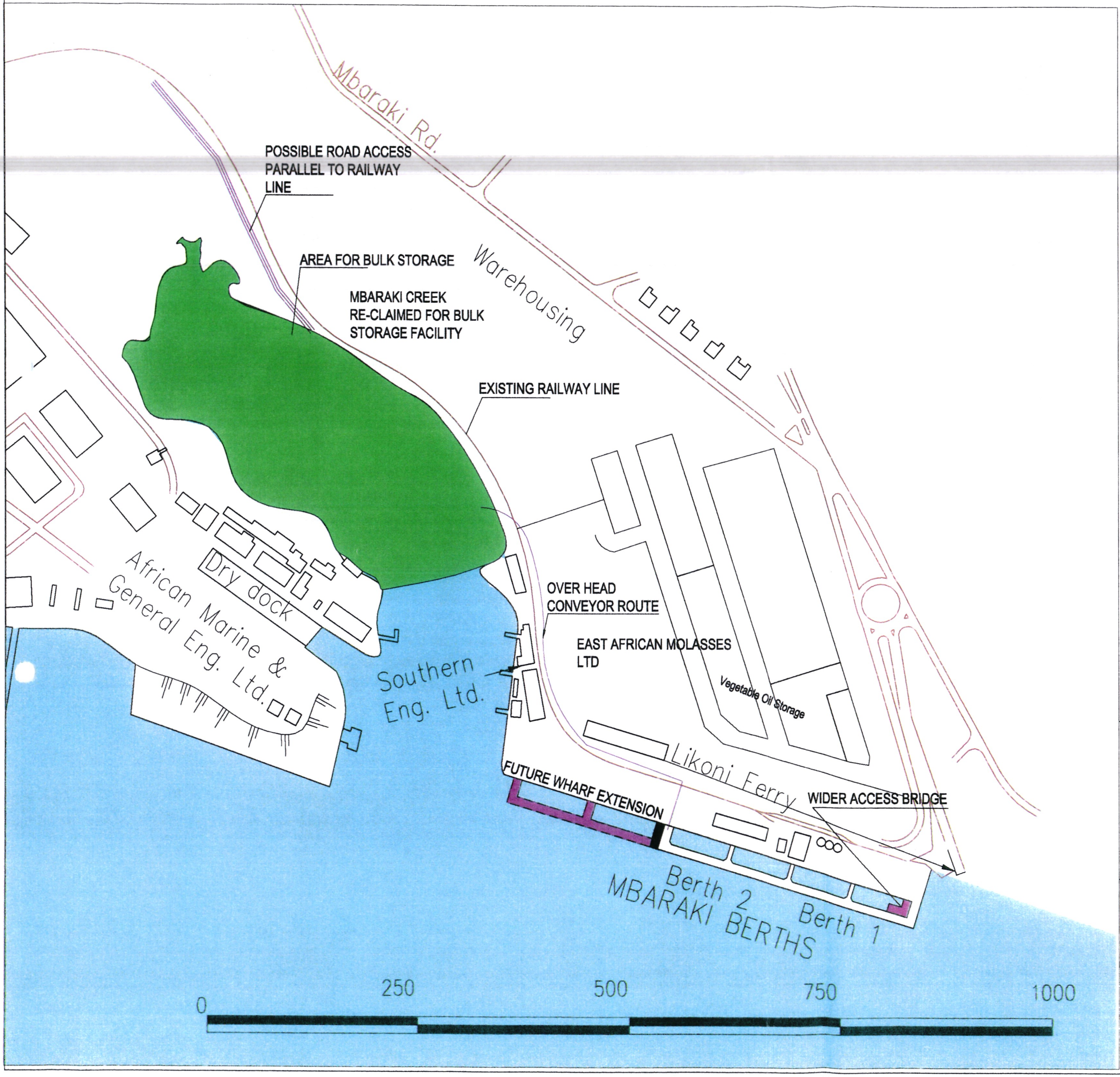



| | |
|---|---|
| client: KENYA PORTS AUTHORITY | M.A.CONSULTING GROUP<br>CORNER HOUSE 12TH FLOOR,<br>P.O BOX 73335-00200<br>NAIROBI KENYA<br>TEL:+254-2-2227634<br>FAX:+254202217768<br>E mail:services@magrlcon.com |
| project: REVIEW AND UPDATE OF PORT MASTER PLAN INCLUDING DEVELOPMENT OF FREE TRADE ZONE | in association with:<br>MAXCAD CONSULTING ENGINEERS<br>PRIMECONSULT CONSULTING ENGINEERS |
| description: MBARAKI WHARF - PROPOSED WIDENING OF ACCESS BRIDGES | |
| size: / scale: AS SOWN / Date: March 2009 | project number: KPA.MP/2009 / drawing number: 2009/05 |




NOTE:
THE PROPOSAL TO EXTEND THE WHARF AND RECLAIM MBARAKI CREEK WOULD ONLY BE CARRIED OUT IF SOME DIRTY BULKS ARE NOT MOVED TO DONGO KUNDU

| Revision | Description | drawn | checked | approved | date |
|---|---|---|---|---|---|

client: KENYA PORTS AUTHORITY

project: REVIEW AND UPDATE OF PORT MASTER PLAN INCLUDING DEVELOPMENT OF FREE TRADE ZONE

description: MBARAKI WHARF EXTENSION AND CREEK RECLAMATION PROPOSED LAYOUT

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in association with:

MAXCAD CONSULTING ENGINEERS

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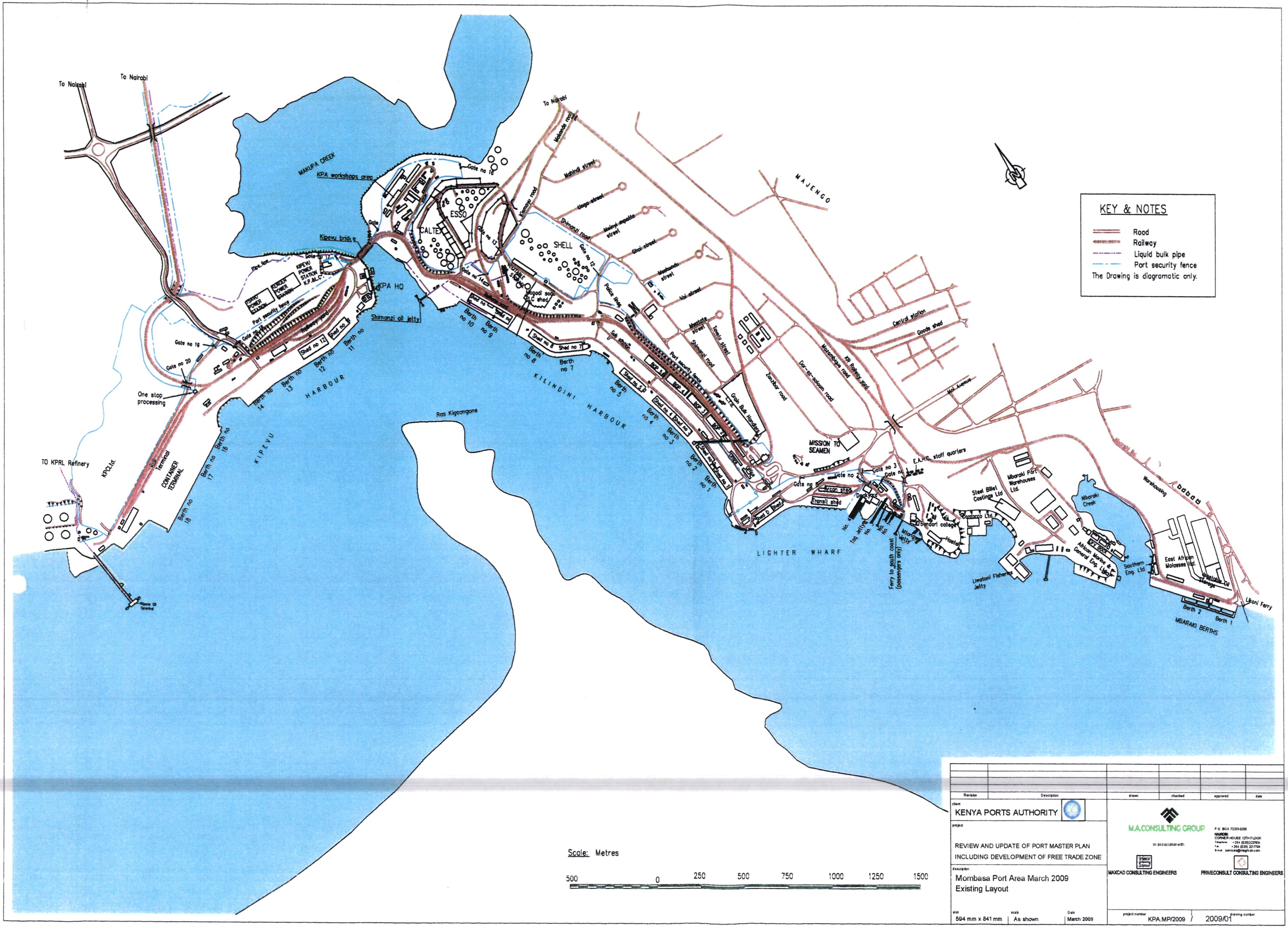
| size | scale | Date | project number | drawing number |
|---|---|---|---|---|
| 594 mm x 841 mm | As shown | March 2009 | KPA.MP/2009 / | 2009/06 |




| Revision | Description | drawn | checked | approved | date |
|---|---|---|---|---|---|

client: KENYA PORTS AUTHORITY

project: REVIEW AND UPDATE OF PORT MASTER PLAN INCLUDING DEVELOPMENT OF FREE TRADE ZONE

description: Mombasa Port Area March 2009 Existing Layout

M.A.CONSULTING GROUP

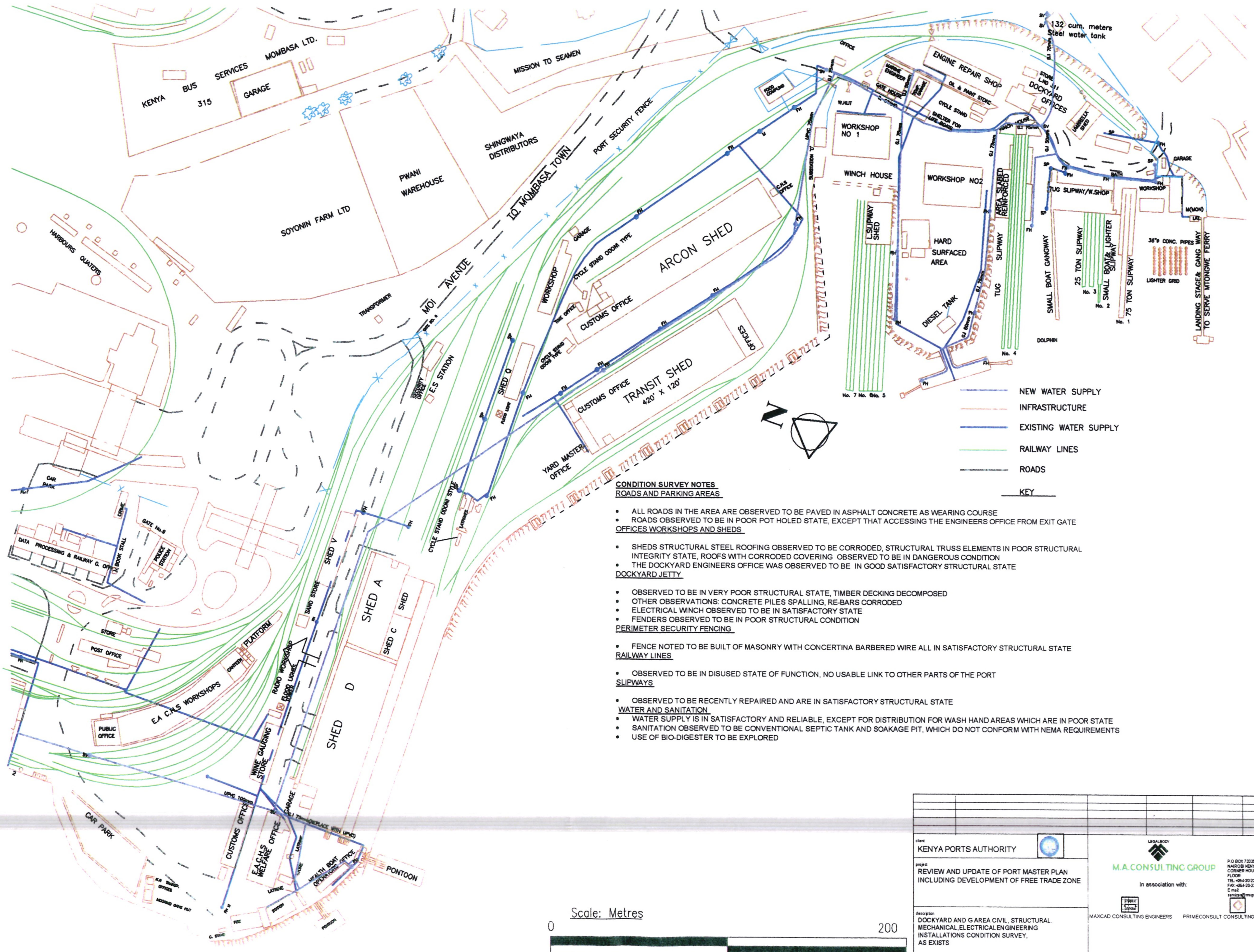
in association with

MAXCAD CONSULTING ENGINEERS

PRIMECONSULT CONSULTING ENGINEERS

size: 594 mm x 841 mm | scale: As shown | Date: March 2009

project number: KPA.MP/2009 / drawing number: 2009/01




**KEY**

- NEW WATER SUPPLY
- INFRASTRUCTURE
- EXISTING WATER SUPPLY
- RAILWAY LINES
- ROADS

**CONDITION SURVEY NOTES**

ROADS AND PARKING AREAS

- ALL ROADS IN THE AREA ARE OBSERVED TO BE PAVED IN ASPHALT CONCRETE AS WEARING COURSE
- ROADS OBSERVED TO BE IN POOR POT HOLED STATE, EXCEPT THAT ACCESSING THE ENGINEERS OFFICE FROM EXIT GATE

OFFICES WORKSHOPS AND SHEDS

- SHEDS STRUCTURAL STEEL ROOFING OBSERVED TO BE CORRODED, STRUCTURAL TRUSS ELEMENTS IN POOR STRUCTURAL INTEGRITY STATE, ROOFS WITH CORRODED COVERING OBSERVED TO BE IN DANGEROUS CONDITION
- THE DOCKYARD ENGINEERS OFFICE WAS OBSERVED TO BE IN GOOD SATISFACTORY STRUCTURAL STATE

DOCKYARD JETTY

- OBSERVED TO BE IN VERY POOR STRUCTURAL STATE, TIMBER DECKING DECOMPOSED
- OTHER OBSERVATIONS: CONCRETE PILES SPALLING, RE-BARS CORRODED
- ELECTRICAL WINCH OBSERVED TO BE IN SATISFACTORY STATE
- FENDERS OBSERVED TO BE IN POOR STRUCTURAL CONDITION

PERIMETER SECURITY FENCING

- FENCE NOTED TO BE BUILT OF MASONRY WITH CONCERTINA BARBERED WIRE ALL IN SATISFACTORY STRUCTURAL STATE

RAILWAY LINES

- OBSERVED TO BE IN DISUSED STATE OF FUNCTION, NO USABLE LINK TO OTHER PARTS OF THE PORT

SLIPWAYS

- OBSERVED TO BE RECENTLY REPAIRED AND ARE IN SATISFACTORY STRUCTURAL STATE

WATER AND SANITATION

- WATER SUPPLY IS IN SATISFACTORY AND RELIABLE, EXCEPT FOR DISTRIBUTION FOR WASH HAND AREAS WHICH ARE IN POOR STATE
- SANITATION OBSERVED TO BE CONVENTIONAL SEPTIC TANK AND SOAKAGE PIT, WHICH DO NOT CONFORM WITH NEMA REQUIREMENTS
- USE OF BIO-DIGESTER TO BE EXPLORED

Scale: Metres

0 200

client: KENYA PORTS AUTHORITY

project: REVIEW AND UPDATE OF PORT MASTER PLAN INCLUDING DEVELOPMENT OF FREE TRADE ZONE

description: DOCKYARD AND G AREA CIVIL, STRUCTURAL MECHANICAL,ELECTRICAL ENGINEERING INSTALLATIONS CONDITION SURVEY, AS EXISTS

| size | scale | Date | project number | drawing number |
|---|---|---|---|---|
| ISO A3 | AS SHOWN | March 2009 | KPA.MP/2009 | 2009/02 |


LEADBODY
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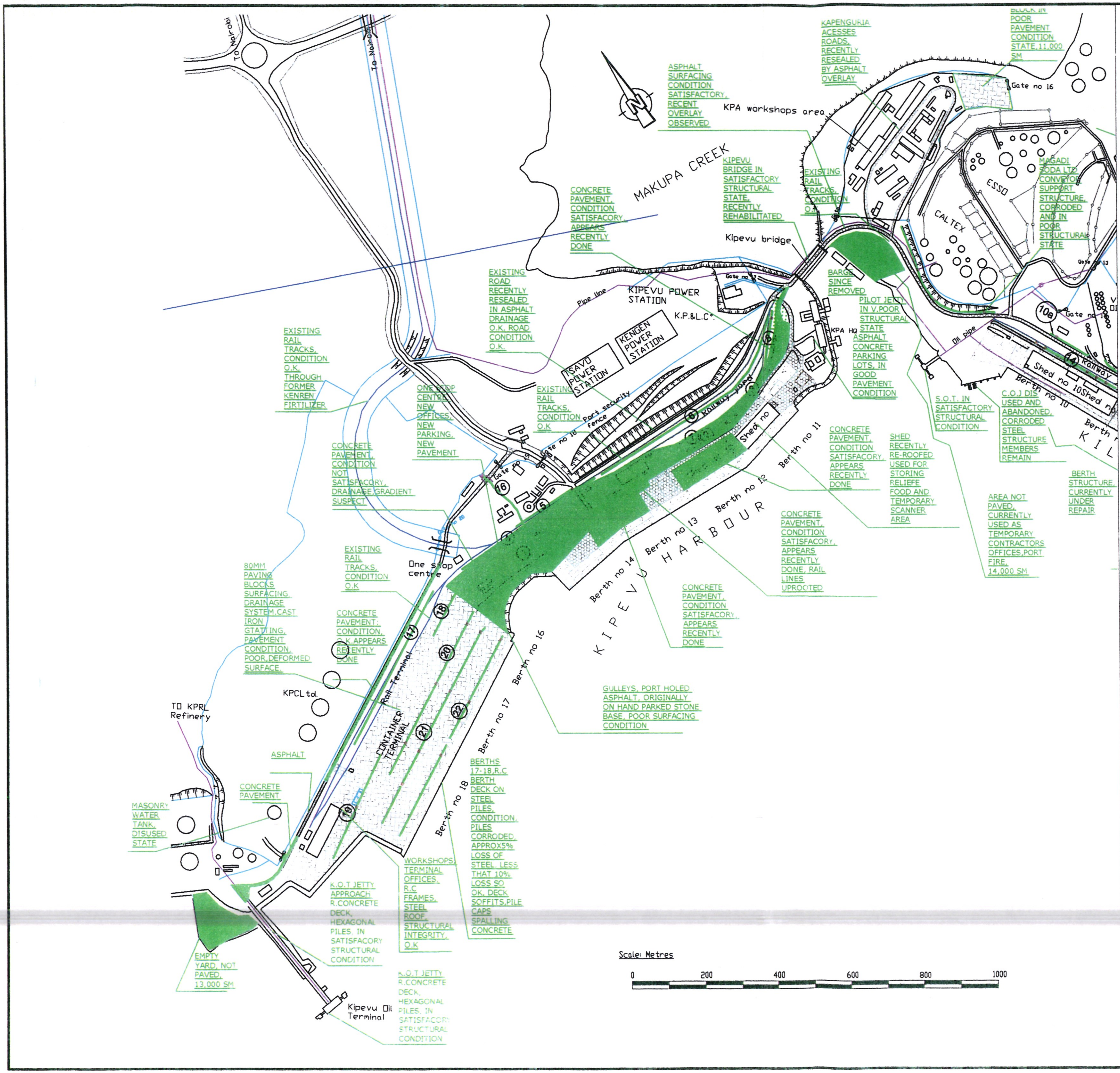
PRIMECONSULT CONSULTING ENGINEERS




KEY & NOTES

Road
Railway
Liquid bulk pipe
Port security fence
Asphalt Pavement
Concrete pavement
Unpaved area
Area with Pavement with Concrete block paving
Area with grass
Manhole
Drain with No. on
Font Colour, Paving required to improve productivity

The Drawing Is diagrammatic only.

client
KENYA PORTS AUTHORITY

project
REVIEW AND UPDATE OF PORT MASTER PLAN INCLUDING DEVELOPMENT OF FREE TRADE ZONE

description
CIVIL, STRUCTURAL, MECHANICAL,ELECTRICAL ENGINEERING INSTALLATIONS CONDITION SURVEY, AS EXISTS, BERTH NUMBER 8 TO KIPEVU OIL TERMINAL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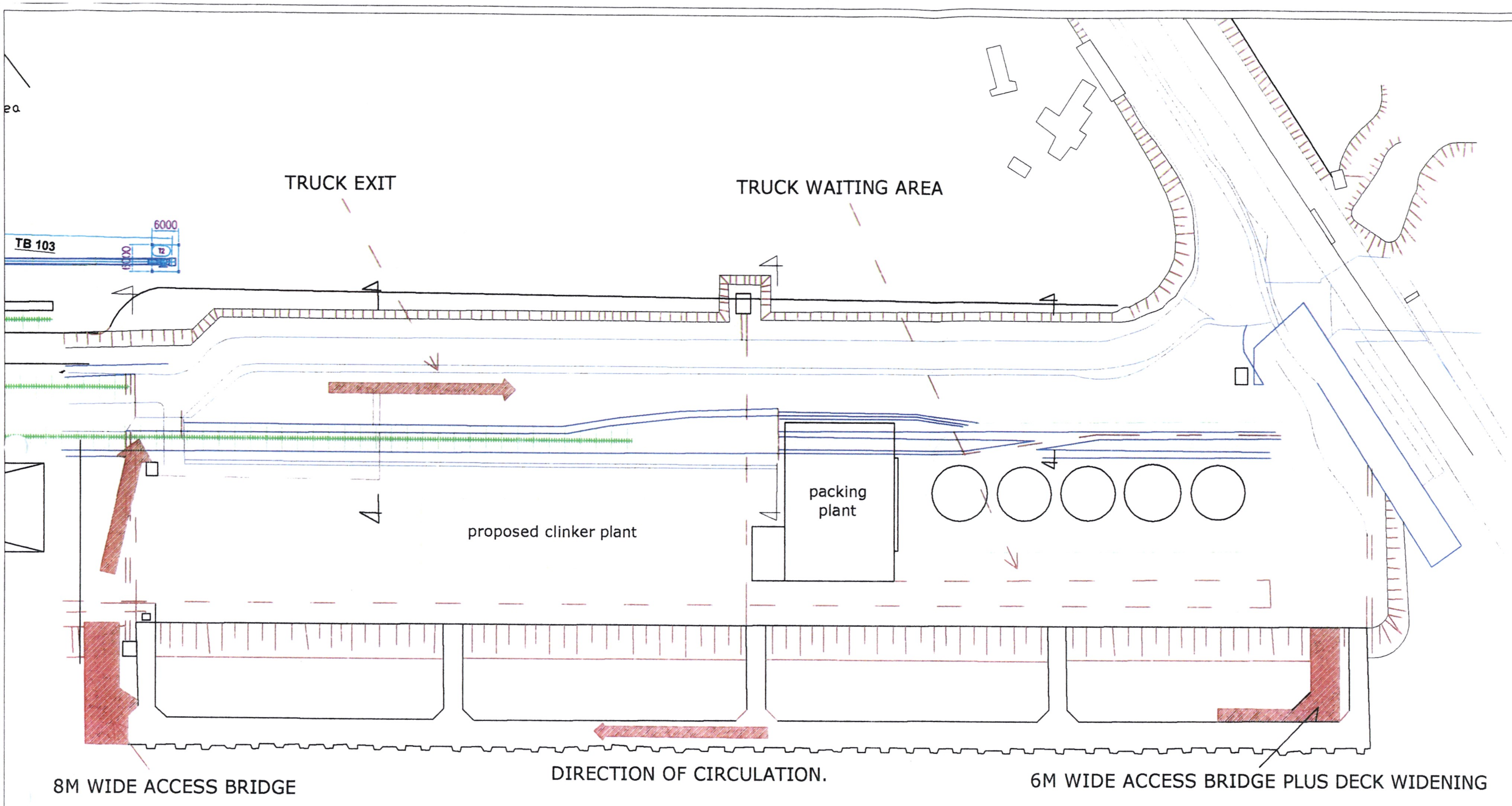
| size | scale | Date | project number | drawing number |
|---|---|---|---|---|
| ISO A3 | AS SHOWN | March 2009 | KPA.MP/2009 / | 2009/04 |




SCALE: METERS
0 10 20 30 40 100

client: KENYA PORTS AUTHORITY

project: REVIEW AND UPDATE OF PORT MASTER PLAN INCLUDING DEVELOPMENT OF FREE TRADE ZONE

description: MBARAKI WHARF - PROPOSED WIDENING OF ACCESS BRIDGES

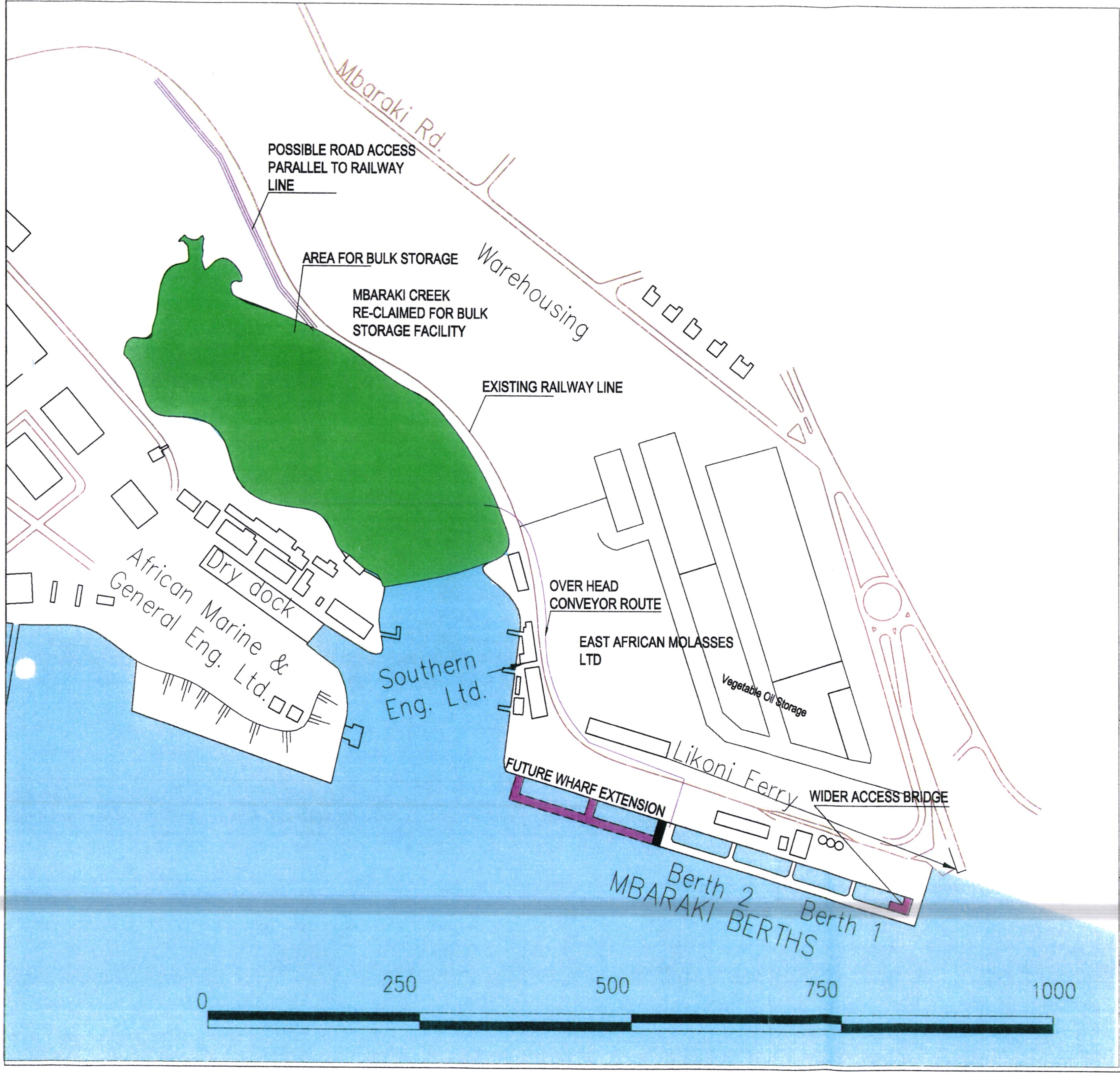
scale: AS SOWN | Date: March 2009

M.A CONSULTING GROUP

in association with:

MAXCAD CONSULTING ENGINEERS | PRIMECONSULT CONSULTING ENGINEERS

project number: KPA.MP/2009 | drawing number: 2009/05




NOTE:
THE PROPOSAL TO EXTEND THE WHARF AND RECLAIM MBARAKI CREEK WOULD ONLY BE CARRIED OUT IF SOME DIRTY BULKS ARE NOT MOVED TO DONGO KUNDU

| Revision | Description | drawn | checked | approved | date |
|---|---|---|---|---|---|

client: KENYA PORTS AUTHORITY

project: REVIEW AND UPDATE OF PORT MASTER PLAN INCLUDING DEVELOPMENT OF FREE TRADE ZONE

description: MBARAKI WHARF EXTENSION AND CREEK RECLAMATION PROPOSED LAYOUT

size: 594 mm x 841 mm | scale: As shown | Date: March 2009

M.A.CONSULTING GROUP

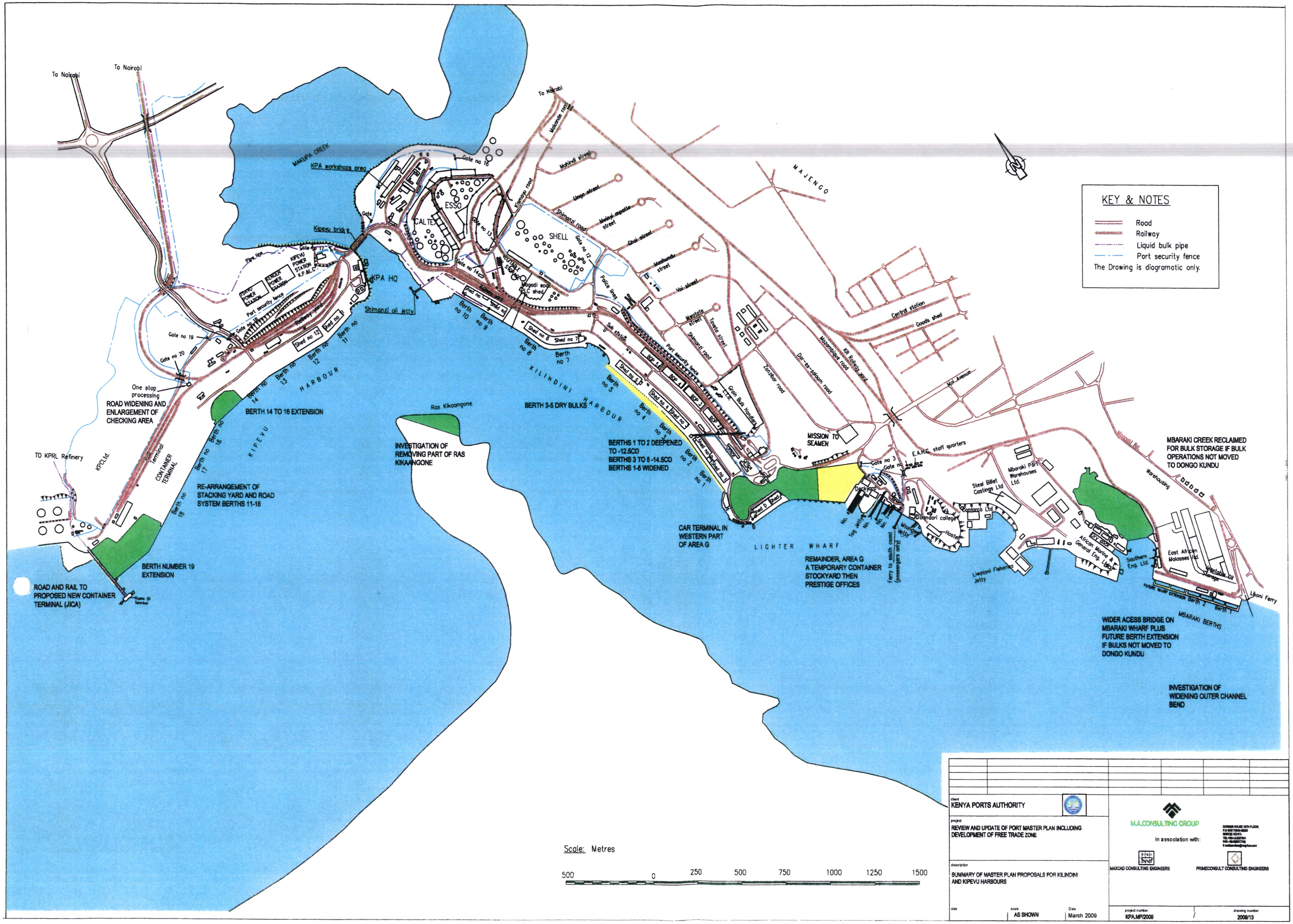
in association with

MAXCAD CONSULTING ENGINEERS

PRIMECONSULT CONSULTING ENGINEERS

project number: KPA.MP/2009 / 2009/06

drawing number




| | |
|---|---|
| client | KENYA PORTS AUTHORITY |
| project | REVIEW AND UPDATE OF PORT MASTER PLAN INCLUDING DEVELOPMENT OF FREE TRADE ZONE |
| description | SUMMARY OF MASTER PLAN PROPOSALS FOR KILINDINI AND KIPEVU HARBOURS |
| scale | AS SHOWN |
| Date | March 2009 |
| project number | KPA.MP/2009 |
| drawing number | 2009/13 |

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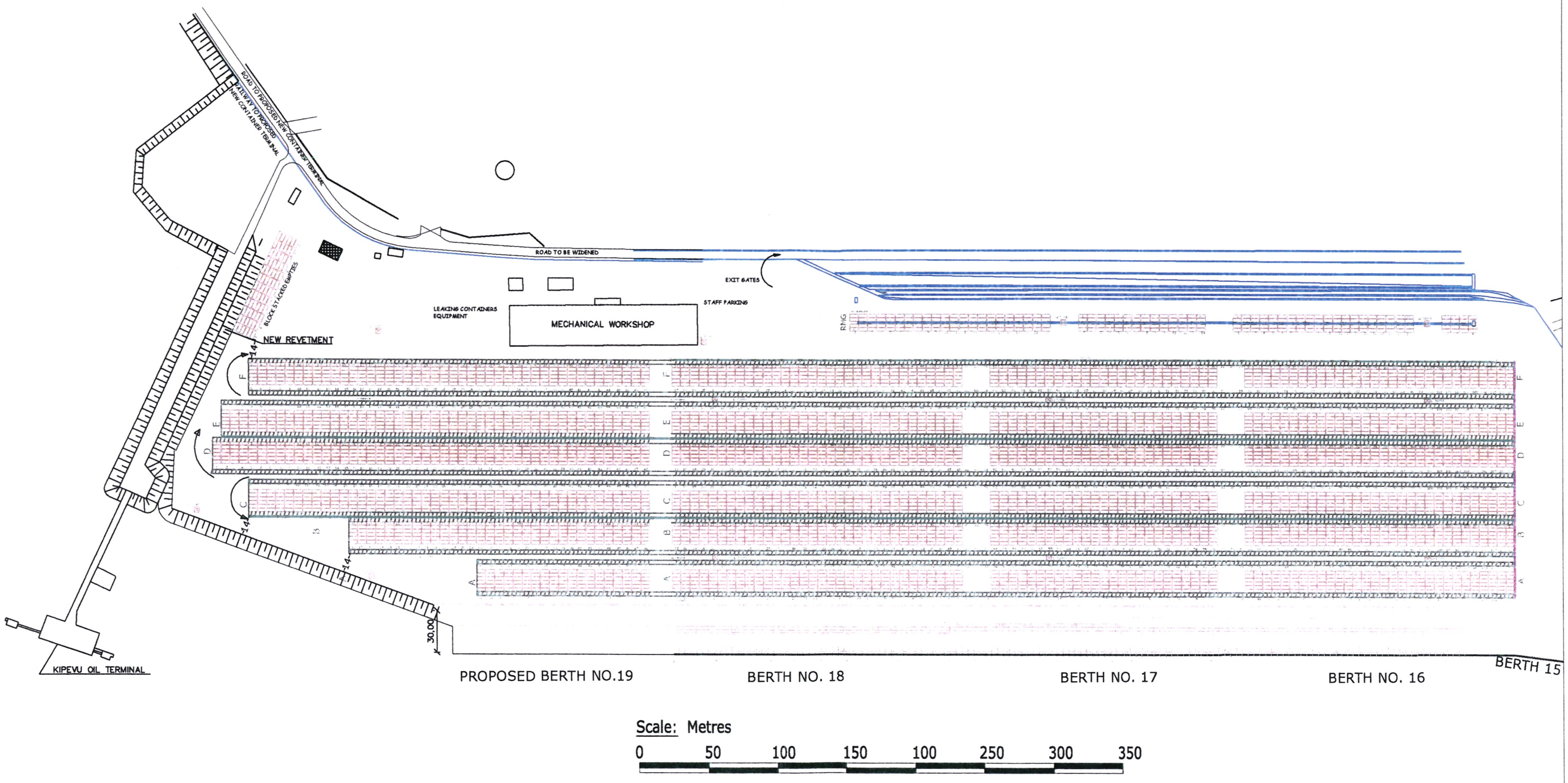
in association with:

MAXCAD CONSULTING ENGINEERS

PRIMECONSULT CONSULTING ENGINEERS




BERTH 19 EXTENSION - 1482 TEU GROUND SLOTS

BERTHS 16-18, INCLUDING RAIL TERMINAL-3372 TEU GROUND SLOTS

TOTAL -4854 TEU GROUND SLOTS

client
KENYA PORTS AUTHORITY

project
REVIEW AND UPDATE OF PORT MASTER PLAN INCLUDING DEVELOPMENT OF FREE TRADE ZONE

description
PROPOSED EXTENSION AND RE-ARRANGEMENT OF CONTAINER TERMINAL-BERTHS 16-19

size

scale
AS SHOWN

Date
March 2009

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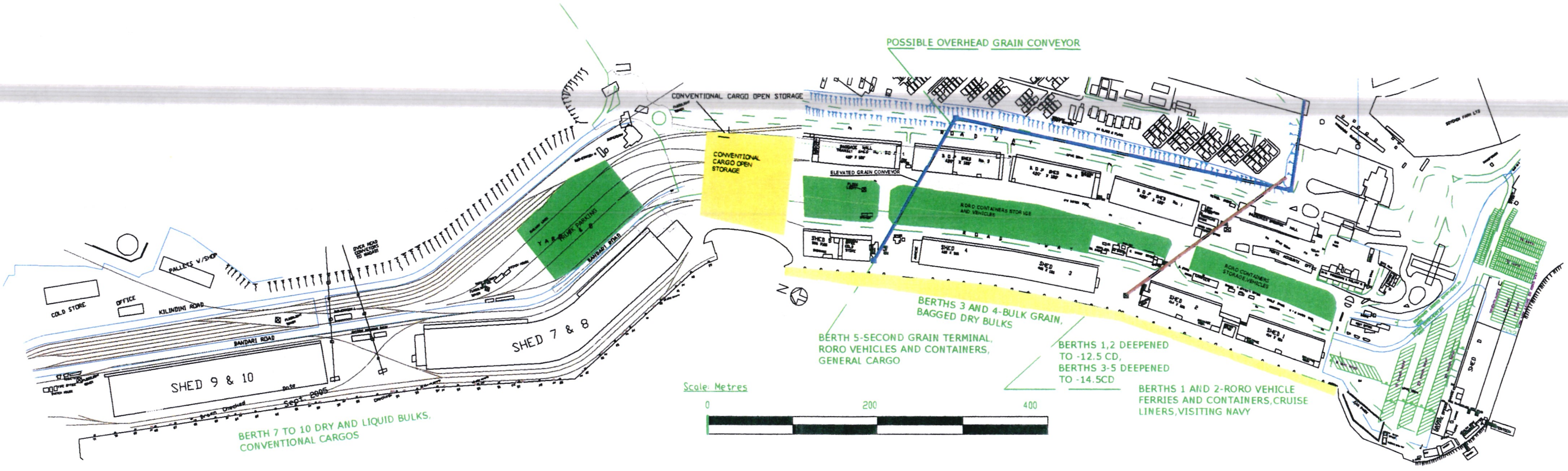
in association with:

MAXCAD CONSULTING ENGINEERS

PRIMECONSULT CONSULTING ENGINEERS

project number
KPA.MP/2009 /

drawing number
2009/11

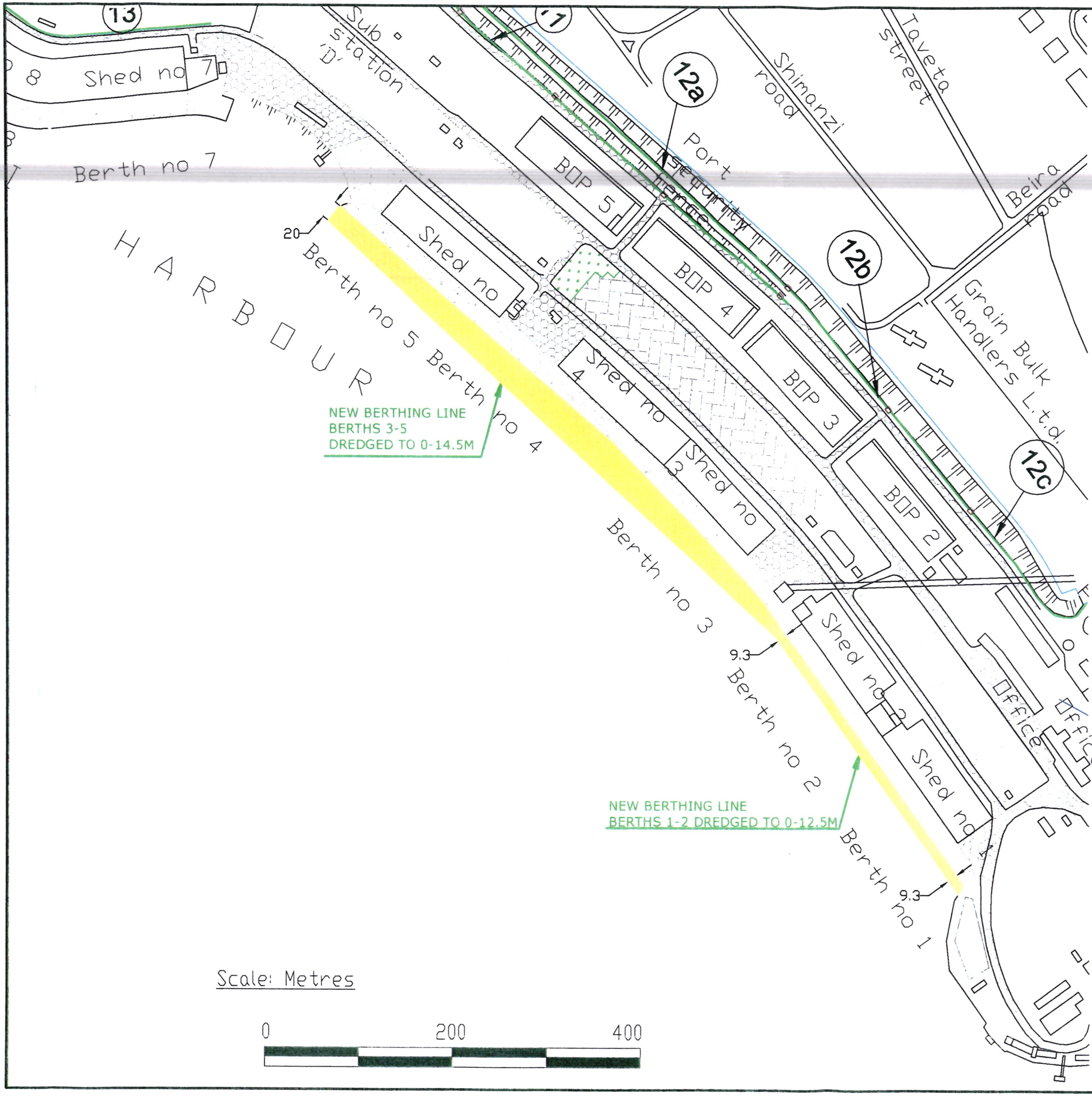



KEY

Infrastructure
Railway lines
Roads

NOTE:
Transit Sheds next to berths can be demolished in future if not required

| | |
|---|---|
| client: KENYA PORTS AUTHORITY | M.A CONSULTING GROUP<br>CORNER HOUSE 12TH FLOOR, P.O BOX 73335-00200 NAIROBI KENYA |
| project: REVIEW AND UPDATE OF PORT MASTER PLAN INCLUDING DEVELOPMENT OF FREE TRADE ZONE | in association with: MAXCAD CONSULTING ENGINEERS, PRIMECONSULT CONSULTING ENGINEERS |
| description: BERTHS 1 TO 10- PROPOSED FUNCTIONS AND BERTH WIDENING | |
| scale: AS SHOWN; Date: March 2009 | project number: KPA.MP/2009; drawing number: 2009/09 |




KEY & NOTES

- Road
- Railway
- Liquid bulk pipe
- Port security fence
- Asphalt Pavement
- Concrete pavement
- Unpaved area
- Area with Truck ballast
- Pavement with Concrete block paving
- Area with grass
- Manhole
- Drain with No. on
- Font Colour, Paving required to improve productivity

The Drawing is diagrammatic only.

| | |
|---|---|
| client | KENYA PORTS AUTHORITY |
| project | REVIEW AND UPDATE OF PORT MASTER PLAN INCLUDING DEVELOPMENT OF FREE TRADE ZONE |
| description | DEEPENING AND RE ARRANGEMENT OF BERTHING LINE, BERTHS 1 TO 5 |
| size | ISO A3 |
| scale | AS SHOWN |
| Date | March 2009 |
| project number | KPA.MP/2009 / |
| drawing number | 2009/08 |

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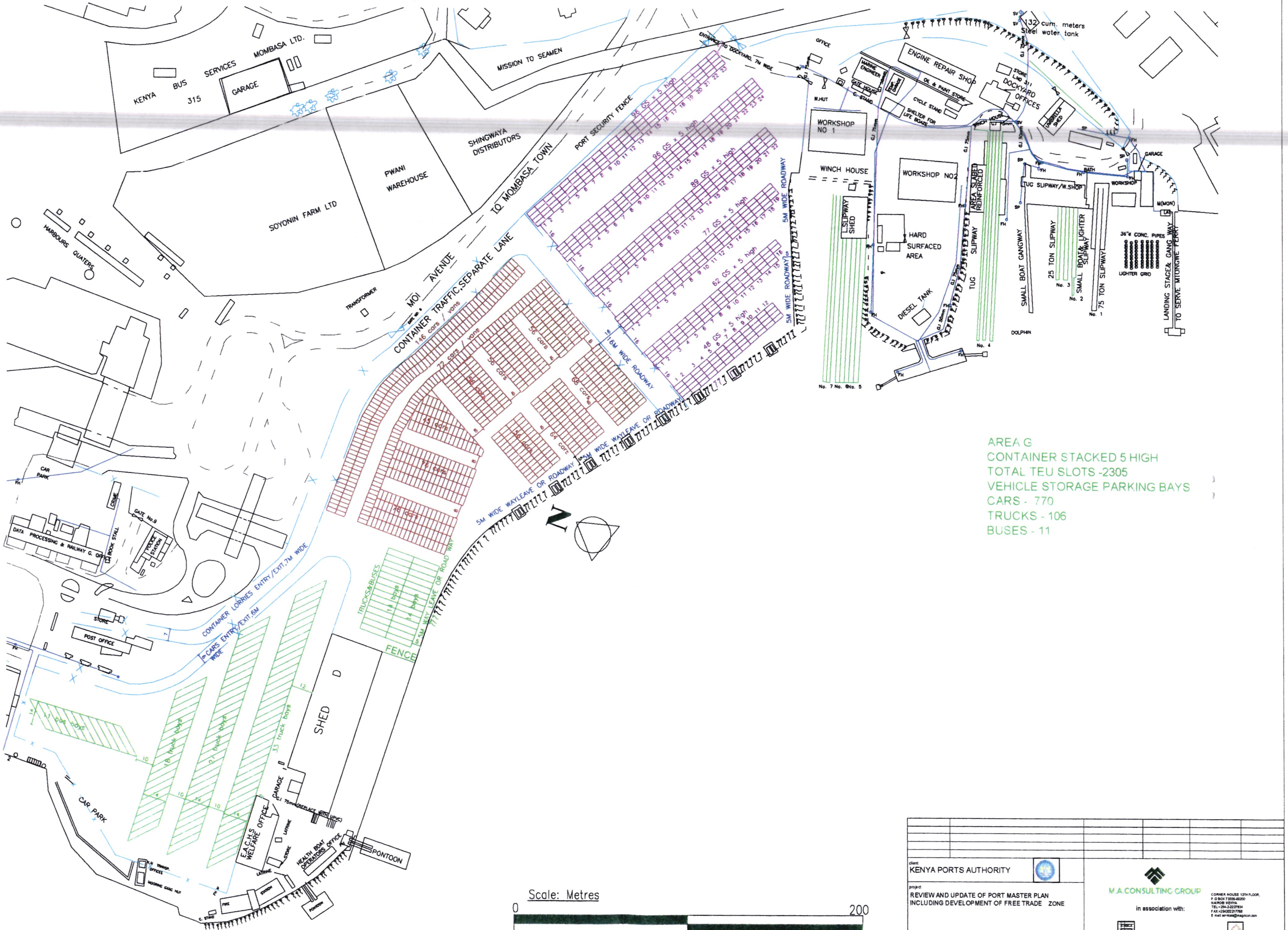
in association with:

MAXCAD CONSULTING ENGINEERS

PRIMECONSULT CONSULTING ENGINEERS




AREA G
CONTAINER STACKED 5 HIGH
TOTAL TEU SLOTS -2305
VEHICLE STORAGE PARKING BAYS
CARS - 770
TRUCKS - 106
BUSES - 11

Scale: Metres
0 — 200

| | |
|---|---|
| client | KENYA PORTS AUTHORITY |
| project | REVIEW AND UPDATE OF PORT MASTER PLAN INCLUDING DEVELOPMENT OF FREE TRADE ZONE |
| description | AREA G- PROPOSED VEHICLE TERMINAL AND TEMPORARY EMPTY CONTAINER STORAGE |
| scale | AS SHOWN |
| Date | March 2009 |
| project number | KPA.MP/2009 |
| drawing number | 2009/07 |

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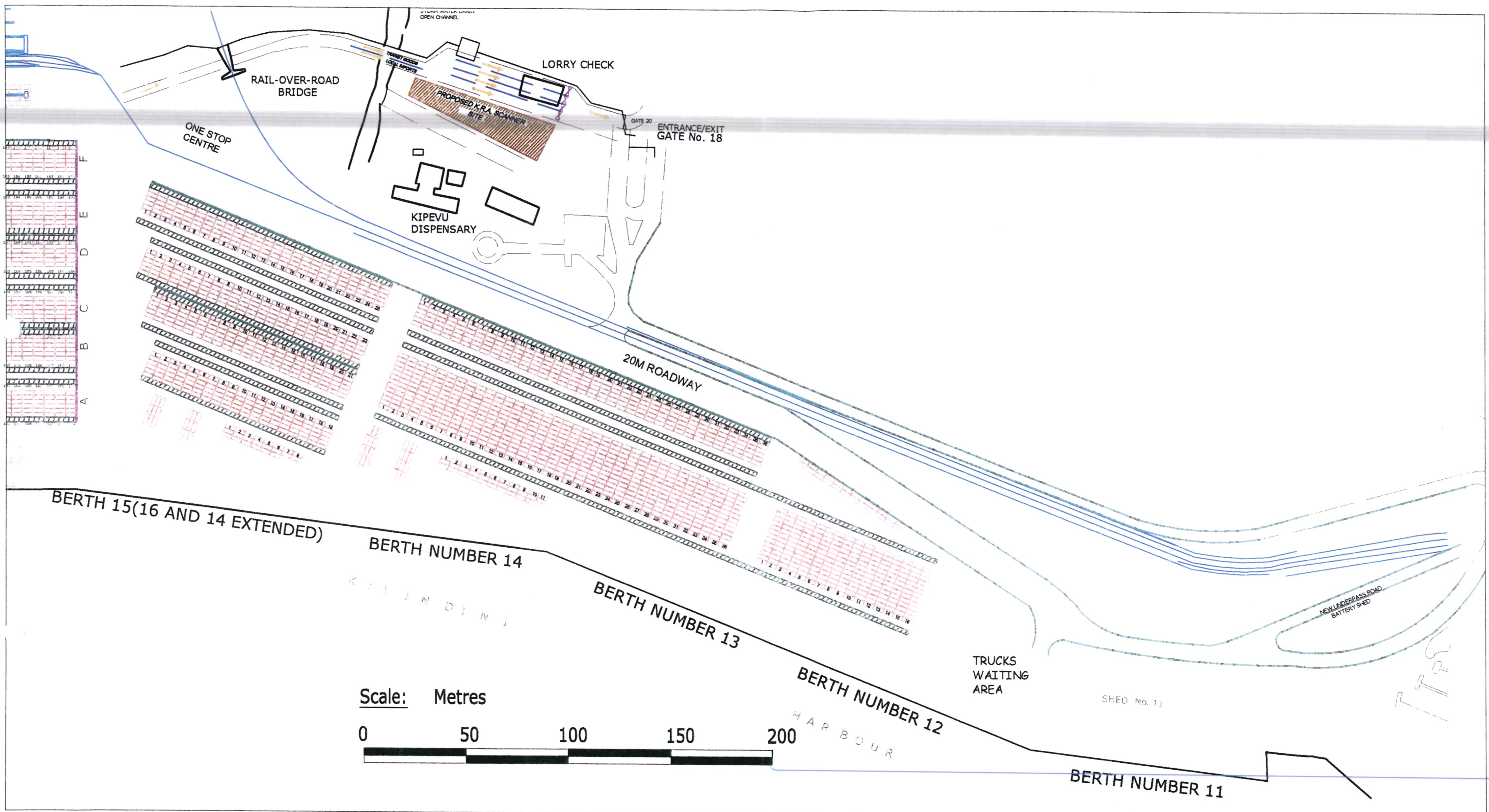
PRIMECONSULT CONSULTING ENGINEERS




TOTAL TEU GROUND SLOTS=1550

| | |
|---|---|
| client | KENYA PORTS AUTHORITY |
| project | REVIEW AND UPDATE OF PORT MASTER PLAN INCLUDING DEVELOPMENT OF FREE TRADE ZONE |
| description | PROPOSED EXTENSION OF BERTH NUMBER 14 AND RE-ARRANGEMENT OF CONTAINER STACKING |
| size / scale / Date | AS SHOWN / March 2009 |
| project number | KPA.MP/2009 |
| drawing number | 2009/10 |

M.A.CONSULTING GROUP

In association with:

MAXCAD CONSULTING ENGINEERS

PRIMECONSULT CONSULTING ENGINEERS

# ANNEX B:

# PLANNING BERTH AND STACKYARD REQUIREMENTS

Appendix B1 - sheet 1

GENERAL CARGOES AND CONTAINERS HANDLED AT BERTHS 1-10 AND MBARAKI (includes GC that is currently handled at berth 11)

| Year | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Clinker** | 1,051 | 1,112 | 1,217 | 1,326 | 1,432 | 1,556 | 1,692 | 1,828 | 1,963 | 2,108 | 2,265 | 2,433 | 2,615 | 2,810 | 3,004 | 3,211 | 3,433 | 3,671 | 3,882 | 4,106 | 4,342 | 4,592 | 4,856 | 5,136 |
| Handling rate T/ship day 7750, increasing to 10,000 in 2014 and 15000 by 2018 | 7,750 | 7,750 | 7,750 | 7,750 | 7,750 | 7,750 | 7,750 | 10,000 | 10,000 | 10,000 | 10,000 | 15,000 | 15,000 | 15,000 | 15,000 | 15,000 | 15,000 | 15,000 | 15,000 | 15,000 | 15,000 | 15,000 | 15,000 | 15,000 |
| Berth days rqd/yr | 136 | 144 | 157 | 171 | 185 | 201 | 218 | 183 | 196 | 211 | 226 | 162 | 174 | 187 | 200 | 214 | 229 | 245 | 259 | 274 | 289 | 306 | 324 | 342 |
| Berth occupancy | 37% | 39% | 43% | 47% | 51% | 55% | 60% | 50% | 54% | 58% | 62% | 44% | 48% | 51% | 55% | 59% | 63% | 67% | 71% | 75% | 79% | 84% | 89% | 94% |
| Berth occupancy allowed 705 | 70% | 70% | 70% | 70% | 70% | 70% | 70% | 70% | 70% | 70% | 70% | 70% | 70% | 70% | 70% | 70% | 70% | 70% | 70% | 70% | 70% | 70% | 70% | 70% |
| Number berths rqd | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 2 | 2 |
| Berth length rqd assuming 40,000dwt vessel 195 m plus end spaces of 40m | 235 | 235 | 235 | 235 | 235 | 235 | 235 | 235 | 235 | 235 | 235 | 235 | 235 | 235 | 235 | 235 | 235 | 235 | 235 | 235 | 470 | 470 | 470 | 470 |
| **Wheat in bulk** | 858 | 893 | 955 | 1,021 | 1,087 | 1,163 | 1,245 | 1,332 | 1,426 | 1,517 | 1,614 | 1,717 | 1,828 | 1,945 | 2,060 | 2,183 | 2,312 | 2,450 | 2,570 | 2,672 | 2,777 | 2,886 | 3,000 | 3,118 |
| Handling rate T/ship day (*assume increased to 3 unloaders in 2013 providing ships are long enough*) | 7,000 | 7,000 | 7,000 | 7,000 | 7,000 | 7,000 | 8,250 | 8,250 | 8,250 | 8,250 | 8,250 | 8,250 | 8,250 | 8,250 | 8,250 | 8,250 | 8,250 | 8,250 | 8,250 | 8,250 | 8,250 | 8,250 | 8,250 | 8,250 |
| Berth days rqd/yr | 123 | 128 | 136 | 146 | 155 | 166 | 151 | 161 | 173 | 184 | 196 | 208 | 222 | 236 | 250 | 265 | 280 | 297 | 312 | 324 | 337 | 350 | 364 | 378 |
| Berth occupancy assuming berth 3 only | 33.58% | 34.96% | 37.40% | 39.97% | 42.55% | 45.53% | 41.34% | 44.24% | 47.34% | 50.37% | 53.59% | 57.03% | 60.69% | 64.59% | 68.42% | 72.48% | 76.78% | 81.35% | 85.35% | 88.72% | 92.22% | 95.85% | 99.63% | 103.56% |
| Berth occupancy allowed 60% | 60.00% | 60.00% | 60.00% | 60.00% | 60.00% | 60.00% | 60.00% | 60.00% | 60.00% | 60.00% | 60.00% | 60.00% | 60.00% | 60.00% | 60.00% | 60.00% | 60.00% | 60.00% | 60.00% | 60.00% | 60.00% | 60.00% | 60.00% | 60.00% |
| Number berths rqd | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Berth length rqd assuming 20,000dwt vessel 160 m plus end spaces of 40m, increasing to 40,000dwt in 2015 | 200 | 200 | 200 | 200 | 200 | 200 | 200 | 200 | 235 | 235 | 235 | 235 | 470 | 470 | 470 | 470 | 470 | 470 | 470 | 470 | 470 | 470 | 470 | 470 |
| **Iron and Steel** | 621 | 639 | 673 | 712 | 755 | 804 | 856 | 912 | 972 | 1,035 | 1,103 | 1,176 | 1,253 | 1,335 | 1,415 | 1,501 | 1,591 | 1,687 | 1,770 | 1,857 | 1,948 | 2,044 | 2,145 | 2,250 |
| Handling rate T/ship day | 2,800 | 2,800 | 2,800 | 2,800 | 2,800 | 2,800 | 2,800 | 2,800 | 2,800 | 2,800 | 2,800 | 2,800 | 2,800 | 2,800 | 2,800 | 2,800 | 2,800 | 2,800 | 2,800 | 2,800 | 2,800 | 2,800 | 2,800 | 2,800 |
| Berth days rqd/yr | 222 | 228 | 240 | 254 | 270 | 287 | 306 | 326 | 347 | 370 | 394 | 420 | 447 | 477 | 505 | 536 | 568 | 602 | 632 | 663 | 696 | 730 | 766 | 804 |
| Berth occupancy for 1 berth | 61% | 62% | 66% | 70% | 74% | 79% | 84% | 89% | 95% | 101% | 108% | 115% | 123% | 131% | 138% | 147% | 156% | 165% | 173% | 182% | 191% | 200% | 210% | 220% |
| Berth occupancy allowed 75% | 75% | 75% | 75% | 75% | 75% | 75% | 75% | 75% | 75% | 75% | 75% | 75% | 75% | 75% | 75% | 75% | 75% | 75% | 75% | 75% | 75% | 75% | 75% | 75% |
| Number berths rqd | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| Berth length assuming 15,000 dwt vessel to 2014 then 20,000 dwt | 167 | 167 | 167 | 167 | 167 | 167 | 334 | 334 | 360 | 360 | 360 | 360 | 360 | 360 | 360 | 360 | 540 | 540 | 540 | 540 | 540 | 540 | 540 | 540 |
| **Edible oil and other bulk liquids** | 676 | 695 | 733 | 775 | 822 | 875 | 932 | 992 | 1,057 | 1,126 | 1,199 | 1,277 | 1,361 | 1,450 | 1,537 | 1,629 | 1,727 | 1,831 | 1,921 | 2,016 | 2,115 | 2,219 | 2,329 | 2,443 |
| Handling rate T/ship day | 5,000 | 5,000 | 5,000 | 5,000 | 5,000 | 5,000 | 5,000 | 5,000 | 5,000 | 5,000 | 5,000 | 5,000 | 5,000 | 5,000 | 5,000 | 5,000 | 5,000 | 5,000 | 5,000 | 5,000 | 5,000 | 5,000 | 5,000 | 5,000 |
| Berth days rqd/yr | 135 | 139 | 147 | 155 | 164 | 175 | 186 | 198 | 211 | 225 | 240 | 255 | 272 | 290 | 307 | 326 | 345 | 366 | 384 | 403 | 423 | 444 | 466 | 489 |
| Berth occupancy for 1 berth | 37.04% | 38.10% | 40.15% | 42.48% | 45.01% | 47.94% | 51.05% | 54.37% | 57.91% | 61.68% | 65.70% | 69.99% | 74.57% | 79.45% | 84.22% | 89.28% | 94.65% | 100.35% | 105.28% | 110.47% | 115.90% | 121.61% | 127.59% | 133.87% |
| Berth occupancy allowed 75% | 75.00% | 75.00% | 75.00% | 75.00% | 75.00% | 75.00% | 75.00% | 75.00% | 75.00% | 75.00% | 75.00% | 75.00% | 75.00% | 75.00% | 75.00% | 75.00% | 75.00% | 75.00% | 75.00% | 75.00% | 75.00% | 75.00% | 75.00% | 75.00% |
| Number berths rqd | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Berth length assuming 20,000 dwt parcel tanker | 190 | 190 | 190 | 190 | 190 | 190 | 190 | 190 | 190 | 190 | 190 | 190 | 190 | 380 | 380 | 380 | 380 | 380 | 380 | 380 | 380 | 380 | 380 | 380 |
| Actual berths rqd | | | | | | | | | | | | | | | | | | | | | | | | |
| **Vehicles** | 287 | 318 | 358 | 405 | 456 | 516 | 579 | 647 | 718 | 792 | 873 | 963 | 1,062 | 1,172 | 1,283 | 1,406 | 1,540 | 1,687 | 1,822 | 1,968 | 2,115 | 2,263 | 2,409 | 2,551 |
| **Vehicles in 000 units** | 74 | 79 | 88 | 99 | 110 | 123 | 137 | 151 | 166 | 182 | 197 | 214 | 230 | 245 | 260 | 275 | 291 | 308 | 323 | 339 | 356 | 374 | 392 | 411 |
| Handling rate units/ship day. Assume increase from 1000 to 1200 after vehicle parking improved | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,200 | 1,200 | 1,200 | 1,200 | 1,200 | 1,200 | 1,200 | 1,200 | 1,200 | 1,200 | 1,200 | 1,200 | 1,200 | 1,200 | 1,200 | 1,200 | 1,200 | 1,200 | 1,200 |
| Berth days rqd/yr | 74 | 79 | 88 | 99 | 110 | 102 | 114 | 126 | 138 | 151 | 165 | 178 | 191 | 205 | 216 | 229 | 243 | 257 | 269 | 283 | 297 | 311 | 327 | 343 |
| Berth occupancy for 1 berth | 20.22% | 21.65% | 24.18% | 27.03% | 30.14% | 28.07% | 31.19% | 34.48% | 37.91% | 41.46% | 45.08% | 48.75% | 52.42% | 56.04% | 59.31% | 62.78% | 66.45% | 70.33% | 73.80% | 77.45% | 81.27% | 85.28% | 89.49% | 93.90% |
| Berth occupancy allowed 75% | 75.00% | 75.00% | 75.00% | 75.00% | 75.00% | 75.00% | 75.00% | 75.00% | 75.00% | 75.00% | 75.00% | 75.00% | 75.00% | 75.00% | 75.00% | 75.00% | 75.00% | 75.00% | 75.00% | 75.00% | 75.00% | 75.00% | 75.00% | 75.00% |
| Number berths rqd | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 2 | 2 |
| Berth length rqd asume 20,000dwt with 60 m space for mooring, ramp increasing to 30,000 dwt | 260 | 260 | 260 | 260 | 260 | 260 | 260 | 260 | 290 | 290 | 290 | 290 | 290 | 290 | 290 | 580 | 580 | 580 | 580 | 580 | 580 | 580 | 580 | 580 |
| **Fertilisers** | 383 | 384 | 387 | 391 | 394 | 398 | 402 | 406 | 410 | 414 | 418 | 423 | 427 | 431 | 435 | 439 | 443 | 447 | 450 | 453 | 456 | 459 | 463 | 466 |
| Handling rate T/ship day | 2,500 | 2,500 | 2,500 | 2,500 | 2,500 | 2,500 | 3,000 | 3,000 | 3,000 | 3,000 | 3,000 | 3,000 | 3,000 | 3,000 | 3,000 | 3,000 | 3,000 | 3,000 | 3,000 | 3,000 | 3,000 | 3,000 | 3,000 | 3,000 |
| Berth days rqd/yr | 153 | 154 | 155 | 156 | 158 | 159 | 134 | 135 | 137 | 138 | 139 | 141 | 142 | 144 | 145 | 146 | 148 | 149 | 150 | 151 | 152 | 153 | 154 | 155 |
| Berth occupancy for 1 berth | 41.97% | 42.12% | 42.46% | 42.82% | 43.21% | 43.64% | 36.73% | 37.09% | 37.46% | 37.83% | 38.21% | 38.59% | 38.97% | 39.36% | 39.71% | 40.07% | 40.43% | 40.79% | 41.08% | 41.36% | 41.65% | 41.94% | 42.24% | 42.53% |
| Berth occupancy allowed 75% | 75.00% | 75.00% | 75.00% | 75.00% | 75.00% | 75.00% | 75.00% | 75.00% | 75.00% | 75.00% | 75.00% | 75.00% | 75.00% | 75.00% | 75.00% | 75.00% | 75.00% | 75.00% | 75.00% | 75.00% | 75.00% | 75.00% | 75.00% | 75.00% |
| Number berths rqd | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Berth length assuming 15,000 dwt vessel to 2014 then 20,000 dwt | 167 | 167 | 167 | 167 | 167 | 167 | 167 | 167 | 180 | 180 | 180 | 180 | 180 | 180 | 180 | 180 | 180 | 180 | 180 | 180 | 180 | 180 | 180 | 180 |
| **Coal** | 176 | 186 | 204 | 222 | 240 | 261 | 283 | 306 | 329 | 353 | 379 | 408 | 438 | 471 | 503 | 538 | 575 | 615 | 650 | 688 | 727 | 769 | 813 | 860 |
| Handling rate T/ship day | 2,500 | 2,500 | 2,500 | 2,500 | 2,500 | 2,500 | 3,000 | 3,000 | 3,000 | 3,000 | 3,000 | 3,000 | 3,000 | 3,000 | 3,000 | 3,000 | 3,000 | 3,000 | 3,000 | 3,000 | 3,000 | 3,000 | 3,000 | 3,000 |
| Berth days rqd/yr | 70 | 74 | 82 | 89 | 96 | 104 | 94 | 102 | 110 | 118 | 126 | 136 | 146 | 157 | 168 | 179 | 192 | 205 | 217 | 229 | 242 | 256 | 271 | 287 |
| Berth occupancy for 1 berth | 19.29% | 20.41% | 22.33% | 24.34% | 26.28% | 28.56% | 25.87% | 27.95% | 30.02% | 32.24% | 34.64% | 37.21% | 39.99% | 42.97% | 45.94% | 49.11% | 52.51% | 56.14% | 59.37% | 62.79% | 66.40% | 70.22% | 74.27% | 78.55% |
| Berth occupancy allowed 75% | 75.00% | 75.00% | 75.00% | 75.00% | 75.00% | 75.00% | 75.00% | 75.00% | 75.00% | 75.00% | 75.00% | 75.00% | 75.00% | 75.00% | 75.00% | 75.00% | 75.00% | 75.00% | 75.00% | 75.00% | 75.00% | 75.00% | 75.00% | 75.00% |
| Number berths rqd | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Berth length rqd assuming 40,000dwt vessel 195 m plus end spaces of 40m | 167 | 167 | 235 | 235 | 235 | 235 | 235 | 235 | 235 | 235 | 235 | 235 | 235 | 235 | 235 | 235 | 235 | 235 | 235 | 235 | 235 | 235 | 235 | 235 |

Appendix B 1
sheet 2

| Year | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Others, Conventional, excl iron and steel | 255 | 253 | 251 | 250 | 260 | 270 | 280 | 290 | 300 | 310 | 320 | 330 |
| Handling rate T/ship day assume increase from 1200 to 1500 | 1,200 | 1,200 | 1,200 | 1,200 | 1,200 | 1,200 | 1,200 | 1,200 | 1,500 | 1,500 | 1,500 | 1,500 |
| Berth days rqd/yr | 213 | 211 | 209 | 208 | 217 | 225 | 233 | 242 | 200 | 207 | 213 | 220 |
| Berth occupancy for 1 berth | 58.22% | 57.76% | 57.31% | 57.08% | 59.36% | 61.64% | 63.93% | 66.21% | 54.79% | 56.62% | 58.45% | 60.27% |
| Berth occupancy allowed 75% | 75.00% | 75.00% | 75.00% | 75.00% | 75.00% | 75.00% | 75.00% | 75.00% | 75.00% | 75.00% | 75.00% | 75.00% |
| Number berths rqd | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Berth length | 115 | 115 | 115 | 115 | 115 | 115 | 115 | 115 | 115 | 115 | 115 | 115 |
| Others, Dry Bulk | 328 | 336 | 345 | 354 | 363 | 372 | 381 | 391 | 401 | 411 | 422 | 433 |
| Handling rate T/ship day | 4000 | 4000 | 4000 | 4000 | 4000 | 4000 | 4000 | 4000 | 6000 | 6000 | 6000 | 6000 |
| Berth days rqd/yr | 82 | 84 | 86 | 88 | 91 | 93 | 95 | 98 | 67 | 69 | 70 | 72 |
| Berth occupancy for 1 berth | 22.47% | 23.04% | 23.63% | 24.23% | 24.85% | 25.48% | 26.13% | 26.80% | 18.32% | 18.79% | 19.27% | 19.76% |
| Berth occupancy allowed 75% | 75.00% | 75.00% | 75.00% | 75.00% | 75.00% | 75.00% | 75.00% | 75.00% | 75.00% | 75.00% | 75.00% | 75.00% |
| Number berths rqd | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Berth length assume 10,000 dwt | 145 | 145 | 145 | 145 | 145 | 145 | 145 | 145 | 145 | 145 | 145 | 145 |
| Containers shipped as RoRo (Messina) TEU (aprox 4.1% of total) | 24,026 | 25,600 | 28,087 | 30,884 | 33,902 | 37,374 | 41,097 | 45,068 | 49,283 | 53,734 | 58,411 | 63,298 |
| Handling rate TEU/shipday | 450 | 450 | 450 | 450 | 450 | 600 | 600 | 750 | 750 | 750 | 750 | 750 |
| Berth days rqd/yr | 53 | 57 | 62 | 69 | 75 | 62 | 68 | 60 | 66 | 72 | 78 | 84 |
| Berth occupancy for 1 berth | 14.63% | 15.59% | 17.10% | 18.80% | 20.64% | 17.07% | 18.77% | 16.46% | 18.00% | 19.63% | 21.34% | 23.12% |
| Berth occupancy allowed 60% | 60.00% | 60.00% | 60.00% | 60.00% | 60.00% | 60.00% | 60.00% | 60.00% | 60.00% | 60.00% | 60.00% | 60.00% |
| Number berths rqd | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Berth length assume 25,000 dwt, plus space | 290 | 290 | 290 | 290 | 290 | 290 | 290 | 290 | 290 | 290 | 290 | 290 |
| EXPORTS | | | | | | | | | | | | |
| Other Dry Bulk | 128 | 114 | 101 | 89 | 79 | 70 | 62 | 55 | 49 | 43 | 38 | 34 |
| Handling rate T/ship day assume a bit better than Mgadi soda rate | 2,000 | 2,000 | 2,000 | 2,000 | 2,000 | 2,000 | 2,000 | 2,000 | 2,000 | 2,000 | 2,000 | 2,000 |
| Berth days rqd/yr | 64 | 57 | 50 | 45 | 40 | 35 | 31 | 28 | 24 | 22 | 19 | 17 |
| Berth occupancy for 1 berth | 17.53% | 15.55% | 13.79% | 12.23% | 10.84% | 9.61% | 8.53% | 7.56% | 6.70% | 5.95% | 5.27% | 4.68% |
| Berth occupancy allowed 75% | 75.00% | 75.00% | 75.00% | 75.00% | 75.00% | 75.00% | 75.00% | 75.00% | 75.00% | 75.00% | 75.00% | 75.00% |
| Number berths rqd | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Berth length assume 10,000 dwt, reducing to 5000 dwt | 145 | 145 | 145 | 145 | 145 | 145 | 145 | 145 | 145 | 120 | 120 | 120 |
| Soda Ash as dry bulk | 77 | 91 | 105 | 120 | 140 | 160 | 180 | 199 | 219 | 235 | 251 | 267 |
| Use Mgadi soda rate inreasing to 2000 in 2012 | 1,500 | 1,500 | 1,500 | 1,500 | 1,500 | 2,000 | 2,000 | 2,000 | 2,000 | 2,000 | 2,000 | 2,000 |
| Berth days rqd/yr | 51 | 61 | 70 | 80 | 93 | 80 | 90 | 100 | 110 | 118 | 126 | 134 |
| Berth occupancy for 1 berth | 14.06% | 16.66% | 19.26% | 21.86% | 25.50% | 21.86% | 24.59% | 27.33% | 30.06% | 32.25% | 34.43% | 36.62% |
| Berth occupancy allowed 75% | 75.00% | 75.00% | 75.00% | 75.00% | 75.00% | 75.00% | 75.00% | 75.00% | 75.00% | 75.00% | 75.00% | 75.00% |
| Number berths rqd | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Berth length assume 10,000 dwt, reducing to 5000 | 145 | 145 | 145 | 145 | 145 | 145 | 145 | 145 | 145 | 120 | 120 | 120 |
| Other Liquid Bulk | 167 | 148 | 131 | 116 | 103 | 91 | 81 | 72 | 63 | 56 | 50 | 44 |
| Handling rate T/ship day | 5.000 | 5.000 | 5.000 | 5.000 | 5.000 | 5.000 | 5.000 | 5.000 | 5.000 | 5.000 | 5.000 | 5.000 |
| Berth days rqd/yr | 33 | 30 | 26 | 23 | 21 | 18 | 16 | 14 | 13 | 11 | 10 | 9 |
| Berth occupancy for 1 berth | 9.15% | 8.11% | 7.18% | 6.36% | 5.64% | 5.00% | 4.43% | 3.92% | 3.47% | 3.08% | 2.73% | 2.42% |
| Berth occupancy allowed 70% | 70.00% | 70.00% | 70.00% | 70.00% | 70.00% | 70.00% | 70.00% | 70.00% | 70.00% | 70.00% | 70.00% | 70.00% |
| Number berths rqd | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Berth length assume 10,000 dwt, reducing to 5000 dwt | 160 | 160 | 160 | 160 | 160 | 160 | 125 | 125 | 125 | 125 | 125 | 125 |
| TOTAL CARGOES - TONNES with RoRo counted as 10 Tonne per TEU (excl petroleum and LoLo containers) | 5,247 | 5,426 | 5,742 | 6,090 | 6,470 | 6,910 | 7,384 | 7,882 | 8,400 | 8,939 | 9,518 | 10,138 |
| Total of berth occupancies | 352.73% | 358.68% | 372.06% | 387.58% | 406.74% | 417.65% | 425.67% | 430.47% | 430.79% | 454.48% | 479.64% | 484.08% |
| Average for Berths 1-5, 7-10, plus say 50% of (11 + MBK). KPA say berth occupancy for GC berths in 2007 was 40%, this checks OK | 37% | 38% | 39% | 41% | 43% | 44% | 45% | 45% | 45% | 48% | 50% | 51% |
| Total of berth occupancies x berth length | 728 | 747 | 782 | 821 | 866 | 877 | 899 | 905 | 973 | 1,018 | 1,075 | 1,084 |
| Total length of berth rqd for 70% occupancy | 1,041 | 1,068 | 1,117 | 1,173 | 1,238 | 1,252 | 1,284 | 1,293 | 1,389 | 1,454 | 1,536 | 1,548 |

| Year | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Others, Conventional, excl iron and steel | 340 | 350 | 360 | 370 | 380 | 390 | 400 | 410 | 420 | 430 | 440 | 450 |
| Handling rate T/ship day assume increase from 1200 to 1500 | 1,500 | 1,500 | 1,500 | 1,500 | 1,500 | 1,500 | 1,500 | 1,500 | 1,500 | 1,500 | 1,500 | 1,500 |
| Berth days rqd/yr | 227 | 233 | 240 | 247 | 253 | 260 | 267 | 273 | 280 | 287 | 293 | 300 |
| Berth occupancy for 1 berth | 62.10% | 63.93% | 65.75% | 67.58% | 69.41% | 71.23% | 73.06% | 74.89% | 76.71% | 78.54% | 80.37% | 82.19% |
| Berth occupancy allowed 75% | 75.00% | 75.00% | 75.00% | 75.00% | 75.00% | 75.00% | 75.00% | 75.00% | 75.00% | 75.00% | 75.00% | 75.00% |
| Number berths rqd | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 2 |
| Berth length | 115 | 115 | 115 | 115 | 115 | 115 | 115 | 115 | 115 | 230 | 230 | 230 |
| Others, Dry Bulk | 444 | 455 | 467 | 479 | 491 | 503 | 516 | 529 | 543 | 557 | 571 | 585 |
| Handling rate T/ship day | 6000 | 6000 | 6000 | 6000 | 6000 | 6000 | 6000 | 6000 | 6000 | 6000 | 6000 | 6000 |
| Berth days rqd/yr | 74 | 76 | 78 | 80 | 82 | 84 | 86 | 88 | 90 | 93 | 95 | 98 |
| Berth occupancy for 1 berth | 20.26% | 20.78% | 21.31% | 21.85% | 22.41% | 22.98% | 23.57% | 24.17% | 24.78% | 25.41% | 26.06% | 26.73% |
| Berth occupancy allowed 75% | 75.00% | 75.00% | 75.00% | 75.00% | 75.00% | 75.00% | 75.00% | 75.00% | 75.00% | 75.00% | 75.00% | 75.00% |
| Number berths rqd | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Berth length assume 10,000 dwt | 145 | 145 | 145 | 145 | 145 | 145 | 145 | 145 | 145 | 145 | 145 | 145 |
| Containers shipped as RoRo (Messina) TEU (aprox 4.1% of total) | 68,382 | 73,746 | 78,942 | 84,351 | 90,148 | 96,360 | 101,870 | 107,702 | 113,875 | 120,408 | 127,321 | 134,636 |
| Handling rate TEU/shipday | 750 | 750 | 750 | 750 | 750 | 750 | 750 | 750 | 750 | 750 | 750 | 750 |
| Berth days rqd/yr | 91 | 98 | 105 | 112 | 120 | 128 | 136 | 144 | 152 | 161 | 170 | 180 |
| Berth occupancy for 1 berth | 24.98% | 26.94% | 28.84% | 30.81% | 32.93% | 35.20% | 37.21% | 39.34% | 41.60% | 43.98% | 46.51% | 49.18% |
| Berth occupancy allowed 60% | 60.00% | 60.00% | 60.00% | 60.00% | 60.00% | 60.00% | 60.00% | 60.00% | 60.00% | 60.00% | 60.00% | 60.00% |
| Number berths rqd | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Berth length assume 25,000 dwt, plus space | 290 | 290 | 290 | 290 | 290 | 290 | 290 | 290 | 290 | 290 | 290 | 290 |
| EXPORTS | | | | | | | | | | | | |
| Other Dry Bulk | 30 | 27 | 24 | 21 | 19 | 17 | 15 | 13 | 12 | 10 | 9 | 8 |
| Handling rate T/ship day assume a bit better than Mgadi soda rate | 2,000 | 2,000 | 2,000 | 2,000 | 2,000 | 2,000 | 2,000 | 2,000 | 2,000 | 2,000 | 2,000 | 2,000 |
| Berth days rqd/yr | 15 | 13 | 12 | 11 | 9 | 8 | 7 | 7 | 6 | 5 | 5 | 4 |
| Berth occupancy for 1 berth | 4.15% | 3.68% | 3.26% | 2.89% | 2.56% | 2.27% | 2.02% | 1.79% | 1.59% | 1.41% | 1.25% | 1.11% |
| Berth occupancy allowed 75% | 75.00% | 75.00% | 75.00% | 75.00% | 75.00% | 75.00% | 75.00% | 75.00% | 75.00% | 75.00% | 75.00% | 75.00% |
| Number berths rqd | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Berth length assume 10,000 dwt, reducing to 5000 dwt | 120 | 120 | 120 | 120 | 120 | 120 | 120 | 120 | 120 | 120 | 120 | 120 |
| Soda Ash as dry bulk | 283 | 299 | 299 | 299 | 299 | 299 | 299 | 299 | 299 | 299 | 299 | 299 |
| Use Mgadi soda rate inreasing to 2000 in 2012 | 2,000 | 2,000 | 2,000 | 2,000 | 2,000 | 2,000 | 2,000 | 2,000 | 2,000 | 2,000 | 2,000 | 2,000 |
| Berth days rqd/yr | 142 | 150 | 150 | 150 | 150 | 150 | 150 | 150 | 150 | 150 | 150 | 150 |
| Berth occupancy for 1 berth | 38.80% | 40.99% | 40.99% | 40.99% | 40.99% | 40.99% | 40.99% | 40.99% | 40.99% | 40.99% | 40.99% | 40.99% |
| Berth occupancy allowed 75% | 75.00% | 75.00% | 75.00% | 75.00% | 75.00% | 75.00% | 75.00% | 75.00% | 75.00% | 75.00% | 75.00% | 75.00% |
| Number berths rqd | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Berth length assume 10,000 dwt, reducing to 5000 | 120 | 120 | 120 | 120 | 120 | 120 | 120 | 120 | 120 | 120 | 120 | 120 |
| Other Liquid Bulk | 39 | 35 | 31 | 27 | 24 | 21 | 19 | 17 | 15 | 13 | 12 | 10 |
| Handling rate T/ship day | 5.000 | 5.000 | 5.000 | 5.000 | 5.000 | 5.000 | 5.000 | 5.000 | 5.000 | 5.000 | 5.000 | 5.000 |
| Berth days rqd/yr | 8 | 7 | 6 | 5 | 5 | 4 | 4 | 3 | 3 | 3 | 2 | 2 |
| Berth occupancy for 1 berth | 2.14% | 1.90% | 1.68% | 1.49% | 1.32% | 1.17% | 1.04% | 0.92% | 0.81% | 0.72% | 0.64% | 0.57% |
| Berth occupancy allowed 70% | 70.00% | 70.00% | 70.00% | 70.00% | 70.00% | 70.00% | 70.00% | 70.00% | 70.00% | 70.00% | 70.00% | 70.00% |
| Number berths rqd | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Berth length assume 10,000 dwt, reducing to 5000 dwt | 125 | 125 | 125 | 125 | 125 | 125 | 125 | 125 | 125 | 125 | 125 | 125 |
| TOTAL CARGOES - TONNES with RoRo counted as 10 Tonne per TEU (excl petroleum and LoLo containers) | 10,803 | 11,516 | 12,208 | 12,946 | 13,736 | 14,581 | 15,333 | 16,104 | 16,908 | 17,746 | 18,618 | 19,524 |
| Total of berth occupancies | 510.61% | 538.60% | 565.85% | 594.71% | 625.32% | 657.78% | 686.50% | 715.79% | 746.48% | 778.64% | 812.34% | 847.64% |
| Average for Berths 1-5, 7-10, plus say 50% of (11 + MBK). KPA say berth occupancy for GC berths in 2007 was 40%, this checks OK | 54% | 57% | 60% | 63% | 66% | 69% | 72% | 75% | 79% | 82% | 86% | 89% |
| Total of berth occupancies x berth length | 1,144 | 1,207 | 1,265 | 1,509 | 1,585 | 1,666 | 1,737 | 1,497 | 1,651 | 1,720 | 1,792 | 1,867 |
| Total length of berth rqd for 70% occupancy | 1,634 | 1,724 | 1,807 | 2,155 | 2,264 | 2,379 | 2,481 | 2,139 | 2,359 | 2,457 | 2,560 | 2,668 |

**Appendix B1 - sheet 3**

| Year | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Additional berth length required** | | | | | | | | | | | | | | | | | | | | | | | | |
| Length of berths 1-5 plus 7-10 | 1.528 | 1.528 | 1.528 | 1.528 | 1.528 | 1.528 | 1.528 | 1.528 | 1.528 | 1.528 | 1.528 | 1.528 | 1.528 | 1.528 | 1.528 | 1.528 | 1.528 | 1.528 | 1.528 | 1.528 | 1.528 | 1.528 | 1.528 | 1.528 |
| Length of berths 1-5 plus 7-10 plus existing Mbaraki wharf length of 325 m | 1,853 | 1,853 | 1,853 | 1,853 | 1,853 | 1,853 | 1,853 | 1,853 | 1,853 | 1,853 | 1,853 | 1,853 | 1,853 | 1,853 | 1,853 | 1,853 | 1,853 | 1,853 | 1,853 | 1,853 | 1,853 | 1,853 | 1,853 | 1,853 |
| Approx length of new berths rqd (but note that Mbaraki is separate) negative means surplus | -812 | -785 | -736 | -680 | -615 | -601 | -569 | -560 | -464 | -399 | -317 | -305 | -219 | -129 | -46 | 302 | 411 | 526 | 628 | 286 | 506 | 604 | 707 | 815 |
| Berth days rqd for Clinker, coal and fertiliser | 359 | 372 | 394 | 416 | 438 | 464 | 447 | 420 | 443 | 467 | 492 | 439 | 463 | 488 | 513 | 540 | 568 | 599 | 625 | 654 | 684 | 716 | 749 | 784 |
| Berth days rqd for clinker and coal | 206 | 218 | 239 | 260 | 281 | 305 | 313 | 285 | 306 | 329 | 353 | 298 | 320 | 344 | 368 | 393 | 421 | 450 | 476 | 503 | 532 | 562 | 595 | 629 |

| | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **TEU slots for RoRo containers** | | | | | | | | | | | | | | | | | | | | | | | | |
| Assume 7 days dwell time, 2 high ave, 1.2 peaking | 553 | 589 | 646 | 711 | 780 | 860 | 946 | 1,037 | 1,134 | 1,237 | 1,344 | 1,457 | 1,574 | 1,697 | 1,817 | 1,941 | 2,075 | 2,218 | 2,344 | 2,479 | 2,621 | 2,771 | 2,930 | 3,098 |
| Ave stacking height | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Ground slots rqd | 276 | 295 | 323 | 355 | 390 | 430 | 473 | 519 | 567 | 618 | 672 | 728 | 787 | 849 | 908 | 971 | 1,037 | 1,109 | 1,172 | 1,239 | 1,310 | 1,386 | 1,465 | 1,549 |
| Ground slots behind berths 1 to 7 | 1,800 | 1,800 | 1,800 | 1,800 | 1,800 | 1,800 | 1,800 | 1,800 | 1,800 | 1,800 | 1,800 | 1,800 | 1,800 | 1,800 | 1,800 | 1,800 | 1,800 | 1,800 | 1,800 | 1,800 | 1,800 | 1,800 | 1,800 | 1,800 |

**Appendix B2 sheet 1**

| Year | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CONTAINERISED CARGOES** | | | | | | | | | | | | |
| **Imports** | | | | | | | | | | | | |
| **Others. Containerised** | 3.137 | 3.343 | 3.667 | 4.032 | 4.426 | 4.880 | 5.366 | 5.884 | 6.435 | 7.016 | 7.626 | 8.265 |
| of whic - *Sugar* | *272* | *370* | *390* | *418* | *455* | *501* | *551* | *605* | *663* | *726* | *794* | *867* |
| - *Rice* | *315* | *332* | *341* | *352* | *362* | *375* | *387* | *400* | *414* | *428* | *442* | *457* |
| **Exports** | | | | | | | | | | | | |
| **Containerised cargo** | 1.576 | 1.679 | 1.842 | 2.026 | 2.224 | 2.452 | 2.696 | 2.956 | 3.233 | 3.525 | 3.831 | 4.152 |
| Of whicl - *Tea* | *464* | *487* | *512* | *537* | *564* | *592* | *622* | *653* | *686* | *720* | *756* | *794* |
| - *Soda Ash* | *386* | *457* | *529* | *600* | *700* | *800* | *900* | *1,000* | *1,100* | *1,180* | *1,260* | *1,340* |
| **Transhipment (b)** | 426 | 392 | 361 | 333 | 307 | 283 | 260 | 240 | 221 | 203 | 187 | 173 |
| **Total containerised cargoes (000 tonnes)** | 5,139 | 5,414 | 5,871 | 6,391 | 6,957 | 7,614 | 8,322 | 9,080 | 9,888 | 10,744 | 11,645 | 12,589 |
| **Proportion import** | 0.61 | 0.62 | 0.62 | 0.63 | 0.64 | 0.64 | 0.64 | 0.65 | 0.65 | 0.65 | 0.65 | 0.66 |
| **Proportion export** | 0.31 | 0.31 | 0.31 | 0.32 | 0.32 | 0.32 | 0.32 | 0.33 | 0.33 | 0.33 | 0.33 | 0.33 |
| **NUMBERS OF TEU SLOTS** | | | | | | | | | | | | |
| | Assume BERTH 19 reclamation active and stockyard rearrangement with 2051extra ground slots | | | | Assume berth 15 infilled berths 11-TEU ground slots now 1550 | | | Off-dock TEUslots reduced to 5000 | | Assume temp MT storage closed | | |
| **Berths 16 to 18 (existing)** | | | | | | | | | | | | |
| Berths 16 to 18 ground slots | 2.803 | 2.803 | 2.803 | 2.803 | 4.854 | 4.854 | 4.854 | 4.854 | 4.854 | 4.854 | 4.854 | 4.854 |
| Ave Stack height | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.00 | 3.00 | 3.00 | 3.00 | 3.00 | 3.00 | 3.00 |
| **TEU slots** | 8.409 | 8.409 | 8.409 | 8.409 | 14.562 | 14.562 | 14.562 | 14.562 | 14.562 | 14.562 | 14.562 | 14.562 |
| **Berths 12 to 14 (existing)** | 0 | | | | | | | | | | | |
| Berths 12 to 14 - ground slots - RTG | 1.330 | 1.330 | 1.330 | 1.330 | 1.330 | 1.550 | 1.550 | 1.550 | 1.550 | 1.550 | 1.550 | 1.550 |
| Ave Stack height | 2.5 | 2.5 | 2.5 | 2.5 | 2.5 | 2.5 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |
| **TEU slots** | 3.325 | 3.325 | 3.325 | 3.325 | 3.325 | 3.875 | 4.650 | 4.650 | 4.650 | 4.650 | 4.650 | 4.650 |
| **Berths 1 to 7** | | | | | | | | | | | | |
| Berths 1 to 7 ground slots | 1.800 | 1.800 | 1.800 | 1.800 | 1.800 | 1.800 | 1.800 | 1.800 | 1.800 | 1.800 | 1.800 | 1.800 |
| Ave Stack height | 2.0 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| **TEU slots** | 3.600 | 3.600 | 3.600 | 3.600 | 3.600 | 3.600 | 3.600 | 3.600 | 3.600 | 3.600 | 3.600 | 3.600 |
| **Temp MT storage area G** | 0 | 0 | 0 | 2,305 | 2,305 | 2,305 | 2,305 | 2,305 | | | | |
| **Off-dock CFS** | | | | | | | | | | | | |
| TEU slots | 10.000 | 10.000 | 10.000 | 10.000 | 10.000 | 10.000 | 10.000 | 5.000 | 5.000 | | | |
| \temp port storage factor | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | | | |
| Effective off-dock slots allowing for temp port storage | 5,000 | 5,000 | 5,000 | 5,000 | 5,000 | 5,000 | 5,000 | 2,500 | 2,500 | | | |
| **Total TEU slots** | 20,334 | 20,334 | 20,334 | 22,639 | 28,792 | 29,342 | 30,117 | 27,617 | 25,312 | 22,812 | 22,812 | 22,812 |
| **Total TEU slots in Port** | 15,334 | 15,334 | 15,334 | 17,639 | 23,792 | 24,342 | 25,117 | 25,117 | 22,812 | 22,812 | 22,812 | 22,812 |

| Year | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CONTAINERISED CARGOES** | | | | | | | | | | | | |
| **Imports** | | | | | | | | | | | | |
| **Others. Containerised** | 8.928 | 9.629 | 10.307 | 11.013 | 11.770 | 12.581 | 13.301 | 14.062 | 14.868 | 15.721 | 16.624 | 17.579 |
| of whic - *Sugar* | *946* | *1,031* | *1,112* | *1,198* | *1,291* | *1,389* | *1,467* | *1,548* | *1,634* | *1,724* | *1,819* | *1,919* |
| - *Rice* | *473* | *489* | *504* | *519* | *535* | *551* | *565* | *579* | *593* | *608* | *622* | *638* |
| **Exports** | | | | | | | | | | | | |
| **Containerised cargo** | 4.486 | 4.837 | 5.178 | 5.533 | 5.913 | 6.321 | 6.682 | 7.065 | 7.470 | 7.898 | 8.352 | 8.832 |
| Of whicl - *Tea* | *833* | *875* | *919* | *965* | *1,013* | *1,063* | *1,117* | *1,173* | *1,231* | *1,293* | *1,357* | *1,425* |
| - *Soda Ash* | *1,420* | *1,500* | *1,500* | *1,500* | *1,500* | *1,500* | *1,500* | *1,500* | *1,500* | *1,500* | *1,500* | *1,500* |
| **Transhipment (b)** | 159 | 146 | 135 | 124 | 114 | 105 | 97 | 89 | 82 | 76 | 70 | 64 |
| **Total containerised cargoes (000 tonnes)** | 13,573 | 14,613 | 15,620 | 16,671 | 17,798 | 19,008 | 20,080 | 21,217 | 22,420 | 23,695 | 25,046 | 26,475 |
| **Proportion import** | 0.66 | 0.66 | 0.66 | 0.66 | 0.66 | 0.66 | 0.66 | 0.66 | 0.66 | 0.66 | 0.66 | 0.66 |
| **Proportion export** | 0.33 | 0.33 | 0.33 | 0.33 | 0.33 | 0.33 | 0.33 | 0.33 | 0.33 | 0.33 | 0.33 | 0.33 |
| **NUMBERS OF TEU SLOTS** | | | | | | | | | | | | |
| **Berths 16 to 18 (existing)** | | | | | | | | | | | | |
| Berths 16 to 18 ground slots | 4.854 | 4.854 | 4.854 | 4.854 | 4.854 | 4.854 | 4.854 | 4.854 | 4.854 | 4.854 | 4.854 | 4.854 |
| Ave Stack height | 3.00 | 3.00 | 3.00 | 3.00 | 3.00 | 3.00 | 3.00 | 3.00 | 3.00 | 3.00 | 3.00 | 3.00 |
| **TEU slots** | 14.562 | 14.562 | 14.562 | 14.562 | 14.562 | 14.562 | 14.562 | 14.562 | 14.562 | 14.562 | 14.562 | 14.562 |
| **Berths 12 to 14 (existing)** | | | | | | | | | | | | |
| Berths 12 to 14 - ground slots - RTG | 1.550 | 1.550 | 1.550 | 1.550 | 1.550 | 1.550 | 1.550 | 1.550 | 1.550 | 1.550 | 1.550 | 1.550 |
| Ave Stack height | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |
| **TEU slots** | 4.650 | 4.650 | 4.650 | 4.650 | 4.650 | 4.650 | 4.650 | 4.650 | 4.650 | 4.650 | 4.650 | 4.650 |
| **Berths 1 to 7** | | | | | | | | | | | | |
| Berths 1 to 7 ground slots | 1.800 | 1.800 | 1.800 | 1.800 | 1.800 | 1.800 | 1.800 | 1.800 | 1.800 | 1.800 | 1.800 | 1.800 |
| Ave Stack height | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| **TEU slots** | 3.600 | 3.600 | 3.600 | 3.600 | 3.600 | 3.600 | 3.600 | 3.600 | 3.600 | 3.600 | 3.600 | 3.600 |
| **Temp MT storage area G** | | | | | | | | | | | | |
| **Off-dock CFS** | | | | | | | | | | | | |
| TEU slots | | | | | | | | | | | | |
| \temp port storage factor | | | | | | | | | | | | |
| Effective off-dock slots allowing for temp port storage | | | | | | | | | | | | |
| **Total TEU slots** | 22,812 | 22,812 | 22,812 | 22,812 | 22,812 | 22,812 | 22,812 | 22,812 | 22,812 | 22,812 | 22,812 | 22,812 |
| **Total TEU slots in Port** | 22,812 | 22,812 | 22,812 | 22,812 | 22,812 | 22,812 | 22,812 | 22,812 | 22,812 | 22,812 | 22,812 | 22,812 |

**Appendix B2 sheet 2**

CONTAINERS

| Year | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TOTAL CONTAINERS (000 TEU) including RoRo containers | 586 | 624 | 685 | 753 | 827 | 912 | 1,002 | 1,099 | 1,202 | 1,311 | 1,425 | 1,544 |
| **RoRo** | | | | | | | | | | | | |
| RoRo TEU assume 4.1% of total | 24,026 | 25,600 | 28,087 | 30,884 | 33,902 | 37,374 | 41,097 | 45,068 | 49,283 | 53,734 | 58,411 | 63,298 |
| Number of TEU slots rqd | 553 | 589 | 646 | 711 | 780 | 860 | 946 | 1,037 | 1,134 | 1,237 | 1,344 | 1,457 |
| **LoLo** | | | | | | | | | | | | |
| Containers to be handled at terminals TEU (total port less Messina | 561,974 | 598,799 | 656,969 | 722,381 | 792,968 | 874,182 | 961,264 | 1,054,159 | 1,152,751 | 1,256,859 | 1,366,237 | 1,480,567 |
| Box to TEU ratio | 1.35 | 1.37 | 1.39 | 1.41 | 1.43 | 1.45 | 1.47 | 1.49 | 1.51 | 1.53 | 1.55 | 1.57 |
| Boxes (lifts) | 416,277 | 437,079 | 472,639 | 512,327 | 554,523 | 602,884 | 653,921 | 707,489 | 763,411 | 821,477 | 881,443 | 943,036 |
| **Berths 11 to 14** | | | | | | | | | | | | |
| Lifts/crane hour | 12 | 12 | 12 | 12 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 |
| Working hours when ship alongside | 17 | 17 | 17 | 17 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 |
| Number of cranes (assume geared vessels or mobile crane) | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 |
| Handling rate lifts/day all berths | 816 | 816 | 816 | 816 | 1120 | 1120 | 1120 | 1120 | 1120 | 1120 | 1120 | 1120 |
| Berth occupancy (adjusted in 2007 to give actual number of TEU handled) | 60.73% | 60.73% | 60.73% | 60.73% | 65.00% | 70.00% | 70.00% | 70.00% | 70.00% | 70.00% | 70.00% | 70.00% |
| Capacity of berths 11 to 14 Boxes based on CRANES | 180878 | 180878 | 180878 | 180878 | 265720 | 286160 | 286160 | 286160 | 286160 | 286160 | 286160 | 286160 |
| Capacity TEU based on CRANES | 244186 | 247803 | 251421 | 255038 | 379980 | 414932 | 420655 | 426378 | 432102 | 437825 | 443548 | 449271 |
| Dwell time imports | 11 | 11 | 11 | 11 | 11 | 11 | 10 | 10 | 9 | 9 | 9 | 9 |
| Dwell time exports | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 |
| Dwell time empties | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 |
| Average dwell time (exports are .42 of imports | 12.14 | 12.14 | 12.14 | 12.14 | 12.14 | 12.14 | 11.64 | 11.64 | 11.14 | 11.14 | 11.14 | 11.14 |
| TEU slots rqd based on CRANES | 8122 | 8242 | 8362 | 8483 | 12638 | 13801 | 13415 | 13597 | 13188 | 13363 | 13537 | 13712 |
| Actual TEU slots behind berths | 3.325 | 3.325 | 3.325 | 3.325 | 3.325 | 3.875 | 4.650 | 4.650 | 4.650 | 4.650 | 4.650 | 4.650 |
| Capacity based on actual TEU slots | | 99969 | 99969 | 99969 | 99969 | 116505 | 145812 | 145812 | 152356 | 152356 | 152356 | 152356 |
| **Berths 16 to 18** | | | | | | | | | | | | |
| Boxes to handle (total less Messina less berhs 11 to 14) LIFTS | 235,399 | 256,201 | 291,761 | 331,449 | 288,803 | 316,724 | 367,761 | 421,329 | 477,251 | 535,317 | 595,283 | 656,876 |
| Lifts/crane hour | 9.4 | 10.5 | 13 | 14 | 16 | 18 | 18 | 18 | 18 | 18 | 18 | 18 |
| Working hours when ship alongside | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 |
| Number of cranes SSGs | 4 | 4 | 4 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 |
| Handling rate lifts/day TOTAL of all berths | 827.2 | 924 | 1144 | 1848 | 2112 | 2376 | 2376 | 2376 | 2376 | 2376 | 2376 | 2376 |
| Target max berth occupancy (ACTUAL 2007, 2008) | 80.00% | 80.00% | 80.00% | 63.00% | 63.00% | 63.00% | 63.00% | 63.00% | 63.00% | 63.00% | 63.00% | 63.00% |
| Capacity based on CRANES and future target berth occupancy - LIFTS (using actual berth occupancy for 2007, 2008) | 241,542 | 269,808 | 334,048 | 424,948 | 485,654 | 546,361 | 546,361 | 546,361 | 546,361 | 546,361 | 546,361 | 546,361 |
| Capacity based on CRANES and future target berth occupancy - TEU (actual BO in 2007,2008) | 326,082 | 369,637 | 464,327 | 599,176 | 694,486 | 792,224 | 803,151 | 814,078 | 825,005 | 835,933 | 846,860 | 857,787 |
| Average dwell time days | 12.14 | 12.14 | 12.14 | 12.14 | 12.14 | 12.14 | 11.64 | 11.64 | 11.14 | 11.14 | 11.14 | 11.14 |
| TEU slots rqd based on FORECAST THROUGHPUT (Total less RoRo less Berths 11to 14 crane capacity - this asumes that berths11 to 14 utilise the slots behind berths 1 to 5 and some off-dock storage) | 10,570 | 11,674 | 13,489 | 15,544 | 13,736 | 15,275 | 17,240 | 20,020 | 21,995 | 24,997 | 28,161 | 31,476 |
| Total slots required whole port based on FORECAST THROUGHPUT | 19,244 | 20,505 | 22,497 | 24,737 | 27,155 | 29,936 | 31,601 | 34,655 | 36,317 | 39,597 | 43,043 | 46,644 |
| Total slots available | 20,334 | 20,334 | 20,334 | 22,639 | 28,792 | 29,342 | 30,117 | 27,617 | 25,312 | 22,812 | 22,812 | 22,812 |
| Shortfall in TEU slots (negative means surplus) | -1,090 | 171 | 2,163 | 2,098 | -1,637 | 594 | 1,484 | 7,038 | 11,005 | 16,785 | 20,231 | 23,832 |
| Equivalent throughput not catered for TEU | | 5152 | 65043 | 63088 | | 17849 | 46531 | 220686 | 360570 | 549946 | 662850 | 780866 |

| Year | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TOTAL CONTAINERS (000 TEU) including RoRo containers | 1,668 | 1,799 | 1,925 | 2,057 | 2,199 | 2,350 | 2,485 | 2,627 | 2,777 | 2,937 | 3,105 | 3,284 |
| **RoRo** | | | | | | | | | | | | |
| RoRo TEU assume 4.1% of total | 68,382 | 73,746 | 78,942 | 84,351 | 90,148 | 96,360 | 101,870 | 107,702 | 113,875 | 120,408 | 127,321 | 134,636 |
| Number of TEU slots rqd | 1,574 | 1,697 | 1,817 | 1,941 | 2,075 | 2,218 | 2,344 | 2,479 | 2,621 | 2,771 | 2,930 | 3,098 |
| **LoLo** | | | | | | | | | | | | |
| Containers to be handled at terminals TEU (total port less Messina | 1,599,462 | 1,724,945 | 1,846,470 | 1,972,987 | 2,108,576 | 2,253,878 | 2,382,763 | 2,519,184 | 2,663,568 | 2,816,370 | 2,978,070 | 3,149,177 |
| Box to TEU ratio | 1.59 | 1.61 | 1.62 | 1.63 | 1.64 | 1.65 | 1.66 | 1.67 | 1.68 | 1.69 | 1.70 | 1.71 |
| Boxes (lifts) | 1,005,951 | 1,071,394 | 1,139,796 | 1,210,422 | 1,285,717 | 1,365,987 | 1,435,399 | 1,508,493 | 1,585,457 | 1,666,491 | 1,751,806 | 1,841,624 |
| **Berths 11 to 14** | | | | | | | | | | | | |
| Lifts/crane hour | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 |
| Working hours when ship alongside | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 |
| Number of cranes (assume geared vessels or mobile crane) | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 |
| Handling rate lifts/day all berths | 1120 | 1120 | 1120 | 1120 | 1120 | 1120 | 1120 | 1120 | 1120 | 1120 | 1120 | 1120 |
| Berth occupancy (adjusted in 2007 to give actual number of TEU handled) | 70.00% | 70.00% | 70.00% | 70.00% | 70.00% | 70.00% | 70.00% | 70.00% | 70.00% | 70.00% | 70.00% | 70.00% |
| Capacity of berths 11 to 14 Boxes based on CRANES | 286160 | 286160 | 286160 | 286160 | 286160 | 286160 | 286160 | 286160 | 286160 | 286160 | 286160 | 286160 |
| Capacity TEU based on CRANES | 454994 | 460718 | 463579 | 466441 | 469302 | 472164 | 475026 | 477887 | 480749 | 483610 | 486472 | 489334 |
| Dwell time imports | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 |
| Dwell time exports | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 |
| Dwell time empties | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 |
| Average dwell time (exports are .42 of imports | 11.14 | 11.14 | 11.14 | 11.14 | 11.14 | 11.14 | 11.14 | 11.14 | 11.14 | 11.14 | 11.14 | 11.14 |
| TEU slots rqd based on CRANES | 13887 | 14061 | 14149 | 14236 | 14323 | 14411 | 14498 | 14585 | 14673 | 14760 | 14847 | 14935 |
| Actual TEU slots behind berths | 4.650 | 4.650 | 4.650 | 4.650 | 4.650 | 4.650 | 4.650 | 4.650 | 4.650 | 4.650 | 4.650 | 4.650 |
| Capacity based on actual TEU slots | 152356 | 152356 | 152356 | 152356 | 152356 | 152356 | 152356 | 152356 | 152356 | 152356 | 152356 | 152356 |
| **Berths 16 to 18** | | | | | | | | | | | | |
| Boxes to handle (total less Messina less berhs 11 to 14) LIFTS | 719,791 | 785,234 | 853,636 | 924,262 | 999,557 | 1,079,827 | 1,149,239 | 1,222,333 | 1,299,297 | 1,380,331 | 1,465,646 | 1,555,464 |
| Lifts/crane hour | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 |
| Working hours when ship alongside | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 |
| Number of cranes SSGs | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 |
| Handling rate lifts/day TOTAL of all berths | 2376 | 2376 | 2376 | 2376 | 2376 | 2376 | 2376 | 2376 | 2376 | 2376 | 2376 | 2376 |
| Target max berth occupancy (ACTUAL 2007, 2008) | 63.00% | 63.00% | 63.00% | 63.00% | 63.00% | 63.00% | 63.00% | 63.00% | 63.00% | 63.00% | 63.00% | 63.00% |
| Capacity based on CRANES and future target berth occupancy - LIFTS (using actual berth occupancy for 2007, 2008) | 546,361 | 546,361 | 546,361 | 546,361 | 546,361 | 546,361 | 546,361 | 546,361 | 546,361 | 546,361 | 546,361 | 546,361 |
| Capacity based on CRANES and future target berth occupancy - TEU (actual BO in 2007,2008) | 868,714 | 879,642 | 885,105 | 890,569 | 896,032 | 901,496 | 906,960 | 912,423 | 917,887 | 923,350 | 928,814 | 934,278 |
| Average dwell time days | 11.14 | 11.14 | 11.14 | 11.14 | 11.14 | 11.14 | 11.14 | 11.14 | 11.14 | 11.14 | 11.14 | 11.14 |
| TEU slots rqd based on FORECAST THROUGHPUT (Total less RoRo less Berths 11to 14 crane capacity - this asumes that berths11 to 14 utilise the slots behind berths 1 to 5 and some off-dock storage) | 34,930 | 38,585 | 42,207 | 45,981 | 50,032 | 54,379 | 58,225 | 62,301 | 66,621 | 71,197 | 76,045 | 81,180 |
| Total slots required whole port based on FORECAST THROUGHPUT | 50,390 | 54,343 | 58,172 | 62,158 | 66,430 | 71,007 | 75,068 | 79,365 | 83,914 | 88,728 | 93,822 | 99,213 |
| Total slots available | 22,812 | 22,812 | 22,812 | 22,812 | 22,812 | 22,812 | 22,812 | 22,812 | 22,812 | 22,812 | 22,812 | 22,812 |
| Shortfall in TEU slots (negative means surplus) | 27,578 | 31,531 | 35,360 | 39,346 | 43,618 | 48,195 | 52,256 | 56,553 | 61,102 | 65,916 | 71,010 | 76,401 |
| Equivalent throughput not catered for TEU | 903593 | 1033122 | 1158564 | 1289160 | 1429120 | 1579106 | 1712146 | 1852965 | 2002004 | 2159732 | 2326645 | 2503267 |

936,000 TEU is about the maximum capacity of the existing terminal plus berth 15 infill and berth 19 reclamation. This is based on 3.5 ave stack height plus off-dock storage. Capacity reduces to about 750,000 TEU when CFS are closed and ave stacking reduced to 3 high and temp MT storage closed

**Appendix B2 - sheet 3**

| Year | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **KIPEVU WEST TERMINAL** | | | | | | | | | | | | | | | | | | | | | | | | |
| Phase 1 capacity TEU 190 m + 350 m (note L shape) | | | | | | | 450000 | 450000 | 450000 | 450000 | 450000 | 450000 | 450000 | 450000 | 450000 | 450000 | 450000 | 450000 | 450000 | 450000 | 450000 | 450000 | 450000 | 450000 |
| Phase 2 capacity TEU 320 m | | | | | | | | | 400000 | 400000 | 400000 | 400000 | 400000 | 400000 | 400000 | 400000 | 400000 | 400000 | 400000 | 400000 | 400000 | 400000 | 400000 | 400000 |
| Phase 3 capacity TEU 230 m | | | | | | | | | | 250000 | 250000 | 250000 | 250000 | 250000 | 250000 | 250000 | 250000 | 250000 | 250000 | 250000 | 250000 | 250000 | 250000 | 250000 |
| Total new capacity | | | | | | | 450000 | 450000 | 850000 | 1100000 | 1100000 | 1100000 | 1100000 | 1100000 | 1100000 | 1100000 | 1100000 | 1100000 | 1100000 | 1100000 | 1100000 | 1100000 | 1100000 | 1100000 |
| Shortfall in TOTAL PORT capcity TEU | | | | | | | -403469 | -229314 | -489430 | -550054 | -437150 | -319134 | -196407 | -66878 | 58564 | 189160 | 329120 | 479106 | 612146 | 752965 | 902004 | 1059732 | 1226645 | 1403267 |
| **ADDITIONAL CONTAINER BERTH LENGTH RQD** | | | | | | | | | | | | | | | | | | | | | | | | |
| Additional terminal capacity rqd TEU 300 m | | | | | | | | | | | | | | | 375000 | 375000 | 375000 | 375000 | 375000 | 375000 | 375000 | 375000 | 375000 | 375000 |
| Additional terminal capacity rqd TEU 300 m | | | | | | | | | | | | | | | | | | 375000 | 375000 | 375000 | 375000 | 375000 | 375000 | 375000 |
| Additional terminal capacity rqd TEU 500 m | | | | | | | | | | | | | | | | | | | | | 625000 | 625000 | 625000 | 625000 |
| Total Extra capacity | | | | | | | | | | | | | | | 375000 | 375000 | 375000 | 750000 | 750000 | 750000 | 1375000 | 1375000 | 1375000 | 1375000 |
| **CHECK TOTAL CAPACITY PROVIDED** | 586,000 | 624,399 | 685,056 | 753,265 | 826,870 | 911,556 | 1,405,830 | 1,328,542 | 1,691,465 | 1,860,647 | 1,861,798 | 1,863,000 | 1,864,250 | 1,865,570 | 2,241,847 | 2,243,178 | 2,244,604 | 2,621,132 | 2,622,487 | 2,623,921 | 3,250,440 | 3,252,046 | 3,253,747 | 3,255,546 |
| **JICA STACKYARD** | | | | | | | | | | | | | | | | | | | | | | | | |
| TEU slots for specified capacity - Phase 1 | | | | | | | 14351 | 14351 | 13734 | 13734 | 13734 | 13734 | 13734 | 13734 | 13734 | 13734 | 13734 | 13734 | 13734 | 13734 | 13734 | 13734 | 13734 | 13734 |
| TEU slots for specified capacity - Phase 2 | | | | | | | | | 12208 | 12208 | 12208 | 12208 | 12208 | 12208 | 12208 | 12208 | 12208 | 12208 | 12208 | 12208 | 12208 | 12208 | 12208 | 12208 |
| TEU slots for specified capacity - Phase 3 | | | | | | | | | | 7630 | 7630 | 7630 | 7630 | 7630 | 7630 | 7630 | 7630 | 7630 | 7630 | 7630 | 7630 | 7630 | 7630 | 7630 |
| Total new JICA TEU slots | | | | | | | 14351 | 14351 | 25942 | 33573 | 33573 | 33573 | 33573 | 33573 | 33573 | 33573 | 33573 | 33573 | 33573 | 33573 | 33573 | 33573 | 33573 | 33573 |
| Length of 6 wide stackyard reqd for Phase 1 new capacity - metres | | | | | | | 5023 | 5023 | 4807 | 4807 | 4807 | 4807 | 4807 | 4807 | 4807 | 4807 | 4807 | 4807 | 4807 | 4807 | 4807 | 4807 | 4807 | 4807 |
| Number of Phase 1 stacks for berth length | | | | | | | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 |
| Length of 6 wide stackyard reqd for Phase 2 new capacity - metres | | | | | | | 0 | 0 | 4273 | 4273 | 4273 | 4273 | 4273 | 4273 | 4273 | 4273 | 4273 | 4273 | 4273 | 4273 | 4273 | 4273 | 4273 | 4273 |
| Number of Phase 2 stacks for berth length proposed | | | | | | | 0 | 0 | 13 | 13 | 13 | 13 | 13 | 13 | 13 | 13 | 13 | 13 | 13 | 13 | 13 | 13 | 13 | 13 |
| Length of 6 wide stackyard reqd for Phase 3 new capacity - metres | | | | | | | 0 | 0 | 0 | 2671 | 2671 | 2671 | 2671 | 2671 | 2671 | 2671 | 2671 | 2671 | 2671 | 2671 | 2671 | 2671 | 2671 | 2671 |
| Number of Phase 3 stacks for berth length proposed | | | | | | | 0 | 0 | 0 | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 |

## SPREADSHEET FOR PLANNING BERTH AND STACKYARD REQUIREMENTS

Appendix B3

| EXISTING CARGOES '000 tonnes | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Imports | | | | | | | | | | | | |
| Handled at oil jetties | | | | | | | | | | | | |

| EXISTING CARGOES '000 tonnes | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Imports | | | | | | | | | | | | |
| Handled at oil jetties | | | | | | | | | | | | |

### PETROLEUM, CRUDE AND PRODUCTS

| Year | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Petroleum, crude and products | 4,798 | 4,891 | 5,094 | 5,319 | 5,553 | 5,816 | 5,080 | 5,346 | 5,613 | 4,891 | 5,180 | 5,482 |
| Of which, handled at KOT *(75% increasing to 85% in 2012)* | 3,599 | 3,668 | 3,820 | 3,989 | 4,165 | 4,943 | 4,318 | 4,544 | 4,771 | 4,157 | 4,403 | 4,659 |
| Average curent overall handling rate T/ship day | 14,084 | 14,084 | 14,084 | 14,084 | 14,084 | 16,901 | 16,901 | 16,901 | 16,901 | 16,901 | 16,901 | 16,901 |
| Berth days rqd/yr | 256 | 260 | 271 | 283 | 296 | 292 | 256 | 269 | 282 | 246 | 261 | 276 |
| Berth occupancy single berth | 70.00% | 71.36% | 74.32% | 77.60% | 81.02% | 80.13% | 70.00% | 73.67% | 77.34% | 67.39% | 71.37% | 75.53% |
| Target maximum berth occupancy | 70.00% | 70.00% | 70.00% | 70.00% | 70.00% | 70.00% | 70.00% | 70.00% | 70.00% | 70.00% | 70.00% | 70.00% |
| Number berths rqd | 1 | 2 | 2 | 2 | 2 | 2 | 1 | 2 | 2 | 2 | 2 | 2 |
| Of which, handled at SOT *(assume 25% of total, reducing to 15% in 2012 assuming LPG and some products transferred to LPG terminal and KOT)* | 1,200 | 1,223 | 1,273 | 1,330 | 1,388 | 872 | 762 | 802 | 842 | 734 | 777 | 822 |
| Handling rate t/ship day | 5.056 | 5.056 | 5.056 | 5.056 | 5.056 | 5.056 | 5.056 | 5.056 | 5.056 | 5.056 | 5.056 | 5.056 |
| Berth days rqd/yr | 237 | 242 | 252 | 263 | 275 | 173 | 151 | 159 | 167 | 145 | 154 | 163 |
| Berth occupancy single berth | 65.00% | 66.26% | 69.01% | 72.05% | 75.23% | 47.27% | 41.29% | 43.46% | 45.62% | 39.75% | 42.10% | 44.55% |
| Max berth occupancy allowed | 70.00% | 70.00% | 70.00% | 70.00% | 70.00% | 70.00% | 70.00% | 70.00% | 70.00% | 70.00% | 70.00% | 70.00% |
| Number berths rqd | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |

| Year | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Petroleum, crude and products | 5,796 | 5,123 | 5,430 | 5,749 | 6,080 | 6,423 | 6,700 | 6,985 | 7,279 | 7,581 | 7,892 | 8,212 |
| Of which, handled at KOT *(75% increasing to 85% in 2012)* | 4,926 | 4,355 | 4,616 | 4,887 | 5,168 | 5,459 | 5,695 | 5,937 | 6,187 | 6,444 | 6,708 | 6,980 |
| Average curent overall handling rate T/ship day | 16,901 | 16,901 | 16,901 | 16,901 | 16,901 | 16,901 | 16,901 | 16,901 | 16,901 | 16,901 | 16,901 | 16,901 |
| Berth days rqd/yr | 291 | 258 | 273 | 289 | 306 | 323 | 337 | 351 | 366 | 381 | 397 | 413 |
| Berth occupancy single berth | 79.86% | 70.59% | 74.82% | 79.21% | 83.77% | 88.50% | 92.32% | 96.25% | 100.29% | 104.45% | 108.74% | 113.15% |
| Target maximum berth occupancy | 70.00% | 70.00% | 70.00% | 70.00% | 70.00% | 70.00% | 70.00% | 70.00% | 70.00% | 70.00% | 70.00% | 70.00% |
| Number berths rqd | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Of which, handled at SOT *(assume 25% of total, reducing to 15% in 2012 assuming LPG and some products transferred to LPG terminal and KOT)* | 869 | 768 | 815 | 862 | 912 | 963 | 1,005 | 1,048 | 1,092 | 1,137 | 1,184 | 1,232 |
| Handling rate t/ship day | 5.056 | 5.056 | 5.056 | 5.056 | 5.056 | 5.056 | 5.056 | 5.056 | 5.056 | 5.056 | 5.056 | 5.056 |
| Berth days rqd/yr | 172 | 152 | 161 | 171 | 180 | 191 | 199 | 207 | 216 | 225 | 234 | 244 |
| Berth occupancy single berth | 47.11% | 41.64% | 44.14% | 46.73% | 49.42% | 52.21% | 54.46% | 56.78% | 59.16% | 61.62% | 64.15% | 66.75% |
| Max berth occupancy allowed | 70.00% | 70.00% | 70.00% | 70.00% | 70.00% | 70.00% | 70.00% | 70.00% | 70.00% | 70.00% | 70.00% | 70.00% |
| Number berths rqd | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |

# ANNEX C:

# MARKETING STRATEGY AND COMPETITION FROM OTHER PORTS

## C.1 Regional Context

Mombasa faces relatively little competition for Kenyan cargoes, although the proposed construction of 470m of dry bulk and multi-purpose berths at Mwambani Bay near Tanga could result in Mombasa losing a small amount of domestic traffic from the area near the border, as well as most of its Tanzanian transit traffic.

Although the commercial viability of Mwambani Bay is marginal, and dependent on the outcome of some large agricultural and mining projects which have still to be finalized, the Mwambani Bay project is supported by the Tanzanian Government for regional development reasons. There is also some interest in it in Uganda, although the opening up of a new corridor from Uganda to Tanga is conditional on major investments in the road and rail networks of Northern Tanzania. These seem unlikely before 2015.

The remainder of the regional market that is of relevance to Mombasa can be divided into two parts:

- Traditional transit countries: Uganda, Rwanda, Burundi, and the eastern part of DR Congo.
- New transit countries: Southern Sudan and Ethiopia.

For the traditional transit countries the main competition comes from Dar es Salaam. For the new transit countries Mombasa's main competitor is likely to be Djibouti and (possibly) a new Kenyan deepwater port at Lamu.

## C.2 Transit Countries

### *Uganda*

Mombasa is the first choice of port for Ugandan trade, handling between 88-96% of its container traffic in recent years, and all of its oil imports. Small amounts of traffic from south west Uganda move via Dar es Salaam, and this may increase as the road along the western shore of Lake Victoria from Nyakanazi to Bukoba is gradually improved.

Most of the Ugandan cargo moving through Dar es Salaam, however, uses Lake Victoria ferry services between Port Bell and Mwanza, moving between Mwanza and Dar es Salaam by rail. The rail service has deteriorated dramatically in the last five years, which is why Mombasa has been able to increase its share of Ugandan container traffic.

The problems faced by the Tanzanian Government with the TRL rail concession are in many respects similar to those facing the Kenyan Government in its dealings with Kenya Rift Valley Railways. It is not clear which of the two Governments will be the first to achieve the improvement in rail services needed to support its port.

The civil disturbances in Kenya in 2007-8 raised awareness in Uganda of the risks of relying on a single port, and led to renewed interest in rehabilitating the Central Corridor route to Dar es Salaam. In mid-2008 the Ugandan Government agreed to provide funding for a new ferry, and the Tanzanian Government began to look at plans for the modernisation of

Mwanza port, although this will be of limited benefit until the rail link to Dar es Salaam is improved. At the same time, private ferry operators on Lake Victoria have begun to press for investment in container handling facilities at Mwanza, with a view to introducing 100-150 TEU container ships onto the lake.

As a result, competition from Dar es Salaam seems likely to increase, and KPA may have to step up its marketing efforts and logistics support activities in Uganda in order to retain its current market share.

***Rwanda***

Since 2001 Mombasa's share of Rwanda's container traffic has fluctuated between 25-38% (full boxes only, imports and exports combined). This is the market which is most open to competition, although it is much smaller than the Uganda market, with 2007 throughputs of around 11,000 TEU and 72,000 TEU (full) respectively.

The main competitive threat to Mombasa is likely to come from the construction of the Isaka-Kigali rail link, to which the Rwanda and Tanzanian Governments are now committed in principal. The line will probably be European gauge, with a design speed of 120kph, and construction work could be completed by 2015-8. The break in gauge where it meets the existing TRL line at Isaka means that initially either the cargo or the wagons will have to be transhipped, reducing the line's competitive advantage. In the longer term it is intended to covert the whole of the route from Dar es Salaam to Kigali to European gauge, but this is a major undertaking which will take many years.

Perhaps a more serious competitive threat will come from paving of the road between Isaka and the Rwandan border, which is included in Tanzania's Transport Sector Investment Plan 2007/08 – 2016/17 and will significantly reduce transit times between Rwanda and Dar es Salaam.

***Burundi***

There is no direct route from Burundi to Mombasa. Goods must pass through Rwanda and Uganda, which results in additional costs, permit requirements and border delays. As a result, most of Burundi's (relatively small) traffic moves through Dar es Salaam.

The movement of cargo between Burundi and Dar es Salaam is not easy, with most of it being railed from Dar es Salaam to Kigoma and then moved up Lake Tanganyika by barge or ferry to Bujumbura, for onward distribution by road. Some Rwanda traffic handled by Dar es Salaam also moves in this way.

The Tanzanian Ports Authority is planning to upgrade the port facilities at Kigoma, but as at Mwanza, this will be of limited benefit unless there is a significant improvement to the TRL rail link between Kigoma and Dar es Salaam, which has seen a dramatic fall in service quality and frequency in recent years.

The Burundi market, like the Rwanda market, is small, with fewer opportunities for increasing Mombasa's market share. It is therefore a relatively low priority in terms of marketing effort.

### *DR Congo*

The Congo market is potentially much larger, and is growing very quickly, but cargo from Mombasa has to transit Uganda first. As a rough guide the area north and west of Bukavu tends to be served by Mombasa, and the south eastern region (including Katanga) by Dar es Salaam or Durban.

Trading conditions are still chaotic because of the civil war, and cargo volumes are closely linked to military activity and the progress of the mining industry. It is an area in which it is worth investing some marketing effort, but in the expectation of long-term rather than short-term returns.

### *Southern Sudan*

Southern Sudan is smaller and poorer than Eastern Congo, but faces similar problems. Road conditions between Juba and Nairobi (bypassing Uganda) are extremely poor, making Kampala the best inland centre for the consolidation and processing of Sudanese trade.

However the market will grow in future, justifying some exploratory market research.

### *Ethiopia*

Djibouti is the natural outlet for most of Ethiopia's foreign trade, handling 90% of its 3.2m tons of seaborne trade in 2003. There is a long-established rail link between Djibouti and Addis Ababa (782 km), and an all weather road (912km) both of which are much shorter than the road route from Addis Ababa to Mombasa (2,070km).

Nevertheless the Ethiopian Government, like the Ugandan Government, is seeking to reduce its dependence on a single port, opening up a new opportunity for KPA. In addition, the Ethiopian and Kenyan Governments are upgrading the road on both sides of the border, and intend to improve the border crossing. An African Development Fund study of the Mombasa-Addis Ababa Corridor completed in October 2004 considered that in the longer-term Mombasa could handle up to 20% of the cargo whose origin-destination was in southern or south western Ethiopia.

The ability of Mombasa to capture this traffic will also be affected by the Kenyan Government's proposal to build a new deepwater port at Lamu, which is closer to the Ethiopian border. This is expected to be the subject of a separate study later this year, which should produce a large amount of additional information about the Ethiopian market.

## C.3 Competing Ports

In future Mombasa's main competitors will be Dar es Salaam and Djibouti. Exposure to competition is likely to increase as inland transport infrastructure improves, and both ports seek to expand into Mombasa's natural hinterland. Djibouti in particular is also likely to be a fierce competitor for transshipment traffic.

### *Dar es Salaam*

Dar es Salaam is about two thirds the size of Mombasa in terms of physical infrastructure and traffic, and is slightly more dependent on transit country traffic. This accounts for 40% of its trade compared with 27% at Mombasa.

However most of Dar es Salaam's transit traffic comes from regions to the south and west of the port (Zambia, Malawi, Katanga and Burundi). The overlap between its hinterland and that of Mombasa is still fairly small, and biased in favour of Mombasa. Around 15,000 TEU p.a. of Tanzanian container traffic (full +empty boxes) moves through Mombasa, but virtually no Kenyan traffic moves through Tanzanian ports.

The layout of Dar es Salaam is broadly similar to that of Mombasa, and it faces many similar problems. These include:

- An entrance channel that it not deep enough to meet modern shipping needs.
- A severe shortage of container storage capacity.
- Shallow draft general cargo berths with much of the space behind them occupied by containers overspilling from the main container terminal.
- Insufficient space for the storage of car.
- Lack of specialist, mechanised handling equipment for the discharge of dry bulks.
- Inability to develop the main oil jetty because of expansion of the container terminal.
- Collapse of the railway system, resulting in the rapid growth of truck traffic and vehicle circulation and parking problems.

However the solution which is currently under consideration at Dar es Salaam is different to that proposed for Mombasa, namely the construction of a new port on a greenfield site at Bagamoyo, 80km north of Dar es Salaam. This has been triggered by the Tanzanian Government's Free Trade Zone strategy, which is in many respects similar to that of Kenya except that sufficient land is not available on the other side of the creek, forcing industrial development to out of the capital to Bagamoyo, with new port facilities following.

The cost of opening up a completely new site for port development at Bagamoyo will be larger than the incremental type of port development envisaged for Mombasa, and is likely to take longer to implement. As a result, we do not anticipate the competitive threat from Dar es Salaam increasing very much in the short-term (to 2015), although it could become a serious competitor in the long-term, particularly footloose industrial development of the type which Dongo Kundu FTZ will be seeking to attracted

### *Djibouti*

Djibouti is Ethiopia's main outlet to the sea, the two main alternatives being Massawa (not used since the war with Eritrea) and Port Sudan (1,900km from Addis Ababa)

The old port was built mainly between 1947-58, and is made up of:

- 400m container terminal with 4 SSGs and a water depth of 9.5-12.0m
- Three dry bulk berths totaling 607m, with water depths of 10.5-12.0m
- Eight general cargo berths (1,672m) with water depths of 7.0-12.0m
- Two oil berths, which are also used to support a major international bunkering centre.

Because of its restricted space and the long storage times associated with Ethiopian cargoes, the port is operated in association with a Dry Port two km away. This has a total area of 20ha, with storage space for 1,600 TEU of containers and a 3.2ha vehicle compound. This allows the port to offer transit cargoes (90% of the total) longer free storage times.

Dry bulk traffic has been highly cyclical because of the inflow of relief cargoes during the periodic droughts. Partly to handle the large volumes involved, a modern bulk terminal was opened in 2006 equipped with two 300 ton per hour ship unloaders, bagging lines and 70,000 tons of storage space for grain and fertilizers. The stevedoring of non-containerised cargoes is done by licensed private companies, and is said to be reasonably efficient.

Since June 2000, the Port of Djibouti has been operated by DP World on a 20-year concession. Since then has begun the construction of a new port at Doraleh. So far this comprises a container terminal, and oil terminal and a Free Trade Zone

The new container terminal at Doraleh was opened at the beginning of 2009 in response to the congestion caused by long dwell times for transit cargo at the existing port. It has a quay length of 1,050m and a water depth of 18.0m, with a capacity of the first phase is 1.7m TEU p.a., to be expanded to 3.0m TEU p.a. in Phase 2.

Since being operated by DP World the existing container terminal has attracted a reasonable amount of transhipment traffic – 42,000 TEU out of a total of 295,000 TEU in 2007 – but the new terminal has been designed specifically to turn Djibouti into a global transshipment hub. It has a large locational advantage over Mombasa for this type of traffic due to its position at the entrance to the Red Sea, and also benefits from up-to-date facilities and strong private sector management.

The US$ 150m oil terminal was built by Horizon Terminal Limited in 2005, and has two berths capable of accommodating vessels of 80,000det and 30,000dt respectively. It has been designed to handle vegetable oils, molasses and chemicals as well as petroleum products, with room for a further two berths when necessary.

Djibouti Free Zone, 2km from the old port, is already being managed by Jebel Ali Free Zone (JAFZA), which plans to build a much larger Free Trade Zone at Doraleh and a cargo village at Djibouti Airport.

In 2007 Djibouti handled around 7.5m tons of cargo, of which 5.6m tons was for Ethiopia, 1.2m tons for the local market, and 0.6m tons transshipment traffic. The 7.5m tons included

295,000 TEU of container traffic, 2.1m tons f liquid bulks, 0.9m tons of dry bulks, and 1.7m tons of general cargo.

In general, Djibouti appears to be well-placed to defend its position in the Ethiopian market, providing there are no disruptions to its road and rail links, and no major accidents or security threats. However regional politics will continue to be an important determinant of traffic flows in this part of Africa, so the desire of the Ethiopian Government to set up an alternative route through Mombasa should be taken seriously, and investigated in the normal way.

## C.4 SWOT Analysis

To assist in the development of a marketing strategy, a brief assessment of Mombasa's strengths and weaknesses is given in Table C.1.

**Table C.1 SWOT Analysis for the Port of Mombasa**

| Strengths | Weaknesses |
|---|---|
| • Sheltered harbor with reasonably deep water<br>• Gateway to East African Community<br>• Well-developed business infrastructure<br>• Strong financial base | • Port layout (narrow berths with steep slope behind )<br>• Lack of space<br>• Poor condition of existing infrastructure<br>• Lack of modern mechanical equipment<br>• Road access through congested city centre<br>• Collapse of rail services<br>• Weak corporate culture |
| **Opportunities** | **Threats** |
| • First modern container terminal in East Africa: transhipment opportunities<br>• Dongo Kundu Free Trade Zone trade-generated economic growth<br>• Increase in cruise activity more local added-value<br>• Channel dredging larger ships/lower freight rates<br>• Peace in transit countries economic growth during recession<br>• Improvements to inland road network extension of hinterland to Ethiopia and Southern Sudan<br>• Modernisation of existing infrastructure increased productivity/lower costs/higher environmental standards | • Global recession<br>• Slow down in construction activity<br>• Replacement of imports by domestic production (clinker, grain, foodstuffs, consumer goods)<br>• Political instability<br>• Competition from new ports at Bagamoyo and Djibouti<br>• Loss of Uganda trade to Dar es Salaam<br>• Replacement of oil imports by regional energy resources (including renewables) |

## C.5 Marketing Strategy

KPA's existing marketing strategy is set out in its 2007/8 – 2009/10 Business Plan, and it has recently recruited a new Marketing Manager from outside of KPA to implement it. It is still too early to say whether it will achieve its targets, but recent changes within the Marketing Department appear to be moving KPA in the right direction.

This section comments on the marketing strategy outlined in the Business Plan from three different perspectives: international best practice, knowledge of the regional market and competition from other ports, and experience of the way KPA collects and uses information gained during the course of this study.

**Table C.2 Summary of KPA Marketing Strategy**

| Objective | Strategy | Action Plan |
|---|---|---|
| 1. Increase port traffic from 16.0m tons in 2007/8 to 18.8m tons in 2009/10 | 1.A Engage in aggressive marketing efforts in the domestic and regional markets | 1.A.1 Comprehensive marketing plan<br>1.A.2 Vibrant marketing department<br>1.A.3 Structured promotional activities |
| | 1.B Improve the quality of customer service | 1.B.1 Customer care charter<br>1.B.2 Customer service desks in Rwanda and Southern Sudan<br>1.B.3 Strengthen existing office in Kampala<br>1.B.4 Periodic customer service surveys<br>1.B.5 Customer care unit |
| 2. Improve quality of service to international benchmarks | 2.A Enhance customer oriented processes and culture | 2.A.1 Develop Quality Management System based on ISO Quality Certification 9001/2000<br>2.A.2 Sensitize and train staff<br>2.A.3 Implement change management and encourage stakeholders' feedback |
| 3. Increase cruise traffic from 15,785 passengers in 2007/8 to 16,360 passengers in 2009/10 | 3.A Improve cruise ship facilities | 3.A.1 Develop sheds 1 & 2 into cruise passenger handling facilities |
| | 3.B Develop a joint marketing strategy with Kenya Tourism Board | 3.B.1 Produce promotional materials<br>3.B.2 Marketing tours and exhibitions |

Source: KPA Business Plan 2007/8-2009/10

### Objective 1: Increase Port Traffic

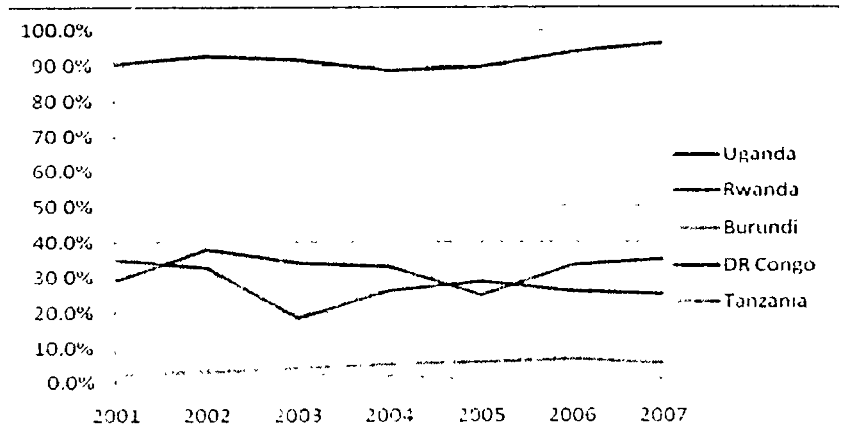
This objective is framed too broadly. Because most of Mombasa's traffic comes from Kenya and Uganda, markets for which there is very little competition, the growth in total port traffic will be largely determined by factors over which the marketing department has little or no control ( for example macro-economic growth, foreign direct investment, and changes in the terms of trade). Success will create a feeling of complacency, failure an unwarranted sense of despair.

Objectives that are directly related to traffic the Marting Department can influence would be more appropriate. This is of three main types:

- Transit country traffic for which Mombasa faces strong competition from other ports.
- Traffic from "new" markets such as Southern Sudan and Ethiopia.
- Footloose traffic such as container transhipment and industrial projects serving regional or international markets.

For transit traffic the main objective should be to maintain Mombasa's share of Uganda traffic, which is already very high, and increase its share of Rwanda, Burundi and Eastern Congo traffic. The main problem with this type of objective is likely to be measuring success. One way of overcoming this difficulty would be to share highly aggregated information about transit country throughputs with the port of Dar es Salaam. This would allow both ports to measure their performance without releasing any commercially sensitive data. However KPA's statistics relating to non-containerised transit country traffic are in poor shape, and need to be significantly improved to allow any monitoring of transit country traffic to take place.

**Figure C.1 KPA Market Share of Transit Country Container Traffic**




Source: KPA statistics + unpublished trade reports

For new markets, the main objective should be to learn more about them. This process should begin with some very basic market research covering:

- The amount and type of each country's foreign trade, and the proportion of it that could be considered as lying within Mombasa's natural hinterland; and
- The economics of moving it through Mombasa (or Lamu) rather than the ports currently used.

Once an estimate has been made of the amounts of additional traffic that Mombasa could reasonably expect to handle for these countries, country-specific marketing plans should be drawn up whose efforts are commensurate with the expected returns. The marketing plans would probably have two or three phases, starting with more market research to identify potential customers, and ending with a list of the measures needed to attract particular cargo flows; at the end of each phase, the results should be evaluated to confirm that it is worth going on.

For footloose traffic, the objectives should be improved access to up-to-date information sources and regular follow-up work. We understand that the Marketing Department already has good links to the Export Promotion Council, and makes use of Kenyan Embassy staff overseas. Links to bodies such as these need to be strengthened by the automatic circulation of information, joint approaches to potential customers, and the use of shared databases to ensure that all leads are followed up on a regular basis. The development of a

Free Trade Zone at Dongo Kundu will offer unprecedented opportunities for joint marketing, and KPA's Marketing Department should seek to become actively involved in setting up the basic systems and processes.
Moving on from Objective 1 to the strategy for achieving it, our brief observation of KPA at work suggests a third item (1C) needs to be added. This is the faster and more effective handling of queries from potential customers.

Four major criticisms can be made of the way in which enquiries are handled at present:

- There is no single point of contact for potential customers, except at the very top of the organization. Each enquiry should be managed by a single person within the Marketing Department responsible for circulating the enquiry to the other KPA Departments involved, and ensuring that they respond in a timely and co-ordinated fashion.
- There is no target date for responding to marketing enquiries. These vary widely in scale and importance, making it difficult to set standard targets. Nevertheless, there should be a fairly short time allowance for the initial response, and all proposals on which KPA cannot reach an immediate decision should be given a time-table and a target response date.
- It is difficult for potential customers to find out exactly what is happening to their proposals. This could be overcome through the use of nominated contact points.
- There are no incentives for staff in the Marketing Department to bring potential deals to a close. This is a tricky issue, as individual incentives create bad feelings amongst staff who do not get the successful leads, and can distort the deal in favour of the customer. Nevertheless marketing would be improved if the efforts of individual staff or small groups were singled out for attention whenever an important deal was signed.

In terms of the Objective 1 Action Plans:

- The comprehensive marketing plan, which was scheduled for 2007-8, has not yet been completed. Whilst we support the concept, a great deal will depend on the sort of document it turns out to be. A practical document which focuses on business processes, lists actions and assigns responsibilities is likely to be most effective at this stage, although we recognize the need for it to be supported by solid market research. The plan should be reviewed and revised at least once a year.
- A vibrant marketing department will be achieved by giving individual staff members specific responsibilities, and making them accountable for achieving clearly defined items in the marketing plan. However they must also be given adequate resources and rewards, and should feel comfortable with the tasks assigned to them. Annual staff appraisals have an important role to play in ensuring that this happens. Marketing is not a skill which comes naturally to all people; every effort should be made to identify people within KPA who have this aptitude, and ensure that their talents are used. Specialist training should also be provided, particularly for those in day-to-day contact with customers.
- Structured promotional activities may require closer liaison between the Marketing Department and the Public Relations Department, and greater clarity about their respective roles. The Marketing Department should be more pro-active in supplying the Public Relations Department with a regular flow of publicity material, and should be

consulted about the content of special events and the participants invited to them. In some ports the Public Relations Department is part of the Marketing Department; we do not believe that this is appropriate for KPA at the present time because of the extent of other corporate activities requiring PR support.

- A Customer Care Charter is useful in raising customer awareness amongst staff outside of the Marketing Department, but experience elsewhere suggests that the message will require continuous reinforcement. This can be done by disseminating information about individual customers to the staff who service them, and ensuring that customers' comments on port performance (favourable and unfavourable) are relayed back to the staff involved. The Stakeholders' Meetings held every Friday are a useful way of getting feedback from customers, but may need to be supplemented by informal, personal contacts.

- Customer service desks in Rwanda and South Sudan are a good idea in principle, but there is a minimum critical size below which decentralized offices do not function effectively. To attract new business it may be necessary to employ the staff who run them on a commission basis, and to employ nationals of the country concerned rather than Kenyans. Each office should be involved in drawing up an agreed annual work programme, and frequent support visits from Head Office are likely to be required in the first 2-3 years.

- The Kampala office has been established for some time, and has reached the point at which functional and/or geographical expansion may be appropriate. As well as strengthening local marketing activities, consideration should be given to the establishment of an ICD in Kampala, to bring the port gate closer to the customer. The key to a successful ICD will be improving the reliability of transport services between Mombasa and Kampala, giving shipping lines the confidence to issue through Bills of Lading. Some of the container lines calling at Mombasa operate rail shuttle services from ports in other developing countries, so KPA should take the initiative by sponsoring discussions between them, the national railways and the two Ministries of Transport, about the liberalization of rail services to/from a new Kampala ICD. Trade facilitation measures which would improve the efficiency of trucking services should also be investigated.

  It may be worth extending the remit of the Kampala office to cover Eastern Congo, if it is not yet practical to establish there a customer service desk similar to those planned for Rwanda and Southern Sudan.

- Periodic customer service surveys are nice to have, but a relatively low priority. The important thing is to identify and contact customers who are NOT using Mombasa at the moment, to understand why they are using competing ports. A checklist of standard questions about port performance should be prepared for use when such opportunities arise, and procedures should be put in place for circulating the customers' comments within KPA, and providing them with feedback when appropriate. Finding out what competing ports do better is one of the best ways of improving KPA's own performance.

- A customer care unit is also probably a luxury at this stage, when there are so many other things to be done. A single contact person with the authority to investigate and resolve problems is the primary requirement of most customers, and this can be dealt with through the key account manager programme.

**Objective 2: Improve Service Quality**

This will also contribute towards the achievement of Objective 1 (more traffic), but relies heavily on business processes and culture change. Missing altogether is the need for better monitoring of service quality. Without this, it will be difficult to identify the causes of poor service quality, and evaluate the success of the different measures which can be used to improve it.

We strongly recommend that a long, hard look is taken at KPA existing system of statistics, to ensure that it meets the port's business needs. At present it is strongly focused on cargo volumes, and the information which is circulated to senior managers and beyond is highly aggregated. Whilst this allows broad trends to be easily identified, it does not highlight localized problems within the port. Very little detailed analysis of the data is undertaken in-house; if it were, the scope for performance improvements would become more readily apparent.

In terms of the actions required to implement the strategy, adherence to formal quality certification standards – although necessary – is not enough. There is a need for quality of service as an ideal to be instilled into the workforce at all levels. This can only be done through training and example, which are largely the remit of the Human Resources and Operations Departments. Nevertheless the Marketing Department does have a role to play in defining which aspects of quality of service the customer finds most important, and in relaying back to the workforce the consequences of improved service quality (or lack of it).

**Objective 3: Increase Cruise Traffic**

The target set for this objective - a 3.6% increase in cruise passengers spread over two years – is not challenging. More appropriate objectives would be an increase in the number of cruise ship calls (perhaps of the order of 15% over 2 years) or – even more relevant – an increase in the number of cruise ship calls by major international operators. Of the 38 calls in 2007, 29 were by the small local cruise ship *Royal Star* and only nine by the prestigious international lines that Kenya has the potential to attract.

Because cruise ship itineraries depend on grouping together attractive ports of call within a relatively short sailing distance of each other, many of the factors determining the growth of the cruise market lie outside of KPA's control. The strategy should therefore focus on:

- Co-operation with other regional ports to market the Indian Ocean as a destination area, and develop within it attractive cruise itineraries.
- Improving contacts with major cruise lines, assisting them in developing attractive packages of excursions from Mombasa (and possibly Lamu).
- Publicising Kenya's unique selling points, such as easy access to game parks, and creating a link between these and cruise tourism.

Because cruise activity is a large potential revenue earner in the longer term, at least one full-time person in the Marketing Department should be assigned to this sector, with sufficient budget to be able to attend and exhibit at major industry gatherings such as the Seatrade Annual Conference in Miami.

The development of passenger handling facilities at Berths 1-2 should be viewed as a short-term measure only. Because the location is far from ideal and the buildings are in poor condition, expenditure should be limited to the minimum required to support passenger processing, adequate waiting area facilities, and efficient transfer to coaches and taxis.

Attention should be turned instead to the development of new cruise facilities at the western end of Port Reitz, between the airport and the southern beach resorts. The use of a greenfield site would allow the facilities to be well-designed and custom-built, opening up the option of private finance. Although the construction programme would have to wait for the Mombasa by-pass to be built (i.e. it would be unlikely to be completed before 2015) the planning process is likely to take some time. Early consultations with cruise lines about their requirements and design preferences for the terminal would be one way of raising Mombasa's profile as a cruise destination.

# ANNEX D:

# RAIL

**Rail**

Rail traffic in Kenya and at Mombasa is low, and it has been declining in recent years.

In 2007 the railways handled only 1.76 million tonnes. Most of it was from the port of Mombasa, which port handled 16 million tonnes in 2007.

It had been hoped that the concessioning out of the Rift Valley Railways on a 25-year contract with the Kenyan and Ugandan governments to operate and refurbish the Kenya-Uganda railway line in 2005 would improve the railways. But the users of the port were almost unanimous in regarding the railways as worse now than before the concession. Traffic has declined as follows:

| | (million tonnes) |
|---|---|
| 2005 | 2.04 |
| 2006 | 1.92 |
| 2007 | 1.76 |

By 2008, RVR conceded that it was unable to fulfil its contractual obligations, acknowledging that it was under-funded.

Consequently Kenya Railways Corporation took the RVR to court in January 2009, seeking a court order to terminate the concession because of the firm's poor performance. The Kenya High Court initially ruled in favour of the termination of the contract, but RVR obtained a court injunction to stop the termination.

In May 2009 Kenya took the first step to renegotiate the agreement to concession the railway it shares with Uganda.

In brief, it is likely to take some time before the railways improve. But even if they do, international experience does not give a good basis for optimism about the railways' role in inland transport from the port. Although there are a few countries in which railways have attracted a significant percentage of container traffic (e.g. the US with double stack trains which travel over long distances, and India where road transport is burdened with over-regulation) they are the exceptions rather the rule. Amongst Kenya's neighbours, the railways' shares of port traffic has remained low in Tanzania, Mozambique and South Africa, where rail's share of container traffic has fallen. Also, in Northern Europe, rail's share in Rotterdam is only about 12%, and at Antwerp 8%. UK's rail share appears higher with about 22% of lift on containers, but it is only about 10% if Roro is included.

# ANNEX E:

# PEOPLE CONSULTED

**PEOPLE CONSULTED AT KENYA PORTS AUTHORITY**

| | Organisation | Contact Person | Designation |
|---|---|---|---|
| 1 | Kenya Ports Authority | Mr. James Mulewa | Managing Director |
| 2 | Kenya Ports Authority | Mr. Gichiri Ndua | Corporate Services Manager |
| 3 | Kenya Ports Authority | Eng. J.O Atonga | Chief Operations Manager |
| 4 | Kenya Ports Authority | Eng. Khamis Twalib | Harbour Master |
| 5 | Kenya Ports Authority | Mr. James Rarieya | Container Terminal Manager |
| 6 | Kenya Ports Authority | Capt. A.A. Banafa | Assistant Harbour Master |
| 7 | Kenya Ports Authority | Eng. Alfred Masha | Chief Civil Engineer |
| 8 | Kenya Ports Authority | Eng. D. Amadi | PCE (P) |
| 9 | Kenya Ports Authority | Eng Samatar | Technical Services Manager |
| 10 | Kenya Ports Authority | Eng. Oremo | Civil Engineer |
| 11 | Kenya Ports Authority | Mr. Nune Bwana Kombo | Civil Engineer (P) |
| 12 | Kenya Ports Authority | Capt. Patrick Onyango | Senior Marine Pilot |
| 13 | Kenya Ports Authority | Eng. Birir | Electrical engineer |
| 14 | Kenya Ports Authority | Eng. Oluoch | CM |
| 15 | Kenya Ports Authority | Capt. Ruto | |
| 16 | Kenya Ports Authority | Mr. Fred Oyugi | Chief Internal Auditor |
| 17 | Kenya Ports Authority | Ms. Catherine N. Mturi-Wairi | Financial Controller |
| 18 | Kenya Ports Authority | Mr. Akuka | Management Accountant |
| 19 | Kenya Ports Authority | Mr. Patrick Nyoike | MFA |
| 20 | Kenya Ports Authority | Mr. Mohammed Alawi Hussun | Assistant Corporation Secretary |
| 21 | Kenya Ports Authority | Mr. Edward Kamau | Marketing Manager |
| 22 | Kenya Ports Authority | Mr. Salim Chingabwi | Human Resources and Administration Manager |
| 23 | Kenya Ports Authority | Mr. Vincent M. Wa-Kayanda | Human Resources Project Manager |
| 24 | Kenya Ports Authority | Mr. Kennedy Muema | Logistics Manager |
| 25 | Kenya Ports Authority | Mr. Oyaro | Procurement Manager |
| 26 | Kenya Ports Authority | Mr. Ngamba | IT Manager |
| 27 | Kenya Ports Authority | Mr. Patrick Kamau | Principle Operations Officer (Shore) |
| 28 | Kenya Ports Authority | Mr. Sudi Amani | Principle Operations Officer |
| 29 | Kenya Ports Authority | Mr. Peter Masinde | Senior Operations Officer (ROP) |
| 30 | Kenya Ports Authority | Ms. Evelyn Mwamure | Conventional Cargo |
| 31 | Kenya Ports Authority | Mr. Ahmed Abdiraham | Principle Officer (Conventional Cargo) |
| 32 | Kenya Ports Authority | Mr. Paul Bor | Principle Officer (Conventional Cargo) |
| 33 | Kenya Ports Authority | Mr. Bernard Osero | PRM |
| 34 | Kenya Ports Authority | Mr. Samuel Helu | Principle Planning Officer |
| 35 | Kenya Ports Authority | Mr. Mohammed Faruk | Senior Statistics Officer |

| | | | |
|---|---|---|---|
| 36 | Kenya Ports Authority | Mr. Mohammed Jezan | CRO Uganda/ Rwanda |

**OTHER PEOPLE CONSULTED**

| | Organisation | Contact Person | Designation |
|---|---|---|---|
| 1 | AGOL - LPG Project | Mr. Esrah Paktar | Managing Director |
| 2 | Artumas Group Inc | Mr. Peter Gathercole | Business Development Director |
| 3 | Bamburi Cement | Mr. Albert Onyango | Terminal Manager |
| 4 | Bidco Oil Refineries | Mr. Vimal Shah | Managing Director |
| 5 | C. Czarinikow Sugar Limited | Ms. Faith Kamau | Operations Manager |
| 6 | Carghill | Mr. Tony Mwakesi | Shipping Manager |
| 7 | CMC Motors | Mr. Titus Mbiti | Regional Manager |
| 8 | Grain Bulk Handlers Limited | Mr. Jon Stokes | Financial Director |
| 9 | Grain Bulk Handlers Limited, Fertiliser Terminal Project | Mr. Davis Harris | Technical Director |
| 10 | Ignazio Messina & Co. | Mr. Kwinga | |
| 11 | Kenya Association of Manufacturers | Mr. Tobias Alando | Executive Officer |
| 12 | Kenya Petroleum Refineries Ltd | Mr. John Mruttu | General Manager |
| 13 | Kenya Petroleum Refineries Ltd | Mr. Andrew harvey | Manufacturing Manager |
| 14 | Kenya Shell and BP | Mr. Peter Murungi | Terminal Manager |
| 15 | Kenya Ship Agents Association | Capt. Fredrick Wahutu | Chairman |
| 16 | Mabati Rolling Mills | Mr. S. Suryanarayana | General Manager, Operations |
| 17 | Maersk Kenya | Mr. Mandeep Singh | General Manager, Operations |
| 18 | Magadi Soda | Mr. Dominic Mwashigadi | Shipping Director |
| 19 | Magadi Soda | Mr. Ngarachu | |
| 20 | Ministry of Energy | Mr. John Omenge | Chief Geologist |
| 21 | Ministry of Planning, National Development and Vision 2030 | Mr. Stephen Wainaina | Economic Planning Secretary |
| 22 | Mombasa Maize Millers | Mr. Munir Thabit | |
| 23 | MSC Oceanfreight | Mr. Fiorenzo Castellano | General Manager |
| 24 | National Cereals and Produce Board | Mr. N. Wambua | Regional Manager |
| 25 | PIL (Kenya) Ltd | Mr. Sreeni Ram | General Manager |
| 26 | Rift Valley Railways | Mr. Kevin Whiteways | Managing Director |
| 27 | SDV Transami | Ms. Rosemary Okech | Route Manager |
| 28 | Sea Bulk Grain Handlers | Mr. S. N. Nadhir | Managing Director |
| 29 | Tiomin Kenya Limited | Mr. Joe Schwartz | General Manager |
| 30 | TransCNG International (OSG/ Transcanada) | Mr. John Eltringham/ Greg Cano | |
| 31 | Transit Representative of Uganda | Mr. William Kidima | Transit Representative |
| 32 | Yara Hydro | Mr. Lode | Managing Director |

# ANNEX F:

# TERMS OF REFERENCE

# TERMS OF REFERENCE

## a) Background

The Port Master Plan details the long-term development programme of the port based on cargo projections, anticipated vessel traffic and broad port development plans. The current Port Master Plan Study Including the Development of a Free Trade Zone was prepared in 2004 with the projected traffic based on a low economic growth rate of about 3.5% per annum over the 25-year plan period upto the year 2028.

The recent growth rates have been 4.8 percent in 2004, 5.8 percent in 2005 and is estimated to be 6 percent in 2006 and to rise to 7 percent in 2007. These high growth rates have made the projected traffic in the current Master Plan suspect.

In October 2006, the Government unveiled Vision 2030 with the aim of fast-tracking the realization of an annual growth rate of 10 per cent for the nect 25 years and consequently turn round the economy to rival the Asian Tigers.

The Vision, which will be implemented in 5-year Medium Term Plans starting from the period 2008-2012, is based on the following three main pillars:

i) **Economic pillar**: To maintain a sustained economic growth of 10% per annum in the next 25 years;

ii) **Social pillar**: to have a just and cohesive society enjoying equitable social development in a clean and secure environment; and,

iii) **Political pillar**: To have an issue-based, people-centered, result-oriented and accountable democratic political system.

The Vision has also identified various flagship projects to be implemented during the successive plans. These include building of one Free Port in Mombasa with the Wholesale and Retail trade sector of the Economic pillar in the 2008-2012 plan period.

The Port of Mombasa in particular is expected to play a major role in facilitating and sustaining the projected growth by supporting commercial, industrial and other sectors of the economy. This will have an impact on the traffic levels projected in the Port Master Plan. Consequently, traffic handled is expected to increase beyond the figures anticipated in the current port Master Plan.

## b) Objectives of the assignment

The objectives of the Review and Update of the Port Master Plan is to enhance the development and performance of the Port of Mombasa in facilitating trade and meeting the country's long-term economic development goals as outlined in Vision 2030 as well as promoting trade and development of the neighbouring countries in East Africa

### c) The Scope of work

The review should examine the current facilities and operations of the port, revisit the traffic projections and appraise the proposed strategies, programmes and other measures.

The update of the Port Master Plan should take into account the following:

- Collecting all relevant data and information for the traffic forecast in Kenya and the hinterland countries which include Uganda, Tanzania, Southern Sudan, Rwanda, Burundi, Ethiopia, Somali and the Eastern part of the Democratic Republic of Congo. These will include data on the national economic development policy, macro-economic data and policy framework, review of trade statistics, export/ import transshipment and transit figures, historical shipping patterns, call sizes and frequencies, vessel types and sizes;
- Collecting, studying, analyzing and updating relevant information from previous studies. These will comprise the Mombasa Port Container Terminal Expansion Project by Japan Port Consultants, September 2006 and the recent Master Plan Study by Royal Haskoning and M.A. Consulting, among others;
- Carry out research on economic trends that affect port services demand and anticipate future demand levels using the hinterland countries macro-economic data. The consultant should also review the strengths and opportunities of the existing port and provide trade forecasts in relation to the new growth targets upto 2030 with alternative scenarios;
- Reviewing planning information including:
  - Carrying out a traffic survey, forecast and projections to the year 2030. the traffic forecast should analyze various economic development scenarios deemed appropriate. The consultant should make projects using an appropriate marine traffic simulation model. The modeling procedure should be informed by recent/ previous studies done in Kenya and internationally. The forecast should be broken down by origin and destinations, types of commodities, and modes of inland transport. This should be done for both conventional and containerized cargo to be apportioned into full, empties, 20 and 40 TEUs components;
  - Analysis of present port operations to determine future port infrastructure development needs and other requirements;
  - Review of Port of Mombasa capacity simulation and analysis;
  - Review the proposed infrastructural options, associated requirements and environmental assessment;
  - Review all other issues pertaining to development plans of other competitive East African ports, and the effects of integration of the rail based hinterland network in the region.

    The analysis should also include effects of regionalism, globalization of the world economy and shipping lines and /or de-globalization; and,
  - Review of land use planning and requirements.

- Review and determine the behaviour and plans of shipping lines, both in the container and other trades, including strategies of the carriers and current and future types and sizes of vessels. The shipping lines related data and the data to support the cargo unitization trend analysis will be gathered using a suitable survey approach. The survey should be designed to obtain and estimate each individual shipper's planned future commodity movements by specified origins and destinations, as well as the associated traffic information;
- Analyze and quantify the potential of Mombasa to serve as a regional transshipment hub. Using the output of the tasks in this TORs the consultant should also develop a marketing strategy for the port of Mombasa;
- Prepare an investment plan that identifies the short, medium and long term proprieties to be implemented and possible sources of finance in order to enable priorities to be implemented and possible sources of finance in order to enable the port meet the projected increased traffic and ensure its continued success; and,
- Synthesize and review the conclusions and recommendations in the existing Master Plan in light of the new developments.

**Deficiencies in the current Master plan that needs particular attention**

Review of the new policy direction for the country, particular attention will need to be put in the following areas in the updated Port master plan:

- Traffic surveys to give a more realistic projection which is not based purely on historical figures;
- Recent and anticipated future developments in the maritime industry;
- Future port traffic scenarios indicating the key factors and the proposed yearly growth in percentage and volume terms under the different scenarios.

For example, the Hong Kong Master Plan (2020), the scenarios were as follows:

**Projected growth and increase in port throughput**

| Scenario | Key Paramenters | Growth | Volume in TEU (m) | | | |
|---|---|---|---|---|---|---|
| | | | 2005 | 2010 | 2015 | 2020 |
| Scenario A | Existing trends plus committed infrastructure (but otherwise assuming no competitiveness enhancement measures) | 3.5% | 22.84 | 26.14 | 31.94 | 35.32 |
| Scenario B1 | Built on Scenario A but with competitiveness enhancement measures including those outside Hong Kong control and assuming that measure are fully effective | 5.0% | 24.82 | 30.64 | 40.38 | 46.46 |
| Scenario B2 | Same as Scenario B1 but excluding increased triangulation | 4.7% | 23.83 | 29.14 | 38.27 | 43.51 |
| Scenario C1 | All the enhancement measures under Scenario B1 are only partially (60%) effective | 4.5% | 24.03 | 28.84 | 37.0 | 42.0 |
| Scenario C2 (Preferred Scenario) | Same as Scenario B2, but measures are only partially (60%) effective | 4.2% | 23.44 | 27.94 | 35.74 | 40.23 |

- The port capacity simulation model and analysis which should be incorporated in the updated Master Plan; and,
- Likely economic impact of the port in realizing the vision.

**Features/ details required for inclusion in the Updated Master plan**

The updated Port Master Plan should therefore have the following features/ details, among others:

i) Detailed analysis of macroeconomic policy framework (i.e. any changes in policy direction with a bearing on the port sector) and trade scenarios upto 2030;

ii) Challenges and emerging issues facing the port in view of the new national vision;

iii) Review and analyzing of trends in cargo unitization, indicating quantitative changes that are likely to occur during the period to year 2030. These should be based in industry databases, interviews with main shipping lines and shipping agents, UNCTAD, and other sources;

iv) Impact of maritime trade on the port of Mombasa;

v) Investment and funding plan giving detailed and costed investment plan with prioritized development activities and other strategies, implementation framework (short, medium and long-term) and possible sources of funds;

vi) Forecasted financial and economic performance;

vii) Environmental protection and hazardous material handling;

viii) Government policy (including the Integrated National Transport Policy privatization and Trade in services – Marine transport sub-sector) and how it impacts on port development and general Maritime industry; and,

ix) Clear and concise recommendations and conclusions.

## d) Training (where appropriate)

The consultants will share their knowledge with the KPA counterpart team particularly in the following areas:

### I) Module on Port Economics and Business Development

Traffic Forecasting
Truck Survey
Marketing
Strategic Planning and Positioning of the Port of Mombasa
Development of Public-Private Partnership
Research and Development

### ii) Module on Port Development

Port Zoning Planning
Port Infrastructure Development
Port Equipment and Operations
Environmental Governance
Organizational Development
Financial Planning

### iii) Module on Freeport Planning

Freeport Demand Analysis
Freeport Facility Development
Institutional Planning

## e) Reports and Time Schedule

The consultant will be expected to submit the reports as follows:

| No. | Report | Cumulative Period (Months) |
|---|---|---|
| 1. | Inception Report | 1 |
| 2. | Interim Progress Report<br>a) First Status Report<br>b) Second Status Report | <br>2<br>3 |
| 3. | Draft Report | 4 |
| 4. | Final Report | 6 |

The reports shall be submitted in the course of the assignment and will constitute the basis for the payments

## f) Data Services, Personnel and Facilities to be provided by the Client, and Personnel

**Data Service**

The Authority shall provide the following:

i) Requisite data and other information needed for the study
ii) Facilities access to other organizations for collection of information needed for the assignment.

**Personnel**

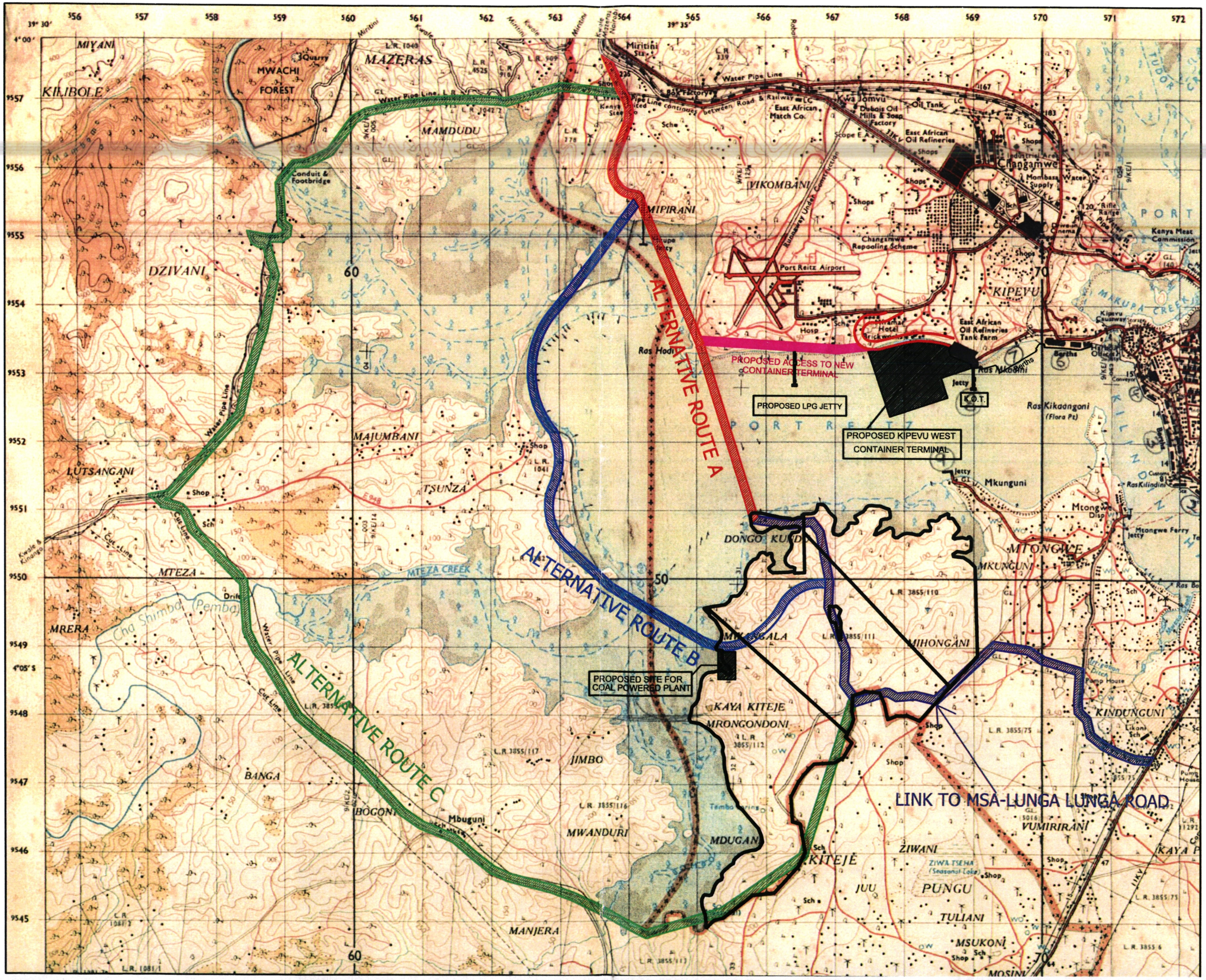
The Authority shall provide the counterpart personnel to facilitate the work of the Consultant(s). The required local experts and other personnel for the Review will be as follows:

| |
|---|
| Co-Team Leader/ Office Administrator |
| Port Engineers |
| Port Planning Experts |
| Port Statisticians |
| Port Marketing Experts |
| Port Legal Experts |
| Port Financial Experts |
| Documentation Expert |
| Secretary |

**Equipment and Facilities**

The Authority shall avail to the Consultants the following equipment and facilities:

i) Computer(s)
ii) Office space
iii) Secretary


ALTERNATIVE ROUTE A
ALTERNATIVE ROUTE B
ALTERNATIVE ROUTE C
LINK TO MSA-LUNGA LUNGA ROAD
PROPOSED ACCESS TO NEW CONTAINER TERMINAL
PROPOSED LPG JETTY
PROPOSED KIPEVU WEST CONTAINER TERMINAL
PROPOSED SITE FOR COAL POWERED PLANT
K.O.T.
PORT REITZ
Port Reitz Airport
MIPIRANI
DONGO KUNDU
KIPEVU
Changamwe
VIKOMBANI
MAZERAS
MWACHI FOREST
KILIBOLE
MIYANI
DZIVANI
LUTSANGANI
MTEZA
MRERA
MAJUMBANI
TSUNZA
JIMBO
BANGA
BOGONI
MWANDURI
MDUGANI
MANJERA
KAYA KITEJE
MRONGONDONI
MIHONGANI
KINDUNGUNI
VUMIRIRANI
ZIWANI
PUNGU
TULIANI
MSUKONI
MTONGWE
Mkunguni
Ras Kikaongoni
Ras Hodi
MTEZA CREEK
Cha Shimba (Pemba)
Water Pipe Line
Cut Line