Client:
PORT OF PLOCE AUTHORITY
20324 PLOCE
Trg kralja Tomislava 21

PLOCE BULK CARGO TERMINAL PROJECT

ENVIRONMENTAL IMPACT ASSESSMENT
EXECUTIVE SUMMARY

Contractor
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0. EXECUTIVE SUMMARY

1. General

This document is a part of the Environmental Assessment Report developed for the World Bank (WB) to make an appraisal of the Cargo Bulk Terminal (CBT) Project in the area of Port of Ploče.

In addition to the environmental assessment (EA), the Investor, the Port Authority of Ploce, is preparing also an Environmental Impact Assessment Study (EIAS) based on the Croatian legislation. EIASs in Croatia are developed in accordance with the Environmental Protection Act (Gazette 82/94, 128/99) and the Ordinance on Environmental Impact Assessment (Gazette 59/00, 136/04). When making an EIA Study also any other relevant Croatian laws, bylaws and regulations should be observed inclusive of applicable international agreements signed by the Republic of Croatia. In spite of some differences in the contents of EA and EIAS, it is a question of similar document. Consequently, this EA integrates the most relevant facts and results of the environmental impact assessment of CBT including also the measures for environmental protection and a monitoring plan.

The Port of Ploče is situated in the area of the south Croatian seaside along the arterial road connecting the towns of Split and Dubrovnik. It is some hundred kilometres away from those two well known Croatian towns. This one of rare places where, beside good maritime conditions and a natural bay, there is an exceptionally good lowland railway connection towards the inland. This means that Ploče has a potential large gravity area covering, in addition to Croatia, also Bosnia and Herzegovina, Serbia and Monte Negro, and a substantial part of the Central and Easter European countries (a part of Austria, Hungary, Check Republic, Slovakia, Poland, and Romania) cf. Figure 1-3 in Chapter 1.

It was already at the end of 19th century when the railway Metković-Sarajevo was built thus opening the possibility of goods transport to hinterland. The port construction started in 1939 and was commissioned after the World War II, in 1945. The port traffic was growing from year to year and in 1988 it reached some 4.5 million tons. During the Croatian War of Independence, the traffic decreased to only 268,000 tons (1994). Pursuant to the decision by the Government of the Republic of Croatia of 13 February 1997, the Port Authority of Ploče was set up as a public, non-profit organization responsible for construction, maintenance, management, protection and improvement of the port traffic. Since 1997 the Port of Ploče has been reconstructing and repairing its obsolete and damaged port facilities, which helped it to increase its traffic to some 2 million tons in 2004.

The terminal planned for bulk cargo is one of the projects that will additionally improve and increase the traffic to some 5 million tons planned in 2010.

At the place of the present-day port, there were hardly any indigenous villages so the increase in the town of Ploče inhabitants took place along with the construction and increase in the Port
traffic. In terms of social-economic aspect, the lives of almost all inhabitants of Ploče are directly or indirectly related to the Port.

This is the reason for relatively high tolerance to environmental impacts (dust and noise emission, etc.) that are unavoidably generated by the Port. The inhabitants of Ploče are ready to endure adverse impacts of the Port far beyond the applicable standards.

Another important characteristic of the area is the vicinity of the Neretva River Delta of exceptional local, regional, and even continental ecological importance. The spring of the Neretva River is at the foot of Zelengora Mountain in Bosnia and Herzegovina (BiH) 1095 m a.s.l. Its watercourse runs first in NE direction to Konjic and then turns southward forcing its way through the canyons and mountain-encircled valleys to the sea in the area of Ploče. Its total length is 225 km of which 203 km in BiH and 22 km in the Republic of Croatia. Around Metković, some twenty kilometres from its mouth, a wider area of the Neretva Delta starts – some 246 km² surface area.

The Neretva Delta is the only Mediterranean wetland habitat in Croatia and one of the last in the Mediterranean, which gives it also international importance.

Because of its natural values, the Neretva Delta is anticipated for protection in the nature park category by the strategic documents (National Strategy and Action Plan for Biodiversity and Landscape Protection, Strategy of Physical Planning in the Republic of Croatia, and Physical Plan of Dubrovnik-Neretva County). It has also been included in the Ramsar List of wetlands of international importance and in the Important Bird Areas Program implemented by the BirdLife International.

As a result of favourable geographical characteristics, there are two very different areas in its vicinity – the Port of Ploče and a very valuable ecological area.

Although no substantially adverse impacts of the Port of Ploče on the natural values of the Neretva Delta have been identified thus far (the impact of intensive farming in some parts of Delta is much more serious), when making the environmental impact assessment of CBT, special attention should be paid to the Project impact on this ecologically valuable region.
2. Project Description

The entire CBT Project is planned at the area that, pursuant to the applicable physical planning documents, is intended for development of the Port of Ploče. That area covers some 230 hectares of which only its smaller part (c. 83 hectares) is used for the existing facilities:

<table>
<thead>
<tr>
<th>Area Description</th>
<th>Ha</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dry Bulk Cargo</td>
<td>9.35</td>
</tr>
<tr>
<td>General and Loose Cargo</td>
<td>11.42</td>
</tr>
<tr>
<td>Timber Storing</td>
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</tr>
<tr>
<td>Liquid Cargo</td>
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</tr>
<tr>
<td>Special Cargo</td>
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<td>Maintenance and Repair</td>
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</tr>
<tr>
<td>Passenger Terminal</td>
<td>1.50</td>
</tr>
<tr>
<td>Office Buildings</td>
<td>1.44</td>
</tr>
<tr>
<td>Garages</td>
<td>2.96</td>
</tr>
<tr>
<td>Area Built but not Used</td>
<td>7.29</td>
</tr>
<tr>
<td><strong>Total Built</strong></td>
<td><strong>82.72</strong></td>
</tr>
<tr>
<td><strong>Area for future development</strong></td>
<td><strong>147.58</strong></td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>230.30</strong></td>
</tr>
</tbody>
</table>

CBT area will cover below areas:

- Access channel to the CBT berth and the entering part of Vlaška Channel, which should be dredged to achieve depth of 16 m for 80,000 DWT ships;
- Zone 1: The main area of the terminal planned on the current onshore part of the Port of Ploče onto which material was dumped for years from dredging and maintaining the access canal and Vlaška channel for the needs of the existing terminal for liquid cargo (zone 1 surface area of 190,000 m²).
- Zone 2: An area planned for construction of berth, storage area along the berth, and a new working area for the future expansion of the terminal. Zone 2 of 65,000 m² will be fully developed as land expansion to the current offshore zone, which requires backfilling of sea (reclamation) at depths to 4.80 metres;
- Zone 3: Onshore area of the Port of Ploče of 277,455 m² provided for disposal of the material dredged;
- Zone 4: Offshore contained part of the Port of Ploče of 115,200 m² provided for disposal of the material dredged - maximum depth of 4.80 to 5.90 metres;

Figures 1-1, 1-2 (Chapter 1) and Figure 2-1 (Chapter 2) shows the area of the Port of Ploče with current facilities plotted in and the areas provided for construction of the CBT. Figures 2-2 and 2-3 (Chapter 2) shows the terminal (CBT) and its main facilities.
EA and EMP for New Cargo Bulk Terminal at the Port of Ploče

Basic data on CBT:

- Import: 4,600,000 ton of coal, bauxite and iron ore per year
- Storage Capacity: 700,000 ton (main storage area) plus 60,000 ton (storage area along the berth for emergency use only)
- Average ship unloading rate: 35,000 ton per day (unloading from 80,000 DWT ships)
- Average wagon loading: 15,000 ton per day
- Approximately 78 port calls per year
- Service time per call manoeuvring, hatch moving, etc: 8 hours per call
- Total berth occupancy: 175 days (unloading from 80,000 DWT ships)
- Up to 350 working days per year

New Bulk Cargo Terminal is designed to perform the following main operations:
- handling bulk cargo as coal, iron ore, bauxite from ocean going ships,
- load rail wagons for transhipment of those products to the hinterland,
- provide a strategic and operational stocks for the operations and
- provide auxiliary services such as weighing, sampling and quality control.

The Project planned covers:
- deepening and broadening of access channel to CBT berth and to the Vlaška Channel (dredging),
- construction of the CBT berth and development of a new surface area by reclaiming the sea area,
- construction of storages (main storage area and outdoor storage alongside the berth that will be used for emergency use only),
- construction of supporting infrastructure, and
- use of the Project, i.e., use and operation of the bulk cargo terminal

The layout of CBT has been determined after a few options had been analyzed. The location chosen is almost fully drawn out of the Vlaška Channel thus eliminating the works within the nature park planned (left, i.e. south bank of the Vlaška Channel remains untouched) and considerably reducing the works on broadening the access navigable channel/waterway to the berth and terminal location.

To allow ships up to 80,000 DWT to come to the terminal, current navigable waterway should be broadened and deepened (dredged). Current channel is dredged to approximately 11.0 to 12.0 m below sea level. The required depth of the future channel is 16.0 m below sea level. The required bottom width of the future channel is 120 m. Slide slopes are assumed to have an inclination of 1:3 (in line with side slopes of the existing channel).

Two technical solutions for broadening and deepening of the access navigable waterway have been analyzed, which involves dredging of some 553,000 m³ of the material from the sea.
bottom and its disposal at the Zone 3 and if need be also at the Zone 4, which, if utilized, will be constructed as a confined disposal area\(^1\).

A) Hydraulic dredging:

A1) TSHD (Trailing Suction Hopper Dredger) is a special-purpose ship that intakes the material from the channel and takes it to its storage tanks. When TSHD is fully loaded, the ship goes to the disposal site where the material dredged is unloaded by means of a piping. TSHD can move freely thus allowing free pass for other ships. By this dredging technology up to 200% of water is taken with the material, which results in some 1,659,000 m\(^3\) of mud that should be transported and disposed at a place provided.

A2) CSD (Cutter Suction Dredger) is a craft without its own drive, with mechanical rotary dredging unit and the pumps for transport of the material dredged to a disposal site. This technology increases the volume of the material dredged by some 100% thus generating c. 1,106,000 m\(^3\) of mud.

B) Mechanical dredging:

Mechanical dredging by a standard navigable dredger using a hanging grab for dredging and emptying the material dredged to a barge which, when fully loaded, takes that material to unloading places, where the material is loaded onto trucks or re-pumped directly to the disposal site. The volume becomes only 20% larger by this technology meaning that only some 664,000 m\(^3\) of the material has to be disposed. However, the working speed and the capacity of those machines is some ten times lower than of the previous ones so more time is needed even if several machines work at the same time.

Advantages of hydraulic dredging (TSHD and CSD) are faster operation and lower price, its drawbacks are difficulties in engaging a big ship for relatively small scope of works and possible higher rate of seawater mud sitting up because of large quantity of seawater brought onshore and drained back to the sea, which would require additional environmental protection measures.

On the other hand, mechanical dredging brings 5-6 times less water onshore, so it is more environmentally favourable and the technology is more suitable for the Project. Its drawbacks are somewhat higher price, longer time of works execution and possible additional problems relating to onshore handling (additional reloading, transport by trucks and additional handling works at the location).

After an in-depth analysis, it was decided to propose both options (hydraulic and mechanical) at the EIAS level and to make final decision during the next phase of the Project.

The total volume of 1,161,000 m\(^3\) of stone will be required for CBT construction (for breakwaters, fills, containment of Zone 4, and similar). As it does not exist at the location of the

\(^1\) Construction of areas for disposal of dredged material (Zone 3 and 4) is described in Chapter 2.2.1. Deepening and Broadening (Dredging) of Access Channel to CBT and to Vlaška Channel and in Environmental Management Plan - Chapter 6.1.1. Mitigation measures under the items 1, 2 and 3.
Port of Ploče the stone material will be provided from excavations made for construction of a nearby section of the Adriatic Highway.\(^2\)

The construction of the new 7.5 km long access road for transport of reclamation-purpose and soil-improvement stone to the CBT area, and an environmental impact assessment for those works will be a subject matter of a separate EIA Study. The access road and highway section to Ploče design and EIA preparation are in progress (financed by HAC, Croatian Highway Corp.).

Beside stone supplied from the places outside the location of the Port of Ploče, some fresh water will also be supplied for the needs of the CBT (wetting water to prevent dust emission, firewater, and similar). Water for those needs will be supplied by a separate water supply pipeline from a lake Jezerine at the foot of Veliki Trovro Mountain (Figure 2-6, Chapter 2).

3. Environmental Characteristics of Site and its Vicinity

Land Ecology

As already mentioned in the introduction, there are many valuable ecological regions – either protected or recommended for protection. The natural values protected and the regions foreseen for protection in the broader region of the Project location are showed on Figure EA-5. The closest to the port area are special ichthyological and ornithological preserves Parila Lake and Neretva Mouth.

Because of its natural values, the Neretva Delta is anticipated for protection in the nature park category by the strategic documents (National Strategy and Action Plan for Biodiversity and Landscape Protection, Strategy of Physical Planning in the Republic of Croatia, and Physical Plan of Dubrovnik–Neretva County). It has also been included in the Ramsar List of wetlands of international importance and in the Important Bird Areas Program implemented by the BirdLife International.

Habitats in the area of the Neretva Delta could be grouped in several categories of which the most important ones from the nature protection point of view are the habitats of surface land waters, wetland habitats, and the seacoast. In the Delta, there is the most developed area of brackish waters in Croatia with the most representative saltmarshes, shoals, and muddy marshes overgrown with halophytes (communities of glasswort, *Salicornia Spp.*), areas with reed-patches, and the lagoons of Vlaška and Parila. Prominent also are Neretva current waters with backwaters Desanka and Crna Rijeka, and Matica, then the lakes of Baćinska, Birina, Vlaška, Desne, and a number of water sources (Modro oko, Klokun, and others).

On the SE part of the Neretva mouth (some 2 km from the Project location), there is an ichthyological-ornithological reserve (Neretva mouth). The Physical plan of Dubrovačko-

\(^2\) Based on current and planned status of these activities, the licensing process (location permit, construction permit) and the construction of the access road and delivery of stone material to the Port area is expected to be largely harmonized with the CBT Ploče planned schedule of licensing and development activities.
neretvanska County anticipates the area of Ploče-Parila near the Project location for is proposed for protection as an ichthyological and ornithological preserve. The Parila Lagoon is one of very few conserved lagoons and a very suitable place for fish spawning and feeding and growing of fish fry. There is a series of fish species breeding there – a few species of greys, sea bass, sole, gilthead, and others. It is an important habitat of abundant population of chequered carpet shell (*Tapes decussates*) and vital for birds migration and wintering.

In the Delta area, there are three ornithological preserves, Pod Gredom (Vid, Prud (Mekotić), and Orepek (Kula Norinska), and an ichthyological-ornithological preserve the Neretva Mouth including a large area with glasswort at the very entrance of Neretva River into sea. Furthermore, there are surrounding shoals and lagoons important as a resting place during bird migrations and for wintering and nesting of numerous bird species, as well as for fish spawning, and feeding and growing of fish fry.

At the very location of CBT, vegetation is meagre and grows on the material dredged from sea when the Vlaška Channel was broadened. In terms of environmental protection, this area does not have either local or regional importance.

**Marine ecology**

For the EIAS purpose diving survey, during days and nights, to detect communities of the sea bed and coast and the composition of flora and fauna in the area that will be dredged was conducted. Results are displayed in:

- table of identified plant and animal species (**Table 3.2-1** in Chapter 3)
- table of identified marine biocenoses (**Table 3.2-2** in Chapter 3)
- map of marine biocenoses distribution (**Figure 3-3** in Chapter 3)

In the project broader area fish population and population of other economically important organisms are still relatively rich and only partly affected by human activities. Some of these organisms inhabit this area permanently, either as a benthos or in pelagic zone, while others come occasionally to seek food, shelter or for spawning. Economically most important organisms are European eel (*Anguilla anguilla*), *Mugil* spp., diverse fish from family *Sparidae* and Striped red mullet (*Mullus surmuletus*). Moreover, marine shrimps *Crangon crangon*, *Penaeus keraturus* (usually inhabit depths between 10 and 40 m) and *Squilla mantis* are also important for the local economy. There are numerous cephalopods such as squids *Loligo vulgaris* and *L. media*, Common cuttlefish (*Sepia officinalis*) and to a less extent Common octopus (*Octopus vulgaris*). Diverse cockles from genus *Cardium* and genus *Venerupis* are also present.

Almost all mentioned species migrate through the Vlaška Channel. The largest is the migration of adult eels toward the sea in the autumn. Before winter Gilthead seabream and soles migrate upwards through the channel for spawning. Moreover, diverse fish and molluscs come in the shallow waters in the autumn and spring. Daily migration is also important in the area, fish from family *Sparidae* and genus *Mullus* and especially pelagic cephalopods come during night. Thus
"small" fishery is developed in the area of Ploče City. Unfortunately, in the moment it is much unorganized and illegal fishery prevails. Diverse fishing devices are being used but we will mention only the ones which are being used in the project area. Bivalves are harvested in the shallow sea and trawl lines are thrown in the Vlaška Channel during day. During night numerous fishing nets are being thrown and crustaceans are harvested. Moreover, during diving survey of area nearby the location of new CBT shells' remains of protected bivalve *Pinna nobilis* have been found but no living organisms were found.

**Characteristics of Marine Sediments**

The results of 28 off boreholes have been analyzed for the EIS which were made onshore and offshore. Granulometric composition of sea bottom layers in the terminal area is illustrated on Figure 3-16 (Chapter 3) by a curve of maximum and minimum graduation.

It is obvious that analysed layers consist of fine particles (sand and silt) and that 60-90 percent of particles are smaller than 0.1 mm, and 10-45 percent of particles are smaller than 0.01 mm.

Sediment samples taken on two places on the sea bottom are from five sea depths. One sample is taken close to the CBT at 10 m depth, and the other at 20 m depth at a distance of some 800 metres towards the high sea. The samples have been adequately processed and subject to chemical analysis in a certified laboratory (ACME – Analytical Laboratories Ltd. 852 E Hastings Street, Vancouver, BC, Canada). Forty one (41) off elements have been identified in the samples. Following Table 0-1 shows the results for the main elements. The results are within the limits for fully clean areas taking into account local natural conditions.

**Table 0-1: Composition of sediments (main elements):**

<table>
<thead>
<tr>
<th>SAMPLES</th>
<th>Mo ppm</th>
<th>Cu ppm</th>
<th>Pb ppm</th>
<th>Zn ppm</th>
<th>Ni ppm</th>
<th>Co ppm</th>
<th>Mn ppm</th>
<th>As ppm</th>
<th>Cd ppm</th>
<th>Ca %</th>
<th>P ppm</th>
<th>Cr ppm</th>
</tr>
</thead>
<tbody>
<tr>
<td>10m 5cm</td>
<td>0.6</td>
<td>20.5</td>
<td>21.1</td>
<td>71</td>
<td>41.2</td>
<td>10.7</td>
<td>507</td>
<td>14</td>
<td>0.3</td>
<td>11.7</td>
<td>0.054</td>
<td>59.6</td>
</tr>
<tr>
<td>10m 10cm</td>
<td>1</td>
<td>19.4</td>
<td>21.3</td>
<td>72</td>
<td>38.8</td>
<td>10</td>
<td>515</td>
<td>13</td>
<td>0.2</td>
<td>11.56</td>
<td>0.053</td>
<td>57.7</td>
</tr>
<tr>
<td>10m 15cm</td>
<td>0.7</td>
<td>17.9</td>
<td>20.4</td>
<td>71</td>
<td>36.7</td>
<td>9.6</td>
<td>487</td>
<td>14</td>
<td>0.3</td>
<td>12.93</td>
<td>0.056</td>
<td>57.8</td>
</tr>
<tr>
<td>10m 20cm</td>
<td>0.8</td>
<td>14.4</td>
<td>17</td>
<td>60</td>
<td>31.6</td>
<td>8.7</td>
<td>472</td>
<td>11</td>
<td>0.1</td>
<td>12.54</td>
<td>0.049</td>
<td>50.8</td>
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<tr>
<td>10m 25cm</td>
<td>0.8</td>
<td>14</td>
<td>16.1</td>
<td>60</td>
<td>30.6</td>
<td>9</td>
<td>453</td>
<td>9</td>
<td>0.2</td>
<td>12.6</td>
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<td>20m 5cm</td>
<td>1.1</td>
<td>24.5</td>
<td>25.2</td>
<td>81</td>
<td>44.1</td>
<td>10.7</td>
<td>459</td>
<td>13</td>
<td>0.4</td>
<td>16.52</td>
<td>0.053</td>
<td>57</td>
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<td>20m 5cm R</td>
<td>1.3</td>
<td>27.8</td>
<td>26.6</td>
<td>88</td>
<td>49.1</td>
<td>12.7</td>
<td>439</td>
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<td>0.056</td>
<td>61.6</td>
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<tr>
<td>20m 15cm</td>
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<td>520</td>
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<td>16.21</td>
<td>0.052</td>
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</tr>
<tr>
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<td>17.03</td>
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<tr>
<td>20m 25cm R</td>
<td>1.5</td>
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<td>30</td>
<td>94</td>
<td>50.7</td>
<td>12.3</td>
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<td>15</td>
<td>0.4</td>
<td>17.06</td>
<td>0.057</td>
<td>57.7</td>
</tr>
</tbody>
</table>
Site Meteorology

Basic meteorological characteristics in the area of Ploče have been developed from the weather station Ploče located on site at 2 m a.s.l. Data are available from the period 1978-1994.

The climate in the area of Dalmatian coast and also in the area of Ploče is Mediterranean climate characterised by moderately warm and rainy winters and with hot and dry summers.

Maximum mean monthly air temperature is about 25 degC in July and August and minimum mean air temperature is in about 6 degC in January.

Average annual relative humidity is some 63%, the lowest being in summer months and the highest in October and November.

Total annual precipitation for Ploče amounts 1100 mm on average. The precipitation amount is minimal in summer months and maximal in late fall (October and November).

Annual course of the number of days with precipitation and thunder is showed on Figure 3-6 (Chapter 3). Two maxima could be noticed - one in the spring months (March, April) and the other in the fall (October, November, and December). On average there are about 100 days per year with precipitation although the largest number of days with less than 1 litre/m². The amount of precipitation in some 10% cases is larger than 10 litres per square metre and in some 5% cases it is larger than 20 litres per square metre, whereas there are only 3 days in a year when very heavy precipitation could be expected (50 litres per square metre and more).

Air quality

The time wind roses show that the flow direction from the north quadrant (N-E) prevails in the morning and in the evening, whereas during the day the air flow is from the west and south-west direction. Considering all that (all three climatological observation times) in the area of Ploče north winds prevail.

The most frequent wind is not at the same time the strongest by its intensity. The strongest winds are related to south-east (SE) flow direction.

Five monitoring stations have been installed for the purpose of EIA Study to measure total deposited matter (TDM) and the following parameters in TDM: insoluble and soluble part; lead (Pb), cadmium (Cd), thallium (Tl), aluminium (Al) and iron (Fe) in insoluble part; calcium (Ca²⁺), chlorides (Cl⁻) and sulphates (SO₄²⁻) in soluble part.

Monitoring started at 1st of October 2005 and three-months results show that concentrations of total deposits and the elements contained therein on all monitoring points are inside the limit values stipulated by the Regulations about limit values of pollutants in air (Gazette 133/05).
4. Environmental impact assessment

It was assessed that possible significant environmental impacts are the following:

- Impact on sea water quality and on marine communities
- Noise impact
- Impact on the air quality
- Waste production

Impact on sea water quality and on marine communities

The largest impact on sea water and marine communities during the construction of CBT is produced by excavation/deepening of sea bed for the ship landing. Rising of sediment and increased sedimentation of particles on the both sides of construction works will occur during this stage.

Due to shallow sea and large inflow of fresh water from the Baćinska Lakes, the Neretva River and other smaller sources most of the colloid particles will be kept in an upper layer with smaller density. Because of that dispersion of particles will be large and their sedimentation will occur in a large area thus with smaller amounts per area unit. Larger impacts on marine communities will appear only in the relatively small area near construction works. Any impact in areas more distant than 400 m in all direction is not expected. Impacts in the excavation area, approximately 15 ha, is high because the upper layer of sediment with all benthic organisms will be removed. Sedimentation of material will have negative impact on benthic organisms only for a short period because they will return fast to the sediment surface. It can be assumed that the major negative impact will be on organisms which live on the sea bed and can not move e.g. sea grass from genus Posidonia and algae.

Due to construction of the Zone 2 and Zone 4 (if needed) of the terminal a part of the sea bed will be covered including biologically important area with protected bivalve *Pinna nobilis* and the sea grass. This is an important negative effect of the project. Although negative, the impact is of very limited range as important species located there are present in other areas in the vicinity and the percentage of destroyed population is almost negligible.

Noise impact

There is a noise impact both during construction and during the operation. Because of special characteristics of some sources and their environmental impact, the noise impact during the terminal construction has been considered through three project phases:

- excavating of sea bed for ship approach to the CBT
- construction works on the coast and its skirting part
- berth construction – piling

3 During diving survey no living organisms but only shells' remains have been found.
Excavating of sea bed Trailing Suction Hopper Dredger was analysed in detail as a worst technology. Noise generated by TSHD, later in the document considered as one source, comes from several different components. Primary components are divided according to the environment to which they emit noise:

a) Noise to water: suction pipe, operating propeller, generators, gearbox, pumps
b) Noise to air: ship's engine, generators, ventilation systems, pumps

It is used the emission level generated by TSHD Taccola (Ref. Langworthy 2004, An Assessment of the Underwater Noise Radiated by the Dredger Taccola, Report No. 614 R 0205). The capacity of TSHD Taccola is 4400 m³, and the one foreseen by the technical analysis 5000 m³. They are both categorized as medium size TSHDs. Since the split up within the group is made according to the capacity, the ship selected could be considered representative.

Table 0-2 reviews the noise emission level by octaves for heavy-duty construction machines used at the begging stage. Later on, this situation will be modelled as the worst possible case. Data have been taken from DEFRA, Update of Noise Database for Prediction of Noise on Construction and Open Sites 2005.

Table 0-2: Sound characteristics of construction machines

<table>
<thead>
<tr>
<th>Noise Source</th>
<th>Sound power per octaves, dB(A)</th>
<th>$L_{1/3}$ dB(A)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dumper</td>
<td>90 97 101.3 105.4 107.8 108 102.6 95</td>
<td>113</td>
</tr>
<tr>
<td>Dozer</td>
<td>82.8 93.9 92.4 89.8 94 91.2 89 85.1</td>
<td>100.1</td>
</tr>
<tr>
<td>Tracked</td>
<td>70.8 88.9 81.4 89.8 90 89.2 84 78.1</td>
<td>96</td>
</tr>
<tr>
<td>excavator</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Loader</td>
<td>88.3 89.2 90.5 94.7 99.1 98.5 90.1 78.2</td>
<td>103.4</td>
</tr>
<tr>
<td>Generator</td>
<td>62.8 72.9 78.4 76.8 79 81.2 77 74.1</td>
<td>86.3</td>
</tr>
<tr>
<td>Roller</td>
<td>73.8 76.9 88.4 88.8 87 83.2 75 67.1</td>
<td>93.6</td>
</tr>
<tr>
<td>Pile driver</td>
<td>66.8 68.9 76.4 80.8 90 93.2 93 89.1</td>
<td>97.8</td>
</tr>
</tbody>
</table>

The only technique still used for construction of berths and underwater piling is impact piling (hammer piling), which is also the noisiest method.

At this stage of design development, no specific piling equipment has been selected. On the market, there are diesel, air, steam and hydraulically operated pile hammers. They are listed herein according to the noise emission level they radiate, from the most silent to the loudest. They also considerably differentiate according to the place of piling, under or above the water level, which depends on the noise level radiated to air or water. When determining the noise emission levels, the worst possible case will be considered – the noise emission level; the least favourable case for each medium.

Noise emission level to air will be taken according to DEFRA. For piling Ø 600 mm piles, a 5 ton hydraulic hammer is sufficient. Below are its noise emission levels per octaves (Table 0-3).
Table 0-3: Sound characteristics of a hydraulic hammer for air

<table>
<thead>
<tr>
<th>Noise Source</th>
<th>Sound power per octaves, dB(A)</th>
<th>$L_W$ dB(A)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>63</td>
<td>125</td>
</tr>
<tr>
<td>Hydr. hammer</td>
<td>75.8</td>
<td>85.9</td>
</tr>
</tbody>
</table>

Noise in Water

Theoretically, it is difficult to assume sound propagation in shallow coastal belt. Sometimes, the calculations are made with cylindrical and sometimes with spherical divergence. Each method gives better results at a certain distant area and a certain location.

British Petrol (BP) conducted a series of geological investigations on the south-east of England in an underwater area similar to that around Ploče (An Investigation Of Underwater Sound Propagation In Shallow Coastal Waters, by J. R. Nedwell (Subacoustech Ltd.), K. Needham (Subacoustech Ltd), A.W. H. Turnpenny (Fawley Aquatic Research Laboratories Ltd.) and R. M. H. Seaby (Fawley Aquatic Research Laboratories Ltd.)). The Port of Poole Bay, situated at the river mouth has an average sea depth between 5 and 20 metres and shallow sea depth of 1 to 5 metres. The sea bottom is sandy with gradual increase in depth. By mathematical calculation and calculation modelling for theoretically ideal sea surface, expected attenuation of sound of some $40\log(R)$ was obtained, but actual measurements during rough sea showed sound attenuation between $21\log(R)$ and $26\log(R)$. Since underwater noise sources have the highest intensity at low frequencies similar to those used by so called "airgun" for geological investigations, the results of that investigation are used for predicting sound propagation attenuation in water.

Dredging - deepening and broadening of access channel to CBT berth and to the Vlaška Channel

For assumed noise emission level of 180.4 dB (1μPa), below are the ground level emissions depending on the source distance (Figure 0-1).

![Figure 0-1: Ground level noise intensity at different distances during dredging](image-url)
Piling

According to above described theory of sound wave propagation in water/sea, below is ground-level emission depending on the distance from the source (Figure 0-2). The level of noise radiated by a hydraulic hammer is 194 dB (1μPa).

![Figure 0-2: Ground level noise intensity during piling](image)

**Noise during CBT construction**

The calculation does not take into account meteorological correction. A coefficient of soil absorption is 0 (zero) and land is assumed completely flat. The calculation parameters of sound attenuation due to air absorptions are:
- Temperature 20°C
- Pressure 101.33 kPa
- Relative humidity 60%

The situation was modelled according to ISO (described in document ISO 9613-2).

**Noise emission during operation of CBT**

Table 0-4 gives a review of assumed emission levels of ship unloader, trucks and cranes per octaves.
Table 0-4: Assumed noise emission levels of equipment at the port terminal

<table>
<thead>
<tr>
<th>Noise Source</th>
<th>Sound power per octaves, dB(A)</th>
<th>( L_W ) dB(A)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>63</td>
<td>125</td>
</tr>
<tr>
<td>Gantry crane</td>
<td>82.9</td>
<td>92</td>
</tr>
<tr>
<td>Conveyor belt</td>
<td>39</td>
<td>58.1</td>
</tr>
<tr>
<td>Stacker/reclaimer</td>
<td>75.8</td>
<td>84.9</td>
</tr>
<tr>
<td>Loader</td>
<td>88.3</td>
<td>89.2</td>
</tr>
<tr>
<td>Train loading station</td>
<td>82</td>
<td>101.1</td>
</tr>
<tr>
<td>Truck</td>
<td>78.8</td>
<td>89.9</td>
</tr>
<tr>
<td>Truck crane</td>
<td>80.8</td>
<td>85.9</td>
</tr>
</tbody>
</table>

Table 0-5 gives a review of noise emission level per octaves for a point source.

Table 0-5: Noise emission levels for a bulk cargo terminal – calculated surface area of 235 000 m²

<table>
<thead>
<tr>
<th>Noise source</th>
<th>Sound power per octaves, dB(A)</th>
<th>( L_W ) dB(A)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>63</td>
<td>125</td>
</tr>
<tr>
<td>Terminal</td>
<td>66.8</td>
<td>85.9</td>
</tr>
</tbody>
</table>

Two situations are modelled: the worst possible scenario and a scenario that best resembles the reality. Both understand 24-hour work time of the terminal when a ship arrives to the port. It is assumed that all noise sources, except for auxiliary loaders and trucks, and auxiliary truck crane, are continuous emitter of noise during that time.

In relation to noise impact it is concluded the following: By determining the noise impact a worst-case scenario is considered. Such includes the minimal construction time and therefore, development of more construction activities at the same time. Modelling was done according to ISO 9613 standard, which is regulated by the Croatian Noise Protection Act (Official Gazette No. 20/03).

According to the noise maps (Figures 4.2.2-1 and 4.2.2-2 in Chapter 4), it is obvious that the noise from the CBT location does not influence the population areas of Ploče (Ordinance on highest noise levels in areas where people live and work, Official Gazette No. 20/04).

As for the noise influence on marine species it is difficult to make a final conclusion. No country in the world has regulations on that matter and since the monitored area is not from the special interest for the underwater world it is assumed that there would not be a significant impact.

The problem appears in the area of nature preserve in Delta of Neretva River. The regulation do not prescribe the permissible noise levels for this area, but in order to respect the general recommendations of the majority of European and world countries - related to noise influence on birds - the necessary abatement measures should be carried out. The scope of measures will depend on detailed monitoring which will be conducted during the later phases of Project.

Birds, except for owls, have hearing organs that cover the same range of sound frequencies and level like people so generally the limits for the highest allowed levels of noise stipulated for
people are also appropriate for birds (EPA – Environment Protection Authority, Best Practice Environmental Management – Guidelines for Dredging).

During the execution of the works, birds affected by the noise will leave the area and go to more suitable places. They will probably return when the works are over.

When determining the optimum time for execution of the works, it should be taken into account that birds are extremely sensitive during migration. Birds leave the area affected by high noise and this unnecessary use of energy could disturb their feeding process and resting during migration. The area of Neretva River estuary is an important rest place for the bird migration, mainly from the north of Europe to Africa, from the second half of August to the end of October and from the end of March to July and as wintering site. Higher noise level is also a problem for the birds during nesting, spring and summer, because parents could leave the nest permanently or, because of higher noise level, they could leave nests more often and for longer time thus exposing the nest, eggs and their young to predators and overheating. The area of the project is less important as a nesting than migration and wintering site.

Because of above-mentioned impact, the most suitable time that is the time of the lowest impact on bird fauna for execution of works would be summer period until the start of autumn migration. In that period there would be no impact on migratory birds thus they could feed and rest normally and on wintering birds.

**Impact on the air quality**

The major ambient air impact during operation of the bulk cargo terminal will be that from fugitive emission from the bulk cargo handling and storage. Fugitive emissions are caused by the bulk cargo unloading from the ships to the stockpile, wind erosion of material disposed on the stockpile, and reloading from the stockpile into the bulk cargo wagons.

AP-42 methodology of the American Environmental Protection Agency (EPA) was used for calculation of fugitive emissions. **Figure 0-3** shows annual emission calculated for maximum use of New Cargo Bulk Terminal capacity, and its annual capacity is 2,800,000 ton of coal, 600,000 ton of bauxite and 1,200,000 of iron ore.
Modern equipment for bulk cargo handling is of environmental design, i.e. in-use dust emission should be even lower than estimated. Further, according to the design documentation, spraying of the bulk cargo stockpile will also reduce emission.

The project impact on ambient air quality was assessed on the bases of the ISCST3 air quality calculation model. A method is applied that gives conservative results. This method asks for use of the so-called “worst case meteorological data”, namely set of meteorological data used to simulate different combination of meteorological parameters needed for calculation of dispersion and deposition.

Figure 0-4 shows results of calculation of maximum hourly concentration of PM-10 and deposition, and Table 0-6 gives maximum calculated values.

<table>
<thead>
<tr>
<th>LOCATION</th>
<th>WIND DIRECTION</th>
<th>CALCULATED MAXIMUM HOURLY VALUES</th>
<th>ESTIMATED VALUES</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Concentration of PM-10 (µg/m³)</td>
<td>Quantity of deposited matter (mg/m²/h)</td>
</tr>
<tr>
<td>Max. impact on LAND</td>
<td>SW</td>
<td>315 (6454100, 4766050)</td>
<td>558 (6453450, 4765800)</td>
</tr>
<tr>
<td>Max. impact on SEA</td>
<td>NE</td>
<td>306 (6453250, 4765450)</td>
<td>548 (6453450, 4765800)</td>
</tr>
</tbody>
</table>

(All points are within Port of Ploče borders, see figure 0-4)
Fig. 0-4: Maximum hourly concentration of particulate matter (PM-10) and total deposited matter (TDM)
Based on the calculation results obtained by application of the dispersion model and information on the climate characteristics, particularly the wind conditions at the town of Ploče area, it can be concluded that operation of the New Cargo Bulk Terminal will not cause degradation of the first category air quality due to the particulate concentration (PM-10) and deposition at the town of Ploče area.

**Waste management**

Most of the waste produced during the Project operation will be the waste from ships. It will consist of waste oil (hazardous waste) and oiled waste – oiled water, oiled materials (hazardous waste), bilge water (hazardous waste), cargo residues, sewage water, and other waste such as food leavings, food packaging material, etc.

Currently, the services for receiving liquid waste generated on board ships are solved on a contract basis with the company Pomorski servis – Luka Ploče ltd (concession holder), which is authorized for collection of hazardous waste by the Ministry of Environmental Protection, Physical Planning and Construction. Following the opinion of the current concession holder, current system for receiving waste in the area of Ploče Port hardly meets the current situation. Below are the actions required before commissioning of the Project:

- Development of a Plan for reception and handling of waste from watercrafts and cargo residue in the area of the Ploče Port; according to the content defined in the By-law stipulating conditions for port operation (Gazette 110/04).

- Installation of waste reception facilities for waste generated on board ships having sufficient capacity for all types of waste. Provision of an adequate place for collecting and storing all types of waste generated during the Project operation that will satisfy the provisions of the Law on Waste (Gazette 178/04) and other operational and supporting documents of that Law. If there is no possibility for adequate final treatment of waste at the Project location, treatment of single types of waste should be contracted with a legal entity registered for that line of business.

- Types, quantities, place of origin, way and place of storing, treatment and disposal of waste shall be duly recorded. Data on handling different types of waste shall be regularly submitted to competent authorities on stipulated forms and reporting sheets. Likewise, once a year, the competent authorities should be informed about the condition of reception facilities for waste and cargo residue. The Porth Authority of Ploče should be recommended to present a Waste Management Plan.

5. **Mitigation Measures and Environmental Monitoring Plan**

These parts are elaborated in the separately prepared Environmental Management Plan (EMP).

---

4 First Category Air Quality - clean or slightly polluted air; the limit values (LV) are not exceeded for any pollutant (see, Chapter 4, Table 4.2.1-1).
PLOČE CONTAINER TERMINAL PROJECT
ENVIRONMENTAL IMPACT ASSESSMENT
EXECUTIVE SUMMARY
Draft

Contractor
RIJEKAPROJEKT d.o.o.
Rijeka, Moše Albaharija 10a

Rijeka, February 2006
Client
PORT OF PLOČE AUTHORITY
20324 PLOČE
Trg kralja Tomislava 21

Coordinators:
Anders O. Halldin
Mikko M. Venermo

PLOČE CONTAINER TERMINAL PROJECT
ENVIRONMENTAL IMPACT ASSESSMENT
Draft Report - EXECUTIVE SUMMARY

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Rn 03-033

Rijeka, February 2006
EXECUTIVE SUMMARY

1. INTRODUCTION

1.1. BACKGROUND

Specific phenomenon of Croatia is very long and well-indented seashore in term of space that during the history has extended preferential treatment to development of ports on a large number of places being acceptable for technique and technology of that time. In recent years, the development of world economy has led to phenomena of giving prominence to some ports as linking stakeholder.

The physical planning strategy of the Republic of Croatia has ranged the Port of Ploče among the seven biggest ports on the Croatian coast.

In Croatia and adjacent countries there is a badly need to resurge maritime transport at both international as well as national level.

Transport, unloading and reloading technology as well as technology for port handling are developing today so that the ports are going to be specialized for particular purposes and individual cargo types. The first specialization level is introduction of unit cargo from port to port with automatic monitoring of cargo from consigner to consignee including all actions and changes of traffic lines as a final form. The level reached by the PPR within this segment is very low, and should be as better and as soon as possible qualified for possibilities already known and being applied in the developed world.

The development of the Port of Ploče should proceed primarily for needs of the adjacent Bosnia and Herzegovina but also of larger national and international hinterland.

1.2. OBJECTIVES OF THE PROJECT

In the year 2002, the Port of Ploče has unloaded and reloaded about 10,000 TEUs. There is continuous feeder line to the ports of Malta and Gioia Tauto in Italy. The ship operator is the Lošinjška ploviba - brodarstvo d.d. The ship UPA can transport 226 TEUs. In this year, the ship RAPOČA of the same ship operator has joined this line being used by traffic twice a week.

This existing container traffic represents a problem for the Port of Ploče.

There are no quay background areas on which containers would be stored; the areas have not been designed for heavy loads by equipment required by suchimonials; bearing capacity of quays are questioned for installation of special equipment for container unloading and reloading being elaborated several times. Finally, the Port of Ploče does not dispose of equipment that could be used for unloading and reloading of container units by LO-LO technology.

The explicit goal has been set based on this reasons:

The Port of Ploče has to be qualified for container traffic by construction of container terminal with capacity of 100 000 TEUs a year.
2. PROJECT DESCRIPTION

According to its purpose, the container terminal belongs to port areas intended for container transport and depot. New areas shall be constructed on part of the port area together with new quay for putting in of container ships. The capacity of container terminal shall be approximately 100,000 TEUs/year. The following shall be constructed for needs of Ploče container terminal:

- New quay long 300 m to be used for ships’ accommodation of the highest maritime requirements, deadweight of 60,000 DWT and big draft without restriction. At the same time 1 ship of said deadweight or 2 ships of requirements reduced by half can be berthed alongside.

- New depots and handling areas having an area of totaling 154,000 m² (15.4 ha) on land and 53,000 m² (5.3 ha) on sea respectively with a grand total of 209,000 m² (21 ha).

The land part of the terminal shall be arranged as a functional integrity according to the technological requirements. Within this integrity, five zones can be distinguished for which specific construction type and area planning has been foreseen:

I. Aprons – planned for development of open stocking area for handling and stocking of containers
II. Quay background area— for loading and unloading of containers with Ro – Ro ramps
III. Traffic routes and infrastructure structures – new traffic routes are planned for construction, roads and railway as well as development of access roads and access railways to the terminal through the port area
IV. Covered storage – a covered storage shall be constructed for needs of container loading and unloading
V. Auxiliary facilities – it is planned to construct a structure for control and protection of primary entrance next to which a parking area for vehicles for heavy loads and passenger cars and a workshop for repair of containers and terminal mechanization shall be arranged.

Basic Area Presentation

- Aprons 86,000 m²
- Quay background area 17,000 m²
- Traffic routes and infrastructure structures 24,000 m²
- Covered storages 12,000 m²
- Auxiliary structures 15,000 m²

- Total quay area 154,000 m²
  (thereof traffic and operating area have an area of 127,000 m²)
- Water area (sea) 53,000 m²

Grand total 209,000 m²
2.1. HISTORY OF THE PROJECT

The construction of the Ploče Container terminal is a spatial intervention that has undergone all legally prescribed procedures to determine the location: (I) environmental impact assessment, (II) conformity of the Project with the physical planning documents and (III) obtaining the location permit.

The Environmental Impact Assessment (EIA) for the Ploče Container terminal was made in the year 2004. Public disclosure and public debate about the EIA were completed in January 2005 and the Committee for EIA’s evaluation agreed on acceptance of the Project with application of prescribed measures for environmental protection and environment monitoring program in February 2006.

The construction of the Ploče Container terminal is planned in accordance with relevant physical planning documentation:

a) Physical Planning Program of the Republic of Croatia,
b) Physical Plan of the Dubrovačko-neretvanska County as well as

c) Physical Plans of the local self-government units, Town of Ploče.

The Physical Plan for the area of the Dubrovačko-neretvanska County was developed and adopted. The Physical Plan of the Town of Ploče defined the maritime system of traffic infrastructure in concept and in terms of space as part of national infrastructure in which the Ploče Container terminal is an integral part of the Croatian maritime traffic system.

The Location permit for Ploče Container terminal was obtained (27 July 2005), the Main design necessary for obtaining the construction permit is being developed and the construction may start upon obtaining the construction permit.
3. DESCRIPTION OF THE CURRENT ENVIRONMENT

CLIMATE
The area of the Port of Ploče has the Mediterranean climate. It is temperate warm rainy climate with no dry season and with hot summer. The number of cold, foggy, snowy days and days with hail is trivial and it could be said that the Port of Ploče has very good climatic conditions for work.

WATER MASS DYNAMICS

TIDES
Dynamics of periodic rise and fall of sea surface has a nature of half-day period on area of the Port of Ploče. It could be appraised that there is no danger of resonant effects at the port.

SEA CURRENTS
With regard to the present conditions, there is no sea current impact in the port basin.

SEA WAVES
The location at the Port of Ploče foreseen for the Project is very well protected against wind waves.

GEOLOGIC STRUCTURE AND SOIL
The area where the Port of Ploče is located is the wide delta of the river Neretva. Therefore, this territory is formed mainly of sediment formations from the Quaternary age formed of thick formations accumulated over the karst paleorelief. On the area foreseen for Container terminal and Quay 7 construction, the thickness of Quaternary formations exceeds 100 m. Sediment formations are of very different grain size content and are often intermixed. According to the research studies performed in 1989, for the stage I of the Container terminal construction in the Quay 7 background, the following types of ground were established:
- from elevation 0 to elevation -20 mud and sand material
- from elevation -20 to elevation -35 clayey materials
- from elevation -35 to elevation -42 sand
- from elevation -42 to elevation -52 gravel

SEA FLORA AND FAUNA
The life-communities on sea bottom have been examined along two transacts on the area of the foreseen container terminal at the Port of Ploče. Through the researches has been found out that as the most frequent flora are: white bladderworts, special kind of conifers, moss colonies, sea flowering plants and flora: brown comber, surmullet, periwinkles and special kind of crabs.

AIR
On the area of the Port of Ploče, there are no bigger stationary, point sources of air pollution.

NOISE
During the economic activities, the existing external noise level outside of the Port of Ploče does not exceed the permitted values.
4. POSSIBLE ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

4.1. MICROCLIMATIC CONDITIONS
No changes of and impacts on microclimate are expected relating to the type and size of the project for container terminal construction.

4.2. SEA AND LAND NATURAL ECOSYSTEM

LAND
The impact on port environment shall not be increased by construction of the Container terminal at the Port of Ploče that is situated in the middle of the port area of the Port of Ploče.

SEA
The quay structure shall be laid on concrete columns – piles. When using the structure the impact of municipal waste and industrial waters, crude oil and petroleum products, silting and solid litters' contamination in incident cases can be expected. The environmental conditions shall be improved by construction of straightened quay (the existing one is not straightened, it is shallow with a number of above-water and underwater rocks) since there will be no accumulation of inorganic and organic material of the quay. Planning of waterway and depth enlargement shall have positive impact on sea flow in and around the water area.

4.3. INTENDED USE OF THE SPACE
The construction of the Container terminal and planning of space of container handling shall have neither adverse impact on other structures and their purposes on this area nor shall affect their functioning.

4.4. AESTHETIC ASPECT
The visual aspect of this part of the Port of Ploče should be significantly improved through attentive new construction with stress on selection of colors.

4.5. AIR
No additional air pollution shall occur when loading and reloading of containers as for instance when loading and reloading dry bulk and bulk cargos. Possible air pollution sources are ships at berth and heavy road vehicles (trucks). However, due to the distance the impact on residential quarters of the town of Ploče is insignificant. In order to mitigate the negative effect of traffic means on air quality, the vehicles for heavy loads being used on the terminal must meet the new Standards EURO II and EURO III.

4.6. SEA
The enlargement of the port basin between the Quay 5 and the future Quay 7 is planned within this Project, representing in fact correction and enlargement of the existing basin being today to narrow to accommodate planned sizes of container ships on this terminal. The Project shall have positive impact on sea flow in water area of the port and its surrounding. On the area of the Project sea pollution by discharging untreated wastewater of the Town of Ploče remains as a problem.

SEDIMENTS
Sediment at the Port of Ploče can be classified to the II class, i.e. to poor polluted sediments, as the concentrations of hazardous substances in sediment eluat are low. Dredged material shall be used for quay filling. Referring to dredging technology with which the sediment when excavating shall be mixed with specific amount of water (app. 40% sediment and app. 60% water) the water shall be percolated from material disposed on land. The possible adverse impacts of disposal of dredged material on
sea quality and sea ecosystem shall be significant mitigated by keeping the dredged material in sedimentation basins for the period of 24 hours.

4.7. **NOISE**

When using the Container terminal the noise shall have no significant impact on the environment since the location of the Terminal is situated in the middle of the port area on the external part towards the sea. The distances from the town of Ploče are considerable and they amount more than 1500m².

4.8. **TRAFFIC IMPACT**

It is not expected that this new traffic organization shall have an increased impact on the environment, than the expectations are that it shall be mitigated. The conclusion is based on facts that the cargo shall be handled and transported in more economic way what is the basic purpose of this new construction. On the sea part arrival in and departure from the basin between the Quay 5 and the Quay 7 are considered as maneuver and not as tramping so it might be concluded that the ships berthed to the Quay 7 of the Container terminal shall not interfere safe passageway for ships arriving in or departing from the Port of Ploče.
5. ENVIRONMENTAL MANAGEMENT PLAN

The Environmental Management Plan (EMP) has been developed to define all activities relating to environmental monitoring, responsibility for supervision and implementation of the EMP, training needs and reporting requirements. The coordinator for environmental protection at the Port of Ploče Authority shall guarantee the implementation of the EMP. In addition, County office of the Ministry of Environmental Protection and Physical Planning shall supervise, within its sphere of action, that the requirements set out in the EMP are respected.
**A. ADVERSE ENVIRONMENTAL IMPACT MITIGATION MEASURES**

<table>
<thead>
<tr>
<th>Stage</th>
<th>Issue</th>
<th>Mitigation Measures</th>
<th>Cost (Euro)</th>
<th>Institutional Responsibility</th>
<th>Comments (e.g. secondary impacts)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preparation</td>
<td>Air</td>
<td>- Include air pollution prevention and mitigation regulations relating the ships</td>
<td>Installation in Charge</td>
<td>Port of Ploče Authority</td>
<td>Environmental Inspector</td>
</tr>
</tbody>
</table>
|             | Unexpected Pollution       | - Development of installation design on land for disposal of oily water from ships at the Port of Ploče  
|             | Waste Water                | - Construction of waste water treatment plant of lower degree and submarine outlet on the peninsula Višnjica  
|             |                            | - Construction of supply channel, terminal pumping station (PS 19) and pressure pipeline  
|             |                            | - Connection to pumping station for consumers of the Town of Ploče, i.e. main sewer  
|             | Traffic                    | - The design has to provide that the oily waste waters from the plant for maintenance of port mechanization and vehicles are treated on separator-sedimentation tank before being discharged into the sea  
|             |                            | - To develop design with separated sewer system for sanitary-feecal wastewater, waste precipitation water from traffic and operating areas of the port and «clean» precipitation – roof water.  |                          | Port of Ploče Authority          | Environmental Inspector           |
|             | Environmental Management   | - Before putting the Container terminal into operation the connecting road running from the Adriatic arterial road to the Industrial district of the port where the Container terminal is located to the intersection must be in function. This refers also to the first stage of terminal construction, i.e. the first stage is operable only when the connecting road is in function.  
|             | Aesthetic Aspect           | - Sea traffic in the area of the Container terminal has to be regulated based on existing legislation and rules for sea traffic and the Maritime study for arrival and departure for the new conditions within the basin has to be developed.  |                          | Port of Ploče Authority          | Environmental Inspector           |
|             |                            | - Already when developing the preliminary design the anticipated technological solutions for all activities must include and adopt as final solutions: actions and processes, machines and devices transmitting minimal levels of acoustic power under normal conditions.  |                          | Port of Ploče Authority          | Environmental Inspector           |
|             |                            | - Environmental management policy  
|             |                            | - Environmental conditions survey  
|             |                            | - Environmental management program  
<p>|             |                            | - During designing special attention has to be drawn to aesthetic aspect of the port, structure, quay, quay areas surface treatment and the best location for disposal of surplus construction material has to be defined by main design, site organization  |                          | Port of Ploče Authority          | Environmental Inspector           |</p>
<table>
<thead>
<tr>
<th>Construction</th>
<th>Noise</th>
<th>Head of Execution Team</th>
<th>Sanitary Inspector</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air Pollution</td>
<td>Transport means have to be supervised referring to amount and quality of exhaust gases permanently</td>
<td>Head of Execution Team</td>
<td>Sanitary Inspector</td>
</tr>
<tr>
<td>Waste</td>
<td>Packing waste must be collected separately and marked in a special way</td>
<td>Head of Execution Team</td>
<td>Environmental Inspector</td>
</tr>
<tr>
<td>Excavations</td>
<td>Material obtained by submarine excavation must be disposed within the port area, on location of the Container terminal and on areas intended for further development of the port.</td>
<td>Head of Execution Team</td>
<td>Environmental Inspector</td>
</tr>
<tr>
<td>Rad</td>
<td>Noise</td>
<td>To arrange cargo (containers) and equipment for reloading so that they with their dimensions represent suitable located barrier for noise spreading from the loudest source</td>
<td>Port of Ploče Authority</td>
</tr>
<tr>
<td>Waste</td>
<td>All dangerous waste, packing waste and municipal waste emerged on the port area must be collected separately, marked in a special way and regularly removed.</td>
<td>Port of Ploče Authority</td>
<td>Environmental Inspector</td>
</tr>
<tr>
<td>Traffic</td>
<td>All vehicles coming in and leaving the area of the new Container terminal must be equipped according to the prevailing legislation</td>
<td>Port of Ploče Authority</td>
<td>Environmental Inspector</td>
</tr>
<tr>
<td>Sea</td>
<td>When using the Container terminal it is necessary to apply all measures arising from other laws, acts, regulations, standards applying in the Republic of Croatia as well as those having international importance.</td>
<td>Port of Ploče Authority, Authorized Organization</td>
<td>Environmental Inspector, Sanitary Inspector</td>
</tr>
<tr>
<td>Possible Ecological Accidents</td>
<td>When using the Container terminal, in addition to already mentioned environmental risks, ecological accidents could occur only in case of natural disasters as earthquakes and fire of larger scale.</td>
<td>Port of Ploče Authority</td>
<td>Environmental Inspector</td>
</tr>
</tbody>
</table>
# B. MONITORING PLAN FOR ENVIRONMENT

<table>
<thead>
<tr>
<th>Stage</th>
<th>What to monitor?</th>
<th>Where</th>
<th>How to monitor the parameter?</th>
<th>When to monitor the parameter?</th>
<th>Why to monitor the parameter?</th>
<th>Cost</th>
<th>Responsibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>In charge</td>
<td>Conditions of animal life- communities</td>
<td>On transects PL-01 i PL-02</td>
<td>Flora and fauna changes</td>
<td>Every four years</td>
<td>Continuous monitoring of macrobenthonic organism settling process and recovery of bottom-dwelling communities</td>
<td>Install</td>
<td>Port of Ploče Authority</td>
</tr>
<tr>
<td>Waste water</td>
<td>On outlet of the waste water treatment plant – oiled water SZV 1</td>
<td>pH, total suspended substances, chemical consumption of oxygen, biochemical consumption of oxygen, total mineral oils, anion and not anion detergents</td>
<td>4 times a year</td>
<td>Sea and groundwater protection</td>
<td>Install</td>
<td>Port of Ploče Authority</td>
<td></td>
</tr>
<tr>
<td>Sea quality</td>
<td>On transect PL-01 station PLS-01</td>
<td>Transparency, temperature, salinity, dissolved oxygen, PH, Mineral oils, ammonia, bacteriological tests (fecal contamination indicators) ammonia, bacteriological tests (fecal contamination indicators)</td>
<td>Twice during summer months at bottom-dwelling and surface sea stratum. Before beginning of construction (&quot;zero state&quot;) During use every year</td>
<td>Sea protection</td>
<td>Install</td>
<td>Port of Ploče Authority</td>
<td></td>
</tr>
<tr>
<td></td>
<td>On transect PL-02 station PLS-02</td>
<td></td>
<td></td>
<td></td>
<td>In charge</td>
<td>In charge</td>
<td>Authorized organization</td>
</tr>
</tbody>
</table>

RIJEKAPROJEKT d.o.o.
<table>
<thead>
<tr>
<th>In charge</th>
<th>Sediments</th>
<th>Lead</th>
<th>Cooper</th>
<th>Zinc</th>
<th>Tin</th>
<th>During use every two years, once a year</th>
<th>Sea protection</th>
<th>Port of Ploče Authority</th>
<th>Authorized organization</th>
</tr>
</thead>
<tbody>
<tr>
<td>Land traffic</td>
<td>on transect PL-01 station PLS-01</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>on transect PL-02 station PLS-02</td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>Sea traffic</td>
<td></td>
<td>issue of status report of transport means equipment</td>
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<td></td>
<td></td>
<td>issue of annual report about cases of emergency on the quay</td>
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<td></td>
<td></td>
<td>make and issue annual reports on measurements of wind-wave climate</td>
<td></td>
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<tr>
<td>Waste</td>
<td>on port area</td>
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<td></td>
<td>Twice a year make and issue reports about disposal of all kinds of waste</td>
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<td></td>
<td></td>
<td>Once a year provide for certificate – propriety certificate</td>
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</tr>
<tr>
<td>Noise</td>
<td>on three points B1, B2 i B3</td>
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<tr>
<td></td>
<td></td>
<td>Noise intensity measurement on three control points</td>
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<td></td>
<td></td>
<td>Upon completion of construction</td>
<td>People protection</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Noise source change</td>
<td>Legal obligations</td>
<td></td>
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<td></td>
<td></td>
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<td>on inspector's request</td>
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<td></td>
<td></td>
<td></td>
<td>upon complaint of citizens against noise intensity</td>
<td></td>
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</tr>
</tbody>
</table>
C. INSTITUTIONAL STRENGTHENING

1. Equipment Purchase – upon adoption of the Main design

2. Training – the recommendation is to expand the authorizations and duties of the PPA Division for port safety and supervision of maritime traffic to the following: responsibility for environmental issues, specially for implementation and control of implementation of mitigation measures and monitoring during construction and operate phase, and after that, for drawing environmental reports and submission to responsible institutions, and for review of compliance with environmental legislation. If not, these responsibilities should be awarded to another division within Port of Ploče Authority. After adoption of recommendation by PPA, it would be possible to plan training.

3. Consultant Services – not necessary

4. Special Studies – not necessary

D. IMPLEMENTATION SCHEDULE

<table>
<thead>
<tr>
<th>MITIGATION ACTIVITIES</th>
<th>Starting date</th>
<th>Ending date</th>
</tr>
</thead>
<tbody>
<tr>
<td>baseline</td>
<td>November 2005</td>
<td>June 2006</td>
</tr>
<tr>
<td>construct</td>
<td>December 2006</td>
<td>December 2008</td>
</tr>
<tr>
<td>operate</td>
<td>December 2008</td>
<td>thenceforward</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MONITORING ACTIVITIES</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>baseline</td>
<td>November 2005</td>
</tr>
<tr>
<td>operate</td>
<td>December 2008</td>
</tr>
</tbody>
</table>

E. INSTITUTIONAL ARRANGEMENT

<table>
<thead>
<tr>
<th>Responsibilities for mitigation and monitoring</th>
<th>Environmental information flow (reporting-from who and to who and how often)</th>
<th>Decision making chain of command for environmental management (to take action to authorize expenditures, to shut down, etc.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Port of Ploče Authority</td>
<td>Head of the PPA</td>
<td>Monitoring the implementation of Environmental Management Plan</td>
</tr>
<tr>
<td></td>
<td>to County Dubrovačko-nerevanska Environmental Department;</td>
<td>PPA, Water Management Inspector - State Directorate for Water Management, County Department</td>
</tr>
<tr>
<td></td>
<td>to Harbor Masters Office, Port State Control;</td>
<td>Sanitary Inspector for Health Management - County Department</td>
</tr>
<tr>
<td></td>
<td>to County Dubrovačko-nerevanska Administration for Inspecting</td>
<td>Safety of Sailing Inspector - Harbor Masters Office, Port State Control</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Environmental Inspector - MEPPPC County Department</td>
</tr>
<tr>
<td></td>
<td>Head of the PPA</td>
<td>Monitoring Reports to County Environmental Department-yearly</td>
</tr>
<tr>
<td></td>
<td>to County Dubrovačko-nerevanska Environmental Department</td>
<td>PPA, Environmental Inspector - MEPPPC County Department</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Monitoring the implementation of Environmental Management Plan</td>
</tr>
<tr>
<td></td>
<td>Head of the PPA</td>
<td>Monitoring Reports to County Environmental Department-yearly</td>
</tr>
<tr>
<td></td>
<td>to County Dubrovačko-nerevanska Environmental Department</td>
<td>PPA, Environmental Inspector - MEPPPC County Department</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Monitoring the implementation of Environmental Management Plan</td>
</tr>
</tbody>
</table>

All activities and responsibilities should be overseen by the Ministry of Environmental Protection, Physical Planning and Construction (MEPPPC).
The organizational structure of the state and local governments in the Republic of Croatia guarantees implementation of prescribed environmental protection measures and control of their efficiency by monitoring. The implementation shall be supervised institutionally through the Ministry of Environmental Protection and Physical Planning and organizational units in the Counties.

The Investor is responsible for financing, implementation of the measures prescribed and monitoring the environment conditions. The implementation of prescribed protection measures (adverse impact mitigation measures) and environmental monitoring during construction and use of structures being the components are obligation of the investor, Port of Ploče Authority.

The contractor is responsible for implementation of environmental impact mitigation measures during the construction. Control of implementation of these measures shall be carried out by the Ministry of Environmental Protection and Physical Planning and Construction (Environmental Department, Environmental Inspector) and/or State Directorate for Water, County Department.

The owner is responsible for implementation of environmental impact mitigation measures during the use and implementation control shall be carried out by the Ministry of Environmental Protection and Physical Planning and Construction (Environmental Department, Environmental Inspector) and/or State Directorate for Water, County Department.

For monitoring there are in the Republic of Croatia organizations authorized by the Ministry of Environmental Protection and Physical Planning.
6. REPORTING AND PUBLIC CONSULTATION

The Project environmental Impact Assessment Committee in its first session held on 12 October 2004 in Ploče evaluated that the Assessment is set up expertly and developed in accordance with regulations, but that it contains smaller imperfections to be eliminated according to comments of the Committee members before the Assessment shall be presented for further consideration. In the same session, the Committee made the decision to forward so finalized Assessment to public disclosure and public debate.

The public disclosure has taken place on the area of the Town of Ploče for the period of 14 days (from 23 December 2004 to 5 January 2005) and was coordinate by Administrative department for public utility services of the Dubrovačko-neretvanska County. The public debate took place on 28 December 2004. During the public disclosure, one written comment has been received on subject request of the Administrative department for public utility services of the Dubrovačko-neretvanska County, on 11 January 2005.

All comments have been taken into consideration, corrected and inserted in the Assessment.

Based on the Environmental Impact Assessment of aimed content "Container terminal at the Port of Ploče" being developed by the company Rijekaprojekt d.o.o. from Rijeka, in July 2004 and finalized in November 2004, the Committee evaluated that the Project is acceptable for the environment with implementation of environmental protection measures and monitoring program.

The Committee proposes to issues for the subject Project the decision on Project affordability with implementation of environmental protection measures and monitoring program, Int. No.: NM/AK-05-2, Zagreb, 15 February 2005.
7. INFORMATION SOURCES

- Environmental Impact Assessment of aimed content “Container terminal at the Port of Ploče”, July 2004

- Summary of the Environmental Impact Assessment of aimed content “Container terminal at the Port of Ploče” for public disclosure, November 2004

These documents are available on following places:

- Port of Ploče Authority, Trg Kralja Tomislava 21, Ploče, Croatia
- Ministry of Environmental Protection and Physical Planning and Construction, Republike Austrije 20, Zagreb, Croatia
- World Bank Office, Trg. J.F. Kennedya 6b, Zagreb, Croatia