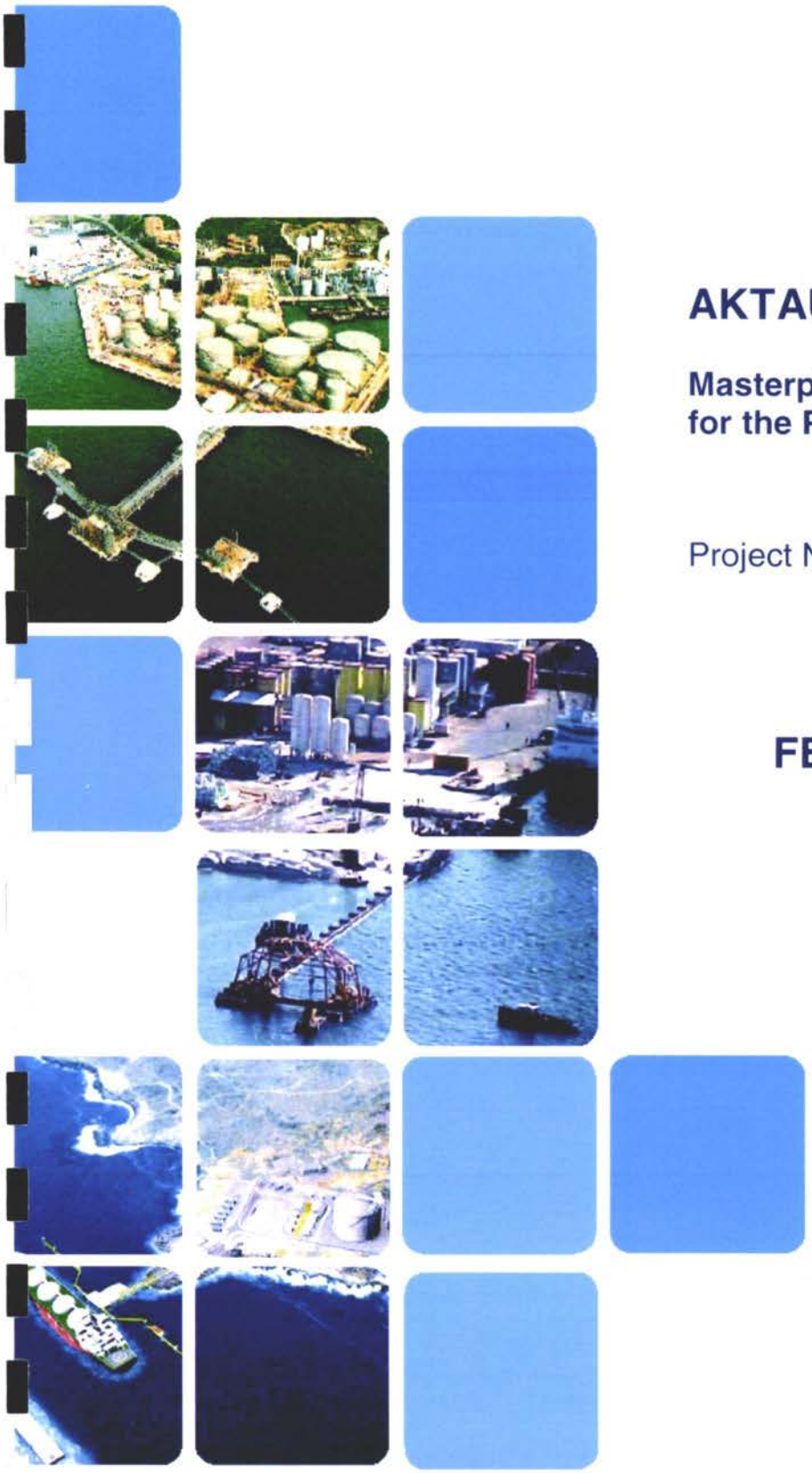


AKTAU PORT DEVELOPMENT

Masterplanning & Feasibility Study for the Port of Aktau, Kazakhstan

Project №: EuropeAid/123967/C/SER/KZ

FEASIBILITY REPORT

Prepared for:

June 2008

TABLE OF CONTENTS

LIST OF TABLES:

LIST OF FIGURES:

LIST OF MAPS:

1 EXECUTIVE SUMMARY

1.1 Basis for this study

The report presents the findings of a Feasibility Study for the expansion of Aktau Port and is one of the key deliverables for this regional TACIS project. The study has concentrated on meeting the requirements of the Terms of Reference (ToR) for the project but has also taken account of developments in the port which have occurred after the formulation of the ToR. The study has determined the likely future traffic at the port and the ability of the existing port to handle this traffic.

It has also examined possible options for improving the facilities in the existing port so that it could handle more traffic and has examined the expansion works in the North Port that are already underway. Although alternative designs for the North Port have been considered during the study they are not presented in this report because the current works have reached a sufficiently advanced stage to preclude the option of changing the design at this stage.

1.2 Current port traffic

The port of Aktau handled 11.5 million tonnes of cargo in 2006, of which 87% was oil exports. The average growth rate was 12.6% p.a over the last five years (see Table 1).

TABLE 1 : Aktau Port Traffic 2002-2006 (000 tonnes)

	2001	2002	2003	2004	2005	2006	Growth (% p.a.) 2001-2006
Oil	5,035	5,553	6,971	8,289	8,913	9,960	14.6%
Steel etc	1060	574	836	1,011	1,024	1,029	-0.6%
Grain	84	209	5	13	33	118	7.0%
Others	181	615	268	378	399	398	17.1%
Total	**6,360**	**6,951**	**8,080**	**9,691**	**10,369**	**11,505**	**12.6%**

1.3 Current port facilities

The port consists of four dedicated oil berths, berths 4, 5, 9 and 10; three multipurpose general cargo berths, berths 1,2, and 3; a grain berth, berth 6, which is also used by quarter ramp roro vessels; and a jetty, berth 8, for the rail ferries which is also used as an oil jetty. Berth 11 has been refurbished for use as an extra oil berth but is not currently in operation due to safety concerns. There is also a small area for port craft.

The berths on the breakwater are limited in their availability per year due to wave transmission through the breakwater and overtopping of the breakwater.

The lengths and drafts of the berths are as shown in Table 2:

TABLE 2: Lengths and Drafts of Main Berths

Berth	Length (m)	Draft (m)
1 Dry Cargo	150	6.3
2 Dry Cargo	150	6.3
3 Dry Cargo	100	6.3
4 Oil	205	8.7
5 Oil	205	9.0
6 Grain	150	6-7.0
7	65	7-8.0
8 Ferry	100	6-7.0
9 Oil	175	7.0-9.0
10 Oil	190	9.0
11 Oil (unused)	123	3-12.0

The capacities of the main berths are estimated to be approximately as follows on the basis of existing handling speeds.

TABLE 3: Existing Throughput Capacity

Cargo	Capacity (million tonnes)
Oil	11.5
Metals & dry cargo	1.6
Grains	0.4

1.4 Current rail and pipeline capacity

Cargo is transported to and from Aktau port by rail and to a lesser extend by pipeline and road. The rail access is managed by KTZ on the main line and KTS on the local lines.

Pipelines: There is a 500mm diameter pipeline from the Buzachi field with a capacity of 4 – 4.2 mt/y

Rail Access: *KTZ* rail access to Aktau Port is constrained in terms of capacity by the last section of the route between Sai Utes and Mangyshlak. The present capacity of this section is 12.6 mt/y and after allowing for 2.5 mt/y of non-oil cargo, the maximum oil capacity on this stretch of line is approximately 10.1 mt/y.

Assuming that additional pipelines are not constructed the total pipeline/rail throughput capacity of oil is 14.1 to 14.3 mt/y.

To increase capacity beyond this level, which is essential if projected volumes of cargo are to reach Aktau, KTZ would need to either double the track section at a cost of approximately US$70m, or to investigate provision of additional locomotive power for trains using this section of route. Track capacity cannot be increased quickly, even if funding were available, and a lead-time of at least 24 months from the date of authority should be assumed to be the minimum achievable.

KTS currently controls rail access to the port and its key customers. Current system capacity is assessed by KTS themselves at 8-9 million tonnes. However the system is configured to serve former industry rather than being totally appropriate for the needs of the current terminals and

the port. Some reconfiguration of the network would therefore be appropriate to assist in increasing volumes.

The key action which would improve system throughput would be to encourage terminals and KTS to co-operate in basing as much traffic movement on trainload (block) working rather than staging trains at Aktau port station. This would cut down the amount of shunting and remarshallings required, and simplify wagon handover between KTZ and KTS.

Given current resources and track capacity on the KTS network it appears that there is capacity within this system to increase traffic by up to 50% given reasonable modifications to the track layout, methods of working and concentration on trainload traffic movements. This will require co-operation between KTS, terminals and the port, but should be achievable to match projected traffic build up. KTS has already indicated that it is able to handle the projected additional TCO traffic forecast for 2008.

KTZ has prepared plans to construct an independent rail access on its own network infrastructure to serve both the port and some or all of the oil terminals. Details are still provisional, but this access would further boost the rail capacity of the port and surrounding industry.

1.5 Current situation in the North Port

The North Port breakwater and mole have been partially constructed but the construction contract was terminated in 2006 when the work was less than 25% complete. A contract to complete the mole and breakwater was awarded in November 2007 with a scheduled completion date of December 2008.

As a consequence of the layout of the mole and the position of the entrance channels it is only possible to create three new dry cargo berths in the North Port and of these three one is proposed to be a dedicated grain berth. The land reclamation proposed with these three berths is approximately 30 Ha which is a very large area to support three small berths and results in approximately 50% of the land area not being effectively utilised.

1.6 Projected future cargoes

Oil: Future cargo volumes are very sensitive to the assumptions made on the future movement of oil. At present the main exporter in the region, Tengizchevroil, has short term plans to transport large volumes of oil exports by rail to the port of Odessa; and in the long term they may divert some of their exports to the new port likely to be built at Kuryk, 70 kilometres south of Aktau. Kuryk is being built by the operators of the new Kashagan oilfield, and will open around 2012-2013.

Three scenarios have been examined:

Scenario A: Aktau wins traffic back from the rail route to Odessa, and Kuryk handles only exports from the Kashagan oilfield when it opens in 2012/13. On this basis, Aktau traffic would peak at about 23 million tonnes just before Kuryk opens and then settle down to 14-17 million tonnes. ***This would be the least cost scenario,*** as routes via Aktau have lower costs than via Odessa or Kuryk (as demonstrated in the economic evaluation)

Scenario B: Aktau does ***not*** win traffic back from the Odessa route, and Kuryk handles only Kashagan's exports. On this basis, Aktau's traffic would reach peaks of 18-19 million tonnes in 2011-2013, and then settle down in the range 8-9 million tonnes

Scenario C: Kuryk handles Tengizchevroil as well as Kashagan exports. On this basis it is estimated that Aktau's traffic would peak at 16 million tonnes in 2012, before falling back to around 8 million tonnes.

Dry Cargo: For dry cargo the projected future volumes are well above the AISCP forecast. The main reasons for the higher forecast are (i) the exports planned by the new fertiliser plant, (ii) the additional grain exports likely to result from the new export strategy of JSC Ak Biday and their investment in new coastal silos in Iran, Azerbaijabn and Georgia, and (iii) imports of construction materials and later consumer goods from Dubai and Turkey for the New City.

Steel exports to Iran account for a large proportion of Aktau's dry cargo. Mittal and Castings have forecast that future exports will rise to about 1.5 million tonnes via Aktau by 2010. This may seems slightly high; as Mittal has no plans to increase production at present (its investment programme is focussing on quality improvements). But Castings is planning an increase in production of 0.4 million tonnes – equivalent to a 10% increase in national production - and the Iranian and Kazakhstan governments recently agreed to an Iranian company constructing a modern steel plant in Kazakhstan. Given the strong growth of imports into Iran, and the fact that the fast-growing Kazakh economy has a well-established steel in Kazakhstan dominated by Mittal, it seems likely that the steel exports via Aktau will increase. However, in view of the negligible growth in recent years it has been assumed that future growth will be modest, at around 5% p.a.

In the longer term the Special Economic Zone should generate additional traffic, but it will take time. None of the projects currently in the pipeline will generate significant port traffic, and no distribution companies, which are the key players at other successful SEZs such as Jebel Ali, have yet been set up in the SEZ. Also, additional traffic may be attracted away from their overland overland current routes to Novorossiysk and Ukrainian ports on to Traceca routes via Aktau - if key reforms are carried out, especially in rail pricing and cross border procedures. But these reforms will take time. They have been under discussion for several years and there is little sign of progress as yet.

Total Volumes: The following Table 4 summarizes the total projected volumes (oil volumes are based on Scenario "A"):

TABLE 4: Traffic Forecasts (Scenario A) (000 tonnes)

	2006	2010	2015	2020
Oil	**9,900**	**14,000 (a)**	**15,000**	**17,000**
Dry Cargoes				
Steel	947	1,151	1,469	1,875
Scrap	51	100	200	300
Grain	118	400	1,000	1,250
Other	30	30	40	50
Rail ferry inbound, existing traffic	148	259	417	613
Rail ferry inbound, New City cargo	0	330	330	330
Rail ferry outbound (fertilisers)	0	0	1,000	1,200
Containers, existing Traffic	10	51	154	310
Containers, New City Cargoes	0	330	330	330
Total Dry Cargo	**1,304**	**2,651**	**4,940**	**6,258**
Total Liquid and dry	**11,204**	**16,651**	**19,940**	**23,258**

(a) Rising to 23 millions tonnes in 2012, before declining to 15 million tonnes.

1.7 Additional berths needed in Existing Port and North Port: 2008 to 2020

To handle the projected volumes additional facilities and berths will be needed in both the existing and North port.

Existing Port: To a certain extent some of the projected volumes can be handled by increasing the capacity of the existing port by relatively minor modifications to the existing berths. These modifications would result in the following revised port capacity:

TABLE 5: Existing Port Throughput Capacity following Upgrade

Cargo	Proposed Upgrade	New capacity (million tonnes)	Approximate cost of upgrade (US$)
Oil	▪ Increase pumping rates and number of loading arms at all berths; ▪ Upgrade berth 9 to take 12000dwt tankers; ▪ Complete works on berth 11 and commission.	14.4	8.25
Metals & dry cargo	▪ Upgrade berth 12 to create 220m of new dry cargo berth with back-up land and yard;	1.85	10.0
Grains	▪ Upgrade berth 6 with additional silo and loading shute.	0.5-0.75	Covered by grain company
Total			**18.25**

North Port: As can be seen in Figures 1, 2 and 3 below the upgrades to the existing port will not be sufficient to meet all traffic requirements over the forecasting period. In addition to the upgrading work in the existing port, additional berths will be required in the North Port. In the case of oil however, the peak demand for new berths will be relatively short-lived under all three Scenarios, "A", "B" and "C".

The peak will occur around 2012-2013, after which traffic will settle down to lower levels. It should also be noted that, as mentioned above, the current total pipeline/rail throughput capacity of oil is 14.1 to 14.3 mt/y. which is similar to the capacity of the existing port after upgrading works. Therefore any further investment in berths, as in the North Port, will need to be matched by investment in new pipelines or rail if the potential of the new berths is to be realised.

In the case of dry cargo the situation is more straightforward and but may in the longer term, after 2020, reach the situation where the three possible dry cargo berths are insufficient and a reconfiguration of the North Port will then be required to provide space for additional berths.

As in the case of oil the capacity of the mainline rail will need to be increased in parallel with the development of the North Port dry cargo berths.

FIGURE 1: Forecast Oil traffic and Existing Port Capacity

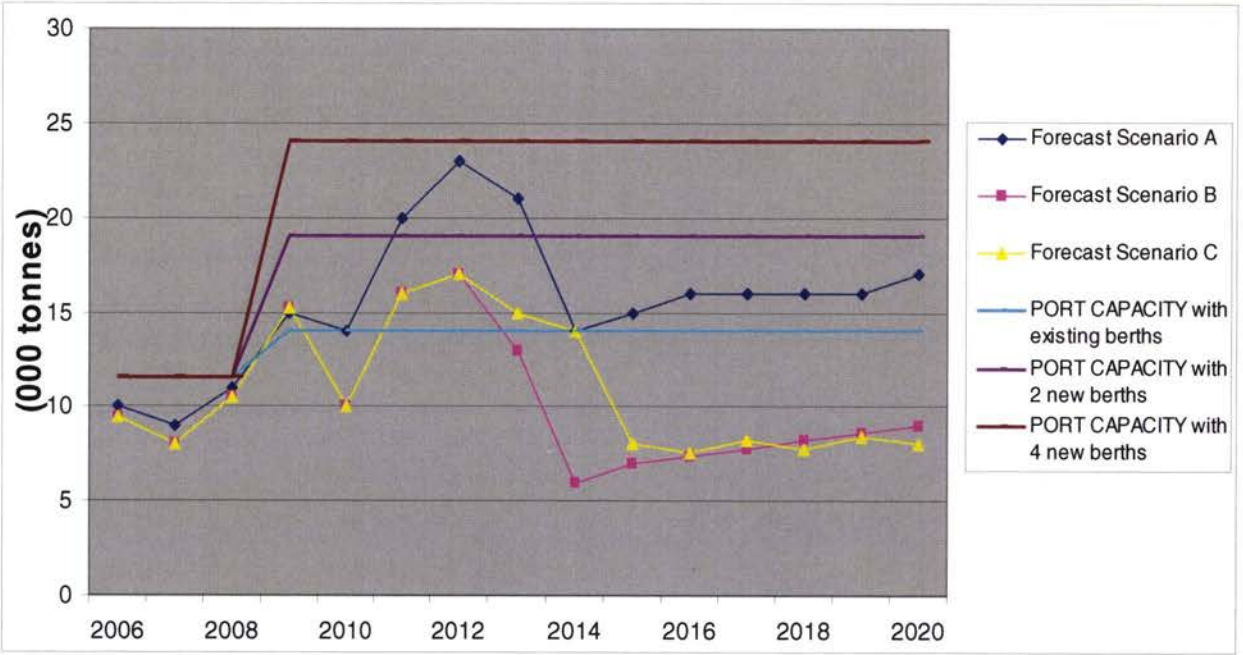


FIGURE 2: Forecast Dry Cargo traffic and Existing Port Capacity

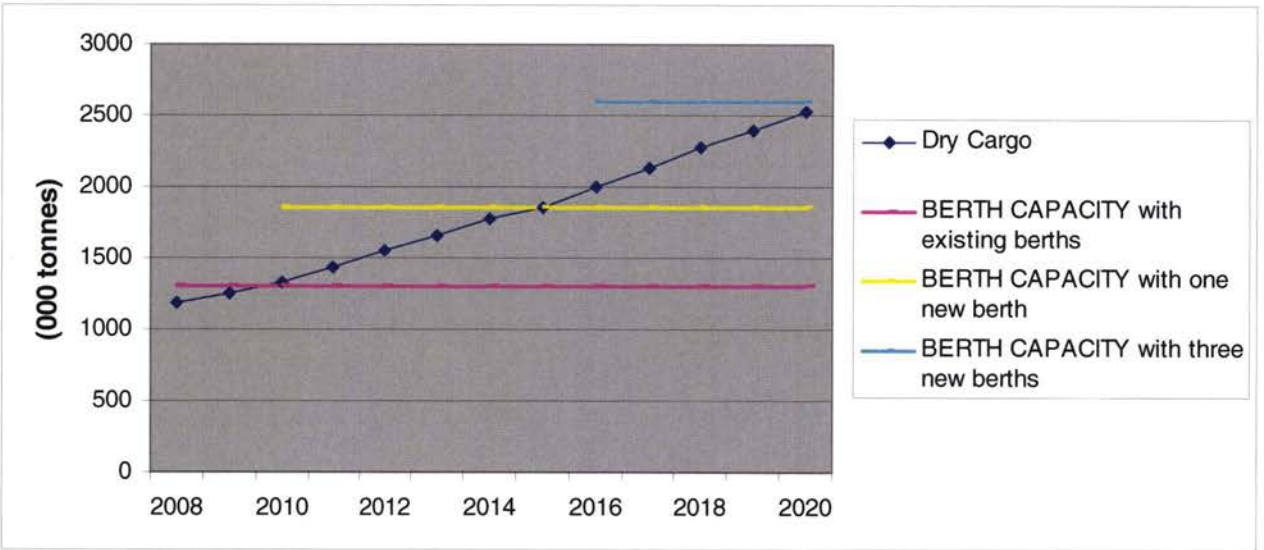
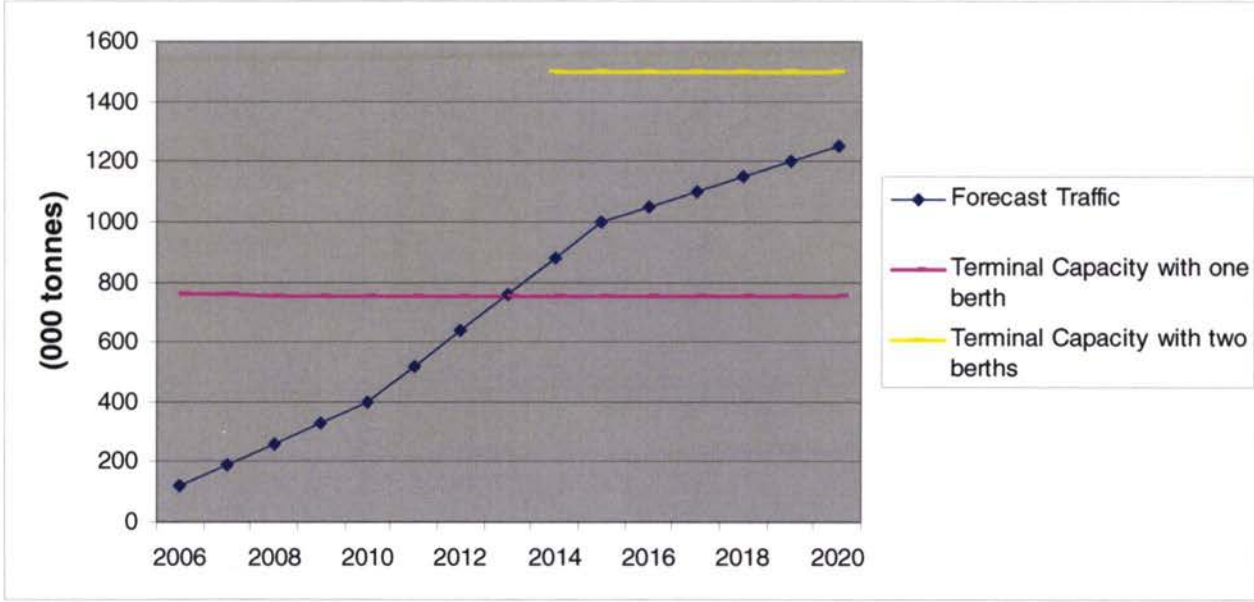


FIGURE 3: Forecast Grain Cargo traffic and Port Capacity



The options evaluated for to meet the traffic volumes are summarized shown in Table 6:

TABLE 6: Possible Investments in North Port

		Cost US$ million
COSTS ALREADY COMMITTED		
Facilities already constructed by Mobilex	Partially constructed mole and reclamation.	25.0
Facilities already committed via breakwater contract signed in Nov.07	Complete the mole and breakwater that was started by Mobilex	72.0
COSTS OF PROPOSED NEW BERTHS		
Oil berths	Construct Berths 14,15,16 and 17 Equipment such as loading arms and pipe work which might be provided by AISCP **or** private operator	35.0 Plus 25.0 = 60.0
Additional basic infrastructure to be completed at the time as oil berths	Dredge North Port Harbour basin, 1.6 million cubic metres	30.0
General cargo berths	One general cargo berth in the South Port, at end of existing general cargo berths	10.0
	Construct Berths 21 and 22	40.0
Additional basic infrastructure that must be completed at the same time as the dry cargo berths	Completion of Reclamation that was started by Mobilex Roads, rail, services buildings to serve berths 21,22 and 23	10.0 50.0
Grain berth	Construct Berth 23 as a new dedicated grain berth. It is assumed that private operator provides silos and loading shutes	20.0
PORT EQUIPMENT	Quay cranes, forklifts for general port work assumed to be provided by AISCP	20.0
TOTAL		337

1.8 Economic evaluation

An economic evaluation was carried out to compare the costs and benefits of optional investments in the port from the viewpoint of Kazakhstan's economy. It was carried out primarily on the Scenario "A" forecasts", but the sensitivity of the results to Scenarios "B" and "C" was also examined. For Scenario "A" the results were as follows:

Oil berths. The Economic Internal Rates of Return (EIRR) on the construction of the new oil berths are high – at 59% for four berths and 70% for two berths, to be constructed immediately in both cases. The main benefits would be the avoidance of diversion costs to the port of Odessa and the avoidance of high queuing costs for ships as berth occupancies rise. The EIRRs on the oil berths for Scenario B traffic are estimated at 17% for the two berth expansion and 3% for the four berth expansion; and the EIRRs for the oil berths for Scenario C traffic are estimated at 9% for the two berth expansion and 0% for the four berth expansion.

The above analysise were carried out without including the already committed costs for the breakwater and mole or the cost of the railway upgrade that is necessary to ensure that the projected volumes can reach the port. However, if the costs of the recent work by Mobilex and the already committed infrastructure are included in the total costs, the EIRRs fall to 33% for 4 berths and 34% for 2 berths. If, in addition, the costs of the investment necessary to upgrade the railway to ensure that increased volmes of oil can get to the port, the EIRRs fall further to 23% for 4 berths and 23% for 2 berths. A similar analysis was made for Scenarios B and C and in these cases the EIRR falls below zero which means in this situation there is no benefit in proceeding with any new oil berths.

Dry cargo berths. The EIRR for three new dry cargo berths, to be built in 2010 and 2017 (2), is estimated at 45%

Grain Terminal. The EIRR for the new grain terminal, to be built by 2014, is estimated at 59%

The most economic construction programme is presented in the Table 7.

TABLE 7: Proposed Construction Programme

	Timing	Berth No
Oil berths	2 in 2010	2 berths have a higher EIRR than 4
Dry cargo berths	1 in 2010 2 in 2017	berth 12 berths 21 & 22
Grain terminal	1 in 2014	berth 23

1.9 Financial Analysis

In addition to the economic analysis, a financial evaluation was carried out to compare the revenues and expenditures from the proposed projects from the viewpoint of the investors, AISCP. Most of the economic benefits of port construction – for example, reductions in ships' queuing costs, avoidance of additional transport costs via second best routes and the removal of bottlenecks to the growth of exports - do not appear in the accounts of the port authority or in the financial analysis.

Two sets of financial evaluations are necessary to complete the feasibility study. They are:

- a projection of revenues and expenditures to determine the Financial Internal Rate of Return (FIRR) on the Northern Extension as a stand alone project; and

- a forecast of revenues and expenditures for the port as a whole, to ascertain whether the port will have sufficient reserves to repay the loan for the project (as well as the EBRD loan for the earlier project).

The calculation of the FIRR **does not** include the costs of investments in the mole and breakwater which have been completed or committed. Nor does it include the revenues from ferries, which are unaffected by the proposed North Extension project. The revenues included are limited to those paid to the port as a result of **additional** oil, dry cargo and grain traffic and the costs are limited to the **additional** costs incurred as a result of constructing the new berths.

The financial rates of return on the proposed projects are low:

- For the construction of ***four oil berths*** (plus 3 dry cargo berths and a grain terminal) the FIRR is ***0.5%*** on the assumption of minimal increases in operating costs. If, however, the north extension had to bear the same level of operating costs as at the existing port the FIRR would be negative.
- For the construction of ***two berths*** (plus 3 dry cargo berths and a grain terminal) the FIRR is ***1.7%*** on the assumption of minimal increases in operating costs. If, however, the north extension had to bear the same level of operating costs as at the existing port the FIRR would again be negative.

It should be emphasised that low financial rates of return on port projects are quite normal - as the traffic often continues to come to the port in the "without investment" case, even if congestion costs are very high, so that additional revenues "with" the project are low.

In the case of the Northern Extension, however, there is a more fundamental reason for the low FIRR. It is that the revenues associated with the project are low compared with the investment costs, and this remains so throughout most of the project's duration. Even in the better years the annual additional revenues are only about $15 million, compared with a total investment cost of $220 million; and the net revenues after subtracting operating costs are much lower.

Three options open to AISCP, given this low rate of return, are as follows:

a) To increase tariffs.

b) Identify a lower cost engineering design.

c) Separate out the basic infrastructure costs and allow them a long cost recovery period and a lower required rate of return.

1.10 Forecast of Revenues and Expenditures for AISCP

Profit & Loss: In projecting the likely financial outturns the following assumptions have been made:

- Revenues –current tariffs are applied against the volumes of the Traffic Forecast.
- Operating costs – adjusted upwards annually between 10 and 2.5% dependent upon the movement of traffic volumes.
- Depreciation – calculated to write off structural investments over thirty years and equipment over ten years.
- Finance/Loan Interest - principally based upon loans outstanding at the beginning of the year at 7% per annum.

The following table summarises the operating profit performance over the period of the forecast.

TABLE 8: Operating Profit (US$ millions)

	2006	2010	2015	2020	2025
Revenues	**40**	**53**	**75**	**91**	**98**
Operations	13	18	26	30	34
Depreciation	4	11	11	17	17
Finance	0	10	9	13	6
Total Costs	**17**	**39**	**46**	**60**	**57**
Profit before Tax	23	14	29	31	41
%	57.5	26.4	52.0	34.1	41.0

The cashflow (US$ millions) remains as positive throughout the period and demonstrates that loan repayments can be serviced. The loan profiles in each case assume a repayment holiday of two years, interest at 7% per annum and repayments over fifteen years.

Table 9: Cash Balances (US$ millions)

	2006	2010	2015	2020	2025
Cash and cash equivalents	12	40	138	210	301

The most likely risks to positive cashflow would be:

- Decline in revenues;
- Loan repayments only over ten year period not fifteen. (This would increase the average annual repayment from US$ 14.6 million to 21.6 per annum).

Balance Sheet: This grows considerably in value over the period of the forecast due in particular to:

- Capital investment of US $ 344 million in specifically identified projects along with a further US$ 60 million of routine replacements.
- The plotting of the specific investments through external funding.
- AISCP is not required to pay a dividend or distribute its post tax profits.
- The value of capital investment likely to be further enhanced through the application of asset revaluations in line with international accounting standard requirements.

Table 10: Balance Sheet Highlights (US $ millions)

	2006	2010	2015	2020	2025
Balance Sheet Value	126	289	349	487	563
Equity	60	98	206	292	415
Loans	49	177	123	174	83
% of Loans to Equity	82%	180%	60%	60%	20%
Return on Capital %	38.3%	14.3%	14.1%	10.6%	9.9%
Adjusted Return on Capital %	47.9%	25.9%	34.9%	29.2%	32.8%

The return on capital remains positive throughout and with the removal of cash balances (adjusted return on capital) is extremely attractive by both sector and normal commercial standards.

1.11 Conclusions

There is an opportunity for Aktau port to handle increased volumes of cargo providing the existing port is upgraded; the proposed North Port expansion is constructed; and the rail and/or the pipeline transporting oil into Aktau is expanded to match the projected future oil volumes.

The projected increased volumes are predominantly oil but the study has shown a large potential spread in the volume that might be exported through Aktau. This means that there is a risk that new facilities will be underutilised in the future unless AISCP can obtain guarantees from Government or binding commitments from oil companies that the projected volumes, that are used as the basis for constructing new facilities, will be underwritten.

The study has shown that because the cost of the expansion works is high compared to the revenue from the additional volumes, the works on their own do not appear to be an attractive business project for the port. However, the usual tests or criteria that are applied to investment decisions are generally driven by the economic and commercial purposes of the organisation.

In the case of AISCP no one measure in isolation should be the determinant of whether to invest or not. In addition to financial considerations AISCP have national responsibilities to ensure that the efficient movement of goods is a priority objective. This is closely monitored by many interested parties including other Government Departments.

The net result is that whilst financial tests examined in the Study are important, they may need to be over ridden in the wider interests of the State. As the FIRR for investment in the North Port is not commercially attractive it would be preferable to source as much funding as possible through an increase in equity/capital.

The alternative is to seek external funding but such institutions may seek sovereign guarantees before they would commit to investments with such a modest financial return. However, AISCP can financially sustain the investments and in relation to the smaller investments possibly fund them from cash flow generated by the business.

A further important issue is timing and whilst the investment programme has been formulated to maximise finances against traffic movements, provision should be made for flexibility in investment programming.

1.12 Recommendations

The study has shown that there are several actions that need to be taken immediately to meet the projected demand to handle future cargo volumes. To assist AISCP with identifying these actions the following recommendations are made:

1. AISCP seek meetings with Ministry of Transport, Ministry of Energy and Ministry of Economy to clarify the inconsistencies in State forecasts of oil volumes and to seek guaranteeing of oil volumes or underwriting the repayments of the loan if the volumes do not materialize.
2. AISCP should seek meetings with the oil companies, notably Tengiz Chevroil, to discuss sharing of the costs of investment in the oil berths as is common in many oil terminals worldwide.
3. AISCP should put in hand efficiency improvements to the existing cargo operations.
4. AISCP should co-ordinate institutional reform amongst the agencies involved in customs clearance, immigration, security and quality testing;
5. Upgrading work should be carried out immediately in the existing port to meet immediate projected increases in traffic volumes;
6. AISCP should complete their investigations which are currently in hand as soon as possible to confirm the practicality of increasing oil volumes through the Existing Port;
7. To maintain AISCPs role as a key player in the export of Kazak crude oil at least two new oil berths should be operational in the North Port by 2010;
8. AISCP should build on existing arrangements and work more closely with the oil companies to determine the optimum procurement strategy and port tariffs for the new oil berths given the possible short term requirement for these berths;
9. To compete with alternative transport routes AISCP should establish a forum for working with the oil, rail, pipeline and tank storage companies to ensure that oil exporting facilities and procedures at Aktau are as attractive as the alternative transport routes that are available and that the capacity of the rail and pipeline are increased so that they can handle the projected future volumes.
10. AISCP should source as much funding as possible through an increase in equity/capital, but be prepared to provide sovereign guarantees to attract external funding institutions;
11. AISCP should plan to construct a new grain terminal in the North Port by 2014 and two new dry cargo berths in the North Port by 2017
12. AISCP should consider finding additional/alternative use for the large reclamation in the North Port, such as tank farms or industrial development both for the temporary condition until the new dry cargo berths are required and for the permanent condition where a significant proportion of the reclamation is unlikely to be needed for port operations;

13. Following the Second Steering Committee Meeting held in Astana on 27th March 2008 the Consultant should proceed with designs and tender documents based on FIDIC conditions of contract for new oil berths in the North Port. Designs will be prepared for four berths. It is expected that by the time the designs are completed, the forecasts of demand for oil shipment will have been clarified through the AISCP activities listed under points 1, 2 and 3 of the General Recommendations on Actions to be taken before implementation of the Master Plan". It will then be possible to firm up the scope and financing of the oil berth procurement package.

2 EXISTING PORT TRAFFIC

2.1 Cargo Volumes

The Port of Aktau handled 11.5 million tonnes of cargo in 2006 (see Table 11).

The range of cargoes handled, however, is limited, with oil accounting for 87% of the total and metals, mainly steel exports, for another 9%. Most of the remaining cargo is carried in the ferries connecting Aktau with Azerbaijan and Iran.

Table 11: Aktau Port Traffic 2006

	('000 tonnes)	%
Oil	9,960	87%
Metals	1,029	9%
Grains	118	1%
Others	398	3%
Total	**11,505**	100%

The limited range of cargo handled at Aktau is not a post-Soviet Union phenomenon. Even in the 1980s, Aktau handled only about 7 million tonnes of oil and a few hundred thousand tonnes of low value materials, such as salt and coal. The city of Aktau was constructed only in the 1960s, after oil was discovered in the region, and its main activity in later years centred around the nuclear power station.

Aktau's traffic has grown rapidly by 12.6% p.a. in the last five years (see Table 12). This growth, however, was all in oil and 'other' cargoes, with steel exports remaining flat over the five year period. The grain traffic, for which silos have been built in the port, has been volatile and not yet taken off.

Table 12: Growth of Aktau Port Traffic 1996 - 2006 ('000 tonnes)

	1996	1997	1998	1999	2000
Oil	101	868	1,815	2,067	3,386
Steel etc	222	226	140	235	702
Grain	16	11	28	8	15
Others	36	46	27	38	43
Total	**376**	**1,150**	**2,011**	**2,348**	**4,144**

	2001	2002	2003	2004	2005	2006	Growth (% p.a.) 2001-2006
Oil	5,035	5,553	6,971	8,289	8,913	9,960	14.6%
Steel etc	1060	574	836	1,011	1,024	1,029	-0.6%
Grain	84	209	5	13	33	118	7.0%
Others	181	615	268	378	399	398	17.1%
Total	**6,360**	**6,951**	**8,080**	**9,691**	**10,369**	**11,505**	**12.6%**

Source: AISCP

2.2 Import and Exports

Almost all of Aktau's cargo consists of exports. Although Kazakhstan's imports were over $25 billion in 2006, they entered the country mainly by rail, or, if they were of higher value, by road. This is because their origins are mainly in countries with land borders with Kazakhstan – e.g. Russia, Iran and China. In the third quarter of 2006, 42% of imports came from Russia or the Ukraine, and 20% from China or Korea, and almost all of this is assumed to enter Kazakhstan by rail. The traffic from Western Europe, Iran and Turkey moves predominantly by road.

2.3 Origins and Destinations

Almost all of Aktau's dry cargo goes to ***Iran*** at present, along with about 40% of the oil. The other main destinations for the oil are Baku in Azerbaijan (25%) and Makhachkala (35%) in Russia.

The only other destinations of Aktau's dry cargoes are Baku, for the ferry traffic, and Greece and Turkey for small volumes of steel scrap.

2.4 Roro and Containers

Roro

Aktau is served by a rail ferry from Baku run by the Caspian Shipping Company (Caspar). It calls on a regular schedule. Its cargoes have consisted mainly of oil shipments in rail wagons from Aktau to Baku and mixed general cargoes on the return voyage back to Aktau. The general cargo from Baku to Aktau has been increasing rapidly (see Table 13). But the oil shipments on the ferry have fluctuated from year to year and fell sharply in 2006. Consequently, the number of calls per week has fallen from 3 in 2005 to one in 2007.

The ferries were designed in Soviet times to carry passengers, but passenger traffic is now minimal.

Table 13: CASPAR Rail Ferry Traffic 2001-2006 ('000 tonnes)

	2002	2003	2004	2005	2006	Growth p.a 2002-06
Aktau-Baku	509	198	230	525	160	-25.1%
Baku-Aktau	83	46	112	103	148	15.6%
Total	592	244	342	628	308	-15.1%

A second ferry service to Makhachkala was opened in 2007, but was discontinued almost immediately

Containers

Aktau handled only 1000 containers, which is an extraordinarily low number by international standards, in 2006. They almost all come from Iran, on the non-scheduled general cargo vessels run by Khazar Shipping, a subsidiary of the Iranian national shipping line (IRISL). Their main southbound cargo is steel. Northbound the vessels bring building products, oil industry equipment and consumer goods, partly in containers. The origins of these goods are in Dubai or the Iranian port of Bandar Abbas, from where they are trucked across Iran to the Caspian ports of Amirabad, Anzali and Nourshar, and ferried up to Aktau. Almost all the southbound containers are empty.

The gap between inbound and outbound traffic shown in Table 14 implies that the majority on the containers are not being returned – i.e. the trade is based on the use of one-way boxes. The container traffic, however, has doubled in the last two years.

Table 14: Aktau Container Traffic 2004-2006 (Number of Containers)

	In	Out	Total
2004	326	147	473
2005	407	268	675
2006	716	290	1006
Growth p.a. 2004-2006	48.2%	40.5%	45.8%

Source: AISCP

In brief, although both container and inbound Roro traffic are very low by international standards they are increasing rapidly, by 48% p.a. and 16% p.a. respectively. Their future growth will be followed up in Chapter 4.

2.5 'Corridor' Traffic

Four international transport corridors pass through the territory of Kazakhstan. They are

1. The Traceca Corridor, from Europe to Central Asia and China via the Black Sea, Caucasus and the Caspian;
2. The North-South Corridor from Northern Europe to the Persian Gulf/India, via Russia and Iran;
3. The Southern Corridor, from South East Europe to China and South East Asia, via Turkey, Iran and the Central Asian republics;
4. The Northern Corridor from Western Europe to China, Korea and Japan, via Russia and Kazakhstan.

Of these only the Traceca corridor would be likely to use the port of Aktau (see Chapter 4.11 for detailed discussion). But so far Aktau has handled very little Traceca Cargo apart from oil. Almost all the potential Traceca route cargoes - grains, fertilisers, sulphur, coal, etc – are using direct rail routes to Black Sea ports, bypassing the Caspian Sea. It will require several reforms – including much more flexible pricing by the Kazakh, Azeri and Georgian railways, streamlining of border crossing procedures and removal of the obligation to add VAT to Aktau's tariffs - to be successfully introduced if these cargoes are to be attracted to Aktau (see Chapter 4.11 for discussion).

The North South Corridor from India (i.e. Mumbai) to north-west Russia and Europe would be unlikely to use the port of Aktau. It would be much more likely to use ports at the northern end of the Caspian, such as Makhachkala or Astrakhan/Olya.

2.6 Special Economic Zone Traffic

The Aktau Special Economic Zone opened in 2003 has not yet generated any significant traffic for the port. It is, however, starting to attract investment and its future contribution to Aktau's traffic will be discussed in Chapter 4.

2.7 Shipping Traffic

Ship sizes at Aktau are small, as is the case in all Caspian Sea ports. Even when volumes were higher in some Caspian ports in Soviet times, the need to keep the option of using the Volga Don Canal open restricted vessel sizes to about 4000 dwt.

More recently, however, larger ships have been built, mainly for oil, to trade *within* the Caspian, and the oil traffic at Aktau is now handled by in tankers in the 5000 - 12000 dwt range.

Typical ships calling at Aktau in recent years are shown in the Table 15.

Table 15: Typical Ships Calling at Aktau in Recent Years

Vessel name	Vessel type	Length (m)	Beam (m)	Cargo draft (m)	Cargo capacity, (tonnes)	Deadweight
Alexander	Tanker	128	16.6	5.5	5700	6400
General Aslanov	Tanker	136	17.5	8.0	11500	12450
Apsheron	Tanker	137	17.4	5.3	7000	7410
Captain Pshiniscin	Tanker	134	16.5	4.5	5300	5825
Geydar Aliyev	Tanker	143	17.3	7.14	12500	13470
Iran Daleer	Dry cargo	140	16.0	4.7	5700	5992
Iran Gadeer	Dry cargo	136	13.5	4.7	3809	4000
Omskyi 113	Dry cargo	108	13.0	4.7	3230	3600
Dobrogast	Dry cargo	106	16.5	3.7	3665	3983
Neferudovoz	Dry cargo	114	13.0	3.7	3070	3280
Monoxylion	Dry cargo	106	16.7	3.7	3709	4100
Compositor Rahmaninov	Ro-Ro Cargo ferry	117	16.2	4.7	3463	4673
Azerbaijan	Ferry	154	17.0	4.2	3435	11500

Source: Kazhydro

Ship Calls

Aktau received 1987 ship calls in 2006. As shown in Table 16, almost three quarters were oil tankers.

Table 16: Ship Calls at Aktau (number of vessels)

	2003	2004	2005	2006	Ave growth p.a.
Oil	1177	1337	1367	1467	7.6%
Dry Cargo	275	314	343	390	12.4%
Ferry	126	171	171	130	1.0%
Total	**1578**	**1822**	**1881**	**1987**	**8.0%**

Source: AISCP

The growth rate for ship calls over the period 2003-2006 was 8% p.a. Calls by oil tankers and general cargo ships have been increasing steadily, but calls by the ferries have been declining – as a result of the switch of oil exports to tankers.

Ship Sizes

The ***average ship load*** in 2006 was 6,789 tonnes for oil and 2,941 tonnes for dry cargo. The ship loads for oil have been increasing at 5% p.a. while loads for dry cargo vessels have been declining slightly (see Table 17).

Table 17: Average Ship Load, 2003-2006 (tonnes)

	2003	2004	2005	2006	Ave growth p.a.
Oil	5,923	6,200	6,520	6,789	4.7%
Dry Cargo	3,058	3,261	3,082	2,941	-1.3%
Ferry	1,937	2,000	3,673	2,369	7.0%

The growth of ship sizes, however, is likely to accelerate for both oil and dry cargo. For ***oil***, the average ship size has been kept low because a significant part of total exports has been to Iran, where the port, Neka, cannot accommodate ships over 5000 DWT. But Iran's share of total traffic is likely to decline in the future, because shipments via Baku's pipelines will increase.

Furthermore, there is pressure from the oil companies to use larger ships, which give economies of size and also spend less time in port per tonne of cargo loaded than smaller ships, and Kazmortransflot, the Kazakh oil shipping line, is ordering 12,000 DWT ships. The ship sizes for ***dry cargo*** are also likely to increase. The dominant dry cargo shipping line at Aktau (Khazar Shipping, which is a subsidiary of the main Iranian shipping line, IRISL) has been using ships averaging about 4500 DWT, but has recently acquired four 6500 DWT ships. Khazar Shipping's fleet now consists of the following ships:

- 4 X 6500 DWT;
- 2 X 5700 DWT;
- 3 X 3700 DWT;
- ? X 2700 DWT.

These ships are used to carry steel to Iran and general cargo, including all the containers, back to Aktau. They are also used on other routes, not just Aktau-Iran; but the larger ships will be deployed more on the Aktau route in the future as cargo volumes are likely to be boosted by growth in containers, imports for the new city and steady growth in steel traffic (see Chapter 4).

Against this background the growth in ship loads for oil is forecast to accelerate to 7.5% p.a. up to 2010 and then fall to 5% p.a. from 2010 to 2015; and dry cargo ship loads are forecast to increase by 5% p.a. On this basis the average ship loads would be as shown in Table 18.

Table 18: Forecast Ship Loads, 2006-2020 (tonnes)

	2006	2010	2015	2020
Oil	6,789	9,067	11,572	12,000
Dry Cargo	2,941	3,575	4,562	5,823

2.8 Competing Ports

There are only two ports that may be considered as potential competitors to Aktau in the Caspian basin: they are **Turkmenbashi** and **Astrakhan**.

The Caspian also has several other ports which are sometimes identified incorrectly as competitors to Aktau. In fact they are the trading partners of Aktau, and their facilities and traffic are discussed in the next section, 2.9.

Turkmenbashi

The port of Turkmenbashi has 6 oil berths, 4 dry cargo berths, and a rail ferry berth which handles a service to Baku. The port is Aktau's only competitor for Traceca cargoes. It currently handles raw materials for an aluminium plant in Tajikistan and some oil products from Central Asian countries. It also handles declining volumes of cotton.

The dry cargo, ferry and oil loading terminals have been rehabilitated with loans from the European Bank for Reconstruction and Development.

Astrakhan

Astrakhan is the largest port in the Caspian. The complex includes terminals at Olya, Astrakhan and Buzan. It has a total of 21 berths.

In 2004 the port handled 5.7 million tonnes, mainly dry cargo, including metals and metal goods (their share in 2004 was 33 %), sulphur (24 %), timber and sawn wood (6 %), paper (2 %) and containerized cargo (2 %).

The port also handles transit traffic, mainly steel pipes and metal products, from the Black Sea (including Turkey and the Ukraine) to Azerbaijan and Iran.

The port benefits from competition between a large number of cargo handling companies; but suffers from being closed by ice during the winter.

The Russian government plans to set up ferry services at Astrakhan.

2.9 Aktau's Trading Partner Ports: Destination and Origin Ports

The main destination / origin ports for the ships calling at Aktau are:

Baku

The port of Baku, located in Azerbaijan, is the main Caspian transit port for crude oil for export to the west. The port has 8 berths and a maximum water depth of 7 metres.

The port's cargo traffic fell sharply from 30 million tonnes p.a. before 1990 to 3 million tons in 1998/1999; but it is now reviving again. Oil and oil products account for the majority of the traffic. In 2006 a quarter of Aktau's oil went to Baku.

A large part of the oil goes to either:

- the port's oil terminal at Dubendy, which has two berths for tankers up to 8,000 DWT. Its capacity is about 3 million tonnes p.a. The oil landed there is moved either to the local oil refinery or to the port of Batumi in Georgia by rail; or
- a private Azpetrol terminal with a capacity of about 4 million tonnes p.a.

Baku's role will expand following the recent opening of the 60 million tonnes pa. Baku-Tbilisi-Ceyhan pipeline.

There are also ferry services from Baku to Aktau and Turkmenbashi, operated by the Caspian Shipping Company. Traceca cargoes would probably have to use these ferry services, and this raises problems, as the services are generally regarded as expensive and inefficient.

Neka (Iran)

The port of Neka has one berth with a draft of 4.9 metres for tankers up to 5,000 tonnes.

The port took 40% of Aktau's oil shipments in 2006 – mainly under swap arrangements.

It is reported that the Iranian government is considering constructing an SBM to accept 60,000 DWT tankers from Kuryk.

Makhachkala

The port of Makhachkala in Russia is free from ice all the year round. It has five berths, with a capacity of 5 million tonnes, for ships up to 12,000 DWT. Its water depth is 9 metres.

It received 35% of Aktau's oil shipments in 2006.

Makhachkala has a petroleum storage depot which is connected to the pipeline from Baku to Novorossiysk and has a storage capacity of 500 thousand cubic metres, which is more than twice that at Baku.

There are plans to dredge the port and reconstruct 5 piers, increasing capacity up to 11 million tonnes.

Most of the traffic is oil, but general cargo has been increasing.

A rail ferry service between Makhachkala and Aktau was introduced recently, but lasted only a short time.

Anzali (Iran)

The port of Anzali in Iran is the origin of most of Aktau's container traffic. About 1000 TEU were carried on the Khazar Shipping services from Iranian ports to Aktau in 2006.

The port has eight general cargo berths, an oil berth and a passenger berth. Its capacity is around 5 million tons of cargo a year.

Its water depth, however, is only 5.5 metres, limiting vessel sizes to 6,000 DWT.

Currently, the port has no railway and the access road is in need of reconstruction.

Noushahr (Iran)

Noushahr in Iran has three berths with a maximum draft of 5.5 m.
The annual throughput of the port is 1.5 million tons.

Amirabad (Iran)

The port of Amirabad (Khazar) has a capacity of 5 million tonnes but only a shallow draft.

There is a plan to expand the capacity of the port to 8 million tonnes a year. The plans include a container terminal with two shore gantry cranes.

A special economic zone specializing in storage and processing has been set up and an oil-refinery and a grain silo (part owned by Kazakh investors) is planned.

3 THE ECONOMY

3.1 GDP, Import and Export Growth

Kazakhstan's economy went into a steep decline in the early 1990s following the collapse of the Soviet Union, but revived with the discovery and production of large volumes of oil. In the last five years Kazakhstan's GDP growth has averaged just under 10%, which is faster than China's and India's. The high growth, however, reflects not only increasing oil production, which averaged only 8% p.a. in the last five years, but also the increase in world oil prices.

Imports have also increased rapidly, by 32% p.a. in the period 2002-2006. Aktau has not benefited from this growth, as the port handles few imports.

Table 19: Kazakhstan's GDP, Imports and Exports 2002-2006 (% Growth p.a.)

	GDP	Exports	Imports
2002	9.8		
2003	9.3	32	19
2004	9.4	56	45
2005	9.7	37	30
2006	10.6	37	34
Average	**9.76**	**40.5**	**32**

Source: EIU

Kazakhstan's exports are dominated by oil, and to a lesser extent metals. As shown in Table 20 they accounted for 88% of national exports in 2006 and for imports machinery represented 45% as shown in Table 21.

Table 20: Kazakhstan's Exports, by Main Product 2006

	% OF VALUE
Petroleum and Mineral products	72
Metals	16
Chemicals	4
Food	3
Others	5
Total	100

Source: EIU

Table 21: Kazakhstan's Imports, by Main Product 2006

	% OF VALUE
Machinery and Equipment	45
Mineral products	14
Metals	13
Chemicals	11
Food	7
Others	10

Source: EIU

The main destinations of exports and origins of imports are shown in Tables 22 and 23.

Table 22 Origins of Kazakhstan's Imports (% of Value)

	% OF VALUE
Russia and Ukraine	42
China and Korea	20
EU	26
Iran	4
Turkey	3
Others	5
Total	100

Source: IMF, third quarter of 2006

Table 23: Destinations of Kazakhstan's Exports (% of Value)

	% of Value
Italy	13
Germany	12
Russia	11
China	10
Romania	5
Iran	4
Turkey	3
Others	41
Total	100

Source: IMF, third quarter of 2006

3.2 Location of Kazakhstan's Exports

Oil

The existing oilfields are located mainly in the west of Kazakhstan, relatively close to Aktau, and the main ***future*** sources of oil – Kashagan, Tengiz, Karachaganak and Kurmagazy – are, fortunately for Aktau, also all in the west, mainly at the northern end of the Caspian Sea.

Minerals

Kazakhstan is well-endowed with minerals, but they are *located mainly in the east of the country*, far from Aktau. Kazakhstan has:

- 18% of the world's zinc reserves and 6% of the world's copper reserves. The production plants, however, are located at Zhezkazgan, in the centre of Kazakhstan, and Balkash, in the east of Kazakhstan;
- 15% of the world's lead reserves, but the mines are located close to Ust Kamenogorsk in the north east;
- half of the FSU's tungsten reserves that are located in northern Kazakstan;
- one fifth of the FSU's coal reserves with most of the production being in the east. There are long term prospects for coal mining in the Mangystau Peninsula, but the 250 million tonne reserves located there have not yet been exploited.

Kazakhstan also has the eighth largest iron ore reserves in world, but again they are in the east of the country, as are the steel plants that use these raw materials. Despite this, the steel industry exports about a quarter of its products through Aktau.

Other minerals that possibly are better located for Aktau are:

- chrome: Kazakhstan's has 90% of the FSU's chrome reserves and they are mined in the northwest near Aktobe; and
- asbestos: which is mined in the north east, but presently being exported via Novorossiysk.

4 TRAFFIC FORECASTS

4.1 Petroleum

4.1.1 Production and Exports

Aktaus' traffic is dominated by oil, and much of Aktau's potential traffic growth is likely to be in oil.

Kazakhstan produced 67 million tonnes of oil in 2006, of which 57 million was exported; and the Government's current plans envisage rapid growth of ***exports*** to about 80 million tonnes[1] in 2010 and 123 million tonnes by 2015[2].

The majority of Kazkhstan's oil is well-located for Aktau Port. A large part of existing oil production is already concentrated in the west of Kazakhstan and by 2015 the vast majority will be produced around the northern shores of the Caspian Sea. The main oilfields in 2015 will be:

- The Kashagan field, which is being developed by ENI/AGIP-KCO, which holds 18.52% of the shares. It has six other shareholders - ExxonMobil (18.52%), Shell (18.52%), Total (18.52%), ConocoPhillips (9.26%), Kazmunaigaz (8.33%) and Inpex 8.33%). It is the largest oilfield that has been discovered worldwide in the last 30 years, and is now expected to cost about $130 billion to develop. It was originally scheduled to open around 2008, but there has been a series of delays, and it is now unlikely to come on stream before 2012 at the earliest. Even this date may prove to be optimistic, as a dispute between the government and AGIP over environmental problems, continuing delays and soaring costs had halted operations at the time of writing (October 2007);
- Tengiz, on the north east shore of the Caspian, which is the largest field currently in operation. It is owned by ChevronTexaco (50%), ExxonMobil (25%), Kazmunaigaz (20%) and LukArco (5%);
- Karachaganak, an onshore field north of the Caspian Sea on the Russian border near Russia's Orenburg oilfield and refinery. It is owned by AGIP of Italy (32%), BG UK (32%0, Chevron (20%) and Lukoil (15%);
- Kurmagazy, on the maritime border between Kazakhstan and Russia, to the west of Kashagan. It is the least developed of Kazakhstan' new oilfields. It is being developed by Kazmunaigaz (50%) and the Russian oil company, Rosneft (50%); and
- Others, including the Kumkol, Aktobe, Uzen and Emba oilfields.

Several forecasts of production by oilfield have been made by the government, but the most recent information provided by Kazmunaigaz is shown in Table 24:

[1] The forecast of total **production** including crude oil used in domestic refineries is 94 million tonnes in 2010, 143 million in 2015 and 181 million tonnes in 2020; but some of this would be used in domestic refineries.

[2] The government's target has been reduced from 150-175 million tonnes, partly because of delays in the development of Kashagan.

Table 24 Forecast Breakdown of Kazakhstan's Oil Production (a) by Field up to 2020 (million tonnes)

	2010	2015	2020
Kashagan	0	30	56
Tengizchevroil	25	41	50
Others (b)	69	72	75
Total	**94**	**143**	**181**

(a) The production figures include oil used in local refineries as well as exports.
(b) Including Kumkol, Uzen, Aktobe, Karachaganak, Kurmangazy, Emba, etc.

Sources: Kazmunaigaz and others, with some adjustments and assumptions related to the continuing delays in production, especially at Kashagan

4.1.2 Pipelines, Ports and Railways Competing for Kazakh Oil Exports

At present the oil is exported via five main routes, and they will soon be joined by two more. The five main existing routes are as follows:

- The ***CPC pipeline***, which opened in 1999, and now handles about half of Kazakhstan's exports. It is nearly 1,600 km long and runs from the Tengiz oilfield to the port of Novorossiysk. It is owned by ChevronTexaco (15%), LukArco (Russia/US, 12.5%), Rosneft-Shell (Russia-U.K./Netherlands, 7.5%), ExxonMobil (US, 7.5%), Oman (7%), Agip (Italy, 2%); BG (U.K., 2%), Kazakh Pipelines (1.75%), Oryx (U.S, 1.75%), and various Russian (24%) and Kazakh interests (19%). Its Phase I capacity is supposed to be 565,000 bbl/d (or 28 million tonnes p.a) but it is handling slightly more in practice. The original plan of the western shareholders was to expand capacity to 1.34 million barrels a day (67 million tonnes p.a.) by 2015, at a cost of $1.6 billion. The expansion would involve the construction of 15 new pumping stations, 12 additional tanks and a third loading buoy at CPC's Marine terminal at Novorossiysk. The Phase II expansion, however, requires Russia's approval, as the pipeline passes mainly through Russian territory and its ownership is about one third Russain). But Russia is currently reluctant to grant its consent. In fact, the Russian authorities have been creating tension by threatening to withdraw CPC's operating licence, by demanding high back taxes from the CPC and by insisting that the fees should be increased. They have has raised several issues with the CPC Consortium, and the CPC shareholders have already agreed to lower the interest rate on the producing companies' loans from 12% to 10.5%, to accept the "deliver or pay" principle, to establish the Board of Directors and grant equal status to all lenders, to increase pipeline transportation tariff from $28.33 per ton to $30.83. There are, however, still some unresolved issues, including the refusal of the shareholders to accept Russia's proposal to introduce a tariff revision mechanism. The concern is that this would introduce too much uncertainty into producing companies' business plans. As a result the negotiating process has stalled.

  Nevertheless, it was reported in the press in May 2007 that Presidents Putin and Nazarbayev had agreed to an expansion. The reports, however, were inconsistent. Some suggested that the agreement was for an expansion to 40 million tonnes, others suggested that it was to over 60 million tonnes and others stated that there was no agreement. Despite their opposition, the expansion of the pipeline would clearly have some advantages for Russia: it would send more oil via Russian territory in a pipeline with a significant Russian share; it would increase Russian revenues from the pipeline; and it would give Russia more potential ability to "turn off" the oil. It would also divert Kazakh oil from the independent BTC and Batumi rail route. It might be considered surprising that these advantages appear to be outweighed by the facts that (i) the Russians consider that the CPC tariffs are too low, (ii) interest rates on the loans for construction are too high, (iii) the pipeline assists one of their competitors' (i.e. Kazakhstan's) oil exports and (iv) that the pipeline is making a large loss. It might be speculated that Russia' eventual aim is to have the pipeline closed down on the grounds that it is accumulating losses, and then renegotiate the ownership to give Russian

interests a much larger share. The assumptions made for forecasting purposes, however, are that *the CPC will have a capacity of 40 million tonnes by 2010 and 67 million tonnes p.a by 2015.*

- The ***Atyrau-Samara*** pipeline carries the second largest volumes into Russia. Prior to the opening of the CPC opening this was the main outlet for Kazakh oil exports;
- Modest volumes of oil are exported into Russia ***by pipeline from the Karachaganak*** oilfield in the north east of Kazakhstan, close to the Russian border;
- China is now starting to take increasing volumes of oil. A ***pipeline from Kazakhstan to China*** is being constructed in stages and the capacity is scheduled to reach 20 million tonnes within five years. The oil likely to be diverted includes the Kumkol production of Petrokazakhstan, which has been taken over by a Chinese oil company.
- Most of the rest of the oil is currently exported via the **port of Aktau**. The destinations of the Aktau exports in 2006 were **Iran** (40%), **Makhachkala**, Russia (35%) and **Baku**, Azerbaijan (25%). Until recently, the oil unloaded at Baku had been transported onwards to the world's shipping lanes on the Black Sea and the Mediterranean via three routes – the **Baku-Supsa pipeline** (5 million tonnes p.a), the **Baku-Novorossiysk pipeline** (5 million tonnes p.a.) and **by rail to the port of Batumi in Georgia**. However, a large part of this oil will be diverted to the ***50 million tonnes p.a. Baku-Tbilisi-Ceyhan pipeline*** (length, just over 1000 miles) which opened in 2005. This pipeline is the largest in the region. Its capacity is greater than is needed for Azeri oil exports and the Kazakh Government has recently signed an agreement for up to 30 million tonnes p.a. of Kazakh oil to be exported via this pipeline.

Two other new routes will become important in the near future. They are:

- A ***new port at Kuryk***. Plans have been announced for a new port with single buoy moorings (SBMs) for oil exports at Kuryk, 70 km south of Aktau (loading at the Kashagan oilfield is reportedly not possible in winter due to ice). It will require a 700 km pipeline from Eskene, close to the Kashagan oilfield, to Kuryk, and SBMs at the receiving ports. The initial reports suggested that they will use 60,000 dwt tankers but more recent reports suggest that the KCTS group, which is developing the plans for the ports (the group includes Agip, Chevron, ExxonMobil, Lukarco, KMG and Total), are now reconsidering the ship size, and could even use 12,000 dwt tankers, the same size as those using Aktau. The decision will be made on the basis of calculations trading off economies of size with larger tankers against the cost of constructing the SBMs in deeper water. The operators will be Kazmunaigaz, Kazmortransflot and AGIP. The initial capacity of the pipeline from Eskene to Kuryk will be about 23 million tonnes p.a. in the early years, and it will eventually be expanded to about 56 million tonnes, according to the most authoritative source contacted, Kazmunaigaz, (It is noted that the 56 million tonnes capacity is the same as Kazamunaigaz's forecast of their own level of production in the period 2015-2020)
- Shipment by ***rail to the port of Odessa***. Tengizchevroil has recently ordered 12,000 rail wagons for this purpose.

The capacities, costs and lengths of the pipelines are summarised in Table 25. Their locations are shown in Maps 1 and 2.

In 2006 the volumes of Kazakhstan crude oil exports using each route were estimated as follows, according to KOGIG:

Table 25 Estimated volumes of crude oil by pipelines 2006

	Million tonnes
CPC pipeline, Tengiz-Novorossiysk	24.5
Atyrau-Samara pipeline	16.5
Atyrau-Orenburg refinery (Russia)	2.5
Atasu-Alashankou (China)	2.2
Aktau port to Baku, Neka and Makhachkala	9.7
Others	2
TOTAL	**57**

(a) Almost 10 million tonnes are shipped from Aktau, but only 2.4 million tonnes went to Baku in 2006, with 7.4 million tonnes going to Iran and Makhachkala.

Map 1: Map of Oil Pipelines and Fields adjacent to Caspian Sea

Map 2: Map of Oil Pipelines and Fields adjacent to Caspian Sea

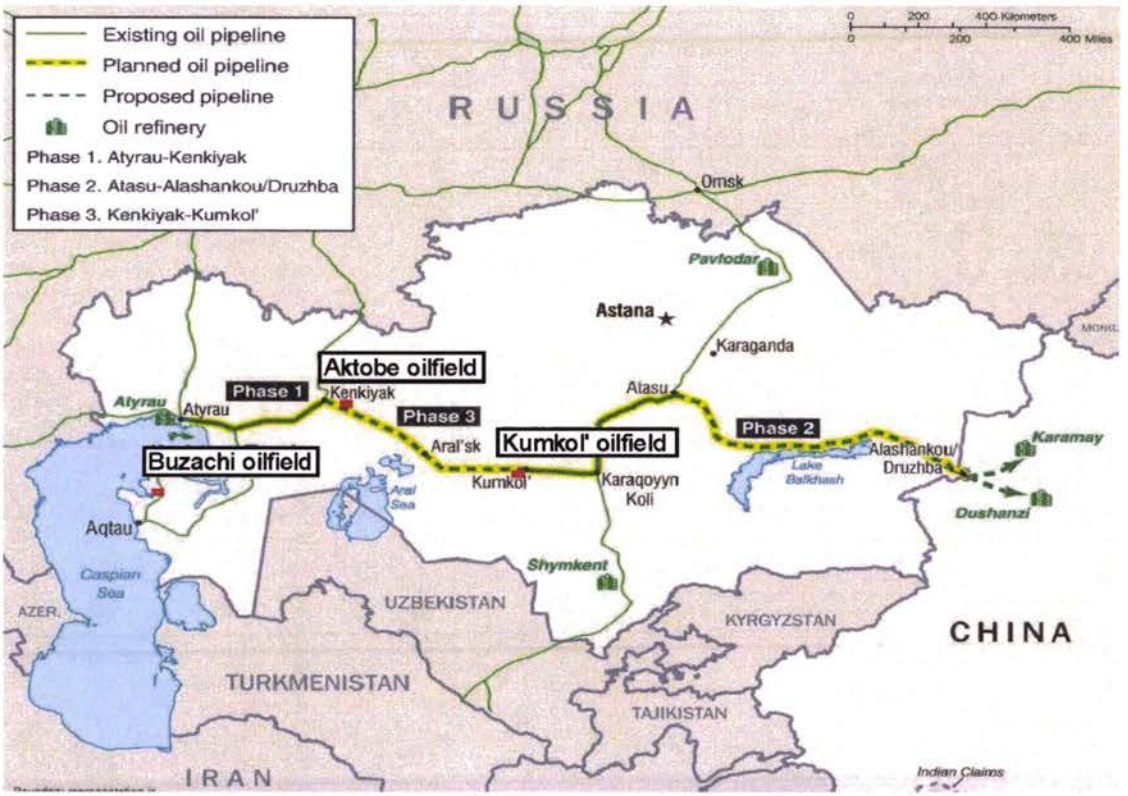


Table 26 Existing and Planned Pipelines in the Caspian

Name	Route	Capacity (tonne p.a).	Length	Cost
EXISTING PIPELINES				
Caspian Pipeline Consortium (CPC)	Tengiz oil field (Kazakhstan) to Novorossiisk	30 Planned: 50	990 miles	$2.5 billion for Phase 1 $4.2 billion total when completed
Baku-Ceyhan ("Main Export Pipeline")	Baku to Ceyhan (Turkey)	50	Approx 1,038 miles	$2.9 billion
Atyrau-Samara Pipeline	Atyrau (Kazakhstan) to Samara (Russia), linking to Russian pipeline system	15	432 miles	
Baku-Supsa Pipeline (AIOC "Early Oil" Western Route)	Baku to Supsa (Georgia)	Upgraded to 7	515 miles	$600 million
Baku-Novorossiisk Pipeline (Northern Route)	Baku via Chechnya (Russia) to Novorossiisk (Russia)	5 possible upgrade to 15	868 miles; 90 miles are in Chechnya	$600 million to upgrade to 300,000 bbl/d
Baku-Novorossisk (Chechnya bypass, with link to Makhachkala)	Baku via Dagestan to Tikhoretsk (Russia) and Novorossiisk	6	204 miles	$140 million

PLANNED PIPELINES				
North Caspian to Kuryk	Iscene to Kuryk	23-56	450 miles	$1.5 billion
Central Asia Oil Pipeline	Kazakhstan via Turkmenistan and Afghanistan to Gwadar (Pakistan)	50	1,040 miles	$2.5 billion
Iran-Azerbaijan Pipeline	Baku to Tabriz (Iran)	10	N/A	$500 million
Iran Oil Swap Pipeline	Neka (Iran) to Tehran (Iran)	9	208 miles	$400 million to $500 million
Kazakhstan-China Pipeline	Aktyubinsk (Kazakhstan) to Xinjiang (China)	20	1,800 miles	$3 billion to $3.5 billion
Kazakhstan-Turkmenistan-Iran Pipeline	Kazakhstan via Turkmenistan to Kharg Island (Iran) f	50	930 miles	$1.2 billion
Khashuri-Batumi Pipeline	Dubendi (Azerbaijan) via Khashuri (Georgia) to Batumi	3.5	Rail system from Dubendi to Khashuri, then 105 mile pipeline from Khashuri to Batumi	$70 million for pipeline renovation
Trans-Caspian (Kazakhstan Twin Pipelines)	Aktau (western Kazakhstan, on Caspian coast) to Baku; could extend to Ceyhan	N/A	370 miles to Baku	$2 billion to $4 billion (if to Ceyhan)

Source: USEIA

4.1.3 AISCP's and Other Forecasts of Oil Traffic at Aktau

The AISCP's current forecast of oil traffic at Aktau, which was based mainly on information received from the oil companies, is shown in Table 27.

Table 27: AISCP Forecast of Oil Traffic via Aktau ('000 tonnes)

	2007	2008	2009	2010	2011	2012	2013	2014	2015
Name of Companies									
Agip					*5,000*	*7,000*	*7,000*	*7,000*	*7,000*
Tengis Chevron	*1,000*	*2,000*	*2,000*	*2,000*	*4,900*	*4,900*	*5,100*	*5,300*	*5,900*
Buzachi Operating LTD OK	1,500	2,400	2,600	3,100	3,100	3,000	3,000	3,000	3,000
Karagambasmunai OK	1,300	1,300	1,300	1,300	1,300	1,300	1,300	1,300	1,300
Mangistau Munaigas OK	1,200	1,200	1,300	1,300	1,300	1,300	1,200	1,200	1,200
JV Kazgermuny some to china	2,000	2,000	2,000	1,700	1,500	1,500	1,300	1,100	900
Maersk Oil Kazakhstan	400	500	600	700	900	900	1,000	1,000	600

CNPC Aktobe Munygas Off to china	1,500	600	600	600					
Petro Kazakhstan	500								,
TOTAL	**9,400**	**1,0000**	**10,400**	**10,700**	**18000**	**19,900**	**19,900**	**19,900**	**19900**

Source: AISCP

Much of the traffic shown in Table 27 is from local oilfields, including Mangistau Munaigas, Karagambasmunai and Buzachi, which have been using the port for several years. In 2006, 40% of Aktau's exports came from the Kumkol field to the east near the Aral Sea, and 25% from the local Buzachi field. The traffic from these fields is considered to be relatively captive, except that some will go to China in the future (see next section).

The additional traffic shown in the AISCP's forecast from 2010 onwards, however, comes mainly from two sources - ***AGIP/Kashagan*** and ***Tengizchevroil*** in the north Caspian.

Unfortunately almost all the forecasts of Kazakhstan's oil routeings that have been published in recent years – not only AISCP's forecasts - have tended to seem outdated within a year. There are several reasons. First, new options become available (e.g. the construction of the port at Kuryk). Secondly, some Kazakhstan-based companies have been taken over by Chinese interests, which will divert the exports to China rather than moving the west. And, thirdly, new routes have been identified; e.g. Tengizchevroil has recently identified the rail route to Odessa as a serious contender.

Another reason for the disparity between forecasts is that different organisations have their own interests, partly political and partly commercial. This was confirmed in a wide range of discussions with the main "players" – Agip, Tengizchevroil, Kazamunaigaz, Kazmortansflot, the Ministry of Transport, etc. The following paragraphs, which summarise some of their main views and forecasts, highlight the large element of disagreement between them:

Forecasts of main ministries and government shipping lines:

- The MOTC stated that the seaborne oil exports would be split 50/50 between Kuryk and Aktau, with ***20 million tonnes each***. They stated that the Ministry of Energy had been involved in this decision and that the government guarantees these traffic volumes; "it is state policy".
- The Ministry of Energy's most recent forecast, on the other hand, shows Aktau's oil traffic at ***only 7-9 million tonnes*** throughout the next 10 years. Their forecast, however, seems rather out of date. In particular they do not take into account the current plans of Tengizchevroil (TCO), which will be the largest exporter for many years to come. TCO is well-known to be planning to (i) send a large part of their oil to Odessa, (ii) at least 5 million tonnes to Aktau for several years and (iii) lower volumes to the CPC than shown in Ministry of Energy forecasts (58 million tonnes by 2012) because the go ahead for the expansion of the capacity to handle the volumes shown had not yet been given.
- Kazmortransflot (via the MoTC) took a middle view. They stated that here was "a ***possible*** increase to ***20 million tonnes*** of oil p.a." at Aktau, based on the fact that "Tengizchevroil has expressed its interest in transportation of oil through the port of Aktau in the amount of 10 million tons of oil p.a. by the way of reorientation of oil from the Northern route (the port of Odessa)". They emphasised, however, that "Tengizchevroil is willing to consider this route ***(only)*** on condition that oil handling capacity of the port of Aktau should be increased

through modernization of the existing infrastructure and increase in efficiency of transport operations".

- Another forecast by Sheila Farrell Associates, prepared for EBRD in 2006, projected Aktau's oil traffic to increase to a peak of ***17 million tonnes in 2010, falling back to 11 million tonnes by 2015.***

Views of main oil companies on routeing of oil:

- Tengizchevroil stated that they ***will use the port of Kuryk*** when it opens for some of their exports.
- Kazmunaigaz, however, stated that the Tengizchevroil will ***not*** use Kuryk (on the other hand, they stated that Aktau port will have to be expanded, suggesting that it will retain about 20 million tonnes of oil exports, with Kuryk concentrating on Kashagan's light oil).
- AGIP stated that the use of the expected pipeline to Kuryk is ***unresolved***; it will be some time before final access is known with any certainty, but it would be reasonable to expect that the line ***will serve Tengiz*** and Kashagan well as potentially other producing fields in Kazakhstan. It is in the nation's interest to ensure all of their oil can be exported by as many routes as possible (including Aktau).

Against this background it is not surprising that AISCP's forecast is questionable.

4.1.4 Most Likely Future Routeing of Exports

The following forecast of Aktau's future oil traffic was based on a full review of recent forecasts and discussions with the main exporters and transport companies.
The exports are examined in three categories:

- Local oil fields
- Kashagan
- Tengiz

Local Oil Fields

In recent years Aktau's oil exports have came mainly from within a few hundred kilometres of the port. In 2006, 40% of the exports came from the Kumkol field to the east near the Aral Sea (see map 2), and 25% from the local Buzachi field.

Aktau is likely to lose some of this local traffic. It will divert to China, because their owners have been taken over by Chinese companies, and the last links of the pipeline from Kazakhstan into China have now been given the go ahead. These pipelines China will have a capacity 10 million tonnes by 2010 and 20 million tonnes within 5 years. They will supply China with Kazakh oil, especially from the Aktyubinsk region and from the Kumkol fields of the newly acquired company, PetroKazakhstan.

The main oil companies likely to divert their Kazakh oil to China are:

- PetoKazakhstan, which has been bought by the Chinese oil company CNPC. The completion of the Alasu-Alashankou pipeline in 2005 will encourage the diversion of this oil to China.
- Aktobe Munaigas which has been majority owned by the Chinese oil company CNPC since 1997. It has reportedly been exporting oil from the Aktobe / Zhanazhol fields via the CPC

pipeline, but will divert most of its exports to China after the Kekiyak-Kumkol pipeline is completed.

- Karazambasmunai, which was purchased by a Chinese conglomerate, CITC, in December 2006.
- Kazgermuny, which is located close to Kumkol, and may also take advantage of the proximity of the new pipeline into China.

This is likely to leave only about 6 million tonnes to be exported from existing customers such as Buzachi, Karagambasmunai, Mangistau Munaigas and various traders.

It has been reported that the diversion to China has already started. Aktau's traffic having fallen from an average of 825,000 tonnes per month in 2006 to 550,000 in September 2006.

There is also a further danger. Some of the remaining oils are very heavy, having APIs as low as 19 degrees, and the traffic in heavy oils could be threatened by the fact that there may be a scarcity of light oils to blend with them. For example, the Makhachkala pipeline needs light oils to blend with the local heavy oils (Makhachkala has become more attractive as a destination since it upgraded to accommodate 12,000 tankers 2 years ago). The local oil producers might even have to send the heavy oil up the pipeline to Samara via Uzen. The worst case scenario is that Aktau could end up as a niche port for traders of heavy oils.

To summarise, there is a possibility that only about 6 million tonnes would be left from the existing Aktau customers, and even that oil might be difficult to sell.

This base load of local traffic would increase, on recent growth rates to about 7 million tonnes by 2010 and 9 million tonnes by 2015.

Kashagan

Kazakhstan's largest oil exporter by 2015-2020 will be the Kashagan field. Existing plans are to produce about 23 million tonnes soon after opening and 56 million tonnes by 2020.

The operators of the field confirmed that the vast majority of the Kashagan oil, which will be exported from 2012/2013 onwards, is likely to be routed via Kuryk. (This, however, will not be taken for granted, as the costs via Kuryk are likely to be high, see the final section below for further discussion).

Tengiz

Against this background, the main prospect for additional traffic for Aktau is Tengiz. Tengiz's exports have unexpectedly remained static in 2007, at around 13 million tonnes, but current plans are to ramp up exports to a new level of about 26 million tonnes from 2008 onwards. Of this total, TCO current intentions are to send about:

- 13 million tonnes via the CPC;

- 8 million tomes via Odessa (in 12,000 wagons that TCO has ordered for the purpose); and

- 5 million tonnes via Aktau. The Aktau shipments are expected to start low and reach 5 million tonnes within a couple of years.

The cost of the shipments via Odessa, however, will be higher than via Aktau (see below).

Implications for Aktau

These current pans suggest a minimum traffic level of about 11 million tones at Aktau by 2010 – consisting of 7 million tonnes of local oil and 5 million tonnes of Tengizchevroil (TCO) oil.

However, Aktau is in a position to attract additional shipments because of its lower costs – especially if it improves its facilities and operational standards.

First, Aktau could attract back some of the 8 million tonnes which are currently lined up for Odessa. The costs via Odessa will be very high, at around US$60 per barrel, while the costs via Aktau would be in the range $21-40 per tonne (see Annex 5). Discussions with exporters suggested that the actions necessary to win traffic from Odessa would include the following:

- Improvements to the ageing breakwater
- Rehabilitation of berths 4-5
- Introduction of more spacing between berths 9 and 10
- Reduced time for documentation, etc
- Enhancement of the pumping capacity, and also proper metering, segregation.
- Price reductions.
- Introduction of more 12000 dwt tankers, which handle more per gross hour in port.

If Aktau is not able to attract a large part of the traffic currently earmarked for Odessa (in the absence of any guarantee of sufficient capacity at Aktau) these oil exports would have to have to bear an additional cost of at least $20 per tonne – i.e about $160 million p.a. for the 8 million tonnes scheduled for Odessa. *The high cost TCO is willing to pay to export via Odessa can be regarded as a measure of the acuteness of the problem of insufficient transport capacity out of the north Caspian.* This will be reflected in the economic evaluation, which will estimate the cost savings resulting from exporting via Aktau rather than Odessa.

Secondly, despite the apparent commitment of Kashagan's exports to Kuryk, that route will have higher costs than Aktau, at least in the early years when traffic volumes are not as high. The additional cost via Kuryk is estimated at about $8 per tonne (see Annex 5 for details). Consequently, market forces should allow Aktau to win at least modest volumes of traffic from Kashagan.

Finally, it should be emphasised that one other consideration is very important. Both the main operators stated that efficient, safe operations are of prime importance. The key to success therefore lies to some extent in Aktau's hands.

On this basis the most likely breakdown of future oil traffic by route is calculated on three main sets of assumptions in Tables 28 to 30, with the main assumptions given in the footnotes. As shown:

- Scenario A: With Aktau winning traffic back from the Odessa route and Kuryk handling only Kashagan's exports Aktau traffic would peak at about 23 million tonnes just before Kuryk opens and then settle down to 14-17 million tonnes. ***This would be the least cost scenario***, as routes via Aktau have lower costs than via Odessa or Kuryk (as will be demonstrated in the economic evaluation).
- Scenario B: With Aktau ***not*** winning traffic back from the Odessa route and Kuryk handling only Kashagan's exports, Aktau's traffic would reach peaks of 18 million tonnes and 19 million tonnes respectively just before the opening of the CPC extension and the Kuryk pipeline, and then settle down in the range 8-11 million tonnes.
- Scenario C: If Kuryk and its pipeline were designed to handle Tengizchevroil as well as Kashagan exports it is estimated that Aktau's traffic would peak at 16 million tonnes, before falling back to around 8 million tonnes.

Table 28: Oil Traffic Forecasts (million tonnes)

A: With Aktau

- Winning traffic back from the Odessa Route;
- Kuryk handling only Kashagan exports.

	2006	2007	2008	2009	2010	2011	2012	2013
CPC (a)	25	25	25	25	34	34	34	34
Atyrau-Samara	17	17	17	17	17	17	17	17
Atyrau-Olden	3	3	3	3	3	3	3	3
China (b)	2	3	4	5	7	10	12	15
Kuryk (c)	0	0	0	0	0	0	5	15
Aktau	**10**	**8**	**11**	**15**	**14**	**20**	**23**	**21**
Odessa			**8**	**8**	**4**	**4**	**2**	**0**
Others	0	1	1	1	1	1	1	1
TOTAL	**57**	**57(d)**	**69**	**74**	**80**	**89**	**97**	**106**

	2014	2015	2016	2017	2018	2019	2020
CPC (a)	42	42	42	42	42	42	42
Atyrau-Samara	17	17	17	17	17	17	17
Atyrau-Olden	3	3	3	3	3	3	3
China (b)	17	20	20	20	20	20	20
Kuryk (c)	20	25	31	37	44	50	56
Aktau	**14**	**15**	**16**	**16**	**16**	**16**	**17**
Odessa	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Others	1	1	1	1	1	1	1
TOTAL	**114**	**123**	**130**	**136**	**143**	**149**	**156**

Assumptions:

a) The CPC pipeline capacity will be expanded to 40 million tonnes p.a. in 2010 and to 60 million tonnes by 2015. The percentage of the pipeline capacity used by Kazakh oil (mainly Tengizchevroil's) was about 85% in 2006, with 15% is dedicated to Russian oil, currently that of Rosneft and TNK-BP. The percentage used by Kazakh oil will be assumed to remain at 85% in 2010 but then fall to 70% by 2015 as a result of Russian demands to expand their share of the ownership of the pipeline.

b) Pipelines to China are scheduled to increase their capacity to 20 million tonnes by 2015, but there are no further expansion plans.

c) The capacity of the Kuryk pipeline planned by Kazmunaigaz is 23 million tonnes in the early years increasing to 56 million tonnes in the period 2015-2020) is the same as Kazmunaigaz's forecast of oil production at Kashagan. The implication is that the Kuryk pipeline is for Kashagan only. This assumption was confirmed to be correct by Kazmunaigaz, but other sources have given differing opinions. The planning of the Eskene pipeline is not yet sufficiently advanced for it to be clear whether oilfields other than Kashagan will have links into the pipeline.

d) It is reported (e.g. by KOGIG) that production is scheduled to remain flat in 2007, mainly because Tengiz has remained at 13 million t.p.a. in the last 3 years, and expects the same in 2007 (well below the expected 20 million). This is claimed to be partly due to Russian interference in the CPC (they are delaying approval of CPC II. The ramp up to Tengiz' second phase of production is being delayed to 2008-9).

Table 29: Oil Traffic Forecasts (million tonnes)

B: With Aktau

- Not winning traffic back from Odessa;
- Kuryk handling only Kashagan exports.

	2006	2007	2008	2009	2010	2011	2012	2013
CPC (a)	25	25	25	25	34	34	34	34
Atyrau-Samara	17	17	17	17	17	17	17	17
Atyrau-Olden	3	3	3	3	3	3	3	3
China	2	3	4	5	7	10	12	16
Kuryk	0	0	0	0	0	0	5	15
Aktau	**10**	**8**	**11**	**15**	**10**	**16**	**17**	**13**
Odessa	0	0	4	8	8	8	8	8
Others	0	1	5	1	1	1	1	0
TOTAL	**57**	**57**	**69**	**74**	**80**	**89**	**97**	**106**

	2014	2015	2016	2017	2018	2019	2020
CPC (a)	42	42	42	42	42	42	42
Atyrau-Samara	17	17	17	17	17	17	17
Atyrau-Olden	3	3	3	3	3	3	3
China	17	20	20	20	20	20	20
Kuryk	20	25	31	37	44	50	56
Aktau	**6**	**7**	**7**	**8**	**8**	**9**	**9**
Odessa	8	8	8	8	8	8	8
Others	1	1	2	1	1	0	1
TOTAL	**114**	**123**	**130**	**136**	**143**	**149**	**156**

Table 30: Oil Traffic Forecasts (million tonnes)

C: With Kuryk and its pipeline expanded to handle Tengizchevroil as well as Kashagan exports

	2006	2007	2008	2009	2010	2011	2012	2013
CPC (a)	25	25	25	25	34	34	34	34
Atyrau-Samara	17	17	17	17	17	17	17	17
Atyrau-Olden	3	3	3	3	3	3	3	3
China	2	3	4	5	7	10	12	15
Kuryk	0	0	0	0	0	0	5	15
Aktau	**10**	**8**	**11**	**15**	**10**	**16**	**17**	**15**
Odessa			**8**	**8**	**8**	**8**	**8**	**6**
Others	0	1	1	1	1	1	1	1
TOTAL	**57**	**57**	**69**	**74**	**80**	**89**	**97**	**106**

	2014	2015	2016	2017	2018	2019	2020
CPC (a)	42	42	42	42	42	42	42
Atyrau-Samara	17	17	17	17	17	17	17
Atyrau-Olden	3	3	3	3	3	3	3
China	17	20	20	20	20	20	20
Kuryk	20	32	39	45	52	58	65
Aktau	**14**	**8**	**8**	**8**	**8**	**8**	**8**
Odessa	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Others	1	1	1	1	1	1	1
TOTAL	**114**	**123**	**130**	**136**	**143**	**149**	**156**

Risks

The forecasts shown in Tables 28-30 are subject to the following risks.

- The CPC could be expanded more than assumed in Table 28-30. If so it would probably take at least part of the Tengizchevroil oil which would otherwise make up a significant share of Aktau's expected traffic.
- New pipelines may be built. Possibilities include (i) a 50 million tonnes p.a. pipeline from Kazakhstan to Iran via Turkmenistan; (ii) a pipeline from the Kumkol field to the port of Turkmenbashi; and (iii) a Trans-Caspian pipeline under the sea (see footnotes at the beginning of this section for details). The probabilities of these pipelines being built does not appear to be high, but they nevertheless pose some risk for Aktau's traffic volumes.

Strengths and Advantages of Aktau

On the other hand, there are several factors favourable for Aktau:

- Aktau's berths are already full, and Kuryk is unlikely to be built before 2013. Consequently, there is a very urgent need for additional capacity during the period 2009-2013 - 2009 being the earliest date at which Aktau's new oil berths could be completed and 2013 being the earliest date at which the port Kuryk is likely to open, as it will not be opened before Kashagan starts production. The only option during thos period is the expensive Odessa route.
- Tengizchevroil (TCO), despite apparently supporting the new port at Kuryk, has sent a written request to the AISCP to route 5 million tonnes p.a. via the port, at least until 2013, and a contract is reported to be under negotiation. TCO is requesting some exclusivity for berths N4 and 5 and some other concessions if it is to ship oil again via Aktau from 2008.

- The Kuryk route will be very expensive during its early years. Aktau will be able to offer lower costs, and if the two ports end up competing in the market Aktau will have the advantage.
- Here was a consensus amongst the organisations contacted, including Kazmunaigaz, that Aktau's new oil terminals were necessary and should be built.

4.2 Steel

Exports to Iran

Steel exports to Iran account for almost all of Aktau's dry cargo.

Kazakhstan produced 4.1 million tonnes of steel in 2006, mostly for export. The main exporter is a plant run by Mittal, the world's leading steel company. Kazakhstan's steel production had fallen sharply after independence, but revived strongly after LMN Mittal took over the country's largest steel plant in 1995 and invested $1billion, doubling production.

The Mittal plant is located at Termirtau in the east of Kazahkstan, and the second largest plant, the Castings LLP steel mill, is also located in the east, north of Almaty, at Pavlodar. It opened in 2001 to exploit casting facilities in an old tractor production plant and currently produces 0.3 million tonnes, but is expected to expand to 0.7 million tonnes per annum.

The main destinations of Kazakhstan's steel exports are China and Russia, but about a quarter is transported from the steel plants to Aktau by rail, and then exported to Iran. Aktau handled 0.95 million tonnes of steel in 2006.

The steel exports from Aktau have been relatively static in recent years, as shown in Table 31.

Table 31: Steel Exports at Aktau, 2004-2006 ('000 tonnes)

	Ispat	Casting	Other	Russian	Total
2004	719	209	7	20	955
2005	683	149	21	105	958
2006	608	287	47	5	947

Future growth will depend on Iranian demand for steel imports, which has been increasing. Iran produced about 11 million tonnes of steel, and exported about 2 million tonnes in 2006 (see Table 3.9). But despite being the largest producer in the region Iran it is also the largest importer of steel, accounting for one third of steel imports to the Middle East. A combination of exports and imports by major steel producing counties is not unusual, as reflected in a recent statements by a spokesman for the Iranian steel industry that "steel products are quite diverse and no country is able to supply its entire demand: there is no economic justification in investing in all steel-related areas".

The Iranian imports are likely to continue to increase, as the Iranian government is becoming fewer protectionists. It cut steel import tariffs to 10 percent in 2005, dismissing arguments by the domestic steel producers that a decline in import tariffs would badly affect the national industry. Steel industry officials suggested that if the government did not increase steel import tariffs, almost all steel producing factories would be closed down. But others argued that if the country is to become competitive it should remove import barriers.

Since then imports rose from 7 million tonnes in 2005 to 8 million tonnes in 2006; and the growth continued into 2007. Iranian steel imports almost doubled to 3 million tonnes in the first quarter of 2007 compared to the same period in 2006.

Table 32: Iranian Steel Production, Exports and Imports 2004-2006 (Million tonnes)

	2004	2005	2006
Production	9.4	10.6	11.1
Exports	..	2.5	2.0
Imports	7	7	8

Mittal and Castings have forecast that future exports will rise to about 1.5 million tonnes via Aktau by 2010. This may seems slightly high; as Mittal has no plans to increase production at present (its investment programme is focussing on quality improvements). But Castings is planning an increase in production of 0.4 million tonnes – equivalent to a 10% increase in national production - and the Iranian and Kazakhstan governments recently agreed to an Iranian company constructing a modern steel plant in Kazakhstan.

Given the strong growth of imports into Iran, the fact that the fast-growing Kazakh economy has a well-established steel in Kazakhstan dominated by Mittal, it seems likely that the steel exports via Aktau will increase. But in view of the negligible growth in recent years it will be assumed that future growth will be modest, at around 5% p.a. On this basis Aktau's steel exports are projected to increase as shown in Table 33.

Table 33: Forecast of Steel Exports via Aktau

	(000 tonnes)
2006	947
2010	1,151
2015	1,469
2020	1,875

Exports to Europe

Mittal Steel also exports steel products to Europe, but they are shipped directly to the port of Novorossiysk by rail. The transport cost via Novorossiysk is estimated to be $15-20 per tonne less than via Aktau and Georgian ports, so there appears to be little prospect of attracting this cargo to Aktau.

4.3 Grain

Kazakhstan is the fifth largest wheat producing country in the world. It produced 16 million tonnes of grains in 2006, and production is forecast to increase to 20 million tonnes in 2010/11, according to the President's Program.

About 35-40% of the production (just over 6 million tonnes) was exported in 2006.

About 70% of the wheat is grown in the north of Kazakhstan on the border with Russia, and in the 1990s about 90% of the grain produced in Kazakhstan was exported to Former Soviet Union countries.

Today the destinations are more diversified. Russia takes about 2 million tonnes; about 800,000 tonnes are exported to the west via Ukrainian ports; Iran takes about a million tonnes; and over half a million tonnes go to Azerbaijan. Almost all of the traffic leaves Kazakhstan by rail. But minor volumes are shipped to Iran by sea.

In 2001 a bilateral contract was arranged for Kazakhstan to export 2 million tonnes of grain to Iran through Aktau. There were also negotiations about the use of the port of Aktau to ship Kazakh grain to Azerbaijan where a new grain facility has recently been opened. At the time,

grain producers believed that export volumes to Iran would be boosted by the construction of a railway link between Altynsarino and Khromtau that would shorten the export route by half.

To handle these exports, Aktau the government-owned grain export company "JSC Ak Bidai – Terminal", which has sold grains to 46 countries, built a specialised grain berth, with a silo capacity of 25,000 tonnes, at Aktau.

In the event, the grain traffic has never materialized. About 200,000 tonnes were handled via Aktau in 2002, but after that it declined.

Over the last five years, however, Aktau's grain exports have slowly started to increase (see Table 34).

Table 34 – Grain Exports via Aktau, 2001-2006 ('000 tonnes)

2003	2004	2005	2006	2007
5	13	33	118	180(a)

(a) JSC Ak Biday estimate for 2007
Source: AISCP for 2002-2006

Building on this recent growth, JSC Ak Biday has drawn up a strategy which, if successful, would result in much higher volumes being shipped via Aktau. The following paragraphs outline this strategy.

The closest markets available to Kazakhstan's grain exporters are in Azerbaijan and Iran, where the total requirement for imports is around **3-4 million tonnes p.a.** Of this total:

- Azerbaijan imports about 1 million tonnes p.a., from both Russia and Kazakhstan. Overall they share the market about half and half, but the shares vary year by year.
- Iran imports about 3 million tonnes (including all grains, not only wheat). But while Azerbaijan is fully dependent on Kazakh and Russian grain, Iran is not: it also imports from Canada and Australia - via Panamax ships at Arabian Gulf ports.

Other countries bring Kazakhstan's total grain export market up to **6-8 million tonnes p.a**

Of this total, the main movements of exports in 2006 were as follows. Almost all were transported by rail, including:

- About 700,000 tonnes were exported to Azerbaijan – but all went by rail, down the west coast of the Caspian Sea, via the Aksaray and Samur border stations.
- About 1 million tonnes were exported to Iran. Almost 90% of it however was also transported by rail, crossing Uzbekistan and Turkmenistan, to reach Iran. There are, however, problems on the border between Kazakhstan and Iran, at Serax, where the gauge is different and the wagons have to be changed. Delays at the border can add 1-2 weeks to transit times.
- A further 800,000 tonnes were exported to western destinations, after being transported by rail to ports on the Black Sea, mainly in Ukraine.
- Additional volumes were routed via Baltic ports.
- Over a million tonnes were exported to Russia, much of it to Moscow which relies on Kazakhstan's high quality grain for half of its supplies.

The terminal operators consider that there are three main reasons for so little grain having used Aktau. First, until recently it was necessary to cross the border into Russia for part of the journey from Northern Kazakhstan to Aktau; but the new Kromtau rail link now avoids the need for this diversion. Secondly, the inefficient KTZ rail operations at Aktau add to costs. And, thirdly, the rail tariffs from Northern Kazakhstan to Aktau are high. As shown in Table 35 total

transport costs to the Ukrainian Black Sea ports are $20 per tonne lower than via Aktau-Baku-Poti.

Table 35: Comparison of Grain Export Transport costs via Aktau versus Ukrainian Ports ($/ tonne, in 60 tonne wagons)

	Northern Kazakhstan (Kovylnaya) to Ukrainian ports		
KzRW	Kovylnaya – Tobol		4.3
RRW	Tobol – Solovey		28.9
UzRW	Topoli - Ukrainian ports		15.05
Total			**48.25**
	Northern Kazakhstan (Kovilnaya) to Poti via Aktau		
KzRW	Kovylnaya – Aktau		18
	Expenses in Aktau (port charges, station services, Customs and etc.)		14
	Baku-Aktau ferry		14
	Expenses in Baku (port charges, station services, etc.)		6
AzRW	Baku- Beyuk-Kiasik		8
GRW	Garbadani – Poti		8
			68

Sources: JSC Ak Biday, Scott Wilson

JS Ak Biday's current targets are:

- to win 50% of the Azeri and Georgian markets;
- to export 1 million tonnes p.a. to Iran; and
- to route a much larger part of this traffic via Aktau.

For this purpose JSC Ak Biday is setting up three new silos at Poti (cost, $18 million), Baku ($12-13 million) and Amirabad ($18 million). Their aim is to provide stockpiles within the consuming countries from which to sell and distribute the wheat. The need to do so is a consequence of the difficulties of trading with the Caspian countries. They include the banking problem that the letter of credit must come from a first class bank and this is difficult, especially for Iranians, to arrange. Consequently prepayment is required in practice.

The foreign silos will avoid these problems by providing a store from which to sell in the markets - making the grain available in the destination country, rather than a distant and complicated location outside the country. The future trade with Iran should also be assisted by the fact that grains trade in Iran, which had previously been in government hands, has now been liberalised and largely privatised. On the Kazakh side, grain trades have been free for many years, with economics deciding sales and routings. Although there are still bilateral government agreements, business is the main driver. Government only role in practice is to help with permits etc.

The location of the three silos will strengthen the switch from rail to sea transport, as they are all on the coast.

On this basis grain traffic is forecast as follows:

Table 36: Forecast of Grain Exports at the Port of Aktau (000 tonnes)

	(000 tonnes)
2003	33
2007	180 (a)
2010	400
2015	1,000

(a) Estimated by JSC Ak Biday

The existing silos at Aktau (capacity, 600,000 tonnes p. a.) would be able to handle these traffic volumes up to about 2012, but if the 2015 export target of 1 million tonnes p.a is achieved a new silo would be required.

4.4 Minerals

Kazakhstan exports several different minerals to Europe, and it might be expected that part of this traffic could be attracted to TRACECA routes via Aktau, for shipment to Baku and then on to Georgian ports.

In practice, however, it appears that ***most of the exports with destinations in the west go overland to Novorossiysk and other ports by rail***. In particular:

- About 2 million tonnes of coal are exported to Europe and Turkey, but not via Traceca routes. The route used is by rail to Novorossiysk. Coal transport through the TRACECA corridor at current rates [3] is $20-25 higher per tonne than via Novorossiysk.
- Ferro-alloys production is concentrated around Aktau, the main producer being Kazkhrome. The annual export volumes exceed 900,000 tonnes but they are routed mainly though Klaipeda to the Netherlands. Thus, although the tariffs applied by Georgian ports, Caspar and the railways of Georgia, Azerbaijan and Kazakhstan seem to be reasonably competitive, the fact that the main consumers are concentrated in Northern Europe limits the transport volumes through TRACECA corridor to about 20,000 tonnes per year.
- Copper is produced mainly by the Kazakhmis Corporation based in Zhezkagan. About 400,000 tonnes per year are exported, mainly to China; and about 150,000 tonnes is transported to Italy and Germany, but they are routed via the ports of Novorossiysk and St Petersburg. Comparisons of existing transport tariffs suggest that the part of this cargo that goes to Italy (more than 20,000 tonnes) could be attracted to the TRACECA corridor if the lower tariffs were applied.
- The main producer of asbestos is Kostanay Asbestos, which has an export potential of up to 200,000 tons per year. About 50,000 tonnes per year is sent to Europe, but is being transported through Novorossiysk port where costs are $20-25 per tonne lower than via the TRACECA corridor.

It is concluded that the unless major reforms necessary to make the Aktau-Baku-Poti route more attractive (see Section 4.11) are implemented Kazakhstan's mineral exports will continue to bypass Aktau.

4.5 Fertilisers

A large fertiliser plant is being reconstructed in Aktau, and the management plans to export large volumes via the port.

[3] 2006 rates

The plant was built by the Soviet government in the 1960s, adjacent to the nuclear power plant on the outskirts of Aktau. Initially it manufactured products from uranium and phosphatic materials, but it later reoriented its production to concentrate on fertilizers. The plant was eventually closed in 1994, but started up again in 2006 after being bought by Aspect (from its previous owner, Kazazot). It is now producing about 250,000 tonnes p.a. of fertilisers and ammonium nitrate.

Aspect will reconstruct the plant with loans of $1.5 billion. The reconstruction will be completed in 2011.

Future production in the period 2011-15 will be around 2500 tonnes/day of urea and 1000 tonnes/day of ammonium nitrate; and after 2015 it will produce another 2500 tonnes/day of urea. The total output will therefore be about 1.2 million tonnes p.a. in the first phase and 2 million tonnes in the second

The raw material is natural gas, from a field near Uzen. The idea of producing sulphuric acid, which was being considered, has now been dropped

It will be the only fertilizer plant in Kazakhstan.

The production will be almost entirely for export (98-99%), as the fertilizers for Kazakh agriculture, which is located mainly in the north, comes from 3-4 Russian fertilizer plants just over the border in Russia.

Urea

The main destinations for the urea will be to the west, in Northern Europe, South America, etc, and it is planned to route it *mainly via the port of Aktau* to Baku and then to Poti or Batumi by rail in hopper wagons. The urea will be transported in powder form (85-90%), with a small amount in big bags.

Another export route which is being considered by Aspect is the Volga Don Canal, but the limited ship size is a problem. There could also be some shipments to the Indian sub continent, via Iran. Although there is little demand in Iran itself there is more in Pakistan (it imports about 2 million tonnes) and India, and Aktau-Iran would be the best route to the Indian sub continent.

The plant intends to switch to sea transport for the urea because the new markets will not be well-located for rail transport. They also expect the route via Aktau to be much more economic than rail routes to Novorossiysk or Ukrainian ports, given the plant's location in Aktau. Aspect is currently paying about $45-50/tonne for rail to the Baltic and $60/tonne for rail to the Romanian border crossing, but expect to pay only $8/t for the Aktau-Baku ferry (in rail wagons) and $10 on the Azeri/Georgian railway, giving a total of $18/tonne fro Aktau to Poti. (This seems optimistic, but even the costs were significantly higher, they would still be well below the costs via other routes.)

On the basis of Aspect's plans and the assumptions that:

1) output will be 75% of the planned urea capacity (fertiliser plants rarely averaged 100% utilization of capacity over a period of years);
2) a modest amount of the fertilisers will be used for domestic purposes; and
3) a minor part of the exports will take all rail routes

exports via Aktau would be around 500,000 tonnes p.a. in the period 2011-2015 and 1 million tonnes after 2015.

Table 37: Forecast of Urea Exports via Aktau

	(000 tonnes)
2010	0
2015	500
2020	1,000

Aspect plan to export the urea in rail wagons, carried by ferry. The volumes required will exceed the capacity of the existing Caspar ferries, and will therefore require additional vessels. There will not, however be a need for additional rail ferry terminal facilities at the port, as the existing terminal is empty most of the week.

Ammonium Nitrate

The ammonium nitrate is currently exported by rail, and will continue to do so. The main markets are in the Baltic region and Eastern Europe (Romania, Bulgaria, etc). The company has 100 special wagons for this purpose.

4.6 Special Economic Zone

Aktau has a major opportunity to expand its role - by becoming a distribution hub for the Caspian. The obvious model is the Free Trade Zone[4] at the United Arab Emirates port of Jebel Ali, which has consolidated a position as the leading commercial centre of the Middle East over the last 30 years. It achieved this by making itself an easy place in which to do business in a region where business is made difficult by bureaucracy, red tape and a lack of commercial traditions. The breakthrough in Dubai was achieved by the rapid liberalization of customs, business practices and entry/visas, together with elimination of taxes on imports and corporations. The similarities between the Middle East in 1975 and the Caspian today – both oil regions - are therefore obvious. But so far no port in the Caspian has emerged to take over a role comparable with that of Jebel Ali, and certainly not Baku or Turkmenbashi, where customs, permits and other paperwork are major impediments to economic activity. The Central Asian Republics, the Caspian and the Caucasus remain very difficult places in which to do business.

In addition, the emergence of an efficient free zone at Aktau could have the further benefit of attracting other industries to the area and assisting in the development of a market economy, as has happened in Jebel Ali. As well as becoming the distribution centre for the Middle East, the Jebel Ali Free Zone has served as a vehicle for diversification away from dependence on oil by attracting industrial plants for aluminum, chemicals, food processing, textiles, footwear, electronics, etc. (The Aktau SEZ staff confirmed that one of its aims is to diversify economic activity to make Kazakhstan less dependent on oil.)

The setting up of a Free Zone or SEZ, however, does not guarantee success. Most countries have Free Zones, but there have been many more failures than successes. For example, Africa has a large number of Free Zones, but none are successful. The success of the Aktau SEZ will therefore require a high level political intervention and commitment by the tax authorities, customs and the immigration department to create a genuinely deregulated working environment.

There are also negative features. Costs can be high (Jebel Ali cost $2.5 billion to build in the 1970s); and business can take a long time to build up. Also, from a ports viewpoint, the cargo volumes, despite being of high value, are often low in weight terms; and they may be transported by air rather than via ports.

Aktau's Special Economic Zone was set up in 2002/3 and now has three areas (total, 720 hectares) within the city. In addition, the port has SEZ status.

[4] The difference between Free Trade Zones and Special Economic Zones (which were pioneered in China) is that Free Trade Zones tend to limit their concessionary terms and conditions to exports, while Special Economic Zones also cater for goods produced for the local market. In most ways, however, they are very similar.

Its terms and conditions are similar to those offered in other countries, including Jebel Ali. In particular, there are:

- No import duties, although this concession applies only to a selected list of goods,
- No corporation tax,
- No property tax,
- No VAT or customs duties on goods imported for personal needs.

Plots of land are leased out to occupants for the duration of the SEZ, which was originally up to 2015, although it has been reported that a 25 years extension being considered by the government. The occupants have a right to purchase the land after the SEZ regime is terminated.

The Aktau SEZ has made has modest progress so far. The projects planned at the SEZ are shown in Table 38. As shown, the main projects are dominated by metal products and machinery, with a bias towards the oil industry.

Only two or three of the projects, however, are expected to generate exports (see Table 38). They are pharmaceuticals and battery projects. Another, Mittal steel, is shown as a potential exporter by the SEZ, but not by its website (see footnotes to Table 38).

It is concluded that the SEZ is now starting to attract investment after a slow start, but that no significant port traffic will be generated in the near future by the nine projects committed so far. The only two potential exporters, the pharmaceuticals and batteries factories, produce goods that are of high value but low volume.

Table 38: Projects Planned at the Special Economic Zone

Company/ Agency	Product	Area (hecs)	Expected Start of Operations	Investment ($ million)	Employ ment (staff no)	Production	% for export
Mittal	Pipes	52	2007	32	176	60,000 tonnes	25% (b)
Silicasolar Aktau	Solar batteries	…	2007	142	100	100 megawatts	100%
Chakur	Pharmaceuticals	…	2007	12	180	…	30%
Keppel	Steel construction	44	2005	40	708	7,000 tonnes	…
AEST	Glass fibre pipes	12	2003	5.5	200	400,000 metres	…
Multimodal transport Logistics Centre	Transport/distrib ution centre	200	2008	280	200	3.3 min tonnes in 2010 5 mn tonnes in 2017 (a)	…
Thyssen Krupp-Imstalcon	Metal products	…	2007	16	20	25,000	…
Petrochem Kazakhstan	Lubricants	5	2007	5	50	5000 tonnes, later 15,000 tonnes	…
Danake	Machinery, electric cable…	9	2007	90	1010	77,000	…

(a) A study is being undertaken for JICA but drafts were not made available to the consultants. The traffic figures shown above are clearly optimistic
(b) Information from Mittal's website, however, suggests that the pipes will be for the domestic market, not export.
Source: Special Economic Zone "Morport Aktau"

4.7 New City

A potential source of large volumes of future cargo is the construction of the Aktau New City which is being planned by investors from Dubai. The launching of the project in September 2007 was attended by the President of Kazakhstan, the UAE's foreign minister and the chairman of the Abu Dhabi Cultural and Heritage Authority.

The city will provide attractive living conditions especially for staff working in the fast-growing oil industry, especially at Tengiz and Kashagan, the largest oilfield to have been discovered worldwide in 30 years. It is located 600 kilometres to the north of Aktau, at Atyrau. Atyrau is an unattractive town, muddy in the summer and iced up in the winter, but with a large number of high income employees. In contrast, the New City at Aktau is envisaged as a modern city, "complete with infrastructure and an entertainment industry". The master developer is Kazemir Aktau Development Ltd.

The long term aim is to develop 35-40 square kilometres of land along 10 km of coastline on the northern borders of Aktau, at a cost of $40 billion. The developers have suggested that there could be a city of one million people by 2020, compared with the existing population of about 150,000.

The first phase, however, will reportedly concentrate on 35% of the final area. Up to $7 billion are to be invested within the first five years of construction.

The project will require large amounts of construction materials and when the city is built it will require consumers goods.

The basic construction materials, including cement steel and timber may not use the port. They may well be sourced either internally or overland, as is the case at present (none off these cargoes, which have been required for recent construction projects at Aktau, have entered via the port). The cement is likely to be sourced from Kazakh plants or, if not, from Russia. But imports may not be necessary as there are plans to increase Kazakhstan's production. Similarly, steel is likely to be sourced domestically and, where not, from Russian imports.

Fittings and higher value products, however, would be much more likely to come from sources outside the Former Soviet Union. Given that (i) the investors are from Dubai and (ii) the most successful international construction companies in the region are Turkish it is likely that a large part of the more valuable products and machinery would come from Dubai and Turkey.

The transport route used from Dubai would almost certainly be the route via Bandar Abbas, then by road to the Iranian ports on the Caspian, from which they would be transported to Aktau by sea (i.e. the route currently served by Khazar Shipping). Traffic on this route has been growing at 50% p.a. and is reported to be relatively problem-free.

The dominant transport route from Turkey would be via Baku to Aktau – either by truck or rail wagon. In both cases they would be likely to use the Caspar ferries.

The majority of this cargo would probably be carried in containers, although some of the lower value goods from Turkey may come by rail wagons – with the completion of the link from Kars in north west Turkey improving the competitiveness of the rail services.

There are no construction plans on which to estimate (i) the cargo volumes required, or (ii) whether they would come via Aktau rather than overland, as almost all imports do at present.

However, a very rough guide might be derived from the estimated expenditure of $7 billion over the first five years (see above). If it were assumed that the basic low value construction material

such as cement, steel and timber account for only a minor percentage of this expenditure, it could be assumed that about $1 billion p.a. of higher vale imports would be required. As a very broad rule of thumb $1 million of imports requires about 33 TEU (i.e. the average container holds about $30,000 of goods). And on this assumption an investment of $1 billion p.a would require about 33,000 TEU – or 66,000 TEU if empty outbound movements are included.

On this basis, the traffic required for the new city might be approximated as follows:

Table 39: Possible Order of Magnitude of New Aktau City Traffic, including empty Returns (000 TEU)

	2006	2010	2015
New Aktau City Traffic	0	66	66

The geographical origins and handling methods can only be a matter of guesswork, but for port planning purposes it might be speculated that half of the traffic might come form Dubai and half from Turkey - and it might be spit 50/50 between containers and Roll on Roll off ferries.

Although highly ambitious, this project appears to be taken very seriously, and there would be a major bottleneck if berths were not available to handle the necessary imports.

4.8 Containers

Aktau's container traffic is still very low, with only 1000 containers handled in 2006. But the growth rate is high, at 50% p.a. on the period 2004-2006 (see Table 40).

The main cargoes are building products, oil industry equipment and consumer goods. The containers come mainly from Dubai via Bandar Abbas, then by truck to the Caspian ports of Iran, and on by sea to Aktau. This route has only recently been established but is reported to be relatively problem free by the standards of the Caspian region.

The existing import traffic will be assumed to continue increase at the current growth rate of 50% p.a. up to 2010 and then at 25% p.a. over the next five years. In addition it is assumed that half the requirement for high value building materials will come to Aktau by container via Dubai/Bandar Abbas (see previous section for an order of magnitude estimates of cargo volumes). On this basis container traffic would be as shown in Table 40.

Table 40: Forecast Growth of Existing and New City Container Traffic at Aktau (000 TEU) (a)

	2006	2010	2015
Existing Traffic	1.0	5.1	15.4
New Aktau City Traffic	0	33.0	33.0
Total	1.0	38.1	48.4

(a) The average load per TEU is about 10 tonnes

4.9 Roro Ferries

The Caspian Shipping Company rail ferry to Baku calls twice a week at Aktau. The main cargoes have been oil on the voyages out of Aktau (into Baku) and mixed general cargo on the voyages into Aktau.

Table 41: Caspian Shipping Company Rail Ferry Cargo 2001-2006 (thousand tonnes)

	2002	2003	2004	2005	2006	Growth p.a 2002-06
Aktau-Baku	509	198	230	525	160	-25.1%
Baku-Aktau	83	46	112	103	148	15.6%
Total	592	244	342	628	308	-15.1%

The inbound mixed general cargo will be assumed to continue to grow at the same rate as over the last five years (15% p.a.) until 2010 and at 10% p.a. from 2010 to 2015. The oil traffic to Baku, on the other hand, will be assumed to divert almost entirely to tankers; but it will be replaced by fertilisers from the reconstructed Aspect plant (see section 4.5).

In addition a significant part of the construction materials are likely to come from Turkey, which is the leading construction country in the region (see section 4.7). On this basis rail ferry traffic is forecast as in Table 42.

Table 42: Forecast of Rail Ferry Cargo 2006-2020 (thousand tonnes)

	2006	2010	2015	2020
Baku-Aktau, existing traffic	148	259	417	613
Baku-Aktau, ew City Construction materials	0	330	330	330
Aktau-Baku Fertilisers	160	500	1,000(a)	1,200 (a)
Total	308	1,089	1,747	2,143

4.10 Sulphur

The oil from the region has high sulphur content, and has to be separated from the oil. At present Kazakhstan's oil companies are producing approximately 1.4 million tonnes of sulphur per annum, and there is now a stockpile of about 8-9 million tonnes. The oil companies are under pressure to dispose of it. Consequently, they have started to export it, and have sold about 1.5 million tonnes so far. It has been sold to 50 customers in 22 countries.

The majority of the sulphur is being sent to Ukrainian ports via rail.

This is a cargo for which Aktau could compete. The costs via Aktau are, as shown in Table 43, only slightly above the current cost via Ukrainian ports. But unless the major reforms necessary to make the Aktau-Baku-Poti route more attractive (see Section 4.11) are implemented the sulphur will continue to bypass Aktau.

Table 43: Comparison of Costs of Routeing Sulphur Exports via Ukrainian Ports and Poti ($/tonne in 60 tonne wagons)

Carrier	Kulsary – Ukrainian ports	
KzRW	Kulsary- Aksaraiskaya	5,58
RRW	Aksaraiskaya – Gukovo	20,95
UzRW	Krasnaya Mogila – Ukrainian Ports	19,3
Total		**45,83**
	Kulsary - Poty (via Aktau)	
KzRW	Kulsary – Aktau	7,79
	Expenses in Aktau (port charges + station services, Customs and etc.)	2
	Baku-Aktau ferry	17,5
	Expenses in Baku (port charges, station services, etc.)	1
AzRW	Baku- Beyuk-Kiasik	12,08
GRW	Garbadani – Poti	8,86
Total		**49,23**

Transported in 2006: *Kulsary - Ukrainian ports – 815 000 tonnes*
Aktau- Baku - 0 tonnes

4.11 Corridor Cargoes

Traceca

Since the mid 1990s the EU has been promoting the attraction of cargo to the Transport Corridor Europe-Caucasus-Asia (TRACECA). Its original aims were (i) to revive the transport route via the 'Silk Road' to give landlocked Former Soviet Union countries access to world markets and (ii) to avoid the need to use routes via Russia. It was expected that Aktau would become a key port on the Traceca route

In practice, however, Aktau is currently handling relatively little TRACECA transit traffic other than oil produced in the port's immediate catchment area.

The only *transit* traffic that has been handled at Aktau was steel moving between Russia and *Iran* about five years ago. But this is not a TRACECA route, and in any case it was lost after Russia reduced its domestic rail tariffs to attract the cargo back to Russian ports (this was part of national policy: Russian railways introduced similar tariff cuts in the Baltic to attract steel back to Russian ports). Consequently, steel transit traffic has almost disappeared in the last four years, with the exception of 2004, when 105,000 tonnes were handled.

There are three fundamental problems for the TRACECA routes at present:

- The container shipping services between the Far East and Europe, with which TRACECA would have to compete for transit traffic, are highly efficient and tariffs are lower than 10 years ago. The container freight rate between Hong Kong and North West Europe is only $1500-1800 per 20' container, and the transit time can be as low as 20 days. Even the Trans Siberian route, which is the most problem-free of the land routes between the Far East and Europe, has failed to attract much traffic away from shipping services, despite having been being managed by highly efficient operators. It has been reported that when Russian tariff authorities almost doubled the charges in 2006, it resulted in the collapse of the already minimal cargo volumes from around 100,000 TEU in 2005 to 8,000 TEU in 2006 – which is well below 1% of the Far East-Europe container traffic.

- Traffic volumes from/to Caspian ports are limited by a classic regional trade problem. All the main Caspian countries - Kazakhstan, Azerbaijan, Iran and Russia - have only one major export, which is oil. The other countries do not therefore need Kazakhstan's exports. Conversely, none of the manufactured goods and machinery which Kazakhstan needs are produced in Caspian countries. Instead, they come from Europe, Turkey, Russia and China. In other words, Caspian countries are neither a destination for Kazakhstan's exports nor an origin for Kazakhstan's imports; and trade between the Caspian countries is therefore limited.
- There are alternative *overland* routes to ports located on the Black Sea, running across the northern shore of the Caspian. Brief reference to a map will show that, prima facie, these direct routes appear more attractive than routes involving a switch from rail to a ferry terminating in a landlocked country (Azerbaijan). And in practice Kazakhstan's exporters do prefer to use these *overland routes to Novorossiysk and Ukrainian ports.* In fact there are now *overland movements to Azerbaijan and Georgia,* via Russia. They were assisted by an 80 km railway line which was constructed in Dagestan in 2001-2 in order to bypass Chechnya, and there are now reportedly 8-10 trains per day at the Azeri-Russian border crossing at Samur. The main traffic moving westwards by rail from Kazakhstan in 2006 was as follows:

Table 44: Kazakh Exports Transported to the West by Rail, Bypassing Traceca Routes

Cargo (all by rail, to the port shown)	Tonnes p.a
Grains to Ukrainian ports	800,000
Grains to Azerbaijan (via border crossings at Aksaray and Samur)	700,000
Sulphur to Ukrainian ports	800,000
Fertilisers to Eastern and Northern Europe	250,000
Coal to Europe and Turkey mainly via Novorossiysk	2,000,000
Copper to Europe, transported to Italy via Novorossiysk and to Germany via St Petersburg	150,000
Ferro-alloys tonnes, mainly via Klaipeda to the Netherlands.	900,000
Asbestos to Europe via Novorossiysk	50,000

In contrast, Aktau sends only very minor volumes of dry cargo westwards by sea. They include about 20,000 tonnes of grain. They are carried on the Caspar ferries, which also send about 150,000 tonnes p.a on the return leg into Aktau.

If any significant volumes of the cargoes shown in Table 1 are to be attracted to Traceca routes via Aktau, there will have to be major reforms and lower tariffs on these routes.

There are three main obstacles to attracting Traceca traffic to Aktau.

- So far the Traceca countries have not discounted their rail tariffs significantly to attract transit traffic. In contrast the Russian railways, which are Traceca's main competitors, have been discounting tariffs for several years. They have been reducing prices by up to 70% to recover Russian traffic which was being handled at foreign ports - e.g. in Kazakhstan, Estonia, Latvia and Lithuania. The Russian railways reportedly have a staff of several hundred working on the discounts necessary to attract traffic. The fact that Russia appears to have "stolen Traceca's clothes" by implementing commercial pricing policies first should be regarded as a cause for concern. It is also of concern that although the port of Aktau port

is allowed to discount tariffs to attract traffic, it has to wait 2 months for approvals by government.

- Cross border formalities on Traceca routes are still resulting in delays of up to five days at the borders. These delays are entirely unnecessary, especially for transit containers where seals can be used. The majority of trucks crossing borders within Europe do so without stopping.
- The port of Aktau has to add VAT to their tariffs, while rail operators providing services crossing Kazakhstan's land borders do not. This burden adds 14% to Aktau's charges. The Ministry of Finance should remove this anomaly to allow a level playing field for competition between rail and sea transport.

It will be necessary to deal with these problems, particularly the first two, if significant progress is to be made on attracting transit traffic to Traceca routes. If traffic is to be diverted away from existing direct all-rail routes terminating at Black Sea ports (such as Novorossiysk, the Ukrainian ports or the Baltic ports), in order to use Traceca routes involving a sea leg to a landlocked country (Azerbaijan), the transport service will have to be both seamless and economic. It should be emphasised, however, that Aktau's ability to influence routeings is limited, because the railway tariffs account for a much higher percentage of total costs than port tariffs.

The scope for reducing tariffs if the necessary reforms are implemented has been estimated in Annex 2 to the Chapter 4, and summarised in Table 45 below.

Table 45: Comparison of (i) Current and Recommended Costs via Traceca Routes With (ii) Costs via Routes Currently Used (US$)

Cargo		Current Cost	Current Cost via Traceca (Poti)	Cost via Traceca after Reforms
Grain	Per tonne	48 via Ukrainain Ports	68	47
Ferrous Metal	Per Tonne	76 via Ukrainian Ports	97	68
Sulphur in Bulk	Per Tonne	46 via Uktainian Ports	49	39
Non Ferrous Metal	Per TEU	1,703 via Novorossiysk	2,500	1425

Source: See Appendices I and II

The reforms necessary to have the Traceca tariffs reduced, border formalities streamlines and VAT removed will take some time to achieve. Traceca has been in place for 13 years and progress has been slow. ***It is therefore recommended that no port investment for traffic dependent on these reforms should be carried out in advance of the reforms. That is to say, the reforms should precede the investment rather than vice versa.***

A Note on Transit Traffic from North West China

Another possible source of transit traffic which was investigated was transit cargo from China. China is now the second largest exporter in the world, after Germany. The vast majority of the Chinese exports come from the east coast, especially Guangzhou and Shanghais. But there is now increasing manufacturing in North West China, around Urumuchi; and Kazakhstan's imports from China have increased sharply to just over 20% in the third quarter of 2006 (source IMF statistics). China is now second to Russia which accounts for just under 40% of Kazakhstan's imports.

The fast-increasing trade with China raises the question of whether Aktau could attract transit traffic from Western China to destinations across the Caspian. But brief reference to a map shows that this is unlikely. The shortest rail route from north west China to Azerbaijan is via Turkmenbashi, not Aktau. And despite the need to cross three borders (China-Kazakhstan (at Dostik)-Uzbekistan-Turkmenistan), the route via Turkmenbashi is the route favoured in practice by westbound exports from both western China and Uzbekistan. Turkmenbashi does in fact handle modest volumes of this trade (e.g. imports destined for the growing population of Chinese in Georgia), while Aktau, which entails a long diversion to the north, handles none. It will be recalled when the Uzbek cotton exports used the Traceca route for a short period several years ago, it was routed via Turkmenbashi, not via Aktau. JICA are currently working on the subject of transit traffic from China, and confirmed that they consider Turkmenbashi better located for this traffic than Aktau.

4.12 Conclusions

The traffic forecast is summarised in Table 46.

Table 46: Summary of Traffic Forecasts (000 tonnes)

	2006	2010	2015	2020
Oil (see Table 3.5)	**9,900**	**12,000**	**15,000**	**17,000**
Dry Cargoes				
Steel	947	1,151	1,469	1,875
Scrap	51	100	200	300
Grain	118	400	1,000	1,250
Other	30	30	40	50
Rail ferry inbound, existing traffic	148	259	417	613
Rail ferry inbound, New City cargo	0	330	330	330
Rail ferry outbound (fertilisers)	0	0	1,000	1,200
Containers, existing traffic	10	51	154	310
Containers, New City Cargo	0	330	330	330
Total Dry Cargo	**1,304**	**2,651**	**4,940**	**6,258**
Total Liquid and dry	**11,204**	**14,651**	**19,940**	**23,258**

Comparison of Forecasts with AISCP and EBRD Forecasts

The ***oil*** forecasts shown in Table 46 are below the AISCP's forecasts, but above those of the EBRD for 2015 (see Table 47).

For ***dry cargo***, however, the 2015 forecast shown in Table 3.30 is well above AISCP forecast. The main reasons for the higher forecast are (i) the exports planned by the new fertiliser plant, (ii) the additional grain exports likely to result from the new export strategy of JSC Ak Biday and their investment in new coastal silos in Iran, Azerbaijabn and Georgia, and (iii) imports of construction materials and later consumer goods from Dubai and Turkey for the New City.

In the longer term the Special Economic Zone should generate additional traffic, but it will take time. None of the projects currently in the pipeline will generate significant port traffic, and no distribution companies, which are the key players at Jebel Ali, have yet been set up in the SEZ.

Also, additional traffic may be attracted away from their overland current routes to Novorossiysk and Ukrainian ports on to Traceca routes via Aktau - if key reforms are carried out, especially in rail pricing and cross border procedures. But these reforms will take time. They have been under discussion for several years and there is little sign of progress as yet.

Table 47: Existing AISCP and EBRD Traffic Forecasts ('000 tonnes)

	2006	2010	2015
AISCP Forecast			
Oil	9,900	24,300	28,200
General cargo	1,028	3,000	3,800
Grain	118	500	500
Total	**11,046**	**28,250**	**33,595**
EBRD Forecasts			
Oil	9,900	15,800	11,400
General cargo	1,028	2,000(b)	2,500 (b)
Grain	118	500	500
Total (a)	**11,046**	**18,300**	**14,400**

Notes:
(a) Excludes ferry traffic
(b) Excludes grains and ferry traffic

5 PORT FACILITIES

5.1 Existing Port

5.1.1 Existing Port Breakwater

The existing port is protected by a breakwater approximately 1.5 km long which protects the port from wave action from the south and west. The port is not protected in the quadrant west to north. The breakwater was built in the 1960s and comprises mainly 40 tonne concrete cube armour without any core. As a consequence of not having a core there is a considerable amount of wave transmission through the breakwater and until recently this problem was compounded by waves overtopping the breakwater and causing disruption to berths 9 and 10. The wave overtopping problem has diminished slightly following a fall in water level in the Caspian over the last 15 years.

The wind and wave roses for Aktau are shown on Drawing 13. For approximately 24% of the time wind blows from directions between West and North and for 15% of the time wind blows from directions between West and South. The corresponding figures for waves are 46% and 55%. The extreme waves from the south west are larger than those from the north west, 1 in 100 year wave heights are Hs=7.2m and Hs=5.4 m respectively. Not surprisingly the northern most berth, berth 5, experiences more wave downtime than other berths because this berth is not protected by the existing breakwater.

Between 1997 and 1999 studies and model tests were carried out to determine possible methods for upgrading the breakwater to reduce wave overtopping and wave transmission. It was concluded that modifying and improving the existing jetties 9 and 10 was more economical than constructing two new jetties in the southern part of the existing harbour.

5.1.2 Existing Port Access Channel

Access to the existing port is via a channel from the North West as shown on drawing number 1. The depth available is approximately 9 metres and the width of the channel is approximately 200m. It is reported that the channel operates as a one way channel and that in cross wind conditions there can be delays in navigating the channel. The harbour tug is used to assist ships in navigating the channel but it is not known if this applies to all ships.

5.1.3 Existing Port Berths

The port consists of four dedicated oil berths, berths 4, 5, 9 and 10, three multipurpose general cargo berths, berths 1, 2, and 3, a grain berth, berth 6, that is also used by quarter ramp roro vessels, and a jetty, berth 8, for the rail ferries which is also used as an oil jetty. Berth 11 has been refurbished for use as an extra oil berth but is not currently in operation due to safety concerns. There is also a small area for port craft. The layout of the existing port is shown in Figure 1 (see next page).

The berths on the breakwater are limited in their availability to about 325 days per year due to wave transmission through the breakwater and overtopping of the breakwater. Berth 5 is even more exposed and has only 270 days per year availability due to wave conditions. The finger pier comprising berths 4 and 5 acts like an inner breakwater because there is currently no breakwater protection in the north-west sector of the port.

The lengths and drafts of the berths are as shown in Table 48:

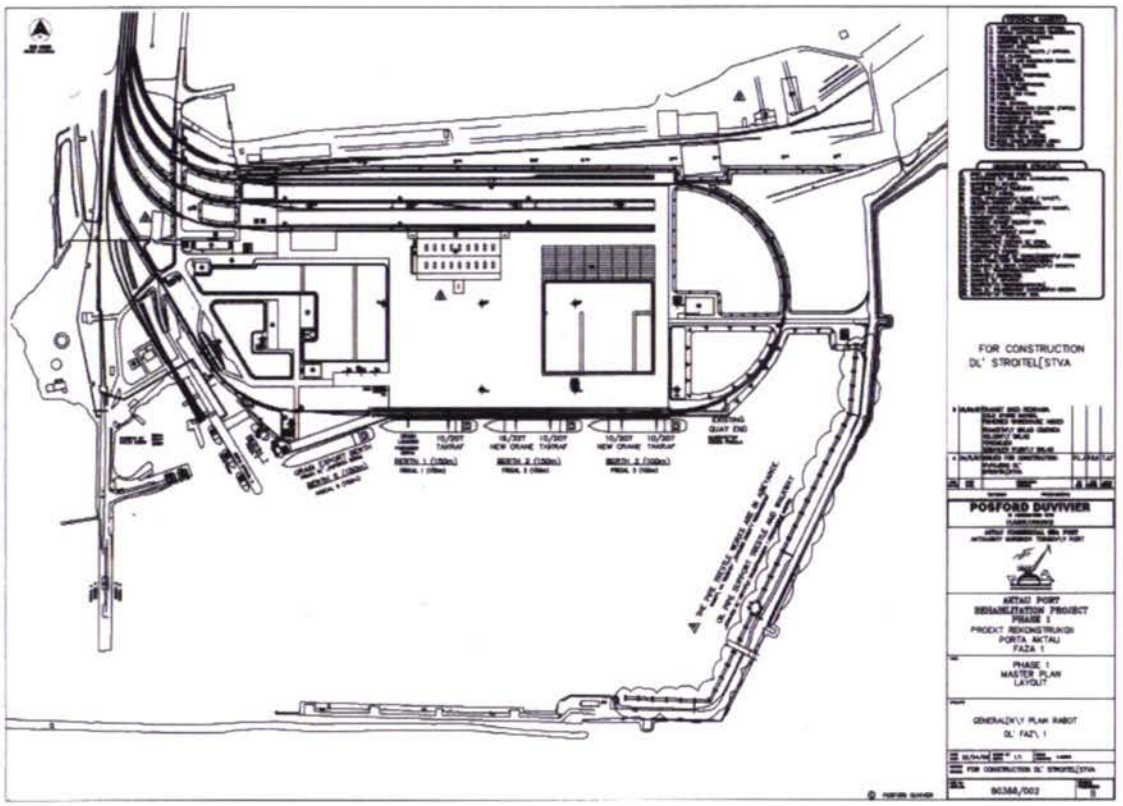
Table 48: Lengths and Drafts of Main Berths

Berth	Length (m)	Draft (m)
1 Dry Cargo	150	6.3
2 Dry Cargo	150	6.3
3 Dry Cargo	100	6.3
4 Oil	205	8.7
5 Oil	205	9.0
6 Grain	150	6-7.0
7	65	7-8.0
8 Ferry	100	6-7.0
9 Oil	170	7.0-9.0
10 Oil	190	9.0
11 Oil (unused)	123	3-12.0

The table shows the berth sizes in terms of draft and berth lengths. These are well below the typical dimensions at most international ports. These smaller dimensions, as indicated, reflect the impact of the limits of the Volga Don Canal on ship design and the limitations of the water depths adjacent to Aktau port.

The port has been extensively rehabilitated. The dry cargo berths (B 1-3 and B6) were rebuilt in 1997–1999 with the aid of a US$54 million loan from the EBRD. They provide the port with 550 m of quay, some 72,000 sq m of open storage and 6,000 sq m of covered storage. In addition, new rail tracks were laid together with office buildings, workshops, electrical and mechanical services and other ancillary works. The berths are dredged to -33.0 m Baltic Datum (BD) (-5.0 m Caspian Sea Datum). The water level in the Caspian Sea is currently at about -27.0 m Baltic Datum, having dropped from a peak of -26.63 m BD in 1995.

Figure 4 – Plan of the existing port



Since completion of the main dry cargo berth rehabilitation work, the rail ferry ramp on Berth 8 has been reconstructed and oil pipework has been added so that the berth can also accommodate tankers. Berths 4 and 5 (oil) have been reconstructed and deepened by KMTF to handle ships of up to 12,000 dwt. Some strengthening work has been carried out to the causeway leading to the oil berths on the breakwater (B 9-10) and various improvements made to the oil pipework. There are some plans to adapt Berth 11 to handle oil tankers, but this has not yet been completed.

Oil Berths

The existing berths handling oil are as follows:

- Berth numbers 4 and 5 are at the northern end of the port that can accommodate tankers up to 12,000 dwt;
- Berth 9 on the main breakwater that can accommodate tankers up to 7,000 dwt; and
- Berth 10 also on the main breakwater that can accommodate tankers up to 12,000 dwt.
- Berth 8 which is shared with the rail ferry can handle ships up to 7,000dwt
- Berth 11 is intended for oil but currently is not in use.

Pumping rates in the winter are lower than in the summer, falling from 1,000 tonnes per hour to 900 tonnes per hour on the larger vessels.

Three of the oil berths (B4, B5 and B9) were leased to Kazmortransflot, (KMTF) but these leases have been suspended and since July 2007 all berths in the port are operated by Aktau International Commercial Sea Port.

Grain

A grain terminal has been constructed adjacent to Berth 6 and it has a storage capacity of 25,000 tonnes and has three loading spouts. The loading rate is up to 300 tonnes per hour. In addition, grain can be loaded direct from rail wagons.

Storage

The port has 7.5 hectares of open storage and 0.6 hectares of covered warehousing. A second warehouse together with additional open storage has recently been constructed by the Port.

Immediately outside of the port there are three privately-operated tank farms with the following capacities:

	Storage capacity ('000m^3)	Throughput capacity (m tons p.a.)
Kaztransoil (KTO)	140	4.2+
Mobilex/Terminalix	60	3.2
Artis Overseas	60	3.2

The Mobilex tank farm was operational only between June 2004 - June 2005 and is now run by another company, Terminalix.

The KTO storage tanks are supplied mainly by pipeline, whilst the other two companies are supplied mainly by rail. Most of the oil berths have pipelines to all three tank farms, the main exceptions being Berth 9 (KTO only) and Berth 11 (Terminalex only), if it were ever used.

5.1.4 Weather Related Downtime

In spite of the reconstruction work the port experiences significant downtime due to the poor condition of the breakwater. The crest height of the breakwater is only -24.5 to -23.5 m BD, having been constructed when the level of the Caspian Sea was some two metres lower than

present levels. As a result, it is subject to serious overtopping and also, due to its form of construction, which consists mainly of large blocks of concrete, it allows transmission of waves into the harbour basin. A project to improve the effectiveness of the breakwater was considered between 1997-1999 when the water level had risen to its highest level for over 65 years, but due to the subsequent reduction in level and the costs involved the project was not implemented, apart from the strengthening to the approach to the breakwater mentioned earlier.

The port also suffers from strong winds, which limit the working of cranes at the dry cargo berths. The rail-mounted quay cranes have to stop work when the wind speed reaches 15 m/sec and the Liebherr mobile cranes when it reaches 18 m/sec. In addition the quay cranes cannot move along the quay in wind speeds in excess of 10 m/sec. Aktau tends to suffer from high winds throughout the winter period.

There is an average downtime of 40 - 60 days per year at most of the berths. This is due to a combination of wave transmission through the breakwater, which particularly affects B 9-10, and high winds which particularly affect B1-3.

5.1.5 Condition of Existing Berths

The condition of the existing berths and their suitability for upgrading to handle additional cargoes are summarised in the following table:

Berth No.	General Description	Suitability for upgrading
1,2,3	▪ Berth Design: Metallic sheet pile wall, Larsen 5 ▪ Berth Type: Dry cargo berth ▪ Length: 150 m ▪ Width: -* adjacent to the coast; exact width is unknown ▪ Draft (Water depth at berth): 6.3 m ▪ Current Structural Condition: o Metallic elements: Along the entire length of the berth, the joints of metal sheet piles were subject to corrosion in the interval of variable water 0.7 – 0.9 m wide. The underwater part has insignificant layer of biofouling less than 5 mm thick. No breaks of locks, scouring, backfilling or other defects were detected. o Reinforced concrete elements: Reinforced-concrete pile foundation is above the high-water mark. The condition is satisfactory; no damage was detected. ▪ Condition of the bottom along the berth: The bottom is even. Foreign items of V= 4 m^3 such as tire covers were found in the zone up to 16 m wide. ▪ The berth was rebuilt in **1997–1999.** ▪ The port also suffers from strong winds, which limit the working of cranes at the dry cargo berths. The rail-mounted quay cranes have to stop work when the wind speed reaches 15 m/sec and the Liebherr mobile cranes when it reaches 18 m/sec. In addition the quay cranes cannot move along the quay in wind speeds in excess of 10 m/sec. Aktau tends to suffer from high winds throughout the winter period. There is an average downtime of 40 - 60 days per year at most of the berths. This is due to a combination of wave transmission through the breakwater and high winds (particularly affecting this berth).	**Yes, but no structural upgrade required**

4,5	▪ Berth Design: Two-side pier in the form of metallic sheet pile wall, Larsen 5. ▪ Berth Type: Oil berth ▪ Length: 195 m ▪ Width: 20 m ▪ Draft (Water depth at berth): 8.7 – 9 m ▪ Current Structural Condition: ▪ Metallic elements: The condition of the pile wall in the variable water level zone is satisfactory; there is no damage. The underwater part has insignificant layer of biofouling less than 5 mm thick. No breaks of locks, scouring or backfilling were detected. ▪ Reinforced concrete elements: Reinforced-concrete pile foundation is above the high-water mark. The condition is satisfactory; no damage was detected. ▪ Condition of the bottom along the berth: The bottom is uneven. The surveyed area was strengthened with rocks with a diameter of 2-2.5 m. No foreign items were detected. ▪ These berths are at the northern end of the port have been reconstructed and deepened by KMTF to handle ships of up to 12,000 dwt. Currently they can accommodate tankers up to 12,000 dwt. ▪ These berths were leased to Kazmortransflot, (KMTF) but the lease has been suspended and since July 2007 all berths in the port are operated by Aktau International Commercial Sea Port. ▪ The KTO storage tanks are supplied mainly by pipeline, whilst the other two companies are supplied mainly by rail. These berths have pipelines to all three tank farms. There is an average downtime of 40 - 60 days per year at most of the berths. This is due to a combination of wave transmission through the breakwater and high winds.	**Yes. Suitable for additional loading arms, pipework and pumps to increase throughput.**
6	▪ Berth Design: Metallic sheet pile wall, Larsen 5. ▪ Berth Type: Grain berth ▪ Length: 150 ▪ Width: -* adjacent to the coast; exact width is unknown ▪ Draft (Water depth at berth): 6-7 ▪ Current Structural Condition: o Metallic elements: Along the entire length of the berth, the joints of metal sheet piles were subject to corrosion in the interval of variable water 0.7 – 0.9 m wide. The underwater part has insignificant layer of biofouling less than 5 mm thick. No breaks of locks, scouring, backfilling or other defects were detected. o Reinforced concrete elements: Reinforced-concrete pile foundation is above the high-water mark. The condition is satisfactory; no damage was detected. ▪ Condition of the bottom along the berth: The bottom is even. Foreign items of V= 6.5 m3 (tire covers, scrap metal) were found in the zone up to 12 m wide. ▪ The berth was rebuilt **in 1997–1999.** ▪ A grain terminal has been constructed adjacent to Berth 6 and it has a storage capacity of 25,000 tons and has three loading spouts. The loading rate is up to 300 tons per hour. In addition, grain can be loaded direct from rail wagons. There is an average downtime of 40 - 60 days per year at most of the berths. This is due to a combination of wave transmission through the breakwater and high winds.	**Yes. Additional silo and loading shute(s) to be added to increase throughput.**

7	▪ Berth Design: Metallic sheet pile wall, Larsen 5. ▪ Berth Type: Harbour craft berth ▪ Length: 65 m ▪ Width: -* adjacent to the coast; exact width is unknown ▪ Draft (Water depth at berth): 7 – 8 m ▪ Current Structural Condition: o Metallic elements: The underwater part has insignificant layer of biofouling less than 5 mm thick. No breaks of locks, scouring or backfilling were detected. o Reinforced concrete elements: The condition of the reinforced-concrete pile foundation is satisfactory; no damage was detected. Defective parts were repaired in 2005-2006. ▪ Condition of the bottom along the berth: The bottom is even and covered with sludge deposits up to 300 mm thick. Tire covers of V = 11.2 m^3 and sludge deposits of V = 15 m^3 were found near the sea water pumping station. There is an average downtime of 40 - 60 days per year at most of the berths. This is due to a combination of wave transmission through the breakwater and high winds.	**Yes, but no structural upgrade is required**
8	▪ Berth Design: Two-side pier in the form of metallic sheet pile wall, Larsen 5U. ▪ Berth Type: Oil berth with ferry terminal ▪ Length: 100 m ▪ Width: 13 m ▪ Draft (Water depth at berth): 6 – 7 m ▪ Current Structural Condition: o Metallic elements: Along the entire left side of the pier, in the interval of variable water 0.7 – 0.9 m wide. Below the variable water level, the pile corrosion is insignificant; biofouling is up to 5 mm thick. No breaks of locks, scouring or backfilling were detected. o Reinforced concrete elements: On the right side of the pier, below the water edge, under every line of piles are spots of concrete destruction 10-30 cm deep and 0.5-0.7 m high with bare reinforcing bars. The total volume of cavities is V = 5 m^3. A cavity with a volume of about 8.2 m^3 was detected near the head abutment of the draw bridge at the ferry terminal. ▪ Condition of the bottom along the berth: The bottom is even. Foreign items of V = 1.5 m^3 (scrap metal, piles) were found in the zone 12 m wide at the ferry terminal. ▪ Since completion of the main dry cargo berth rehabilitation work, the rail ferry ramp on Berth 8 has been reconstructed and oil pipework has been added so that the berth can also accommodate tankers. However, it will only be used as a stand-by oil berth when other berths are not available. There is an average downtime of 40 - 60 days per year at most of the berths. This is due to a combination of wave transmission through the breakwater and high winds, which particularly.	**Yes. Suitable for additional loading arms, pipework and pumps to increase throughput.**
9,10	▪ Berth Design: Pile-based pier of double Larsen 5 sheet piles with reinforced concrete caps and in-situ concrete superstructure. ▪ Berth Type: Oil berth ▪ Length: 365 m ▪ Width: 18 m	**Yes. Suitable for additional loading arms, pipework and pumps to increase throughput.** **Berth 9 to be also**

	▪ Draft (Water depth at berth): 7 – 9 m ▪ Current Structural Condition: o Metallic elements: The condition of box piles of double Larsen 5 sheet piles is satisfactory. Their corrosion in the variable water level zone and underwater is insignificant; biofouling is 5 mm thick. o Reinforced concrete elements: Reinforced-concrete caps are in satisfactory condition (repaired in 2005-2007). ▪ Condition of the bottom along the berth: The bottom is even. Foreign items of V= 4.0 m^3 (scrap metal, tire covers, debris) were found in the zone up to 4 m wide. ▪ Berth 9 on the main breakwater that can accommodate tankers up to 7,000 dwt while berth 10 also on the main breakwater that can accommodate tankers up to 12,000 dwt. ▪ Berth 9 was leased to Kazmortransflot, (KMTF) but the lease has been suspended and since July 2007 all berths in the port are operated by Aktau International Commercial Sea Port. ▪ Some strengthening work has been carried out to the causeway leading to the oil berths on the breakwater (B 9-10) and various improvements made to the oil pipework. ▪ The KTO storage tanks are supplied mainly by pipeline, whilst the other two companies are supplied mainly by rail. Berth 10 has pipelines to all three tank farms but Berth 9 only has a pipeline connection to KTO. There is an average downtime of 40 - 60 days per year at most of the berths. This is due to a combination of wave transmission through the breakwater (particularly affecting these two berths) and high winds.	**deepened and lengthened to take 12000dwt ships**
11	▪ Berth Design: Two-side pier in the form of metallic sheet pile wall, Larsen 5. ▪ Berth Type: Oil berth (not operational) ▪ Length: 123 m ▪ Width: 22 m ▪ Draft (Water depth at berth): 3 – 12 m ▪ Current Structural Condition: o Metallic elements: The condition of the pile wall in the variable water level zone is satisfactory; there is no damage. The underwater part has insignificant layer of biofouling less than 5 mm thick. No breaks of locks, scouring or backfilling were detected. o Reinforced concrete elements: The condition of the reinforced-concrete pile foundation is satisfactory; no damage was detected. ▪ Condition of the bottom along the berth: The bottom is uneven. The surveyed area was strengthened with rocks with a diameter of 0.2-4 m. No foreign items were detected. ▪ This berth is not used. ▪ This berth, if ever used has only a pipeline connection to Terminalex. There is an average downtime of 40 - 60 days per year at most of the berths. This is due to a combination of wave transmission through the breakwater and high winds.	**Yes. Suitable for additional loading arms, pipework and pumps to increase throughput.**
12	▪ Berth Design: Metallic sheet pile wall, Larsen 5. ▪ Berth Type: Harbour craft berth ▪ Length: 75 m ▪ Width: -* adjacent to the coast; exact width is unknown	**Yes, could be deepened and extended southwards to form extension of**

	▪ Draft (Water depth at berth): 6 m ▪ Current Structural Condition: ▪ Metallic elements: The underwater part has insignificant layer of biofouling less than 5 mm thick. No breaks of locks, scouring or backfilling were detected. o Reinforced concrete elements: The condition of the reinforced-concrete pile foundation is satisfactory; no damage was detected. Defective parts were repaired **in 2005-2006.** o Condition of the bottom along the berth: The bottom is even. Foreign items of V = 10.4 m^3 (rocks with a diameter of up to 1 m, entangled pieces of wires and capron ropes, tire covers) were found in the zone up to 8 m wide. There is an average downtime of 40 - 60 days per year at most of the berths. This is due to a combination of wave transmission through the breakwater and high winds.	**berths 1,2 and 3**
Ecological Berth	▪ Berth Design: Metallic sheet pile wall, Larsen 5. ▪ Berth Type: Harbour craft berth ▪ Length: 84 m ▪ Width: -* adjacent to the coast; exact width is unknown ▪ Draft (Water depth at berth): 3 – 6 m ▪ Current Structural Condition: o Metallic elements: The underwater part has insignificant layer of biofouling less than 5 mm thick. No breaks of locks, scouring or backfilling were detected.. o Reinforced concrete elements: The condition of the reinforced-concrete pile foundation is satisfactory; no damage was detected. ▪ Condition of the bottom along the berth: The bottom is even. Foreign items of V = 4.0 m^3 (rocks with various diameters, tire covers) were found in the zone up to 6 m wide. Sludge deposits 0.2 m deep were detected. There is an average downtime of 40 - 60 days per year at most of the berths. This is due to a combination of wave transmission through the breakwater and high winds.	
Boom Berth	▪ Berth Design: Metallic sheet pile wall, Larsen 5. ▪ Berth Type: Mooring of oil-spill boats. Storage and treatment of oil booms ▪ Length: 60 m ▪ Width: 14 m ▪ Draft (Water depth at berth): 3 – 9 m ▪ Current Structural Condition: o Metallic elements: The underwater part has insignificant layer of biofouling less than 5 mm thick. No breaks of locks, scouring or backfilling were detected. o Reinforced concrete elements: The condition of the reinforced-concrete pile foundation is satisfactory; no damage was detected. ▪ Condition of the bottom along the berth: The bottom is uneven. The surveyed area was strengthened with rocks with a diameter of 0.2-4 m. No foreign items were detected. There is an average downtime of 40 - 60 days per year at most of the berths. This is due to a combination of wave transmission through the breakwater and high winds.	

5.1.6 Existing Port Quay Areas, Utilities, Rail and Road access

The port has 7.5 hectares of open storage and 0.6 hectares of covered warehousing. A second warehouse together with additional open storage has recently been constructed by the Port.

Road Access

The port has a single road access point in the north east corner of the port. This road is a standard two lane road – one in each direction and links up with the local road system. Shipments can be sent to the port by road without passing through the city. Given the low percentage of cargo arriving and leaving the port, as well as passenger traffic, this road is sufficient to meet both present and future need identified in the forecast.

Rail Access

The rail access is much more important, given that the port is dependant on rail traffic as around 90% of cargo destined to move through the port or from the port is carried by rail. The port has a single access line to the local rail network operated by KTS. This single line splits at a 'triangular' junction approximately 1.5 km outside the port. A spur line runs off this junction to the KTO oil tank farm. The other line runs towards the port and into the port marshalling area. This yard services both the port and the Artis tank farm and is 0.5 km from the port entrance.

The Artis tank farm has one entry line from the marshalling yard that splits into two lines inside their site. From this yard there are 8 port entry/exit lines, including one loop line around the port (thus 2 connections). Four lines are for the rail ferry service that concentrates into two lines close to the loading ramp. The loop line runs around the eastern side of the port around the southern end and at berths 1-3 splits into two quayside lines before becoming one line again at berth 6 and back into the marshalling yard. There is a spur off this loop line at berth 6 for handling grain cargoes. In addition, there are two lines on the eastern side of the site inside the loop line.

All these lines are in regular use. All direct shipment traffic – i.e. from rail wagon to vessel and vice versa is routed on the loop line, as is grain traffic. Most of the steel bars are also moved on this line as it is stored adjacent to the quay. Most of the steel reels are sent to the port using the two inner lines to the rear of the storage area. The rail ferry lines are only used for the ferry traffic.

There are potentially significant congestion problems in the network between the single line connection to the rest of the KTS network and the port depending on the volumes of cargoes to the two tank farms and the port. It is estimated that the potential capacity of this part of the rail network is around 8-9 million tonnes. This issue is discussed in more detail in Chapter 11.

Utilities

Water

Use of energy resources in 2006		
Month	Drinking water in m^3	
	Total	Aktau Port
January	4,450	4,066
February	3,400	2,620
March	3,442	2,739
April	3,440	2,854
May	3,197	2,741
June	2,542	2,099
July	2,789	1,546
August	3,154	1,819
September	3,261	1,937
October	7,102	5,850
November	3,634	2,674
December	4,228	2,888
Total	44,639	33,834

Sewerage

Use of energy resources in 2006		
Month	Drainage system in m^3	
	Total	Aktau Port
January	766	480
February	1,396	985
March	1,419	1,016
April	1,103	699
May	1,047	664
June	747	499
July	1,370	831
August	966	565
September	997	670
October	1,841	1,139
November	1,842	1,156
December	1,659	902
Total	15,153	9,607

Power

Use of energy resources in 2006		
Month	Electricity (kw/hour)	
	Total	Aktau Port
January	585,792	453,878
February	472,320	342,908
March	392,640	305,066
April	265,152	203,852
May	229,248	175,069

June	211,200	183,391
July	202,560	169,984
August	209,280	165,820
September	222,720	164,332
October	265,440	204,163
November	370,560	272,455
December	553,440	426,274
Total	3,980,352	3,067,192

Use of energy resources in 2006		
Month	Heat (Hydrocalories)	
	Total	Aktau Port
January	326.00	305.94
February	244.00	223.94
March	170.00	149.94
April	40.00	33.31
May	0.00	0.00
June	0.00	0.00
July	0.00	0.00
August	0.00	0.00
September	0.00	0.00
October	0.00	0.00
November	98.00	87.99
December	215.00	194.94
Total	1,093.00	996.06

Oil traps

There are no oil traps currently at the port.

Dangerous goods areas

There's no designated area for dangerous goods at the port at present. The dangerous goods handled by the port are limited with to about 3 to 4 wagons of cyanide (in special containers) per month which are transported by rail ferry and therefore not stored at the port.

The port is following international legislations in handling dangerous goods.

5.1.7 Scope for Expansion of the Existing Port

There is only limited scope to provide new berths within the existing harbour. The two main locations that have been considered to date are:

1. Extend the general cargo berths southward from berth 1. This area is currently occupied by a short berth, known as berth 12 which is used by military boats and open water, but it would be possible to extend berth 12 and carry out reclamation to create a new general cargo berth approximately 220m long. It is understood that AISCP are undertaking preliminary design studies for this option;
2. Construct a new finger pier in the southern part of the harbour between berths 12 and 9, running north/south and connected to the breakwater. This finger pier could provide two new oil berths similar to berths 4 and 5. However, there are concerns that there is

insufficient space for manoeuvring oil tankers in this area and this option has not been pursued.

Apart from these two options the main options available to the port concern upgrading the facilities and water depths at the existing berths.

In anticipation that the addition berths and berth upgrading in the existing port will not be sufficient to meet future needs work commenced on the development of the North Port in 2006. Under the current configuration this has the potential to provide 4 oil berths and 3 dry cargo berths.

5.2 North Port

5.2.1 North Port Breakwater and Mole

The North Port breakwater and mole have been partially constructed but the construction contract was terminated in 2006 when the work was less than 25% complete. A contract to complete the mole and breakwater was awarded in November 2007 with a scheduled completion date of December 2008. The design of the mole and breakwater remains as contained in the original construction contract except for some modifications to the cross-section of the breakwater.

5.2.2 North Port Harbour basin

The area enclosed by the mole and breakwater will be dredged to -36.0m BD at the oil berths and -33.0m BD at the dry cargo berths. This involves removing approximately 2-3m depth of sea bed as shown on Drawing 12. The material is predominantly silt and clay with some marl and the total volume to be removed is approximately 1.6 million cubic metres. An area in the sea approximately 30km south of Aktau has been designated as a suitable area to dump the material and the Environmental Permit for the dredging works has been granted on this. Consideration has been given to dumping the material ashore, and possibly creating development land, but, as no suitable location could be found on land and as the dredged material might take a considerable time to consolidate, it was decided not to pursue this method of disposal of the dredged material.

5.2.3 North Port Access Channels

It is proposed by AISCP that the existing channel will be deepened to -37.0 m BD and widened to 250m and in addition a new channel will be created to the south west which will be dredged to -36.5 m and be 250m wide.

5.2.4 North Port Berths

Four oil berths (berth numbers 14 to 17) which are to be dredged to -36.0 m Baltic Datum are proposed to be located on the side of a new northern mole. With a water level of -27.0 m BD this would provide a water depth of 9.0 m. The length of each berth is 170 m.

In addition 3 dry cargo berths, berths 21 to 23, are proposed on the eastern side of the North Port Basin backed up by approximately 30 hectares of port operating area created by reclamation. It is probable that one of these berths would be dedicated to grain and the other two would handle general cargo. These berths are to be dredged to -33 m Baltic Datum providing alongside water depths of 6.0 m. The length of each berth is 150 m. as shown on Drawing 5.

The layout as planned provides a new port entrance that faces north-west with a channel dredged to -36.5 m BD. There is a second entrance to the port between the end of the existing breakwater and the new offshore breakwater. This entrance is to be dredged to -37.0 m BD.

The north-west entrance faces the predominant offshore wind direction, see Drawing 13. Winds from the west and north-west exceed 15 m/sec (about 28 knots) about 28 days per year and speeds of about 13 m/sec (24 knots) are exceeded about 55 days per year.

The entrance is about 250 m wide and this will allow considerable wave penetration into the harbour. A study by Kashydro indicated that waves (calculated as the height of the 5% highest waves) of 1.26 m could reach the location shown as Berth 20 when wind speeds are 13 m/sec from the west. The maximum wave height estimated by Kashydro for the location of Berth 20 is 2.34 m. Berth 20 is well inside the harbour and it seems possible that Berths 14, 15, 16 and 17 would experience similar wave disturbance but this has not been verified by calculation or modelling. At an oil berth where the tankers are connected to loading arms wave heights should generally be below 0.8 m. to allow loading operations to proceed. To take account of this potential downtime, the financial feasibility analysis will examine the impact of downtime ranging from 10 to 20%.

Existing proposals for the oil and dry cargo berths show these berths to be solid berths fronted by steel sheet piles as shown on Drawings 7&9. Berth 5 on the south side of the North Port basin is also a solid berth. These solid faces will reflect waves and would aggravate any adverse wave conditions caused by the breakwater layout as discussed above. An alternative design using a less reflective type of structure would be preferable, as shown on Drawings 6&8.

5.2.5 North Port Quay Areas, Utilities, Rail and Road access

It is intended that one of the dry cargo berths, berth 23, will be a dedicated grain berth with grain silos constructed close to the water's edge. This berth will require rail and road access. An alternative option would be to place the silos close to the existing rail and road and transport the grain to the berth side by overhead conveyor. This would have the benefit of reducing the infrastructure cost for the new berth and allow the berth to be used for other dry cargoes when not in use as a grain berth.

It is currently proposed that the other two dry cargo berths, berths 21 and 22, are serviced by quay cranes and rail but it is possible that some considerable cost savings could be made by using mobile cranes and fork lifts transporting goods to and from a rail head at the port entrance.

As a consequence of the layout of the mole and the position of the entrance channels it is only possible to create these three new dry cargo berths, 21-23, in the North Port.The land reclamation proposed with these three berths is approximately 30 Ha which is a very large area to support three small berths and results in approximately 50 % of the land area not being effectively utilised. It is possible that 10-15 Ha could be used for commercial non port use thereby reducing port development costs and providing a new source of income for AISCP,as indicated on Drawing 3. One possible use would be as a Port Oil Depot as described in Chapter 8..

6 EXISTING PORT EQUIPMENT

6.1 Cargo Handling Equipment

The main items of cargo handling equipment owned by the Port are listed in Table 50.

Table 50: Cargo Handling Equipment

No.	Type of Equipment	Manufacturer	Number of Units	Year of Manufacture
1	Rail-mounted portal crane 10/20 t.	Man Takraf, Germany	1	1978
2	Rail-mounted portal crane 10/20 t.	Man Takraf, Germany	1	1985
3	Rail-mounted portal crane 10/20 t.	Man Takraf, Germany	1	1989
4	Rail-mounted portal crane 10/20 t.	Kranbau, Germany	1	1998
5	Rail-mounted portal crane 16/32 t.	Kranbau, Germany	1	1998
6	Mobile harbour crane 36 t.	Liebherr, Austria	1	1998
7	Mobile harbour crane 36 t.	Liebherr, Austria	1	2006
8	Mobile harbour crane 64 t.	Liebherr, Austria	1	1998
9	Mobile crane 80 t.	Liebherr, Germany	1	2002
10	Forklift loader 1.8 t.	Komatsu, Japan	4	1998
11	Forklift loader 3.5 t.	Komatsu, Japan	2	1998
12	Forklift loader 5 t.	Komatsu, Japan	2	1998
13	Forklift loader 16 t.	Komatsu, Japan	2	1998
14	Forklift loader 16 t.	Kalmar, Sweden	1	2000
15	Forklift loader 16 t.	Kalmar, Sweden	2	2002
16	Forklift loader 16 t.	Kalmar, Sweden	2	2005
17	Forklift loader 16 t.	Kalmar, Sweden	1	2006
18	Forklift loader 28 t.	Kalmar, Sweden	1	2004
19	Forklift loader 28 t.	Sisu, Finland	1	1998
20	Port tractor	Sisu, Finland	4	1998
21	Port semitrailer 50 t.	Buiskar, Holland	12	1998
22	Bucket autoloader 3.5 m^3	Komatsu, Japan	2	1998
23	Forklift loader 16 t.	Kalmar, Sweden	1	2007
24	Forklift loader 5 t.	Toyota, Japan	2	2007
25	Tipper truck	Volvo, Sweden	4	

The five portal cranes operate on the 10.5m span rail tracks at Berths 1 to 3. They are electrically powered, via trailing cables that are mounted on a reel on the crane leg and run in a slot behind the landward rail. The cables are plugged into sockets and the electricity is supplied at 380V. It was reported that power cuts occur only rarely, but on such occasions the cranes cannot operate since the Port's stand-by power generator only supplies the fire fighting pumps.

For the two older portal cranes, the electrical systems have been replaced.

The mobile cranes are deployed in the storage yard, at the railway sidings or at the quay, depending on the operational requirements.

All cranes have to be erected following delivery to the Port, since the Volga Don waterway limits the size of vessel that can be used to carry them.

In addition to the equipment listed in Table 50, there is a 300tph grain shiploader and portable grain loaders, which are owned and operated by the grain silo operator.

The Port also possesses a range of crane attachments for handling cargo, as listed in Table 51.

Table 51: Crane Attachments

No.	Type of Equipment	Number of Units
1	Grab 7 m^3	1
2	Grab 6.7 m^3	1
3	Grab 5 m^3	1
4	Grab 4.25 m^3	1
5	Grab 4 m^3	4
6	Grab 3.4 m^3	1
7	Grab 2.5 m^3	1
8	Spreader 20'-40'	1
9	Spreader 20'	1
10	Magnet 20t	2
11	Magnet 20t	2
12	Magnet 20t	2
13	Vehicle ramp	1

The grabs are used to handle dry bulk materials, and the magnets (of which different types are allocated to the different cranes) for loose scrap metal. However, most of the scrap is now handled in skips.

The spreaders are used to handle containers: the larger one is adjustable and able to handle all sizes of container except 45' boxes, whereas the smaller unit can only handle 20' boxes.

The vehicle ramp is used to load cars and other vehicles on and off railway wagons.

6.2 Equipment Maintenance

The Port has a group of reasonably modern workshops that are located at the northern end of the storage yard, to the east of the grain silos. The facilities include:

- a workshop to service mobile cargo handling equipment – this includes an overhead hoist and access platform, an inspection pit and an elevated ramp;
- a workshop to service cars owned by the Port;

- a small machine shop;
- stores, offices and amenities.

The Port can undertake most standard maintenance work, but structural steel and painting work are contracted out.

Equipment maintenance is the responsibility of the Chief Mechanical Engineer, whose office is in the Despatch Office building, located close to the workshops.

The utilisation of each item of equipment is recorded, as are the power or fuel consumed. The mobile harbour cranes (MHCs) were said to operate typically 3,500-5,000 hours per year, which equates to 40-55% of the available time: a reasonable figure that leaves some margin for additional usage.

The fuelling station is located at the northern end of the main port area, near the main gate.

The equipment is serviced in accordance with the manufacturers' schedules, at intervals based on utilisation and elapsed time. The Port prepares a maintenance schedule showing the timing of each service. Typically, the portal cranes require 2 days per month each, while the MHCs only need 1 day every 1.5 months. These are equivalent to approximately 7% and 2% of total time, respectively.

Leakage of hydraulic fluids was said to be a problem for the MHCs: one example observed during the site visit had resulted in damage to a tyre caused by dripping fluid.

The lifting mechanisms of the cranes must be tested, according to national law, at least once every 3 years, but after the machine age reaches 10 years the testing interval reduces to 1 year.

The main issue for the equipment was said to be the time required for obtaining spare parts. High value parts (costing above 4 million Tenge) have to be purchased in accordance with State procurement procedures, which entails obtaining tenders from 3 suppliers, receiving approval, then waiting for the part to be manufactured, delivered and fitted. This is particularly difficult for the older cranes for which parts are not readily available. It also causes difficulties for the Liebherr cranes because that company is not registered in Kazakhstan as an approved spares supplier.

Standard spares are procured on the basis of annual budgets, and there is also a contingency fund. Local agents are used wherever possible, and the State procurement procedures do not apply unless the cost of the part exceeds the threshold value.

There are standard periods for the operating life of equipment. For portal cranes, the period is 16 years and for the MHCs 20 years. This period has already been exceeded in the case of the two oldest portal cranes, but since these have received new electrical gear there is no reason to suppose that they need to be replaced immediately. However, for budgeting purposes, the Port should be planning a rolling replacement programme for all of its equipment in accordance with the standards.

Other items for which replacement should be considered in the near future include the Sisu (Kalmar) tractors and Buiskar trailers, purchased in 1998, for which a life of 8-10 years would be generally adopted for normal use: since it appears that these machines may have been used less extensively than normal, the replacement timing could be deferred. In addition, the small Komatsu forklifts, the 28t Sisu (Kalmar) unit and the 3.5 m^3 Komatsu bucket loader, all of which were also purchased in 1998, should be assessed for replacement after 10-12 years, ie by 2010.

The equipment fleet is probably sufficient for present throughput levels, provided the number of machines out of service at any time is not excessive. If throughputs increase significantly, further items of equipment may be required, and these should be in addition to the replacement schedule referred to above.

6.3 Marine Equipment

The Port owns the following marine equipment:

VESSELS

A tug (2,700 HP, 30t bollard pull), equipped with fire fighting equipment and a 7t capacity foam tank, supplied by the Dutch company van Damen in 2005.

A ballast water barge

Two ecological vessels

A second tug is on order, due for delivery in 2008. It will have a smaller capacity than the present vessel (2,100 HP, 25t bollard pull), and will not be equipped for fire fighting.

A 300t capacity ballast water / garbage vessel is due to be delivered in 2009, which will replace the existing ballast water barge.

There are no pilot launches, since pilotage is not required at the Port.

It is estimated that with two tugs the Port will be able to handle all vessels calling at the port for the foreseeable future, including those using the North Port.

Navigation Aids

The approach channel is marked by illuminated buoys and a pair of lead-in towers and lights. There are also two buoys inside the harbour to mark the limits of the deep water area for turning vessels.

6.4 Oil Spill Clean-Up Equipment

AISCP provided the following list of oil spill clean-up equipment currently available at the port:

No	Name of equipment	Quantity	Note
1.	Quick unrolling booms "Lamor"-1300 (red)	290 rm	On the reel - 200 m; 90 m – packed in basket; delivered in - 2000
2.	Booms «Lamor» -1500	200 rm	Delivered in -2000 (200 r.m. from 400 rm are prepared for discarding), service life - 5 years
3.	Harbor boom -1100	400 rm	Produced in 2002, delivered – in 2005; service life -4 years; made in Russia, S.-Petersburg
4.	Harbor boom NOV 1200	800 rm	Delivered in – November 2005 ("Lamor"), service life -5 years;
5.	Reservoir for storing of oil on the land and at sea , capacity 5,0 m^3, LFT G5	1	Delivered in – November 2005, («Lamor»); length -3,5 m; width -2,5 m; weight -27 kg; Service life -3 years
6.	Belt-type oil skimmer model C-24d with diesel drive	1	Oil harvesting capacity – up to 3,2 ton/hour; pump weight - capacity – diesel 4 hor/power, discharge hose -15 m; suction hose 3 m, delivered in 2000
7.	Port system for oil harvesting "Lamor" float skimmer	1	Oil harvesting capacity - 30,0 m^3 per hour; weight -75 kg without pump; weight of the pump-35 kg; delivered -2005

8.	Manual oil-spill boat «Lamor» LRC-01-2005	1	Manual oil-spill boat, weight-6,5 kg, length - 1,5 m; width -0,4 m; service life -5 years; for coastal and shore -2005
9.	Oil-gathering system Lamor «Minimax-10»	1	Oil-gathering capacity - 10,0 ton/hour; purification efficiency- 95% of oil; length - 0,84m; width -0,66 m; height -0,32 m; mass -22 kg; construction – fiberglass plastic; conditions for running - max. height of the wave -3 m, t^0 of the air - from -20°C up to +50°C; t^0 of water from 0°C to +50°C; delivered in -2005; service life -7 years;
10.	Oil-gathering system Lamor «Minimax-30 BC»	1	Oil-gathering capacity -30,0 m^3 /hour; length -2,4 m; width - 1,7 m; mass -220kg; purification efficiency 95% oil ; 05 %-вода; construction – aluminum, fiberglass plastic, polyurethane; Condition for running - max. height of the wave -1 m, t^0 of the air from -20°C to +50°C; t^0 of water from 0°C to +50°C; delivered in -2005 года; Service life -7 лет;
11.	Oil spill eliminating vessel «AKKU».	1	Length -10,0 m; width -3,5 m; draft -0,7 m; speed-10 knots; capacity -235 h/power, lifting power – to 3 tons; hull – aluminum; delivered in -2000; service life- 15 years
12.	Motor boat «Ob»	1	
13.	Oil skimmer HMC-205	1	Delivered in September 2005; Length– 20,106 m; width - 19,24 m; depth - 2,59 m; draft -1,82 m; one shift -2 persons; gross tonnage -60 registered tons; storing reservoir for oil - 2 sections in 10,0 m^3 each, total -20,0 m^3; foul water - 2 tanks in 3,8 m^3 each, total -7,6 m^3 speed 7 knots; vessel cranes lifting power is – 2 ton;
14.	Synthetic sorbents , granular: 1) –Sorbent-napkin 53 x 39sm.; 2) –Sorbent-canvas, width – 1m; 3) - Sorbent-canvas, width - 0,5м; 4) –Grained sorbent ; 5) – Sorbent booms D 12 sm., length 3m; 6) - Sorbent booms D 20 sm., length 3m		

7 EXISTING PORT OPERATIONS

The port operates a three x 8 hour shift system 365 days per annum with all cargo handling being nominally undertaken using port labour. The port operations cover 11 berths, of which 2 berths (7 & 11) are not used for cargo handling. There are 4 dedicated oil berths, 3 dry cargo berths, 1 grain/general cargo berth and a roll-on-roll-off/oil berth (see Chapter 5).

7.1 Liquid Cargo Handling

Oil accounts for almost 87% of all cargo handled at Aktau Port and is therefore the main cargo handling operation. There are nominally 6 oil berths, but currently only 5 are in regular use. The main facilities are located at berths 4 & 5 adjacent to the harbour entrance and berths 9 & 10 on the inside of the breakwater. In addition, berth 8 is used for loading of oil when a roll-on-roll-off (roro) vessel is either not on the berth or due within the next 24-48 hours. Tonnages handled in the last 3 years are as follows:

Table 52: Oil Tonnage through Aktau Port 2004-2006

	2004	2005	2006
Tonnage ('000 tonnes)	8,289	8,913	9,960
% growth over previous year	18.9	7.5	11.7

Source: AISCP statistics

The oil cargo handling operations are generally similar to those of any other oil port. On arrival the vessel is berthed using the port tug and mooring crews from the port and then undergoes 'free practique' services to clear the vessel with the relevant border and maritime agencies. Following this clearance, the vessel's loading valves are connected to the shore pipe system by means of the pipe connections on the loading arms, which in turn connect to the pipe network from the respective tank farms. This operation is undertaken by the tank farm and ships personnel – AISCP only provide the berth. Pumping generally commences within 2-3 hours of arrival on the berth, but may be longer if 'slops' have to be removed or prior ballast pumping is required. Loading is at a constant rate, but indications are that the flow rate normally reduces considerably as the vessel reaches capacity. On completion of loading, the vessel is disconnected and the various technical and administrative controls have to be completed before the vessel is cleared to sail.

The loading rates will vary according to the technical specifications of the vessels handled. The average loading rate for oil at the port of Aktau in 2005, the last year for which full records were available, was estimated at 882 tonnes per hour[5] (see Table 53).

Table 53: Average Oil Handling Speed at the 5 Oil Berths in 2005

Tonnes Handled at berths 4,5,8,9,10 in 2005	Loading Time at Berth, Excluding non-working Time (days)	Tonnes Handled per hour
8,912,000	421	882

Source: Calculated from AISCP statistics

[5] 890 tonnes per hour at berths 4, 5 and 9, and 873 tonnes per hour at berths 8 and 10.

The tankers, however, spend additional time at berth before and after the loading operation. Kazmortransflot for example estimated that the average ship spends an additional 8 hours at berth per call – 3 hours before the start of operations and 5 hours after loading. This additional time is mainly due to unloading slops, ballasting prior to loading and documentation after loading (border clearance and requirements for technical quality control certificates). A sample of vessel records from detailed operational statistics for 2007 showed the ratio of total time at berth to working time to be 2.2 to1. On this basis the ***average handling speed for Aktau's oil tankers is estimated at 9,622 tonnes per ship day at berth***.

The breakdown of total ship time in port in 2005 is shown in Table 54. This indicates that, in addition to the time on the oil berths, there is the waiting time off the berth for vessels anchored outside the port.

Table 54: Breakdown of Ship Time at Aktau Oil Berths 2005 (hours per annum)

Berth	Loading Time	Additional Time at berth	Weather Delays	Waiting for a berth	Waiting for Cargo, Customs etc (off berth)	Total Time in Port
4, 5, 9	5,578	5,867	2,527	7,845	8,036	29,853
8, 10	4,523	4,099	2,282	8,594	9,738	29,236
Total	10,101	9,966	4,809	16,439	17,774	59,089
%	17	17	8	28	30	100

Source: AISCP statistics

The ratio of waiting to service time at the oil berths in 2005 was estimated at 0.82:1 (see Table 55).

Table 55: Ratio of Waiting to Service Time at Aktau Oil Berths 2005 (days)

Berths	Loading Time	Additional days at Berth	Total days at Berth	Waiting for Berth	Waiting to Service Time Ratio
4,5,9	232	244	477	327	
10,8	188	171	359	358	
Total	421	415	836	685	0.82

Source: calculated from AISCP statistics.

AISCP does not maintain specific berth occupancy statistics. The berth occupancy at the five oil berths in 2005, however, was estimated, see Table 56, at 63% assuming 100 % availability of berths 4, 5, 9 and 10 and 50% availability of berth 8. The traffic handled in that year was 8.9 million tonnes.

Table 56: Berth Occupancy at the 5 Oil Berths (2005)

Berths	Loading Time (days)	Additional days at Berth	Total days at Berth	Available berth days (a) (b)	Berth Occupancy
4,5,9	232	244	477		
10,8	188	171	359		
TOTAL	421	415	836	1,332	63%

(a) The available berth days assume the availability of 4.5 berths as one is shared with the ferries.

(b) The weather related downtime at the oil berths was recorded at 19%, equivalent to 69 days in 2005 (see Table 3). This brings operational days down to 296. The port weather closure days are around 20 days per annum, the remainder being weather down time on the berth – i.e. while the berth is occupied.

The occupancy at the oil berths increased in 2006 as the tonnage has risen, although this is partially offset by the introduction of the new 12,000 tonne tankers that have a higher unit turnaround performance than smaller tankers. The situation is complicated by additional factors such as not all tank farms being connected to all berths and the use of berth 8 on a part time basis when not occupied by a roll-on-roll-off vessel.

The berth occupancy of 63% would not normally be considered to be a potential operational problem.

Dispatch department is responsible for berth allocation following requests from the shippers. Not all berths are connected to all tank farms and earlier in 2007 certain berths were leased to individual companies, rather than being common user berths. In practice, most ships for a particular shipper go to an allocated berth, but if that is not available it is scheduled to another berth where there is connectivity. Berth allocation with the existing berth occupancy levels, is not considered to be an issue.

Occasionally, a 'slops' tanker calls and this is berthed at the grain terminal at berth 6. These are pumped direct from road tankers to the vessel.

7.2 Dry Cargo

Dry cargo traffic consists of three main traffic streams – general cargo, unitised cargo and dry bulk cargo.

Berth allocation is relatively simple in that the vessel can generally be allocated to any of the 3 berths. Scrap metal is normally loaded at berth 3 because of its better access to road transport without impinging on operations at berths 1, 2 or 6. Grain vessels and roros with quarter ramps are allocated to berth 6 and the rail ferry to the special roro terminal at berth 8.

Data on cargo handling productivity provided by the Port gives different results, and therefore in this section a range of results is given where it is not possible to give a conclusive answer. The data used includes individual ship records and overall cargo handling records for 2004-07, although large gaps in the data prevent a comprehensive picture being developed.

A large proportion of the time that vessels spend at the berth is non-productive, and the berth records provide detailed breakdowns of these periods. Reasons for these times are attributable partly to the Port and partly to other parties. They include time for ballast handling, waiting for consignor's instructions, documentation, inspections, payments and working committees; in addition, grain handling has to wait for disinfection/fumigation to take place. These non-productive times significantly reduce the overall productivity results and increase the berth occupancies.

In addition to a review of overall port statistics, a detailed analysis was undertaken of four months during 2007: January, April, July and October were selected, in order to provide a reasonable spread across the year. It main conclusions were that:

- Average handling speeds per ship day at berth were approximately 2,250 tonnes for steel, 250 tonnes for scrap and others and 1,920 tonnes for containers.
- Downtime for weather (which is recorded separately at the dry cargo berths) amounted to about 6% of total berth time. As expected, weather downtime hardly occurs during the summer.

On this basis the occupancy of berths 1,2 and 3 in 2006 was estimated at 74% (see Table 57)

Table 57: Estimated Berth Occupancies of General Cargo Berths 2006

Cargo	Traffic ('000 t) 2006	Gross Handling Speed (Tonnes /day) (a)	Number of Days Required	Days Available p.a. (b)	Number of Berths	Berth Days Available p.a.	*Occupancy 2006 (est)*
Metals	947	2,250	420.89				
Scrap, others	81	250	324.00				
Containers	10	1920	5.21				
TOTAL	**1,038**		**750**	**340.00**	**3.00**	**1020**	**74%**

Notes
(a) The handling speeds shown are based on a sample of records for 2007.

The occupancy at the grain berth in 2006, however, was lower, estimated at 27%

Table 58: Estimated Berth Occupancies of Grain Berth 2006

Cargo	Traffic ('000 t) 2006	Gross Handling Speed (Tonnes/day) (a)	Number of Days Required	Days Available p.a. (b)	Number of Berths	Berth Days Available p.a.	*Occupancy 2006 (est)*
Grains	118	1,300	91	340	1	340	27%

(a) The handling speed shown are based on a sample of records for 2007.

The corresponding figure for roro ferries at berth 8 is 11%, which confirms that at current levels of ferry activity there is considerable potential for use of this berth for loading oil.

Vessels carrying dry cargo experience considerable waiting times before they reach the berth. Average waiting times are longer in winter than summer, which is consistent with the fact that the port closes to vessels in bad weather conditions. The average waiting time for all dry cargo vessels in 2007 was 34 hours, which appears high.

The average waiting: service time ratio for the four months analysed in 2007 was 1.25, but varied from 0.72 to 1.94. Ferries suffered the highest waiting: service time ratio (4.77), but this was because they stay in port a much shorter time (average 10 hours) than other vessels. While this seems to be an excessive time for a ferry with a dedicated berth to have to wait, it may be due to oil tankers occupying the berth.

It is possible that some of the waiting times were due to vessels arriving early and / or choosing not to go to the berth when one was available, but the data obtained do not provide this level of detail. Nonetheless, there are certainly instances where vessels (apart form ferries) have waited for considerable lengths of time for lack of a berth.

At most ports with a limited number of berths, occupancies of over 70% would be difficult to accept since vessel waiting times would start to become excessive and cause unacceptable delay costs. At Aktau, however, long waiting times appear to be less of a problem.

The conclusion to be drawn from the handling speeds and berth occupancies in Tables 57 and 58 is that the proportion of non-productive vessel time at berth needs to be reduced, especially for grains and scrap. It is acknowledged that some of the causes are outside the Port's control,

but in some cases it should be possible for activities to run concurrently, thereby reducing the total elapsed non-productive time.

For all vessels except those carrying steel, the cargo handling time 'norm' published by the Government exactly matched the actual recorded working time: the reason for this is not known, but it does raise doubts over the veracity of the data. In the case of steel, in every case but one the handling time was far shorter than the 'norm', which indicates that the 'norm' basis (at least for steel) has become outmoded.

Steel

The main general cargo is steel, usually in the form of steel reels or bars. Annual throughput appears to have stabilised at around 1 million tonnes per annum (see Table 59).

Table 59: Steel through Aktau Port 2004-2006

	2004	2005	2006
Tonnage ('000 tonnes)	1,011	1,024	1,029
% growth over previous year	20.9	1.3	0.5

Source: AISCP statistics

The steel is forwarded by the shippers/steel brokers to the port by rail. The cargo is unloaded from the rail wagons by crane or fork lift truck and stored in batches. In almost all cases there is no end-user or shipment date nominated at the time of its arrival in the port and therefore the steel is discharged to become part of the overall stock located at the port. The volume of such traffic unloaded direct from rail wagon to vessel is very small. Steel bars tend to be unloaded nearer the berth to facilitate later handling. This requires use of the rail lines running under the quay cranes and the ship-shore cranes are often used for unloading these wagons when not working vessels.

When the steel has been sold, a nominated vessel has been allocated and it has berthed alongside, the steel is moved to the vessel for loading. The movement from the storage area to the ship's side is undertaken either by means of a forklift truck or road truck. If stored close to the ship's side direct movement from the storage stack to the loading crane is accomplished by means of fork truck, and if further by means of trailers for the transit movement. This is standard international practice given that fork trucks are principally designed for vertical rather than lateral transit and that the tugs and trailers are the most effective equipment for lateral movement. Operationally, the problem is that since there is no ship nominated at the time of receipt of the traffic, it is not possible to plan the storage operation. Thus, some ships tend to work faster than others because of longer or shorter transit distances between the stack and the loading crane and there is insufficient space to prepare a 'buffer stock' alongside to compensate for the longer transit times between the stack and quay crane. This problem could be overcome by deploying more trailers for shipments where the steel is stacked remotely from the berth.

The ship loading is handled in the conventional manner using one of the five rail mounted ship-shore cranes, supplemented by one of the three Liebherr mobile cranes, if required. Depending on the stowage and size of the vessel, two cranes per vessel would normally be utilised. There is currently no pre-slinging of steel cargo, and it was noted that separate slinging is sometimes used for the terminal transit and the loading.

The loading rate will vary according to the size of the lift, particularly the weight of the individual reels, the size of the vessels with consequent access and stowage factors, and the efficiency of

the supply system between the stack and the loading crane. Analysis of a sample of operations in 2007 suggests that the average loading rate for steel cargoes is around 3,870 tonnes per day during ship working time and 2,250 tonnes per ship day at berth including non-working time. The gross figure is considered reasonable for the sizes of vessel using the port, but as noted above the net figure shows a large reduction in actual productivity on account of non-productive berth activities.

Analysis of waiting records indicates that steel vessels sometimes incur waiting time outside the port even though berths are available. These are reported to be due to decisions of the ship's agent or the shipper who may instruct the vessel to wait outside port (thereby avoiding unnecessary port charges) until they have agreed terms of shipment and sale with the purchaser in Iran and prepared/presented corresponding documents.

Other Metals

There are small shipments of other metal cargoes. These are generally in palletised form and are unloaded by fork lift truck from the rail wagons and stored in the transit shed to avoid exposure to the weather. When a vessel is nominated, the goods are moved to the vessel in the same manner as steel, but more commonly are transferred using tractor trailer units.

General Cargo

The only genuine general cargo traffic is that coming on the 'liner' service from Iran. This consists mainly of building materials, such as window framing etc and some consumer goods. If it is construction materials, following discharge it is stored alongside the berth and later forwarded to the warehouse area and loaded into rail wagons from the loading platform. It is noted that the cargo is usually 'handballed' into the closed wagons in order to maximise the load per wagon. Consumer goods etc are normally placed directly in the warehouse. Again, this is standard international practice, except that the imports would generally not be stacked close to the berth, but would be moved to the rear of the storage area. However, at Aktau the storage environment whereby there is 'random' storage of export steel means that the current system of storing imports post-discharge close to the berth is logical.

7.3 Unitised Cargo

The unitised cargo consists of three main traffic streams – roll-on-roll-off (roro) services, unitised chemicals and containers.

Roro

The roro services represent the largest flow in terms of tonnage and handling activity. Aktau is served by a rail ferry from Baku run by the Caspian Shipping Company (Caspar). It calls on an irregular schedule based on demand, but currently is approximately 4 times per month. Its cargoes consist mainly of oil shipments in rail wagons from Aktau to Baku and some grain and cement and mixed general cargoes, ethanol and cement on the return voyage back to Aktau. The oil shipments on the ferry have fluctuated from year to year and fell sharply in 2006 but the general cargo from Baku to Aktau has been increasing rapidly (see Table 60).

Table 60: Rail Ferry Traffic at Aktau Port 2004-2007 ('000 tonnes)

	2004	2005	2006	2007 (est)
Aktau-Baku	230	525	160	n/a
Baku-Aktau	112	103	148	n/a
Total	342	628	308	250

Source: AISCP statistics

The cargo handling operation is a standard rail ferry activity in that the ship uses the shore ramp to interconnect with the rail lines on board the vessel. The rail wagons are shunted aboard or drawn off using a locomotive with 'spacer' wagons to ensure that the locomotive does not need to enter the vessel, as the vessel's ballasting system is unable to cope with the entry of the heavy locomotive. The road traffic consists only of powered units that are driven aboard by the vehicle's driver. It can be seen that the main cargo handling activities are undertaken by rail personnel and ship's crew and that the use of shore labour from the port is minimal.

The vessel normally starts working in the morning and leaves in the evening, with a turnaround time of 8-12 hours. In an international context this is considered slow, but there appears to be limited commercial pressure to speed up the process at this stage. The trans-Caspian ferry services generally operate on an on-demand basis and as such this makes programming more difficult, particularly as berth 8 doubles up as an oil berth.

Unitised Chemicals

The port handles unitised chemicals in large pallet bags. This is usually carried on the roro service to Iran using a vessel with quarter ramp that normally uses berth 6, which doubles up as a grain berth. Cargo handling is predominantly based on use of a fleet of small fork trucks with the forks being use to lift the 'strops' that are incorporated within the pallet bag.

Containers

The volumes are small with only around 1,000 containers per annum. No records are maintained as to the 20/40 ft mix. They almost all come from Iran, on the non-scheduled general cargo vessels run by Khazar Shipping, a subsidiary of the Iranian national shipping line (IRISL). Northbound the vessels bring building products, oil industry equipment and consumer goods, partly in containers. The origins of many of these goods are in Dubai or the Iranian port of Bandar Abbas, from where they are trucked across Iran to the Caspian ports of Amirabad, Anzali and Nourshar, and ferried up to Aktau. However, there is also consolidation traffic of consumer goods, much of which is shipped in containers in order to avoid pilferage. Almost all the southbound containers are empty. The gap between inbound and outbound traffic shown in Table 61 implies that the majority of the containers are not being returned – i.e. the trade is based on the use of 'one-way boxes'. The container traffic, however, has doubled in the last two years.

Table 61: Aktau Container Traffic 2004-2006 (Number of Containers)

	In	Out	Total
2004	326	147	473
2005	407	268	675
2006	716	290	1006
Growth p.a. 2004-2006	48.2%	40.5%	45.8%

Source: AISCP statistics

7.4 Dry Bulk

The main bulk cargoes are grain and scrap metal.

Grain

The grain shipments have been growing rapidly in the last two years (see table 62), though still have to reach the levels achieved in 2002. Grain is loaded in two ways. Firstly, directly from the storage silos using grain that was delivered earlier by rail and, secondly, loading direct from rail wagons brought alongside. Both are standard applications, with the second method being substantially slower, due to the need to constantly move wagons during the loading procedure. Loading rates vary significantly but during a sample period in 2007 they averaged 2,860 tonnes per day gross (i.e. including only working time at berth) and 1,280 tonnes per day net (i.e. including total ship time at berth).

Table 62: Grain through Aktau Port 2004-2006

	2004	2005	2006
Tonnage ('000 tonnes)	13	33	118
% growth over previous year	61.5	60.6	72.0

Source: AISCP statistics

Grain arrives at the port by rail in bulk wagons equipped with bottom-opening doors. The grain is railed to berth 6 where it is discharged, wagon by wagon, and elevated to the storage silos. The current silo capacity is 20,000 tonnes. The grain is loaded to ship through a single delivery chute at a rate of up to 3,000 tonnes per day using the grain terminal operator's labour: this rate is similar to the gross loading rate recorded in 2007.

This trade showed the lowest working time as a proportion of berth time. The difference between the gross and net handling rates shows that the total amount of non-productive time exceeds the total loading time, and this needs to be improved by organizing some of these activities in parallel.

In 2007 grain vessels waited on average 42 days before berthing, longer than for any other dry cargo vessel.

This trade also exhibited the highest average weather downtime in relation to potential working time, but this was possibly due to the lack of shipments in the three summer months.

Scrap Metal

The scrap is brought directly into the port in skips from the exporter's scrap yard located in Aktau. The loading is carried out by means of lifting the skip and tipping the contents into the hold. The major problem from an operational perspective is that the land transport delivery capacity does not equate to that of the loading method and as a result there is significant idle time awaiting delivery of the skips. In addition, normally it is only possible to work with one gang. As a result the loading rate for scrap metals in 2007 is only around 360 tonnes per ship day gross (i.e. excluding non working time) or 250 tonnes per day net (i.e. including non-working time on the vessels).

The working time as a proportion of berth time was greater than for any other trade, but this is consistent with the low productivity.

The waiting: service time ratios were the lowest of all and far lower than the overall dry cargo figures. The average vessel waiting time was 23 hours, the lowest for all dry cargo vessels except ferries.

This trade exhibited one of the lowest average weather downtimes in relation to potential working time.

Until approximately 2002 scrap metal was stockpiled in the port behind berth 3. However, as the demand for export of the higher value steel product grew, the port took the decision to stockpile the scrap outside the Port area in the exporters' yards, thereby freeing up the back of berth 3 for steel product. The scrap is now sorted outside the port before being brought forward to the berth alongside the vessel by truck for loading.

7.5 Storage Regime

An important feature of the cargo operations at Aktau port is the high requirement for storage, particularly of the steel cargoes. This situation arises due to the situation in that when the steel arrives at the port it has no vessel assigned and no identified end user. In reality, the steel cargoes are being 'stock' stored within the port area. Most ports only undertake 'transit' storage, which covers the short term storage requirements arising at the interface of the intermodal change. This arises on imports as it takes time to clear the cargo and therefore precludes direct delivery (ship to wagon alongside the vessel) and in the case of exports it is usual to build up a supply of traffic to ensure the efficiency of loading. Aktau port is engaged in very limited transit storage, usually on imports awaiting clearance.

At Aktau, where the goods are held as stock around the port, they are generally being stored according to production 'batch' numbers. The owner of the steel at this point is usually one of the major steel brokers or sometimes the manufacturer. When the broker or manufacturer's agent in Iran has 'sold' the product then an order is placed, a vessel is assigned and the shipment is 'called off' the stock in the port and loaded. Usually the shipment is based on production batch numbers so that the receiver knows that all the shipment has the same characteristics.

A modern port is generally striving to become more of a 'transit' facility in a through transport logistics chain. It therefore only offers transit storage and keeps storage 'dwell' times down by giving low numbers of free storage days and gradually increasing the daily storage charges to encourage receivers to take early delivery. It can be seen that at Aktau the situation is completely different. The port encourages stock storage activities by offering generous initial free storage time (60 days) followed by low storage charges. It does this in order to offer an attractive 'service package' to its steel customers and to match the 'service packages' being offered by competing ports, most of whom have similar regimes. Current average dwell times on steel cargoes are around 70 days, thus confirming its stock storage status.

7.6 Modal Split on Port Traffic

The port does not maintain records on how the cargo arrives or leaves the port. However, given the profiles of the traffic it is possible to provide general estimates. All oil cargo is physically delivered to the port by pipelines from the respective tank farms. In 2007 the oil cargo was lower than in 2006 for technical reasons, but it is generally accepted that on the assumption that traffic would have been around 10 million tonnes, 6 million would have been delivered to the tank farms by rail and 4 million by pipeline.

Of the main general cargo exports, steel, metals and grain etc all are delivered to the port by rail and scrap metal, chemicals and the road traffic for the rail ferry service all arrive by road. Imports are split between local goods forwarded by road and materials for the rest of Kazakhstan and Kyrgyzstan that is forwarded by rail. Of the total non-oil traffic estimated at 1.6 million tonnes for 2007, it considered that only about 10% is by road and the remaining 90% is by rail. It can thus be seen that rail capacity and connectivity are critical to the operations at Aktau port.

7.7 Other Port Operations

AISCP provides a number of ancillary services common to many ports. A towage service is provided by the port's single vessel, not an unusual monopoly situation where a single unit is sufficient for the port's overall requirements. Generally, the private sector would only be interested in a multi-unit situation.

In addition, the port provides personnel for other services, such as for berthing and unberthing and for forwarding of cargo from the open and covered storage areas to road or rail transport, as well as the general port security and emergency services.

8 CARGO HANDLING OPTIMISATION

In examining the potential to optimise cargo operations it is important that the subject is considered in the context of the specific operating environment at Aktau port. Transport services, of which the port is a part, usually consist of a combination of cost, speed and reliability. In major container ports speed and reliability are paramount and users are prepared to pay more in order to achieve these.

However, as the value of the product decreases the cost becomes more critical as it starts to become a more significant part of the sale value. As a result, the user seeks lower cost transport services knowing that they will usually be slower and possibly less reliable. A prime example of this is the use of rail versus road, whereby road is generally faster and more reliable than rail but much more expensive over long distances. Lower value products moving in volume tend therefore to always use the rail mode to save costs.

Aktau Port in its general cargo operations is predominantly handling relatively low value products in volume – steel, grain, scap etc. Consequently, price is likely to be more critical than performance, as represented by speed and reliability. This suggests that performance from a user perception may not be a key issue. The situation is compounded by the high port dwell times due to 'stock' storage of products. As indicated, steel cargoes average 70 days in store in the port prior to shipment. In the context of the overall logistics of the steel shipments, the speed of loading to a certain extent becomes relatively unimportant.

It is evident that the port cargo handling operations at Aktau generally lack 'urgency', and therefore do not achieve the performance of major seaports. The low berth occupancy means that there is not the need to turnaround vessels rapidly in order to get another vessel on the berth. Indeed, in many cases when the ship finishes both the berth and labour become idle. This is not a criticism of current cargo handling operations, which are generally considered to be satisfactory in meeting the current needs of the port, but merely reflects the environment within which the port operates. Aktau port is not a high performance environment because the commercial pressures to achieve increased performance are not present at this stage.

Theoretically, oil cargoes are now high value and therefore should justify higher service levels. However, in reality they tend to be extremely price sensitive and therefore tend to seek service levels usually associated with lower value products (if oil prices fell to 2004 levels it would again be considered as a low value commodity). The shipments through Aktau form part of a through-transport chain and it is clear that the efficiency of this 'chain' is not at its optimal, as evidenced by tankers on completion anchoring offshore because of constraints at the terminals in Azerbaijan, Iran and Russia. Consequently, there is limited pressure from the oil customers to achieve rapid turnaround in the port, even with the current high berth occupancy.

Given this situation the need to optimise cargo handling operations is more in terms of enhancing the potential of the port to be able to cope with increased demand as it arises using existing resources, rather than improvement in current operations. As indicated, the cargo handling performance appears adequate in meeting current requirements. Clearly, the pressure to achieve higher handling performance will grow as berths move towards their capacities.

8.1 Oil Cargo

The port is currently loading tankers at an estimated rate of 9,622 tonnes per ship day at berth, based on a review of various sets of statistics provided by the port. The actual loading rate is fixed by the pumping capacity of the relevant oil tank farms and is therefore beyond the control of the port. Analysis of the turnaround of the vessels and berth occupancy highlights two key factors affecting operational performance:

- Non-operational time on the berth; and
- Weather downtime.

Analysis of the berthing records indicates that the non-working time before and after loading is slightly higher than the actual loading time (see section 7.1). Clearly, if this time could be reduced this would lower the berth occupancy time and enable the port to handle more vessels as the throughput demand increases. The time taken before commencement of loading is mainly related to 'free practique' (border clearance) services. Specific recommendations were provided on the previous project but unfortunately have not been implemented. The five key recommendations were as follows:

- Port health clearance should be based on exception with the master being responsible for advising of health problems prior to berthing, and if no problems the vessel is given automatic clearance on arrival, possibly with random checks to ensure compliance;
- The free practique clearance operations should be undertaken concurrently with commencement of cargo handling operations, rather than having to wait for completion of the clearance procedures;
- The free practique procedures should be considerably simplified, especially for regular vessels;
- The Harbour Master checks should be undertaken during cargo working and be in the form of spot checks, rather than being merely an administrative procedure; and
- Sailing checks should be significantly simplified rather than in many cases being repeat checks of documents already checked on arrival, sometimes on the same day.

These recommendations are all in line with international best practice and are used in all EU ports, as well as major ports worldwide. The target should initially be to commence working within 1 hour after berthing and eventually reduce this to 30 minutes, as exists at other oil ports. It is recognised that the port is dependent in this regard on the modernisation of the procedures of external agencies.

The more serious problem of delays on sailing arises from the necessity to obtain the quality and conformity certificates for the loaded cargo involving samples from the tank farms and the vessel. This averages 3 – 4 hours. There are three certification agencies working in the port – SGS, Inspectorate UK and Saybolt. The necessity arises because of the need to mix oil and to ensure that the mix is to an agreed standard. This is a particular problem in relation to shipments to Iran, which represents 40% of oil traffic. It is recommended that discussions be held with these agencies and the border control agencies to identify ways that the process could be speeded up. If the port became very busy, one option would be for the vessel's tanks to be sealed and moved to the anchorage and the certificate to be sent out or transmitted electronically to the receiving port.

The other problem is downtime due to weather, estimated at about 60 days per year. This is principally due to prevailing winds from the north-west (75% of wind direction) with resulting swell entering the port. The oil cannot be loaded on vessels moving up and down in the swell. The major problem is at berth 4 that is the most exposed, but berths 5 and 8 can be affected by indirect swell. Berths 9 and 10 can also be affected by indirect swell and under certain conditions are affected by the problems with the protecting breakwater. These are technical issues addressed elsewhere in the study, but adversely affect cargo handling operations.

8.2 Dry Cargo

In practice, the speed of cargo handling of steel cargoes is dictated by the storage yard logistics – the movement between the storage stack and the vessel. Given the inability to plan the storage in advance because the vessel sailing date is unknown at the time of arrival, the transit distances between the stack and the vessel will vary significantly. Indeed, in many cases the vessel will load batch consignments from different areas of the storage yard. This movement is undertaken by large fork lift trucks, depending on the reel size, or by means of a road trailer. It is noted the large fork trucks are being used for 'ferrying' steel significant distances, as opposed to using road trailers. These units were not designed for such long distance lateral movement and should be restricted to vertical lifting operations and short distance transits. There is no evidence to suggest this practice is adversely affecting performance, but it is increasing the 'wear and tear' on this expensive equipment.

It may be possible to increase the amount of pre-slinging of cargo. The wire sling could be placed on at the point of movement from the stack by either a crane or fork truck and thus arrive at the quay crane already pre-slung. This would reduce the loading cycle time and therefore increase handling performance, provided the shore operation can maintain supplies to the quay. In essence, it can be seen that any improvement in performance will be predominantly due to ensuring that the landside operation is at its maximum. This suggests that any new cargo handling equipment purchased should be concentrated on this operation.

Weather also adversely affects the handling of dry cargo in that the quay crane operations are suspended when the wind exceeds a given wind velocity. This is standard international practice and it is recognised that Aktau is particularly susceptible to such winds in winter. This downtime may be less that that applicable to the more exposed oil berths but is still an operational constraint adversely affecting performance.

8.3 Unitised Cargo

The main unitised ferry service is the Baku rail ferry. As indicated the turnaround of this vessel is around 8-10 hours. The normal turnaround for a vessel of this size with mixed rail and road traffic would be about 4 hours. The current operations are characterized by long periods of inactivity, particularly between discharge and loading operations. The reasons for this slow performance consist of a series of factors including that the vessel has a schedule that does not require a rapid turnaround and thus any delays are unimportant. The other factor may be late clearance of the export cargo at the berth, particularly if quality certificates are required for the oil. In addition, some road vehicles are known to be delivering to locations close to Aktau and can discharge in the morning, clear customs and return in order to catch the vessel in the evening.

It is clear that operating performance could be significantly improved, thus releasing the berth for loading of oil cargoes. However, there seems little pressure to do so on behalf of the ferry operator. The decline in southbound cargo is a serious concern and adversely affects the potential viability of this service. Consequently, it is not considered that AISCP may be in a position to 'insist' on more rapid turnaround.

As indicated in chapter 6, the container traffic is minimal. As such, this does not support investment in specialised container handling equipment to increase performance. Current volumes can be handled efficiently with the combination of the mobile cranes and heavy fork trucks with overhead spreaders.

8.4 Dry Bulk

The main dry bulk cargo is grain. The current gross rate of 2,860 tonnes per day or 120 tonnes per hour is considered to be low, and the net rate, including non-working vessel time at berth, is worse, at 1282 tonnes per day. It may be that the positioning of the silos and the transfer systems to the loading chutes are not at their optimal. In addition, the occasions when direct loading from rail wagons takes place (twice in 2007) severely reduces the loading rate, both because of the capacity of the mobile unloading equipment from the rail wagon and the need for constant shunting. It is clear that if the port is to handle the potential grain traffic projected a new facility will be required with significantly higher loading rates.

The other main dry bulk cargo is scrap metal. The major problem with this cargo is the delivery system between the scrap yard and the vessel: this results in a low delivery rate to the berth, which in turn means that normally only one gang can be employed. In reality, AISCP is not in a position to improve the performance in that the loading system at the quayside is relatively efficient. If scrap volumes increase as predicted some improvement in the supply system will be essential.

The handling speed for scrap is particularly important as it accounts for a disproportionately large part of current berth occupancy. But it would be sub-optimal to build general cargo berths to handle scrap at only 250 tonnes per ship-day. It will therefore be assumed that future scrap handling rates below 500 tonnes per day are unacceptable.

8.5 Storage

The storage area that is predominantly used for the storage of the export steel cargo is efficiently laid out and managed. It is noted in particular that the area is kept clean and orderly and is exemplary of suck a stock storage facility. Given the large storage – around 200,000 tonnes of steel in batches - it is considered that this scale of operation could justify an automated storage management system with mapping capability. This would not only facilitate the easy locating of consignments and possible planning, but also ensure that accurate records are maintained for recovery of storage income.

8.6 Conclusion

There is some scope for improving productivity for oil, via minor investments and streamlining of paperwork and other procedures.

In the dry cargo sector, productivity is reasonable for the main cargo, steel, but sub-standard for scrap and grains.

9 PORT CAPACITY & IDENTIFICATION OF POTENTIAL OPERATIONAL CONSTRAINTS

In this section an analysis is made of the existing capacity and the operational and facility constraints that potentially may arise as the forecast demand materialises within the projected phased development programme.

9.1 Existing Port Capacity

There have been a number of previous assessments made of the port capacity. These have all been re-examined and are indicated for comparison purposes with this operational assessment. Given the nature of the traffic and continuous fluctuations in daily demand, it is recognised that such an assessment is based on best estimates.

Oil Cargo

The pre feasibility report indicated the economic capacity of the oil berths was 10.2 million tonnes based on a 4 berth scenario. In this reassessment the situation regarding berth 8 has been included. This is based on two scenarios. Firstly, that the berth is used in combination with the rail ferry in which case (based on the current low ferry utilisation) it is available 75% of the time for handling oil cargoes. Secondly, that the rail ferry service was suspended and therefore it became a dedicated oil berth.

The current average ship handling speed is estimated at 9,622 tonnes per 24 hour day at berth. Full utilisation at 100% berth occupancy would mean a theoretical throughput of around 3.5 million tonnes per berth. However, this figure should be reduced to allow for weather stoppages estimated at around 16% of available time (based on the average for all the oil berths), thus each berth is physically available 306 days per year. This reduces the potential throughput to 2.95 million tonnes. Berth occupancy of 100% of available time is unrealistic and 80% is normally considered to be the level after which congestion risks and queuing costs rise significantly. Combining this occupancy with the weather downtime gives a more realistic capacity of 2.4 million tonnes per berth.

The performance will vary between berths due to the different effects of weather and that larger tankers with a higher unit performance rate can only use certain berths. Also not all berths are connected to all farms and pumping rates will differ. The above assessment therefore represents only an average. Assuming berth 8 is available half of the time ***the overall oil capacity of the port with current operations would therefore be around 10.6 million tonnes per annum (see below)***. These figures exclude berth 11, which is assumed to be unavailable for handling oil.

Table 61: Indicative Calculation of Oil Capacity at Existing Berths with Current Operations

	Current
Weather-related delays	60 days
Load per ship (tonnes)	6,700
Loading speed (tonnes per ship day at berth)	9,622
CAPACITY p.a. @ 80% occupancy	
- With 4.75 berths	10,564, 000

These handling speeds, however, could be increased with relatively minor investments, as follows:

Table 62: Minor Investments to Increase Oil Handling Capacity at Existing Berths

Berth No		Cost ($ million)
9	Increase water depth and mooring facilities to allow 12000dwt ships to use berth; Add additional loading arm and pumping	5.0
10	Add additional loading arm and pumping	1.0
8	Add additional loading arm and pumping	0.5
11	Add loading arm and pumping; Increase water depth; Add fire fighting equipment	0.75
4,5	Add additional loading arms and pumping	1.0

It should also be noted that productivity would be increased by if there is an increase in the size of ships using the port. At present there are significant variations in the size of vessels handled and this affects performance, and hence capacity. The Iranian receiving port (Neka) can only handle shipments up to a maximum of 6,000 tonnes and the average shipment size is only 5,000 tonnes, whereas both Baku and Makhachkala can accept the 12,000 DWT tankers full. At present approximately 40% of the oil is for Neka, but this proportion will fall as the additional oil traffic is destined for the other ports.

Thus, the proportion of larger ships handled will theoretically increase. Kazmortransflot has indicated that the potential to substantially increase oil throughput depends on all operations being based on 12,000 – 13,800 tonnes vessels and dredging of all the oil berths to be able to accommodate such vessels. As previously indicated these larger vessels have a faster unit turnaround and increased use of larger vessels would increase capacity. However, they have ignored the 40% of cargo for Iran that has to use smaller vessels and other operational issues. Whilst it is believed that the proposals contain some merit, they are not implementable, may represent vested interests and suggest a throughput that is not considered to be possible without additional berths.

In addition, Chapter 7 indicated that there is significant scope to reduce the non-operational time on the berth, but this is dependent on factors beyond the port's immediate control. It is not anticipated that implementation of these procedural changes will be easy and can be achieved in the short term.

For the purposes of this feasibility study it is considered that a combination of Improvements in procedures to reduce non-working time on the berth and the minor investments shown above should be able to increase productivity by around 15-25%.

Dry Cargo

There are 3 dedicated dry cargo berths: 1, 2 and 3 and berth 6, which is dedicated to the grain and sundry other vessels not requiring the use of quayside cranes. The main cargo handled at the three dry cargo berths is steel and metal cargoes representing 93% of dry cargo throughput

in 2007 (excluding grain and rail ferry). The current handling rate for steel and scrap cargo based on 2007 performance was 2,500 tonnes per ship day at berth gross (i.e. excluding non-working time) and 1,570 tonnes per day net (i.e. excluding non-working time). The corresponding rates for steel alone were 3,870 and 2,250 tonnes per day.

If all 3 berths were handling only steel with 70% berth occupancy, this would equate to around 2.45 million tonnes per annum, or 1.7 million tonnes over two berths.

However, it is recognised that the rate is lower for non-steel cargoes and especially scrap metal. On current figures, a dedicated scrap berth would only be able to handle around 100,000 tonnes per annum, and it is doubtful that this would be commercially viable. However, with a mix of general (non-metal) cargoes it might be possible to achieve a single berth throughput of around 200,000 tonnes per annum. Combining these two figures gives a capacity for berths 1-3 of 1.9 million tonnes per annum, which compares with the estimate of 1.6 million tonnes per annum by the port operations department.

It is recognised that these potential throughput levels are significantly higher than the 1.2 million tonnes per annum shown in the October 2000 Calculation of Theoretical Port Capacity produced by Posford Duvivier – Haskoning. However, it should be noted that their assessment was 'theoretical' and did not reflect the actual mix of cargo being handled at Aktau. Thus, it included significant quantities of general cargo, which has much slower handling rates.

The grain cargo capacity on berth 6, assuming it was dedicated, would be around 385,000 tonnes per annum based on current performance and 70% berth occupancy: this would reduce to 290,000 tonnes if the present practice of 3 months closure during the summer continues. The berth is also for sundry other shipments, which can be slotted into the intervals between grain shipments.

A capacity assessment for the rail ferry services has not been undertaken as it is considered there are no capacity issues in the foreseeable future. Indeed, the concern is whether this service will continue given the declining tonnages. In the calculations regarding rail capacity a maximum of 200,000 tonnes per annum in each direction has been assumed.

To summarise, it is considered that the current dry cargo capacity of Aktau port, excluding grain and rail ferry traffic, is 1.9 million tonnes maximum and that above this level operational constraints should be anticipated. In addition, the port can handle 400,000 tonnes of grain (over 12 months) and 400,000 tonnes of rail ferry traffic.

Storage

The port has 72,000 sq metres of open storage area used predominantly for stock storage of steel cargoes. Storage density is currently around 3 tonnes per sq metre. In addition there is 6,000 metres of covered storage. Current stock levels of around 200-220,000 tonnes are being retained by the port's steel customers.

It is estimated that the port could probably stack up to 4 tonnes per sq metre or 280,000 tonnes, provided there was no significant increase in other cargoes, such as containers and construction cargo that require significant areas of storage.

9.2 Existing Port Capacity versus Traffic Projections

In this section the existing capacity as indicated in the above section is compared with the forecasts contained in Chapter 3.

Oil Cargo

The oil capacity of the port is provisionally estimated at 12 million tonnes. This is well below the forecast oil traffic (in the "base case") which rises to over 20 million tonnes in the period 2011-2013, before settling back to 16-17 million tonnes in the period 2015-2020.

As indicated, it may be possible to raise capacity by changes in administrative procedures to reduce the non-working time and minor investments, but this will probably enable only another 15% to be handled, insufficient to cover the projected levels of demand. This suggests that new oil berths are the only solution to enable the port to meet market requirements.

In addition to the provision of new berths with associated piping and pumping systems, investment in infrastructure will be required by both KTZ and KTS railways to increase their respective capacities, and possibly the tank farms, to meet the forecast longer term level of 16-17 million tonnes per annum.

Dry Cargo

The capacity of the 3 general cargo berths is provisionally estimated at around 1.6 million tonnes per annum.

This would be sufficient to handle the forecast dry cargo up (steel, scrap, containers etc, but excluding grain) up to 2013. The volumes forecast for 2015 and 2020 are 1.9 milion tonnes and 2.5 million tonnes

This suggests that the existing facilities should be sufficient to handle the projected traffic levels for approximately the next 6-8 years.

However, the key capacity issue is the growth of container or construction traffic because of its impact both on berths and especially on the storage space (see next section). The growth in the existing traffic should not cause a problem, but when the projects relating to the New Aktau City generate either containers or loose cargo then capacity problems would arise because of the reduced availability of berths to handle the main cargo – steel – and the slower discharging rate.

Given the profile of the steel traffic, it is essential that the steel cargoes are stored in one common area. Thus, even if new general cargo berths were developed in the North Port the steel operations should remain in the existing port. Split stock would cause major problems and loss of operational performance. This suggests that the timing of North Port developments are likely to be determined by the growth in container or construction cargo.

One potential option could be to develop berth 12 as a specialised berth to handle general cargo and containers, thus leaving the other three berths to concentrate on steel and metals cargo. This would have to be undertaken in combination with infilling the adjacent land area to form a supporting storage facility. It is understood that currently this land (around 20,000 sq metres) is leased to TNT and therefore such an option would be dependent on their agreement or renegotiating the lease. The effect of such a development would not necessarily increase the overall tonnage that could be handled but would enable the port to handle a wider mix of traffic, and delay the need to build new berths.

However, if the cargo mix handled at Berths 1-3 remains unchanged, Berth 12 would provide additional capacity. Based on the following assumptions:

- Berth occupancy: 50% (lower than for the metal cargoes to reflect the smaller number of vessels and the disruption caused by railway operations along the curved track behind the berth);
- Total time for vessel to enter and exit the port: 3 hours;
- Delay due to customs procedures: 3 hours;
- Working hours/day: 20;
- Working days/year: 365;
- Average number of TEU exchanged per vessel: 200;
- Number of cranes: 1;
- Average lifts per hour per crane:12 (allowing for re-stowing containers on board, delays waiting for trailers and inefficiency due to wave-induced vessel motion); and
- Split of 20':40' containers: 60:40.

the estimated annual capacity of the berth handling only containers would be approximately 40,000 TEU. If the weight of cargo carried in each container is 10 tonnes (allowing for a proportion of empty units), this amounts to 400,000 tonnes per annum of cargo.

Storage Area

One of the key concerns has been the shortage of storage area for steel with the projected growth. However, this does not pay due regard to the nature of the storage activity. Since it is stock storage, rather than transit storage, there is no evidence that the storage requirements would actually increase in line with higher loaded tonnages. In practice, the turnover cycle of the existing stock would merely increase proportionately, i.e. the average dwell time would decrease. Thus, it is not considered that additional storage areas are required for steel shipments.

However the major storage concern is likely to be the potential growth in container traffic. It is clear that it already takes a disproportionate area in relation to throughput. This is a common problem with low throughput, whereby only single stacking is used and levels of handling equipment are low. While increases in traffic will result in more economic use of space, it is clear that the existing open storage area has limited capacity given the high stocks of steel. This suggest that additional storage will be required if the container traffic increases significantly, unless the steel stock can be reduced.

The same applies to construction materials. The port is indicating that it is rejecting offers of such traffic because of inadequate storage capacity. Clearly, there is a concern by the port that this could incur high port dwell times and thus constrain the steel storage capability.

There are considered to be several options to address this situation until there is a requirement for additional cargo berths in the North Port. Storage is low revenue earning and lack of capacity should not be considered as a 'trigger' to invest in berths. The first option could be to develop the TNT leased land (irrespective of the construction of berth 12). This would enable a container terminal to be developed outside the main steel storage area. A second option could be to extend the existing storage area into the 18 hectares of storage area south east of the port that is owned by AISCP. The north-eastern part is allocated as a perishable cargo site. The recent storage extension including paving cost $2.5 million and a similar sized development may be required prior to development in the North Port. In the case of container cargo another alternative would be to transfer all landed cargo to an Inland Container Depot / Container Freight Station, possibly in the free zone including the land designated for new port. This is a standard international application and such a requirement is covered in the recently modernised Customs Act.

10 PORT SAFETY

In this section an analysis is made of the various port safety issues.

10.1 Safety and Overall Emergency Planning

The port has emergency planning procedures that are submitted to the Ministry of Emergencies and the regional government for approval. These are incorporated in each others' plans. These have to be updated and agreed by the respective authorities annually.

The port has comprehensive emergency planning manuals. These are used as the basis of training of personnel on what action they are required to taken in the event of different types of emergency. In addition, there is a full-time safety officer and an organisation chart indicating individual contacts and telephone numbers for those persons responsible for different emergencies. There have not been any accidents for at least 4 years.

10.2 Oil Spill Safety Planning

The port annually publishes contingency plans in the event of an oil spill. These formal procedures were adopted and have been approved by the Government of Aktau Region.

The port has 12 specially trained staff working on shifts at the 'ecological berth' providing 24 hour cover. Twice a year oil-spill drills are carried out by this oil spill safety team. These drills include placing oil booms around vessels at the various berths. More minor drills are conducted monthly.

The safety plans are concentrated around the 'ecological berth', which is located in the harbour basin between berths 8 and 11. This is the site where the AICSP berths two specialised vessels and stores special equipment for limiting pollution in the case of oil spills in the harbour basin. According to AISCP's Chief Expert on Environmental Control the selection of equipment is based on and compliant with the specific requirements of the MARPOL Convention.

1.3 km long oil booms are available at this site. At present, these booms are stored on the berth under the sun, but in the future they may be permanently kept in the water to provide quicker response. In case of an oil accident the booms would be brought to the place of action by the environmental vessel or port tug.

A second ship is set aside for taking in spilled oil from the sea, supported by various items of equipment that is stored nearby in several metal containers. Inside the port this ship can operate under any wind conditions. Outside the port responsibility for action in case of oil spills lies with the Mangistau Region, who seem to be less well equipped than the AICSP.

Oil accidents are generally rare in the Port of Aktau and are mainly related to the loading of vessels. On average in the past, 2 to 3 minor oil spills per year have occurred, but in 2007 no such incidents have occurred. In general, these accidental oil spills are caused by negligence rather than technical failure and are minor in nature. The last significant incident was around 35 years ago.

10.3 Fire Safety Planning

The port does not have its own fire brigade but is dependent of the city's fire service. However, the nearest station is located at the KTO site less that 2 km from the port entrance. Officers from that station make regular visits to the port and are familiar with the layout.

The port has its own fire department with a central fire control centre monitoring the port's fire alarm system. All oil berths have breakable glass alarm panels, which also exist at other strategic locations throughout the port. This modern alarm system was installed as part of the port modernisation project in 2000. Each berth has fire hydrants using sea water pumped from the pump-house near berth 6. In addition there is a foam system and there is a 120 tonne elevated fresh water tank dedicated to fire fighting.

In the case of tankers, if a fire should occur on board at one of the main oil berths the fire system forms a water barrier/screen between the berth and the vessel, which should then leave the berth. The port's new tug has fire fighting equipment including 2 high velocity water cannons and a 7 tonne foam tank.

10.4 Port Security

The port area is completely enclosed with wire fencing and the port has its own port security department with 32 personnel. They are responsible for monitoring the whole site and controlling access for all personnel at the port gate. All personnel entering or leaving the port have to pass through the pedestrian entrance and show passes. Visitors require prior permission from the security department and have to present identification.

It should be noted that in addition the port is a customs controlled area and therefore the port gate is also manned by customs police who check all road traffic entering and leaving the port area. Only vehicles with the appropriate permission of the port security can enter the port, either on the basis of permanent passes or passes issued in relation to vehicles undertaking a specific transaction inside the port area, such as collecting or delivering cargo, stores, equipment etc.

Aktau is not included by the International Maritime Organisation in its list of ports having ISPS certification.

10.5 Dangerous Cargo

The port handles dangerous cargoes in compliance with the international conventions. Other than the oil cargoes the port handles only very small quantities of hazardous goods. In relation to general cargo this can be accomplished by means of separation from other cargoes if required, but since the main storage is of steel cargo the normal concerns of cross contamination or fire are negligible. The goods are stored in a zone where easy access can be obtained by the fire service or other technical authority. This is not a fixed area but one that is selected to accommodate the cargo at that time. Given the negligible volumes this policy seems reasonable.

Cyanide is occasionally imported on the rail ferry service that is destined for the gold mining operations in Kyrgyzstan. Specific precautions are taken in regard to these shipments and they are removed from the port immediately following discharge from the vessel.

11 CAPACITY OF RAIL, PIPELINES AND TANK FARMS

11.1 Introduction

This chapter examines the rail infrastructure that serves the port of Aktau, and its associated freight terminals. It reviews the current position with each of the railway operators, assesses the likely changes to rail infrastructure over the next 5 years, and reviews the traffic volumes currently handled by rail and the scope for rail to accommodate possible traffic increases.

Aktau Port is served by road, rail and pipeline, but in practice until now the road connections are of limited value. A new European standard road is being constructed between Atyrau and Aktau, and this will make road movement of freight easier, especially to the major oil developments at Kashagan and Tengiz. However, until now almost all freight through the port is rail based, and in total this position is likely to continue for major freight traffic flows.

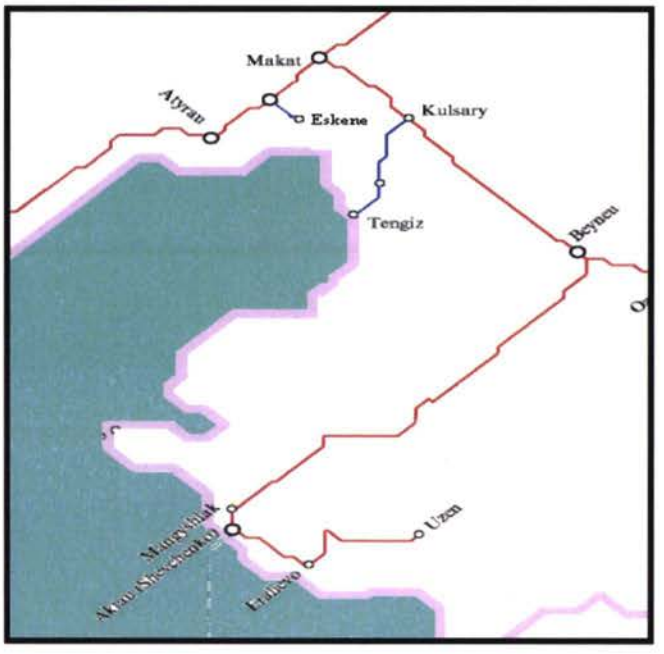
Oil traffic predominates at Aktau Port because of the large oil fields in western Kazakhstan, the lack of pipeline capacity to transport all oil production, and the ability of the port to provide tanker access to key the destinations of Baku in Azerbaijan (for the BTC pipeline to Ceyhan) and Neka in Iran (for the swap market to Bander Abbas). At present oil represents 70% of all cargo shipped via Aktau Port by volume.

11.2 Rail infrastructure

Rail Access - KTZ

The state rail network of Kazakhstan operated by Kazakhstan Temir Zholy (KTZ) serves the Port of Aktau, though is not linked directly to it. The line to Aktau runs from a junction with the main east–west corridor linking Almaty and Astana with the Russian border at Aksarayaska at Makat station and is single track for the entire distance. A map of the rail connections is shown below.

Figure 5 – KTZ routes in the Mangystau Region



Until Beyneu the line is relatively flat, and the maximum permitted load for a freight train is 6,000 tonnes. Between Makat and the Mangistau region station at Mangyshlak the line climbs over high ground, and the severity of the gradient restricts the maximum permitted loads. Until recently the maximum permitted load on the Beyneu – Mangyshlak section was 3,200 tonnes. KTZ is now re-enging its main line locomotive fleet with General Electric power units, which increase the hauling power of the 2TE10 double locomotives used on freight traffic, and this has increased the permitted load by 20% to 3,800 tonnes. The gradients in the return (northbound) direction are even greater, but as the northbound traffic predominantly consists of empty wagons the impact of this has been ignored in this report.

Standard crude oil block train (trains comprising wagons of one type and commodity for one customer) from TCO and Kashagan to Beyneu consist of 60 loaded RTCs, each RTC containing up to 65 tonnes of crude oil. Because of the load constraints, at Beyneu these trains have to be split into sections, as the maximum forward load to Mangyshlak/Mangistau is 42 wagons.

At Mangyshlak railway station, KTZ operates a large 12-road gravity yard which sorts freight traffic bound for Aktau Port and other destinations. Substantial expansion works have been undertaken at this yard over the last 3 years. From Mangyshlak wagons are worked forward to Aktau Port station (approximately 3.5 km distant) where traffic is handed over to Kaz Trans Service (KTS), the local port and industrial area railway operator.

Trains between Mangyshlak and Aktau Port run with a maximum of 35 wagons, and therefore remarshalling of all incoming trains is required at Mangyshlak station.

Rail Access - KTS

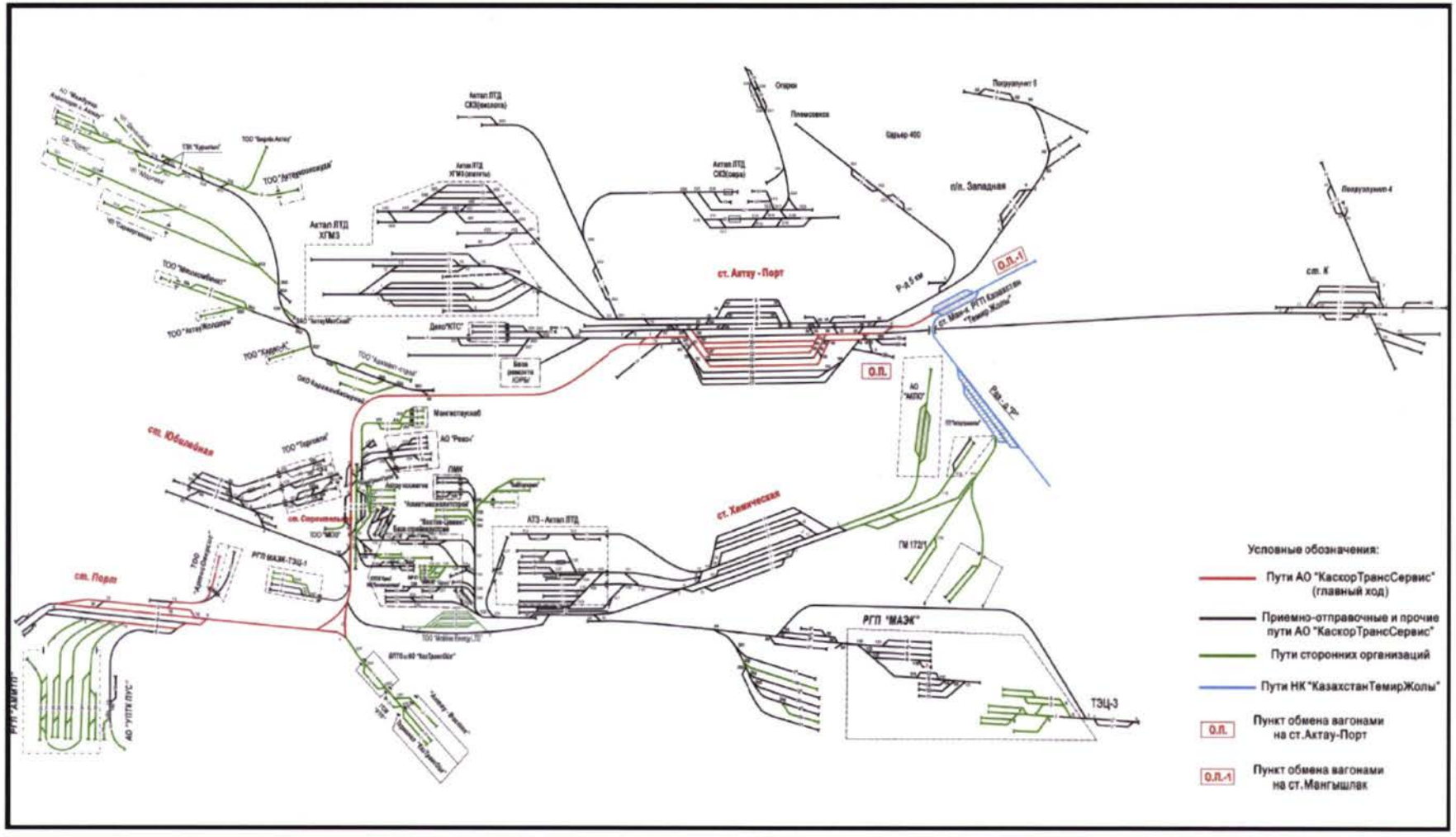
KTS is an independent railway JSCO, privatised as part of the government process. Exact details of share ownership are not known, but a number of the key port operators (including KTO, Terminalex and Artis Overseas), are shareholders.

The KTS track layout is shown on the following page. KTS owns and operates a 160 track mile rail network. From Aktau Port station onwards KTS takes wagons direct to the receiving oil terminal/tank farms, port and other different destinations. The maximum train size is 35 wagons; though many terminals are configured only to be able to receive smaller trains. There is therefore a need to remarshal trains once again at Aktau Port station. At Aktau port KTS has a marshalling yard and storage sidings (and is planning to expand these sidings to provide even more holding capacity).

The distance between Aktau Port Station and the port is 15 km.

A track diagram of the KTS system is reproduced on the page below.

Figure 6 – KTS network



KTS has wagon turnaround agreements with the terminals that it serves, and generally there are penalty charges for late handback of wagons berthed for unloading. However there appear to be no penalties paid by KTS for wagons delayed en route and 'on face value' the arrangement appears to be somewhat one sided.

Aktau Port station is congested with wagons waiting discharge. At the time of the visit in October 2007 Aktau Port had approximately 1,300 wagons on hand awaiting discharge (1,000 oil RTCs and 300 other cargo wagons – mainly steel products). Even at maximum discharge rates, this equates to approximately 4 days worth of traffic waiting unloading. The reasons for the backlog of wagons are complex and different parties have offered different explanations. KTZ and customers appear to generally believe that it is due to the inefficiency of KTS, while KTS believes that it is due to customers being highly selective as to the wagons they call forward (especially for oil traffic where terminals blend different oil from different customers to achieve a uniform quality grade). Whatever the reason, there is a considerable backlog of wagons awaiting discharge and this inevitably has impact on the commercial attractiveness of transport via the Port of Aktau.

KTS charges tariffs independently of KTZ, and is a commercially independent organisation. In Europe, it would be normal for KTS to act as a subcontractor to KTZ and for KTZ to charge inclusive tariffs direct to destination terminal with the rate incorporating the sub contract charge. This does not happen in Kazakhstan, with the result that forwarders have to have two separate contracts, one for KTZ and one for KTS. This makes the rail offer more complicated and generally explains why most traffic to Aktau port is controlled by freight forwarders, rather than by freight customers themselves.

The tariff charged by KTS appears high for the short route section of 15 km, and is currently 36,000 tenge per wagon. It is generally felt by customers at Aktau that this acts as a major commercial disincentive, and that KTS is a generally uncommercial organisation that has a monopoly due to its control of all rail traffic currently accessing the port.
However, it is considered that KTS's costs per route km will inevitably be considerably higher than those required for normal main line operations, due to the amount of shunting and marshalling that is required to service the multiplicity of sites, while the track diagram demonstrates that the amount of infrastructure per route km is also extremely high.

KTS capacity

KTS has reported that it has a system capacity capability of between 8 and 9 million tonnes of traffic per annum. At an average load of 55 tonnes per wagon this would equate to 450 wagons per day handed over between KTZ and KTS. Currently KTS has agreements in place that commit it to be able to handle a maximum of 420 wagons per day. It is therefore fair to assume that KTS believes that it is operating near to its fullest capacity.
At the moment KTS suffers from congestion on the system at a number of key points. The sidings accommodation at Aktau Port station is full, with many wagons on hand waiting orders or terminal call off. At the last time of visit (and consistent with previous visits) Aktau port had 1,200 wagons on hand. Even at maximum discharge rates this equates to at least 3 days' traffic for all the terminals and port combined.

The second key area is the port reception sidings, a fan of 4 sidings that handle traffic onto and off the port, traffic for Artis Overseas, and some if not all of the oil traffic for the KTO terminal. These sidings are said to be a key constraint to increasing capacity (and indeed Artis reported that it experiences delays between the removal of empty wagons and berthing of the next set of loaded ones.

It is understood that KTS believes that to increase capacity across the system will require a significant capital expenditure, possibly as much as $300 million. While undoubtedly major

expenditure would result in much greater capacity, the project team believes that there are a number of key initiatives that could be employed to increase the capacity of the system.
The system is characterised by a large number of siding connections that are now redundant, the industries served by them having closed, and infrastructure that in many cases is inappropriate for the current traffic. Therefore long-term remodelling is inevitably required, though as in all rail systems this will be a gradual and continuous process. However reconfiguration of the network to handle the traffic has already taken place, and KTS operates with Service Level Agreements (SLAs) to most of its key customers, which indicates that it has already adopted a planned and disciplined approach to the traffic needs of the terminals it serves.

The key issue at the moment appears to be the extent to which trains are broken at both Mangyshlak (KTZ) and Aktau Port (KTS) stations, which involves a large amount of shunting time, only for the RTCs to then be called forward by the terminals in quality order. A key objective of both TCO and Agip is to move as far as possible to block train movement where intermediate marshalling requirements are minimised. This in turn will increase both the throughput and speed of traffic at key locations, and it is recommended that KTS and AISCP consider the extent to which this strategy can be used to meet the anticipated throughput increase due in 2008.

Each of the 3 oil terminals has servicing agreements in place with KTS, which provide for 3 shunts per day. In total this provides for the terminals to receive and unload approximately 500 wagons per day, producing an annual offloading capacity (assuming 65 tonnes per wagon) of 11.7 mtpa. Strategies to maximise this capacity would therefore provide an increase of 3 mtpa in system capacity, while the use of block trains would make this perfectly possible.
The maximum train length within the KTZ and KTS systems is 42 wagons, which equates to the maximum train lengthy which KTO can handle, and if Artis is going to invest in capacity for their terminal then they should be encouraged to standardise at this length also to maximise capacity. Terminalex is located on a different part of the KTS system with a separate rail interface with KTZ, and is capable of handling trains of 60 RTC length. Even with reassembling of trains from Beyneu at Mangyshlak, it should be possible to move trains of that length to the Terminalex reception sidings from there in a continuous movement (possibly with through working of KTZ or KTS locomotives).

Investment in reconfiguring sidings areas at the port entrance and adjacent to each of the 3 terminals would therefore result in increases in system capacity. Some of these sidings are controlled by power signalling, which necessitates more complex upgrades, and it may be prudent to consider when the current KTS signalling control system needs replacement, and to time capacity upgrades to coincide with this. However even if this is not possible reconfiguring of the track layout at key areas to reflect current and future operations rather than the traditional system uses should be an urgent priority.

At this stage detailed discussions with KTS over capacity enhancements have not been held, but we assess that the works required are relatively low scale siding and track alterations. It is debateable where funding for such upgrades should be sources from. KTS is an independent profitable company, with a shareholding including some of the key port users. Additional traffic will provide higher revenues and to some extent this will fund the capital cost of any capacity increases (providing the longevity of traffic moved can be guaranteed or assured).
However, given that the port is largely dependent on the capacity of the rail network to support the projected traffic volumes, it would be prudent to include an element of capital cost for siding alterations in the project within the port upgrade capital budget.

Service Level Agreement with KTS underwriting the benefits gained from expenditure must of course accompany any contribution. At this stage we would suggest that a budget figure of $2 million should be allocated fro siding and terminal servicing capacity upgrades, to be paid as a contribution to KTS for defined capacity works.

Main line KTS system capacity is dependent on both the amount of signalled track capacity available and the locomotive and driver fleet available. KTS currently operates 6 locomotives of varying type (TEM2 and M62) all of which are capable of moving the maximum trainloads on the system (42 wagons) and capable of shunting into terminals. Normally KTS operates 5 locomotive duties from its total fleet. Increases in the locomotive fleet would be easy to arrange on a temporary or permanent basis, either by short-term hire from KTZ or locomotive JSCs, or by procuring additional serviceable locomotives (a TEM2 shunting locomotive can be procured in fully refurbished condition for approximately $500,000). Given that locomotive costs are directly linked to traffic levels any additional procurement is therefore a matter for KTS alone and easily solved.

A move to concentrate on trainload movements wherever possible will maximise system capacity. Given the relatively small size of the system and short journeys a disproportionate portion of the total train time is inevitably occupied by shunting activities, but it is fair to assume that the maximum out and back time from Aktau Port station to any terminal should be 2 hours. On this basis, and assuming that 3 of the duties are available for running 'main line' services (the other 2 being occupied with shunting duties at the port, Aktau Port and tripping to KTZ), it ought to be possible to run 8 'trains' per day with one locomotive. This produces a servicing capacity of 24 'trains' per day or a maximum servicing capability of 1,000 wagons per day, far in excess of the maximum target throughput.

The remaining capacity issue is the volume capability of the single line from Aktau Port station to the port reception sidings. Colour light signalling controls this line and by observation has sufficient capacity for the traffic movements. Even on the basis that it were restricted to occupation by one train at any time, and given a maximum occupation time of 30 minutes, this would produce a maximum train capacity of 48 trains per day, again far in excess of what is required.

11.3 New Port Access

Both KTZ and the Port of Aktau have stated that a scheme is being developed to create a new independent main line rail access (approximately 14 km length) to the Port of Aktau. The scheme involves the construction of a new route to the port, linking to the KTS network close to the KTO terminal. KTZ stated in a meeting that the budget cost for the scheme is $ 4-5 million ($300k x 14 km). However, it is not clear who will fund the construction costs, though there are suggestions from the port that the funder may be KMG, or possibly KTZ.

The advantage of this scheme is that it will create a new KTZ-controlled access to the port that will act as a competitor to KTS, and will provide a considerably reduced tariff that could reduce overall transit charges to the port. KTZ estimated that the tariff charge would be 20% of that charged by KTS, and will produce savings of 29,000 tenge ($240) per wagon. This would equate to a saving of $4 per tonne. The other advantage of the scheme is that KTZ will be able to offer a tariff direct to the port or terminal, thus simplifying commercial arrangements.

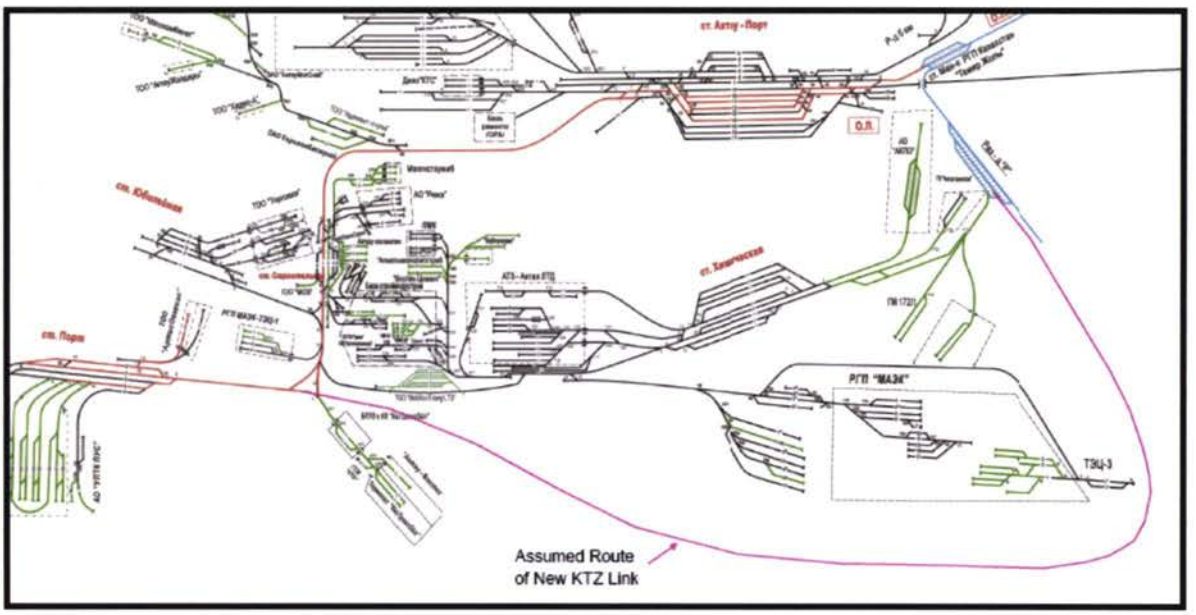
The route of the new link is on land within the Special Economic Zone of the port, but land ownership is not clear. The final 2km of the route to the port are on KTS owned track, and either this part of the route will be transferred to KTZ, or some form of track sharing will be required. It is not clear at this stage which operator will own this joint section, or indeed who will operate services over it.

Crucially, the only terminal served appears to be KTO, which would be logical if the funder is indeed KMG. It is unclear whether KTO's competitor, Artis Overseas, would be able use the link, and if it would be able to obtain the lower rates, as its terminals would not be directly serviced by the KTZ operated link. However, they are not far from the link and the same track sharing options may apply. It is recommended that the AISCP should develop a commercial relationship

with the scheme promoter, as it will have a substantial commercial and logistical impact on the port traffic prospects.

The probable route of the new link is shown in sketch form marked in pink on the following plan:

Figure 7 – Potential new KTZ Port Access route



11.4 Main Line Capacity

KTZ, in common with other CIS systems, calculates track capacity in terms of the number of train pairs (one train in each direction) permitted per route section. Capacity is then stated as the number of pairs used. In terms of route capacity, the constraining factor between Makat and Mangyshlak is the final steeply graded section between Sai Utes and Mangyshlak. Data provided by KTZ states that the maximum permitted number of pairs per day on this section is 16, with 3 of these paths being dedicated to the daily passenger services two for Mangistau and one for Uzen). This leaves 13 train pairs available for freight traffic.

Each train on this section comprises 42 wagons. If an average payload per wagon of 60 tonnes is assumed this produces a payload per loaded train (Sai Utes to Mangyshlak) of 2,500 tonnes. Given that standard KTZ practice is to run the maximum number of wagons on every train run this is a valid calculation assumption (oil trains will run with 66 tonnes per wagon while general cargo trains will run with an average of between 50 and 60 tonnes per wagon).

At an average of 360 days of operation per annum this means that every train pair conveys 900,000 tonnes per annum. Given KTZ's stated capacity of 13 pairs per day, this means that the total capacity per annum on the route to Mangyshlak is currently 11.7 m tonnes per annum.

However, TCO has invested a capital sum to upgrade the railway line to provide additional capacity, both for oversized loads of plant and machinery and in providing an additional two passing loops to create additional route capacity. In interviews KTZ at Mangyshlak stated that total route capacity is now 17 pairs, producing a maximum freight capacity of 14 pairs or 12.6 m tonnes per annum (mtpa).

Route capacity on the rest of the route is 26.7 m tonnes per annum achieved through the regular capacity of 19 full sized pairs per day. The only realistic way in which capacity on the Sai Utes – Mangyshlak section could be substantially increased and could match this capacity

would be to double track the 225 km section throughout (a rough budget estimate for this would be $68 million, based on a notional total construction cost of $300 per metre of doubled track).

11.5 Terminals

Visits have been made to each of the principal terminals on the KTS system, to understand the traffic that they currently handle and future prospects. This section sets out the findings and draws conclusions as to the total volume being handled now and the potential volume that could be handled in the future.

Oil Terminals

There are 3 terminals in the port area, all served by both rail and pipeline from the Busachi field, linked to Aktau by a 20" pipeline with 160,000 bopd (4 – 4.2 mtpa) capacity.

Artis Overseas

Artis Overseas operates the oldest of the tank farms with relatively poor facilities. Artis is a British Virgin Islands registered company, believed ultimately to be of Turkish ownership. However, according to the trade press Artis purchased Mobilex in September 2007 and therefore took control of the Mobilex (Terminalex) terminal as well.

Artis currently handles 1.8 mtpa of oil from a variety of markets, principally Vitoil, all bound for the Iranian swap market. The maximum volume the site could handle is 2.1 m tpa and therefore the site is operating near to its maximum capacity. The site can unload 38 RTCs at one time on a single siding, and generally handles 4 trains per day. The site has 55,000 m^3 storage capacity. However it is understood that Artis has held discussions with TCO in 2007 and would be prepared to carry out substantial investment to increase its rail discharge capability by adding a second track and increasing unloading capability to 4.8 mm tpa by 2008.

Terminalex (Mobilex)

Terminalex (the new name for Mobilex) opened the terminal in 2005. It is now understood that Artis Overseas has purchased the site (see above).

Terminalex has the most modern and best equipped of all the terminals. Unloading facilities consist of 4 x 30 RTC parallel unloading racks, and 120 RTCs can be unloaded at the same time. KTS provides a maximum of 3 shunts a day. Terminalex has a storage capacity of 60,000 m^3. Maximum capacity of the site is 3.6 mtpa, though at the moment tonnage handled is approximately 1.5 mtpa. It appears that Terminalex is having difficulty gaining sufficient berth access and that its operations are being severely restricted, as in normal conditions it would be expected to be handling more traffic than it currently does.

Terminalex has held discussions with TCO, and expects to handle 3 mtpa from early 2008, though contracts have not yet been signed.

Overall Terminalex has plans to increase site capacity by adding 2 x 45 unloading lines and upgrading tank farm capacity to 160,000 m^3. The ambition is to increase total handling capability to 12 – 17 mtpa. However this appears to be totally dependent on an expansion of the port to provide additional 12,000 dwt loading berths, as this is the current constraining factor.

KTO

Kaz Trans Oil (KTO) is a state owned company responsible for oil terminals across Kazakhstan. The Aktau site has unloading facilities for 2 x 42 RTCs and 140,000 m^3 storage capacity.

Currently the site handles 700,000 – 850,000 tonnes per month (8.5 – 10 mtpa), including 4 mtpa of oil from the Busachi field. KTO estimates that the maximum capacity of the site is 15 mtpa, and that storage capacity can be increased to 100,000 m^3 by doubling the size of the 20 5,000 m^3 tanks. At the moment KTO appears to have no plan to increase the capacity of the site, and indeed is concerned that in the medium term they may have to adapt the terminal to handle other traffic (such as LPG) if the KCTS pipeline abstracts substantial amount of traffic. The terminal has already lost traffic following the diversion of Kumkol traffic that it used to handle to China (via Atasu).

11.6 Aktau Port

Aktau Port is served by rail directly serviced by KTS shunting locomotives. The port does not have its own shunting locomotives or staff. Principal traffics handled by rail are:

- Train ferry traffic – the train ferry runs to and from Baku and also handles ro-ro lorry traffic. The ferry has limited capacity - a maximum of 28 freight wagons - and sails infrequently (at the moment it appears to operate approximately 4 times per month). The train ferry berth is normally used for oil tanker loading for both Artis and KTO.
- Steel traffic – the port is currently handing approximately 1 mtpa of steel – a combination of hot rolled and cold reduced coil and flat sheet. Maximum lifts are 25 tonnes. As is usual in Kazakhstan, general wagon types (principally flats and gondolas) are used to carry the traffic. Though these are not customised for the traffic and make terminal handling difficult, they are in generally good supply. It is apparent that the steel is stored for extended lengths of time on the port.

11.7 Future development

There are a number of planned developments that will affect the future volume of oil traffic handled via Aktau port. These developments have been detailed in the time sequence in which they are likely to occur.

TCO Oil

TCO currently produces 13 mtpa (300,000 bopd) of crude oil from its onshore field at Tengiz, all of which moves via the CPC pipeline to Novorsyssk for export shipment. TCO is about to double the oil it produces to 26 mpta (600,000 bopd) as part of its phase 2 development, which will come on stream in 2008. As there is no spare pipeline capacity available to carry this traffic, most will be moved by rail to a number of destinations. It is understood that TCO's plan is that they will move most of this volume (8m tpa) to Odessa on the Black Sea and transfer it to ship from there, but that they will move 5 mtpa via Aktau – the likely maximum that Aktau can handle from both a rail and port capacity point of view.

All three oil terminal operators that we contacted during the site visit confirmed that they are in discussion with TCO about handling oil traffic and all confirmed that TCO have nominated a total tonnage of 5 m tpa through Aktau. However it is understood that the tonnage on offer is only quoted until 2012. This is almost certainly because of the likely construction of the KCTS pipeline (see below). TCO will know that terminal operators will be looking to invest to create extra capacity to handle their traffic (at present there is only just enough spare capacity to handle the volume and then possibly at the expense of other traffic). Therefore they can be expected to offer as long a period of contractual security as they can.

Four years is considered too short to realistically underwrite investment, and therefore it is concluded that TCO have very little intention at the moment of using terminals in Aktau if an alternative pipeline route via Kuryk is likely to become available. This would explain why the company is only prepared to offer traffic guarantees up until 2012 at the moment.

The conclusion therefore is that the 5 mtpa of TCO traffic is a short-term opportunity only, and that after 2012 there is no certainty that the traffic will be continue.

KCTS

KCTS (Kazakhstan Caspian Transport System) is a joint project between KMG, TCO and Agip KCO to build a pipeline from Eskene and Tengiz to a new site at Kuryk, south east of Aktau. The parties signed an MOU in January 2007 for the $3 bn project, which is scheduled for completion in 2011 –12. Nominal capacity is 25 mtpa. The pipeline would feed an oil-loading terminal at Kuryk based on single point moorings (SPM) and possibly involving larger tankers than can currently operate via Aktau or Baku ports. It is reasonable to assume (in view of the inherent economics of pipeline transport and the need for the partners to recoup their investment) that once this pipeline is open all oil from Tengiz and Kashagan routed into the BTC pipeline at Baku will be routed via this pipeline and that rail traffic will cease.

Though there is a possibility that a branch of this pipeline would be constructed to Aktau, both for regular shipment and to provide standby capacity in the event of serious plant failure or bad weather closing the Kuryk terminal, it is understood that no firm decision has yet been taken by At the moment there appears to be considerable doubt as to when KCTS would actually be completed. At worst political and environmental issues could delay the project until at least 2020. However, it is concluded that there is sufficient likelihood that the pipeline will be constructed to make it impossible to place any reliance on substantial rail movement of oil beyond 2012 from either Kashagan or Tengiz.

Kashagan

The Kashagan oil field currently being developed by Agip KCO on behalf of a consortium of partners is due now to produce first oil at the end of 2010. The project has already suffered a number of production delays and the first oil date has already slipped from initial estimates by 2 years. Kashagan is the largest oil field outside the Middle East, with proven recoverable reserves of 10 bn barrels. As with Tengiz, the key issue for Kashagan is that there is insufficient pipeline capacity available to move the production volume, and rail will be required to move initial production. Agip KCO expects to produce about 350,000 barrels per day, and until pipeline capacity is available up to 300,000 barrels per day (14 mtpa) will move by rail. As with TCO therefore, there should be an expectation that some of this volume would move via Aktau. Agip KCO is known to have conducted exploratory meetings with terminal operators at Aktau. However, use of the rail line to Aktau and terminals will only be possible if there is sufficient spare capacity in both, and at the moment it appears that capacity will be taken up by TCO traffic. Furthermore, as Agip KCO is a partner in the KCTS project, it can be assumed that if this pipeline opens then all Kashagan output for Baku will switch immediately to the pipeline and will cease to move by rail.

There is further uncertainty about the first oil date that Agip KCO is likely to achieve. There has already been a succession of delays to the project and at the moment no certainty that the declared first oil date will be achieved. At the time of writing this report the ROK Government has suspended exploration operations for 3 months to conduct a full cost review of the project and is claiming several billion dollars damages for environmental impact. Whatever the outcome of this, further project delays seem to be very likely.

There is therefore a very small time window in which oil may be transported by rail via Aktau Port before KCTS opens, and in any event this time window will be smaller than that for the TCO traffic. It is therefore impossible to base any recommendations on upgrading port facilities or rail and terminal capacity on Kashagan traffic.

11.8 Conclusions

Rail Access

KTZ rail access to the Aktau Port is constrained in terms of capacity by the last section of route between Sai Utes and Mangyshlak. At the moment rail does not seem able to deliver more than 12.6 million tonnes of traffic per annum. Of this approximately 2.5 m tonnes are non-oil cargo. This means that the maximum oil capacity on this stretch of line is approximately 10.1 million tonnes. The existing pipeline brings in another 4 million tonnes of traffic per annum, and it therefore appears that the total transport capacity (ignoring road) to Aktau produces a total throughput capacity of around 14.1 million tonnes of oil traffic per annum. These figures indicate that KTZ is a concern when overall traffic to the port exceeds 15 million in total.

It is considered that to increase beyond this level KTZ would need to either double the track section, or to investigate provision of additional locomotive power for trains using this section of route. Track capacity cannot be increased quickly, even if funding were available, and a lead-time of at least 24 months from the date of authority should be assumed to be the minimum achievable.

Given that track capacity plays a major part in the port's economic and logistical capabilities, it would be sensible for the port management team to actively pursue the issue of capacity with KTZ in Astana and Mangyshlak to ensure that its development plans are well understood and that KTZ's regional investment policy correctly reflects the port's needs.

KTS Capacity

KTS currently controls rail access to the port and its key customers. KTS is often quoted as the major constraint to volume increases, but this disguises some of the more systemic logistical problems in providing rail access to terminals that in some cases lack the total capacity to efficiently handle maximum volumes.

Current system capacity is assessed by KTS themselves at 8-9 million tonnes. However the system is configured to serve former industry rather than being totally appropriate for the needs of the current terminals and the port. Some reconfiguration of the network would therefore be appropriate to assist in increasing volumes.

It is suggested that some money be budgeted within the port development plan to contribute to the resolution of immediate bottlenecks to capacity. An initial figure of $2 million is suggested.

The key action which would improve system throughput would be to encourage terminals and KTS to co-operate in basing as much traffic movement on trainload (block) working rather than staging trains at Aktau port station. This would cut down the amount of shunting and remarshallings required, and simplify wagon handover between KTZ and KTS.

Given current resources and track capacity on the KTS network it appears that there is capacity within the system to increase traffic by up to 50% given reasonable modifications to the track layout, methods of working and concentration on trainload traffic movements. This will require co-operation between KTS, terminals and the port, but should be achievable to match projected traffic build up. KTS has already indicated that it is able to handle the projected additional TCO traffic forecast for 2008.

New KTZ rail access to the port

KTZ has prepared plans to construct an independent rail access on its own network infrastructure to serve both the port and some or all of the oil terminals. Details are still provisional, but this access would further boost the rail capacity of the port and surrounding industry, while KTZ can offer lower tariffs and a competitive force to ensure that rail servicing of terminals is the most efficient and economic possible. It is recommended that AISCP should participate as fully as possible in the development of this project in order to ensure that the maximum benefits for the port estate are secured, even if this means consideration of capital participation.

12 SBM OPTIONS

Possible locations for a single buoy mooring (SBM) have been identified at Aktau but AISCP have stated that an SBM is not beneficial to their business, therefore detailed technical and cost studies on this option have not been carried out. It is possible that in the future the use of larger ships, such as the 60,000 dwt ships proposed for Kuryk, which can not be accommodated in Aktau Port, may become widespread in the Caspian in which case re-examination of the case for an SBM at Aktau may be justified.

13 DEVELOPMENT OPTIONS AND COST ESTIMATES

13.1 Options

The main factors which affect the choice of future development options for Aktau port are:

- The volume of oil to be exported. The projected future volumes of oil and the timing of demand for additional facilities have been shown to cover a significant range, Scenarios A, B or C as discussed in Section 4 ; and

- The ability of the rail and pipeline systems to deliver oil to the port for export. As discussed in Section 11 the existing capacity of the rail system is insufficient to meet the requirements of Scenarios A, B or C and without expansion of the systems the North Port expansion would not be justified.

The development options available are:

- Upgrade the existing port immediately to the limit of it's capacity at which point the port and rail and pipeline capacities are approximately equal, and then cease expansion works until the rail and pipeline capacity into Aktau has been increased to match potential oil and dry cargo traffic projections;
- Upgrade the existing port immediately to the limit of its capacity and in parallel carry out a phased development of the North Port to match the oil and dry cargo traffic projections on the assumption that the rail and pipeline infrastructure is upgraded in parallel with port development

The nature of the phased development of the North Port will depend to some extent on whether the growth in oil volumes follows Scenario A, B or C. In the case of Scenario A the cost estimates and the corresponding estimated improvement in port throughput, as discussed in Section 8, are summarized in the following table:

Location	Year re-quired	Berth num-ber	Proposed improvement	Reference drawing	Estimated improve-ment in capacity Tonnes/yr	Cost US$ million (excluding equipment)
Existing Port	2008	1,2,3	Improve customs and immigration procedures; improve/increase cargo storage area.	N/A	400,000	0.5
	2010	12	Extend existing berth face southwards; extend crane rails; extend port paving and reclamation; localised dredging	• Typical cross section no 2	400,000	10.0
	2010	9	Increase water depth and mooring facilities to allow 12000dwt ships to use	• Layout drawing no 1	1,000,000	5.0

			berth; Add additional loading arm and pumping			
	2010	10	Add additional loading arm and pumping	• Layout drawing no 1	750,000	1.0
	2010	8	Add additional loading arm and pumping	• Layout drawing no 1	150,000	0.5
	2010	11	Use of this berth is subject to resolution of safety issues by AISCPand has not been included at this stage	• Layout drawing no 1		
	2008	4,5	Add additional loading arms and pumping	• Layout drawing no 1	1,500,000 ??	1.0
					Oil 3,400,000 Dry (non grain &rail) 800,000	**18.00**
North Port	2010	No berths	Construct mole and breakwater, complete reclamation and protect with revetment	• Layout drawing no 10	0	107.00
	2010	14&15,	Construct 2 oil berths only and carry out dredging of North Port Basin and access channels, remainder of North Port remain as for no berth case	• Layout drawing no 10 • Typical cross sections no 6&7 Drawings for both solid and open piled options	5,000,000	30.00 (excluding equipment) Plus 30.00 for dredging
	2010 or 2015	16&17	Construct 2 oil berths either at the same time as 14&15 or later if oil volumes are uncertain	• Layout drawing no 10 • Typical cross sections no 6&7 Drawings for both solid and open piled options	5,000,000	30.00 (excluding equipment)
	2017	21&22	Construct 2 general cargo berths & full development of North Port	• Layout drawing no 10 • Typical cross sections no 8&9 Drawings for both solid and open piled options	850,000	60.00 (including equipment
	2014	23	Construct new grain berth	• Layout drawing no 10 • Typical cross section no 8&9 Drawings for both solid and open piled options	500,000	20.00
	2015		New roads, services, buildings to support new berths	• Layout drawing no 3	Incl above	50.0
					Oil 10,000,000	**327**

					Gen cargo 850,000 Grain 500,000	

It should be noted that the layout for the North Port as approved by AISCP and Government only has sufficient space for 7 new berths: 4 oil berths and 3 dry cargo berths. In addition there is an area of approximately 50 Ha for a backup area behind the dry cargo berths. The consequence of the limited space for berths means that beyond 2020 further new options will be required. This subject is discussed further in the Master Plan which is contained in a separate Report.

In the case of Scenarios B and C only 2 oil berths are required. If these are berths 14 and 15 then berths 16 and 17 could be developed as dry cargo berths to meet any demand beyond 2020.

14 ECONOMIC EVALUATION

The economic evaluation in this chapter compares the costs and benefits of optional investments in the Northern Extension from the viewpoint of Kazakhstan's economy. It is to be distinguished from the financial analysis which compares the revenues and expenditures from the proposed projects from the viewpoint of the investors (the AISCP). Most of the economic benefits of port construction – for example, reductions in ships' queuing costs, avoidance of additional transport costs via second best routes and the removal of bottlenecks to the growth of exports - do not appear in the accounts of the port authority or in the financial analysis.

The economic evaluation is carried out primarily on the "Base Case Forecasts" (see Scenario A in Chapter 4), the main features of which are Aktau winning oil traffic back from the high cost Odessa Route, and Kuryk handling only Kashagan exports. The text also tests the sensitivity of the results to two other scenarios, i.e.

- Scenario B (see Chapter 4) with Aktau ***not*** winning traffic back from Odessa, and Kuryk handling only Kashagan exports
- Scenario C. (see Chapter 4), with Kuryk and its pipeline expanded to handle Tengizchevroil as well as Kashagan exports

The fundamental principle applied in this analysis is that berths should not be built until the benefits in their first year of operation exceed the annualised costs of the berths. The underlying objective is to minimise total costs to the national economy. After identifying the optimal timing for each new berth on the basis of their first year rates of return, the EIRR is calculated for the resulting phased investment programmes.

14.1 Base case: scenario "A"

14.1.1 Traffic Volumes

The traffic volumes forecast under Scenario A are shown in Chapter 4 and are summarised as follows:

Table 63: Summary of Traffic Forecasts (000 tonnes)

	2006	2010	2015	2020
Oil (see Table 3 for fluctuations by year)	**9,900**	**12,000**	**15,000**	**17,000**
Dry General Cargo	**1,146**	**1,681**	**2,709**	**3,475**
- of which				
Steel	947	1,151	1,469	1,875
Scrap	51	100	200	300
Grain	118	400	1,000	1,250
Other	30	30	40	50
Ferry	148	589	1,747	2,143
Containers	**10**	**381**	**484**	**640**
Total Dry Cargo	**1,304**	**2,651**	**4,940**	**6,258**
Total Liquid and dry	**11,204**	**14,651**	**19,940**	**23,258**

14.1.2 Investment Costs

The construction costs for the proposed Northern Extension are estimated at $327 million, details of which are shown in Table 64.

As shown, some of the basic infrastructure has already been built and other contacts for other parts have been signed. In particular, part of the mole and breakwater has already been built at cost of $25 million and the funds for its completion ($72 million) are already committed under a contact signed in November 2007. *Neither of these already committed investments will be included in the economic evaluation; but the impact of including these already committed costs is shown in section 14.1.3.2.*

Table 64: Construction Costs (a) for the Northern Extension

		Cost US$ million
COSTS ALREADY COMMITTED		
Facilities already constructed by Mobilex	Partially constructed mole and reclamation.	25.0
Facilities already committed via breakwater contract signed in November 2007	Complete the mole and breakwater that was started by Mobilex	72.0
COSTS OF PROPOSED NEW BERTHS		
Oil berths	Construct Berths 14,15,16 and 17 Equipment such as loading arms and pipe work which might be provided by AISCP **or** private operator	35.0 Plus 25.0 = 60.0
Additional basic infrastructure that must be completed at the same time as oil berths	Dredge North Port Harbour basin, 1.6 million cubic metres	30.0
General cargo berths	Construct Berths 21 and 22	40.0
Additional basic infrastructure that must be completed at the same time as the dry cargo berths	Completion of Reclamation that was started by Mobilex Roads, rail, services buildings to serve berths 21,22 and 23	10.0 50.0
Grain berth	Construct Berth 23 as a new dedicated grain berth. It is assumed that private operator provides silos and loading shutes	20.0
PORT EQUIPMENT	Quay cranes, forklifts for general port work assumed to be provided by AISCP	20.0
TOTAL		327

(a) The costs shown do not include significant import duties or excise taxes

The outstanding costs (excluding the already committed costs) are allocated to the three main sets of cargoes as follows:

	Outstanding costs ($ million)
Four New Oil berths	
First berth, including dredging of basin ($15 million + $30 million)	45
Second berth	15
Third berth	15
Fourth berth	15
Total	*90*
Two New General Cargo Berths (including equipment)	
First berth, including completion of reclamation started by Mobilex, plus roads, rail, services buildings to serve berths 21,22 and 23	80
Second berth	20
Total	*100*
Grain Berth, including allowance for equipment	*30*
TOTAL (including general cargo equipment)	**220**

The costs shown are financial costs. There is, however, no need for shadow pricing to convert the financial costs into economic costs. The port does not pay significant import duties or excise taxes for construction, and the labour market is relatively tight, suggesting little need for shadow pricing of labour. Nor does foreign exchange require shadow pricing as the Tenge is subject to market forces:

14.1.3 Economic Evaluation of the Oil Berths

14.1.3.1 Benefits

Failure to build the Northern Extension would have two main consequences for the oil traffic:

- First, additional vessels would continue to call at the existing port, and queues would build up. This would result in increased costs of ships' time queuing for berth and therefore higher freight rates for serving the route.
- Secondly, after the full capacity of the berths was reached, the oil would have to find optional routes. The main optional route under the Base Case forecast, i.e. Scenario A, is by rail to Odessa for loading to ocean-going tankers.

It is also possible that some of the traffic would not be able find optional routes, so that export volumes would be choked off. But this appears unlikely at present, as the oil companies have confirmed that they are willing to use ports as far distant as the Ukraine, despite the high cost.

The benefits of the Northern Extension would be the avoidance of these costs, which are estimated as follows.

Rising Berth Occupancies and Associated Queuing Costs

The occupancy at the five oil berths is estimated to have been 66% in 2006. This is based on an average handling speed of 9,622 tonnes per ship day at berth, and loss of 60 days of operation per year because of bad weather (see Chapter 7). The source of these statistics was AISCP records

The current handling speeds, however, can be increased at a relatively low cost, via investment in additional loading arms, pumping and water depths (see section 13 for details). It is assumed that this will result in a 15% increase in the average handling speeds.

On this basis, the ***berth occupancies*** would rise with increasing traffic as shown in Table 65. As shown, the pattern over the next ten years will be erratic. The occupancies will increase sharply between 2007 and 2009 as Tengizchevroil starts to use Aktau, compensating the port for the loss of some its existing traffic to pipelines to China. There will then be a dip, as oil will divert to the CPC after its expansion around 2010. But this will be followed by very high occupancies in the period 2011-2013 as Kazakh oil exports – especially Tengizchevroil's – continue to expand. In this period, 2011 to 2013, Aktau would be the only significant route for getting oil to Baku and the onward pipelines (BTC, Supsa, etc). During this period, the Kazak oil industry would have major problems reaching export markets at an acceptable cost if Aktau did not have increased capacity. This "high" traffic, however, will tail off with the opening of the port of Kuryk and its pipeline from Eskene (see Chapter 4 for details).

Table 65: Forecast Oil Berth Occupancies at Aktau WITHOUT the Northern Extension

	Forecast Oil Traffic (million tonnes)	Handling Speed (tonnes per Ship day At Berth)	Ship Days at Berth	Berth Days Available p.a.at 5 Berths (a)	Berth Occupancy at the existing 5 berths (b)
2006	10	9,622	1,008	1,525	**66%**
2007	8	9,622	831	1,525	**55%**
2008	11	9,622	1,143	1,525	**75%**
2009	15	10,584	1,417	1,525	**93%**
2010	12	11,065	1,084	1,525	**71%**
2011	20	11,065	1,807	1,525	**119%**
2012	23	11,065	2,079	1,525	**136%**
2013	21	11,065	1,898	1,525	**124%**
2014	14	11,065	1,265	1,525	**83%**
2015	15	11,065	1,356	1,525	**89%**
2016	16	11,065	1,446	1,525	**95%**
2017	16	11,065	1,446	1,525	**95%**
2018	16	11,065	1,446	1,525	**95%**
2019	16	11,065	1,446	1,525	**95%**
2020	17	11,065	1,536	1,525	**101%**

(a) Weather-related downtime, 60 days
(b) Occupancies over 100% are, of course, notional.

Notes:
- *Number of berths: 5*
- *Handling speed while loading : 882 tonnes per hour*
- *Additional time at berth for documentation, formalities, etc: 2.2 times loading times*
- *Increases in handling speeds with minor investments, 15%*

* * *

The ***costs of ship waiting times*** at these occupancies are estimated in Table 66. As shown, they would rise to a maximum of $41 million p.a in 2012 – at least in theory, if there were sufficient berths to physically handle the forecast traffic. But in practice the maximum that could be handled would be the traffic in the period 2016 to 2018 (16 million tonnes) for which the cost of ships waiting time would be $28.9 million p.a.

These ship waiting time costs would fall with the addition of new berths. The impact of each additional berth on waiting to service time ratios and therefore annual ships' queuing cost is shown in Annex 14.2 and summarised in Table 67.

Table 67 also shows:

- the annualised costs of the new berths necessary to reduce the queuing costs; and
- ***the years in which the savings in queuing cost exceed the annualised cost of new berths.***

The conclusions to be drawn are that, on the basis of queuing cost savings alone:

- ***four new berths would only be justified for the years 2012 and 2013,*** when Kazakhstan's oil exports will be rising and there will be limited routes to the export markets in the last years before Kuryk is opened.
- ***Otherwise, only two new berths would be needed for the traffic forecast up to 2020.*** In particular, two berths are adequate for the period the period 20i6 to 2020. During these years the construction of the second new berth would give queuing savings of $3.6 million p.a. compared with an annualised berth cost of $2.01 million p.a.; while the construction of a third berth would give annual queuing savings of only $0.7 million.

Table 66: Costs of Ships Waiting Time 2006-2020, WITHOUT New Oil Berths

	Berth Occupancy	Ship Days At Berth	Cost of Ship Days at Berth (a) ($ million)	Waiting to Service Time Ratio (b)	Cost of Ship Days waiting for Berths ($ million)
2006	66%	1,008	10.1	**0.14**	1.4
2007	55%	831	8.3	**0.06**	0.5
2008	75%	1,143	11.4	**0.28**	3.2
2009	93%	1,417	14.2	**1.65**	23.4
2010	71%	1,084	10.8	**0.22**	2.4
2011	119%	1,807	18.1	**2.00**	36.1
2012	136%	2,079	20.8	**2.00**	41.6
2013	124%	1,898	19.0	**2.00**	38.0
2014	83%	1,265	12.7	**0.57**	7.2
2015	89%	1,356	13.6	**1.01**	13.7
2016	95%	1,446	14.5	**2.00**	28.9
2017	95%	1,446	14.5	**2.00**	28.9
2018	95%	1,446	14.5	**2.00**	28.9
2019	95%	1,446	14.5	**2.00**	28.9
2020	101%	1,536	15.4	**2.00**	30.7

(a) Ship cost per day in port ($) 10,000 (see Annex 2.1)
(b) Based on waiting to service time ratios derived from queuing theory, published by UNCTAD (see Annex 13.1). The maximum occupancy would be around 95% in practice. The figures shown for occupancies over 95% are therefore illustrative only, as the maximum waiting time costs would be those at 95% occupancy, i.e $28.9 million p.a.

Table 67: Potential Saving in Annual Queuing Costs with Additional Berths ($ million)

Number of New Berths--->	1	2	3	4
SAVINGS / BENEFITS WITH NEW BERTHS				
2006	0.9	0.3	0.1	0.1
2007	0.3	0.1	0.1	0.0
2008	2.3	0.6	0.2	0.1
2009	**19.4**	**2.7**	0.9	0.3
2010	1.7	0.4	0.1	0.1
2011	(a)	**27.8**	**5.8**	1.6
2012	(a)	(a)	**32.8**	**6.0**
2013	(a)	**24.7**	**9.7**	**2.3**
2014	5.4	1.1	0.4	0.1
2015	**10.7**	2.0	0.7	0.1
2016	**24.0**	**3.6**	0.7	0.4
2017	**24.0**	**3.6**	0.7	0.4
2018	**24.0**	**3.6**	0.7	0.4
2019	**24.0**	**3.6**	0.7	0.4
2020	**23.0**	**5.7**	1.2	0.5
COSTS OF NEW BERTHS				
Construction Cost	45	15	15	15
Annualised Cost *	**6.04**	**2.01**	**2.01**	**2.01**

* Based on:
Life of Berth: 30 years
Opportunity Cost of capital: 12%
Plus 1% for annual maintenance

(a) No queuing costs are saved in these years of very high forecast traffic, because queues are at maximum length with or without the new berths. The main benefits in these years are the avoidance of the costs of diverting oil exports to Odessa, see below.
Note: the years in which the annualised savings in queuing cost exceed the annualised costs of new berths are shown in bold

The EIRRs of both solutions – the construction of four new berths versus two new berths – are shown in the next section.

The second benefit of the new berths is the avoidance of the cost of using second best transport routes. After full capacity at Aktau is reached, the oil exports would have to ***divert to alternative routes***. The route that has been selected from the available options is the route by rail to the port of Odessa. Tengizchevroil is already making plans to use this route. The cost of the North Caspian to Odessa route, however, is high, at about $60 per tonne, compared with $40 per tonne from the North Caspian to Ceyhan, via Aktau and Baku

The ***volumes of crude oil that would be diverted to Odessa*** because of insufficient capacity (and/or efficiency) at Aktau is estimated in Table 68.

Table 68: Cost of Diversion of Crude Oil Exports to Odessa WITHOUT Any New Berths at Aktau

	Forecast Oil Traffic	Handling Speed (Tonnes per Ship day at berth)	Physical Capacity of Aktau at 95% Occupancy (a)	Volume Diverted to Odessa	Cost of Diversion To Odessa (b)
	(mn tonnes)		(mn tonnes)	(mn tonnes)	($ million)
2006	9.7	9,622	13.9	0	0
2007	8	9,622	13.9	0	0
2008	11	9,622	13.9	0	0
2009	15	10,584	15.3	0	0
2010	12	11,065	16.0	0	0
2011	20	11,065	16.0	4	79
2012	23	11,065	16.0	7	139
2013	21	11,065	16.0	5	99
2014	14	11,065	16.0	0	0
2015	15	11,065	16.0	0	0
2016	16	11,065	16.0	0	0
2017	16	11,065	16.0	0	0
2018	16	11,065	16.0	0	0
2019	16	11,065	16.0	0	0
2020	17	11,065	16.0	1	19

(a) Maximum physical capacity, but with extremely high queuing costs
(b) At $20 per tonne. The cost of transport to Odessa by rail is estimated at $60 per tonne, versus $40 per tonne via Aktau-Ceyhan, via Baku.

The ***benefits*** of building the Northern Extension would be the avoidance of the costs shown in Tables 66 and 68.

14.1.3.2 Economic Internal Rate of Return (EIRR)

On this basis the economic cost and benefits of two solutions – the construction of two versus four oil berths - are compared in Tables 69 and 70.

As shown the EIRRs are high – at 59% for four berths and 70% for two berths. The dominant reason for the high returns is that without the extension the diversion costs to Odessa resulting from inadequate capacity at Aktau would be high.

Impact of Including the Already Committed Costs and Railway Investment Costs

If the costs of the recent work by Mobilex work and the already committed infrastructure are included in the total costs, the EIRRs for Scenario A fall to 33% for 4 berths and 34% for 2 berths. And if the additional costs of the railway investment necessary to get the oil to the port are also included the EIRRs fall further to 23% for 4 berths and 23% for 2 berths. If a similar analysis is made for Scenarios B and C the EIRR falls below zero which means in this situation there is no benefit in proceeding with the construction of any new oil berths.

Table 69: Economic Internal Rate of Return on Construction of 4 New Oil Export Berths ($ million)

	COSTS.....		BENEFITS.....		NET BENEFITS
	Investment	Operating Costs	Avoidance of Ships' Queuing Cost	Avoidance of costs of diversion of exports to Odessa	
	(a)	(b)	(c)	(d)	
2008	-45				-45
2009	-45				-45
2010		-1	2.4	0	1
2011		-1	35.2	79	114
2012		-1	38.9	139	177
2013		-1	36.6	99	135
2014		-1	7.1	0	6
2015		-1	13.6	0	13
2016		-1	28.8	0	28
2017		-1	28.8	0	28
2018		-1	28.8	0	28
2019		-1	28.8	0	28
2020		-1	30.4	19	49
2021		-1	30.4	0	30
2022		-1	30.4	0	30
2023		-1	30.4	0	30
2024		-1	30.4	0	30
2025		-1	30.4	0	30
2026		-1	30.4	0	30
2027		-1	30.4	0	30

EIRR = 59%

(a) Investment in dredging and four new berths: 90 $ million
(b) Annual maintenance: 1% of construction cost
(c) See Table 67
(d) See Table 68

Table 70: Economic Internal Rate of Return on Construction of 2 New Oil Export Berths ($ million)

	COSTS.....		BENEFITS.....		NET BENEFITS
	Investment	Operating Costs	Avoidance of Ships' Queuing Cost	Avoidance of costs of diversion of exports to Odessa	
	(a)	(b)			
2008	-30				-30
2009	-30				-30
2010		-1	2.2	0	2
2011		-1	27.8	79	107
2012		-1	0.0	128	128
2013		-1	24.7	99	123
2014		-1	6.6	0	6
2015		-1	12.7	0	12
2016		-1	27.6	0	27
2017		-1	27.6	0	27
2018		-1	27.6	0	27
2019		-1	27.6	0	27
2020		-1	28.7	19.4	48
2021		-1	28.7	19.4	48
2022		-1	28.7	19.4	48
2023		-1	28.7	19.4	48
2024		-1	28.7	19.4	48
2025		-1	28.7	19.4	48
2026		-1	28.7	19.4	48
2027		-1	28.7	19.4	48

EIRR = 70%

(a) Investment in dredging and two new berths: $60 million
(b) Annual maintenance: 1% of construction cost
(c) See Table 67
(d) See Table 68

14.1.4 Economic Evaluation of the General Cargo Berths

14.1.4.1 Investment Costs

The costs of the proposed general cargo berths are shown in Table 71.

Table 71: Cost of Construction for General Cargo Berths

		Cost US$ million
COSTS ALREADY COMMITTED		
Facilities already constructed by Mobilex	Partially constructed mole and reclamation	25.0
Facilities already committed via breakwater contract signed in November 2007	Complete the mole and breakwater that was started by Mobilex	72.0
NEW COSTS		
One general cargo berth in the South Port, at end of existing general cargo berths		10.0
Basic infrastructure that must be completed at the **same time** as North Port's dry cargo berths	Completion of Reclamation that was started by Mobilex	10.0
	Roads, rail, services buildings to serve berths 21,22 and 23	50.0
Two general cargo berths in the North Port	Construct Berths 21 and 22	40.0
Port equipment	Quay cranes, forklifts for general port work assumed to be provided by AISCP	20.0
TOTAL		**227.0**

14.1.4.2 Benefits

Rising Berth Occupancies and Associated Queuing Costs

The occupancy at the three general cargo berths is estimated to have been 74% in 2006. But this figure was inflated by the very low handling speeds for one minor cargo, scrap. Although he handling speed per ship day on port for the main dry cargo, steel, was reasonable at 2250 tonnes per ship day at berth, the handling speed for scrap was only 250 tonnes per ship day (see Chapter 6). If the scrap had been handled at a more reasonable 500 tonnes per day the berth occupancy would have been only 58%.

The average future handling speeds are assumed to increase by around 10% for steel and to 500 tonnes per day for scrap (see Chapter 7).

On this basis, the ***berth occupancies*** would rise with increasing traffic as shown in Table 72.

Table 72: Forecast Dry Cargo Berth Occupancies at Aktau WITHOUT the Northern Extension

	Forecast Traffic (000 tonnes)	Handling Speed (Tonnes per Ship Day at berth)	Ship Days at Berth	Berth Days Available	Berth Occupancy
		(a)		(b)	
2008	1,180	1,853	637	1,020	**62%**
2009	1,251	1,833	683	1,020	**67%**
2010	1,332	1,783	747	1,020	**73%**
2011	1,442	1,729	834	1,020	**82%**
2012	1,551	1,684	921	1,020	**90%**
2013	1,661	1,648	1,008	1,020	**99%**
2014	1,771	1,617	1,095	1,020	**107%**
2015	1,863	1,623	1,148	1,020	**113%**
2016	1,997	1,610	1,241	1,020	**122%**
2017	2,132	1,599	1,333	1,020	**131%**
2018	2,266	1,589	1,426	1,020	**140%**
2019	2,400	1,581	1,519	1,020	**149%**
2020	2,535	1,573	1,611	1,020	**158%**

(a) The average handling speed declines because scrap traffic, handed at 500 tonnes per day is increasing faster than metals, which are handled at 2500 tonnes per day
(b) Days out of service for weather, 25

The ***costs of ship waiting times*** at the occupancies shown in Table 72 are estimated in Table 73. As shown, they would rise to a maximum $9-10 million p.a in 2012-13 when occupancies are over 90%.

Table 73: Costs of Ships Waiting Time 2006-2020, WITHOUT New Dry Cargo Berths

	Berth Occupancy	Ship Days at Berth	Cost of Ship Days at Berth (a) ($ million)	Waiting to Service Time Ratio (b)	Cost of Ship Days waiting for Berths ($ million)
2006	58%	588	2.94	0.18	0.53
2007	62%	636	3.18	0.25	0.79
2008	62%	637	3.19	0.25	0.80
2009	67%	683	3.41	0.33	1.13
2010	73%	747	3.73	0.54	2.02
2011	82%	834	4.17	0.98	4.09
2012	90%	921	4.61	2.00	9.21
2013	99%	1,008	5.04	2.00	10.08
2014	107%	1,095	5.48	2.00	10.08
2015	113%	1,148	5.74	2.00	10.08
2016	122%	1,241	6.20	2.00	10.08
2017	131%	1,333	6.67	2.00	10.08
2018	140%	1,426	7.13	2.00	10.08
2019	149%	1,519	7.59	2.00	10.08
2020	158%	1,611	8.06	2.00	10.08

(a) Ship cost per day in port: $ 5,000
(b) Based on waiting to service time ratios derived from queuing theory, published by UNCTAD (see Annex 14.1).

These ship waiting time costs would fall with the addition of new berths. The impact of each additional berth on waiting to service time ratios, and therefore annual ships' queuing costs, is shown in Appendix 03 and summarised in Table 74 below.

Table 74: Savings in Queuing Costs with Additional Dry Cargo Berths ($ million)

Number of New Berths→	1	2	3	4
2008	0.51	0.13	0.06	..
2009	0.72	0.20	0.07	..
2010	**1.46**	0.30	0.07	0.07
2011	3.13	0.50	0.21	0.08
2012	7.55	0.97	0.32	0.14
2013	..	1.97	0.45	0.20
2014	..	3.45	0.82	0.27
2015	..	5.28	1.09	0.40
2016	..	9.24	1.80	0.56
2017	..	..	**3.20**	0.93
2018	..	..	5.28	1.57
2019	..	..	10.71	2.43
2020	..	..	..	**3.46**
Cost of New Berths ($ million)	10 (in existing port)	80 (in North Port)	20 (in North Port)	20
Annualised Costs of New Berths ($ million)*	**1.34**	**10.73**	**2.68**	**2.68**

* Based on:
Life of Berth, 30 years
Opportunity Cost of capital, 12%
Plus 1% for annual maintenance

Note: the years in which the annual savings in queuing costs first exceed the annualised costs of new berths are shown in bold.

See Annex 14.2 for details.

Table 74 also shows:

- the annualised costs of the new berths necessary to reduce the queuing cost; and
- ***the years in which the construction of the berths is economically justified - i.e. the first year in which annual savings in queuing costs exceed the annualised costs of new berths. These years are shown in bold type.***

The conclusions to be drawn from Table 74 are that, on the basis of queuing cost savings:

- The first new berth is economically justifiable in 2010. Its early construction is justified partly because the cost of the first new berth, in the existing port, is relatively low, at $10 million. At this cost, it minimises transport costs if the new berth is built when the occupancy rises above 73%. As shown in Table 16.12, the annualised cost of the new berth is only $1.34 million, while the savings in annual queuing costs would be $1.46 million.
- The second new berth is not economically justified until 2017. The reason is the high costs of the first berth in the new harbour, at $80 million. This is because it will first be necessary

to complete the reclamation that was started by Mobilex and build roads, railways, services and buildings to serve the new berths. The expenditure of $80 million to introduce the first new dry cargo berth is not justified until occupancy goes over 90%. Until that point the queuing costs, although high, are not as high as the annualised cost of the first new berth ($10.73 million). There would also be additional benefits when occupancy went over 90%, i.e. the avoidance of the choking off steel exports to Iran. But they would only enter the picture at the same time as the queuing costs reach very high levels, and so do not bring forward the year in which the second berth is justified. *It should be noted that if the Initial expenditure of $80 million on infrastructure was not required the first new dry cargo berth in the North Port nwould be justified earlier.*

- The third new berth (i.e. the second in the North Port), is justified at the same time as the second, in 2017. This is because its cost is much lower than the second berth and its annualised cost is lower than the queuing cost that would be incurred if it were not built.
- The fourth new berth is justified in 2020 when the queuing costs that would be incurred without the new berth would be greater than the annualised cost of the new berth (see Table 75).

In brief, the optimal timing of the new general cargo berths would be as follows:

Berth 12 in the existing port	2010
Berth 21	2017
Berth 22	2017

14.1.4.4 Economic Internal Rate of Return

The benefits and cost of the three new dry cargo berths are compared in Table 75.

As shown, the EIRR is estimated at 45%

Table 75: Economic Internal Rate of Return on Construction of Three New Dry Cargo Berths ($ million)

	TRAFFIC	COSTS		BENEFITS		NET BENEFITS
	(000 tonnes)	Investment	M&R	Reductions in Queuing Costs		
				First New Berth	Two Additional Berths	
2008	1,180					
2009	1,251	10				-10.00
2010	1,332		0.1	3.13		3.03
2011	1,442		0.1	7.55		7.45
2012	1,551		0.1	7.11		7.01
2013	1,661		0.1	9.18		9.08
2014	1,771		0.1	9.18		9.08
2015	1,863		0.1	9.18		9.08
2016	1,997	80	0.1	9.18	11.04	-59.88
2017	2,132	20	0.9	9.18	11.04	-0.68
2018	2,266		1.1	9.18	11.04	19.12
2019	2,400		1.1	9.18	11.04	19.12
2020	2,535		1.1	9.18	11.04	19.12
2021	2,669		1.1	9.18	11.04	19.12
2022	2,803		1.1	9.18	11.04	19.12
2023	2,888		1.1	9.18	11.04	19.12
2024	2,888		1.1	9.18	11.04	19.12
2025	2,888		1.1	9.18	11.04	19.12
2026	2,888		1.1	9.18	11.04	19.12
2027	2,888		1.1	9.18	11.04	19.12
2028	2,888		1.1	9.18	11.04	19.12
2029	2,888		1.1	9.18	11.04	19.12
2030	2,888		1.1	9.18	11.04	19.12
						EIRR= 45%

14.1.5 Economic Evaluation of the Grain Terminal

14.1.5.1 Investment Costs

The cost of the grain berth is estimated at $20 million, plus an additional $10 million for silos and loading chutes.

14.1.5.2 Benefits

Rising Berth Occupancies and Associated Queuing Costs

The occupancy at the grain terminal in 2006 is estimated to have been 30%. This is based on the actual average handling speed of 1300 tonnes per ship day at berth, based on AISCP statistics (see Chapter 7) and annual traffic of only 118,000 tonnes.

This handling speed, however, is far too low, and should be at least 3000 tonnes per day. This would be consistent with the stated capacity of the terminal of 500,000 tonnes p.a., which might be calculated as follows: 340 working days (with 25 days lost because of weather) x 3000 tonnes per ship day at berth x 50% berth occupancy.

On this basis, the ***berth occupancies*** at the grain terminal would rise with increasing traffic as shown in Table 76.

Table 76: Forecast Berth Occupancies at Aktau Grain Berth WITHOUT the Northern Extension

	Forecast Grain Traffic (000 tonnes)	Handling Speed (tonnes per Ship Day at Berth)	Ship Days at Berth	Berth Days Available	Cost of Ship Days At Berth (a) ($ million)	Berth Occupancy
2008	259	3000	86	305	0.35	28%
2009	330	3000	110	305	0.44	36%
2010	400	3000	133	305	0.53	44%
2011	520	3000	173	305	0.69	57%
2012	640	3000	213	305	0.85	70%
2013	760	3000	253	305	1.01	83%
2014	880	3000	293	305	1.17	96%
2015	1000	3000	333	305	1.33	109%
2016	1050	3000	350	305	1.40	115%
2017	1100	3000	367	305	1.47	120%
2018	1150	3000	383	305	1.53	126%
2019	1200	3000	400	305	1.60	131%
2020	1250	3000	417	305	1.67	137%

(a) Cost of ship time per day: $5,000

The ***costs of ship waiting times*** at the occupancies shown in Table 76 are estimated in Table 77. As shown, they would rise to a maximum of $2.03 million p.a. in 2013-14 when occupancies are over 80%.

Table 77: Costs of Ships Waiting Time 2006-2020, WITHOUT New Dry Cargo Berths

	Berth Occupancy	Ship Days at Berth	Cost of Ship Days at Berth (a) ($ million)	Waiting to Service Time Ratio (b)	Cost of Ship Days Waiting for Berths ($ million)
2008	28%	86	0.35		
2009	36%	110	0.44	0.43	0.19
2010	44%	133	0.53	0.56	0.30
2011	57%	173	0.69	0.95	0.66
2012	70%	213	0.85	1.70	1.45
2013	83%	253	1.01	2.00	2.03
2014	83%	253	1.01	2.00	2.03
2015	83%	253	1.01	2.00	2.03
2016	83%	253	1.01	2.00	2.03
2017	83%	253	1.01	2.00	2.03
2018	83%	253	1.01	2.00	2.03
2019	83%	253	1.01	2.00	2.03
2020	83%	253	1.01	2.00	2.03

The cost of the ship waiting time shown in Table 77 is not very high, reaching a maximum of only $2.03 million p.a. 2013. This cost is low compared with the cost of building a new terminal. The construction costs are estimated at $30 million, and the annualised costs - based on an opportunity cost of capital of 12%, a berth life of 30 years and 1% of capital cost for annual

maintenance - are $4.02 million. It is therefore concluded that savings in queuing costs cannot justify a new berth. It is more economic to accept the rising queuing costs until the berth is working at full capacity. This will be assumed to be at the point where the waiting to service time ratio is 2.00, which is reached when occupancy reached s about 83%. At this point the exports of grain to the port-based silos in Iran and Baku would be choked off. Table 78 shows the estimated loss of revenue to the Kazakh economy.

Table 78: Lost Export Revenues without a Second Grain Terminal in the North Port

	Traffic (000 tonnes)	Berth capacity (000 tonnes)	Traffic using port (000 tonnes)	Lost exports (000 tonnes)	Lost export revenues ($ million)
		(a)			(b)
2006	118	846	118		
2007	189	846	189		
2008	259	846	259		
2009	330	846	330		
2010	400	846	400		
2011	520	846	520		
2012	640	846	640		
2013	760	846	760		
2014	880	846	816	64	6.4
2015	1000	846	816	184	18.4
2016	1050	846	816	234	23.4
2017	1100	846	816	284	28.4
2018	1150	846	816	334	33.4
2019	1200	846	816	384	38.4
2020	1250	846	816	434	43.4

(a) The capacity calculation assumes loss of 25 days per year due to weather, occupancy of 83% and a handling speed of 3000 tonnes per day.
(b) The loss of net export revenues is calculated on a long tem average value of wheat exports of $200 per tonne, of which the value added is assumed to be $100 per tonne

The combined benefits of the potential queuing cost reduction and the avoidance of lost export revenues are sufficient to justify the second grain terminal by 2014. That is to say, when the benefits of additional export volumes in 2014 ($6.4 million) are added to the potential queuing savings ($2.03 million) the total benefits of $6.43 million are well above the annualised cost of $4.02 million for the new terminal.

14.1.5.3 Economic Internal Rate of Return

The benefits and cost of the second grain terminal are compared in Table 79.

As shown, the EIRR is estimated at 59%

Table 79: Economic Internal Rate of Return on Construction of a Second Grain Terminal ($ million)

	TRAFFIC (000 tonnes)			COSTS		BENEFITS		NET BENEFITS
	Forecast Traffic	Traffic Handled at Existing Terminal (a)	Exports lost Without New Terminal	Investment	M&R	Savings in Ships Queuing Cost	Avoidance of Loss of Export Revenues (b)	
2008	259	259						
2009	330	330						
2010	400	400						
2011	520	520						
2012	640	640						
2013	760	760		30				-30.00
2014	880	846	34		0.3	2.03	3.40	5.13
2015	1,000	846	154		0.3	2.03	15.40	17.13
2016	1,050	846	204		0.3	2.03	20.40	22.13
2017	1,100	846	254		0.3	2.03	25.40	27.13
2018	1,150	846	304		0.3	2.03	30.40	32.13
2019	1,200	846	354		0.3	2.03	35.40	37.13
2020	1,250	846	404		0.3	2.03	40.40	42.13
2021	1,300	846	454		0.3	2.03	45.40	47.13
2022	1,350	846	504		0.3	2.03	50.40	52.13
2023	1,400	846	554		0.3	2.03	55.40	57.13
2024	1,450	846	604		0.3	2.03	60.40	62.13
2025	1,500	846	654		0.3	2.03	65.40	67.13
								EIRR = 59%

(a) The capacity calculation assumes 25 days lost per year due to weather, and occupancy of 83% and a handling speed of 3000 tonnes per day.
(b) The loss of net export revenues is calculated on a long tem average value of wheat exports of $200 per tonne, of which the value added is assumed to be $100 per tonne

14.1.5.4 Conclusions

Drawing together the conclusions of the previous sections, the most economic construction programme would be as follows:

Oil berths	2 in 2010 (4 berths would also have a high EIRR, but lower than for 2 berths)
Dry cargo berths	2010, 2017 (2) and 2020
Grain terminal	2014

14.2 Scenarios "B" and "C"

In the other scenarios the oil forecast is lower than in Scenario A (see Chapter 5). In both Scenarios B and C there are only three years in which the traffic rises above the operational maximum capacity of about 14 million tonnes at the existing port. They are 2009, 2011 and 2012. But even in these years the traffic is only in the range 15-17 million tonnes, compared with 20-23 million tonnes in Scenario A. Furthermore, after 2014 the traffic settles down to levels lower than in Scenario A.

The EIRR for Scenario B traffic is estimated at 17% for the two berth expansion and 3% for the four berth expansion.

The EIRR for Scenario C traffic is estimated at 9% for the two berth expansion and 0% for the four berth expansion.

Annex 14.1

Table 79a: Waiting to service time ratios

Occupancy	No of berths.....>							
	1	2	3	4	5	6	7	8
0.30 .	0.32	0.08	0.03	0.02	0.01			
0.31	0.34	0.09	0.03	0.02	0.01			
0.32	0.35	0.09	0.03	0.02	0.01			
0.33	0.36	0.09	0.04	0.02	0.01			
0.34	0.37	0.10	0.04	0.02	0.01	0.01		
0.35	0.39	0.11	0.04	0.02	0.01	0.01		
0.36	0.41	0.11	0.04	0.03	0.02	0.01		
0.37	0.43	0.12	0.05	0.03	0.02	0.01		
0.38	0.44	0.13	0.05	0.03	0.02	0.01	0.01	
0.39	0.46	0.13	0.05	0.03	0.02	0.01	0.01	
0.40	0.48	0.14	0.06	0.03	0.02	0.01	0.01	
0.41	0.50	0.15	0.06	0.03	0.02	0.01	0.01	
0.42	0.52	0.16	0.06	0.04	0.02	0.02	0.01	0.01
0.43	0.54	0.16	0.07	0.04	0.02	0.02	0.01	0.01
0.44	0.56	0.17	0.07	0.04	0.03	0.02	0.01	0.01
0.45	0.59	0.18	0.08	0.04	0.03	0.02	0.01	0.01
0.46	0.61	0.19	0.08	0.05	0.03	0.02	0.02	0.01
0.47	0.64	0.20	0.09	0.05	0.03	0.02	0.02	0.01
0.48	0.66	0.21	0.09	0.05	0.04	0.03	0.02	0.01
0.49	0.69	0.23	0.10	0.06	0.04	0.03	0.02	0.01
0.50	0.72	0.24	0.11	0.06	0.04	0.03	0.02	0.01
0.51	0.74	0.25	0.12	0.07	0.04	0.03	0.02	0.02
0.52	0.78	0.26	0.13	0.07	0.05	0.03	0.02	0.02
0.53	0.81	0.28	0.13	0.08	0.05	0.04	0.03	0.02
0.54	0.84	0.29	0.14	0.08	0.05	0.04	0.03	0.02
0.55	0.88	0.31	0.15	0.09	0.06	0.04	0.03	0.02
0.56	0.91	0.33	0.16	0.10	0.06	0.05	0.03	0.02
0.57	0.95	0.35	0.17	0.11	0.07	0.05	0.04	0.03
0.58	1.00	0.37	0.18	0.11	0.07	0.05	0.04	0.03
0.59	1.04	0.39	0.19	0.12	0.08	0.06	0.04	0.03
0.60	1.08	0.42	0.20	0.13	0.08	0.06	0.05	0.04
0.61	1.13	0.44	0.22	0.14	0.09	0.07	0.05	0.04
0.62	1.18	0.47	0.23	0.15	0.10	0.07	0.06	0.04
0.63	1.23	0.49	0.25	0.16	0.11	0.08	0.06	0.05
0.64	1.29	0.51	0.27	0.17	0.12	0.08	0.07	0.05
0.65	1.34	0.53	0.29	0.19	0.12	0.09	0.07	0.05
0.66	1.40	0.60	0.31	0.20	0.13	0.10	0.08	0.06
0.67	1.48	0.63	0.33	0.22	0.14	0.11	0.09	0.06
0.68	1.55	0.66	0.36	0.23	0.16	0.12	0.09	0.07
0.69	1.62	0.70	0.38	0.25	0.17	0.13	0.10	0.08
0.70	1.70	0.72	0.42	0.27	0.19	0.14	0.11	0.09
0.71	1.80	0.78	0.44	0.29	0.20	0.15	0.12	0.10
0.72	1.90	0.83	0.48	0.31	0.22	0.17	0.13	0.11
0.73	1.99	0.87	0.51	0.34	0.24	0.18	0.14	0.12
0.74	2.08	0.93	0.54	0.36	0.26	0.20	0.16	0.13
0.75	2.20	1.00	0.59	0.39	0.28	0.22	0.17	0.14
0.76	2.31	1.08	0.63	0.42	0.30	0.24	0.19	0.15
0.77	2.46	1.16	0.68	0.45	0.33	0.26	0.21	0.17
0.78	2.59	1.23	0.73	0.49	0.36	0.28	0.23	0.19
0.79	2.75	1.30	0.79	0.53	0.40	0.31	0.25	0.21

0.80	2.95	1.40	0.84	0.57	0.43	0.34	0.27	0.22
0.81	3.17	1.55	0.92	0.63	0.47	0.38	0.30	0.24
0.82	3.45	1.70	0.98	0.68	0.52	0.42	0.34	0.27
0.83	3.75	1.85	1.08	0.74	0.57	0.47	0.38	0.31
0.84	4.10	1.90	1.16	0.81	0.64	0.50	0.42	0.34
0.85	4.40	2.05	1.28	0.90	0.70	0.56	0.46	0.38
0.86	4.75	2.20	1.40	0.98	0.76	0.61	0.51	0.42
0.87	5.20	2.40	1.52	1.07	0.84	0.67	0.56	0.47
0.88	5.60	2.60	1.68	1.16	0.92	0.75	0.63	0.52
0.89	6.10	2.85	1.83	1.29	1.01	0.83	0.70	0.58
0.90	6.60	3.20	2.00	1.43	1.12	0.92	0.76	64.00
0.91	6.60	3.20	2.00	1.70	1.27	1.05	0.84	0.71
0.92	6.60	3.20	2.20	2.10	1.45	1.20	0.93	0.79
0.93	6.60	3.20	2.40	2.50	1.65	1.40	1.04	0.90
0.94	6.60	3.20	2.80	2.50	1.90	1.65	1.18	1.05
0.95	6.60	3.20	2.80	2.50	2.00	1.75	1.40	1.25

Source: UNCTAD. Based on random arrivals and Erlang 2 service time distributions.

ANNEX 14.2

COSTS OF SHIPS WAITINNG TIME WITH INCREASING NUMBERS OF BERTHS

Table 80: Oil Berths

Cost of Ship Waiting Time with 5 Berths

Year	Forecast Oil Traffic (million tonnes)	Berth Occupancy	Ship Days at Berth	Cost of Ship Days at Berh (a) ($ millon)	Waiting to Service Time Ratio (b)	Cost of Ship Days waiting for Berths ($ million)
2006	10	66%	1,008	10.1	**0.14**	1.4
2007	8	55%	831	8.3	**0.06**	0.5
2008	11	72%	1,091	10.9	**0.22**	2.4
2009	15	94%	1,441	14.4	**2.00**	28.8
2010	14	83%	1,265	12.7	**0.57**	7.2
2011	20	119%	1,807	18.1	**2.00**	36.1
2012	23	136%	2,079	20.8	**2.00**	41.6
2013	21	124%	1,898	19.0	**2.00**	38.0
2014	14	83%	1,265	12.7	**0.57**	7.2
2015	15	89%	1,356	13.6	**1.01**	13.7
2016	15	91%	1,392	13.9	**1.45**	20.2
2017	16	94%	1,428	14.3	**1.90**	27.1
2018	16	96%	1,464	14.6	**2.00**	29.3
2019	17	98%	1,500	15.0	**2.00**	30.0
2020	17	101%	1,536	15.4	**2.00**	30.7

Table 81: Oil Berths

Cost of Ship Waiting Time with 6 Berths

Year	Forecast Oil Traffic (million tonnes)	Berth Occupancy	Ship Days at Berth	Cost of Ship Days at Berh (a) ($ millon)	Waiting to Service Time Ratio (b)	Cost of Ship Days waiting for Berths ($ million)
2006	10	55%	1,008	10.1	**0.05**	0.5
2007	8	45%	831	8.3	**0.02**	0.2
2008	11	60%	1,091	10.9	**0.06**	0.7
2009	15	79%	1,441	14.4	**0.31**	4.5
2010	14	69%	1,265	12.7	**0.14**	1.8
2011	20	99%	1,807	18.1	**2.00**	36.1
2012	23	114%	2,079	20.8	**2.00**	41.6
2013	21	104%	1,898	19.0	**2.00**	38.0
2014	14	69%	1,265	12.7	**0.14**	1.8
2015	15	74%	1,356	13.6	**0.22**	3.0
2016	15	76%	1,392	13.9	**0.26**	3.6
2017	16	78%	1,428	14.3	**0.31**	4.4
2018	16	80%	1,464	14.6	**0.38**	5.6
2019	17	82%	1,500	15.0	**0.42**	6.3
2020	17	84%	1,536	15.4	**0.50**	7.7

Table 82: Oil Berths

Cost of Ship Waiting Time with 7 Berths

Year	Forecast Oil Traffic (million tonnes)	Berth Occupancy	Ship Days at Berth	Cost of Ship Days at Berh (a) ($ millon)	Waiting to Service Time Ratio (b)	Cost of Ship Days waiting for Berths ($ million)
2006	10	47%	1,008	10	**0.02**	0.2
2007	8	39%	831	8	**0.01**	0.1
2008	11	51%	1,091	11	**0.02**	0.2
2009	15	67%	1,441	14	**0.09**	1.3
2010	14	59%	1,265	13	**0.05**	0.6
2011	20	85%	1,807	18	**0.46**	8.3
2012	23	97%	2,079	21	**2.00**	41.6
2013	21	89%	1,898	19	**0.70**	13.3
2014	14	59%	1,265	13	**0.05**	0.6
2015	15	63%	1,356	14	**0.07**	0.9
2016	15	65%	1,392	14	**0.08**	1.1
2017	16	67%	1,428	14	**0.09**	1.3
2018	16	69%	1,464	15	**0.10**	1.5
2019	17	70%	1,500	15	**0.12**	1.8
2020	17	72%	1,536	15	**0.13**	2.0

Table 83: Oil Berths

Cost of Ship Waiting Time with 8 Berths

Year	Forecast Oil Traffic (million tonnes)	Berth Occupancy	Ship Days at Berth	Cost of Ship Days at Berh (a) ($ millon)	Waiting to Service Time Ratio (b)	Cost of Ship Days waiting for Berths ($ million)
2006	10	41%	1,008	10	**0.01**	0.1
2007	8	34%	831	8	**0.00**	0.0
2008	11	45%	1,091	11	**0.01**	0.1
2009	15	59%	1,441	14	**0.04**	0.6
2010	14	52%	1,265	13	**0.02**	0.3
2011	20	74%	1,807	18	**0.14**	2.5
2012	23	85%	2,079	21	**0.42**	8.7
2013	21	78%	1,898	19	**0.19**	3.6
2014	14	52%	1,265	13	**0.02**	0.3
2015	15	56%	1,356	14	**0.02**	0.3
2016	15	57%	1,392	14	**0.03**	0.4
2017	16	59%	1,428	14	**0.03**	0.4
2018	16	60%	1,464	15	**0.04**	0.6
2019	17	61%	1,500	15	**0.04**	0.6
2020	17	63%	1,536	15	**0.05**	0.8

Table 84: Oil Berths

Cost of Ship Waiting Time with 9 Berths

Year	Forecast Oil Traffic (million tonnes)	Berth Occupancy	Ship Days at Berth	Cost of Ship Days at Berh (a) ($ millon)	Waiting to Service Time Ratio (b)	Cost of Ship Days waiting for Berths ($ million)
2006	10	37%	1,008	10	**0.00**	0.0
2007	8	30%	831	8	**0.00**	0.0
2008	11	40%	1,091	11	**0.00**	0.0
2009	15	52%	1,441	14	**0.01**	0.1
2010	14	46%	1,265	13	**0.01**	0.1
2011	20	66%	1,807	18	**0.05**	0.9
2012	23	76%	2,079	21	**0.13**	2.7
2013	21	69%	1,898	19	**0.07**	1.3
2014	14	46%	1,265	13	**0.01**	0.1
2015	15	49%	1,356	14	**0.01**	0.1
2016	15	51%	1,392	14	**0.01**	0.1
2017	16	52%	1,428	14	**0.01**	0.1
2018	16	53%	1,464	15	**0.01**	0.1
2019	17	55%	1,500	15	**0.02**	0.3
2020	17	56%	1,536	15	**0.02**	0.3

Table 85: Dry Cargo Berths

Cost of Ship Waiting Time with 3 Berths

Year	Forecast Traffic (000 tonnes)	Berth Occupancy	Ship Days at Berth	Cost of Ship Days at Berth (a) ($ million)	Waiting to Service Time Ratio (b)	Cost of Ship Days waiting for Berths ($ million)
2008	1180	62%	637	3.19	0.25	0.80
2009	1251	67%	683	3.41	0.33	1.13
2010	1332	73%	747	3.73	0.54	2.02
2011	1442	82%	834	4.17	0.98	4.09
2012	1551	90%	921	4.61	2.00	9.21
2013	1661	99%	1,008	5.04	2.00	10.08
2014	1771	107%	1,095	5.48	2.00	10.95
2015	1863	113%	1,148	5.74	2.00	11.48
2016	1997	122%	1,241	6.20	2.00	12.41
2017	2132	131%	1,333	6.67		
2018	2266	140%	1,426	7.13		
2019	2400	149%	1,519	7.59		
2020	2535	158%	1,611	8.06		

Table 86: Dry Cargo Berths

Cost of Ship Waiting Time with 4 Berths

Year	Forecast Traffic (000 tonnes)	Berth Occupancy	Ship Days at Berth	Cost of Ship Days at Berth (a) ($ million)	Waiting to Service Time Ratio (b)	Cost of Ship Days waiting for Berths ($ million)
2008	1180	47%	637	3.19	0.09	0.29
2009	1251	50%	683	3.41	0.12	0.41
2010	1332	55%	747	3.73	0.15	0.56
2011	1442	61%	834	4.17	0.23	0.96
2012	1551	68%	921	4.61	0.36	1.66
2013	1661	74%	1,008	5.04	0.59	2.97
2014	1771	81%	1,095	5.48	0.92	5.04
2015	1863	84%	1,148	5.74	1.28	7.35
2016	1997	91%	1,241	6.20	2.00	12.41
2017	2132	98%	1,333	6.67	2.00	12.41
2018	2266	105%	1,426	7.13	2.00	12.41
2019	2400	112%	1,519	7.59	2.00	12.41
2020	2535	118%	1,611	8.06	2.00	12.41

Table 87: Dry Cargo Berths

Cost of Ship Waiting Time with 5 Berths

Year	Forecast Traffic (000 tonnes)	Berth Occupancy	Ship Days at Berth	Cost of Ship Days at Berth (a) ($ million)	Waiting to Service Time Ratio (b)	Cost of Ship Days waiting for Berths ($ million)
2008	1180	37%	637	3.19	0.05	0.16
2009	1251	40%	683	3.41	0.06	0.20
2010	1332	44%	747	3.73	0.07	0.26
2011	1442	49%	834	4.17	0.11	0.46
2012	1551	54%	921	4.61	0.15	0.69
2013	1661	59%	1008	5.04	0.20	1.01
2014	1771	64%	1095	5.48	0.29	1.59
2015	1863	68%	1148	5.74	0.36	2.07
2016	1997	73%	1241	6.20	0.51	3.16
2017	2132	78%	1333	6.67	0.79	5.27
2018	2266	84%	1426	7.13	1.16	8.27
2019	2400	89%	1519	7.59	2.00	15.19
2020	2535	95%	1611	8.06	2.00	15.19

Table 88: Dry Cargo Berths

Cost of Ship Waiting Time with 6 Berths

Year	Forecast Traffic (000 tonnes)	Berth Occupancy	Ship Days at Berth	Cost of Ship Days at Berth (a) ($ million)	Waiting to Service Time Ratio (b)	Cost of Ship Days waiting for Berths ($ million)
2008	1180	31%	637	3.19		
2009	1251	33%	683	3.41		
2010	1332	37%	747	3.73	0.03	0.11
2011	1442	41%	834	4.17	0.04	0.17
2012	1551	45%	921	4.61	0.05	0.23
2013	1661	49%	1,008	5.04	0.07	0.35
2014	1771	54%	1,095	5.48	0.09	0.49
2015	1863	56%	1,148	5.74	0.10	0.57
2016	1997	61%	1,241	6.20	0.13	0.81
2017	2132	65%	1,333	6.67	0.17	1.13
2018	2266	70%	1,426	7.13	0.20	1.43
2019	2400	74%	1,519	7.59	0.27	2.05
2020	2535	79%	1,611	8.06	0.36	2.90

Table 89: Grain Berths

Cost of Ship Waiting Time with 1 Berth

Year	Forecast Traffic (000 tonnes)	Berth Occupancy	Ship Days at Berth	Cost of Ship Days at Berth (a) ($ million)	Waiting to Service Time Ratio (b)	Cost of Ship Days waiting for Berths ($ million)
2008	259	28%	86	0.35		
2009	330	36%	110	0.44	0.43	0.19
2010	400	44%	133	0.53	0.56	0.30
2011	520	57%	173	0.69	0.95	0.66
2012	640	70%	213	0.85	1.70	1.45
2013	760	83%	253	1.01	2.00	2.03
2014	880	96%	293	1.17	2.00	2.35
2015	1000	109%	333	1.33	2.00	2.67
2016	1050	115%	350	1.40	2.00	2.80
2017	1100	120%	367	1.47	2.00	2.93
2018	1150	126%	383	1.53	2.00	3.07
2019	1200	131%	400	1.60	2.00	3.20
2020	1250	137%	417	1.67	2.00	3.33

Table 90: Grain Berths

Cost of Ship Waiting Time with 2 Berths

Year	Forecast Traffic (000 tonnes)	Berth Occupancy	Ship Days at Berth	Cost of Ship Days at Berth (a) ($ million)	Waiting to Service Time Ratio (b)	Cost of Ship Days waiting for Berths ($ million)
2008	259	14%	86	0.35		
2009	330	18%	110	0.44		
2010	400	22%	133	0.53		
2011	520	28%	173	0.69	0.20	0.14
2012	640	35%	213	0.85	0.39	0.33
2013	760	42%	253	1.01	0.52	0.53
2014	880	48%	293	1.17	0.69	0.81
2015	1000	55%	333	1.33	0.88	1.17
2016	1050	57%	350	1.40	1.00	1.40
2017	1100	60%	367	1.47	1.13	1.66
2018	1150	63%	383	1.53	1.23	1.89
2019	1200	66%	400	1.60	1.40	2.24
2020	1250	68%	417	1.67	1.62	2.70

15 FINANCIAL EVALUATION

15.1 Financial internal rate of return

In addition to the economic analysis, a financial evaluation was carried out to compare the revenues and expenditures from the proposed projects from the viewpoint of the investors, AISCP. Most of the economic benefits of port construction – for example, reductions in ships' queuing costs, avoidance of additional transport costs via second best routes and the removal of bottlenecks to the growth of exports - do not appear in the accounts of the port authority or in the financial analysis.

Two sets of financial evaluations are necessary to complete the feasibility study. They are:

- a projection of revenues and expenditures to determine the Financial Internal Rate of Return (FIRR) on the Northern Extension as a stand alone project; and
- a forecast of revenues and expenditures for the port as a whole, to ascertain whether the port will have sufficient reserves to repay the loan for the project (as well as the EBRD loan for the earlier project).

The financial analysis in the first part of this chapter assesses the viability of the proposed projects from the viewpoint of the investors, i.e. AISCP. It is to be distinguished from the economic evaluation in the previous Chapter, which compares the costs and benefits of the project to the economy of Kazakhstan.

The financial analysis is based on:

- Traffic volumes as forecast in Scenario A in Chapter 4.
- Construction costs as shown in Chapter 13.
- Operating costs based on two sets of assumptions. The first is derived from a combination of estimates by Kazhydro, EBRD/SFA and the AISCP accounts (the traffic volumes at the existing ports are similar to those at the proposed Northern Extension). They are shown in Table 91. These costs, however, seem, much too high when compared with ports elsewhere. Experience of similar ports would suggest that the North Extension could be run without any significant increase in staff or other costs except for fuel and maintenance.
- Revenues based on the following tariffs (based on the tariff book and AISCP accounts)

	$/tonne
Cargo Handling	
Oil	1.72
Dry Cargo	6.89
Port Dues on Ships (est)	
Oil	0.81
Dry Cargo	1.51
Storage, $/tonne (estimated: storage accounted for 9% of AISCP revenues)	
Oil	0 (oil is stored outside the port)
Dry Cargo	2.30

Table 91: Operating Costs Based on Previous Estimates

	AISCP Accounts 2006 (a)		Kazhydro Estimate	EBRD/SFA Estimate	Average of three estimates
	$ million 2005	(%)	$ million	$ million	$ million
Staff	6.6	51.3%	4.34	6.14	6.4(a)
Maintenance and Repairs	0.4	2.6%	2.18	2.18	1.3
Fuel	0.6	3.1%	0.51	0.51	0.6
Utilities	0.4	1.8%	...	...	
Insurance	0.8	5.7%	...	...	
Tug Hire	0.0	4.8%	...	...	
Indirect taxes	1.4	8.2%	...	...	
Other	2.7	23.2%	4.39	4.39	4.8
Total	**12.9**	**100.0%**	**11.42**	**13.22**	**13.1**

(a) Staff costs are assumed to increase by 5% p.a. if additional staff are employed

The calculations of the Financial Internal Rates of Return are shown in Table 92 and 93 (for construction of four oil berths) and 94 and 95 (for construction of two oil berths). It should be noted that the project costs do not include the costs of investments which are either completed or committed, especially the costs of the breakwater. Nor do they include the revenues from ferries, which are unaffected by the proposed North Extension project. The revenues included are limited to those paid to the port as a result of *additional* oil, dry cargo and grain traffic and the cost are limited to the *additional* costs incurred as a result of constructing the new berths.

As shown, the rates of return are low:

> For the construction of ***four oil berths*** (plus 3 dry cargo berths and a grain terminal) the FIRR is ***0.5%*** on the assumption of minimal increases in operating costs (see Table 92)
>
> If, however, that the north extension had to bear the full additional operating cost shown in Table 93 the FIRR would be negative (see Table 93).
>
> For the construction of ***two oil berths*** (plus 3 dry cargo berths and a grain terminal) the FIRR is ***1.7%*** on the assumption of minimal increases in operating costs (see Table 94)
>
> If, however, that the north extension had to bear the full additional operating cost shown in Table 95 the FIRR would again be negative.

The low rate of return should not necessarily be a cause for concern. Low financial rates of return on port projects[6] are quite normal - as the traffic often continues to come to the port in the "without investment" case, even if congestion costs are *very* high (in Table below it has been assumed that in the "without investment" case the traffic would continue to come to the port until it reaches maximum capacity, which is defined as when the waiting to service time ratio reaches 2.00). The major economic benefits in terms of reduced queuing costs or the removal of

[6] It is emphasized that this text refers to the financial internal rate of return ***on the North Extension***, not on the operations of the AISCP as a whole. Two sets of analysis are being carried out. The first, which is the subject of this chapter, evaluates the financial viability of the North Extension as a stand-alone project – to ascertain whether its revenues are sufficient to cover its costs and give an acceptable rate of return. The objective of the second financial exercise that examining the overall financial position of the AISCP, is to confirm whether the AISCP will be able to repay its loans. This second exercise is not included in this chapter

impediments to exports are *often* not accompanied by large additional financial revenues to the port, at least in the early years of the project, which dominate the rate of return calculation.

In the case of the Northern Extension, however, there is a more fundamental reason for the low FIRR. It is that the revenues associated with the project are low compared with the investment costs, and this remains so throughout most of the project's duration. Even in the better years the annual additional revenues are only about $15 million, compared with a total investment cost of $220 million; and the net revenues after subtracting operating costs are much lower.

Three options open to AISCP, given this low rate of return, may be as follows:

d) To increase tariffs. Although the AISCP oil tariffs are a slightly high by international standards, it may be possible to increase them. The port's ability to do so would be assisted where the port's customers have no options for getting oil exports to Baku. That is to say, if the oil that cannot find space in the CPC and Samara pipelines they may have to pay whatever AISCP decides to charge them. This, however, would not apply to the same extent when Kuryk is built.

e) Identify a lower cost engineering design.

f) Separate out the basic infrastructure costs and allow them a long cost recovery period and a lower required rate of return. The subsidization of breakwaters, channels and reclamation is quite common practice in other countries. In Aktau, however, the breakwater construction is already committed and part of the reclamation has already been complete. Consequently, neither is included in the financial evaluation of the project (although it is of course included in the financial evaluation of the port as a whole). But channel dredging and the remainder of the reclamation, which are an essential and as yet uncommitted precondition for the construction of new berths, might be separated out and allowed a lower rate of return.

Table 92: FINANCIAL INTERNAL RATE OF RETURN ON NORTHERN EXTENSION AS A STAND ALONE PROJECT *

(With 4 oil berths and low operating costs)

BASED ON "SCENARIO A" FORECASTS
(US$ 000)

	2008	2009	2010	2011	2012	2013	2014	2015
CARGO TRAFFIC AT AKTAU								
(forecast, 000 tonnes)								
Oil			14,000	20,000	23,000	21,000	14,000	15,000
Dry Cargo, excl grain			1,281	1,367	1,452	1,538	1,624	1,709
Grain			400	520	640	760	880	1000
Total			**15,681**	**21,887**	**25,092**	**23,298**	**16,504**	**17,709**
Capacity of Existing Port								
(physical, @ max berth occupancy) (a)								
Oil			13,668	13,668	13,668	13,668	13,668	13,668
Dry Cargo			1,637	1,637	1,637	1,637	1,637	1,637
Grain			847	847	847	847	847	847
Traffic at North Extension								
(total traffic minus port capacity)								
Oil ..Maximum: 12,150			332	6,332	9,332	7,332	332	1,332
Dry Cargo			0	0	0	0	0	72
Grain			0	0	0	0	33	153
Total			**332**	**6,075**	**6,075**	**6,075**	**365**	**1,557**
	2008	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**
REVENUES								
(US$ 000)								
Cargo Handling								
Oil			570	10,449	10,449	10,449	570	2,290
Dry Cargo			0	0	0	0	0	497
Storage								
Oil (d)			0	0	0	0	0	0
Dry Cargo			0	0	0	0	0	166
Port Dues on Ships								
Oil			269	4,921	4,921	4,921	269	1,079
Dry Cargo			0	0	0	0	0	109
Grain			0	0	0	0	50	232
Total Revenues			**839**	**15,369**	**15,369**	**15,369**	**889**	**4,372**
Investment	45,000	45000	10,000			20,000		
OPERATING COSTS								
Staff (b)								
Maintenance and Repairs			1,271	1,271	1,271	1,271	1,271	1,271
Fuel			470	470	470	470	470	470
Others								
Total Operating Costs			**1,741**	**1,741**	**1,741**	**1,741**	**1,741**	**1,741**
SURPLUS /DEFICIT	**- 45,000**	**- 45000**	**-10,902**	**14,278**	**21,868**	**-3,192**	**-852**	**2,631**

Coninued.....

FIRR = 0.5%

Table 92 (continued)

FINANCIAL INTERNAL RATE OF RETURN ON NORTHERN EXTENSION AS A STAND ALONE PROJECT *

(With 4 oil berths and high operating costs)

BASED ON "SCENARIO A" FORECASTS
(US$ 000)

	2016	2017	2018	2019	2020
CARGO TRAFFIC AT AKTAU					
(forecast, 000 tonnes)					
Oil	15,400	15,800	16,200	16,600	17,000
Dry Cargo, excl grain	1,281	1,812	1,915	2,019	2,122
Grain	1,050	1,100	1,150	1,200	1250
Total	**18,262**	**18,815**	**19,369**	**19,922**	**20,475**
Capacity of Existing Port					
(physical, @ max berth occupancy) (a)					
Oil	13,668	13,668	13,668	13,668	13,668
Dry Cargo	1,637	1,637	1,637	1,637	1,637
Grain	847	847	847	847	847
Traffic at North Extension					
(total traffic minus port capacity)					
Oil ..Maximum: 12,150	1,732	2,132	2,532	2,932	3,332
Dry Cargo	175	278	382	485	588
Grain	203	253	303	353	403
Total	**2,110**	**2,663**	**3,217**	**3,770**	**4,323**
	2016	**2017**	**2018**	**2019**	**2020**
REVENUES					
(US$ 000)					
Cargo Handling					
Oil	2,978	3,666	4,354	5,042	5,730
Dry Cargo	1,208	1,918	2,629	3,340	4,051
Storage					
Oil (d)	0	0	0	0	0
Dry Cargo	403	640	878	1,115	1,352
Port Dues on Ships					
Oil	1,403	1,727	2,051	2,375	2,699
Dry Cargo	265	420	576	732	888
Grain	307	383	458	534	609
Total Revenues	**6,563**	**8,755**	**10,946**	**13,138**	**15,329**
Investment	80,000	20,000			
OPERATING COSTS					
Staff (b)					
Maintenance and Repairs	1,271	1,271	1,271	1,271	1,271
Fuel	470	470	470	470	470
Others					
Total Operating Costs	**1,741**	**1,741**	**1,741**	**1,741**	**1,741**
SURPLUS /DEFICIT	**-75,178**	**-12,986**	**9,205**	**11,397**	**13,588**

** The project **costs** do not include the costs of investments either completed or committed, especially the cost of the breakwater. Nor do they include the **revenues** from ferries, which are unaffected by the proposed North Extension project.*

(a) The capacity shown is the maximum operational capacity as distinct from the economic capacity. It is assumed that ships will call until occupancy reaches the maximum operational capacity, which is defined as where the waiting to service time ratio reached 2.00, at which point the congestion/waiting times will be intolerable.
(b) Where additional staff costs are included they are assumed to increase by 5% p.a in real terms.

(c) Oil is stored by companies outside the port.

Table 93: FINANCIAL INTERNAL RATE OF RETURN ON NORTHERN EXTENSION AS A STAND ALONE PROJECT *

(With 4 oil berths and high operating costs)

BASED ON "SCENARIO A" FORECASTS
(US$ 000)

	2008	2009	2010	2011	2012	2013	2014	2015
CARGO TRAFFIC AT AKTAU								
(forecast, 000 tonnes)								
Oil			14,000	20,000	23,000	21,000	14,000	15,000
Dry Cargo, excl grain			1,281	1,367	1,452	1,538	1,624	1,709
Grain			400	520	640	760	880	1000
Total			**15,681**	**21,887**	**25,092**	**23,298**	**16,504**	**17,709**
Capacity of Existing Port								
(physical, @ max berth occupancy) (a)								
Oil			13,668	13,668	13,668	13,668	13,668	13,668
Dry Cargo			1,637	1,637	1,637	1,637	1,637	1,637
Grain			847	847	847	847	847	847
Traffic at North Extension								
(total traffic minus port capacity)								
Oil ..Maximum: 12,150			332	6,332	9,332	7,332	332	1,332
Dry Cargo			0	0	0	0	0	72
Grain			0	0	0	0	33	153
Total			**332**	**6,075**	**6,075**	**6,075**	**365**	**1,557**
	2008	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**
REVENUES								
(US$ 000)								
Cargo Handling								
Oil			570	10,449	10,449	10,449	570	2,290
Dry Cargo			0	0	0	0	0	497
Storage								
Oil (d)			0	0	0	0	0	0
Dry Cargo			0	0	0	0	0	166
Port Dues on Ships								
Oil			269	4,921	4,921	4,921	269	1,079
Dry Cargo			0	0	0	0	0	109
Grain			0	0	0	0	50	232
Total Revenues			**839**	**15,369**	**15,369**	**15,369**	**889**	**4,372**
Investment	45,000	45000	10,000			20,000		
OPERATING COSTS								
Staff (b)			6,587	6,916	7,262	7,625	8,006	8,406
Maintenance and Repairs			1,271	1,271	1,271	1,271	1,271	1,271
Fuel			470	470	470	470	470	470
Others			5,232	5,232	5,232	5,232	5,232	5,232
Total Operating Costs			**1,741**	**1,741**	**1,741**	**1,741**	**1,741**	**1,741**
SURPLUS /DEFICIT	**-45,000**	**-45000**	**-10,902**	**14,278**	**21,868**	**-3,192**	**-852**	**2,631**

Continued.....

FIRR = Negative

Table 93 (continued): FINANCIAL INTERNAL RATE OF RETURN ON NORTHERN EXTENSION AS A STAND ALONE PROJECT *

(With 4 oil berths and high operating costs)

BASED ON "SCENARIO A" FORECASTS (US$ 000)

	2016	2017	2018	2019	2020
CARGO TRAFFIC AT AKTAU					
(forecast, 000 tonnes)					
Oil	15,400	15,800	16,200	16,600	17,000
Dry Cargo, excl grain	1,281	1,812	1,915	2,019	2,122
Grain	1,050	1,100	1,150	1,200	1250
Total	**18,262**	**18,815**	**19,369**	**19,922**	**20,475**
Capacity of Existing Port					
(physical, @ max berth occupancy) (a)					
Oil	13,668	13,668	13,668	13,668	13,668
Dry Cargo	1,637	1,637	1,637	1,637	1,637
Grain	847	847	847	847	847
Traffic at North Extension					
(total traffic minus port capacity)					
Oil ..Maximum: 12,15o	1,732	2,132	2,532	2,932	3,332
Dry Cargo	175	278	382	485	588
Grain	203	253	303	353	403
Total	**2,110**	**2,663**	**3,217**	**3,770**	**4,323**
	2016	**2017**	**2018**	**2019**	**2020**
REVENUES					
(US$ 000)					
Cargo Handling					
Oil	2,978	3,666	4,354	5,042	5,730
Dry Cargo	1,208	1,918	2,629	3,340	4,051
Storage					
Oil (d)	0	0	0	0	0
Dry Cargo	403	640	878	1,115	1,352
Port Dues on Ships					
Oil	1,403	1,727	2,051	2,375	2,699
Dry Cargo	265	420	576	732	888
Grain	307	383	458	534	609
Total Revenues	**6,563**	**8,755**	**10,946**	**13,138**	**15,329**
Investment	80,000	20,000			
OPERATING COSTS					
Staff (b)	8,827	9,268	9,732	10,218	10,729
Maintenance and Repairs	1,271	1,271	1,271	1,271	1,271
Fuel	470	470	470	470	470
Others	5,232	5,232	5,232	5,232	5,232
Total Operating Costs	**13,560**	**13,560**	**15,800**	**16,241**	**16,705**
SURPLUS /DEFICIT	**-89,237**	**-27,487**	**-5,759**	**-4,054**	**-2,373**

Table 94: FINANCIAL INTERNAL RATE OF RETURN ON NORTHERN EXTENSION AS A STAND ALONE PROJECT *

(With 2 oil berths and low operating costs)

BASED ON "SCENARIO A" FORECASTS (US$ 000)

	2008	2009	2010	2011	2012	2013	2014	2015
CARGO TRAFFIC AT AKTAU								
(forecast, 000 tonnes)								
Oil			14,000	20,000	23,000	21,000	14,000	15,000
Dry Cargo, excl grain			1,281	1,367	1,452	1,538	1,624	1,709
Grain			400	520	640	760	880	1000
Total			**15,681**	**21,887**	**25,092**	**23,298**	**16,504**	**17,709**
Capacity of Existing Port								
(physical, @ max berth occupancy) (a)								
Oil			13,668	13,668	13,668	13,668	13,668	13,668
Dry Cargo			1,637	1,637	1,637	1,637	1,637	1,637
Grain			847	847	847	847	847	847
Traffic at North Extension								
(total traffic minus port capacity)								
Oil ..Maximum: 6,075			332	6,075	6,075	7,332	332	1,332
Dry Cargo			0	0	0	0	0	72
Grain			0	0	0	0	33	153
Total			**332**	**6,075**	**6,075**	**6,075**	**365**	**1,557**
	2008	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**
REVENUES								
(US$ 000)								
Cargo Handling								
Oil			570	10,449	10,449	10,449	570	2,290
Dry Cargo			0	0	0	0	0	497
Storage								
Oil (d)			0	0	0	0	0	0
Dry Cargo			0	0	0	0	0	166
Port Dues on Ships								
Oil			269	4,921	4,921	4,921	269	1,079
Dry Cargo			0	0	0	0	0	109
Grain			0	0	0	0	50	232
Total Revenues			**839**	**15,369**	**15,369**	**15,369**	**889**	**4,372**
Investment	45,000	15000	10,000			20,000		
OPERATING COSTS								
Staff (b)								
Maintenance and Repairs			1,271	1,271	1,271	1,271	1,271	1,271
Fuel			470	470	470	470	470	470
Others								
Total Operating Costs			**1,741**	**1,741**	**1,741**	**1,741**	**1,741**	**1,741**
SURPLUS /DEFICIT	**-45,000**	**-15000**	**-10,902**	**13,628**	**13,628**	**-6,372**	**-852**	**2,631**

Continued.....

FIRR =1.7%

Table 94 (continued): FINANCIAL INTERNAL RATE OF RETURN ON NORTHERN EXTENSION AS A STAND ALONE PROJECT *

(With 2 oil berths and low operating costs)

BASED ON "SCENARIO A" FORECASTS (US$ 000)

	2016	2017	2018	2019	2020
CARGO TRAFFIC AT AKTAU					
(forecast, 000 tonnes)					
Oil	15,400	15,800	16,200	16,600	17,000
Dry Cargo, excl grain	1,281	1,812	1,915	2,019	2,122
Grain	1,050	1,100	1,150	1,200	1250
Total	**18,262**	**18,815**	**19,369**	**19,922**	**20,475**
Capacity of Existing Port					
(physical, @ max berth occupancy) (a)					
Oil	13,668	13,668	13,668	13,668	13,668
Dry Cargo	1,637	1,637	1,637	1,637	1,637
Grain	847	847	847	847	847
Traffic at North Extension					
(total traffic minus port capacity)					
Oil ..Maximum: 6,075	1,732	2,132	2,532	2,932	3,332
Dry Cargo	175	278	382	485	588
Grain	203	253	303	353	403
Total	**2,110**	**2,663**	**3,217**	**3,770**	**4,323**
	2016	**2017**	**2018**	**2019**	**2020**
REVENUES					
(US$ 000)					
Cargo Handling					
Oil	2,978	3,666	4,354	5,042	5,730
Dry Cargo	1,208	1,918	2,629	3,340	4,051
Storage					
Oil (d)	0	0	0	0	0
Dry Cargo	403	640	878	1,115	1,352
Port Dues on Ships					
Oil	1,403	1,727	2,051	2,375	2,699
Dry Cargo	265	420	576	732	888
Grain	307	383	458	534	609
Total Revenues	**6,563**	**8,755**	**10,946**	**13,138**	**15,329**
Investment	80,000	20,000			
OPERATING COSTS					
Staff (b)					
Maintenance and Repairs	1,271	1,271	1,271	1,271	1,271
Fuel	470	470	470	470	470
Others					
Total Operating Costs	**1,741**	**1,741**	**1,741**	**1,741**	**1,741**
SURPLUS /DEFICIT	**-73,660**	**-12,480**	**8,699**	**9,879**	**13,588**

Table 95: FINANCIAL INTERNAL RATE OF RETURN ON NORTHERN EXTENSION AS A STAND ALONE PROJECT *

(With 2 oil berths and high operating costs)

BASED ON "SCENARIO A" FORECASTS (US$ 000)

	2008	2009	2010	2011	2012	2013	2014	2015
CARGO TRAFFIC AT AKTAU								
(forecast, 000 tonnes)								
Oil			14,000	20,000	23,000	21,000	14,000	15,000
Dry Cargo, excl grain			1,281	1,367	1,452	1,538	1,624	1,709
Grain			400	520	640	760	880	1000
Total			**15,681**	**21,887**	**25,092**	**23,298**	**16,504**	**17,709**
Capacity of Existing Port								
(physical, @ max berth occupancy) (a)								
Oil			13,668	13,668	13,668	13,668	13,668	13,668
Dry Cargo			1,637	1,637	1,637	1,637	1,637	1,637
Grain			847	847	847	847	847	847
Traffic at North Extension								
(total traffic minus port capacity)								
Oil ..Maximum: 6,076			332	6,075	6,075	7,332	332	1,332
Dry Cargo			0	0	0	0	0	72
Grain			0	0	0	0	33	153
Total			**332**	**6,075**	**6,075**	**6,075**	**365**	**1,557**
	2008	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**
REVENUES								
(US$ 000)								
Cargo Handling								
Oil			570	10,449	10,449	10,449	570	2,290
Dry Cargo			0	0	0	0	0	497
Storage								
Oil (d)			0	0	0	0	0	0
Dry Cargo			0	0	0	0	0	166
Port Dues on Ships								
Oil			269	4,921	4,921	4,921	269	1,079
Dry Cargo			0	0	0	0	0	109
Grain			0	0	0	0	50	232
Total Revenues			**839**	**15,369**	**15,369**	**15,369**	**889**	**4,372**
Investment	45,000	15000	10,000			20,000		
OPERATING COSTS								
Staff (b)			6,587	6,916	7,262	7,625	8,006	8,406
Maintenance and Repairs			1,271	1,271	1,271	1,271	1,271	1,271
Fuel			470	470	470	470	470	470
Others			5,232	5,232	5,232	5,232	5,232	5,232
Total Operating Costs			**13,560**	**13,889**	**14,235**	**14,598**	**14,979**	**15,380**
SURPLUS /DEFICIT	**-45,000**	**-15000**	**-22,721**	**1,480**	**1,134**	**-19,229**	**-14,090**	**-11,008**

Continued.....

FIRR =negative

Table 95 (continued): FINANCIAL INTERNAL RATE OF RETURN ON NORTHERN EXTENSION AS A STAND ALONE PROJECT *

(With 2 oil berths and high operating costs)

BASED ON "SCENARIO A" FORECASTS (US$ 000)

	2016	2017	2018	2019	2020
CARGO TRAFFIC AT AKTAU					
(forecast, 000 tonnes)					
Oil	15,400	15,800	16,200	16,600	17,000
Dry Cargo, excl grain	1,281	1,812	1,915	2,019	2,122
Grain	1,050	1,100	1,150	1,200	1250
Total	**18,262**	**18,815**	**19,369**	**19,922**	**20,475**
Capacity of Existing Port					
(physical, @ max berth occupancy) (a)					
Oil	13,668	13,668	13,668	13,668	13,668
Dry Cargo	1,637	1,637	1,637	1,637	1,637
Grain	847	847	847	847	847
Traffic at North Extension					
(total traffic minus port capacity)					
Oil ..Maximum: 6,075	1,732	2,132	2,532	2,932	3,332
Dry Cargo	175	278	382	485	588
Grain	203	253	303	353	403
Total	**2,110**	**2,663**	**3,217**	**3,770**	**4,323**
	2016	**2017**	**2018**	**2019**	**2020**
REVENUES					
(US$ 000)					
Cargo Handling					
Oil	2,978	3,666	4,354	5,042	5,730
Dry Cargo	1,208	1,918	2,629	3,340	4,051
Storage					
Oil (d)	0	0	0	0	0
Dry Cargo	403	640	878	1,115	1,352
Port Dues on Ships					
Oil	1,403	1,727	2,051	2,375	2,699
Dry Cargo	265	420	576	732	888
Grain	307	383	458	534	609
Total Revenues	**6,563**	**8,755**	**10,946**	**13,138**	**15,329**
Investment	80,000	20,000			
OPERATING COSTS					
Staff (b)	9,732	10,218	10,729	11,265	11,829
Maintenance and Repairs	1,271	1,271	1,271	1,271	1,271
Fuel	470	470	470	470	470
Others	5,232	5,232	5,232	5,232	5,232
Total Operating Costs	**16,705**	**17,191**	**17,702**	**18,239**	**18,802**
SURPLUS /DEFICIT	**-5,759**	**-4,054**	**-2,373**	**-1,730**	**-1,114**

15.2 Forecast of Revenues and Expenditure for AISCP

The second section of this chapter reflects a financial assessment of the impacts on AISCP of the series of investments to improve the capacity and operational efficiency to meet the anticipated demand from the Traffic Forecasts in chapter 4. Details of the model used in the financial assessment are given in Appendix 3.

AISCP FINANCIAL POSITION

Audited accounts are available up to 2006. The highlights of past performance are summarised below:

Table 96: Summary of AISCP Financial Statements (US million)

	2002	2003	2004	2005	2006
Profit & Loss					
Sales	17.9	22.3	29.6	32.5	40.3
Operating Costs	7.3	9.8	12.0	13.6	11.1
Depreciation	2.1	2.1	2.3	3.6	4.5
Interest	1.4	0.8	0.6	1.7	1.8
Operating Income	7.2	9.6	14.6	13.6	22.9
Net Income after tax	2.9	10.0	13.1	9.4	15.2
Cashflow					
Net cash from					
Operations	8.3	8.1	9.9	14.3	8.5
Investment	-1.3	-0.7	-1.8	-12.4	-24.2
Financing	-5.1	-8.6	-4.0	-4.0	18.7
Total	1.9	-1.3	4.0	-2.1	3.0
Balance Sheet					
Assets					
Current	8.8	8.0	15.4	12.3	22.4
Long-term	64.2	59.5	61.4	95.4	106.0
Total	73.0	67.5	76.8	107.7	128.4
Liabilities					
Current	5.8	5.1	6.4	6.6	7.9
Long-term					
Equity	-10.5	-0.1	13.0	43.5	59.4
Debt	54.4	40.3	35.6	25.3	44.5
Other long-term	23.4	22.1	21.9	32.3	16.6
Total	73.0	67.5	76.9	107.7	128.4

NB/ Figures for 2002 to 2004 have been converted from Tenge at the exchange rate on the 30th June of each year whereas for 2005 and 2006 they have been converted at the principal exchange rate used in the accounts.

As shown above, total revenues amounted to $40.3 million in 2006. Total costs, including depreciation and interest, amounted to $17.4 million, giving an operating income of $22.9 million.

Operating income has been increasing steadily over the period with the exception of 2005 when cost increases outstripped income by $1 million. This position was corrected in 2006.

Around 97% of AISCP's revenue comes from its operations at Aktau with the remainder from Bautino. At Aktau, the main sources of revenue in 2006 were as follows:

	% of Aktau revenues in 2006
Public Berths	
Oil	52.4%
Metals	22.5%
Other dry cargo	2.6%
Grain	0.9%
Ferry	2.0%
Leased berths 4,5&9	13.2%
Cargo storage	6.1%
Other	0.3%
Total	100.0%

In 2006, approximately 55% of AISCP's revenues came from cargo handling and 33% from ship dues.

Tariffs quoted are in Tenge. The main cargo handling rates at 2006 were:

	Tenge per Ton	US$ equivalent
Oil	218.7 (a)	1.72 (a)
Metals	874.7	6.89
Grain	131.2	1.03
Other dry bulks	874.7	6.89
General cargo	131.2	1.03

(a) The port plans to increase the oil handling charge to 430 Tenge ($3.4) per tonne in March 2008.

Port dues are more difficult to estimate as they depend on the precise dimensions of each vessel but it is considered that they span between US$ 4-7000 per ship, depending on size.

Operating costs have risen broadly in line with operating revenues and can be analysed as follows:

	% of operating costs in 2006
Wages	44.5%
Repairs & maintenance	2.9%
Fuel	4.0%
Utilities	2.9%
Spare parts and materials	15.7%
Depreciation	27.7%
Other	2.3%
Total	100.0%

In addition net income has been affected by such items as foreign exchange losses and tax.

AISCP has already repaid US $36.417m of the US $51.480 million drawn down from the first EBRD loan, leaving a balance of US $15.063 million outstanding. This balance is after deducting the US$ 6.0 million repaid voluntarily in advance of scheduled requirements.

Future Investments

The following table charts the proposed future investments with an indicated budget and optimum timing for the investment.

Table 97 Table of Investments (US$ millions)

	2008/9	2010	2013	2016	2017	2020	Total
Breakwater/Mole	76						76
4 Oil berths	90						90
Oil berth equipment	8.25						8.25
4 Dry cargo berths		10		100		20	130
Dry berth equipment					20		20
Grain berth			20				20
Total	174.25	10	20	100	20	20	344.25

Funding for the breakwater/mole has already been arranged which leaves additional funding in the region of US$ 268 million to be sourced.

As stated in the first part of this chapter, the FIRR on the North Harbour as a stand alone project is not commercially attractive, and therefore it would be preferable to source as much funding as possible through an increase in equity/capital. The alternative is to seek external funding but such institutions may seek sovereign guarantees before they would commit to investments with such a modest financial return.

Profit & Loss

In projecting the likely outturns for this study, the following assumptions have been made:

- Revenues – per the application of current tariffs against the volumes of the traffic forecast.
- Operating costs – adjusted upwards annually between 10 and 2.5% dependent upon the movement of traffic volumes.
- Depreciation – calculated to write off structural investments over thirty years and equipment over ten years.
- Finance/Loan Interest - principally based upon loans outstanding at the beginning of the year at 7% per annum.

The following table summarises the operating profit performance over the period of the forecast:

Table 98 Operating Profit (US$ million)

	2006	2010	2015	2020	2025
Revenues	40	55	77	92	98
Costs					
Operations	13	18	26	30	34
Depreciation	4	11	11	17	17
Finance	0	10	9	13	6
Profit before Tax	23	16	32	32	40
%	56	30	41	55	41

Profit performance is subject to considerable fluctuations between highs of 56% against revenues to lows of 29%. However, these are reasonable results for the sector.

For a loss to occur requires would either be the result of exceptionally high costs (unlikely as these should be within the control of management) or a decline in revenues of at least 25%. Such a change should not materialise in a short period without management being able to take appropriate remedial financial action.

Cashflow (US$ millions)

The cashflow remains as positive throughout the period and demonstrates that loan repayments can be serviced. The loan profiles in each case assume a repayment holiday of two years, interest at 7% per annum and repayments over fifteen years.

Table 99 Cash Balances (US$ millions)

	2006	2010	2015	2020	2025
Cash and cash equivalents	12	40	138	210	301

The most likely risks to positive cashflow would be:

- Decline in revenues – see earlier comments.
- Loan repayments only over ten year period not fifteen. This would increase the average annual repayment from US$ 14.6 million to 21.6 per annum.

Services offered by AISCP are generally on a cash basis which means that debt collection of substance is not a management issue.

Balance Sheet

This grows considerably in value over the period of the forecast due in particular to:

- Capital investment of US $ 344 million in specifically identified projects along with a further US$ 60 million of routine replacements.
- The plotting of the specific investments through external funding.
- AISCP is not required to pay a dividend or distribute its post tax profits.
- The value of capital investment likely to be further enhanced through the application of asset revaluations in line with international accounting standard requirements.

Table 100: Table of Balance Sheet Highlights (US $ millions)

	2006	2010	2015	2020	2025
Balance Sheet Value	126	296	382	526	562
Equity	60	105	239	331	456
Loans	49	177	123	174	83
% of Loans to Equity	82%	169%	51%	53%	18%
Return on Capital %	38%	16%	13%	10%	9%
Adjusted Return on Capital %					

The return on capital remains positive throughout and with the removal of cash balances (adjusted return on capital) is extremely attractive by both sector and normal commercial standards.

In normal commercial environments excess cash would discounted in calculating return on capital which is the more appropriate performance indicator.

16 CONCLUSIONS

Options for Action

The forecasts of oil throughput at Aktau port, presented in Scenarios A, B and C are unusual from a port planning viewpoint. All three scenarios suggest the need to invest in new oil berths which will only be fully utilised from around 2010 for a very short number of years, after which time they will become under-utilised. In this situation it is questionable whether an investment bank will be attracted. There are a number of views which could be taken which can assist in proposing a strategy. These are described below.

1. As port owner, the Government of Kazakhstan might take the view that in any case the necessary infrastructure to respond to the short-term demand should be provided. In fact the economic rate of return is high because the new berths would avoid the extremely high costs of diversion to Odessa and Government could decide that it is in the best interest of the State to construct the berths. In this case Government should expect to have to proceed without the participation of development banks.
2. A contrasting view would be to place the obligation to provide infrastructure for the short-term peak of oil traffic with the oil industry. The major oil operators of Tengiz field, who will be the main users of Aktau port, might be willing to provide their own berths and oil handling equipment in the North port after AISCP has completed the provision of the breakwater, mole and dredging. Temporary loading facilities, perhaps involving floating pontoons or jack-up platforms could be a solution. In effect the oil companies would be offered a short-term lease which would be negotiated on mutually agreeable terms. The oil companies would avoid incurring the high overland transport costs by rail from Tengiz to Odessa and this could be used as a negotiating point by AISCP. This is in line with common international practice whereby a port owner provides the essential but high-cost basic infrastructure (breakwaters and dredging), the harbour services such as towage, tugging and pilotage, fire fighting, safety and communications services, whilst the operators or cargo owners provide their own specific infrastructure, equipment and services under an operating agreement. More international examples are provided below.
3. A third view would be to seek from the oil companies an undertaking to continue to ship a certain minimum volume of oil across the Aktau berths after the critical date of 2013 for a minimum period (perhaps 10 years). In effect this would be a classical marketing task. AISCP would need to be able to offer enhanced service packages and financial concessions. To make the proposal potentially attractive to the oil companies AISCP should be ready to discuss, or offer, at least the following:
    - Tariffs below the general rate
    - Undertakings to maintain fixed tariffs for the medium term and a cap on increases in the long term
    - Certain minimum operational efficiency levels. These would include agreed benchmarks on berth availability, harbour services, berth service time and documentation time.

    Some efficiency improvements are outside the control of the port company, for example reductions in time taken to process papers (customs, quality control etc)

4. One further option is that AISCP could seek an undertaking from Government to guarantee minimum oil volumes across the berths of Aktau port. It is felt that Government could prevail on the Kazakhstan partners of the oil industry (particularly Kazmunaigaz) to sustain the necessary volumes in the state interest.
5. Finally, it would be logical to consider a different phased development of the North Port involving phased usage of the new cargo berths. The general cargo berths in the North Port are not required until approximately 2014. It would be possible to construct the general cargo berths immediately and put them into use as oil berths, reverting to dry cargo use by 2014.

The Consultant's understanding is that the approved layout of the North Port is to be taken as Government strategy and that modification of the layout of the berths and the numbers of berths is not for consideration. Therefore the recommendations made below in Chapter 17 take account of this situation.

Efficiency Improvements to Current Cargo Operations

Thirty years ago ports were barriers to trade in many countries. They were often highly inefficient, expensive, and plagued with over-manning and restrictive labour practices.

These problems gave incentives for radical port reforms. The most common measures were the abolition of government monopolies and introduction of competition where possible. This generally entailed privatisation; deregulation of entry, investment and tariffs; and government measures to tackle labour problems, especially those of over manning and restrictive practices. There is now a general consensus on the desirability of the ***withdrawal of port authorities to a landlord role***, with all operations carried out by private companies in a competitive environment.

These reforms have had been extremely successful in many countries. It is not uncommon for productivity to have risen to levels three times as high as at the state-run ports; and tariffs have often fallen sharply at the private ports. In addition, employment has fallen to a small fraction of previous levels.

The greatest and most publicised impact of the port reforms has been in container terminals, which handle the majority of world trade in terms of value.

The situation in oil terminals has similarities and also differences.

First, most oil terminals have always been owned and operated by private companies, i.e. oil companies - independently of port authorities. This was so before the introduction of the port reforms described above.

This pattern has emerged because much of the oil is transported directly to refineries which are owned by oil companies from oil export terminals located near oil fields. Often the shipping requires berths with deeper drafts than in the established ports. It is often handled at SBMs outside ports. For example, almost all the seaborne oil traffic in the UK is handled at terminals which are owned and operated by the oil companies (e.g. Esso at Fawley, Elf at Milford Haven, BP at Grangemouth and Phillip-Imperial at Tees).

There are also, however, many examples of private operators operating with the port boundaries, on facilities on long leases. For example, at Rotterdam, the largest oil port in the

world, there are four refineries, 40 petrochemical companies, 13 major storage and distribution companies (e.g. Vopak), all operated by private companies within the port area, on long leases.

In the Caspian region, the dominant terminals of Dubendiy (Azerbaijan) and Batumi (Georgia) are also owned and operated by independent companies (Azpetrol and Greenoak)

At present, such arrangements would be ruled out in Aktau, by current law. This law, which is understood to have been partly the reason for terminating the Mobilex contract, is out of line with modern practice in ports elsewhere in the world, and should be repealed.

It should also be mentioned that the oil companies place a high priority on efficiency, safety and environmental/ pollution controls, and they will require that operations at Aktau should meet internationally accepted levels of performance which at present they do not. The improvements necessary could be facilitated by the involvement of the companies in the port operations

Rail and Pipeline Access into Aktau

The current rail and pipeline systems transporting goods into the port, particularly oil, do not have sufficient capacity to carry the projected volumes which have been the basis for proceeding with the North Port. Future expansion in the North Port should not proceed without parallel investment in the railway and pipeline systems.

Institutional Reform and Efficiency Improvements within other Port Agencies

It is proposed that the Consultant prepares terms of reference for a technical assistance programme which will reach those agencies providing customs clearance, immigration, security and quality testing.

Financial considerations

The study has shown that because the cost of the expansion works is high compared to the revenue from the additional volumes, the works on their own do not appear to be an attractive business project for the port. However, the usual tests or criteria that are applied to investment decisions are generally driven by the economic and commercial purposes of the organisation.

In the case of AISCP no one measure in isolation should be the determinant of whether to invest or not. In addition to financial considerations AISCP have national responsibilities to ensure that the efficient movement of goods is a priority objective. This is closely monitored by many interested parties including other Government Departments.

The net result is that whilst financial tests examined in the Study are important, they may need to be over ridden in the wider interests of the State. As the FIRR for investment in the North Port is not commercially attractive it would be preferable to source as much funding as possible through an increase in equity/capital.

The alternative is to seek external funding but such institutions may seek sovereign guarantees before they would commit to investments with such a modest financial return. However, AISCP can financially sustain the investments and in relation to the smaller investments possibly fund them from cash flow generated by the business.

A further important issue is timing and whilst the investment programme has been formulated to maximise finances against traffic movements, provision should be made for flexibility in investment programming.

The case for new oil berths at Aktau

- Oil traffic has been increasing rapidly since 2000, and Aktau's oil berths are approaching their maximum capacity.
- The government forecasts an increase of 40% in Kazakh oil exports between 2006 and 2010.
- But no additional pipelines or port facilities are scheduled until Kuryk opens around 2012. Past experience with delays suggests that its opening may be even later.
- Furthermore, the timing of expansion of the CPC is unknown.
- Faced with this shortage of transport capacity, Tengizchevroil is having to resort to railing the oil to Odessa at the unusually high cost of $60 per tonne during the period 2008-2012/13. This high cost is a measure of the shortcomings of the existing export routes.
- The avoidance of these very high costs is the main reason for the high economic internal rate of return for new berths at Aktau. Even if the berths are underutilised after 2013, their construction is economically justifiable by the savings of around $300 million in the period 2010-2013.
- In brief, failure to build new berths at Aktau could have major consequences for the exports of oil over the next five years, when no other new oil transport facilities are planned.
- The significance of the oil exports for Kazakhstan cannot be overstated. By 2010 the export revenues will be worth approximately $50 billion p.a. The oil is by far the most important source of income for Kazakhstan. In fact, almost without exception, the economies of those FSU countries without oil (e.g. Georgia, Armenia, Kyrgyzstan, Tajikistan, Uzbekistan) have failed to take off. It would seem unwise to put these export revenues at risk by failing to add to transport capacity over these next five years

17 RECOMMENDATIONS

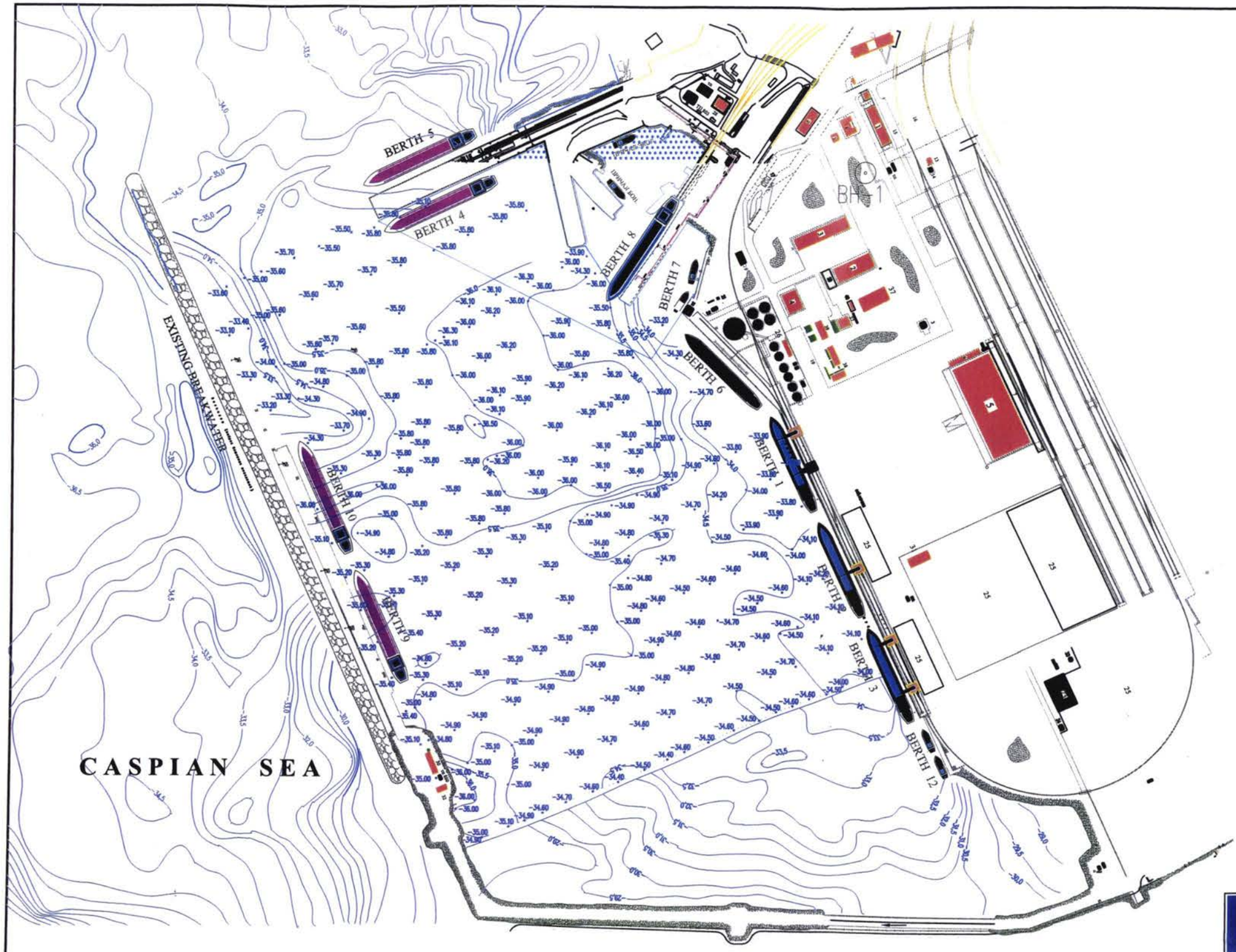
The study has shown that there are several actions that need to be taken immediately to meet the projected demand to handle future cargo volumes. To assist AISCP with identifying these actions the following recommendations are made:

1. AISCP seek meetings with Ministry of Transport, Ministry of Energy and Ministry of Economy to clarify the inconsistencies in State forecasts of oil volumes and to seek guaranteeing of oil volumes or underwriting the repayments of the loan if the volumes do not materialize.
2. AISCP should seek meetings with the oil companies, notably Tengiz Chevroil, to discuss sharing of the costs of investment in the oil berths as is common in many oil terminals worldwide.
3. AISCP should put in hand efficiency improvements to the existing cargo operations.
4. AISCP should co-ordinate institutional reform amongst the agencies involved in customs clearance, immigration, security and quality testing;
5. Upgrading work should be carried out immediately in the existing port to meet immediate projected increases in traffic volumes;
6. AISCP should complete their investigations which are currently in hand as soon as possible to confirm the practicality of increasing oil volumes through the Existing Port;
7. To maintain AISCPs role as a key player in the export of Kazak crude oil at least two new oil berths should be operational in the North Port by 2010;
8. AISCP should build on existing arrangements and work more closely with the oil companies to determine the optimum procurement strategy and port tariffs for the new oil berths given the possible short term requirement for these berths;
9. To compete with alternative transport routes AISCP should establish a forum for working with the oil, rail, pipeline and tank storage companies to ensure that oil exporting facilities and procedures at Aktau are as attractive as the alternative transport routes that are available and that the capacity of the rail and pipeline are increased so that they can handle the projected future volumes.
10. AISCP should source as much funding as possible through an increase in equity/capital, but be prepared to provide sovereign guarantees to attract external funding institutions;
11. AISCP should plan to construct a new grain terminal in the North Port by 2014 and two new dry cargo berths in the North Port by 2017
12. AISCP should consider finding additional/alternative use for the large reclamation in the North Port, such as tank farms or industrial development both for the temporary condition until the new dry cargo berths are required and for the permanent condition where a significant proportion of the reclamation is unlikely to be needed for port operations;
13. Following the Second Steering Committee Meeting held in Astana on 27th March 2008 the Consultant should proceed with designs and tender documents based on FIDIC conditions of contract for new oil berths in the North Port. Designs will be prepared for four berths. It is expected that by the time the designs are completed, the forecasts of demand for oil shipment will have been clarified through the AISCP activities listed under points 1, 2 and 3 of the General Recommendations on Actions to be taken before implementation of the Master Plan". It will then be possible to firm up the scope and financing of the oil berth procurement package.

APPENDIX 1 – DRAWINGS

Table of Drawings

Drawing Number	Drawing Title
1	Existing Port Layout
2	Existing Port Berth 12
3	North Port Reclamation-Plan
4	North Port Reclamation-Section
5	North Port Layout
6	North Port Oil Berth-Open Style
7	North Port Oil Berth-Solid Style
8	North Port General Cargo Berth-Open Style
9	North Port General Cargo Berth-Solid Style
10	North Port Development Plan
11	North Port Dredging Cross Sections
12	Wind and Wave Roses



Notes:

1. Levels are in metres below Baltic Datum.
2. Survay data Source:
   Measurements "Caspmorput" , Azerbijan 2000 и 2005 y.y.

The project is funded by the European Union

The project is implemented by Scott Wilson&Proektirovshik

Aktau Port Development, Kazakhstan
Feasibility Study for the Port of Aktau

Project title

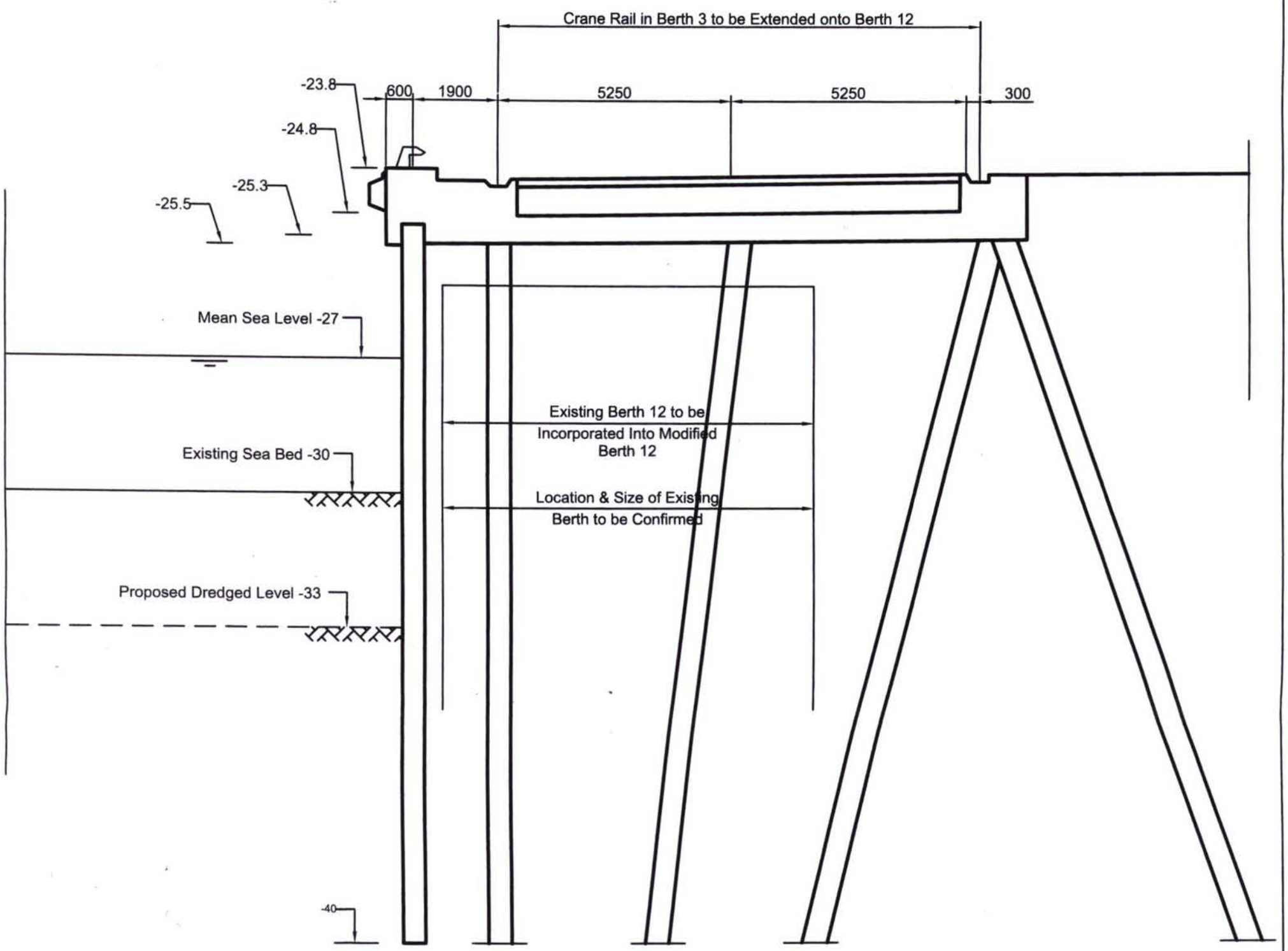
Marine Layout for Existing Port

Drowing title

Sc 1:5 000

Sheet#	Date
1	31.12.2007

format A3



Typical Cross Section for Modified Berth 12
(From Berth3 to Southern Breakwater)

The project is funded by the European Union

The project is implemented by Scott Wilson&Proektirovshik

Aktau Port Development, Kazakhstan
Feasibility Study for the Port of Aktau

Project title

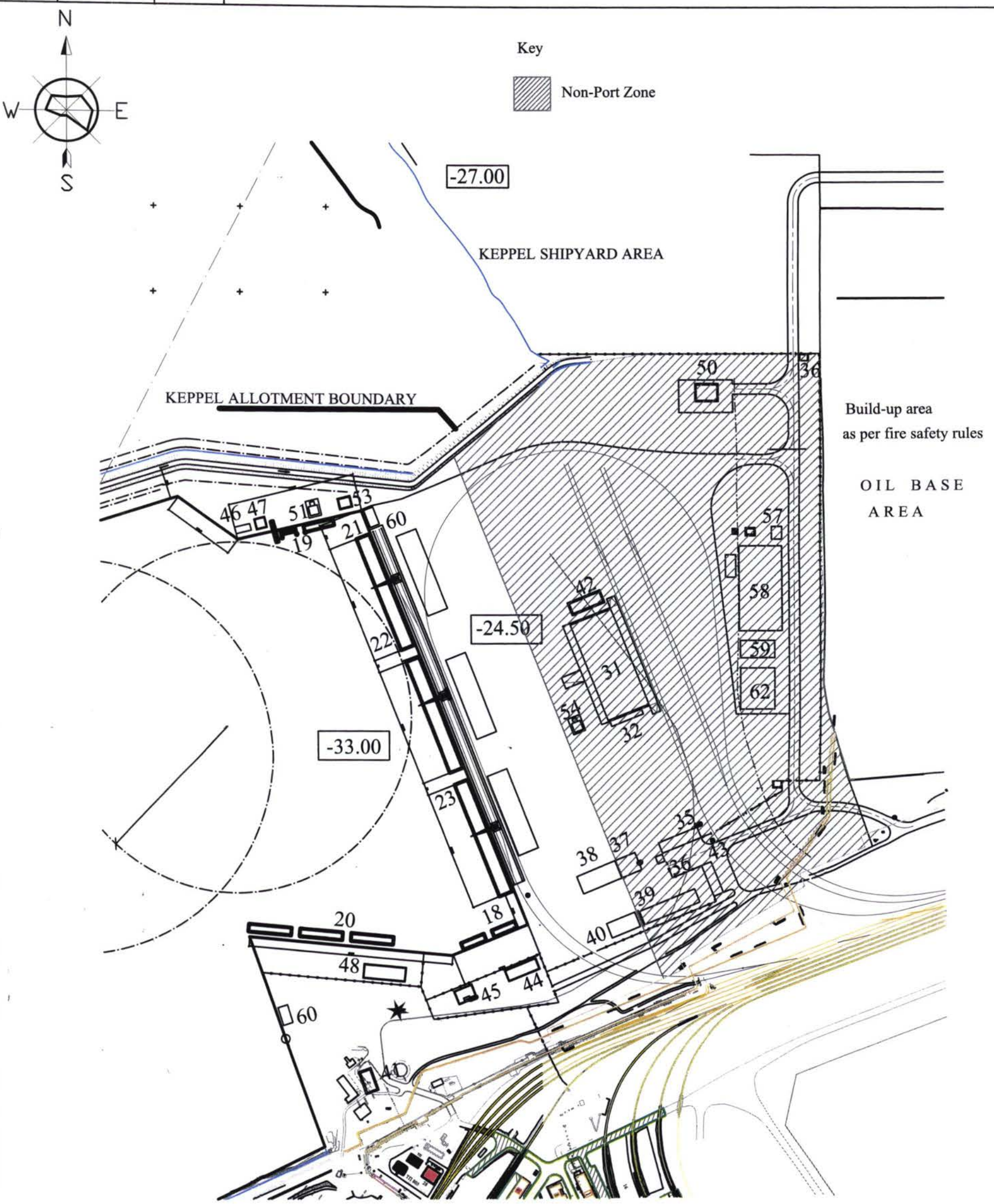
Proposed Modification to Berth 12

Drawing title

Sc NTS

Sheet#	Date
2	31.12.07

format A4



The project is funded by the European Union

The project is implemented by Scott Wilson&Proektirovshik

Aktau Port Development
Feasibility Study for the Port of Aktau

Project title

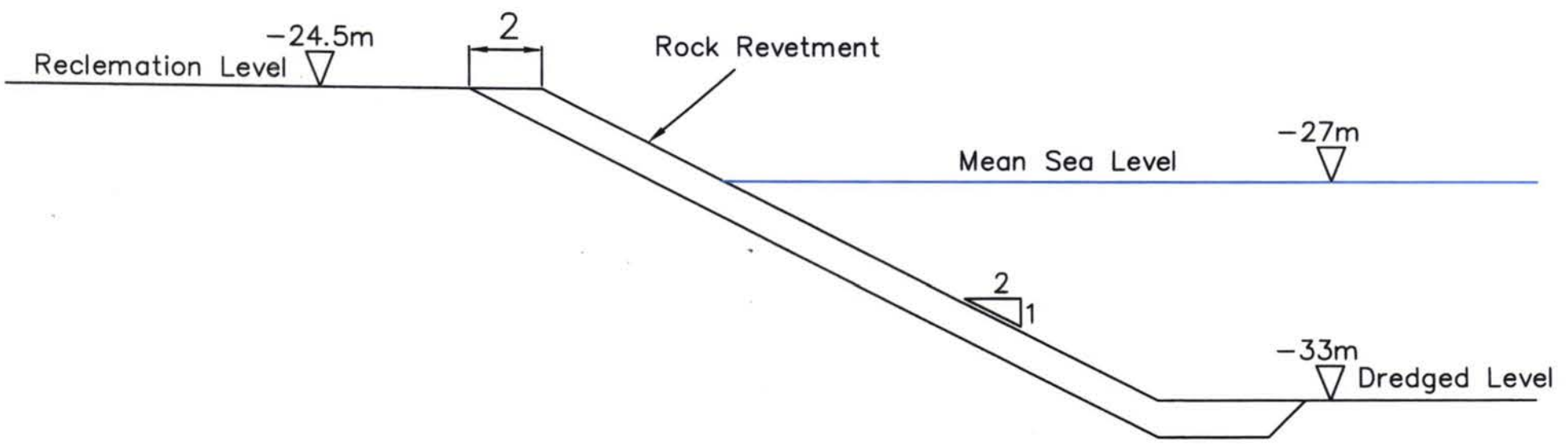
North Port Reclamation Plan

Sc NTS

Drawing title

Sheet#	Date
3	30.11.2007

format A4



Typical Cross Section Through Edge of Reclamation

The project is funded by the European Union

The project is implemented by Scott Wilson&Proektirovshik

Aktau Port Development
Feasibility Study for the Port of Aktau

Project title

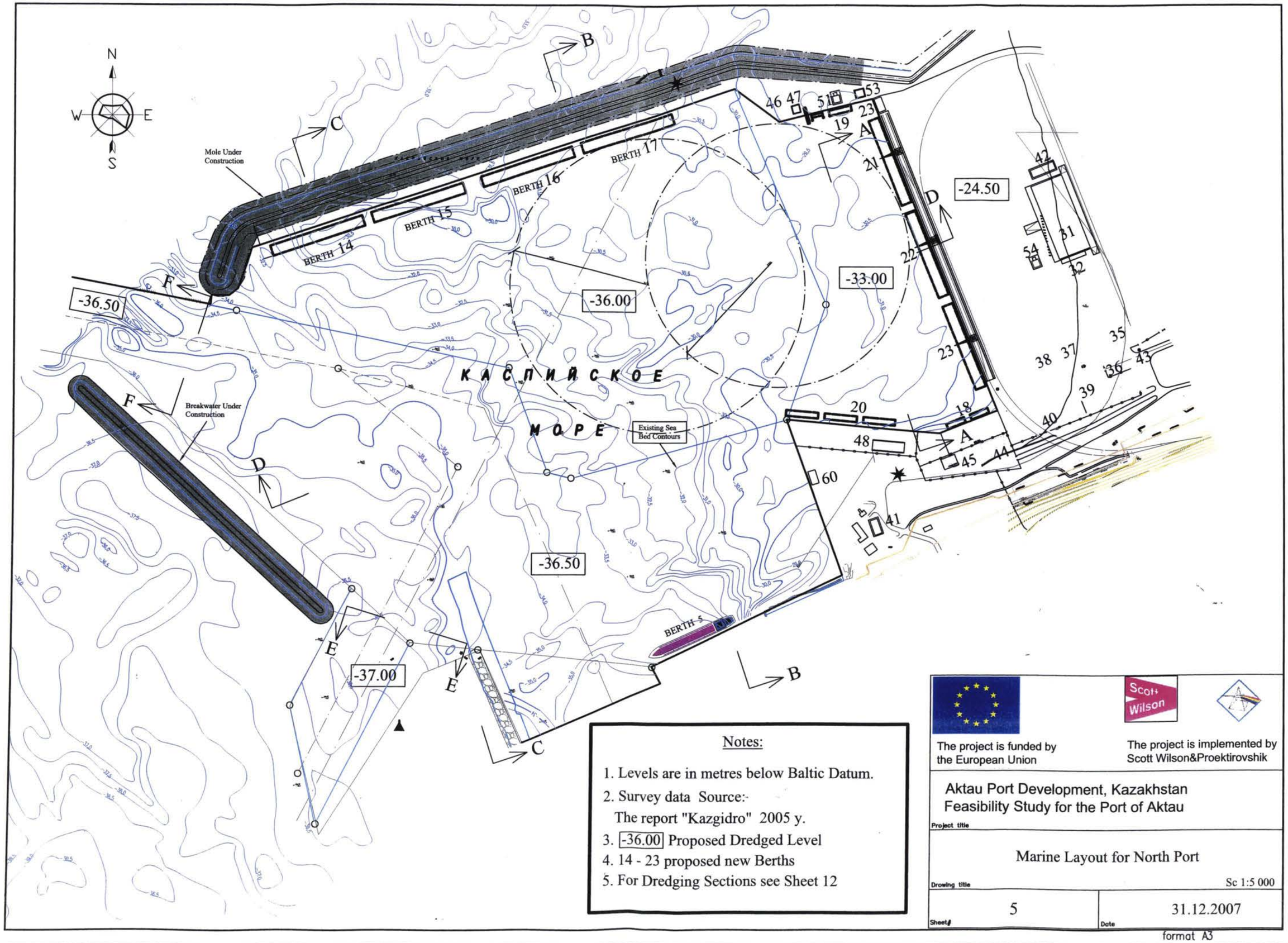
North Port Reclamation Cross Section

Drawing title

Sc NTS

Sheet#	Date
4	30.11.2007

format A4



Notes:

1. Levels are in metres below Baltic Datum.
2. Survey data Source:-
   The report "Kazgidro" 2005 y.
3. -36.00 Proposed Dredged Level
4. 14 - 23 proposed new Berths
5. For Dredging Sections see Sheet 12

The project is funded by the European Union

The project is implemented by Scott Wilson&Proektirovshik

Aktau Port Development, Kazakhstan
Feasibility Study for the Port of Aktau

Project title

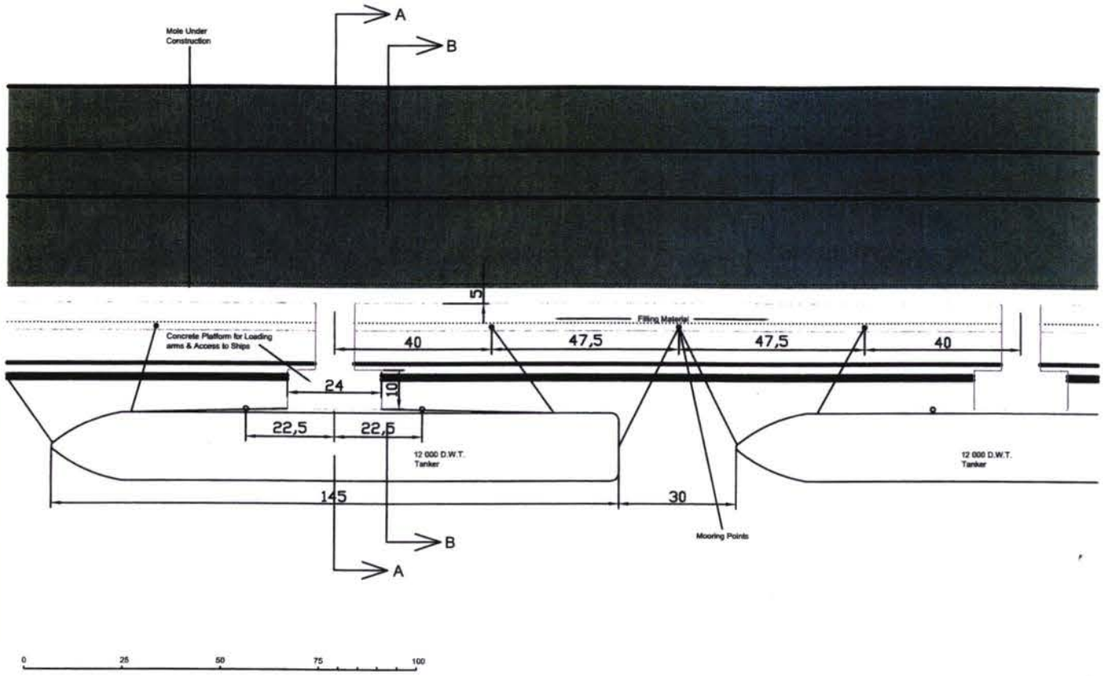
Marine Layout for North Port

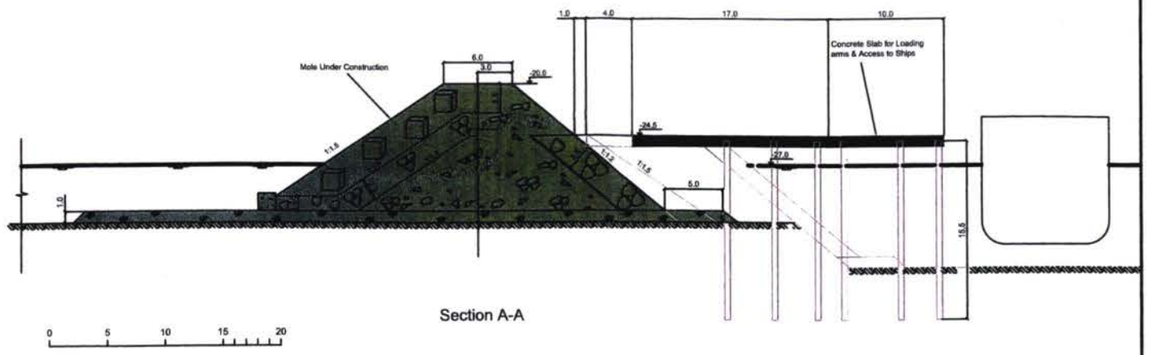
Drawing title

Sc 1:5 000

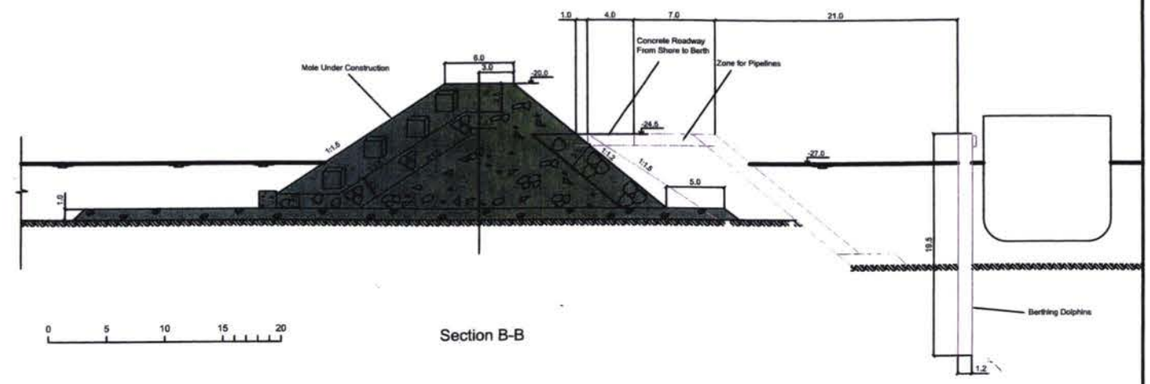
Sheet #	Date
5	31.12.2007

format A3





Section A-A



Section B-B

The project is funded by the European Union

The project is implemented by Scott Wilson&Proektirovshik

Aktau Port Development, Kazakhstan
Feasibility Study for the Port of Aktau

Project title

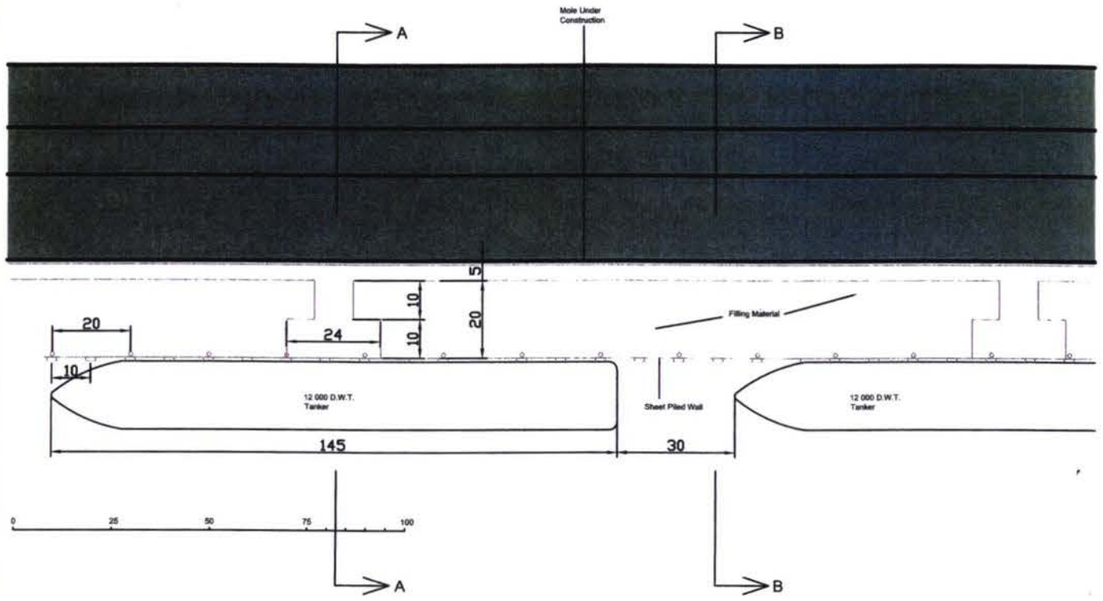
Proposed New Oil Berth
(Open Piled Option)

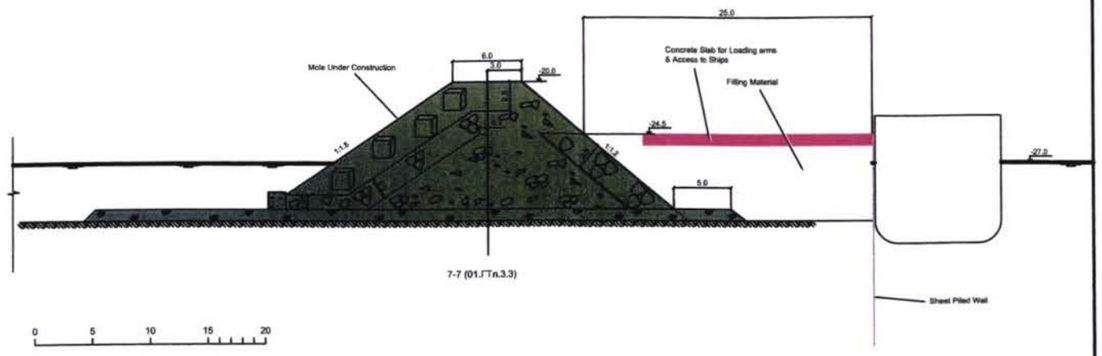
Drawing title

Sc NTS

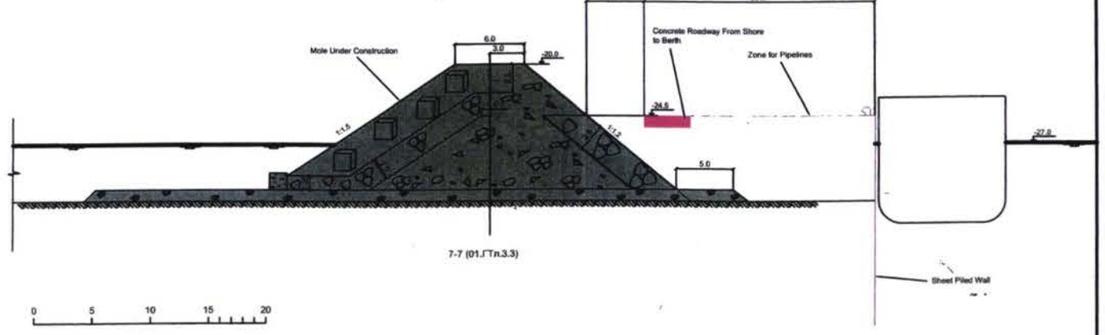
Sheet #	Date
6	31.12.2007

format A3





Section A-A



Section B-B

The project is funded by the European Union

The project is implemented by Scott Wilson&Proektirovshik

Aktau Port Development, Kazakhstan
Feasibility Study for the Port of Aktau

Project title

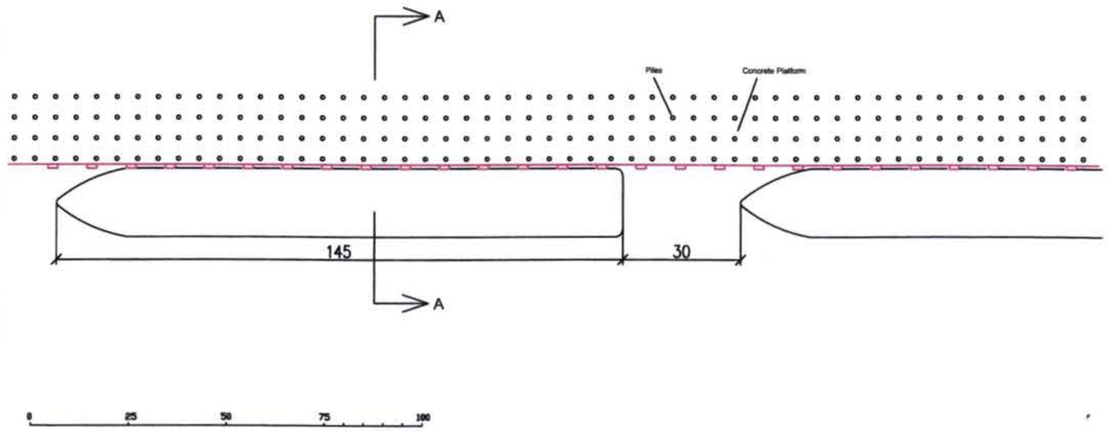
Proposed New Oil Berth
(Sheet Piled Option)

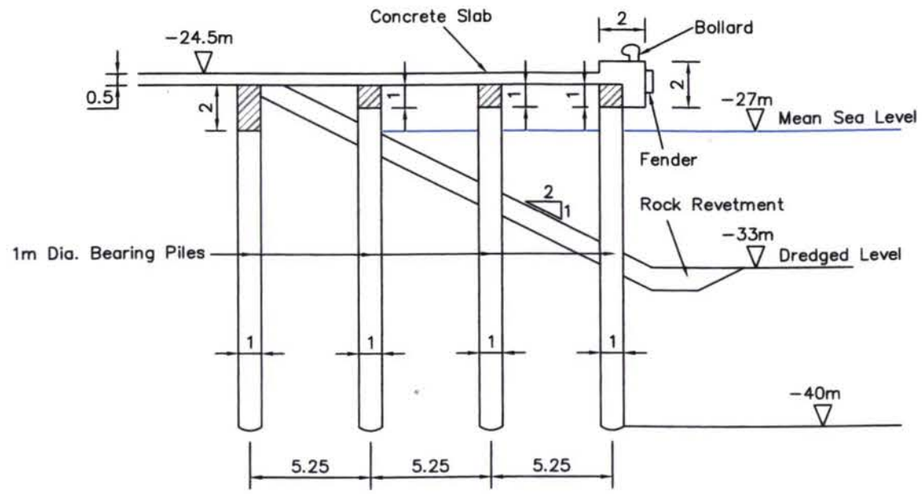
Drawing title

Sc NTS

Sheet #	Date
7	31.12.2007

format A3





Section A–A

The project is funded by the European Union

The project is implemented by Scott Wilson&Proektirovshik

Aktau Port Development, Kazakhstan
Feasibility Study for the Port of Aktau

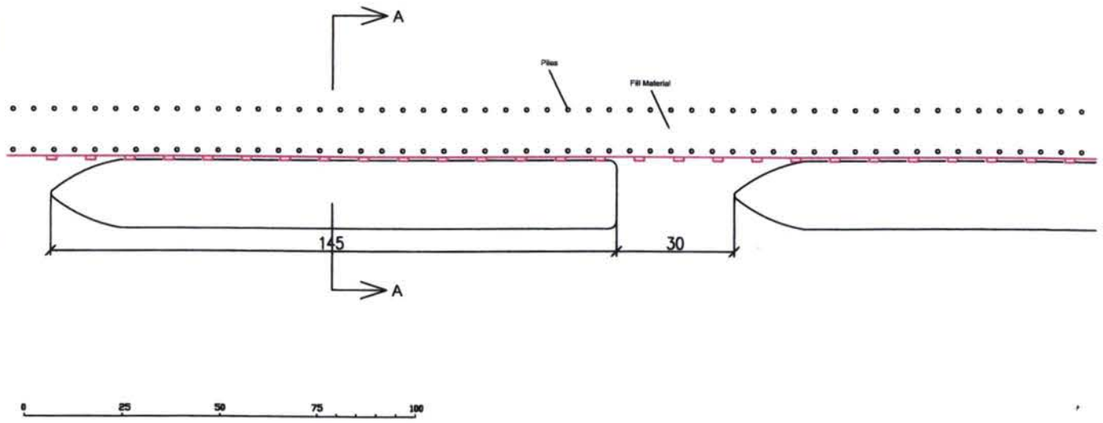
Project title

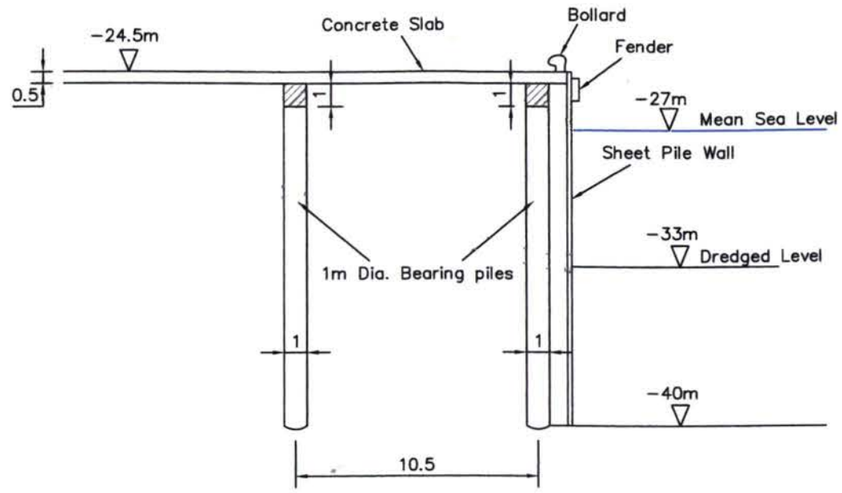
Proposed New General Cargo Berth
(Open Piled Option)

Drawing title

8

Sheet#





Section A-A

The project is funded by the European Union

The project is implemented by Scott Wilson&Proektirovshik

Aktau Port Development, Kazakhstan
Feasibility Study for the Port of Aktau

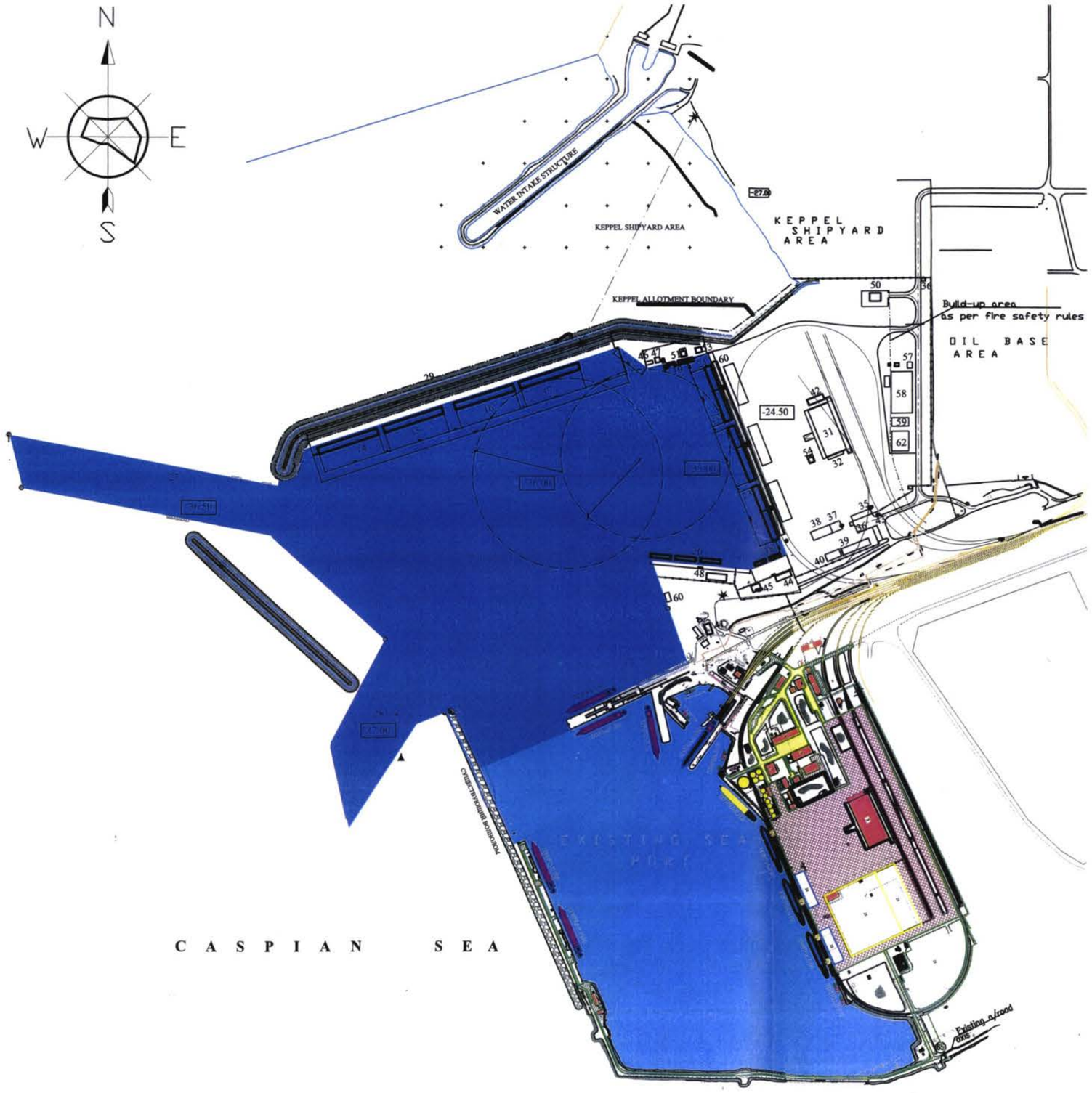
Project title

Proposed New General Cargo Berth
(Sheet Piled Option)

Drawing title

9

Sheet#



LEGEND
NORTH HARBOR FACILITIES

LEGEND

14,15,16,17 - Oil Terminals
18 - Fleet vessels
19 - Ecological Terminal
20 - Naval Forces Terminal
21,22 - Main Cargos Terminals
23 - Multiple Terminal
27,28 - Approach channels
29 - Breakwater
30 - Breakwall
31 - Inside storage
32 - Operating Services Office (OSO-1)
35 - Administrative building - 5 fl.
36 - Ledges of the port (3ea)
37 - Domestic compartments
38 - Automobile repair shops
39 - Material and technical warehouse and repair shop
40 - Automobile box
41 - Coastal Radar (CR)
42 - Operating Services Office (OSO-2)
43 - Customs Service building
44 - Frontier service building
45 - Quarantine Service building
46 - Tank for washing the floating booms
47 - Ecological post
48 - Naval Forces Platform
49 - Check point
50 - Fire station for 2 fire trucks
51 - Foam fire-fighting station #1 with operator's room
53 - Fire pump station (sea water)
54 - Fire pump station of closed type warehouse
55 - Water tower with pump station
56 - Intake tank of oily wastes
57 - Sewage treatment facility
58 - Treated water evaporator
59 - Rainwater storage
60 - Filling station of the fire truck with sea water (2)
62 - Reserve tank for ballast water

The project is funded by the European Union

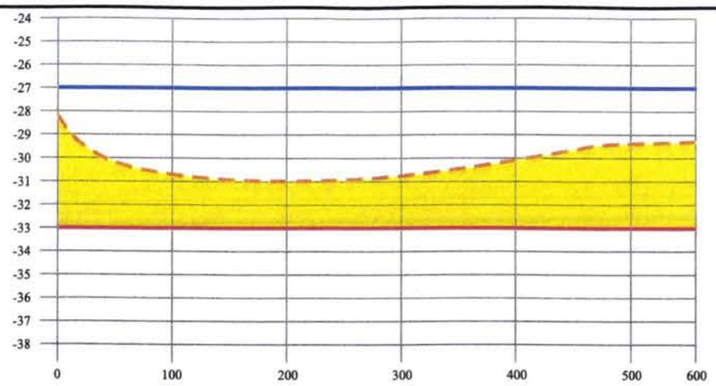
The project is implemented by Scott Wilson&Proektirovshik

Aktau Port Development, Kazkhstan
Feasibility Study for the Port of Aktau
Project title

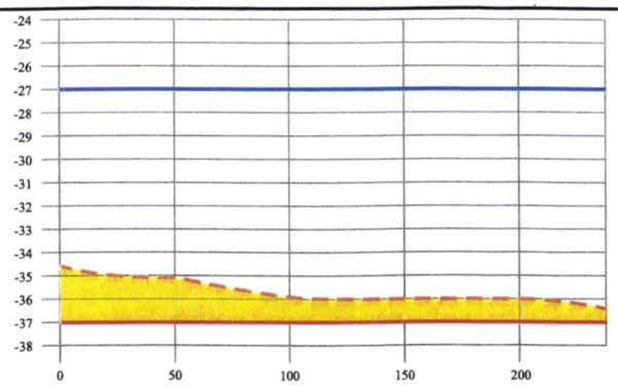
Existing Development Plan for North Port
Drawing title — Sc NTS

Sheet #	Date
10	31.12.2007

format A3



Section A-A



Section E-E

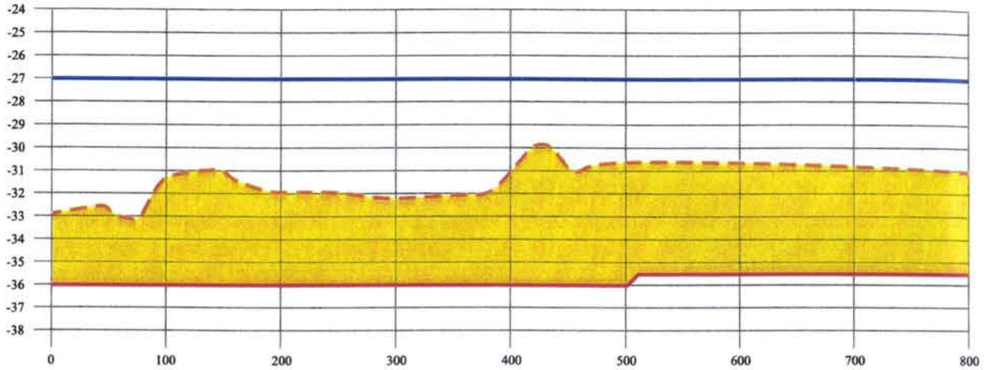
Notes:

Current profile

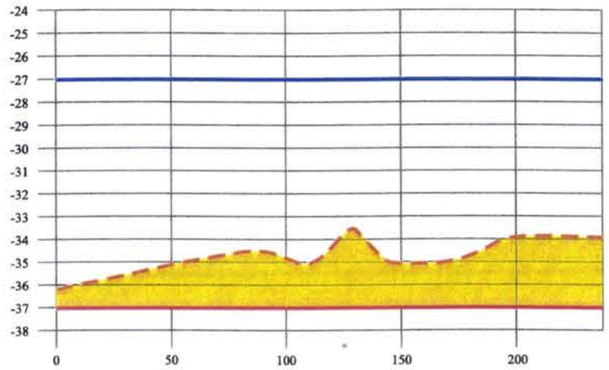
Dredged Profile

Water Level

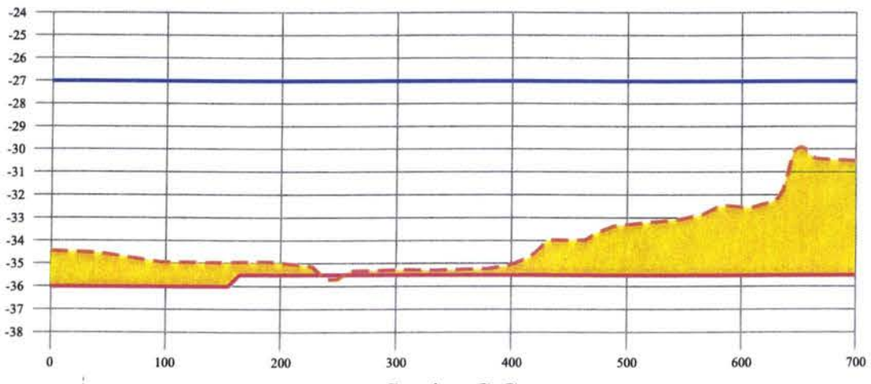
For Section Locations see Sheet 5



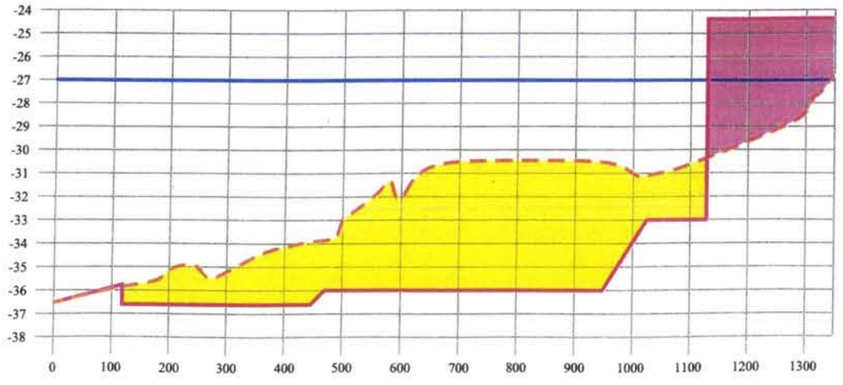
Section B-B



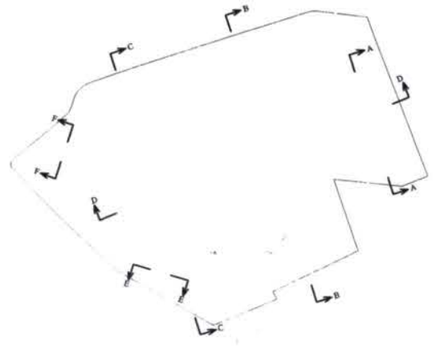
Section F-F



Section C-C



Section D-D



Keyplan

The project is funded by the European Union

The project is implemented by Scott Wilson&Proektirovshik

Aktau Port Development, Kazakhstan
Feasibility Study for the Port of Aktau

Project title

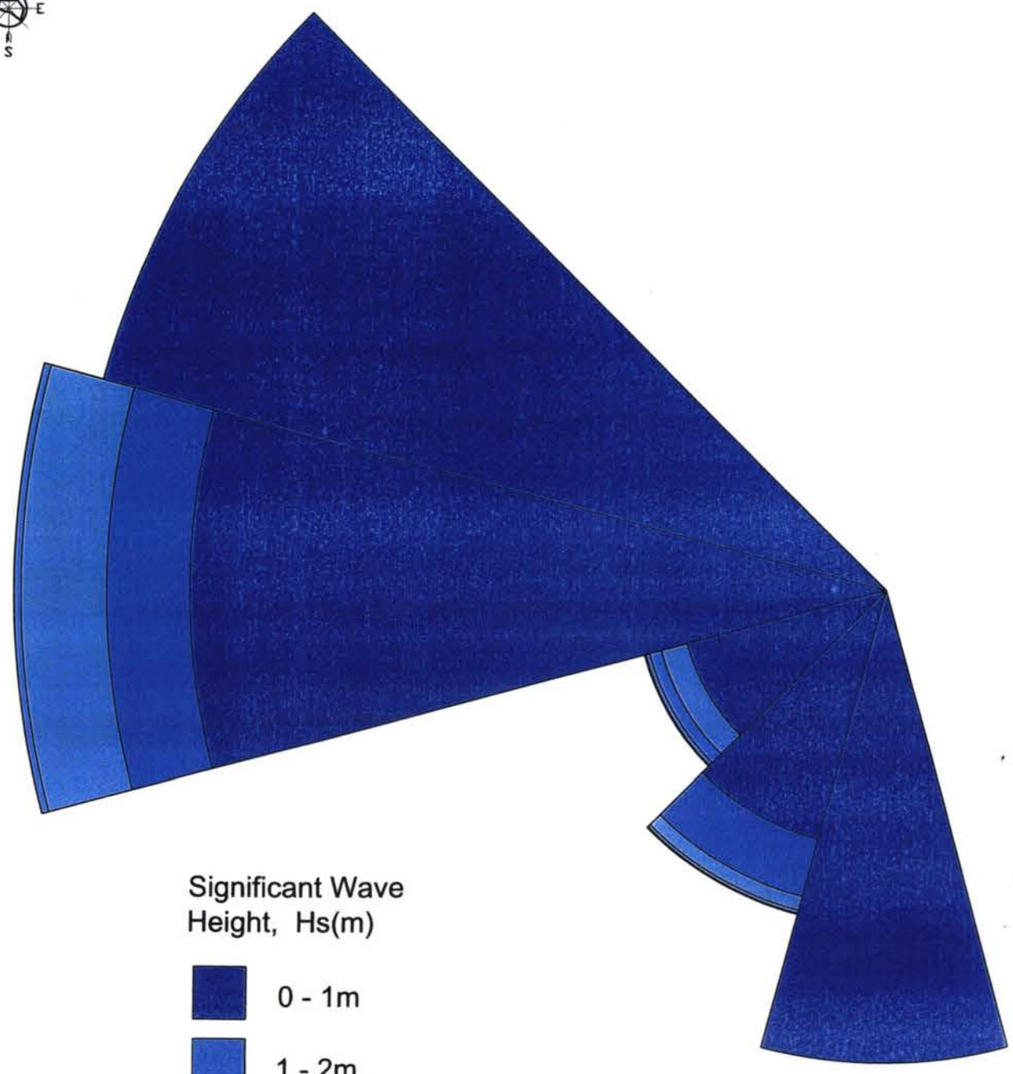
Proposed Dredging Cross Sections

Drawing title

Sc NTS

Sheet#	Date
12	31.12.2007

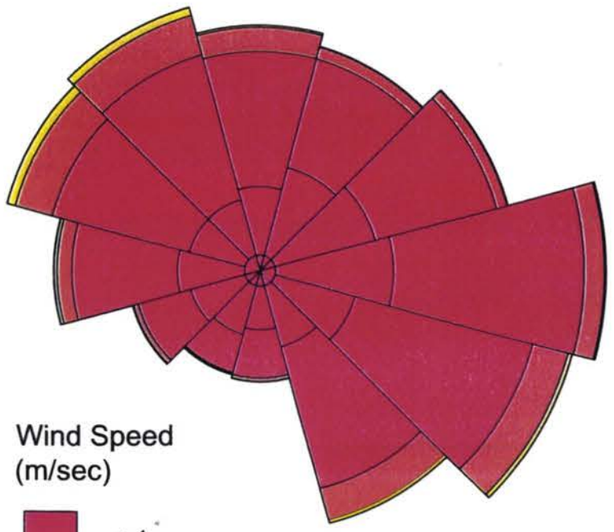
format A3



Significant Wave Height, Hs(m)

- 0 - 1m
- 1 - 2m
- 2 - 3m
- 3 - 7m

Wave Rose



Wind Speed (m/sec)

- < 1
- 1 - 3
- 4 - 8
- 9 - 13
- 14 - 20
- 21

Wind Rose

Reference : HR Wallingford Report EX3619 (1999)

The project is funded by the European Union

The project is implemented by Scott Wilson&Proektirovshik

Aktau Port Development, Kazakhstan
Feasibility Study for the Port of Aktau

Project title

Wave & Wind Rose for Aktau

Drawing title

Sc NTS

Sheet# 13

Date 31.12.2007

format A3

APPENDIX 2 – ANNEXES TO CHAPTER 4

ANNEX 2.I

SHIP OPERATING COSTS

Table A2.1 Ship Operating Costs, 12000 v 60000 DWT (US$)

Ship capacity (DWT)	12000	60000
Construction Cost ($ million)	12.75	54
Speed		
Annual Costs ($000)		
Capital	2,037	8,627
Crew	600	600
Maintenance and Repair	255	1,080
Insurance	191	810
Supplies	500	500
Others	500	500
Total p.a.	4,083	12,117
Operating days p,a.	330	330
Daily cost in port	**12,373**	**36,719**
Fuel per day	4,167	**12,500**
Daily cost at Sea	**16,540**	**49,219**

Notes:

Interest rate	*: 15%*
Vessel Life	*: 20*
Annualised capital cost factor	*: 0.1598*
Crew	*: 20*
Number of crews	*: 2.5*
Cost per crew member ($ p.a.)	*: 12,000*
Maintenance and repair (% of construction costs)	*: 2%*
Insurance (% of construction costs)	*: 1.5%*
Fuel consumption (tonnes/day)	
12000	*: 16.7*
60000	*: 50*
Fuel cost per tonne ($)	*: 250 (a)*

(a) The costs shown here are based on international averages over the period 2001-2006, and are well below 2007 international market levels, which are temporarily very high because of unusually high demand. The charter rates, vessel construction prices and bunker costs will inevitably fall in the medium term. However, the construction costs of ships for the Caspian are well above those in world market; and to take account of this the construction cost of the 12,000 DWT has been assumed to be 50% higher than that in the world's main shipyards and the construction cost of the 60,000 DWT tanker is assumed to be double, because of the need to build the ship in segments and transport them to the Caspian for assembly.

A2.2 Comparison of Shipping Costs from Aktau and Kuryk to Baku (US$)

	AKTAU	KURYK
Ship capacity	12,000	60,000
Distance, Aktau-Baku (n miles)	250	230
Ship speed	12	13
Days at sea	1.74	1.47
Days in port	2	2
Costs per ship day		
at sea	16,540	49,219
in port	12,373	36,719
Costs per round voyage		
Ship time at sea	28,715	72,566
Ship time in port	24,747	73,437
Shipping Cost	**53,462**	**146,003**
Shipping Cost, $ per tonne	**4.46**	**2.43**
plus port dues		
Aktau/Kuryk	3	2
Baku	1	1
TOTAL SEA FREIGHT ($/tonne)	**8.46**	**5.43**

ANNEX 2.2

COSTS OF PIPELINES

The two main pipelines which have been constructed in the recent past are the Caspian Pipeline Consortium (CPC) pipeline which opened in 2000 and the Baku-Tbilisi-Ceyhan pipeline which opened in 2005. Their construction costs, tariffs and order of magnitude revenues are summarised in Table A2.3

Table A2.3: Costs and Tariffs for CPC and BTC Pipelines

	CPC	BTC
Construction cost	$2.6 billion	$3 billion
Route	Tengiz-Novorossiysk	Baku-Tbilisi-Ceyhan (Turkish Mediterranean
Distance (km)	1600	1675
Start of Operation	2000	2005
Construction cost per km ($)	$1.8 million	$1.6 million
Tariff	$30.3/tonne	$24/tonne
Tariff per km (US cents)	**1.9 cents**	**1.4 cents**
Traffic, average over first 10 years (tonnes)	30 million	40 million (a)
Revenues (a)	$900 million	$960 million
Approximate revenues as % of construction costs (b)	**35%**	**32%**

(a) The traffic (and revenues) assumed are based on the assumption of traffic levels of 40 million tonnes p.a. The capacity of the pipeline is 50 million tonnes, but it is unlikely to carry that volume in its early years.

(b) The return on the pipeline investment would be lower than the percentage shown as the revenues have to cover capital repayments as well as interest, and also operating costs, which are estimated at about $3 per tonne. The operating cost of about $150 million for the 1600 km (source: The BTC Pipeline and BP by Claros Consulting, 2003) would suggests operating costs of around $60 million p.a. for the Tengiz-Kuryk pipeline

It will be seen that:

- The construction costs of the pipelines are similar at $1.6-1.8 million per kilometre
- The tariffs for the pipelines are similar, at 1.4-1.9 cents per km, giving an average of 1.65 cents per kilometre
- The required revenue would appear, from the charges applied for the CPC & BTC pipelines, to be over 30% of construction costs. This appears high, but the investors have had to make their investments several years before the revenues start, they may have to face traffic below maximum capacity in early years, as well as operating costs.

It may be concluded that:

- The implied cost for the Tengiz-Kuryk pipeline, for 600 km at approximately $1.7 million per km, would be $1 billion. This is in line with prices quoted in the press.
- If the Tengiz-Kuryk pipeline had to set tariffs to recover the same 30% as at CPC and BTC, there would be about **$15 per tonne** (i.e. 30% of $1 billion, divided by 20 million tonnes p.a).
- But if the tariffs for the 600 km pipeline Tengiz-Kuryk are set at similar levels per kilometre to the CPC and BTC pipelines (1.65 cents per km) this would imply a tariff of about $10 per tonne However, the diseconomies of size with the smaller capacity of the pipeline of the Tengiz-Kuryk pipeline might suggest a tariff of, say, **$11 per tonne**.

ANNEX 2.3

COMPARISON OF COSTS OF SELECTED EXPORTS VIA TRACECA AND COMPETING ROUTES

A2.4 –Grain (in 60 tonne rail wagons)

	Kovylnaya to Ukrainian ports		
KzRW	Kovylnaya – Tobol		4,3
RRW	Tobol – Solovey		28,9
UzRW	Topoli - Ukrainian ports		15,05
Total			**48,25**
	Kovilnaya to Poti (via Aktau)		
KzRW	Kovylnaya – Aktau		26,77
	Expenses in Aktau (port charges + station services, Customs and etc.)		2
	Baku-Aktau ferry		17,5
	Expenses in Baku (port charges + station services and etc.)		1
AzRW	Baku- Beyuk-Kiasik		12,08
GRW	Garbadani – Poti		8,86
Total			**68,21**

A2.5 - Ferrous metal (in 60 tonne rail wagons)

	Zhanaul to Ukrainian ports		
KzRW	Zhanaul – Tobol		16,79
RRW	Tobol- Solovey		43,3
UzRW	Topoli - Ukrainian ports		15,63
Total			**75,72**
	Zhanaul – Poty (via Aktau)		
KzRW	Zhanaul – Aktau		54,45
	Expenses in Aktau (port charges, station services, customs, etc.)		2
	Baku-Aktau ferry		17,5
	Expenses in Baku (port charges, station services and etc.)		1
AzRW	Baku- Beyuk-Kiasik		12,08
GRW	Garbadani – Poti		8,86
Total			**95,89**

Cont...

A2.6 Sulphur in Bulk (in 60 tonne wagons)

Carrier	**Kulsary to Ukrainian ports**		
KzRW	Kulsary- Aksaraiskaya 2		5,58
RRW	Aksaraiskaya – Gukovo		20,95
UzRW	Krasnaya Mogila – Ukrainian Ports		19,3
Total			**45,83**
	Kulsary - Poty (via Aktau)		
KzRW	Kulsary – Aktau		7,79
	Expenses in Aktau (port charges + station services, Customs, etc.)		2
	Baku-Aktau ferry		17,5
	Expenses in Baku (port charges, station services etc.)		1
AzRW	Baku- Beyuk-Kiasik		12,08
GRW	Garbadani – Poti		8,86
Total			**49,23**

A2.7 Nonferrous metals (in 20' containers)

	Zhezkazgan – Novorossiysk		
KzRW	Zhezkazgan - Aksaraiskaya 2		985
RRW	Aksaraiskaya - Novorossiysk		718
Total			**1703**
	Zhezkazgan – Poty (via Aktau)		
KzRW	Zhezkazgan – Aktau		1083
	Expenses in Aktau (port charges + station services, Customs, etc.)		100
	Baku-Aktau ferry		630
	Expenses in Baku (port charges + station services and etc.)		32
AzRW	Baku- Beyuk-Kiasik		530
GRW	Garbadani - Poti		125
Total			**2500**

ANNEX 2.4

A2.8 RECOMMENDED TARIFF RATES TO ATTRACT EXPORTS TO AKTAU AND TRACECA ROUTES

Cargo	**Grain**	**Ferrous metal**	**Sulfur**
Route	**Kovylnaya –Poti**	**Zhanaul- Poti**	**Kulsary - Poti**
Wagon	60t/wagon	60t/wagon	
	US $ / ton	US $ / ton	US $ / ton
KzTJ	15	36	6,84
Charges in Aktau	1	1	1
Aktau-Baku ferry	15	15	15
Charges in Baku	0,7	0,7	0,7
AzRW	8,05	8,05	8,05
GeoRW	7,0	7,6	7,6
UzTY			
Total	***46,75***	***68,35***	***39,19***

Cargo	**Nonferrous metals**	**4.2.1 20 foot Contalner**	
Route	**Zhezkazgan – Poti**	**Poti - Tashkent**	**Poti – Almaty**
Wagon	(20 f container)	(own 20 f container)	(own 20 f container)
	US $ / container	US $ / container	US $ / container
KzTJ	690	245	405
Charges in Aktau	50	50	50
Aktau-Baku ferry	360	360	360
Charges in Baku	25	25	25
AzRW	176	105	105
GeoRW	124	105	105
UzTY		45	
Total	**1425**	**935**	**1050**

ANNEX 2.5

COMPARISON OF COSTS OF OIL EXPORT ROUTES

This Annex compares the costs of the transport for crude oil exports from western Kazakhstan.

The routes examined are:

1. CPC to Novorossiysk

2. Aktau to Baku, plus onward transport via:
   - The Early Oil pipeline to Supsa
   - The Early Oil (Northern) pipeline to Novorossiyask
   - Rail to Batumi
   - The BTC to Ceyhan

3. Kuryk to Baku, plus onward transport via:
   - The Early Oil pipeline to Supsa
   - The Early Oil (Northern) pipeline to Novorossiyask
   - Rail to Batumi
   - The BTC to Ceyhan

4. Rail to Odessa

1 CPC to Novorossiysk.

The price of the CPC was originally $28.33 per tonne, but it was raised to $30.83 and it has recently been agreed to raise it to $38 per tonne.

2 Routes via Aktau

The main costs of using ***Aktau*** are:

- The rail tariff from Tengiz to Aktau. No traffic is moving on this route at present, but when it did so five years ago the rail tariff was reportedly $6 per tonne. This is similar to the tariffs currently charged for oil on the Azerbaijan and Georgian railways. Information available from the Traceca data base suggests that the official tariff is now around $12 per tonne but that a guarantee of large volumes would allow a discount of u to 50%. It will therefore be assumed that the cost remains at $6 per tonne.
- Aktau port charges, including cargo handling and ships dues. The port's accounts show this to be around $3/tonne, the largest charge being $1.65/tonne for handling.
- Sea freight rates to Baku. Calculations based on operating costs for ships of 12,000 DWT, shown in Annex I, suggest that the cost of the Aktau-Baku sea voyage should be $3.7/tonne, but delays and queuing add to these costs. In practice, Caspian Shipping Company has been charging much more than this cost-based rate.

On this basis, the total cost of transport from Tengiz to Baku via Aktau is estimated at $16 per tonne (see Table A2.9).

Table A2.9: Transport Costs from Tengiz to Baku via Aktau

	$ per tonne
Rail, Tengiz-Aktau	6
Aktau port charges	3
Sea freight rate to Baku	5(a)
Baku port charges	2
TOTAL	**16**

(a) Based on ship operating costs with a 15% return (see ANNEX I), rather than Caspian Shipping Company's charges, which include port charges and have a large profit element.

After having reached Baku the oil can take several routes to its final loading port. They are:

Table A2.10: Cost of Transport from Baku to Loading Port

Route	Tariff
The BTC pipeline to *Ceyhan* on the Mediterranean	$24 per tonne for major users.
The pipeline from Baku to *Supsa*	$5 per tonne.
The Northern Pipeline to Novorossiysk	$15 per tonne.
The port of Batumi in Georgia via Azeri and Georgian railways	The cost of the whole route from Aktau to Batumi has varied between $29 and $37 per tonne in recent years, implying a tariff from Tengiz to Batumi of $35-$43 per tonne.

The total costs of each of these routes from Tengiz to the final loading ports are summarised in Table A5.5 at the end of this Annex

3 Routes via Kuryk

The costs via Kuryk will be high. The pipeline is expected to cost about $1.5 billion, and the cost of the whole system is estimated at $4.3 billion (see Table A5.3) which is well above the costs of the CPC pipeline ($2.6 million) and BTC pipeline (between $3 billion and $3.6 billion, according to different reports).

Table A2.11: Costs of the Proposed Kuryk-Based Transport Chain ($ billion)

	Phase I	Phase I + III	Total
Capacity Million t.p.a	**23**	**35-56**	
Pipeline, Eskene to Kuryk	1.5		1.5
Terminal at Kuryk	0.6	0.4	1
Terminals at destination ports	0.7	0.5	1.2
Tankers	0.3	0.3	0.6
Total	**3.1**	**1.2**	**4.3**

Source: Kazmunaigaz

Using these costs, the main costs via ***Kuryk*** in the initial years are estimated as follows:

- The pipeline from Tengiz to Kuryk is likely to cost about $1.5 billion, according to Kazmunaigaz. Its tariffs are not yet known. But the charges for the main pipelines built in recent years (CPC and BTC) suggest that the tariff for Tengiz-Kuryk is likely to be around 1.65 US cents per tonne km, which would entail a tariff of $12 per tonne (see Annex II for details).
- Kuryk port charges, including cargo handling and ships dues, would be higher than at Aktau. The minimum charge that would be necessary to cover the port costs at Kuryk in the early years - when capacity is expected to be around 23 million tonnes p.a - is estimated at about $5 per tonne. The basis for this approximation is a 15% rate of return on the investment of $600 million, giving an annual capital cost of about $90 million, divided by annual traffic of 23 million tonnes, to give a capital cost of $4 per tonne. In addition, operating costs are assumed to be around $1 per tonne, bring the total up to $5 per tonne.
- Sea freight rates to Baku will be lower than via Aktau, as a result of economies of size with larger vessels. Calculations based on ship operating costs for 60,000 DWT tankers, as shown in ANNEX I, suggest that the cost of the Aktau-Baku sea voyage should be $1.5/tonne, and, with port charges, $4.5/tonne. It should be noted, however, as stated above, that Caspian Shipping Company has been charging more than cost based rates.
- Baku port charges, including the link to the BTC pipeline, will also be much higher than at the existing Baku oil terminal. The minimum charge that would cover the new Baku SBM terminal in the early years - when capacity is expected to be around 23 million tonnes p.a - is estimated at about $5.5 per tonne. The basis for this approximation is a 15% rate of return on the investment of $700 million, giving an annual capital cost of about $105 million, divided by annual traffic of 23 million tonnes, to give a capital cost of $4.5 per tonne. In addition, operating costs are assumed to be around $1 per tonne, bring the total up to $5.5 per tonne.

On this basis, the total cost of transport from Tengiz to Baku via Kuryk is estimated at $24.5 per tonne (see Table A5.4)

Table A2.12: Transport Costs from Tengiz to Baku via Kuryk

	$ per tonne
	Early years (Capacity 23 million) tonnes
Pipeline, Tengiz-Kuryk	12
Kuryk port charges	5
Sea freight rate to Baku	2
Baku port charges	5.5
TOTAL	**24.5**

It is concluded that ***Aktau should give significantly lower transport costs ($16/tonne) than Kuryk ($24.5/tonne).***

As in the case of routes from Aktau, the oil can take several routes from Baku to its final loading port. Their costs are shown in Table A5.2 above.

4 Rail to Odessa

The cost from Tengiz to Odessa will be approximately $60 per tonne.

5 Summary of Comparative Costs

Table A2.13 : Summary of Costs from Tengiz to Export Port

Via	$ per tonne
CPC to Novorossiysk	38
Aktau to Baku (a), plus	
- Early Oil pipeline to Supsa (a)	21
- Early Oil (Northern) pipeline to Novorossiysk (a)	26
- Rail to Batumi	35-43
- BTC to Ceyhan	40
Kuryk to Baku (c), plus	
- Early Oil pipeline to Supsa (a)	29
- Early Oil (Northern) pipeline to Novorossiysk (a)	34
- Rail to Batumi	41-49
- BTC to Ceyhan	48
Rail to Odessa	60

These pipelines, however, are mainly for Azeri oil

APPENDIX 3 – ANNEXES TO CHAPTER 15-FINANCIAL MODEL

AISCP - Feasibility Model
Assumptions
Traffic Forecast(000 tonnes)

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
Oil	10 000	9 000	11 000	11 500	12 000	20 000	23 000	23 000	14 000	15 000	16 000	16 000	16 000	16 000	17 000	17 000	17 000	17 000	17 000	17 000	17 000	17 000
Dry																						
Steel	947	1015	1060	1091	1151	1231	1290	1335	1368	1469	1571	1647	1704	1747	1875	1950	2028	2109	2193	2281	2372	2467
Scrap	51	67	78	85	100	125	144	158	168	200	225	244	258	268	300	312	324	337	351	365	380	395
Grain	118	212	275	316	400	550	663	747	810	1000	1063	1109	1145	1171	1250	1 300	1 350	1 400	1 450	1 500	1 550	1 600
Other	30	30	30	30	30	32	34	36	38	40	43	44	46	47	50	52	54	56	58	61	63	66
Rail ferry - existing	148	185	210	226	259	299	328	350	367	417	466	503	530	551	613	613	613	613	613	613	613	613
Rail ferry - new	0	83	165	247	330	330	330	330	330	330	330	330	330	330	330	330	330	330	330	330	330	330
Rail ferry - outbound	0	0	0	0	0	200	400	600	800	1000	1050	1088	1116	1137	1200	1200	1200	1200	1200	1200	1200	1200
Containers - existing	10	20	30	40	51	77	96	111	121	154	193	222	244	261	310	310	310	310	310	310	310	310
Containers - new	0	83	165	247	330	330	330	330	330	330	330	330	330	330	330	330	330	330	330	330	330	330
	1304	1694	2013	2283	2651	3173	3615	3996	4333	4940	5270	5517	5702	5841	6258	6397	6540	6686	6836	6990	7148	7311
Total	11 304	10 694	13 013	13 783	14 651	23 173	26 615	26 996	18 333	19 940	21 270	21 517	21 702	21 841	23 258	23 397	23 540	23 686	23 836	23 990	24 148	24 311

Tariffs

Cargo Handling	
Oil	1,72
Dry Cargo	6,89
Grain	1,03
Containers (per TE	97
Storage, $/tonne	
Oil	0 (Storage revenues go to tank farm operators)
Dry Cargo	2,3
Port Dues on Ships (est by SF)	
Oil	0,81
Dry Cargo	1,51

Profit & Loss
Income

(US$ 000)	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
Cargo Handling																						
Oil	17 200	15 480	18 920	19 780	20 640	34 400	39 560	39 560	24 080	25 800	27 520	27 520	27 520	27 520	29 240	29 240	29 240	29 240	29 240	29 240	29 240	29 240
Metals	6 525	6 993	7 306	7 514	7 930	8 478	8 889	9 197	9 428	10 121	10 821	11 345	11 739	12 034	12 919	13 436	13 973	14 532	15 113	15 718	16 346	17 000
Grain	122	218	283	326	412	567	682	769	834	1 030	1 094	1 143	1 179	1 206	1 288	1 339	1 391	1 442	1 494	1 545	1 597	1 648
Container	97	994	1 892	2 784	3 696	3 945	4 133	4 273	4 379	4 695	5 073	5 357	5 570	5 729	6 208	6 208	6 208	6 208	6 208	6 208	6 208	6 208
Ferries	800	1 446	2 025	2 557	3 184	4 478	5 720	6 921	8 092	9 443	9 978	10 380	10 681	10 907	11 584	11 584	11 584	11 584	11 584	11 584	11 584	11 584
Others	1 441	1 513	1 589	1 668	1 752	1 840	1 931	2 028	2 129	2 236	2 348	2 465	2 588	2 718	2 854	2 996	3 146	3 303	3 469	3 642	3 824	4 015
Storage																						
Oil (d)																						
Dry Cargo	1 089	1 167	1 219	1 254	1 324	1 415	1 484	1 535	1 574	1 689	1 806	1 894	1 959	2 009	2 156	2 243	2 332	2 425	2 523	2 623	2 728	2 837
Port Dues on Ships																						
Oil)																						
Dry Cargo)	12726	12 040	14 650	15 516	16 494	26 088	29 963	30 392	20 640	22 448	23 945	24 223	24 432	24 588	26 184	26 340	26 501	26 665	26 834	27 008	27 186	27 369
Grain)																						
Total Revenues	40 000	39 852	47 884	51 400	55 431	81 211	92 361	94 676	71 156	77 463	82 586	84 327	85 667	86 710	92 432	93 385	94 374	95 400	96 464	97 568	98 713	99 902
Operating Costs	12 900	13 223	14 545	15 999	17 599	19 359	21 295	23 424	24 596	25 825	27 117	27 795	28 490	29 202	29 932	30 680	31 447	32 233	33 039	33 865	34 712	35 580
Depreciation	4 400	4 510	9 218	10 568	10 902	10 902	10 902	10 902	10 902	10 902	14 235	16 902	16 077	16 077	16 743	16 743	16 743	16 743	16 743	16 743	14 743	14 743
Finance Costs	100	2 760	8 098	10 198	10 548	10 019	9 351	10 035	9 320	8 605	14 797	15 388	14 580	13 304	13 336	11 967	10 599	9 230	7 862	6 773	5 895	5 156
Profit before tax	**22 600**	**19 360**	**16 023**	**14 635**	**16 383**	**40 931**	**50 814**	**50 315**	**26 338**	**32 131**	**26 437**	**24 242**	**26 522**	**28 127**	**32 421**	**33 995**	**35 585**	**37 193**	**38 820**	**40 186**	**43 363**	**44 423**
	56,5%	*48,6%*	*33,5%*	*28,5%*	*29,6%*	*50,4%*	*55,0%*	*53,1%*	*37,0%*	*41,5%*	*32,0%*	*28,7%*	*31,0%*	*32,4%*	*35,1%*	*36,4%*	*37,7%*	*39,0%*	*40,2%*	*41,2%*	*43,9%*	*44,5%*
Tax 33%	7 458	6 389	5 288	4 830	5 406	13 507	16 769	16 604	8 692	10 603	8 724	8 000	8 752	9 282	10 699	11 218	11 743	12 274	12 810	13 261	14 310	14 660
Profit after Tax	**15 142**	**12 971**	**10 735**	**9 806**	**10 977**	**27 424**	**34 046**	**33 711**	**17 647**	**21 528**	**17 713**	**16 242**	**17 770**	**18 845**	**21 722**	**22 776**	**23 842**	**24 919**	**26 009**	**26 925**	**29 053**	**29 763**

Notes 1) Income per Traffic Forecasts (Tables 28 ad 48)
2) Operating Costs increased by 10% per annum 2008 to 2014, reduced to an increase of 5% thereafter to 2016 and then 2.5% per annum for the remaining period.
3) Depreciation per the 2006 figure amended per the Cap Ex schedule below.
4) Finance costs per the 2006 figure amended per the loan loan interest calculation as below.

Balance Sheet (US$ 000's)	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
Non current assets	131	134	251	284	297	300	303	326	329	332	435	458	461	464	487	490	493	496	499	502	505	508
Depreciatic	-26	-31	-40	-50	-61	-72	-83	-94	-105	-116	-130	-147	-163	-179	-196	-213	-229	-246	-263	-280	-294	-309
Inventory Holdings	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Receivables and other	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9
Financial investment &	12	95	33	41	51	80	108	133	138	157	171	187	199	210	226	241	258	276	301	330	361	393
	126	208	254	284	296	317	337	374	372	382	485	507	506	504	526	528	532	536	547	562	581	601
Equity capital	-60	-73	-84	-94	-105	-132	-166	-200	-217	-239	-257	-273	-291	-310	-331	-354	-378	-403	-429	-456	-485	-515
Liabilities: General	-3	-3	-3	-3	-3	-3	-3	-3	-3	-3	-3	-3	-3	-3	-3	-3	-3	-3	-3	-3	-3	-3
Taxation	-14	-13	-12	-11	-12	-20	-23	-23	-15	-17	-15	-14	-15	-16	-17	-17	-18	-19	-19	-20	-21	-21
Loans	-49	-121	-155	-176	-177	-162	-145	-148	-136	-123	-210	-217	-197	-176	-174	-153	-132	-111	-95	-83	-72	-62
	-126	-210	-254	-284	-296	-317	-337	-374	-372	-382	-485	-507	-506	-504	-526	-528	-531	-536	-547	-561	-581	-601
(Equity S000's)	-60	-73	-84	-94	-105	-132	-166	-200	-217	-239	-257	-273	-291	-310	-331	-354	-378	-403	-429	-456	-485	-515
(Loans $000's)	-49	-121	-155	-176	-177	-162	-145	-148	-136	-123	-210	-217	-197	-176	-174	-153	-132	-111	-95	-83	-72	-62
(% of Loans to Equity)	82%	165%	185%	188%	169%	122%	87%	74%	63%	51%	82%	79%	68%	57%	53%	43%	35%	28%	22%	18%	15%	12%

Notes
1) Non current assets per opening balance plus notional purchases per cashflow and schedules below.
2) Depreciation of the above calculated at a write off of asset value for structures over 30 years and equipment over 10 years.
3) Inventory holdings and receivables kept at constant because they are de minimus.
4) Financial investment and cash as per cashflow
5) Equity capital per opening balance plus profit after tax.
6) General liabilities kept at constant as de minimus.
7) Taxation as per current years provision plus an allowance for deferred taxation

Cashflow (US$ 000's)	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
Inflow from operations		19 360	16 023	14 635	16 383	40 931	50 814	50 315	26 338	32 131	26 437	24 242	26 522	28 127	32 421	33 995	35 585	37 193	38 820	40 186	43 363	44 423
Add Depn		4 510	9 218	10 568	10 902	10 902	10 902	10 902	10 902	10 902	14 235	16 902	16 077	16 077	16 743	16 743	16 743	16 743	16 743	16 743	14 743	14 743
Interest paid		2 760	8 098	10 198	10 548	10 019	9 351	10 035	9 320	8 605	14 797	15 388	14 580	13 304	13 336	11 967	10 599	9 230	7 862	6 773	5 895	5 156
		28 637	35 347	37 410	39 842	63 863	73 078	73 265	48 574	53 653	57 485	58 549	59 196	59 527	64 520	64 726	64 949	65 190	65 449	65 728	66 028	66 350
Payments																						
Tax		-7 458	-6 389	-5 288	-4 830	-5 406	-13 507	-16 769	-16 604	-8 692	-10 603	-8 724	-8 000	-8 752	-9 282	-10 699	-11 218	-11 743	-12 274	-12 810	-13 261	-14 310
Interest		-2 760	-8 098	-10 198	-10 548	-10 019	-9 351	-10 035	-9 320	-8 605	-14 797	-15 388	-14 580	-13 304	-13 336	-11 967	-10 599	-9 230	-7 862	-6 773	-5 895	-5 156
Loan Repayments		-4 317	-4 318	-9 102	-9 039	-15 067	-16 759	-16 758	-11 857	-13 191	-13 191	-13 191	-19 857	-21 191	-21 191	-21 191	-21 191	-21 191	-15 550	-12 550	-10 550	-10 550	-301 802
Standard Cap Ex		-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	-3 000	-3 000	-3 000	
Major Cap Ex			-114 250	-30 000	-10 000	0	0	-20 000	0	0	-100 000	-20 000	0	0	-20 000	0	0	0	0	0	0	0	
Other items		-1 764	-2 000	-1 999	-1 998	-1 997	-1 996	-1 995	-1 994	-1 993	-1 992	-1 991	-1 990	-1 989	-1 988	-1 987	-1 986	-1 985	-1 984	-1 983	-1 982	-1 981	
		9 337	-102 707	-22 176	428	28 374	28 466	4 707	5 799	18 172	-86 098	-3 745	11 769	11 291	-4 277	15 882	16 955	18 040	24 779	28 611	31 339	31 352	
Loan Funds received		76 000	38 250	30 000	10 000	0	0	20 000	0	0	100 000	20 000	0	0	20 000	0	0	0	0	0	0	0	
		KDB																					
Balance b/f		12 000	97 337	32 880	40 704	51 132	79 506	107 971	132 678	138 477	156 649	170 552	186 806	198 575	209 866	225 590	241 472	258 427	276 468	301 247	329 858	361 197	
Cash and equivalents at year end		97 337	32 880	40 704	51 132	79 506	107 971	132 678	138 477	156 649	170 552	186 806	198 575	209 866	225 590	241 472	258 427	276 468	301 247	329 858	361 197	392 549	

Capital Expenditure	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	**Total**
Breakwater/Mole		0	76 000																				76 000
Oil berths 4			45 000	45 000																			90 000
Oil berths alternative 2			30 000	30 000																			60 000
Oil Equipment			8 250																				8 250
Dry berths					10 000						100 000	0			20 000								130 000
Dry berths equipment												20 000											20 000
Grain								20 000															20 000
Total - 4 Oil berths	0	0	129 250	45 000	10 000	0	0	20 000	0	0	100 000	20 000	0	0	20 000	0	0	0	0	0	0	0	344 250
Total - 2 Oil berths	0	0	114 250	30 000	10 000	0	0	20 000	0	0	100 000	20 000	0	0	20 000	0	0	0	0	0	0	0	314 250
Analysis of Cap Ex																							
Structures Oil			121 000	45 000																			
Dry					10 000						100 000				20 000								
Grain								20 000															
Equipment Oil			8 250																				
Dry												20 000											
	0	0	129 250	45 000	10 000	0	0	20 000	0	0	100 000	20 000	0	0	20 000	0	0	0	0	0	0	0	344 250

Depreciation																							
Structures (30 years)																							
4 Oil berths			4 033	5 533	5 533	5 533	5 533	5 533	5 533	5 533	5 533	5 533	5 533	5 533	5 533	5 533	5 533	5 533	5 533	5 533	5 533	5 533	109 167
Dry Berths					333	333	333	333	333	333	3 667	3 667	3 667	3 667	4 333	4 333	4 333	4 333	4 333	4 333	4 333	4 333	51 333
Grain												667	667	667	667	667	667	667	667	667	667	667	7 333
Equipment (10 years)																							0
Oil			825	825	825	825	825	825	825	825	825												8 250
Dry												2 000	2 000	2 000	2 000	2 000	2 000	2 000	2 000	2 000	2 000		20 000
	0	0	4 858	6 358	6 692	6 692	6 692	6 692	6 692	6 692	10 025	12 692	11 867	11 867	12 533	12 533	12 533	12 533	12 533	12 533	12 533	10 533	196 083
Note - 2 berths only			-150	-300	-300	-300	-300	-300	-300	-300	-300	-300	-300	-300	-300	-300	-300	-300	-300	-300	-300	-300	-5 850
Funding of Cap Ex																							
Breakwater/Mole (Dev bank of Kaz)		76 000	76 000	76 000	71 000	66 000	61 000	56 000	51 000	46 000	41 000	36 000	31 000	26 000	21 000	16 000	11 000	6 000	1 000				76 000
Repayments		0	0	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	1 000				76 000
Balance		76 000	76 000	71 000	66 000	61 000	56 000	51 000	46 000	41 000	36 000	31 000	26 000	21 000	16 000	11 000	6 000	1 000	0				0
Oil Berths - 4	ANO		45 000	90 000	90 000	87 000	81 000	75 000	69 000	63 000	57 000	51 000	45 000	39 000	33 000	27 000	21 000	15 000	9 000	3 000			90 000
Repayments			0	0	3 000	6 000	6 000	6 000	6 000	6 000	6 000	6 000	6 000	6 000	6 000	6 000	6 000	6 000	6 000	3 000			90 000
Balance			45 000	90 000	87 000	81 000	75 000	69 000	63 000	57 000	51 000	45 000	39 000	33 000	27 000	21 000	15 000	9 000	3 000	0			0
Oil berths - 2	ANO		30 000	60 000	60 000	58 000	54 000	50 000	46 000	42 000	38 000	34 000	30 000	26 000	22 000	18 000	14 000	10 000	6 000	2 000			60 000
Repayments			0	0	2 000	4 000	4 000	4 000	4 000	4 000	4 000	4 000	4 000	4 000	4 000	4 000	4 000	4 000	4 000	2 000			60 000
Balance			30 000	60 000	58 000	54 000	50 000	46 000	42 000	38 000	34 000	30 000	26 000	22 000	18 000	14 000	10 000	6 000	2 000	0			0
Dry Berths	ANO				10 000	10 000	10 000	9 333	8 667	8 000	107 333	106 667	106 000	98 667	111 333	104 000	96 667	89 333	82 000	74 667	67 333	60 000	130 000
Repayments					0	0	667	667	667	667	667	667	7 333	7 333	7 333	7 333	7 333	7 333	7 333	7 333	7 333	7 333	77 333
Balance					10 000	10 000	9 333	8 667	8 000	7 333	106 667	106 000	98 667	91 333	104 000	96 667	89 333	82 000	74 667	67 333	60 000	52 667	52 667
Equipment	ANO	0	8 250	8 250	8 250	7 700	7 150	6 600	6 050	5 500	4 950	24 400	23 850	23 300	21 417	19 533	17 650	15 767	13 883	12 000	10 117	8 233	28 250
Repayments			0	0	550	550	550	550	550	550	550	550	550	1 883	1 883	1 883	1 883	1 883	1 883	1 883	1 883	1 883	21 900
Balance			8 250	8 250	7 700	7 150	6 600	6 050	5 500	4 950	4 400	23 850	23 300	21 417	19 533	17 650	15 767	13 883	12 000	10 117	8 233	6 350	6 350
Grain	ANO		0	0	0	0	0	20 000	20 000	20 000	18 667	17 333	16 000	14 667	13 333	12 000	10 667	9 333	8 000	6 667	5 333	4 000	20 000
Repayments								0	0	1 333	1 333	1 333	1 333	1 333	1 333	1 333	1 333	1 333	1 333	1 333	1 333	1 333	17 333
Balance								20 000	20 000	18 667	17 333	16 000	14 667	13 333	12 000	10 667	9 333	8 000	6 667	5 333	4 000	2 667	2 667
Total(4 Berths)		**76 000**	**129 250**	**174 250**	**179 250**	**170 700**	**159 150**	**166 933**	**154 717**	**142 500**	**228 950**	**235 400**	**221 850**	**201 633**	**200 083**	**178 533**	**156 983**	**135 433**	**113 883**	**96 333**	**82 783**	**72 233**	**344 250**
Repayments		**0**	**0**	**5 000**	**8 550**	**11 550**	**12 217**	**12 217**	**12 217**	**13 550**	**13 550**	**13 550**	**20 217**	**21 550**	**21 550**	**21 550**	**21 550**	**21 550**	**17 550**	**13 550**	**10 550**	**10 550**	**282 567**
Balance		76 000	129 250	169 250	170 700	159 150	146 933	154 717	142 500	128 950	215 400	221 850	201 633	180 083	178 533	156 983	135 433	113 883	96 333	82 783	72 233	61 683	61 683
Total(2 Berths)		76 000	114 250	144 250	149 250	141 700	132 150	141 933	131 717	121 500	209 950	218 400	206 850	188 633	189 083	169 533	149 983	130 433	110 883	95 333	82 783	72 233	314 250
Repayments		0	0	5 000	7 550	9 550	10 217	10 217	10 217	11 550	11 550	11 550	18 217	19 550	19 550	19 550	19 550	19 550	15 550	12 550	10 550	10 550	252 567
Balance		76 000	114 250	139 250	141 700	132 150	121 933	131 717	121 500	109 950	198 400	206 850	188 633	169 083	169 533	149 983	130 433	110 883	95 333	82 783	72 233	61 683	61 683
Interest at 7%																							
4 Berth			**2 660**	**9 048**	**12 198**	**12 548**	**11 949**	**11 141**	**11 685**	**10 830**	**9 975**	**16 027**	**16 478**	**15 530**	**14 114**	**14 006**	**12 497**	**10 989**	**9 480**	**7 972**	**6 743**	**5 795**	**5 056**	**24 098**
2 Berth			2 660	7 998	10 098	10 448	9 919	9 251	9 935	9 220	8 505	14 697	15 288	14 480	13 204	13 236	11 867	10 499	9 130	7 762	6 673	5 795	5 056	21 998

Existing Funding		**2 006**	**2 007**	**2 008**	**2 009**	**2 010**	**2 011**	**2 012**	**2 013**	**2 014**	**2 015**	**2 016**	**2 017**	**2 018**	**2 019**	**2 020**	**2 021**	**2 022**	**2 023**	**2 024**	**2 025**	**2 026**	**2 027**	**Total**
EBRD	Balance		14 831	10 514	6 196	2 093	1 425																
	Repayments		4 317	4 318	4 102	669	1 425																
	Balance	14 831	10 514	6 196	2 093	1 425	0																
Rehab	Balance		12 254	12 254	12 254	12 254	12 254	9 803	4 901														
	Repayments		0	0	0	0	2 451	4 901	4 901														
	Balance	12 254	12 254	12 254	12 254	12 254	9 803	4 901	0														
Dev of Kaz	Balance		22 151	22 151	22 151	22 151	21 331	19 690	18 049	16 408	14 767	13 127	11 486	9 845	8 204	6 563	4 922	3 282	1 641				
	Repayments		0	0	0	820	1 641	1 641	1 641	1 641	1 641	1 641	1 641	1 641	1 641	1 641	1 641	1 641	1 641				
	Balance	22 151	22 151	22 151	22 151	21 331	19 690	18 049	16 408	14 767	13 127	11 486	9 845	8 204	6 563	4 922	3 282	1 641	0				
Total	Balance		49 236	44 919	40 601	36 498	35 009	29 493	22 951	16 408	14 767	13 127	11 486	9 845	8 204	6 563	4 922	3 282	1 641				
	Repayments		4 317	4 318	4 102	1 489	5 517	6 542	6 542	1 641	1 641	1 641	1 641	1 641	1 641	1 641	1 641	1 641	1 641				
	Balance	49 236	44 919	40 601	36 498	35 009	29 493	22 951	16 408	14 767	13 127	11 486	9 845	8 204	6 563	4 922	3 282	1 641	0				