Impact Assessment and Mitigation
Part 2 of Environmental Impact Assessment, Palmeira Port, Cape Verde

MITM/ENAPOR

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Final Report
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A COMPANY OF

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Executive Summary EIA Expansion Port of Palmeira (Portuguese)

INTRODUÇÃO

O presente documento constitui o Resumo Não Técnico (RNT) que é parte do Estudo de Impacto Ambiental do projecto de expansão do porto de Palmeira.

A ENAPOR e o Ministério de Infra-estruturas Transporte e Mar (MITM) vêm apostando no processo de expansão e modernização dos portos de Cabo Verde e nomeadamente o de Palmeira em Cabo Verde. As melhorias previstas para o Porto de Palmeira consistem na expansão do cais existente, a criação de berços adicionais para embarcações, a expansão da área de armazenamento, construção de novos edifícios e a demolição dos velhos edifícios e estruturas.

A regulação do decreto-lei n. 14/97 (1 de Julho de 1997) e o actualizado e expandido decreto-lei n. 29/2006 obrigam os promotores a conduzir, para certas actividades, um estudo de impacto ambiental (EIA) que conterá todos os factos relevantes de natureza ambiental para que a Direcção Geral do Ambiente em Cabo Verde possa tomar decisões relativamente a:

- Autorização Ambiental para a ENAPOR/MITM
- As condições sobre o qual o projecto deve proceder, se autorizado

O processo de elaboração do EIA foi evolucionário. Durante um período de onze meses, diferentes alternativas num total de sete, para a localização do novo cais e outras actividades de apoio em terra (por exemplo, localização, configuração, técnicas) para a expansão do porto, foram avaliadas baseadas na sua performance ambiental e sócio-económico. Com base nos aspectos ambientais, económicos, sociais, técnicos, financeiros e outros a opção preferida foi a de expansão e foi finalmente escolhida pela ENAPOR.

OBJECTIVOS E JUSTIFICAÇÃO DO PROJECTO

O desenvolvimento económico da Ilha, principalmente nos últimos 15 anos, estimulado pela modernização do aeroporto internacional, resultou num aumento de transporte de bens, do número de passageiros e de actividades industriais (ex.: exploração de terrenos, industria turística). Como resultado o porto de Palmeira esteve sujeito a um forte crescimento em termos de actividades económicas as quais não estava preparado

As facilidades portuárias actuais e os espaços são por conseguinte, sobre-ocupados e novas facilidades serão necessárias para fazer ao fluxo adicional de cargas geradas pelo desenvolvimento de novas unidades turísticas, construção de habitação para a população em crescimento e para o consumo diário gerado pelos visitantes e pela população residente. A expansão do porto de Palmeira enquadra-se na estratégia geral de desenvolvimento nacional de cabo verde. Esta estratégia tem como objectivo a modernição dos principais portos de cabo verde (ex.: Mindelo, Praia e Palmeira) as assim como o desenvolvimento do seu potencial turístico.

AMBIENTE E EXPANSÃO DO PROJECTO

Área Portuária e o Comercio

O porto de Palmeira localizado na costa ocidental da ilha do Sal e é o terceiro maior porto do pais ao serviço de toda a ilha que representa cerca de 4.5% (20.000 habitantes) do total da população de cabo verde. O porto tem um único berço existente de 120 m de comprimento e com uma profundidade de água variável, assim como o edifício de escritórios e um pequeno armazém aberta para contentores e cabotagem. 'E também um cais de amarração com quarto bóias e um ponto de ligação flexível para descarga do JET-A1 (combustível para aviões) ligado a um conduta submerso para abastecimento da SHELL e da ENACOL (Companhias de combustíveis nacionais). O porto esta protegido com fensas e tem um portão de guarda.

Aproximadamente 75% do transporte no porto, totalizando 130.000 toneladas (dados de 2005) consiste em trafico inter-ilhas. Os Produtos importados representam aproximadamente 80% dos produtos transportados no porto. O numero médio anual de embarcações que visitam o porto é de 300.

Área do Projecto

A área do projecto esta situada na costa ocidental da ilha do Sal no arquipélago de Cabo Verde perto da vila de Palmeira com uma população a volta de 1100 habitantes

Com uma vegetação muito reduzida, a flora terrestre da ilha do Sal, consiste basicamente de poucas espécies comuns como as acácias e palmeiras. O ecossistema marinho a volta da área do projecto é importante interessante em termos de biodiversidade mas menos importante em termos de biomassa que significa que há uma grande variedade de espécies presentes mas numa quantidade reduzida (e com um interesse comercial muito reduzida). As águas do Sal são essencialmente conhecidas pela sua variedade de espécies marinhas e a presença sazonal de cetáceos e de tartarugas.

- Os potenciais receptores mais sensíveis às actividades do Porto da Palmeira são:
- A vila da Palmeira que está localizada nos arredores (200-300 metros) com o centro da vila a uma distancia não menos de 500m do porto;
- Uma industria de pesca artesanal e semi-industrial perto do porto;
- Uma estação de produção de energia eléctrica e de dessalinização de agua do mar pela ELECTRA numa área localizada a norte do porto;
- Uma bóia de combustível e;
- A baia de Murdeira a oito quilómetros a sudoeste do porto que é a primeira reserva marinha de cabo verde, visitada por algumas baleias migratórias (Humpback), varias espécies de tartarugas importantes e funcionando como zona de reprodução para uma variedade de espécies de peixes e invertebrados, incluindo espécies endémicas.

Descrição do projecto
Foi elaborado um *Master Plan* para modernização e expansão do porto de Palmeira (2007). As principais fases de desenvolvimento foram faseadas da seguinte forma:

Primeira fase (a ser concluída no médio de 2009)
Extensão do cais já existente, incluído um berço de roll-on/roll off (ro-ro) e com facilidades de carga e descarga de combustíveis e cimento no berço; um comprimento de 90m, largura de 25m e um calado de 6m.

Nesta fase, somente será construída a extensão do cais existente e facilidades temporárias que serão criadas para as actividades de ro-ro. Uma estrada de acesso ao cais de extensão será criada atrás do cais existente. Esta estrada de acesso também dará acesso ao sítio durante a construção e reduzira o obstáculo das actividades portuárias em andamento. O berço ira, não somente fornecer uma rampa ro-ro, mas também facilidades de carga e descarga de cimento e combustível. O calado disponível na extensão da parte existente será de 6m, aproximadamente 1 m a mais a do cais existente.

Segunda fase (a ser concluída no médio de 2011)
Um novo cais a oeste do porto existente em aguas mais profundas com um comprimento aproximadamente de 150m, largura de 35 m e calado de 9.5 m.

Nesta segunda fase, um novo cais a oeste do cais existente e facilidades em terra e infra-estruturas no terminal serão desenvolvidas. A parte nova, essencialmente para carga internacional, será construída mais distante para o mar, mais ou menos paralelo ao já existente. A profundidade do avental atrás do novo cais será aproximadamente de 35m. A parte nova estará ligada com a terra por meio de calcadas, dando directamente ao parque de contentores internacionais. O acesso náutico para a parte nova estará adequado para embarcações maiores.

Terceira fase (não incluída no EIA)
Uma extensão de 100m do novo cais a ser feita no futuro.
Mais ainda, a primeira e a segunda fase incluem:

- Realocação dos Serviços Administrativos (ENAPOR) para o novo edifício;
- Construção de um terminal de passageiros;
- Construção de uma saída para cargas Internacionais (sob a responsabilidade das alfândegas);
- Construção de uma estação de frete de contentores (Container Freight Station- CFS) para operações de (des) consolidação de carga;
- Construção de uma oficina para a manutenção dos equipamentos do terminal, criação de uma área de estacionamento para equipamentos;
- Replanificação do acesso ao porto e estradas, incluindo a criação de uma área de espera para camiões na entrada do porto;
- Criação de áreas para camiões e viaturas à espera de embarque na embarcação ro-ro
- Demolição das infra-estruturas e os edifícios obsoletos.

IMPACTE AMBIENTAL E MEDIDAS DE MITIGAÇÃO

A avaliação dos potenciais impactos e medidas de mitigação foram, essencialmente desenvolvidas para a fase de construção e a fase operacional.

Fase de Construção

Impacto resultante dos trabalhos gerais de construção

Produção de resíduos durante a fase de construção e medidas de mitigação

As actividades de construção de novas facilidades portuárias resultam na produção de resíduos sólidos e líquidos, nomeadamente os materiais de construção, resíduos domésticos gerados pelos trabalhadores de construção. Potencialmente, resíduos de substâncias químicas de perigo poderão aparecer com o uso e manutenção de maquinarias como óleos e combustíveis e os dos barris contendo essas substâncias. Um impacto (localizado) nas águas subterrâneas e na qualidade dos solos no sítio do projecto pode ocorrer-se, em caso de haver uma gestão imprópria desses resíduos ocorrer, através de uma fuga acidental.

Para mitigar esse impacto é recomendado que o contratante deva gerir todos os resíduos sólidos e líquidos, incluindo os gerados pelos trabalhadores no sítio, resíduos de construção e resíduos perigosos gerados durante os trabalhos de construção.

Medidas devem ser tomadas para assegurar que os resíduos sólidos ou líquidos não sejam despejados no mar ou atiradas fora do sitio de construção. Neste caso, o risco residual e o impacto provavelmente será de menor significância.

Qualidade do Ar

A movimentação de equipamentos e veículos utilizados durante os trabalhos de construção ira contribuir para a deterioração da qualidade do ar ambiente na área de trabalho através da emissão de poluidores como o dióxido de carbono, monóxidos, óxidos de nitrogénio, partículas (ex. PM10), etc.e potencialmente em toda a ilha.

O Empreiteiro deverá aderir às melhores práticas, limitando a emissão para o ar de gazes nocivos.. O uso de camiões relativamente novos e de combustíveis de boa qualidade são recomendados para a redução do transporte de outros veículos. Para o transporte de materiais de construção como pedras para o porto, o uso de caminhos alternativos (camiões sujos que devem ser melhoradas por forma a minimizar poeiras) situando a uma boa distância da vila de Palmeira e Espargos, são recomendados. Se o empreiteiro adoptar as boas práticas na minimização da emissão do ar e da produção da poeira, a significância do impacto pode ser reduzido a um nível negativo menor.

Ruídos

Haverá um aumento dos níveis de ruídos resultante das operações dos equipamentos usados na dragagem, demolição dos edifícios e da construção da marina e das infra-estruturas terrestres. Os ruídos gerados durante as actividades de construção têm um impacto negativo ao nível de ruído já existente que pode resultar em distúrbio nos receptores sensitivos mais próximos, com problemas de saúde associados. As boas praticas de comportamento e acções no sítio como a

programação cuidada do tempo são exigidas para evitar distúrbio nos parâmetros do sono e as reclamações dos residentes. Se os ruídos das actividades de construção forem propriamente geridos e temporizados, o impacto negativo nos receptores sensíveis mais próximos podem ser reduzidos a uma significância menor ou moderada.

Fugas ou derrames
O impacto negativo de fugas ou derrames podem aparecer por causa do uso de equipamentos pesados para a realização dos trabalhos de construção. Se um acidente ocorrer em que há uma fuga ou derrame de óleo ou combustível no meio marinho ou em terra, haverá um impacto negativo na qualidade da água. Boas praticas operacionais como armazenamento, posicionamento e protecção dos reservatórios de combustível, tabuleiros e uma manutenção própria e adequada da planta e dos equipamentos irão minimizar os impactos associados com o derrame. O risco de derrame pode contudo ser reduzido com um potencial impacto residual negativo de significância menor.

Aguas residuais, esgoto e escoamento
As águas de esgoto produzidas pelos trabalhadores no porto podem, se descarregadas directamente no mar, ter um impacto negativo no ambiente.
Para mitigar os impactos relacionados com o escoamento é recomendado uma limpeza do cais e dos terrenos de construção como prevenção de escoamento para minimizar o potencial desses efluentes de alcançarem o meio marinho. O esgoto doméstico deve ser disposto de acordo com os requisitos estabelecidos pelas autoridades de regulação relevantes. O impacto negativo residual é considerado de significância menor.

Uso de recursos naturais
Para a construção do cais, quebra-mar e pavimentação num total de 350.000m3 de materiais rochosos, 145,000 m3 de pedras e agregados, 55.000m3 de areia e 30.000 toneladas de cimento serão necessários.

Pedras podem felizmente, ser fornecidas da pedreira na ilha do Sal. A extracção de areia na ilha do Sal não é permitida por causas das preocupações ambientais. A areia será, então importada. Pedras e areia da dragagem podem, depois de amostragem para verificação de contaminação provavelmente, ser reutilizados nos trabalhos de terraplanagem, contudo as quantidades da dragagem por si só não serão suficientes para a terraplanagem do terreno.

O impacto negativo residual é considerado de significância menor

A sociedade e a economia local
Durante a fase de construção que durara três anos para completar a primeira e a segunda fase, estima-se que 200-300 trabalhadores e outros fornecimentos relacionados serão necessários.

Um impacto positivo estará associado com a fase de construção que irá resultar na criação de emprego (ambos directo e indirecto), o efeito multiplicador (ex. Gastos em materiais locais, ganhos gerados com a oferta local, gasto de dinheiro pelos trabalhadores) e consequentemente o aumento de rendimentos. Outras actividades económicas podem beneficiar da presença dos trabalhadores.

O impacto positivo residual ‘e considerado de significância menor

Segurança
Um plano de saúde e de segurança deve ser preparado e implementado pelo contratante. Ainda, um plano de formação, instruções escritas e equipamentos de protecção de pessoal devem ser fornecidas. O impacto negativo residual ‘e considerado de significância menor.

Pescas
As actividades de construção podem ter um impacto negativo nos pescadores locais, se tiverem que romper a acessibilidade geral das infra-estruturas do porto. Considerando a fase de preparação e de lay-out das actividades de construção, não esta previsto nenhum impacto.

Impacto resultante da construção dum quebra-mar/reverenciamento costeiro

Fundo do mar Natural
O impacto no local do novo quebra-mar e de extensão do novo cais será a perda irreversível do aspecto natural do fundo do mar e das espécies que vivem ligeiramente acima dele (Epibenticas) ou nele. Não há nenhuma indicação de populações significantes de espécies preciosas da fauna e flora marinha no local de construção. Qualquer fauna móvel (ex. Pequenos peixes) pode deslocar a lugares próximos. Ainda, a alternativa de expansão escolhida espera-se ter um impacto mais localizado do que as outras alternativas que foram consideradas. O impacto negativo residual é considerado de significância menor

Erosão e acumulação costeira
Mudanças de correntes causadas pela construção do novo cais e do quebra-mar pode provocar erosão e acumulação de sedimentos na zona costeira. O impacto separado será mínimo devido ao fundo rochoso, à ausência de grandes quantidades de materiais suspensos na água e à fraca presença de correntes na baia de Palmeira. O impacto negativo residual é considerado de significância menor

A vida marinha
A construção do novo quebra-mar e do novo cais podem ter os seguintes impactos na vida marinha: Perda directa do fundo do mar e da fauna de invertebrados s como estrelas-do-mar e corais, adjacentes ou no fundo da área de desenvolvimento; a remobilização dos sedimentos suspensos, causando enfraquecimento da comunidade bêntica marinha como os invertebrados, particularmente espécies de corais; e o impacto dos ruídos nos cetáceos e tartarugas. Boa planificação do tempo de actividades produtoras de ruídos, observação visual de cetáceos e a suspensão imediata dos ruídos diminuirá muito o impacto. O impacto negativo residual é considerado de significância menor.

Qualidade da agua do mar e dos sedimentos
Durante a construção do murro de revestimento há um potencial aumento de curto prazo de sedimentos suspensos resultante do movimento dos navios de dragagem e das actividades de construção. Os sedimentos presentes na baia perto do cais podem estar contaminados, não obstante as amostras de sedimento ate agora recolhidas não apresentarem nenhuma indicação de poluição acima do nível

máximo permitido. A remobilização de sedimentos podem, contudo, apresentar um risco menor de causar deterioração da qualidade da água. O impacto negativo residual é considerado de significância menor.

Impacto dos trabalhos de dragagem e de terraplanagem

Qualidade da agua
Durante a primeira fase da construção é esperado que um volume de 4000m3 será dragado no local da extensão dos quais do porto e constituído de 500m3 pedras e 3500m3 de areia e materiais granulares. No sul do porto a ser expandido uma área rasa será dragado com um volume cerca de 6500m3 consistindo basicamente de rochas (Basalto, Cerca de 2500 m3) e pedregulhos (cerca de 4500 m3). A dragagem de pedras perto do local do cais em extensão esta planeada para ser feita com meios de dragagem com martelo pneumático, através do qual o martelo pneumático será usado para remover a camada de pedras e de bacilose para agarrar e remover essas pedras.

Durante a segunda fase é esperado que um volume de 3000 m^3 de pedras e 1500 m^3 de materiais granulares será dragodo en frente do novo cais.

Isto ira resultar num total de dragagem de 15.000 m3 constituído de 8.500 m3 de areia/materiais arenosos e 6.500 m3 de pedras e alguns pedregulhos.

Espera-se que os sedimentos em suspensão não irão ser removido longe do lugar onde os trabalhos de construção serão levados a cabo uma vez que as correntes locais na baia de Palmeira são fracas e variáveis. O impacto negativo residual ‘e considerado de significância menor.

A vida marinha
A dragagem e terraplanagem podem ter os seguintes potenciais impactos na vida marinha: Perda directa do fundo do mar e da fauna de invertebrados como estrela-do-mar e corais, adjacentes ou na área dragada o terraplanada; a mobilização dos sedimentos em suspensão (ex. da dragagem) causando enfraquecimento da comunidade bêntica marinha como os invertebrados, particularmente espécies corais, e; o impacto dos ruídos nos cetáceos e tartarugas.

Especialmente a dragagem de pedras pode produzir um nível de som subaquático significativo. A escolha de equipamentos de dragagem, o *timing* fora das estações sensíveis, rompimento dos ruídos, designando um observador e desempenhando *checks* visuais e vocais na presença de cetáceos perto da área de dragagem antes do começo da dragagem pode reduzir significativamente o impacto.
Boas praticas de dragagem e *timing* pode reduzir a re-suspensão de sedimentos que pode ter um impacto nos corais

O impacto negativo residual é considerado de significância menor

Impacto resultante da construção das paredes do cais

Fundo do mar Natural
O impacto no local do novo quebra-mar e de extensão do novo cais será a perda irreversível do aspecto natural do fundo do mar e das espécies que vivem

ligeiramente acima dele (Epibenticas) ou nele. Na ausência de qualquer espécie precioso da vegetação subaquática ou de espécies conhecidas, qualquer fauna móvel (ex. Pequenos peixes) podem deslocar a lugares próximos. O impacto negativo residual é considerado de significância menor.

Erosão costeira
Mudanças de correntes ou derivas podem causar alguma erosão e acumulação na zona costeira causadas pela construção do novo cais e do quebra-mar. O impacto negativo residual é considerado de significância menor

Qualidade dos solos (terra dentro)
O impacto da filtração e da acumulação do material de dragagem em terra para ser reutilizado mais tarde na terraplanagem de terrenos pode originar a lavagem dos solos. Medidas devem ser tomadas para evitar o contacto directo com o solo, o chão, com a superfície ou com a água das chuvas. O impacto negativo residual é considerado de significância menor

Impacto resultante da construção de edifícios e de estruturas

Produção de resíduos da construção em terra
As actividades de construção resultam na produção de resíduos sólidos e líquidos de matérias de construção, resíduos produzidos pelos trabalhadores de construção e potenciais resíduos químicos do uso de maquinarias, abastecimento e manutenção. Se impropriamente gerido e sem uma estratégia clara de disposição dos resíduos adoptada pelo empreiteiro escolhido poderá constituir um impacto negativo.

É recomendado que o empreiteiro escolhido gere toda os resíduos sólidos e líquidos, incluindo os resíduos gerados pelos trabalhadores, da construção e de resíduos de azar, gerados durante os trabalhos de construção, assim como para as estruturas a frente do mar e do lado de terra. O impacto negativo residual é considerado de significância menor

Sociedade local e a economia
Para a realização da expansão planeada no lado de terra, um pequeno número de casas (de seis), uma escola primária e um campo de futebol precisam ser removidas e realojadas.

A ENAPOR e a Câmara Municipal informaram as partes afectadas sobre a necessidade de realocação e consideraram e discutiram com eles as opções possíveis de realocação. Se a compensação e a realocação for levado a cabo conforme planeadas e acordadas não haverá nenhum impacto negativo residual.

<u>Fase operacional</u>

Impacto resultante do aumento das actividades Portuárias operacionais.

Sociedade local e a economia
O impacto positivo na economia local ocorrerá na fase operacional com a expansão do porto, a ser essencialmente mais para o desenvolvimento do sector do turismo no Sal. Assim como as consequências benéficas são a criação de emprego,

aumento dos rendimentos portuários, melhoramento no mercado de fornecimento, melhoramento da segurança nas actividades portuárias, oportunidades para estabelecimento de actividades industriais ou de logística, melhoramento do acesso para melhor qualidade de bens e melhoramento dos rendimentos e das condições de vida de muitas famílias. O impacto positivo residual é considerado de significância menor.

Aguas residuais, esgoto e escoamento
O escoamento da matéria-prima armazenada, fugas no manuseamento de cargas e poeiras do manuseamento de cimento podem também de forma adversa afectar a qualidade da água do mar á volta da área. O aumento da quantidade de esgoto será originado conforme o aumento do número de empregados também aumenta. Se esses forem descarregados directamente ao mar, ira causar um impacto negativo na qualidade da água.

A detenção/retenção de tempestade de agua esta incorporado no desenho. As áreas do terminal que podem, potencialmente, provocar um impacto na tempestade de água – como a manutenção da área de equipamentos e da grua – tem de ser equipados com separadores de óleo ou de água. O esgoto recolhido dos escritórios do edifício e do terminal de passageiros devem ser recolhidas e tratadas em pequenos sistemas de tratamento ou em tanques sépticos. Se as medidas descritas anteriormente forem levadas a cabo, nenhum ou um impacto negativo de significância menor pode ocorrer das águas residuais, esgoto e escoamento. O impacto negativo residual é considerado de significância menor.

Qualidade da agua do mar das embarcações
Possíveis descargas das embarcações podem constituir fonte de poluição no mar incluindo água de baleaste, resíduos de óleos, esgoto, lixo e outros resíduos. Fugas, derrames e emissões fugitivas de óleos, lubrificantes, combustíveis e outros líquidos são provavelmente as principais causas de degradação da qualidade das águas do mar durante a fase operacional. Uma gestão correcta das actividades portuárias irá ser essencial para minimizar os impactos na qualidade da água, como o desenvolvimento de um plano de contingência a nível portuário; levar a cabo uma avaliação de riscos das aguas de baleaste, requerer aos navios que chegam ao porto a apresentação dos relatórios ou registos e realizar inspecções/monitorização biológicas no porto e alertar as embarcações sobre possíveis espécies invasores que podem contaminar o meio marinho. O impacto negativo residual é considerado de significância menor (excepto em caso de uma emergência).

Qualidade do ar
Os impactos na qualidade do ar ambiental podem aumentar por causa da intensificação de actividades associadas ao transporte de mercadorias em terra, das operações das embarcações, operações de descargas e da manutenção das embarcações que aumentara a emissão de poluentes atmosféricos. As embarcações são a principal fonte de emissões de poluição, gerados essencialmente durante as manobras e atracagem. Os ventos predominantes de nordeste provavelmente farão dispersar esses poluentes em direcção ao mar. O impacto negativo residual é considerado de significância menor

Manutenção da dragagem

Os impactos negativos na qualidade da água podem ser derivados da manutenção das actividades de dragagem no fundo do mar. Considerando o rácio de sedimentos muito baixo o qual não há nenhum registo na história do porto, às futuras operações de dragagem não serão frequentes e apenas para pequenas quantidades de sedimentos. O impacto negativo residual ‘e considerado de significância menor.

A vida marinha
A Pos-modernizacao do porto de Palmeira no Sal, é esperado que o número de embarcações que utilizam essas actividades ira aumentar resultando numa mais intensa actividades do *shipping* nessa região. É esperado que nos próximos dez anos o número de embarcações que visitam o porto de palmeira ira, pelo menos, duplicar. A primeira reserva marinha de Cabo Verde, a Baia e Murdeira fica a uma distância de oito quilómetros do porto de Palmeira.

Essas ameaças podem afectar tanto o ambiente terrestre como marinho como degradação de habitat resultante do aumento de efluentes e da contaminação do desenvolvimento costeiro de marinas e do aumento do tráfico de botes. Em combinação, esses impactos doem diminuir o estado de saúde dos ecossistemas marinhos.

Por forma a considerar alguns dos potenciais impactos na população marinha do Sal e minimizar alguns dos distúrbios causado pelo aumento do *sharing*, um código de conduta incluindo por exemplo manutenção de embarcações, um percurso e velocidade constante quando aproximam do porto e evitar descargas até que a embarcação seja atracada deve ser elaborada.

Resíduos produzidos pelas embarcações
Durante a fase operacional no sítio do projecto, as embarcações são a principal fonte geradora de resíduos como por exemplo resíduos de óleo, água de lavagem, óleos lubrificantes, resíduos de carga e de baleaste. Esses resíduos têm o potencial de causar problemas sérios se não for controlado ou bem geridos. As condições não sanitárias, cheiros e outras degradações da qualidade da água podem ocorrer.
Todos os resíduos das embarcações com potencial de causar poluição do meio marinha devem ser dispostos de acordo com as indicações estipuladas pela convenção de MARPOL.

É recomendável que para a recolha dos resíduos de óleos e de águas negras uma pequena embarcação ou camião esteja disponível para tal. Os resíduos domésticos gerais e outros resíduos sólidos das embarcações podem ser recolhidos em contentores e dispostos correctamente. As opções de reutilização, reciclagem ou de uso de estações de tratamento fora do porto devem ser investigadas. Mais ainda uma regulação e um sistema de taxas devem ser elaboradas e implementadas de forma suave de forma que as embarcações estejam encorajadas em dispor os seus resíduos de forma apropriada no porto. O impacto negativo residual é considerado de significância menor

Manuseamento de cargas e de resíduos gerados pelo porto
Na área portuária, resíduos gerados durante as operações portuárias terão de ser tratados de forma apropriada, caso contrário, esses resíduos poderão causar poluição em terra e potencialmente no meio marinho. Se os resíduos forem

recolhidos e dispostos de forma inapropriada, estes podem ir parar na água causando riscos de saúde e de segurança.

Os resíduos gerados pelas operações portuárias devem ser geridas de forma apropriada de forma a evitar riscos de saúde e assegurar que os resíduos estão dispostos de forma a não prejudicar o ambiente. As autoridades portuárias devem aplicar os procedimentos apropriados em acordo com as regulações nacionais e internacionais para manuseamento e armazenamento de cargas perigosas e de resíduos gerados por esses tipos de cargas. O impacto negativo residual é considerado de significância menor

Impactos do aumento do consumo de energia
O porto presentemente depende de combustíveis fosseis e da ELECTRA (também operado com combustíveis fosseis e no limite da sua capacidade) para cobrir as suas necessidades energéticas. Como os combustíveis fosseis esta fortemente em crescimento é recomendado que o porto pudesse analisar alternativas de fontes de energias renováveis. O sistema solar e de vento devem provar a sua viabilidade, considerando as condições de clima de sol e vento forte na ilha do Sal.

O uso de equipamento modernos e bem mantido ira reduzir a quantidade de energia requerida no porto. Adicionalmente, uma simples avaliação própria do uso de energia pode indicar o uso elevado de energia e de perdas e indicar oportunidades para redução do uso de energia no Porto. O impacto negativo residual ‘e considerado de significância menor.

Impactos na saúde e segurança
A Saúde e segurança ocupacional específicos de azar e riscos associados com a operação do porto de Palmeira e com embarcações que entram na baia e atracam no cais, como: substancias químicas perigosas que pode conter um potencial espoliado de uma variedade de materiais de riscos, como tintas tóxicas, metais pesados, etc. Em outras substâncias químicas de riscos pode-se incluir os com potencial de incêndio e explosão. O porto é relativamente pequeno, consequentemente esses efeitos podem ser de pequena dimensão; riscos biológicos que pode ser a exposição de patogénicos presentes no porto e no lixo e esgoto das embarcações

Para mitigar os impactos negativos identificados na saúde e segurança a administração portuária deve desenvolver e implementar procedimentos incluindo um plano de gestão de saúde e de segurança, provisão de segurança de incêndios e um plano de segurança Portuário.
O impacto negativo residual ‘e considerado de significância menor

Impactos resultantes do manuseamento do cimento

Qualidade da agua do mar
Para prevenir que os produtos de cimento caiem ou soprados na agua e por conseguinte afectar a qualidade da agua os equipamentos devem ser bem mantidos e o cais propriamente limpo com as aguas residuais recolhidas e tratadas. Devem ser instalados Equipamentos apropriados de armazenagem e de carga e descarga. Se os equipamentos forem adequados e as medidas de limpeza asseguradas o impacto negativo será de menor significância

Impactos resultantes do terminal de óleos/manuseamento dos óleos

Acidentes, derrames e, incêndios e outros desastres
Depois da modernização, é esperado que o número de embarcações usando as facilidades do porto ira aumentar e haverá um aumento de poluentes (ex. Óleo mineral e hidrocarbonetos) e consequentemente um aumento dos riscos de derrames e de acidentes. Fugas, derrames e emissões furtivas de óleos, lubrificantes, combustíveis e outros líquidos são mais prováveis de serem as principais causas da degradação da qualidade da água do mar durante a fase operacional.

O Porto deve desenvolver um plano de contingência próprio de derrames de óleos e ter equipamentos de prevenção de derrames. Procedimentos padrão de operações, manutenção de rotina e planos de testes, indicações de operar em mas condições de tempo e de mar agitado e práticas de operação ambiental próprias devem ser implementadas. Todas as embarcações, se contendo ou não, devem ser reportadas e investigadas e a sensibilização geral de todos os trabalhadores deve ser aumentada através de encontros de formação e de segurança.
O impacto negativo residual ‘e considerado de significância menor (excepto em caso de uma emergência).

Impactos das actividades Ro-ro

Emissão de ar e de ruídos
Presentemente no Porto de Palmeira na existe qualquer facilidade de ro-ro. ‘E esperado que num período de poucos anos a rampa ro-ro estará operacional em Palmeira e um serviço planificado começará brevemente depois da rampa estar construída. O Ro-ro será capaz de transportar cargas gerais e em contentores, assim como passageiros e viaturas.

A chegada do barco ro-ro fará aumentar o tráfico de camiões e carros de passageiros chegando e partindo do porto. Isto pode provocar um impacto temporário negativo do ruído e da emissão do ar nos receptores sensíveis mais próximos na vila de Palmeira de uma significância moderada
Como a expansão do Porto, prevê-se a replanificação do acesso ao porto e estradas, incluindo a criação duma área de espera para camiões na entrada do Porto e estão previstas a criação de uma área para camiões e viaturas a espera de embarcar no ro-ro. Este impacto negativo é considerado de significância menor.

Impacto resultante das operações do terminal de contentores

Emissão de ruídos
Os equipamentos de manuseamento, da planta e de movimentação de cargas irá gerar ruídos, especialmente o manuseamento de contentores vazios. Boas práticas devem ser aplicadas para redução de emissão dos desnecessários intensos ruídos nos receptores sensíveis mais próximos (Vila de Palmeira), como o não manuseamento de cargas durante a noite ou de arrumação de contentores a alturas reduzidas.

O impacto negativo residual é considerado de significância menor

MONITORIZAÇÃO/ PLANO DE GESTÃO AMBIENTAL

As medidas de monitorização conforme descritas do EIA devem ser implementadas na pratica e monitorizadas sobre responsabilidade de certas partes como a ENAPOR, Câmara Municipal do Sal.

Por isso, os planos de gestão e monitorização ambiental para a construção e a fase operacional foram elaborados para os tópicos de gestão de resíduos, dragagem, contingência, saúde e segurança e recursos naturais.

CONCLUSÕES E RECOMENDAÇÕES

Se as medidas de mitigação recomendadas forem executadas de forma correcta assim como monitorizado por varias partes responsáveis, a expansão do porto de Palmeira, deve durante a sua fase de construção assim como depois durante as operações do porto expandido somente contribuirá de forma menor para impactos negativos no seu ambiente e saúde e segurança dos seus trabalhadores e outros receptores sensíveis mais próximos, como os residentes da vila de Palmeira. Espera-se impactos socio-económicos positivos do porto, mesmo a uma forma maior com destaque as operações do novo porto que irá ser a pré-condição para o futuro desenvolvimento económico sustentável (de turismo) na ilha.

Executive Summary EIA Expansion Port of Palmeira (English)

INTRODUCTION

The present document constitutes the Non Technical Summary (NTS), which is part of the Environmental Impact Study for the Expansion of Palmeira Port.

ENAPOR and the Ministry of Infrastructure, Transport and Sea (MITM) are in the process of expanding and modernising the Port of Palmeira on the Cape Verde Islands. The planned improvements will consist of an expansion of the existing quay, the creation of additional berths for marine ships through a land reclamation, expansion of existing storage areas, construction of new buildings and the demolition of old buildings and structures.

The Regulation Decree-law no. 14/97 (1st July 1997) and the updated and expanded Decree-law no. 29/2006 obliges developers to conduct for certain activities an Environmental Impact Assessment (EIA), which should contain all the relevant facts for the General Department of Environment of Cape Verde to take a decision about:

- "Environmental authorisation" for ENAPOR / MITM;
- The "conditions" under which the Project may proceed, if authorised.

The EIA process has been an evolutionary one in that during a period of eleven months different alternatives, as many as seven for the location of the new quay and several for the land based activities (e.g., locations, configurations, techniques), for the expansion of the Port were assessed on their environmental and social performance. Based on environmental, social, technical, financial and other aspects, one preferred option for the Port's expansion was finally chosen by ENAPOR.

PROJECT OBJECTIVES AND JUSTIFICATION

The progressive economic development of the Island, mainly in the last 15 years, stimulated by the modernisation of the international airport, has led to an increase in the transport of goods, numbers of passengers and industrial activities (e.g., quarry exploitation, tourist industry). As a result, the Port of Palmeira has been subject to strong growth in terms of economic activities, which it was not prepared for.

The present Port's facilities and land space are therefore over-occupied and new facilities will be required to serve the additional cargo flows generated by the development of new tourist facilities, new housing for the growing population, and for the increased daily consumption generated by additional visitors and population. The plans for expansion of the Port of Palmeira fit into the overall national development strategy of Cape Verde. This strategy is aiming at strengthening the main ports of Cape Verde (e.g., Mindelo, Praia and Palmeira) as well as developing its tourist potential.

PROJECT ENVIRONMENT AND EXPANSION

Port area and trade

The Port of Palmeira, located on the west coast of Sal Island, is the third largest port in the Cape Verde islands and serves the entire Sal Island, which represents about 4.5% (i.e., 20,000 inhabitants) of the total Cape Verde population. The port has an existing single berth, 120m in length and with variable water depths; as well as office buildings, some storerage buildings, and a small open storage area for containers and cabotage. It also an offshore mooring facility with four mooring buoys and one flexible connection point for unloading JET-A1 (airplane fuel) linked to a submerged pipeline to supply to Shell and ENACOL (National Oil and Gas Company). The port is fenced off and has a guarded gate.

Approximately 75% of the transport through the Port, totalling approximately 130,000 tonnes (2005 data) consists of inter-island traffic. Imported goods represent approximately 80% of the transport of goods through the Port. The yearly average of Port calls is around 300.

Project area

The Project area is located on the west coast of the island Sal on the Cape Verde archipelago near Palmeira village with a population of around 1,100 inhabitants.

What little vegetation there is near the port, on the dry, arid Sal island consists mainly of a few common species such as acacias and palm trees. The marine ecosystem around the project site is interesting in terms of biodiversity but less important in terms of biomass, which means that there are a variety of species present but at low quantities (and with low commercial interest). The waters of Sal are mainly known for its variety of fish species and the seasonal presence of cetaceans (whales and dolphins) and turtles.

The most sensitive potential receptors to the Port are:

- the village of Palmeira, located in close proximity to the Port (200-300m), and with the centre of the village at a distance of less than 500m to the Port;
- a small-scale artisanal fishing industry in and near the Port;
- an electric power plant and a desalinsation plant by ELECTRA in the area north of the Port;
- a fuel buoy; and
- Murdeira Bay at eight kilometer south-west of the port, which is the first Marine Reserve of Cape Verde, home to some migrating humpback whales, various important turtle species and acting as a fish nursery for a wide variety of fish, including a few endemic species.

Project description

A Master Plan has been prepared for the modernization and expansion of Palmeira Port (2007). The main development stages have been phased in the following ways:

First phase (to be completed medio 2009)

Consisting of an extension of the existing quay, including a roll-on/roll-off (ro-ro) berth and with facilities to load and unload fuels and cement at the berth; a length of 90m, a width of 25m and a water depth of 6m.

In this phase, only the extension of the existing quay will be constructed, and temporary facilities will be created for the ro-ro activities. An access road to the quay extension will be created behind the existing quay. This access road will also provide access to the site during construction, and will reduce the hindrance to the ongoing port activities. The berth will not only be provided with a ro-ro ramp, but also with cement and fuel (un)loading facilities. The available water depth at the extension of the existing pier will be 6m, approximately 1m more than at the existing quay.

Second phase (to be completed medio 2011)
A new quay west of the existing port in deeper water with an approximate length of 150 m, width of 35m, a water depth of 9.5m.

In this second phase, the new quay, west of the existing quay, and the landside facilities, and infrastructure on the terminal will be developed. The new pier, mainly intended for international cargo, would be constructed further out to sea and, more or less, parallel to the existing pier. The apron depth behind the new quay would be approximately 35m. The new pier would be connected to the shore by means of a causeway, leading directly into the extended international container yard. The nautical access for the new pier would be suitable for larger ships.

Third phase (not included in the EIA)
An extension of 100m of the new quay, to take place in the future.

Furthermore, the first and second phases include:

- Relocation of the administration (ENAPOR) office to a new building;
- Construction of a passenger terminal building;
- Construction of a cargo shed for international cargo (under customs);
- Development of a Container Freight Station (CFS) for cargo (de)consolidation operations;
- Construction of a workshop for the maintenance of terminal equipment, creation of parking area for equipment;
- Re-planning of port access and roads, including the creation of a truck waiting area at the port entrance;
- Allocation of an area for trucks and cars, waiting to embark the ro-ro ships;
- Demolition of obsolete structures and buildings.

ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

Potential impacts assessment and mitigation measures have mainly been focussed on the construction phase and the operational phase.

Construction phase

Impact resulting from general construction works

Waste generation during construction and mitigation measures
The construction activities for the new Port facilities will result in the production of solid and liquid waste from construction materials, “domestic” (i.e., household) waste generated by construction workers. Potentially hazardous chemical wastes can be expected from machinery use and maintenance, such as fuels and oils and the drums

that contained such substances. A (localised) impact on groundwater and soil quality at the Project site could occur if improper management of these wastes occurs, via an accidental spillage.

To mitigate these impacts It is recommended that the Contractor shall manage all solid and liquid wastes, including general refuse from site workers and construction wastes and hazardous wastes, generated during the construction works. Measures shall be put in place to ensure that solid or liquid wastes are not disposed of to sea or fly-tipped outside the construction site. In this case, the residual risk and impact is likely to be of **minor** significance.

Air quality
The operation of the equipment and vehicles used during the construction works will contribute to deterioration of the ambient air quality in the work area and potentially in the local geographical area by emitting pollutants such as carbon dioxide, carbon monoxide, nitrogen oxides, particulates (e.g., PM_{10}) etc.

The chosen construction contractor should limit air emissions by adhering to best practice for example maintaining and servicing vehicles and construction machinery and good housekeeping measures such as preventing engines from idling and running unnecessarily. The use of relatively new trucks and good quality fuel is recommended to reduce the impact of transport and other vehicles. For the transport of construction materials, such as rocks to the port, the use of alternative routes (dirt tracks which should be upgraded to at least gravel to minimize dust) at sufficient distance from the villages of Palmeira and Espargos are recommended. If the contractor performs well in minimising air emissions and disturbance from dust, the significance of the impact may be reduced to **minor** negative levels.

Noise
There will be an increase in noise levels in the work area as a result of the operation of equipment used in dredging, demolition of the buildings and construction of the planned marine and terrestrial infrastructures. The noise generated during construction activities may have a negative impact on background noise levels, which can result in disturbance and disruption as well as associated health problems at nearest sensitive receptors. Best practice behaviour and actions on site such as careful timing, are required in order to avoid disturbance to sleep patterns at night and complaints from residents. If noisy construction activities are properly managed and timed, the negative, temporary and localised impact of noise emissions at nearest sensitive receptors may be reduced to **minor** to **moderate** significance.

Leakage or spillage
Negative impacts from leakage or spillage may appear due to the use of heavy equipment necessary to carry out the construction works. If any accident takes place in which there is a leakage or spillage of oil or fuel into the water environment or on the ground, there will be a negative impact on water or sediment quality. Good operational practices such as storage, positioning and protection of fuel stores, drip trays, and proper maintenance of plant and equipment will minimise impacts associated with spillages. The risk of spillage can thereby be reduced with a potential residual negative impact of **minor** significance.

Wastewater, sewage and run-off
Sewage originating from the workers working in the Port could, if discharged directly to sea, have a negative impact on the environment.

In order to mitigate impacts related to silt-laden run-off, it is recommended to properly clean quays and construction terrain as to prevent the run-off to minimise the potential of such effluents to reach the marine environment. Domestic sewage must be disposed of in accordance with the requirements of the relevant regulatory authorities. The residual negative impact is considered to be of **minor** significance.

Use of natural resources
For the construction of the quays, breakwater and paving in total about 350,000 m3 quarry run, 145,000 m^3 of rock and aggregates (e.g. gravel), 55,000 m^3 of sand, and 30,000 tons of cement is needed.

Rocks can likely be sourced from a quarry on Sal island. Sand extraction at Sal island is not allowed due to environmental concerns. Sand will therefore have to be imported. Rocks and sand from dredging can after sampling for contaminations probably be re-used in the land reclamation, however dredging quantities alone will not be sufficient for the land reclamation.

The residual negative impact is considered to be of **minor** significance.

Local society and economy
During the construction phase, which will take about three years to complete the first and second phase, it is estimated that 200-300 workers and related supplies will be required.

Positive impacts will be associated with the construction phase which will result in job creation (both direct and indirect), the multiplier effect (e.g., spend on local materials, revenue generated with local suppliers, workers' spending money) and hence, increased income. Other economic activities can benefit from the presence of the workers.

The residual positive impact is considered to be of **minor** significance.

Safety
A Health and Safety plan should be prepared and implemented by the contractor. And proper training, written instructions and personal protective equipment should be provided. The residual negative impact is considered to be of **minor** significance.

Fishery
The construction activities could have a negative impact on the activities of local fishermen, if they were to hamper the general accessibility of the Port infrastructure. Considering the phasing and lay-out of construction activities, no impact is however predicted to occur.

Impact resulting from breakwater/coastal revetment construction

Natural seabed
The impact at the location of the new breakwaters and extensions of the quay will be the irreversible loss of the footprint of seabed and any natural species living just above it

(epibenthic[1]), on or in it. There are no indications for significant populations of precious marine flora and fauna species at the location of construction. Any mobile fauna (e.g., small fish) may relocate to nearby foraging grounds. In addition, the chosen port expansion alternative is expected to have a smaller localised impact than the other alternatives that were considered. The residual negative impact is considered to be of **minor** significance.

Coastal erosion and accretion
Changes in currents caused by the construction (and hence presence) of a new quay and breakwater may lead to erosion and accretion in the shore zone. The impact is expected to be minimal due to the rocky underground, the absence of large amounts of suspended materials in the water and the weak present current in Palmeira Bay. The residual negative impact is considered to be of **minor** significance.

Marine life
The construction of the breakwater and the new quays may have the following potential impacts on marine life: direct loss of seabed and invertebrate fauna, such as sponges and coral, adjacent or underneath the footprint of the development; remobilisation of suspended sediment leading to smothering of benthic marine life, such as invertebrates, particularly coral species and; impact of noise on cetaceans and turtles. Well-planned timing of noisy activities, visual checks on the presence of cetaceans and ramping-up noise will severely decrease the impact. The residual negative impact is considered to be of **minor** significance.

Sea water and sediment quality
During construction of the revetment, there is a potential for short-term increases in suspended sediment as result of dredging vessel movements and construction activities. The sediment present in the bay near the quay might be contaminated, although sediment samples have so far not pointed towards any pollution above maximum allowable levels. The remobilisation of sediment could therefore pose a small risk of causing deterioration of water quality. The residual negative impact is considered to be of **minor** significance.

Impact resulting from dredging and reclamation

Water quality
During phase 1 of construction it is expected that a volume of 4000 m^3 will have to be dredged at the location of the (to be) extended quay wall, of which circa 500 m3 is comprised of rock and 3500 m^3 of sand and granular material. South of the extended quay a shallow point will be dredged with a volume of circa 6,500 m^3, consisting of rock (basalt, circa 2.500 m^3) and granular material (circa 4,500 m^3). Dredging of rock at and near the location of the (to be) extended quay is planned to be carried out by means of dredger with a pneumatic hammer and backhoe, by which the hammer will be used to release a layer of rock and the backhoe to grab and remove these rocks.

Part of the port basin for the phase 2 quay will have to be dredged. The volumes of dredging are expected to be limited to 3000 m^3 of rocks and 1500 m^3 of granular material.

[1] i.e., relating to the area on top of the sea floor. Epibenthic organisms may be freely moving or sessile (permanently attached to a surface).

This would result in a total dredging volume of 15,000 m3, comprising of 8,500 m3 of sandy / granular material and 6,500 m3 of rock.

It can be expected that the suspended sediments will not move far away from the places where the construction work is carried out as the local currents at Palmeira Bay are weak and variable. The residual negative impact is considered to be of **minor** significance.

Marine life
Dredging and reclamation can have the following potential impacts on marine life: direct loss of seabed and invertebrate fauna, such as sponge and coral, adjacent or in the dredged or reclaimed area; mobilisation of suspended sediment (e.g., from dredging) leading to smothering of benthic marine life, such as invertebrates, particularly coral species; impact of noise on cetaceans and turtles.

Especially the dredging of rock can produce significant underwater sound levels, The choice of dredging equipment, timing outside sensitive seasons, ramping up noise, appointing an observer and performing visual and vocal checks on the presence of cetaceans (whales and dolphins) near the dredging area before dredging commences can significantly reduce the impact.

Good dredging practices and timing can reduce sediment resuspension, which could impact on corals.

The residual negative impact is considered to be of **minor** significance.

Impact resulting from construction of quay walls

Natural seabed
The impact at the location of the new breakwaters and extensions of the quay will be the irreversible loss of the footprint of seabed and any natural species living just above it (epibenthic) on or in it. In view of the absence of any precious underwater vegetation and known species, any mobile fauna (e.g., small fish) may relocate to nearby foraging grounds. The residual negative impact is considered to be of **minor** significance.

Coastal erosion
Changes in current and drift may be leading to some erosion and accretion in shore zone caused by the construction of new quay and breakwater. The residual negative impact is considered to be of **minor** significance.

Soil quality (landward)
Impacts from leaching from on-land storage of dredged material to be re-used later for land reclamation may generate leaching in the soil as well as in discharge waters. Measures should be taken to avoid direct contact with soil, ground, surface or rain water. The residual negative impact is considered to be of **minor** significance.

Impact resulting from construction of buildings and structures

Waste generation by landside construction

Construction activities will result in the production of solid and liquid wastes from construction materials, construction workers' wastes and potentially hazardous chemical wastes from machinery use, refuelling and maintenance. If not properly managed and a clear waste disposal strategy adopted by the chosen contractor, this may be a negative impact.

It is recommended that the chosen contractor manage all solid and liquid wastes, including general refuse from site workers and construction wastes and hazardous wastes, generated during the construction works, as well for the structures at the waterfront and landside. The residual negative impact is considered to be of **minor** significance.

Local society and economy
For the realisation of the planned expansion on the landside, a small number of houses (six), a primary school and a football field need to be removed and relocated. ENAPOR and the municipality have informed the affected stakeholders of the required relocation and have considered and discussed with them possible relocation options. If the compensation and relocation is carried out as planned and agreed, there should be no residual negative impact**.**

Operational phase

Impacts resulting from the increase in the Port's operational activities

Local society and economy
Positive impacts on the local economy will occur in the operational phase with the port expansion being essential for the further development of the tourism sector at Sal. As well as the beneficial consequences of job creation, increase in Port revenues, improvement in supplying markets, improvement of safety in port activities, opportunities for the establishment of industrial or logistic activities, improvement of access to better quality goods and the improvement of the income and living conditions of many families. The residual positive impact is considered to be of **major** significance.

Waste water, sewage and run-off
Run-off from raw material storage, spills from cargo handling and dust from cement handling, can also adversely affect sea water quality in the surrounding area. Increased amounts of sewage will be generated as the number of employees will increase. If this is discharged directly to the sea this will cause a negative impact on seawater quality.

Stormwater detention/retention is incorporated in the design. Terminal areas that could potentially impact on stormwater — such as the equipment and crane maintenance areas — have to be equipped with oil/water separators. The sewage collected from the office buildings and the passenger terminal should be collected and treated in a small sewage treatment system or septic tank. If the measures described above are carried out, no or a minor significance negative impact could occur from wastewater, sewage and run-off. The residual negative impact is considered to be of **minor** significance.

Sea water quality from ships
Possible discharges from ships could be sources of pollution in sea water including ballast waters, oil wastes, sewage, garbage and other residues from ships. Leakages,

spills and fugitive emissions of oils, lubricants, fuels and other liquids are likely to be the main cause of the degradation of the seawater quality during operation phase. Correct management of port activities will be essential to minimise impacts on water quality, sich as the development of a “contingency plan” at Port level; to undertake a Ballast Water Risk Assessment (BWRA), to request arriving ships to submit reporting forms; and to conduct biological surveys/monitoring in the port and alert shipping of outbreak of harmful species. The residual negative impact is considered to be of **minor** significance (except in the case of an emergency).

Air quality
Impacts on ambient air quality could increase due to the intensification of activities associated with the overland transport of goods, the operation of ships, cargo landings and ship maintenance, which will increase the emissions of atmospheric pollutants. Ships are expected to be the main source of polluting emissions, generated especially during manoeuvring and berthing. The predominant north-eastern winds are likely to disperse most of these pollutants seawards. The residual negative impact is considered to be of **minor** significance.

Maintenance dredging
Negative impacts on seawater quality may be derived from maintenance dredging activities on the seabed. Considering the very low sedimentation rate, which has not required any maintenance dredging activities in the history of the Port, future dredging operations are expected to be infrequent and only for small quantities of sediment. The residual negative impact is considered to be of **minor** significance.

Marine life
Post-modernisation of the Palmeira Port on Sal, it is expected that the number of ships using these facilities will increase and result in more shipping activity throughout the region. It is expected that in the coming ten years, the number of ships calling at the Palmeira Port will at least double. The first marine reserve of Cape Verde, Murdeira Bay, lies at a distance of eight kilometres downstream of Palmeira Port.

These threats may affect both terrestrial and marine environments, such as habitat degradation resulting from increased effluent and contamination from the coastal development construction of marinas and increased boat traffic. Combined, these impacts could diminish the health of the coastal marine ecosystem.

In order to address some of the potential impacts to the marine population of Sal and to minimise some of the disturbance caused by increased shipping, a Code of Conduct including e.g. ships maintaining a constant course and speed upon approaching the port, and avoiding discharges until ships are docked, should be drafted, distributed to the port users and be strictly monitored. The residual negative impact is considered to be of **minor** significance.

Ship generated waste
During the operational phase, on the Project site, ships are the main sources of waste generation for example, oily wastes, washing water, lubricant oil, cargo residues and ballast. These wastes have the potential to cause serious problems if not controlled or well managed. Unsanitary conditions, odours and other degradation of water quality may occur.

All ship related waste with a potential to cause pollution to the marine environment should be disposed of according to the guidelines stipulated by the MARPOL Convention.

It is recommended that for the collection of oily waste and bilge water, a small collection boat or truck be made available. General household waste and other solid waste from ships can be collected in containers and disposed of correctly. Options for re-use, recycling or the (additional) use of existing waste treatment facilities outside the Port should be investigated. Furthermore, **a regulations and fee system should** be designed and implemented in a smart way such that ships are encouraged to dispose of their waste in a proper way in the port. The residual negative impact is considered to be of **minor** significance.

Cargo handling and port generated waste
In the Port area, waste products generated from operation of Port facilities will have to be treated in an appropriate way, otherwise this waste will cause pollution on land and potentially in the marine environment. If not properly collected and disposed off, waste in the Port could end up in the water causing safety and health hazards.

Waste generated by Port operations shall be managed appropriately in order to avoid health hazards and to ensure that waste is disposed of in an environmentally sound way. The Port authorities should apply appropriate procedures, in agreement with national and international regulations, for the handling and storage of hazardous cargoes and waste generated by handling and storage of this type of cargoes. The residual negative impact is considered to be of **minor** significance.

Impacts from increased energy consumption
The port currently relies on the fossil fuel and the ELECTRA power plant (also operated on fossil fuel and at the limits of its capacity) to fulfil its energy demands. As fossil fuels are heavily on the increase it is recommended that the Port looks into alternative, renewable energy sources for the Port. Solar and wind-powered systems might prove feasibly considering the very sunny and quite windy climate conditions at island of Sal.

Use of modern and well maintained equipment will also reduce the amount of energy required in the port. In addition a simple self-assessment on energy use can indicate high energy uses and energy losses and provide opportunities for reducing the use of energy in the port. The residual negative impact is estimated to be of **minor** significance.

Impacts on health and safety
Specific occupational health and safety hazards and risks are associated with the operation of Palmeira Port and with ships entering the bay and berthing at its quays, such as: physical hazards that may be associated with the work at the Port; chemical hazards that may include potential exposures to a variety of hazardous materials such as toxic paints, heavy metals, etc. Other chemical hazards may include the potential for causing fire and explosions. The Port is relatively small, thus these effects may be of limited size; biological hazards that may include potential exposure to pathogens present in the Port and ship garbage and sewage.

To mitigate the identified negative impacts on health and safety, the Port administration should develop and implement management procedures including a Health and Safety Management Plan, fire safety provisions, and a Port Security Plan.

The residual negative impact is considered to be of **minor** significance.

Impacts resulting from cement handling

Sea water quality
To prevent cement products to drop or be blown in the water and thus affecting water quality, equipment should be well maintained and the quays should be properly cleaned, with the waste water collected and treated. Proper equipment for storage and loading unloading should be installed. If there are proper equipment and cleaning measures in place, the negative impacts will be of **minor** significance.

Impacts resulting from oil terminal/ oil handling

Accidents, spills, fires and other disasters
After modernisation, it is expected that the number of ships using Port facilities will increase and there will be an increase of pollutants (e.g., mineral oils and hydrocarbons) and hence, an increased risk for spills and accidents. Leakages, spills and fugitive emissions of oils, lubricants, fuels and other liquids are likely to be the main cause of the degradation of the seawater quality during operation phase.

The Port should develop their own oil spill contingency plan and have adequate stockpiles of oil spill prevention equipment. Standard operating procedures, routine maintenance and testing schedules, guidelines for operating in poor weather and high sea state conditions and proper environmental operating practices should be implemented. All spills, whether contained or not, should be reported and investigated and general awareness of all workers should be increased through training and safety meetings.

The residual negative impact is considered to be of **minor** significance (except in case of an emergency).

Impacts from ro-ro activities

Air and noise emissions
Currently at Palmeira port there are no ro-ro facilities. It is expected that in a few years a ro-ro ramp will be operational in Palmeira and a scheduled service will start soon after the ramp has been constructed. Ro-ro will be able to transport general cargo and containerized cargo, as well as passengers and cars.

The arrival of a ro-ro vessel will create a flow of trucks and passengers cars arriving and departing from the port. This could result in a temporary, negative impact from noise and air emissions on nearby sensitive receptors in the village of Palmeira of moderate significance.

As the port expansion foresees in the re-planning of port access and roads, including the creation of a truck waiting area at the port entrance; and the allocation of an area for

trucks and cars, waiting to embark the ro-ro ships is foreseen, this negative impact is considered to be of **minor** significance.

Impacts resulting from container terminal operations

Noise emissions
Handling equipment, plant and moving cargo will generate noise, specifically the handling of empty containers. Best practices should be applied to reduce unnecessary loud noise emissions for nearby sensitive receptors (village of Palmeira), such as no cargo handling during night-time, or stacking of containers to reduced heights.

The residual impact will be of **minor** to **moderate** significance.

MONITORING/ ENVIRONMENTAL MANAGEMENT PLAN

Monitoring measures as described in the EIA should be implemented in practice and monitored under the responsibility of certain parties such as the contractor, ENAPOR, Municipality of Sal.

Therefore Environmental Management and Monitoring Plans for the construction and operational phase have been developed for the topics of waste management, dredging, contingency, health and safety, and natural resources.

CONCLUSIONS AND RECOMMENDATIONS

If the recommended mitigation measures are properly executed as well as monitored by the various responsible parties, the expansion of the port of Palmeira should during its construction phase as well thereafter during operation of the expanded Port only contribute to a minor extent to negative impacts on its environment and on health and safety of its employees and other nearby sensitive receptors, such as the residents of Palmeira village. The socio-economic impacts of the port are expected to be positive, even to a major extent with regard to the operation of the extended port which will be a precondition for the future sustainable economic development (of tourism) on the island.

CONTENTS

1 INTRODUCTION

Empresa Nacional de Administração dos Portos, S.A. (ENAPOR) and the Ministry of Infrastructure, Transport and Sea (MITM; hereafter referred to as the "Client" and project proponent) are in the process of expanding and modernising the Port of Palmeira (the "Port") on the Cape Verde Islands. The planned improvements will consist of an expansion of the quay, creation of additional berths for marine ships, expansion of existing storage areas, construction of new buildings and the demolition of old buildings and structures.

The government of Cape Verde is in the process of obtaining financing from the European Investment Bank for the construction cost of the Project.

The Regulation Decree-law no. 14/97 (1st July 1997) and the updated and expanded Decree-law no. 29/2006 obliges developers to conduct (for certain activities) an Environmental Impact Assessment, which has to be approved by the General Department of Environment. The Project must also take into account European Union (EU) environmental guidelines. Furthermore, it is necessary for the State Department of Environment to grant authorization for the "Modernization and Expansion of the Palmeira Port Project" (i.e., the "Project") before it can proceed.

More specifically, the above legislation requires that an environmental study must be undertaken to provide the State Department of Environment with all the relevant facts to take a decision about:

- "Environmental authorisation" for ENAPOR / MITM;
- The "conditions" under which the Project may proceed, if authorised.

The Environmental Impact Assessment (EIA) study has therefore been carried out in line with national legislation, the requirements of the Project's financiers and with international best practices. An EIA is a tool (i.e., process and resulting report) with which to assess the potential adverse (and beneficial) impacts associated with all stages of the Project against the baseline scenarios. The methodology then allows for these impacts to be prioritised and mitigation measures to be planned and designed in order to avoid, reduce and minimise any significant adverse impacts to the environment.

This EIA has been undertaken in two stages: the first stage – the "scoping stage" (completed in February 2007) sought to engage interested and affected parties, gather relevant information on project alternatives, environmental, social and health issues and determine which parameters require further investigation and focus. This part of the study resulted in a "Scoping Report (Royal Haskoning, February 2007) document nr 9R9364.05.9501". In the second stage of the EIA (the main "impact assessment" stage), a picture of the baseline environment was prepared before project alternatives and a wide range of environmental impacts (and their solutions) were further investigated and assessed.

Data on the island of Sal in general and specifically the Port of Palmeira and its immediate surroundings were mainly collected from literature and interviews. Field sampling was conducted for the aspects of soil and sediment pollution. A visual inspection of the bay was conducted in order to acquire an overall insight in its marine ecology. For various aspects no or limited (baseline) data were available. The study did however not allow for additional field studies or modelling on a wide range of topics.

Considering this partial lack of data combined with the limited or negligible foreseen impact of some of these issues, the study regularly provides a qualitative rather than quantitative assessment.

A Baseline Report, submitted in June 2007, was formally part of the assessment stage.

This document – the Impact Assessment and Mitigation Report – follows on from the Scoping and Baseline Reports and includes:

- A project justification;
- Description of the specifications of the Port expansion and main construction activities;
- Description of impacts under a number of physical, chemical, natural and human environmental parameters;
- Description of recommended mitigation measures to minimise or prevent negative impacts.

The EIA process has been an evolutionary one in that during a period of eleven months different alternatives, as many as seven for the location of the new quay and several for the land based activities (e.g., locations, configurations, techniques), for the expansion of the Port were explored and developed. As a result, one preferred option for the Port's expansion beyond the footprint of the existing plot was chosen by the Client. In this Report, the impacts and associated mitigation measures of the preferred planned Port expansion are described and documented.

The following Section 2 outlines the Project objectives and reasoning for its expansion. Section 3 summarises the baseline situation (as reported in more detail in the Baseline Report) whilst Section 4 continues with a presentation of the details and features of the planned Port expansion and modernization. The impact identification and assessment process and findings comprise the critical Sections 6, 7 and 8 whilst the mitigation measures are outlined in Section 9 and 10. Monitoring initiatives are described in Section 11 with Conclusions and Recommendations offered in the last Section 12.

2 PROJECT OBJECTIVES AND JUSTIFICATION

Sal Island has great potential for tourism, due to its year-round sunny climate, the existence of excellent beaches and warm sea water. The mean temperature of the island is around 25 Celsius. The combination of favourable natural conditions alongside good access i.e., Sal International Airport (the first international airport of Cape Verde) is advantageous for the development of many (planned) hotels and resorts.

The progressive economic development of the Island, mainly in the last 15 years, stimulated by the modernisation of the international airport, has led to an increase in the transport of goods, numbers of passengers and industrial activities (e.g., quarry exploitation, tourist industry). As a result, the Port of Palmeira has been subject to strong growth in terms of economic activities, which it was not prepared for. The capacity of Palmeira Port to accommodate for both current market demands and foreseen growth is limited, for several reasons, which are tied to the following factors:

- Palmeira Port has seen a growth in traffic over the last 10 years and foresees substantial growth in the near future, however, current Port facilities (including a single berth and a small land area) are not adequate to cope with this growth;
- There is a need to reorganise the port zone with regard to the siting and zoning of the different types of warehouse areas, workshops, the container park, the administrative area and its support infrastructure;
- There is a need to adjust and increase the productivity of Port equipment, optimising its use, in order to accommodate more ships and with shorter waiting and (un)loading times.

The Port of Palmeira is the only one serving the Island of Sal and together with the International Airport, it is the only entry to the island. The Port therefore plays an indispensable role in the transport of goods to the Island of Sal.

Figure 2-1 Palmeira Port seen from the water front at Palmeira village

The present Port's facilities and land space are over-occupied and new facilities will be required to serve the additional cargo flows generated by the development of new tourist facilities, new housing for the growing population, and for the increased daily consumption generated by additional visitors and population. The absence of new port facilities will certainly delay the construction of new building in Sal and will curtail the pace of development.

There is also a need to link the Port with its hinterland and urban surroundings from the perspective of economics, urban planning, logistics and the location of activities which are complementary to the Port facilities such as, related industries and services (e.g., nautical tourism), commerce, etc.

The plans for expansion of the Port of Palmeira fit into the overall national development strategy of Cape Verde. This strategy is aiming at strengthening the main ports of Cape Verde (e.g., Mindelo, Praia and Palmeira) as well as developing its tourist potential. International tourism has been identified as one of the main economic growth sectors of Cape Verde for the future.

It is clear that Sal Island is currently undergoing a process of strong economic growth with likely positive consequences for its population in economic terms. There is a correlation between increased wealth and more effective environmental performance. To facilitate this process, the Island is dependent on the expansion and modernisation of the existing Port and its facilities.

Figure 2-2 The Port of Palmeira with two ships simultaneously at the quay

3 CHARACTERISTICS OF THE BASELINE ENVIRONMENT

3.1 Port area and trade

The Port of Palmeira, located on the west coast of Sal Island, is the third largest port in the Cape Verde islands. Besides commercial activities associated with the transport of goods and passengers, it also comprises fishery activities and related industries and, without specific support facilities, some recreational sailing/yachting and maritime-tourism activities.

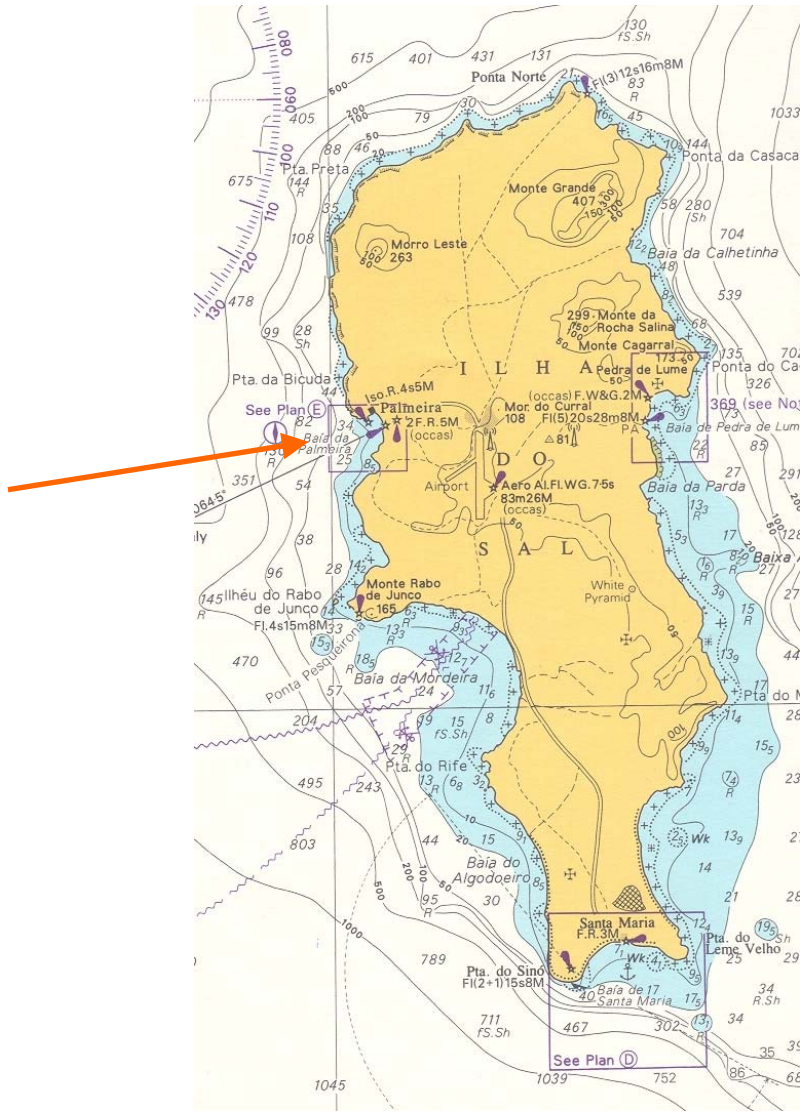


Figure 3-1 Sal island and the location of the Port of Palmeira

The Port of Palmeira has an existing single berth, 120m in length and with variable water depths (5m deep in the first 60m measured from the end of the quay, 3m deep in the next 30m and 2.5m deep in the last 30m closest to shore). It also has an offshore mooring facility with four mooring buoys and one flexible connection point for unloading JET-A1 (airplane fuel) linked to a submerged pipeline. This sea line ensures the supply of JET-A1 to Shell and ENACOL (National Oil and Gas Company). Both have nearby fuel depots, connected to the Port by a pipeline.

At present, Sal is the only island where JET-A1 is imported. From this island it is distributed to all other islands. A second sea line for JET-A1 is planned for the future on the Island of Santiago (Praia).

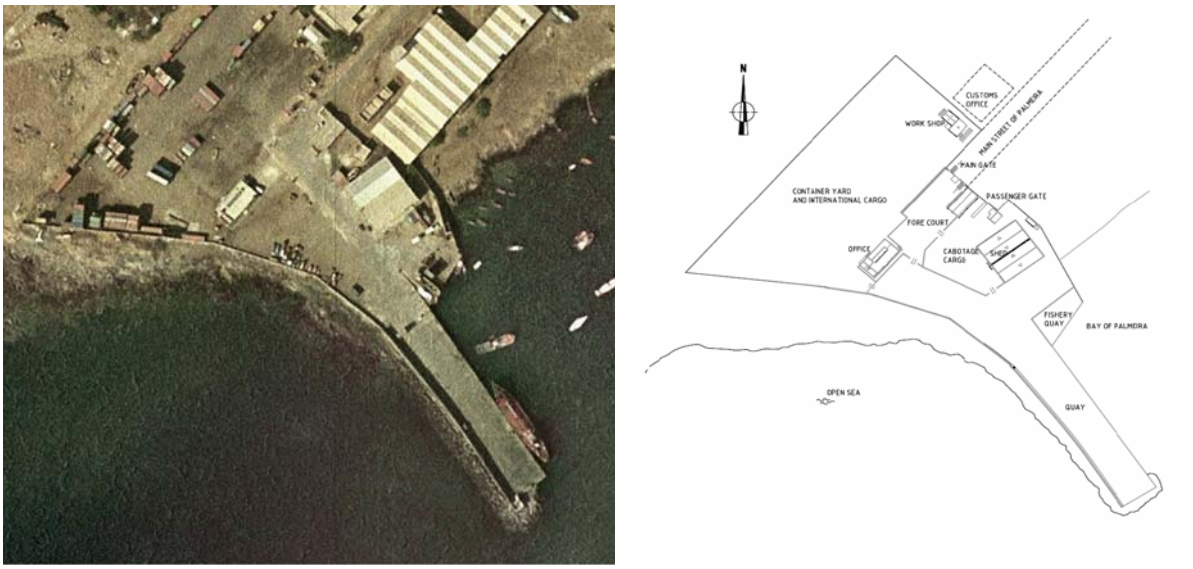


Figure 3-2 Aerial view and layout of the Port of Palmeira

The Port of Palmeira serves the entire Sal Island, which represents approximately 4.5% (i.e., 20,000 inhabitants) of the total Cape Verde population (based on 2006 data).

Approximately 75% of the transport through the Port, totalling approximately 130,000 tonnes (t) (2005 data) consists of inter-island traffic. Imported goods represent approximately 80% of the transport of goods through the Port. There is very little exported although some transhipment of hydrocarbons that have arrived at Sal through the fuel buoy, leave the Port through the pipeline at the quay.

The volumes handled in the Port over the last ten years are presented in the following figures for the inter-island traffic and for international traffic.

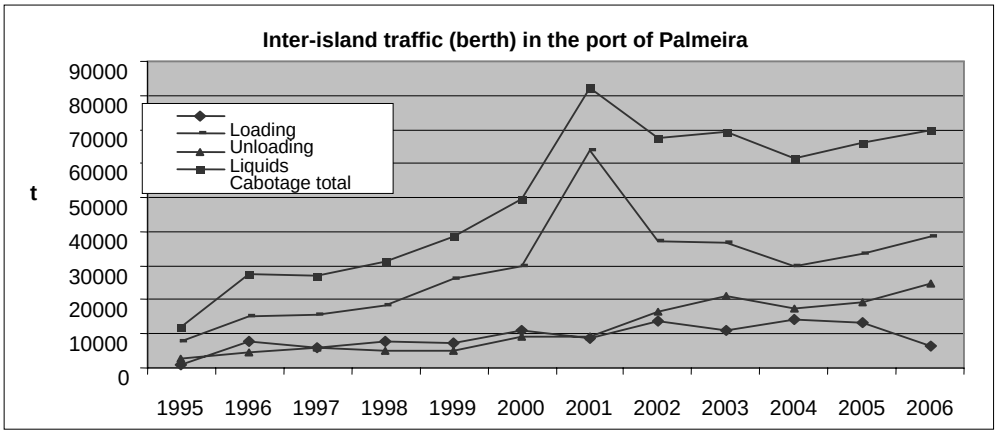


Figure 3-3 Inter-island traffic data for the Port of Palmeira

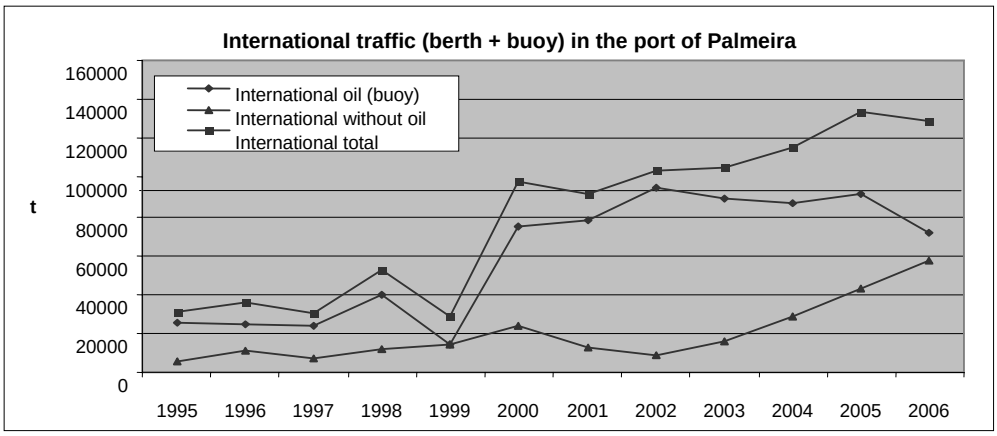


Figure 3-4 International traffic data for the Port of Palmeira

The figures indicate the following trends:

- The amount of cargo loaded (exported) is very small; Sal imports all its products;
- Inter-island traffic has grown gradually over the last three years;
- The international traffic for non-oil products (at the quay) is growing strongly over the last four years;
- The international traffic for oil using the buoy has decreased over the last year. However, this is as a result of the departure of the South African Airlines, and is expected to pick up in 2007.

The traffic flows show a strong dependency of the Island on goods being supplied from other (national or overseas) locations. The yearly average of Port calls is around 300.

The ENAPOR administrative building can be found within the Port boundary, as well as a warehouse used to store goods under customs, open storage areas for containers and also for cabotage cargo. Furthermore, there is a small workshop and some other small storage buildings. The main gate to the Port is guarded and its area has security fencing.

The quay and jetties have limitations in terms of space, reflected in various efficiency and safety restrictions with regard to loading and unloading and the circulation of people at the port. Currently, the transport of passengers conflicts with cargo operations as all these activities take place, sometimes simultaneously, at the same quay. Other problems are the lack of lighting at the jetty, as well as the long-term storage of empty containers in the port area.

Until recently the port operated only one shift a day. Due to increased volumes (over the year 2007) and although the number of ships calling at the port each day fluctuates, the port has now implemented three shifts a day for six days a week (Monday to Saturday) and with one shift on Sunday. The Port expects to operate on a 24/7 schedule in the future.

3.2 Project area

The Project area is located on the west coast of the island Sal on the Cape Verde archipelago. Palmeira is a port village with a population of around 1,100 inhabitants.

Palmeira Port has become of strategic importance for the development of the Island of Sal. Apart from port activities, Palmeira is one of three main towns on the island and with sufficient land available for future urban development.

In spite of the existence of sources of air pollution caused by the circulation of vehicles, marine ships, road traffic and by the power plant operations (ELECTRA) close to the port, air quality in the Palmeira village (port area and urban area) air is not very heavily affected, since the direction of the prevailing wind, from the north-east favours the dispersion of the pollutants in the direction of the sea. There have been no measurements carried out to establish the actual air quality. However, the numbers of complaints to the Client are limited.

Navigation, loading and unloading, and ship repair in the port and its surrounding areas can influence the quality of the water and consequently, of the sediments in the Port area.

The dominant terrestrial vegetation structure in the area is made up by a few common species and palm trees which are not unique in ecological terms or from a commercial point of view. However with Sal having a semi-arid climate, the total number of trees on the island is very low.

The marine ecosystem around the project site is interesting in terms of biodiversity but less important in terms of biomass, which means that there are a variety of species present but at low quantities (and with low commercial interest). Solitary fish species such as demersal fish (i.e., species that live on or near the seabed) or in small shoals such as mackerel species as well as some types of green and brown seaweeds can be seen.

3.3 The Port and nearby sensitive receptors neighbours

Any assessment of development at the Port must take into account its position within the community of Sal and particularly in relation to its immediate neighbours. The most sensitive potential receptors are described below.

1. **Palmeira**. The town of Palmeira is located in close proximity to the Port (edge of village at 200-300m from Port) and the town's master plan includes for further expansion in the direction of the Port. The planned development at the Port needs to be mindful of the need to minimise hindrance to the town's population in particular in relation to environmental nuisances such as traffic (presence and movements), noise and vibration, lighting at night, dust and other forms of pollution. A system of ring roads is already planned to relieve the town centre from heavy commercial traffic and the Port should take these future developments into account in designing new plans.
2. **Fishing industry**. There is an artisanal fishing industry in and near the Port. Although the normal cargo flows do not interfere with the fishing ships, any Port expansion should take into account the position of the fishing industry within the port so to avoid potential conflicts.
3. **ELECTRA power plant**. The area north of the Port belongs to ELECTRA, which operates a new power and desalination plant. From the desalination plant, pipelines run south-west to the sea with inlets for clean seawater, and an outlet for brine (residual water). One hectare of the ELECTRA plant area was recently acquired by the Port and has been allocated for port expansion.
4. **Fuel buoy**. The single buoy off-loading installation for hydrocarbons, in the bay, will have to be relocated because of the Port expansion. ENAPOR has informed the owners and users of this mooring buoy and the underwater pipeline system (Shell and Enacol) about the required relocation. It will be necessary to keep them further informed and to liase with them in adequate advance time in order to obtain agreements on the relocation and to avoid the delay of Port expansion works.
5. **Murdeira Bay** at eight kilometers south-west of the port, is the first "Marine Reserve" of Cape Verde, home to migrating humpback whales, various important turtle species and acting as a fish nursery for a wide variety of fish, including a few endemic species. This designation has been initiated by the project Natura 2000 and has been classified as a natural marine reserve by law decree 3/2003 ("*o regime jurÍdico dos espaços naturais*").

The most sensitive receptors to be exposed to potential adverse environmental impacts as a result of the Port expansion are the Palmeira village, with roughly 1,100 inhabitants, and the Murdeira Bay. There are only a few houses having a direct line of sight to the Port. The centre of the village is at a distance of circa 500m to the Port.

4 SPECIFICATION OF THE PORT EXPANSION AND MODERNISATION PROJECT

4.1 Project and alternatives description

4.1.1 Project description

The Project has prepared alternative options for the modernization and expansion of Palmeira Port, including expansion of the quay facilities, as well as the terminal facilities.

A Master Plan has been prepared by specialist maritime engineers at Royal Haskoning (2007). The main development stages have been phased in the following ways:

- First phase (to be completed at the middle of 2009): Consisting of an extension of the existing quay, including a roll-on/roll-off (ro-ro) berth and with facilities to load and unload fuels and cement at the berth;
- Second phase (to be completed at the middle of 2011): A new quay west of the existing port with an approximate length of 150 m, and including a second ro-ro ramp;
- Third phase (not included in the EIA): An extension of 100m of the quay, to take place in the future.

Furthermore, the first and second phases include:

- Relocation of the administration (ENAPOR) office to a new building;
- Construction of a passenger terminal building;
- Construction of a cargo shed for international cargo (under customs);
- Development of a Container Freight Station (CFS) for cargo (de)consolidation operations;
- Construction of a workshop for the maintenance of terminal equipment, creation of parking area for equipment;
- Re-planning of port access and roads, including the creation of a truck waiting area at the port entrance;
- Allocation of an area for trucks and cars, waiting to embark the ro-ro ships;
- Demolition of obsolete structures and buildings;

4.1.2 Project alternatives

The following alternatives have been considered and are documented in the Master Plan (Annex 1):

For the significant marine structures, five “options” were developed:

1. The existing Master Plan (2004) alternative by DHV, refer to drawing 03.9305;
2. Extension of existing quay, refer to drawing 03.9306;
3. New quay west, south-east orientation, refer to drawing 03.9307;
4. New quay west, south-south-west orientation, refer to drawing 03.9308;
5. Separate breakwater plus quay, refer to drawing 03.9309.

Options 2 to 5 are based on the traffic forecast as prepared by Royal Haskoning in 2007. Option 1 was prepared by DHV in 2004 and therefore was also based on their 2004 traffic forecast.

For the landside, two options were developed. In the first option the present infrastructure at the site is neglected and a completely new design was made. In the second option, optimal use is made of the buildings already present at the site.

During the development of the Project, several variations on the above mentioned alternatives were discussed, such as a port alternative on the southern side of the bay. Over the course of the project the environmental specialists have cooperated and regularly discussed environmental and social issues with the design and engineering team (and the client) concerning the impacts of the different alternatives.

The various alternatives have been assessed on their environmental and social negative and positive impacts using a fixed set of parameters embedded in a Multi-Criteria Analysis. The environmental and social results have been incorporated in a broad assessment of technical and non-technical aspects, resulting in a final layout option as discussed in the following section.

The following environmental and social parameters have been used for the Multi-Criteria Analysis:

Water quality	- stagnation of water behind structures, leading to possible contamination, loss of oxygen and less vital organisms in water - dispersal and settlement of re-suspended particles by dredging - saltwater intrusion and/or undermining of land-edge sediments by dredging
Hydrology	- changes in currents and waves, leading to danger for small ships maneuvering near structures - changes in current and drift leading to erosion and accretion in shore zones
Seabed contamination	- acceleration of sediment deposition behind structures, possibly leading to contamination of sea bottom / mobilization of harmful substances - disposal of (contaminated) dredging material in water
Marine ecology	- destruction of bottom habitat and displacement of fishery resources by dredging - effects of blasting and other construction activities (noise, pressure differences) on nearby marine habitats - disturbance or loss of marine life by reduction of water clarity and visibility due to dredging
Visual quality	- of port structures
Socio-cultural / economic	- disturbance of local population from construction works - temporary displacement of fisheries - temporary alteration of port operation capacity - direct and indirect job creation from construction works
Land	- level of noise and air emissions in port and nearby residential areas - disposal of dredging material and its quantity + quality - quantity of sand, rocks and aggregates required, and where and how to obtain them

4.1.3 Final layout option

The preferred option for the marine structures is a combination of alternatives 2 (extension of existing quay) and option 3 (new quay west, south-east orientation). The Existing quay will be extended (however shorter than proposed in the original alternative 2) and a new quay will be constructed as in option 3 (however shorter than proposed in the original alternative 3). The development of a new quay would be in deeper water and extension of the existing quay with a ro-ro berth. Improvement of existing land-based port structures (maps are included in Annex 2) would also take place. The landside expansion and improvements will make optimal use of existing infrastructure.

Figure 4-1 Aerial view of Palmeira Port

The new layout consists of three berths with a total quay length of 350m and the following features:

1. Existing quay with a (reduced) length of 90m;
2. An extension (additional 30m) of the existing quay;
3. A new quay with ro-ro ramp with a length of 90m, a width of 25m and a water depth of 6m, at the end of the existing quay;
4. New quay, with a length of 150m, a width of 35m and a water depth of 9.5m.

The expansion will be developed in two phases.

- In the *first phase*, only the extension of the existing quay will be constructed, and temporary facilities will be created for the ro-ro activities (Annex 1 Preliminary Design Phase). An access road to the quay extension will be created behind the existing quay. This access road will also provide access to the site during construction, and will reduce the hindrance to the ongoing port activities. The berth will not only be provided with a ro-ro ramp, but also with cement and fuel (un)loading facilities. The available water depth at the extension of the existing pier will be 6m, approximately 1m more than at the existing quay.
- In the *second phase*, the new quay West of the existing quay, and the landside facilities, and infrastructure on the Terminal will be developed. The new pier, mainly intended for international cargo, would be constructed further out to sea and, more or less, parallel to the existing pier. The apron depth behind the new quay would be approximately 35m. This quay would be constructed in deeper water, not requiring dredging at the location of the new quay. However, the cost of breakwater construction will be high. The new pier would be connected to the shore by means of a causeway, leading directly into the extended international container yard. The nautical access for the new pier would be suitable for larger ships (the planned designs are included in Annex 1).

4.2 Main construction and operational activities

4.2.1 Breakwater / coastal revetment

The breakwater consists of a quarry run core, a rock filter and armour layers and concrete armour layers. From the largest quarry operator, BBS, it is understood that rock up to 3 tonnes is available in sufficient quantities. In the design of the breakwater and coastal revetments, this value has been used as the upper limit. The largest applied rock sizes are in the order of magnitude of 3 tonnes (1.2 m^3). It is estimated that about 350,000m^3 quarry run, 90,000 m3 of rock and aggregates, 55,000 m3 of sand and 6,000 ton of cement is needed.

In view of the existing quarries at Sal and the foreseen expansion of the main quarry, the development of a new quarry for the Port construction only has not been foreseen. If existing quarries would not have provided suitable and sufficient rock quantities, a new quarry would have to be opened after consultation with the Municipality of Sal. A new quarry would require a separate EIA. Also the use of concrete units for wave protection is foreseen. For the Palmeira Project, the use of Accropodes or similar would be proposed, as this type can be applied in a single layer, which saves a lot of (scarce) materials. These units can remain stable in a single layer, whereas other type of units require two layers of armour units and therefore also more construction materials.

The programme for the construction of the breakwater (second phase) will take approximately one year.

4.2.2 Dredging & reclamation

The rocky subsoils in and around the Port mean that the layouts have been developed in such a way that sufficient water depth is available in navigation channels and port basins, and no or very little dredging is required. It is expected that (for phase 1 and 2 in total) dredging of sandy / granular materials will be limited to some 8,500m^3 in the port;

and that dredging of rock and some boulders and pebbles will comprise a volume of circa 6,500 m3. Dredging of granular materials will probably be carried out by clamp shell or backhoe on a floating pontoon or barge, whereas dredging of rock will probably take place by means of a pneumatic hammer and backhoe. The dredging locations are indicated in Annex 3.

Five sediment samples taken from the bay area near the port indicate the possibility of limited pollution below maximum allowable levels. Further sampling of the dredged material will have to identify any significant contamination. If the material is too polluted to be re-used, it will need to be treated adequately, as required under international regulations for disposal, such as the London and OSPAR Conventions.

4.2.3 Quay Walls

A concrete block wall is proposed for the quay wall, including boulders and fenders. Furthermore, a foundation bed needs to be constructed.

4.2.4 Buildings and Structures

The following buildings are planned:
- Office building;
- Passenger building;
- Warehouse;
- Container freight station;
- Workshop.

As the Island consist mainly of a rocky underground, no piling will be needed for construction of warehouses and other buildings.

4.2.5 Paving, drainage and lighting

For infrastructure, the following surfaces need paving, drainage and lighting: Full / MT container yard and quay pavement, ro-ro yard, roads, other parking, storage areas and the car park. The pavement will exist of concrete stones and tarmac. Underneath the pavement sand needs to be applied. It is expected that another 20,000m^3 of sand is required for pavement construction.

4.2.6 Other construction related activities

Overland transport of building materials, equipment and heavy machinery
For the overland transport of building materials (other than rock from quarry run) and for the overland transport of construction equipment / heavy machinery, three route options were identified, as indicated on the maps on Figure 4-2 and Figure 4-3. Two of these routes would run close to existing and future housing units. This could result in disturbance by noise and air emissions and would involve relatively high costs in order to upgrade and pave the tracks sufficiently in order to make them as dust free as possible.

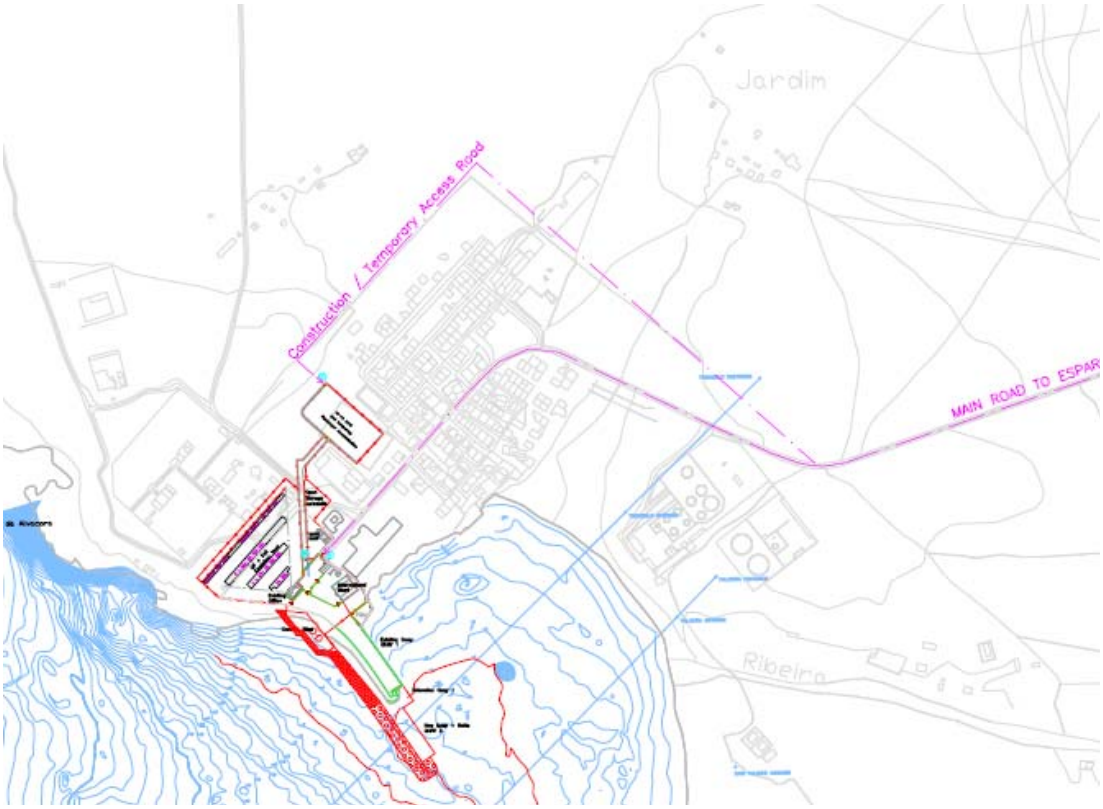


Figure 4-2 Access route 2008

Figure 4-3 Access route 2011

The third option, Route 2 (2011) Final Ring Road around Palmeira, would avoid the village of Palmeira and run through open area towards the main to road to Espargos.

Overland transportation of rock
For transporting the substantial quantities of rock, aggregates (e.g. gravel) and quarry run from the quarry (an estimated 495,000 m^3 in total, with the largest quantity to be sources in phase 2), existing sand-tracks north of the villages of Palmeira and Espargos are likely be used and connected, if upgraded to a level which minimises dust disturbance.

4.2.7 General operational activities

The enlargement of the Port will result in a larger throughput of volume as well as the development of a number of new activities. The traffic in the Port is expected to grow substantially, as the number and size of the ships that will visit the Port increase.

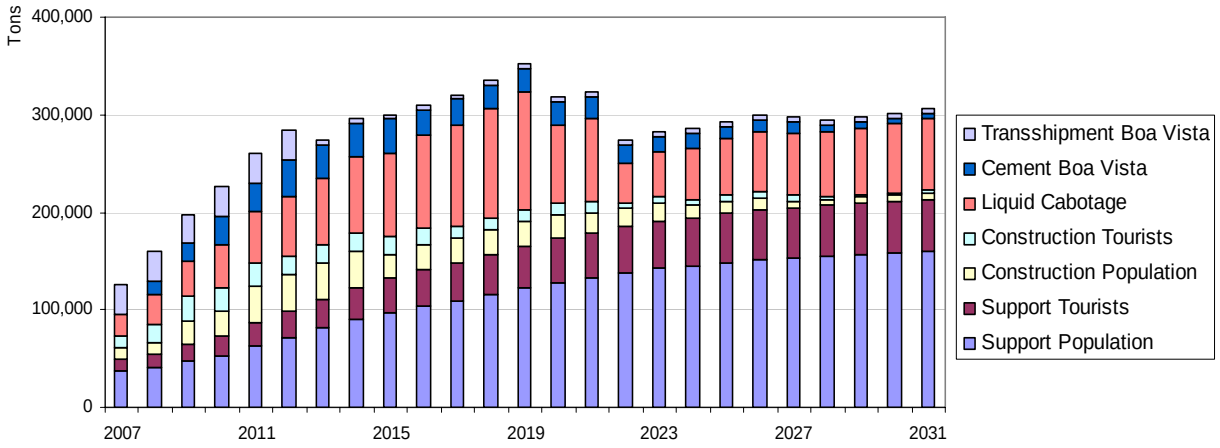


Figure 4-4 Total expected volume over the berth

The operations at the berth deserve special attention because these are most vulnerable to congestion and delays. This is a key element of the planned improvements of the Port.

The potential addition of two new buoys for fuelling may have a significant impact on the utilisation of the berths.

4.2.8 Ro-ro activities

Ro-ro ships can transport general cargo, containerised cargo, passengers and cars. Together with containerisation, ro-ro ships will become one of the primary modes to transport cargo. It is expected that one temporary ro-ro ramp will be operational in Palmeira by the beginning of 2008. This temporary ramp will be located at the head of the quay. A dolphin will be constructed to enable ships to use the ramp. A permanent facility will be ready at the end of 2008 and is part of Phase 1 of the project. A scheduled service will start soon after the ramp has been constructed.

4.2.9 Liquid bulk

Liquid bulk from international ports of origin is transferred to shore via a buoy and a pipeline that is directly connected to the storage facilities of Shell and ENACOL (National Oil and Gas Company). The products that are discharged at Palmeira via the buoy at present are white fuels (Jet-A1 and Gasoline). Sal functions as a hub for these products. In the future a second Jet-A1 sea pipe line will be built in/near Praia. It is assumed that this buoy will be operational in 2022.

When demand for black fuels (Fuel Oil 180 and Gas Oil) in Sal increases, a shift from berth to buoy for these products may become economically viable. This will require the construction of an additional dedicated buoy, piping, and storage facilities, because white and black fuels cannot share facilities. This shift will cause an increase of international imports, because by the time this second buoy is operational, international tanker ship that carry black fuels will directly call at Palmeira.

Phase 1 will include black fuel loading and unloading over the existing quay, as well as over the new extended quay. Part of this fuel is transported through an (overland) pipeline straight to the energy company Electra. All liquid bulk storage facilities are outside the port area, and will not be taken into consideration in this EIA.

4.2.10 Containerised cargo

Although containerisation will not play the most important part in cabotage, its role in the international activities is significant. The last few years have already displayed an impressive growth in the number of TEU[2] that crossed the berth and it is expected that this number will continue to increase over time. An improvement of the prerequisite constraints for optimal containerisation (e.g., accessibility for larger ships, more efficient handling) will strengthen the growth of the number of containers that will go through the port of Palmeira. It is foreseen that by 2031, over 120,000 tonnes of containerised goods will cross the berth at Palmeira. This equates to an amount of over 35,000 TEU. Nearly all of this volume is imported goods, so filled containers will dominate imports, whilst export primarily consists of empty containers. The existing port area will, in future, be used for the storage of full containers only. Empty containers will be stored on the area at the East side of Electra (the layout is included in the drawings in annex 2).

4.2.11 Cement facilities

Various companies will import cement to Sal for the construction of all tourist and residents' housing and facilities.

Cement will either be imported in bulk or bagged in big bags and small bags on pallets. The cement import is mainly international, and partly national (Pozzolane from Santo Antão).

[2] Twenty-foot equivalent units. Another standard container size is the 40-ft (12.2 m) container, also known as 40-foot containers. This is equivalent to 2 TEU. The smaller the shipment sizes, the more 20-foot containers will be used. At present most containers in Palmeira are 20-foot containers.

For the unloading of bulk cement, a pneumatic unloading facility is foreseen in the first phase of the project. This requires the construction of the following facilities in the port:

- cement silos
- loading unloading system (pneumatic conveying systems).

These systems will be built and operated by the cement industry. Enapor will provide space for them only.

5 THE PORT EXPANSION OF PALMEIRA IN RELATION TO THE MASTER PLAN OF SAL

5.1 Introduction

During the years 2006 and 2007, a Master Plan for the municipality and island of Sal has been developed. The Master Plan (July 2007 version) is based on the further development of the island as a tourism destination, and to facilitate the growth in tourism by an increase in residents, urban areas and necessary infrastructure.

The expansion of the Port of Palmeira will be essential to the realization and support of the tourism and urban developments, as the island has very little agriculture, almost no industrial sector besides the Port and limited natural resources.. Food and other commodity items, construction materials and equipment mainly have to be imported to the Island and the Port currently plays the most important role. Other points of import are the airport and small piers / landing docks in the villages of Santa Maria and Pedra de Lume, where small-scale fish catches are brought on land for supply to the hotel industry.

As the expansion of the Port and the further development of the Island are strongly interlinked, this chapter includes a brief (and partial) overview of the Master Plan of Sal is being provided.

5.2 Main objectives and principles

In the Master Plan, a development strategy, its objectives and the main principles for the ongoing development of tourism have been defined.

The development strategy for Sal is based on the following broad objectives:

- To develop a sustainable tourism model, with a balance between hotels and real estate for tourism purposes;
- To offer more flexibility to tourism investments without exclusive confinement to the three ZDTI's (integrated tourism development zones, which are (1) Santa Maria, (2) Murdeira Bay / Algodoeiro and (3) Pedra de Lume; and averaging a total of over 3,000 hectares, 14,3% of the Island's area);
- To valorise the environment and the biophysical systems of major interest and/or fragility;
- To identify the infrastructure required to facilitate the tourist investments and the foreseen urban growth;
- To create focal points for the various existing functionalities;
- To assign the urban areas necessary for the foreseen growth.

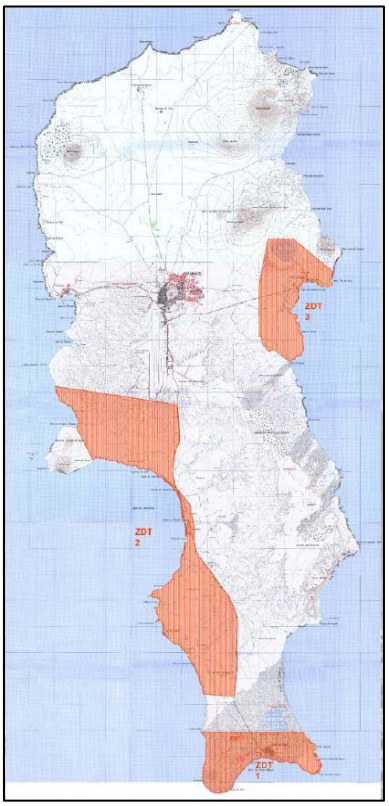


Figure 5.1: The 3 current ZDTI's

For the tourism development of Sal Island, three main principles have been defined:

- The Island of Sal is, and will, continue in the coming years to be a principal tourism destination of Cape Verde, more and more as an entrance port to the archipelago, for the product of “A tour through the islands of Cape Verde”;
- The tourism development in Sal will be based in a “mixed model of tourism and real estate”, which gives right to the importance of the traditional hotel industry and promotes the traditional way of life;
- The tourism development in Sal, independent of the development of tourist resorts and the growth in beds and tourists, will be based in a “management model” that optimizes the available human resources, that provides incentives and encouragement to private investments, that articulates and optimizes the public investment, and that provides the best available to the numbers of people that will be attracted;

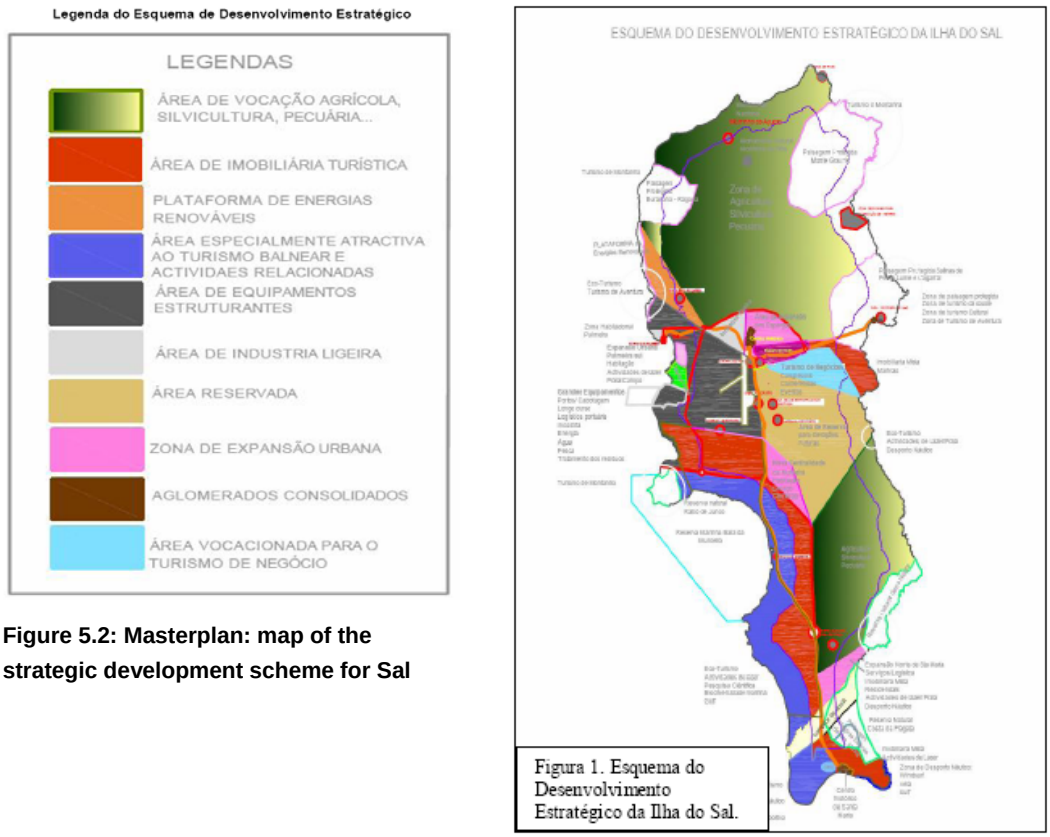


Figure 5.2: Masterplan: map of the strategic development scheme for Sal

5.3 Foreseen tourism and population growth

Since the 1990s the Island of Sal has been turned into a tourism destination, which has resulted in (foreign) *intentions to invest* in Sal for a total of 97,000 beds in tourist establishments for the next 12 years, starting from (currently) an approximate 5,800 beds available in 2007. The dominant tourism product “sun and beach”’ or the most sold “package” is the “return travel and stay in a hotel near the beach”, for a period of four to seven nights, including a half- or whole-day tour of the Island.

The increase in beds would correspond with approximately 41,000 new jobs (at 0.41 job per bed) in tourism and commerce in Sal; and an estimated 70,000 new jobs in Sal in total, taking direct and indirect job creation into account.

The Master Plan of Sal therefore, considering the intended investments, presumes a maximum population growth over the next 12 years of 220,000 people (at 3.14 inhabitants per job), with 18,400 new residents entering Sal each year. The total population of Sal in 12 years would therefore amount to 238,000 inhabitants, taking into account the 18,000 current residents.

In comparison, Palmeira village has grown from almost 300 residents in 1970 to more than 1,100 nowadays. Cape Verde has a total population of approximately 450,000 people, with roughly half of them living on the Island of Santiago, which is also home to the capital of Praia.

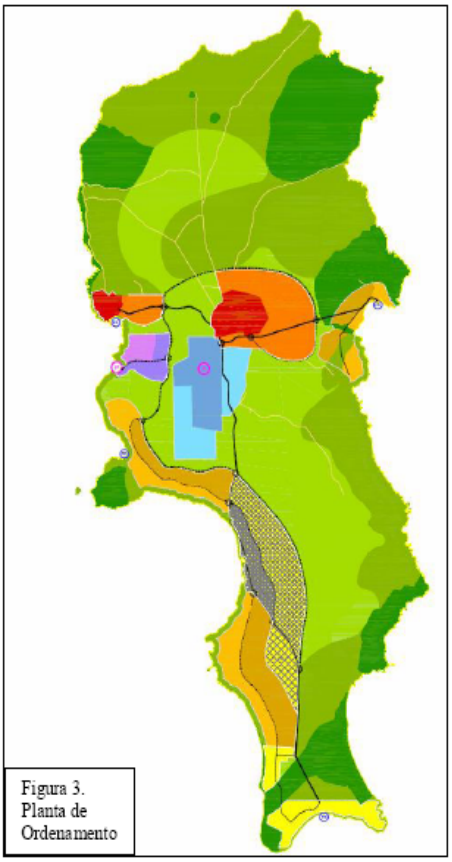
5.4 Classification and functions of areas on the island

Classification of areas

Taking into consideration the objectives and principles for (tourism) development at Sal, a number of categories for the classification of areas for urban planning were created. Examples are natural areas of various levels (level I, II and III, with protected areas classified under the highest level, level I), areas for tourism development (level I and II), areas for urban and infrastructure developments, and for industrial / logistic areas etc. For each category a categorization, objectives and conditions have been developed.

The Master Plan herewith assigns the village of Santa Maria and its vicinity, the western coast of the island from Santa Maria in the south up to and all along the marine reserve Murdeira Bay, plus an area at Pedra de Lume on the east coast (roughly corresponding with the current ZDTI's 1 to 3) as the main tourism areas in which the growth in tourism should mainly be concentrated.

Figure 5.3: Masterplan: map of the classification of areas according to their function at Sal island



The villages of Palmeira and Espargos will remain residential areas for the local population, with respectively mainly a port and an administrative function and with a roughly assigned area for urban expansion. They will, however, allow for certain tourism purposes, in order to have tourists visit the two villages.

The Port of Palmeira should therefore, according to the Master Plan, not only function as an industrial and fishing port, being an important industrial and logistic centre on the Island, but also as a recreational port with maritime tourism activities. The village of Palmeira should be positioned as a gastronomic centre for sea food, after upgrading of its old centre.

Tourism development areas
The foreseen tourism developments are to take place within tourism development areas of level I or II. Level I involves areas situated near the sea. Level II corresponds to the more interior areas. Each tourism development has the obligation to be accompanied by a detailed plan, with certain parameters covered as defined in a Regulation.

These tourism areas should be planned in an integrated complementary manner, associated with various themes according to the local characteristics, such as the traditions, the history of the island etc., and with hotel development in the first line of occupation.

5.5 Concerns regarding the development of Sal

The Masterplan briefly addresses the need for sufficient attention for issues such as waste (water) management, use of natural resources and the quality and degradation of natural areas. It also states a number of specific concerns regarding the foreseen development of Sal Island and its impact on the physical as well as social environment.

With regard to the impact on occupation of the land, the following concerns are voiced:
- The implementation of various businesses in the ZDTI's, without a common vision, thereby not exploring the possible socio-spacial complementary aspects;
- Incongruence between the implementation of tourism developments and the preservation of the natural resources that support it;
- Exponential growth of the population due to the entrance of migrants;
- Residential construction, especially in Santa Maria, not accompanied by the necessary basic infrastructure;
- The provision of water and energy, necessary to accompany the urban and tourism growth;
- A major pressure on the natural resources of the island, by means of the increase in construction activities, especially with regard to sand and inert materials.

With regard to the residents of Sal, the concerns are with:
- Concerns and dislike by the population on the perspective of occupation of certain places on the coast of Sal by tourists and tourism developments, which traditionally have always been inhabited or used by the original residents of Sal;
- Concerns and dislike by the population with regard to the growth of the informal sector, which is mainly the domain of people that emigrated from the east coast of Africa to Sal;
- Little protection of Cape Verdean employment, in view of the influx of foreign immigrants;

- Increase of the general sentiment of insecurity;
- The tourism sector having privileged access to resources, equipment and infrastructure, disfavouring its residents;

5.6 Impacts as a result of tourism and population growth

Key environmental and social impacts on the Island of Sal
The increase in residents and tourism on the Island of Sal can or will result in positive and negative impacts, such creation of employment (positive) and risk of pollution from waste accumulation (negative). A few of the main foreseen negative impacts that could occur on the island and its marine vicinity (if not properly managed) are briefly mentioned below. This overview does not pretend to be extensive, but provides an indication of some of the issues which will require thorough attention in the near future.

Pressure on infrastructure and services / waste pollution issues
The foreseen major increase in residents and tourists will require a major increase in the level of infrastructural facilities as well as services, such as sewerage, wastewater collection and treatment, solid waste collection and treatment or disposal, supply of (potable) water and electricity. Substantial efforts of the municipality are therefore requited to avoid a shortage of water and energy, or to avoid improper (construction, industrial, hotel and residential) waste disposal and waster water discharge, which will not only pollute land and water, but might also negatively impact on tourism. The municipality of Sal is therefore currently developing and implementing various projects to tackle these issues. Whether the efforts will be sufficient, cannot be assessed at this moment.

Pressure on natural resources
The foreseen major increase in residential housing units, tourism hotels and real estate properties will require sufficient quantities of construction materials, such as sand and rocks. Officially, sand extraction at Sal is not allowed anymore although occasionally illegal extraction might still occur. Rock extraction at Sal is putting a strain on its limited number of hills, and in concession areas can also contribute over a larger area to reducing its height above sea level, making it more susceptible to, for example, flooding and sea level rise.

Ground and surface water supply on the Island is very limited, and substantial desalination of sea water for residential and tourism purposes will be required, to avoid a total depletion of its fresh water resources.

Terrestrial and marine ecological resources are vulnerable to increased pressure from tourism activities, such as marinas, tours of the island, diving trips, and from an increased demand for fish and sea food for consumption. This could have a negative impact on for example the marine reserve of Murdeira Bay, where major land-based tourism developments are foreseen. And it could lead to a decrease in the number of turtles coming ashore to lay their eggs. Along the beaches of Santa Maria village this has already been noticed as a result of increased tourism developments. This ecological damage can in turn also impact on the attractiveness of the island as a tourism destination (e.g. activities such as turtle watching, diving and snorkelling depend on the marine ecology of the island).

Without proper management and enforcement, disturbance and depletion of certain species could occur, which in turn might impact on tourism as well.

Increased emission levels
The likely increase in motorized vehicles and ships on and around the Island for construction activities, transport of goods and people will cause an increase in the level of air and noise emissions (as well as an increase in traffic congestion).

The high level of construction activities will involve noise emissions, which could impact on nearby residential or tourism areas.

The increase in light emissions could disturb turtles coming on shore to hatch.

(Foreign) Population increase
The foreseen major increase of job opportunities and thereby inhabitants at the Island of Sal might involve a substantial migration from other Cape Verdean islands, immigration from other countries such as “neighboring” Senegal, and probably also a remigration of Cape Verdeans who have previously left their country (numbering roughly twice the total current population of Cape Verde), in order to supply Sal with sufficient employees.

It will be a challenge for the municipality to provide these migrants timely with sufficient housing, infrastructure and services, such as sewerage, solid waste collection, water and energy supply. The increase in urban, built-up environment may cause a feeling of loss of remoteness and impact on the perception of open space, that the island currently provides.

In addition, the various groups, from the different islands of Cape Verde as well as different countries, are likely not to speak Portuguese (yet) and will have to settle down on the Island in balance with the current residents and with other migrant groups. The municipality will have to facilitate this process, in order to avoid social unrest and feelings of insecurity.

Key environmental and social impacts on / from the Port of Palmeira
A number of specific (positive and negative) possible impacts on the port as a result of the development of the island foreseen in the Master Plan, or from the port expansion on the development of the island as foreseen in the Master Plan, are briefly touched upon below.

Port expansion
To realize the foreseen growth in tourism, even if taking place at a (much) lower growth scenario than currently foreseen, the expansion of the Port of Palmeira is a major prerequisite. Current tourism (construction) developments and establishments have already shown an increase in ships calling at the Port of Palmeira. In response, the Port has, in mid-2007, tripled the number of shifts (from one to three a day), and has started operating on Saturdays (three shifts) and Sundays (one shift) as well. Even under this schedule, the Port occasionally experiences difficulties to sufficiently handle the requests for mooring.

On the other hand to expand the port and operate it in a financially sound manner, a continuation of the growth of residents and tourism at Sal, and thereby a demand for goods and passengers services through the port, is required to cover the substantial costs of its expansion and operation.

Further investigation is required to determine whether the industrial and logistic function of the expanded Port can be combined with marine tourism activities, as suggested in the Master Plan. The combination of a marina with an industrial port for example could raise issues of marine safety and logistic efficiency.

Development of Palmeira village
The economic impulse from the expansion of the Port to the village of Palmeira, and the improved facilities for the fishing sector at the Port can facilitate the development of Palmeira village, with an upgrade of its old centre and positioning it as a gastronomic centre for sea food, as proposed in the Master Plan.

As the villages of Palmeira and Espargos have been assigned as the main residential centers on the Island, Palmeira village is likely to experience a substantial growth of its urban area and its total number of residents under the foreseen residential and tourism increase at Sal Island. The expansion of the village is foreseen under the Master Plan in a mainly eastern direction. This would suggest that the number of residents living near the Port, in the western part of the village, and thereby to be the most sensitive receptors in terms of air, noise and light emissions from the Port, would not substantially increase.

Waste management
The Port expansion will generate construction waste, and during its operation an increased amount (compared to the current situation) of solid and liquid (hazardous) wastes from ships and port activities, used oils and some general “household” waste will have to be disposed of. For the proper disposal or treatment of its solid waste, used oils and wastewater, the Port will to a major extent be dependent on the facilities that the municipality of Sal will install on the Island (in light of its Master Plan and the foreseen growth of residents and tourism). In case the planned facilities would not be available in time and/or able to cope with the total quantities generated on the Island, the Port might have to look for alternative temporary solutions to store or dispose of its wastes in an appropriate manner. This in order to e.g. avoid the dumping of wastes by ships on sea.

5.7 Traffic forecast – Expansion Port of Palmeira

As part of the project for the expansion of the Port of Palmeira, a traffic forecast was prepared, based on historical data, international standards and interviews with stakeholders. This plan calculates a growth scenario for the expansion of the Port of Palmeira using more conservative figures than the Masterplan. As a comparison to the Masterplan, the foreseen growth in number of beds, residents and tourists at the island of Sal as calculated in the traffic forecast is briefly provided below.

Growth in number of beds
For the traffic forecast the pace of development is based on population growth, labour requirements, and competition of other islands, in particular Boa Vista, Maio, and São Vicente. The development of an international airport at Boa Vista as well as São Vicente

for example is expected to cause a redirection of the flow of tourists from Sal to the other islands.

The population growth on Sal was considered to be approximately 6 - 6.6% annually. This is already considered very high and it is expected that the growth rate can not be much higher without creating social disintegration in society. Based on the 6.6% growth the population of Sal will grow to nearly 90,000 residents in 2031.

Based on a personnel support factor of 2, which would mean that for every tourist on the island 2 employed local residents would be required; and a household factor of 2, which would mean that every employed person on the island is responsible for one other person, which is not employed (wife, children, elderly, disabled, etcetera) a population of 90,000 residents would be just enough to provide services to the tourist sector if 30,000 beds are to be realized; however it would not provide for additional construction personnel, neither for peak demand for personnel during the high season, where tourism occupancy rates are expected to be very high.

The relatively low household factor of 2 has been justified when considering the number of single men that have migrated to the island to work in construction and the tourist industry; and considering the current number of double-income households (source J. Carling http://atlas.dragoeiro.com/).

It is therefore believed that in the coming 25 years only 30,000 beds will be realized, plus the existing 6,000 beds which makes a total of 36,000 beds.

Growth in number of tourists
The number of tourists has been calculated by multiplying the number of beds with the projected average yearly occupancy rate. The average occupancy rate at Sal is set at 60%. This figure was selected based on e.g. the occupancy levels of the islands of Tenerife and La Palma over a period of 11 years. In this period these islands showed occupancy rates between 59% and 77%, with a general average of around 70%. Another source for insight in occupancy levels were provided by the biannual figures of the long-standing Belorizonte and Novorizonte Hotels at Sal. This is on average around 64%.

Based on a conservative approach, it is therefore foreseen that the occupancy rate of tourism establishments over the years will be around 60% for Sal. The figure is also supported if taking into account that a number of accommodations will not be entirely available / operational due to ongoing construction works and competitive forces from tourism developments on other islands.

The resulting average number of tourists that will reside at Sal throughout the year, based on a total of 36,000 beds by 2031, is 21,600 per day.

Growth in demand for housing
Considering an influx of 72,000 residents (18,000 current residents; growth of population up to 90,000) and an average number of local residents in one residential unit (house) set at 3, an additional 24,000 houses would have to be constructed at the island for the additional 72,000 residents.

6 POTENTIAL ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

6.1 Introduction

The purpose of this Section is to identify, predict and evaluate the significance of the changes over time in various environmental aspects as a result of developing the proposed Project. Potential impacts assessment has mainly been focussed on the construction phase and the operational phase. The full life cycle of the port (expansion) encompasses the following four phases:

i. **Planning** Development of different alternatives for the modernisation and expansion of Palmeira Port;
ii. **Construction**. Implementation of the Project through physical activities on site, including accidents and unusual conditions. Construction stage impacts are typically temporary in nature;
iii. **Operation**. Normal use of the Project features and project decommissioning, rehabilitation, including accidents and unusual conditions. Operation stage impacts can be permanent;
iv. **Decommissioning phase.** Abandoning of the Port facilities at the end of its useful life.

6.2 Determining impact significance

The potential activities and cumulative impacts of the Project were classified into one of five categories:

a. **Major impact**. An impact is said to be "major" (positive or negative) if the activity has potential to significantly affect an environmental component.

b. **Moderate impact** The impact gives rise to some concern, but is likely to be tolerable in the short term (e.g., during the construction phase). The impact may require a value judgement as to its acceptability;
c. **Minor impact**. If a less than significant impact occurs, it is assigned the category "minor" (positive or negative);
d. **No impact**. If no impact or a negligible impact occurs, it is assigned the category "no impact";
e. **Unknown impact**. Potential impacts will be assessed as being unknown if:
   - the nature and location of the project activity is uncertain;
   - the occurrence of the environmental component within the study area is uncertain;
   - the timescale of the impact is unknown or cannot be quantified;
   - the spatial scale over which the impact may occur is unknown;
   - the magnitude of the impact cannot be predicted.

To determine whether a given impact is significant the following criteria were used:

a. **Spatial scale** of the impact i.e., whether the influence is site, local, regional, or national/international;
b. **Time horizon** of the impact i.e., short-, medium-, or long-term;
c. **Magnitude** of the change in the environmental component brought about by the activities e.g., small, moderate, large;
d. **Importance** to local human populations e.g., fish for consumption, drinking water, agricultural products;

e. Compliance with national development policies, biophysical standards, international commitments etc.;

Where significant negative impacts are expected, mitigation (sometimes referred to as improvement) measures have been developed to reduce the extent of the impact to an acceptable level. The specific mitigation measures are outlined in Section 9 and 10.

There are several strategies to mitigating a significant negative impact. The approach, when developing mitigation strategies employed in the EIA, is dealt with in this order of priority:

1. Avoiding the impact;
2. Minimising (and reducing) the impact;
3. Rectifying the impact;
4. Compensating for the impact.

6.3 Structure of impact assessment

The impact assessment is presented below, per phase i.e., design, construction, operation and de-commissioning. For each phase, the main activities with a possible impact on the environment are presented. The impact assessment for each activity is structured according to the following format:

1. A brief description of the activity (included in chapter four);
2. An assessment of the activity's impact significance;
3. Suggestions for mitigation measures (if the activity will yield negative impacts) and/or enhancement measures (if there are opportunities to enhance the positive impacts of the activity) are presented in Section 9 and 10.

6.4 Overview of potential impacts

A tabular overview of the potential impacts per phase and activity, as well as their significance and possible mitigation measures is provided. Each impact is described in more detail in the successive paragraphs.

6.5 Consideration of impacts during planning phase/ Input to design

In the scoping report it was envisaged that three different alternatives would be developed for the extension of the Port. Royal Haskoning has, over the course of several months, prepared up to eight alternative designs, in different rounds, for the enlargement of the Port, including an alternative on the southern side of the Palmeira Bay. These concepts covered maritime and land-side construction aspects such as breakwaters, quays and reclamation of land, lay-out of Port buildings and land-based infrastructure. The dredge-ability of the material in the Bay of Palmeira, the quality of the subsoil, depth of the bay, prevailing currents, required quantities and types of materials for the land reclamation structures, logistical and economic concerns have played an important role in deciding on the most suitable alternative. In addition, all alternatives have been evaluated against environmental criteria by means of a multiple criteria analysis as well.

7 IMPACTS DURING CONSTRUCTION PHASE

7.1 Impact resulting from general construction works

7.1.1 Impacts from waste generation during construction at the water's edge

The construction activities for the new Port facilities will result in the production of solid and liquid waste from construction materials, "domestic" (i.e., household) waste generated by construction workers. It is expected that 200-300 workers will need to be employed for the construction phase. The majority is expected to originate from other islands of Cape Verde and some may come from the mainland (e.g., Senegal) as is also the case for part of the construction workers that are presently working in hotel developments. It is expected that the construction workers will be living in the villages nearby but a separate camp for these workers may need to be organised.

Potentially hazardous chemical wastes can be expected from machinery use and maintenance, such as fuels and oils and the drums that contained such substances.

A (localised) impact on groundwater and soil quality at the Project site could occur if improper management of these wastes occurs, via an accidental spillage. The construction activities are temporary in nature (i.e., 36 months), however, no proper waste disposal or incineration facilities are available at the Port nor in the nearby village. Waste disposal sites on Sal island are not ready available as their capacity is limited. There is no capability for handling "hazardous wastes".

The overall volume of hazardous wastes anticipated will be low although one accident of even low volume could cause serious damage. Because of the uncertainty of the destination of waste generated and the potential "risk" to the environment, this is considered to be a negative impact of **major** significance.

7.1.2 Impacts on air quality

The operation of the equipment and vehicles used during the construction works will contribute to the pollution of the ambient air quality in the work area and indeed local geographical area. This equipment will emit pollutant gases such as carbon dioxide, carbon monoxide, nitrogen oxides, particulates (e.g., PM_{10}) etc. It is considered that the emissions will cause medium magnitude changes to the air quality since this is a very open zone subject to the influence of the winds (i.e., dominant north-eastern winds, 87% of the time). Therefore the natural meteorological conditions are not conducive to the occurrence of high concentrations of pollutants.

The transport of construction materials to the Port overland may cause disturbance to the village of Palmeira and Espargos if the trucks were to pass through or next to the villages. It is expected that for the construction period a substantial amount of rocks, aggregates (e.g. gravel) and quarry run (an estimated 495,000 m^3 will have to be brought from quarry to Port, with the majority (75%) of rock to be sourced for the second phase of port expansion. This would for the second phase of port expansion result in an estimated one truck passing in each direction every four to five minutes, over a period of approximately one year during five working days a week.

The trucks themselves will contribute to the air pollution and the frequent traffic on the current sandy tracks will cause substantial dust re-suspension into the air. Depending on wind direction, velocity of the trucks speed and location of the main transport routes, dust from tracks could be carried towards the village.

Current construction practices frequently involve old, imported trucks, which usually cause higher air emissions than newer and thereby more modern trucks. At the moment Cape Verde is setting up a compulsory inspection system for trucks, which could stimulate the use of newer, better vehicles.

The temporary and localised impact on the village due to the passing of trucks may be substantial, and is therefore considered to be a negative impact of **major** significance.

7.1.3 Impacts from noise emissions

During the construction phase, there will be an increase in noise levels in the work area as a result of the operation of equipment used in dredging, demolition of the buildings and construction of the planned marine and terrestrial infrastructures. The noise generated during construction activities may have a negative impact on background noise levels, which can result in disturbance and disruption as well as associated health problems at nearest sensitive receptors.

The transfer of building materials to the Port, overland, may cause disturbance and disruption to the residents and businesses of Palmeira village if trucks pass directly through the village. It is expected that during the second phase of the construction period there will be one truck for transportation of rock passing in each direction every four to five minutes.

The noise emissions of bulldozers for construction purposes, for instance, are in the range of 93-96 dB(A)[3]. At a distance of 25m from this noise source, the sound level will diminish to 82 dB(A) across open ground i.e., with no barrier effects. In combination with other construction activities the overall noise from construction may well be significant. Much depends on the timing of the activity. Working at night-time with the possible repercussions of sleep disturbance would be a worst-case scenario.

According to Word Bank Standards, the recommended noise levels (based on an hourly average) at the location of a sensitive receptor, in dB(A) during the day time (i.e., 07.00 – 22.00-hrs.) and night-time (i.e., 22.00 – 07.00-hrs) are:

- For residential, institutional and educational receptors: a maximum of 55 dB(A) by day and 45 dB(A) at night;
- For industrial and commercial areas: maximum of 70 dB(A) by day and 70 dB(A) at night.

Considering the distance from construction activities taking place on the premises of the port to the nearest sensitive receptors (e.g., Palmeira village at 250m and beyond), noise emissions can result in a negative though temporary impact of **moderate** to **major** significance. The factual impact level will depend also on aspects such as the type of equipment to be used, time period and duration, and the perception of specific noise patterns (e.g. continuous, regular intervals, irregular).

[3] A-weighted decibels (as heard by the human ear)

7.1.4 Impacts from leakage or spillage

Negative impacts from leakage or spillage may appear due to the use of heavy equipment necessary to carry out the construction works. If any accident takes place in which there is a leakage or spillage of oil or fuel into the water environment or on the ground, there will be a negative impact on water or sediment quality. In turn, this could have an indirect negative impact on marine and terrestrial life. The potential risks and knock-on effects are high, however, much will depend on the chosen contractor and the environmental management of construction activities on site.

Uncontrolled, the risk could cause a negative impact of **moderate** to **major** significance.

7.1.5 Impacts from wastewater, sewage and run-off

The principal concern relates to the generation of polluted silt-laden run-off during rain events and domestic sewage. Such run-off, if discharged directly into the marine environment, has the potential to generate localised plumes of elevated suspended solids. This will not occur very frequently taking into account the low precipitation rate at Sal.

Sewage originating from the workers working in the Port could, if discharged directly to sea, have a negative impact on the environment.

Considering the moderate magnitude of the impact and the temporary character the impacts from wastewater, sewage and run-off (negative) impacts are considered to be of **moderate** significance.

7.1.6 Impacts related to the use of natural resources

For the construction of the quays, breakwater and paving in total about 400,000 m^3 rocks, 50,000 m^3 sand and 30,000 m^3 of cement is needed.

The rocks are to be sourced from an existing quarry at the island. The main quarry at Sal, , located north-east of the village of Espargos and operated by the company BBS, has an area of 400 hectares and low elevation up to a maximum of roughly 120m above sea level. Extraction works have started at 68 meters above sea level and are expected to continue till a height of 7 meters above sea level. A licence has been granted to the quarry for a period of 50 years. This is currently the only quarry with a long-term license for commercial extraction.

Taking into account that the quantity of rock and sand which is permitted to be extracted at Sal Island is limited, the location of sourcing these materials requires due attention. BBS indicates their current production capacity at the quarry at 300,000 tonnes per year. In 2008 BBS is intending to expand to one million tonnes per year. At an estimated production rate of six days per week this would result in an average 3200 tonnes of rock per day to be produced. The port will require an estimated 1500 tonnes per day (almost 50% of daily production capacity) for 200 days during an approximate one year period (see EMMP on Natural Resources for exemplary calculation).

Several studies carried out in Cape Verde state that the demand for sand in the short and medium terms will increase quickly due to the wider increase of civil and public construction works. The extractions have been carried out mainly in the Islands of Sal, Santiago and S. Vicente, and are driven by increasing population and by the modernization and emergence of the tourism sector.

The extraction of sand from beaches, dunes and also from river beds has, at several islands, led to serious problems such as increased salinity levels of groundwater as increased vulnerability to floods.

Although Sal Island mainly consists of rock and sand, the extraction of sand from beaches for hotel construction has caused problems of erosion and degradation of its much valued beaches, and is now forbidden by the government. The extraction of rock has resulted in the (partial) disappearance of some of the few hills that the mainly flat Sal Island holds.

For the first phase of the expansion of Palmeira Port, rocks can be quarried from the existing quarry (for which an EIA has been carried out). In the second phase of the Project, which would involve a much larger volume of rock, rock could probably be sourced from the quarry, but also alternative options might have to be considered (e.g., importing rock from other Cape Verde island, such as from Sao Vicente, Santiago or San Nicolau; or by replacing rock with cement tripods).

For the supply of sand to the Port, the most likely option is the importation of sand from Mauritania, a solution which has already been investigated by the Cape Verde government. Currently, the ships that will transport the sand are too long and too deep to berth at the quay of Palmeira Port, so they will have to use a different location with sufficient water depth, north of the port which has over 20m of water depth. From there, the sand can be pumped from the ship to the island by means of a floating pipeline and buoys, after which it can be transported to the Port by truck and temporarily stored on land (with sufficient precautions to avoid dispersal by wind).

With the import of sand however, the avoidance of accidentally introducing exotic species such as snakes and scorpions (currently not present in Cape Verde islands) should be made a high priority.

The impact from the use of natural resources is estimated to be of **moderate** significance.

7.1.7 Impacts on local society and economy

During the construction phase, which will take three years to complete the first and second phase, it is estimated that 200-300 workers and related supplies will be required.

Positive impacts will be associated with the construction phase which will result in job creation (both direct and indirect), the multiplier effect (e.g., spend on local materials, revenue generated with local suppliers, workers' spending money) and hence, increased income. All other economic activities will benefit from the presence of the workers, and there will be an overall increase of economic activity and generation of wealth.

The social and cultural impact of 200-300 additional workers on the small community of Palmeira village may be substantial. Among these are the risks of spreading diseases. Proper information and education of the workers and availability of provision may reduce the impact. Also, part of the workers might be sourced from abroad (e.g., from the African mainland) and housed in a temporary labour camp. The living conditions of such labour camps are not always considered as ideal for the workers. Also it raises immigration issues. The potential (negative) impact is estimated to be of **moderate** significance.

The impact resulting of the increase in economic activity is considered to be **minor positive** as it is temporary and reversible.

7.1.8 Impacts on health and safety

The construction activities will pose certain health and safety risks for the construction workers involved.

The increase in transport may cause safety issues for the residents living close to the main transport route. As described in Section 4.2.6, a northern route for transporting construction materials to the Port, which bypasses the villages of Palmeira and Espargos and is based on the upgrading of existing tracks in the desert area, is likely to be chosen.

The negative impact is therefore considered to be of **minor** significance.

7.1.9 Impacts on fishery

The construction activities may have a negative impact on the activities of local fishermen, as the activities may hamper the general accessibility of the Port infrastructure. As the construction activities are planned in such a way that the Port's operations may continue as they do at present, as much as possible, it is expected that there will be **no or a negligible negative impact**.

7.2 Impact resulting from breakwater/coastal revetment construction

7.2.1 Impact on natural seabed

The impact at the location of the new breakwaters and extensions of the quay will be the irreversible loss of the footprint of seabed and any natural species living just above it (epibenthic[4]), on or in it. There are no indications for significant populations of precious marine flora and fauna species at the location of construction. Any mobile fauna (e.g., small fish) may relocate to nearby foraging grounds. In addition, the chosen port expansion alternative is expected to have a smaller localised impact than the other alternatives that were considered.

The significance of this impact is considered to be **minor negative.**

[4] i.e., relating to the area on top of the sea floor. Epibenthic organisms may be freely moving or sessile (permanently attached to a surface).

7.2.2 Impacts on coastal erosion and accretion

Changes in currents caused by the construction (and hence presence) of a new quay and breakwater may lead to erosion and accretion in the shore zone. The impact is expected to be minimal due to the rocky underground, the absence of large amounts of suspended materials in the water and the weak present current in Palmeira Bay. At present, no dredging activities have previously been carried out in the Port, nor deemed necessary.

The significance of this negative impact is considered to be **minor**.

7.2.3 Impacts on marine life

The construction of the breakwater and the new quays may have the following potential impacts on marine life:

- Direct loss of seabed and invertebrate fauna, such as sponges and coral, adjacent or underneath the footprint of the development;
- Remobilisation of suspended sediment leading to smothering of benthic marine life, such as invertebrates, particularly coral species;
- Impact of noise on cetaceans and turtles.

The construction of the breakwater and the quays will create underwater noise which may disturb the whales and other sea mammals in the area, particularly in Murdeira Bay and in any areas that cetaceans use for migrating/feeding outside of the Bay. The noise will be caused by the placing of rocks in the water. No piling is foreseen.

The marine life near Sal is rich in terms of the number of different species although the population densities are small.

Impact of construction on corals
A number of coral species are present in small quantities in Palmeira Bay including hydrocorals, octocorals, rocky corals and black corals. On the slopes of Palmeira Bay a small rock reef can be found. These type of reefs are common around the Island and may be found at several locations. Corals found in Palmeira Bay are defined as “hermatypic”. This means that single celled algae are present within the tissues of the coral polyp. This “symbiotic” relationship allows corals to flourish in nutrient-poor tropical waters as the algae provide the polyp with nutrients from the process of photosynthesis. Therefore corals tend to inhabit coastal waters that have little or no sediment suspended in the water column.

Corals are an important element of the overall ecosystem and in particular for the sustainable development of biological communities dependent on tropical warm water reefs. Unlike many other marine species, corals are very sensitive to external disturbances of the natural environment in excess of natural phenomena like storms, currents and floods. Therefore destruction or artificial loss of coral is considered to be of concern, especially because natural restoration may take many years. The impacts will nevertheless be localised and restricted to the work area and the immediate surroundings and have a partly reversible character as the area affected may be re-colonised by species from the adjacent areas.

This negative impact is considered to be of **minor** significance.

Impact of noise on turtles
Of the seven species of turtle, the presence of six of these has been noted within Cape Verde's coastal waters. The islands are the world's third most important breeding site for loggerhead turtles (*Caretta caretta).* The majority of the estimated 3,000 individuals that breed in Cape Verde are found on Boavista Island but a significant number are also known to breed on Sal. Loggerhead and green turtles are both recognised by The World Conservation Union (IUCN) as endangered species and have been placed on the Red List of threatened species.

Turtles are hearing insensitive but do display avoidance reactions at high levels of sound. For instance, McCauley *et al.* (2000)[5] showed that green and loggerhead turtles displayed avoidance behaviour at 175 decibels (dB). This was extrapolated to mean that behavioural changes would occur at two kilometres and avoidance at one kilometre in depths of 100-120m.

Percussive and vibratory techniques for piling produce sounds of 177-202dB and 173-185dB, respectively, which is in the "avoidance" range of the turtles. These are the noise levels at source (i.e., area of direct impact) and as such the received levels on adjacent turtles (if present) will be lower. If turtles are present in the area then they are likely to display avoidance behaviour at a distance of at least one kilometre, making their presence during construction very unlikely.

It must also be noted that sound energy attenuates more rapidly in shallow water than in deeper water (as used in McCauley *et al.*, 2000)) so the avoidance distance might actually be lower. In addition, the main breeding areas on the island for turtles are located on beaches in the southern part of the island, starting from the marine reserve Murdeira Bay, eight kilometres south of Palmeira Bay.

In view of these factors, and as no piling is planned, a negative impact of **minor** significance might be expected from general construction activities (excluding dredging activities, which are discussed in paragraph 7.3.).

Impacts of noise on cetaceans
Up to 20 species of cetaceans have been recorded in the waters of Sal Island, in particular Humpback whales, Blue whales, Sperm whales, Killer whales and a large variety of dolphins. There are indications that Murdeira Bay could provide a breeding or nursing area for several species during part of the year. No extensive research though has been executed yet on the number of whales visiting the area, the main season and the exact reasons for their visit to the bay.

Harassment of humpback whales[5] from underwater noise has been indicated from a level of 140 dB noise emissions at source. At this noise level whales are likely to display avoidance behaviour if within a distance of less than one kilometer from source.

In view of this, especially during migration season, a negative impact of **moderate** significance might be expected from construction activities, which involve significant (underwater) noise levels.

[5] McCauley, R.D., Fewtrell, J., Duncan, A.J., Jenner, C., Jenner, MN, Penrose, J.D., Prince, R.I.T., Adhitya, A., Murdoch, J. and McCabe, K. (2000). Marine Seismic surveys – A study of environmental implications. APPEA Journal 2000: 692-708.

Cumulative impact on marine life
The overall impact of port construction activities on marine life is considered to be a negative impact of **minor** to **moderate** significance.

7.2.4 Impacts on sea water and sediment quality

During construction of the revetment, there is a potential for short-term increases in suspended sediment as result of dredging vessel movements and construction activities. The sediment present in the bay near the quay might be contaminated, although sediment samples have so far not pointed towards any pollution above maximum allowable levels. The remobilisation of sediment could therefore pose a small risk of causing deterioration of water quality.

There is also the potential for accidental spillage of construction materials, wastes or fuel and lubricants from the machinery. As the precipitation rate at Sal is very low, run-off and spillages into the water may be prevented by proper and timely cleaning and removal of the pollution.

The negative impact on seawater quality due to construction activities is considered to be of **minor** significance.

7.3 Impact resulting from dredging and reclamation

7.3.1 Impacts on water quality

During phase 1 a volume of 4000 m3 will have to be dredged at the location of the (to be) extended quay wall, of which circa 500 m3 is comprised of rock and 3500 m3 of sand and granular material. South of the extended quay a shallow point will be dredged with a volume of circa 6,500 m3, mainly consisting of rock (basalt, circa 2,500 m3) and boulders / pebbles (circa 4,500 m3). Dredging of rock at and near the location of the (to be) extended quay is planned to be carried out by means of dredger with a pneumatic hammer and backhoe, by which the hammer will be used to release a layer of rock and the backhoe to grab and remove these rocks.

Also part of the port basin for the phase 2 quay will have to be dredged to deepen the existing port basin. The volumes of dredging are expected to be limited to 3000 m^3 rock and 1500 m^3 of granular material. Dredging is planned to be carried out by clamp shell or backhoe on a floating pontoon or barge.

This would result in a total dredging volume of 15,000 m3, comprising of 8,500 m3 of sandy / granular material and 6,500 m3 of rock. See Annex 3 for maps of the dredging locations.

The dredging activities will contribute to increased turbidity and temporary reduction in water quality and possibly sediment quality from the re-suspension of dredged material (especially fine particulates - “fines”).

Another direct effect of the re-suspension of the sediment can be the potential for increased concentration in the water of heavy metals and organic compounds absorbed to the solid particles. Analyses of five sediment samples, as elaborated on in the

Baseline report, have shown that sediment is not significantly polluted with heavy metals, pesticides or poly-chlorinated biphenyls (PCBs).

A more detailed assessment of the location and outcomes of sediment sampling has been provided in the Baseline report.

An indirect effect of dredging is the subsequent reduction of dissolved oxygen in the water column. Also, the microbiological quality of the sea water may be changed as a consequence of the re-mobilization of bacteria populations in the surface layer, which will affect seawater quality. However, as discussed in the Baseline report, the main sediment type present in the port area is coarse sand with rock with little or no fine sediment. Given the weak prevailing hydrodynamic conditions experienced at the Port and the coarse nature of the particles sediment transport should be limited to a very localised area.

Furthermore, the process of reclamation of land for the extension of the dock may have negative effects on seawater quality from dewatering activities, depending on the construction method.

It can be expected that the suspended sediments will not move far away from the places where the dredging activities are carried out as the local currents at Palmeira Bay are weak and variable.

As there are no indications of pollution of sediments in the area, dredging is expected to have a temporary negative impact on water quality of **minor** significance.

7.3.2 Impacts on marine life

Dredging and reclamation can have the following potential impacts on marine life:

- Direct loss of seabed and invertebrate fauna, such as sponge and coral, adjacent or in the dredged or reclaimed area;
- Mobilisation of suspended sediment (e.g., from dredging) leading to smothering of benthic marine life, such as invertebrates, particularly coral species;
- Impact of noise on cetaceans and turtles.

Impacts from dredging on marine habitats

The proposed dredging could alter the nature of the seabed by:

- Exposing a different type of sediment to that currently present (e.g., by dredging sand to expose hard ground);
- Changing the topography of the seabed;
- Altering the stability of the seabed.

Sediment type, topography and seabed stability are important in determining the nature of the benthic community occupying a site and, therefore, if they are altered, the nature of the marine communities that colonise the dredged area could be different to the communities there at present.

It is not possible to mitigate against the direct loss of subtidal habitats and associated species due to the construction of the Port and the removal of the marine habitats. However, it is likely that similar communities to those that are already present would re-colonise the dredged area and colonise the new marine structures.

Considering the limited dredging works (not rock dredging) being confined to a small area, the negative impact is considered to be one of **minor** significance.

Impact of dredging on corals
A number of coral species are present in small quantities in Palmeira Bay. Corals tend to inhabit coastal waters that have little or no sediment suspended in the water column. While there are no true **coral reefs** in Cape Verde because the waters are too cool to support reef growth, there are coral-rich communities on rocky reefs in several places Unlike many other marine species, corals are very sensitive to external disturbances of the natural environment. The impacts of dredging will nevertheless be localised and restricted to the work area and the immediate surroundings and have a partly reversible character as the area affected may be re-colonised by species from the adjacent areas. This impact is considered to be negative and of **minor** significance.

Impact of noise on turtles and cetaceans
Especially during the turtle breeding season (May to September) and whale migration season (roughly November to March for humpback whales; however various whale species can be spotted near Sal throughout all 12 months of the year), a negative impact from dredging activities could occur if these would involve significant (underwater) noise levels, such as might be the case when dredging rock.

As elaborated in in section 7.2.3., turtles display avoidance behaviour at 175 decibels (dB) or more, which extrapolated from source would mean that behavioural changes would occur at two kilometres and avoidance at one kilometre in depths of 100-120m.

Harassment of humpback whales from underwater noise has been indicated from a level of 140 dB noise emissions or more at source. At this noise level whales are likely to display avoidance behaviour if within a distance of less than one kilometer from source.

Also if female whales with young are present in the area (which is often the case in and near Murdeira bay) substantial noise level can interrupt with the vocal communication of whales, possibly resulting in the calf loosing track of its mother.

The dredging of rock, is expected to take one to two weeks. Although very limited information is available on noise emission of dredgers, and their impact on cetaceans and turtles, the following information could be obtained on the noise levels of dredging equipment:

- Jackhammer: peak up to 200 dB, average around 161 dB[6]
- Backhoe: average around 161 dB[7]
- Hopper dredge (which is a propelled floating plant which is capable of dredging material, storing it onboard, transporting it to the disposal area, and dumping it): average around 188 dB[8]

[6] Nedwelll, J., Howell, D., A review of offshore windfarm related underwater noise sources, Subacoustech report 544R03088, 2004

[7] Malme, C.I., Miles, P.R., Miller, G.W., Richardson, W.J., Roseneau, D.G., Thomson, D.H., Greene, C.R. 1989. Analysis and ranking of the acoustic disturbance potential of petroleum industry activities and other sources of noise in the environment of marine mammals in Alaska. Final Report No. 6945 to the US Minerals Management Service, Anchorage, AK. BBN Systems and Technologies Corp

[8] Sakhalin, 2005, Comparative environmental analysis of the Piltun-Astokh filed pipeline route options

This would indicate the possible harassment of whales and turtles, leading to avoidance behaviour, if they would be present in an area of roughly one kilometre from the location of dredging.

Considering the limited volume of rock to be dredged during a one to two week period, a negative impact of **minor** to **moderate** significance is anticipated.

Impact of increase suspended sediments
Increases in suspended sediment and its consequent deposition could affect marine communities in the area in several ways. Smothering from the deposition of the sediments can damage or kill sessile organisms, especially filter feeders, by clogging feeding and respiratory appendages. Suspended sediments can also cause irritation and abrasion to the surfaces and gills of fish and will cause them to avoid areas with high turbidity. The effect of suspended sediments on marine organisms depends on the concentration, duration of exposure and the sensitivity of various species. Significant increases in suspended sediments can affect the feeding efficiency of such species, with potential mortality during prolonged periods of excessively high levels of suspended sediments.

As discussed in the Baseline report, the movement of currents within the project site is minimal and the wave climate is relatively sheltered, leaving no mechanism for extensive sediment transport. Given the short duration of the proposed dredge, the coarse nature of the sediment and the prevailing hydrodynamic conditions, it is expected that the extent and dispersion of fine material will not be significant. Therefore the mobilisation of sediment will be localised and confined to the immediate surroundings of the area of construction, posing a negative impact of **minor** significance.

Cumulative impact on marine life
The overall (negative) impact of dredging activities on marine life is considered to be of **minor** to **moderate** significance.

7.4 Impact resulting from construction of quay walls

7.4.1 Impact on natural seabed

The impact at the location of the new breakwaters and extensions of the quay will be the irreversible loss of the footprint of seabed and any natural species living just above it (epibenthic) on or in it. In view of the absence of any precious underwater vegetation and known species, any mobile fauna (e.g., small fish) may relocate to nearby foraging grounds. The significance of this negative impact is considered to be **minor**.

7.4.2 Impacts on coastal erosion

Changes in current and drift may be leading to erosion and accretion in shore zone caused by the construction of new quay and breakwater. The impact is expected to be minimal due to the rocky underground and the duration will be a short period of time. The significance of this minor impact is considered to be **minor**.

7.4.3 Impacts on soil quality (landward)

Impacts from leaching of the placed dredged material for reclamation (i.e., for later operational use) may generate leaching in the soil as well as in discharge waters containing fines. Five samples of sediment in the Port have been taken and analysed for potential pollutants, which did not shown any contamination with an immediate hazard. The potential for temporary storage and thereafter re-use of dredged sandy / granular material, either its treatment and disposal, will have to be further investigated by the contractor.

Therefore the impact cannot be fully assessed, at present. However there are no indications to expect a negative impact **of moderate to major** significance.

7.5 Impact resulting from construction of buildings and structures

7.5.1 Impacts from waste generation by landside construction

Before the planned facilities on land can be realised, parts of the old buildings need to be demolished. This rubble and waste has to be removed and re-used or disposed of. Options for re-use have to be investigated. These old buildings contain hazardous materials such as asbestos (e.g., in roof lining) and PCBs (e.g., in old transformers), which can impact soil or water wherever they are placed.

The soil is polluted at some places, mainly with oil. At one location it is recommended to remove the polluted soil in order to prevent spreading of the contamination (Environmental Site Assessment – annex 2 Baseline Survey).

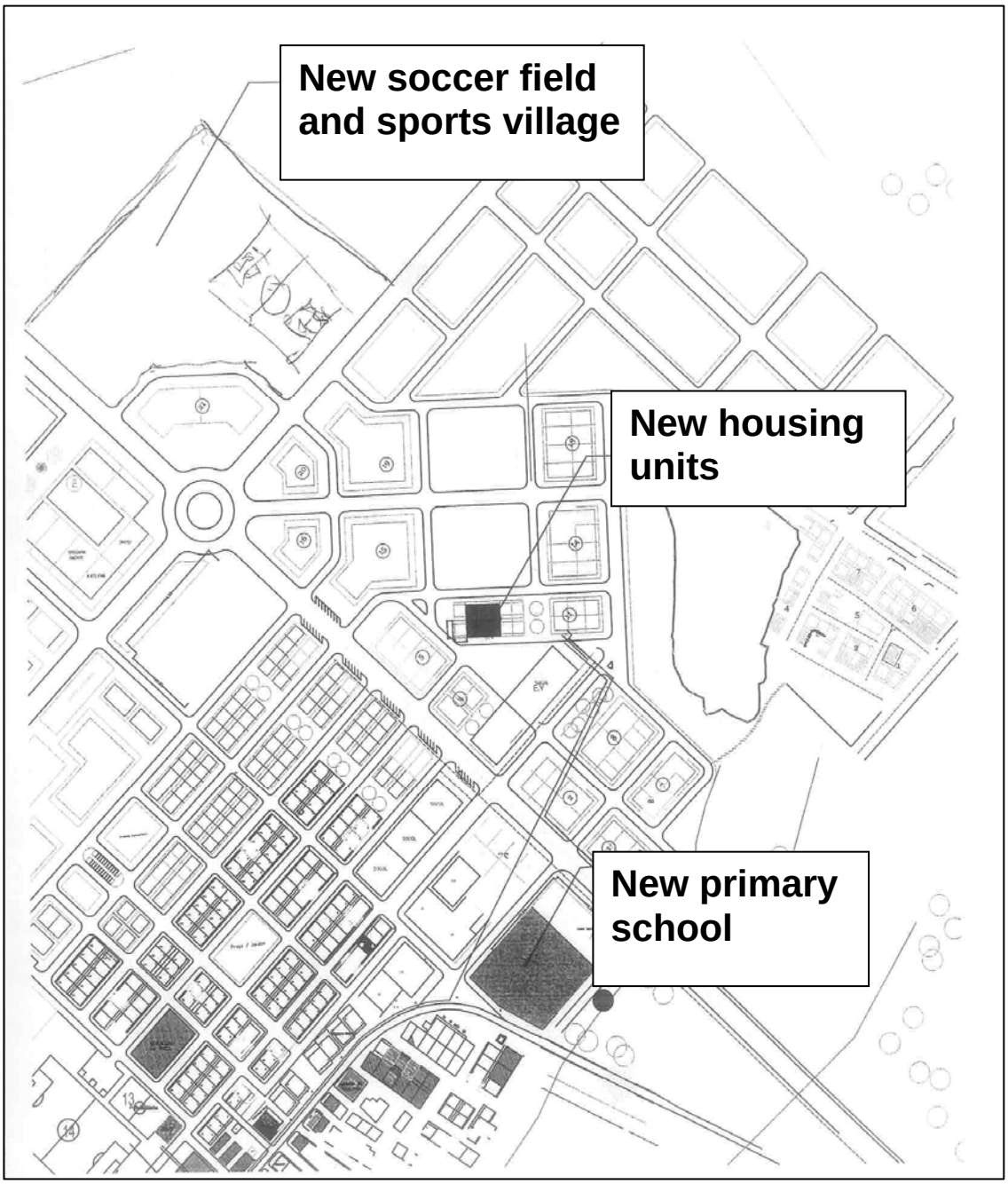
Furthermore, construction activities will result in the production of solid and liquid wastes from construction materials, construction workers' wastes and potentially hazardous chemical wastes from machinery use, refuelling and maintenance. If not properly managed and a clear waste disposal strategy adopted by the chosen contractor, this may be a negative impact, potentially of **major** significance.

7.5.2 Impact on local society and economy

For the realisation of the planned expansion on the landside, a small number of houses (six), a primary school and a football field need to be removed and relocated.

ENAPOR and the municipality have informed the affected stakeholders of the required relocation and have considered and discussed with them possible relocation options.

The municipality foresees the relocation of these six families to a new area to be developed at the south-eastern entrance of the village, a few hundred metres from their current location. The families will be provided with new row houses, which are larger in size and of better quality than their current premises. The Port will pay for their relocation. The municipality states that the families have agreed with the relocation.



For the relocation of the school, a plot will be identified in the new (to be) developed area at the south-eastern entrance of the village, a few hundred metres from its present location. The school will be enlarged to accommodate for a future increase in the number of pupils and its entrance will be located on a small quiet street to secure the safety of the children. The port will pay for the relocation. The municipality has stated that the school has agreed with the relocation.

The planned newly developed area will also house a football field but probably also other sports facilities as the community has requested for the construction of a “sports village”. The Port will pay for the relocation of the football field, however, will not construct other sport facilities at this plot.

The community, however, will have the opportunity to do so. The municipality is still awaiting full agreement with the community on the relocation of the football field.

This is assessed as a negative impact of **minor** significance due to the necessary relocation.

7.6 Impacts resulting from paving, drainage and lighting

7.6.1 Impacts from contaminated soil

Before the planned facilities on land can be realised, the polluted soil should be removed or remediated (see the Baseline Report, Environmental Site Assessment – annex 2 Baseline Survey).

If not properly managed and a clear waste disposal strategy adopted, this may be a negative impact of **major** significance.

8 IMPACTS DURING THE OPERATIONAL PHASE

8.1 Impacts resulting from the increase in the Port's operational activities

8.1.1 Impact on local society and economy

Positive impacts on the local economy will occur in the operational phase as well as the beneficial consequences of job creation, increase in Port revenues, improvement in supplying markets, improvement of safety in port activities, opportunities for the establishment of industrial or logistic activities, improvement of access to better quality goods and the improvement of the income and living conditions of many families. Furthermore, a fully functioning Port will complement the other planned developments in Sal.

At present, the Port employs approximately 70 people. It is estimated that after the expansion of the Port there will be twice as many staff employed.

This is considered to be a positive and permanent impact of **moderate** significance.

As the port is one of the main enabler of the growth of tourism on the island, the expansion of the port will have a strong positive impact on the economic growth through tourism development on the island.

This is considered to be a positive impact of **major** significance.

The strong economic growth, enabled by e.g. the expansion of the port, can, however, have various adverse effects on the environment and society as well. The increased number of tourist, tourism real estate and associated tourism activities may have a negative impact on the marine reserve of Murdeira Bay and on turtle nesting beaches from increased pressure. A decrease in the number of turtles coming ashore to lay their eggs along the beaches of Santa Maria village has already been noticed as a result of the increased tourism developments. This can in turn also impact on the attractiveness of the island as a tourism destination.

Furthermore, many tourist developments cause occupation of places on the coast of Sal traditionally inhabited by the residents of Sal. The influx of immigrants may also cause certain problems, such as the increase of a general sentiment of insecurity. The high growth in number of tourists and tourism establishments may decrease the feeling of remoteness and the perception of open space on the island, and increase the feeling of crowdedness, which will not appeal to all tourists and island residents.

This is therefore considered to be a secondary negative impact of **moderate** to **major** significance, on which the port however does have little influence.

The cumulative impact of the port on economy and society is considered to be a positive impact of **major** significance.

8.1.2 Impacts from waste water, sewage and run-off

Run-off from raw material storage, spills from cargo handling, can also adversely affect sea water quality in the surrounding area.

Increased amounts of sewage will be generated as the number of employees will increase. If this is discharged directly to the sea this will cause a negative impact on seawater quality.

The impact is local but long-term. The risks for negative impacts on the water quality, if not properly managed, are estimated to be of **major** significance.

8.1.3 Impact on sea water quality from ships

Post-modernisation of Palmeira Port, it is expected that the number of ships using the upgraded facilities will increase and there will be a potential corresponding increase of pollutants (e.g., mineral oils and hydrocarbons) derived from materials such as lubricating oils and fuels used in the engines of these ships. Therefore, the possible discharges from ships that could be sources of pollution in water include ballast waters, oil wastes, sewage, garbage and other residues from ships. Leakages, spills and fugitive emissions of oils, lubricants, fuels and other liquids are likely to be the main cause of the degradation of the seawater quality during operation phase.

The risks from potentially negative impacts on the water quality, if not properly managed, are estimated to be of **major** significance.

8.1.4 Impacts on air quality

Impacts on ambient air quality are likely to increase due to the intensification of activities associated with the overland transport of goods, the operation of ships, cargo landings and ship maintenance. Those activities result in polluting air emissions such as carbon monoxide (CO), carbon dioxide (CO2), nitrogen oxides (NOx), particulate matter (PM10), sulphur dioxide (SO2), lead and volatile compounds. Ships are expected to be the main source of polluting emissions, generated especially during manoeuvring and berthing. The predominant north-eastern winds are likely to disperse most of these pollutants seawards.

European Union standards on the most common pollutants from vehicles, in order to protect human health have been set on the following standards for maximum air emissions at the location of a sensitive receptor (based on annual averages):

- For sulphur dioxide : 20 µg/m3
- For nitrogen dioxide: 40 µg/m3
- For particulate matter (PM10): 40 µg/m3 maximum.

At present there are no indications of air quality issues at the nearest sensitive receptors as a result of the port. The very small size of the port and small number of vessels (about 300 annually) and trucks it receives, do also not make current exceedance of air quality limits during operation likely.

The volume of throughput in the port is expected to grow with a factor 2 to 3 against current annual throughput. Even then the port will still remain a port of small size, with no more than a few ships being able to berth at its quays at the same time.

The main type of ships that will call at the port after expansion will be mixed cargo vessels, container vessels, liquid bulk tankers, ro-ro vessels and ferries, and fishing vessels.

With the port expansion a truck waiting area at the port entrance will be created, just as the allocation of an area for trucks and cars, waiting to embark ro-ro ships. Also re-planning of port access and route to port is foreseen, with the construction of a ring road around Palmeira village.

Considering the distance to the nearest sensitive receptors (circa 250 m), the relatively low volume of traffic and favourable winds, the negative impacts on local ambient air quality are estimated to be of **minor** significance,

8.1.5 Impacts from maintenance dredging

Negative impacts on seawater quality may be derived from maintenance dredging activities on the seabed. Maintenance dredging might have to be carried out at a future date to guarantee the safe operation of ships in the Port. Considering the very low sedimentation rate, which has not required any maintenance dredging activities in the history of the Port, future dredging operations are expected to be infrequent and only for small quantities of sediment.

The impacts from maintenance dredging are estimated to be of **minor** significance.

8.1.6 Impacts on marine life

Post-modernisation of the Palmeira Port on Sal, it is expected that the number of ships using these facilities will increase and result in more shipping activity throughout the region. It is expected that in the coming ten years, the number of ships calling at the Palmeira Port will at least double. The first marine reserve of Cape Verde, Murdeira Bay, lies at a distance of eight kilometres downstream of Palmeira Port.

These threats may affect both terrestrial and marine environments, such as habitat degradation resulting from increased effluent and contamination from the coastal development construction of marinas and increased boat traffic. Combined, these impacts could diminish the health of the coastal marine ecosystem.

The dock zone of Palmeira Bay and its slopes – where a small stone reef lays – offers reasonably good conditions and provides shelter for a diversity of animal life. Similar reefs can be found at other locations around the Island. Increased traffic will lead to increased amounts of sediments in the waters at Palmeira Bay which can negatively affect marine fauna.

Increased shipping traffic may further increase the amount of litter in the water as well as increase the risks of accidents and spills.

Impacts on cetaceans and turtles
Increased shipping traffic may have a disturbance effect on cetaceans (e.g., whales) and turtles coming to nearby Murdeira Bay to breed. The green turtles (chelonian mydas; endangered species list of the UN (IUCN: EN A2bd (Endangered);)[9] present in the waters surrounding Palmeira Bay are particularly susceptible to population declines because of their vulnerability to anthropogenic impacts during all life stages, from eggs to adults.

An increase in shipping movements has the potential to impact on cetacean and turtle populations in the following ways:
- Potential collisions with ships;
- Elevated levels of background noise within the water column potentially disturbing breeding or navigation. Whales use their sensitive hearing to follow migratory routes and locate each other at distances, to find food and care for their young. Noise that undermines their ability to hear can threaten their ability to function and survive. Ambient or chronic sounds are primarily created by ships. The sounds are generally low frequency and are prolonged. The humpback whales seem to be under the most affected species;
- Contamination of sediments from discharges from the ships and from the shipyard and resulting bioaccumulation of potential toxins that have passed up through the food chain;
- Reduced water quality resulting from accidental spillage or illegal discharges such as dirty ballast water and such water containing alien species.

The operation of the Port and associated facilities could potentially have a negative impact on nearby cetacean and turtle populations of **moderate to major** significance.

Introduction of alien species through ballast water
Ballast water is carried in unladen ships to provide stability. Water is taken up at a source port and transported (in some cases many thousands of miles) to the destination port where it is discharged. Thousands of marine species can be carried in ships' ballast water. This includes anything that is small enough to pass through a ships' ballast water intake ports and pumps. These include bacteria and other microbes, small invertebrates and the eggs, cysts and larvae of various species.

Problems experienced by the introduction of non-indigenous species include:
- Bio-fouling on ships hulls;
- Fouling of other marine organisms;
- Fouling of water intake pipes and heath exchangers;
- Fouling of cages for aquaculture;
- Reduced catches due to damage of nets;
- Introduction of diseases due to carriers of parasites and pathogens that proceed to infect local marine life.

[9] Green turtles have been placed on the endangered species list due to their rapid decrease in numbers in the past years.

There is currently no method to completely empty the ships' ballast tanks as a residual amount is always left inside the tanks.

As the Palmeira Port is mainly a supply port (cargo and bulk are being brought in to supply hotels and residents), most ships entering the port are expected to be laden for unloading in the port, and thereby not containing significant quantities of ballast water. This is therefore considered to pose a potentially negative impact (on the water quality and marine ecology of the area) of **minor** significance.

Creation of new habitat for marine flora and fauna
The construction of the breakwater will effectively create a new habitat with a network of holes and crevices. These are likely to be utilised by fish for refuge and mobile and encrusting species of invertebrates thus creating a positive impact to the environment of **minor** significance.

Cumulative impact
The negative impact of the port operations upon the environment, if properly managed, especially during migration and breeding seasons of cetaceans and turtles, are estimated to be of **moderate** significance.

8.1.7 Impacts from ship generated waste

During the operational phase, on the Project site, ships are the main sources of waste generation for example, oily wastes, washing water, lubricant oil, cargo residues and ballast. These wastes have the potential to cause serious problems if not controlled or well managed. Unsanitary conditions, odours and other degradation of water quality may occur. Considering the cumulative quantity and the long-term effects, this is considered to be a negative impact of **major** significance (if not dealt with through proper management and mitigation).

8.1.8 Impacts from cargo handling and port generated waste

In the Port area, waste products generated from operation of Port facilities will have to be treated in an appropriate way, otherwise this waste will cause pollution on land and potentially in the marine environment. If not properly collected and disposed off, waste in the Port could end up in the water causing safety and health hazards.

The negative impact is considered to be of **moderate** significance.

8.1.9 Impacts from increased energy consumption

The increase in Port operations are likely to lead to an increase in energy demands, for the various Port operations themselves, warehouse storage (cooling), lightning of the Port and for ships, vehicles and machinery. The latter mainly operate on fossil fuel.

The warehouse storage, lightning of the Port (such as the container terminal) and various Port facilities, like the Port office, source their energy demands from the nearby Electra plant, which is supplied by fossil fuel.

The main consumers of electricity are currently the desalination plant with approximately 38%, the airport and hotels in general. The villages consume between 1.9 MW (Santa Maria and 1.3 MW (Espargos) to 250 KW (Palmeira).

Due to increased demands in energy demands on the Island, the Electra electricity plant is about to reach its maximum capacity in the near future. The plant will be relocated and expanded in the future. The time of relocation is not yet known. Neither is it known what the percentage of increase in installed capacity will be and whether the expanded plant will be fuelled by fossil or renewable fuels. Fossil fuels are currently supplied trough the port.

The municipality of Sal intends to increase the generation of renewable energy up to 25% of total demand. In the recent draft Master Plan of Sal, an area just north of the Port has been assigned for the development of renewable energy sources. Currently one wind turbine generator north of the Port is generating electricity. Total installed capacity of renewable energy on the island is negligible.

Current major increases in the price of fossil fuels on the world market, as a result of increased worldwide demand, combined with the relative scarcity of easily extractable oil sources, are likely to make investments in renewable energy more cost-competitive.

The impact of increased port demands for energy can currently not be assessed.

8.1.10 Impacts on health and safety

Specific occupational health and safety hazards and risks are associated with the operation of Palmeira Port and with ships entering the bay and berthing at its quays, such as:

1. Physical hazards that may be associated with the work at the Port;
2. Chemical hazards that may include potential exposures to a variety of hazardous materials such as toxic paints, heavy metals, etc. Other chemical hazards may include the potential for causing fire and explosions. The Port is relatively small, thus these effects may be of limited size;
3. Biological hazards that may include potential exposure to pathogens present in the Port and ship garbage and sewage.

This is considered to be an impact of **moderate** significance.

8.2 Impacts resulting from cement handling

8.2.1 Impact on sea water quality

Dust from cement handling can adversely affect sea water quality in the surrounding area. As planned, the cement will be discharged with pneumatic conveying systems a type of equipment which is environmentally acceptable for loading, unloading and distribution of cement. The cement and other raw materials are stored in silos which will be constructed at the beginning of the quay.

The risks for negative impacts on the water quality if the proper equipment is not installed or not properly handled are estimated to be **major negative**.

8.3 Impacts resulting from oil terminal/ oil handling

8.3.1 Impact from accidents, spills, fires and other disasters

After modernisation, it is expected that the number of ships using Port facilities will increase and there will be an increase of pollutants (e.g., mineral oils and hydrocarbons) and hence, an increased risk for spills and accidents. Leakages, spills and fugitive emissions of oils, lubricants, fuels and other liquids are likely to be the main cause of the degradation of the seawater quality during operation phase.

Carrying out different activities during the operational phase will involve the handling of substances which are dangerous from a point of view of polluting of soil and marine environment. Hazardous materials associated with repair/maintenance activities on equipment and ships, and dredging are particular risks. Accidents and malpractice may lead to the contamination of soil and marine water. This is considered to be a significant environmental risk, but one that can be managed and controlled (see Section 10).

The risks for negative impacts on the water quality are estimated to be of **major** significance**.**

8.4 Impacts resulting from ro-ro activities

8.4.1 Impacts from air and noise emissions

Currently at Palmeira port there are no ro-ro facilities. It is expected that in a few years a ro-ro ramp at the head of the existing quay, which will be extended (phase 1), will be operational in Palmeira and a scheduled service will start soon after the ramp has been constructed. Ro-ro will be able to transport general cargo and containerized cargo, as well as passengers and cars. ;

The vessels will sail on a fixed schedule and the stand-alone ro-ro ramp will not interfere with the other operations in the port. According to the traffic forecast for the port expansion, ro-ro vessels that will call at Palmeira are expected to be of a size of the Tarrafal vessel, which currently sails the Cape Verdean waters. This vessel can carry up to 500 tons of cargo (net) and nearly 1,000 passengers. This type of vessel should make 2-3 calls per week to be able to carry the expected quantity (80,000 tons) of ro-ro cargo.

The arrival of a ro-ro vessels will create a flow of trucks and passengers cars arriving and departing from the port. This could result in a temporary, negative impact from noise and air emissions on nearby sensitive receptors in the village of Palmeira of moderate significance.

As the port expansion foresees in the re-planning of port access and roads, including the creation of a truck waiting area at the port entrance; and the allocation of an area for trucks and cars, waiting to embark the ro-ro ships is foreseen, this negative impact is considered to be of **minor** significance.

8.5 Impacts resulting from container terminal operations

8.5.1 Impacts from noise emissions

The storage of empty containers will be moved to a location in close proximity to the village of Palmeira. Typically, the sources of noise will be container bangs from cranes and fork-lifts picking up and placing containers. These sounds are known to be a major source of nuisance to residents. The distance between the stacking area and the nearest sensitive receptor at the village is approximately 250 m. In between the stacking area and the empty containers there are some buildings, however, they are not expected to be as high as the stack of containers. The plans of the Port to move to operating 24/7 will augment the impact of noise through the handling of containers.

When containers are placed on top of each other, maximum noise levels emerge. These noise levels can reach levels of 126 dB(A). In order to reduce noise levels to acceptable levels (55 dB(A) by day and 45 dB(A) at night) a proper distance between the Port and nearest the residential area would be 500-600m. The frequency and timing of the noise will depend on the operational hours of the container terminal.

If mitigating measures such as no cargo handling during the night-time, or stacking of containers to reduced heights are not taken into account this could be a negative impact of **major** significance.

9 RECOMMENDED MITIGATION MEASURES FOR THE CONSTRUCTION PHASE

9.1 Introduction

The development of mitigation measures to avoid, minimise and reduce negative impacts – as well as monitoring initiatives – during the construction and operation phases have been discussed and developed throughout the EIA process. Many of the anticipated environmental impacts will occur during construction of the new Port facilities so much of the responsibility for implementing them be on the chosen civil engineering contractor/s and supervisors. The requirement to implement mitigation measures can be built into the construction contract specifications.

9.2 Mitigation of impacts resulting from general construction works

9.2.1 Mitigation of impacts from waste generation during construction

It is recommended that the Contractor shall manage all solid and liquid wastes, including general refuse from site workers and construction wastes and hazardous wastes, generated during the construction works. This includes also the solid and liquid wastes generated on land and that emanating from construction-related ships. Measures shall be put in place to ensure that solid or liquid wastes are not disposed of to sea or fly-tipped outside the construction site. At present no facilities for ship and carog rel;ated waste nor hazardous waste are available in the port. Solid waste resulting from port operations are collected by a local contractor.

The following mitigation measures are recommended:

- **Waste Management Plan (WMP)**. Before the start of the contract, a “Waste Management Plan” should be prepared by the Contractor. Options and the feasibility of maximising the reduction of waste volumes, the re-use and/or recycling of waste and treatment waste should be assessed. The impact of waste generation can be minimised by this approach.
- **On site control**. General waste generated on-site should be stored in enclosed bins and normal waste streams separated from hazardous (sometime referred to as “special” wastes). Hazardous wastes must be stored in a secured area (to prevent vandalism, theft, accidents) and be within a covered area to prevent the ingress of rain. Provision should be made logistically with the Municipality of Sal and a local contractor to remove general refuse from the site on a daily basis to minimise odour, the attraction of pests and litter impact. Floating refuse should also be collected to protect the marine environment. Daily site litter patrols would be useful to keep the construction site tidy and professional. These actions can be documented in the WMP.
- **Waste philosophy**. In general, the waste management system should apply the common principles of “reduce” waste, “re-use” waste, “recycle” waste, “treat” waste and eventually if the previous options are considered non-viable to “dispose” of waste to landfill. Awareness can be raised on site with workers, sub-contractors, visitors etc. via “toolbox” talks and a series of reminders in the form of informative posters placed in strategic places on site.
- **Proper waste disposal site**. In co-operation with the Municipality of Sal, a proper waste disposal site or facility should be chosen. At present the Municipality has developed a comprehensive overall waste management, including separate waste facilities, new controlled landfill and the implementation of wastewater treatment

plant at two locations at the island (Santa Maria and Espargos). However the time frame for implementation and execution of the plan is unclear at present. In case there are no facilities available at Sal the contractor should transport its waste to a proper available facility at Santiago.

Residual Impact – If the mitigation measures described above are implemented and checked regularly then the risks of the construction site becoming a untidy, a waste hazard and a storage depot for wastes are minimised. In this case, the residual risk and impact is likely to be of **minor** significance.

9.2.2 Mitigation of impacts from air emissions and dust

The chosen construction contractor should limit air emissions by adhering to best practice for example maintaining and servicing vehicles and construction machinery and good housekeeping measures such as preventing engines from idling and running unnecessarily. The use of relatively new trucks and good quality fuel is recommended to reduce the impact of transport and other vehicles.

After their usage old trucks are sometimes left behind, rather than being re-used and/or shipped off the island. The contract with the contractor should incorporate:

- **Use of new trucks**. The use of mainly recently built trucks (up to a few years old), which will have lower air emissions compared to old trucks.
- **Removal of trucks.** The obligation to remove the trucks from the Island after construction works have finished if they will and can not be re-used for other purposes on the island.

The dust impact as a results of trucks delivering construction materials, such as rock, and for the transport of equipment and heavy machinery to the Port may be substantially reduced by **using alternative route options**, as described in Section 4.2.6., at sufficient distance from the villages. This would involve **upgrading dirt tracks north of the villages** of Palmeira and Espargos to a level of at least a gravel road. In addition, using these routes would also allow for fewer disturbances from noise emissions and result in lower safety risks for pedestrians.

Residual Impact – If the contractor performs well in minimising air emissions and disturbance from dust, the significance of the impact may be reduced to **minor** negative levels. Proof of performance might be borne in monitoring the number of complaints and site observations.

9.2.3 Mitigation of impact from noise emissions

The overall noise impacts associated with construction activities are likely to peak and trough as certain noisy activities, take place. Best practice behaviour and actions on site are required in order to avoid disturbance to sleep patterns at night and complaints from residents. Such measures might include:

- **Timing**. The greatest benefit can be achieved by adhering to good practice methods. Noise limits and restrictions on working times or areas may be specified and should be identified and embodied within the conditions of contract. No or restricted working (or out of hours deliveries) should occur during weekends or night-time.

- **Awareness on site**. Most importantly, all site-staff should be made aware of the conditions (above) and the reasons for them.

Residual Impact – If noisy construction activities are properly managed and timed, the negative, temporary and localised impact of noise emissions at nearest sensitive receptors may be reduced to **minor** to **moderate** significance.

9.2.4 Mitigation of impacts from leakage or spillage

Any works in close proximity to water have the potential to cause a water pollution incident. Dredgers and other marine equipment carry fuel and oil, which may be accidentally spilt from an on board incident or collision. High pressure hydraulic systems are also prone to possible failure leading to spillages. Construction activities on the reclamation areas will require plant and fuel storage areas, which constitute a spillage risk. Good operational practices and proper maintenance of plant and equipment will minimise impacts associated with spillages.

The key to protecting water quality during construction is careful storage and usage of fuels and oils. The following mitigation checklist is useful in this respect.

- **On or off-site storage**. Consider whether fuel storage is needed on-site, how much is to be stored and how – in large tanks, small stores or a mobile tank.
- **Positioning**. Fuel and oil stores must be located away from the site drainage system and the shoreline. If this is not possible, ensure adequate measures are identified to prevent or contain any spillage (e.g., blocking drainage points). Fuel and oil stores should be kept away from vehicle access routes to prevent collisions.
- **Protection**. Best practice dictates that fuel and oil storage must be sited on an impermeable base within a bund to contain at least 110 per cent of the maximum capacity. All ancillary equipment (e.g., valves, hoses) should be contained securely within the bund when not in use.
- **Labelling**. Ensure that tanks are correctly marked/labelled as to their contents and capacities.
- **Equipment**. Keep a store of spill response equipment at the fuel facility and bowsers.
- **Collection system**. Use drip trays under all static plant (e.g., pumps and generators), particularly during refuelling from mobile plant, and empty them regularly.
- **Maintenance**. All dredging and reclamation equipment (e.g., bulldozers, trucks and ships) should be maintained in good working order to avoid leakage or spillage of contaminants.

Residual Impact – If these measures are taken and checked regularly to ensure that avoidance and prevention tactics are in place, then the risk of spillage will be reduced and the significance of this potential negative impact reduced to one of **minor** significance. Human error causes almost all accidents and most incidents of this nature can be avoided through careful planning and good site behaviour.

9.2.5 Mitigation of impacts from site waste waters, runoff and sewage

In order to mitigate impacts related to silt-laden run-off, it is recommended to **properly clean quays and construction terrain** as to prevent the run-off to minimise the potential of such effluents to reach the marine environment. Domestic sewage must be

disposed of in accordance with the measures described in section 9.2.1., and requirements of the relevant regulatory authorities.

Overall, it is considered that **no** water quality impacts are expected to arise from on-site generated sewage, assuming suitable arrangements are put in place.

The following measure is nevertheless proposed, for the purposes of legal compliance:

- **Permission.** Before discharging any water, permission must be sought that the discharge will comply with any conditions specified in the discharge consent. This may require discharges to be monitored and liaison to be carried out with the relevant regulatory authorities (Municipality of Sal, Environmental department; and future inspectorate of the Ministry of Environment).

Residual Impact – If these mitigation measures on run-off and monitoring are implemented and checked regularly then the control of suspended sediment (into the marine environment) will be limited to acceptable levels. No other third party development is envisaged to be discharging into this part of the marine environment. As a result, we would anticipate the negative impact to be of **minor** significance.

9.2.6 Mitigation of impacts from the use of natural resources

The existing licensed quarry at Sal, operated by BBS, will likely be able to supply sufficient rock for the first and second phase of the port expansion. The quarry also has an installation of crushing facilities with possibilities of producing crushed stones from materials such as basalt for concrete production. For recommended mitigation measures concerning the transport of rock to the port is referred to section 9.2.2.

The **re-use of dredged materials** from the construction phases will be considered, however, the dredged quantity will be too low to fully satisfy the demand for sand and rock for land reclamation. In addition the dredged sand should be checked by means of **sampling** for its usability and possible contaminations.

Importing sand is the most likely alternative to the extraction of sand from the Island, as this is no longer allowed. Currently the import of sand from the deserts of Mauritania is being tested by the Cape Verde government. However, this raises concerns about the possibility of simultaneous importing fauna from continental deserts which is undesirable. The imported sand therefore needs to be **well checked and controlled** before loading in Mauritania and after arrival at Sal, as to prevent the import of exotic species to the island. It is recommended that the sand is **sieved before loading** for transport.

Residual Impact – of the use of natural resources is estimated to be **minor** if only materials from existing quarries and well controlled important sand is used.

9.2.7 Mitigation of impacts on local society and economy

Employing local Cape Verdean construction workers may diminish some of the possible problems associated with labour force imported from abroad and will enhance the local economy, as many islands in Cape Verde still experience a high unemployment rate.

It is recommended that the **use of local employees** is stimulated and the migration of employees from other countries is discouraged. The Master Plan of Sal (2007) showed in its overview of employed and unemployed labour force per sector in Sal and in Cape Verde, in total, that sufficient (unemployed) construction workers are available in-country.

Furthermore, it is recommended that **local enterprises and materials** are used whenever possible, feasible and not environmentally damaging (such as in the case of the now forbidden use of local sand).

Residual Impact – The positive residual impact of the construction activities on the local economy is considered to be of **minor** significance and temporary in nature.

9.2.8 Mitigation of impacts on health and safety

To reduce the hazard and risks associated with the construction works, a **Health and Safety plan** should be prepared and implemented by the contractor (see EMMP). ENAPOR should approve of the plan and periodically monitor the performance.

The contractor should also ensure that workers receive **proper training**, **written instructions**, and **follow certain safety rules and standards** in order to reduce as much as possible the risk of accidents.

Personal protective equipment (e.g. face masks and earplugs) should be provided and worn wherever necessary to avoid damage to worker health. Procedures to avoid over exposure to sun and heat should to be implemented to reduce the risks of heat stroke, etc.

Residual Impact – If properly implemented, the residual impact is considered to be of minor significance.

9.2.9 Mitigation of impacts on fishery

As no impact is predicted to occur, no mitigation measures have been formulated.

9.3 Mitigation of impacts resulting from breakwater/coastal revetment

9.3.1 Mitigation of impacts on natural seabed

As the impact is considered to be minor, no mitigation measures have been formulated.

9.3.2 Mitigation of impacts on coastal erosion

As the impact is considered to be minor, no mitigation measures have been formulated.

9.3.3 Mitigation of impacts on marine life

Because of the potential for disturbance to marine species, the following mitigation is suggested to reduce and minimise the impacts.

- **Timing.** Avoid noisy events through well-planned timing and programming to avoid sensitive seasons.

- **Visual checks.** Perform visual checks on the possible presence of cetaceans and turtles in the area, and adjust accordingly.
- **Ramp-up noise**. Where possible, noise generated during the construction period should undergo a slow and progressive build-up (ramp-up) (i.e., where noise is slowly increased to encourage species to move away from the source area prior to significant noise emissions). High frequency noises should also be reduced as far as possible.

Residual Impact – Water is acoustically hard and noise carried large distances underwater. Subject to these mitigation measures being implemented effectively, the disturbance risk to marine mammals is likely reduced to a level of **minor** significance. The work is temporary and will not be sustained for long periods.

9.3.4 Mitigation of impacts on sediment and water quality

Any works in close proximity to water have the potential to cause a water pollution incident. These are covered under the mitigation measures specified for impacts from leakage or spillage, section 9.2.4. and for impacts from wastewater, sewage and run-off, section 9.2.5.

9.4 Mitigation of impacts resulting from dredging and reclamation

9.4.1 Mitigation of impacts on water quality

As the impact is considered to be of minor significance, no specific “water quality” mitigation measures have been formulated but reference should be made to the best practice measures regarding **avoiding the re-suspension of sediments** as specified in the following section.

9.4.2 Mitigation of impacts on marine life

Mitigating the impact of noise on cetaceans and turtles
The impact from underwater noise on ceteaceans and turtles can be serious. Due to the presence of ceteaceans (whales) and turtles near Palmeira the following mitigation measures are recommended:

- **Dredging equipment.** Noise mitigation for marine works would typically involve the choice of dredging equipment. An inherent mitigation in this case would be that cutter suction dredgers produce the least noise in comparison with other types, such as bucket dredgers; and they minimise the disturbance of sediment resulting in siltation of the water column and potential (re)mobilisation of contaminants. However considering the limited volumes of to be dredged material and high mobilisation costs, it is not likely that the contractor will choose for a cutter section but will apply the dredgers as mentioned earlier.
- **Timing**. Further noise mitigation involves avoiding noisy events through well-planned timing and programming outside sensitive whale and turtle seasons (e.g. avoiding the migration seasons of whales and turtles; humpback whales visit Cape Verde waters mostly during the European winter period, although all year round a variety of whales species can be spotted near Sal; turtles are mainly present between May to September). And by programming any particularly noisy activities for daytime rather than at sunrise or sunset.

- **Ramp-up noise**. If there are opportunities for doing so, the contractor should slowly and progressively ramp-up noise levels.
- **Observer**. As whales might be present at any time of the year, visual and vocal checks on the presence of cetaceans should be executed prior to dredging works. Therefore a qualified person should be appointed by the contractor to act as an observer on board the seismic survey vessel. If possible, such an observer should be an experienced cetacean biologist. As a minimum, it is recommended that the observer should have attended an appropriate training course.
- **Visual and vocal checks**. The contractor should allow adequate time (at least 30 minutes) for sightings to be made prior to commencement of any use of dredging equipment. Observers should carefully make a visual check from a suitable high observation platform to see if there are any marine mammals within 500 metres. Hydrophones may provide additional information on the presence of inconspicuous species or submerged animals, and should be used whenever possible. They can detect cetaceans at a distance up to several kilometres[10].
- **Wait.** If marine mammals are present in the area, the start of the dredging activities should be delayed until they have moved away. Therefore allow adequate time after the last sighting (at least 20 minutes) for the animals to move well out of range.

The visual presence of cetaceans might be indicated by the following signs:

- Dolphins and porpoises generally surface 2-3 times per minute in order to breathe. Dive times and surfacing behaviour are more erratic when they are feeding, but most dives are unlikely to exceed 5 minutes. Large whales surface less often and may remain submerged for some time.
- Splashes may be a cue to the presence of cetaceans.
- Blows of large whales may be more obvious, but still may be difficult to detect in strong winds.
- Some species may be attracted to boats from some distance away, probably by engine noise. If possible, look over the bow of the ship to check for cetaceans close to the ship, which may be hidden from view from the normal vantage points.
- Feeding seabirds can sometimes be evidence of the presence of cetaceans.

Mitigating the impact of re-suspension of sediments on corals

The impact on aquatic ecology due to re-suspension of sediments and sediment plumes can be serious. Due to the coarse nature of the seabed and the weak currents experienced in Palmeira Bay however sediment transport from the construction of the breakwater is likely to be small and localised.

Due to the presence of coral species present in the bay and their susceptibility to disturbance especially from smothering, the following mitigation measures are recommended:

- **Dredging practices.** The extent and concentration of the sediment plume can be controlled by good dredging practices to reduce the rates at which fines are released. This may include measures such as optimisation of trailing/cutting speeds and pump/suction discharge rates, reducing water intake and using return

[10] Guidelines for minimising acoustic disturbance to marine mammals from seismic survey, April 1998, Joint Nature Conservation Committee

flow, and limiting the overflow period (note that limiting the overflow period would result in a greater proportion of fines being pumped into the reclamation/storage area and, therefore, the possibility that a larger proportion of fines are released in the run-off)

- **Timing**. Programming the works at a time when local wind and wave patterns are not likely to transport suspended sediment in the direction of sensitive areas.
- **Re-use or disposal.** The aim is to re-use the dredged material rather than to dispose of it. Clauses should be included in the Tender Documents issued to construction contractors to ensure that a suitable dredge spoil discharge system will be put in place if the dredged material is being re-used in land reclamation or disposed of in water; stipulating that bidders propose in their offer how they will meet the requirement to prevent distribution of suspended solids in the waters outside the re-use or disposal site.

Residual Impact – The residual impact, if the proposed noise emission and sediment re-suspension mitigation measures are properly applied, the residual negative impact is considered to be of **minor** significance.

9.5 Mitigation of impacts resulting from Quay walls

9.5.1 Mitigation of impact on natural seabed

As the impact is considered to be of minor significance, no mitigating measures have been formulated.

9.5.2 Mitigation of impact on coastal erosion

As the impact is considered to be of minor significance, no mitigation measures have been formulated.

9.5.3 Mitigation of impact on soil quality (landward)

Before storage or re-use of dredged material on land, additional sediment sampling will be required to identify possible contaminations. Sampling should be carried out ‘in situ’, and should be finalized before dredging is started. If the dredged material is too contaminated it should be treated or otherwise disposed of at the municipal waste reception facilities. Temporary storage, awaiting further treatment or disposal should be such as to avoid leaching of possibly contaminated sea water into the ground and to avoid the entrance of rain water.

Residual Impact – If properly managed, the negative impact is considered to be of **minor** significance.

9.6 Mitigation of impacts resulting from buildings and structures

9.6.1 Mitigation of impacts from waste

It is recommended that the **chosen contractor manages all solid and liquid wastes**, including general refuse from site workers and construction wastes and hazardous wastes, generated during the construction works, as well for the structures at the waterfront and landside.

Rubble and waste from the **demolition** of buildings should preferably be **re-used** in e.g. other construction activities on the island. Or if not possible, it should be properly disposed of at the municipal waste facilities.

Similar mitigating measures as recommended for waste management in Section 8.2.1 are applicable here.

Residual Impact – If the mitigation measures are properly implemented and regularly monitored, then the risks of the construction site becoming an untidy, waste hazard and storage depot for wastes are minimised. The EMMP provides more details on the monitoring of waste. In properly implemented, the residual risk and impact is likely to be of **minor** significance.

9.6.2 Mitigation of impacts on local society and economy

The removal and relocation of six small houses, a primary school and football field will be part of the Project.

The Municipality has informed the affected stakeholders of the required relocation and has considered and discussed with them possible relocation options.

Construction of the new facilities should start in time in order for them to be ready on or before the date of actual relocation, thereby avoiding the risk that residents would have to make use of temporary facilities after removal from their current location to allow the port expansion as planned.

Periodic monitoring though of the relocation activities will be required, which is described in further detail in the EMMP.

Residual Impact – If the compensation and relocation is carried out as planned and agreed, there should be no residual impact**.**

9.7 Mitigation of impacts resulting from paving, drainage and lighting

9.7.1 Mitigation of impacts from soil contamination

From soil sampling, some minor soil contaminations with e.g. oil (probably gas-oil), below the Dutch maximum limits were observed. Further **sampling of soil** should indicate the extent and severity of the pollution at areas where pavage and drainage will take place. If too contaminated, the soil should be removed to prevent leaching into surface and ground water, and be treated for re-use or taken to landfill.

Residual Impact – If contaminated soil is removed and properly managed this can be considered to be a negative impact of **minor** significance.

9.7.2 Mitigation of impacts from leakage or spillage

Any works in close proximity to water have the potential to cause a water pollution incident. Dredgers and other marine equipment carry fuel and oil, which may be accidentally spilt. High pressure hydraulic systems are also prone to possible failure leading to spillages. Construction activities on the reclamation areas will require plant and fuel storage areas, which constitute a spillage risk. Good operational practices and proper maintenance of plant and equipment will minimise impacts associated with spillages.

The key to protecting water quality during construction is careful storage and usage of fuels and oils. The following mitigation checklist is useful in this respect.

- **On or off-site storage**. Consider whether fuel storage is needed on-site, how much is to be stored and how – in large tanks, small stores or a mobile bowser.
- **Sub-contractors**. Check whether sub-contractors have adequate fuel storage facilities.
- **Positioning**. Fuel and oil stores must be located away from the site drainage system and the shoreline. If this is not possible, ensure adequate measures are identified to prevent or contain any spillage (e.g., blocking drainage points). Fuel and oil stores should be kept away from vehicle access routes to prevent collisions.
- **Protection**. Best practice dictates that fuel and oil storage must be sited on an impermeable base within a bund to contain at least 110 per cent of the maximum capacity. All ancillary equipment (e.g., valves, hoses) should be contained securely within the bund when not in use.
- **Labelling**. Ensure that tanks are correctly marked/labelled as to their contents and capacities.
- **Equipment**. Keep a store of spill response equipment at the fuel facility and bowsers.

Residual Impact – If these measures are taken and checked regularly to ensure that avoidance and prevention tactics are in place, then the risk of spillage will be reduced and the significance of this potential negative impact reduced to one of **minor** significance. Human error causes almost all accidents and most incidents of this nature can be avoided through careful planning and good site behaviour.

10 RECOMMENDED MITIGATION MEASURES FOR THE OPERATIONAL PHASE

10.1 Mitigation of impacts resulting from the increase in operational activities

10.1.1 Mitigation of impacts on local society and economy

No mitigation measures have been formulated.

10.1.2 Mitigation of impacts from waste water, sewage and run-off

Collected stormwater would preferably be treated before being discharged into the sea. As a minimum, it is necessary to incorporate **stormwater detention/ retention** which can retain solid particles, before discharging into surface water channels/drains, as it is incorporated in the design. A flush pond could trap suspended solids. Furthermore, the system will be designed in such a way that the system may be closed-off in order to prevent spillage of oil or chemicals to flow into the sea in case of an accident.

Terminal areas that could potentially impact stormwater — such as the equipment and crane maintenance areas — have to be equipped with oil**/water separators**.

The sewage collected from the office buildings and the passenger terminal should be collected and treated in a **small sewage treatment system or septic tank**.

Residual Impact – If the measures described above are carried out, no or a **minor** significance residual negative impact could occur from wastewater, sewage and run-off.

10.1.3 Mitigation of impacts on sea water quality from ships

Correct management of port activities will be essential to minimise impacts on water quality. Initiatives to reduce the spread of pollutants into the environment may include the adoption of an Environmental Management System (EMS) such as ISO14001.
The key to successfully reducing or eliminating pollutants from daily port operations entering the environment is proper implementation of a port operations related EMS. Catastrophic oil spills are infrequent and therefore not included in daily environmental management, because they are covered by Oil Spill Contingency Plans. Measures might have to be adopted to control the spread of invasive species through ballast water control. Such control mechanisms could include the following:

- **Contingency plan**. Development of a “contingency plan” at Port level (which should be in accordance with the ports contingency plan that is currently being developed at a national level).
- **BWRA**. Undertake a Ballast Water Risk Assessment (BWRA) for the Port identifying high risk ships with appropriate management responses.
- **Forms**. Request arriving ships to submit reporting forms.
- **Surveys**. Conduct biological surveys/monitoring in the port and alert ships of outbreak of harmful species.

Residual Impact – An industry of this nature may still have adverse impacts on the baseline environment despite rigorous environmental control. The residual impacts would be of **minor** significance under normal operations and **major** in the case of a large scale emergency (e.g., toxic spill of substances into the marine environment).

10.1.4 Mitigation of impacts on air quality

As the impact is considered to be of minor significance, no mitigation measures have been formulated.

10.1.5 Mitigation of impacts from maintenance dredging

As the impact is considered to be of minor significance, no mitigation measures have been formulated.

10.1.6 Mitigation of impacts on marine life

Cetaceans and Turtles
In order to address some of the potential impacts to the cetacean and turtle population of Sal and to minimise some of the disturbance caused by increased shipping, a Code of Conduct should be drafted and distributed to the port users. This may include instructions such as:

- **Course**. Maintaining a constant course to port so that cetaceans and turtles learn to avoid ship passage.
- **Speed**. Maintain constant speed when approaching port.
- **Discharges**. Avoidance of discharges from the ships until docked.

The Port of Palmeira should adopt these points into a policy and strict procedure.

Residual Impact – Given that limited information is available on the cetacean and turtle populations of Sal, it is hard to quantify the residual impacts. However, given the global importance of the populations (especially the Humpback Whale and green / loggerhead turtle) it is possible that the Port could have a possible long-term negative effect through disturbance to feeding and breeding grounds.

Corals
Increased shipping movements have the potential to increase suspended sediment concentrations in the vicinity of the harbour through disturbance of the sediment (e.g., propeller movement). There are no indications for the presence of important coral formations in the bay. However at varying locations small numbers of corals are present.

Residual impact – If these measures are taken into account, in general only negative impacts of **minor** significance are expected.

10.1.7 Mitigation of impacts from ship generated waste

All ship related waste with a potential to cause pollution to the marine environment should be disposed of according to the guidelines stipulated by the MARPOL Convention.

At the Port therefore as **minimum facilities** for the following waste streams should be provided:

- Oily waste and bilge water.
- General household waste (ship generated solid waste) from ships.
- Wastes related to (un)loading and storage of goods.

It is recommended that for the collection of oily waste and bilge water, a small collection boat or truck be made available. General household waste and other solid waste from ships can be collected in containers and disposed of correctly at the municipal waste reception facilities.

Options for **re-use, recycling** or the (additional) use of existing waste treatment facilities outside the Port should be investigated to ensure sufficient future capacity for Port or ship generated solid waste and to further improve Port waste management.

Necessary equipment/facilities for the collection of waste will at least comprise of:
- Collection truck or collection boat for liquid (oily) waste.
- Containers for the collection of solid waste.
- Truck for the transport to the disposal side of port-generated waste.
- Treatment facility for the treatment of oily liquid waste.
- Storage tank for liquid waste.

Furthermore, a **regulations and fee system** should be designed and implemented in a way such that ships are encouraged to dispose of their waste in a proper way in the port. This could be done e.g. by not levying a separate fee on waste disposal or to include mandatory disposal in port by-law.
Residual Impact – If there are proper waste management handling plans and proper disposal procedures and locations the potential risks and impacts from waste could be expected to be of **minor** significance.

10.1.8 Mitigation of impacts from cargo handling and port generated waste

In the Port area, waste products generated from operation of the facilities will have to be treated in an appropriate way, otherwise this waste will cause pollution on land and in the marine environment. Referred is to mitigation measures as mentioned in section 10.1.6.

Waste generated by Port operations shall be managed appropriately in order to avoid health hazards and to ensure that waste is disposed of in an environmentally sound way. The Port authorities should apply appropriate procedures, in agreement with national and international regulations, for the handling and storage of hazardous cargoes and waste generated by handling and storage of this type of cargoes.

The following mitigation measures are recommended:
- **Waste philosophy**. In general, the common principles of “reduce” waste, “re-use” waste, “recycle” waste, “treat” waste and eventually if the previous options are considered non-viable to “dispose” of waste to landfill should be applied. Awareness can be raised with port employees via informative talks and a series of reminders in the form of informative posters placed in strategic places in the port.
- **Waste Management Plan (WMP)**. The port should prepare a “Waste Management Plan”. Options and the feasibility of maximising the reduction of waste volumes, the re-use and/or recycling of waste and treatment waste should be assessed. The impact of waste generation can be minimised by this approach.
- **On site control**. General waste generated on-site should be stored in enclosed bins and normal waste streams separated from hazardous (sometime referred to as “special” wastes). Hazardous wastes must be stored in a secured area (to prevent vandalism, theft, accidents) and be within a covered area to prevent the ingress of

rain. Provision should be made logistically with the Municipality of Sal and a local contractor to remove general refuse from the port several times a week to minimise odour, the attraction of pests and litter impact. Floating refuse should also be collected to protect the marine environment. Daily site litter patrols would be useful to keep the port tidy and professional.

- **Proper waste disposal site**. In co-operation with the Municipality of Sal, a proper waste disposal site or facility should be chosen. At present the Municipality has developed a comprehensive overall waste management, including separate waste facilities, new controlled landfill and the implementation of wastewater treatment plant at two locations at the island (Santa Maria and Espargos). However the time frame for implementation and execution of the plan is unclear at present.

Residual Impact – If there are proper waste management handling plans and proper disposal procedures, these impacts will constitute only a negative impact of **minor** significance.

10.1.9 Mitigation of impacts from increased energy consumption

As fossil fuels become more scarce and increasingly difficult to extract, and with the world prices for fossil fuel heavily on the increase and quite unlikely to substantially decrease in the future, the world economy will have to switch from mainly fossil to mainly renewable energy in the next 40-50 years of this century. This will have its effects on Sal as well. It is therefore recommended that the Port operators and authorities look into **alternative, renewable energy** sources for the Port. Solar and wind-powered systems might prove feasibly considering the very sunny and quite windy climate conditions at island of Sal.

Use of modern and well maintained equipment will also reduce the amount of energy required in the port. In addition a simple **self-assessment on energy use** can indicate high energy uses and energy losses and provide opportunities for reducing the use of energy in the port.

Residual Impact – The residual negative impact is estimated to be of **minor** significance.

10.1.10 Mitigation of impacts on health and safety

To mitigate the identified negative impacts on health and safety, the Port administration should **implement management procedures** based on the following items:

- Management of the Palmeira Port according to the provisions of the international Safety Management, including the preparation of a formal, written, Health and Safety Management Plan, which should be regularly updated.
- Port Administration should implement the Plan and ensure that standard health and safety measures are taken.
- The Safety Management System should identify the assignment of roles and responsibilities, the resources available, and emergency procedures, among others.
- Port operators should apply the fire safety provisions according to applicable national and international standards.
- Port Administration should ensure safety instruction and equipment for the workers.
- Port Administration should prepare a Port Security Plan.

Residual Impact – The residual impact, if these measures and procedures are put into place, is anticipated to be of **minor** significance.

10.2 Mitigation of impacts resulting from cement handling

10.2.1 Mitigation of impacts on sea water quality

To prevent cement products to drop or be blown in the water and thus affecting water quality, equipment should be well maintained and the quays should be properly cleaned, with the waste water collected and treated. Proper equipment for storage and loading unloading should be installed.

Residual Impact – If there are proper equipment and cleaning measures in place, the negative impacts will be of **minor** significance.

10.3 Mitigation of impacts resulting from oil terminal / oil handling

10.3.1 Mitigation of impacts from accidents, spills, fires and other disasters

The International Convention on Oil Pollution Preparedness, Response and Co-operation (OPRC Convention) requires States to establish measures for dealing with pollution incidents, either nationally or in co-operation with other countries.

Ships are required to report incidents of pollution to coastal authorities, and the Convention details the actions that are then to be taken. The Convention calls for the establishment of stockpiles of oil spill prevention equipment (e.g., at ports and harbours), the holding of oil spill prevention and reaction exercises and the development of detailed plans for dealing with pollution incidents. A protocol to the Convention on Incidents by Hazardous and Noxious Substances was adopted in 2000 (the HNS Protocol).

The following mitigation measures are recommended:

- Development and implementation of an oil spill contingency plan
- To have adequate stockpiles of oil spill prevention equipment:
- Standard operating procedures that reduce or eliminate the chance of a spill, even in the case of equipment failure, should be instituted for all oil-handling and fuel components.
- Routine maintenance and testing schedules should be determined for all aspects of port operation particular attention paid to product storage and handling, and fuel transfer systems.
- Guidelines for operating in poor weather and high sea state conditions should be established. Good communications and sound marine practices for all vessels will also improve the ability to prevent spills.
- Proper environmental operating practices should be assured through regular inspections and audits of the facilities.
- All spills, whether contained or not, should be reported and investigated so that deficiencies in design or procedures can be identified and corrected.
- The general awareness of all workers should be increased through training and safety meetings.

Residual Impact – If these measures and procedures are put into place, effectively, it is estimated that the residual impacts upon marine life and water quality as a result of oil handling, are of **minor** (general) to **major** (emergency) significance.

10.4 Mitigation of impacts resulting from ro-ro activities

No specific impacts resulting from ro-ro activities i.e., those not covered by the general increase in operations have been identified.

10.5 Mitigation of impacts resulting from container terminal operations

10.5.1 Mitigation of impacts from noise from operations

Handling equipment, plant and moving cargo will generate noise, specifically the handling of empty containers. Best practices should be applied to reduce unnecessary loud noise emissions for nearby sensitive receptors (village of Palmeira), such as no cargo handling during night-time, or stacking of containers to reduced heights.

Residual Impact – The residual impact will be of **minor** to **moderate** significance.

Table 10.1: Overview of impacts, mitigating measures and residual impacts distinguished per activities in the construction and operation phase.

Project Phase / Activities	Potential Impacts	Significance of the impact	Mitigating Measures	Residual Impact
Construction phase				
General construction works	Impacts from waste generation at water's edge	Major negative impact	- Develop waste management plan for construction period - Apply principles of re-use, recycle, treat and eventually dispose - On-site control of waste management practices - Proper final waste disposal site or facility should be arranged	Minor negative impact
	Impacts on air quality	Major negative impact	- Use of well modern and well maintained equipment - Use of good quality fuel - Good housekeeping practices i.e. preventing equipment of running idly or unnecessary - Choosing appropriate transport routes avoiding residence areas - Upgrading of sand track routes to prevent dust from transport	Minor negative impact
	Impacts from noise emissions	Moderate to Major negative impact.	- Construction and demolition activities only carried out during day-time - Awareness among construction workers	Minor to moderate negative impact
	Impacts from leakage or spillage	Moderate to Major negative impact	- Development of a spill contingency plan on-site and on water - Consider whether fuel storage is needed on-site, how much is to be stored, where and how - Ensure adequate measures are identified to prevent or contain any spillage - Keep a store of spill response equipment at the fuel facility and bowsers. - Use drip trays under all static plant (e.g. pumps and generators), particularly during refuelling from mobile plant, and empty them regularly. - All dredging and reclamation equipment (e.g. bulldozers, trucks and ships) should be maintained in good working order to avoid leakage	Minor negative impact

Project Phase / Activities	Potential Impacts	Significance of the impact	Mitigating Measures	Residual Impact
			or spillage of contaminants.	
	Impacts from wastewater, sewage and run-off	Moderate negative impact	- Proper cleaning of the quays as daily practice and immediately in case of a spill - Domestic sewage to be discharged into a sewerage system or a septic tank - Ensure permits for discharging water is in place if applicable	Minor negative impact
	Impact from the use of natural resources	Moderate negative impact	- Use materials from existing licensed quarries only - Controlled import of sand - Re-use of dredged material if not (too) contaminated	Minor negative impact
	Impact on local economy	Minor positive impact	- Use local labour force - Use of local companies and products if available and not environmentally damaging	Minor positive impact
	Impact on safety	Minor negative impact	- Preparation and implementation of Health and Safety plan by contractor - Approval and monitoring of Health and Safety plan by ENAPOR - Proper training and written instructions for construction workers - Construction workers to follow certain safety rules and standards and to wear personal protective equipment - Implementation of procedures to avoid over exposure to sun and heat	Minor negative impact
	Impacts on fishery	No impact		
Breakwater / Coastal revetment	Impact on natural seabed	Minor negative impact	- ALARP – (As Low As Reasonably Possible) applying practices with the smallest impact considering the different alternatives	Minor negative impact
	Impact on coastal erosion	Minor negative impact	- ALARP – (As Low As Reasonably Possible) applying practices with the smallest impact considering the different alternatives	Minor negative impact

Project Phase / Activities	Potential Impacts	Significance of the impact	Mitigating Measures	Residual Impact
	Impacts on marine life	Minor to moderate negative impact	- No construction activities carried out in the water that generate a lot of noise during sensitive season of whales or turtles. - Visual checks on presences of whales and turtles in area - Where possible, noise generated during the construction period should undergo a slow and progressive build-up (ramp-up)	Minor negative impact
	Impacts on sediment and water-quality	Minor negative impact	- Referred is to the mitigation measures for minimizing negative impacts from leakage or spillage, and for minimizing impacts from wastewater, sewage and run-off	Minor negative impact
Dredging & Reclamation	Impacts from noise on marine life	Minor to moderate negative impact	- Apply appropriate dredging technique - Time dredging outside sensitive seasons, and during day-time - Ramp-up noise if possible - Appoint a marine observer - Perform visual and vocal checks on presence of cetaceans and turtles and adjust accordingly - If present, wait at least 20 minutes with start of dredging activities till they have moved out of the area	Minor negative impact
	Impacts from sediment re-suspension on marine life	Minor negative impact	- Apply appropriate dredging technique - Time dredging when wind and wave patterns are not likely to transport sediments - Use of suitable dredge spoil discharge system for re-use or disposal of dredged material	Minor negative impact
	Impacts on water quality	Minor negative impact	- Apply appropriate dredging technique - Time dredging when wind and wave patterns are not likely to transport sediments - Use of suitable dredge spoil discharge system for re-use or disposal of dredged material	Minor negative impact
Quay Walls	Impact on natural seabed	Minor negative impact		Minor negative impact

Project Phase / Activities	Potential Impacts	Significance of the impact	Mitigating Measures	Residual Impact
	Impact on coastal erosion	Minor negative impact		Minor negative impact
	Impacts on soil quality (landward)	Unable to assess	- Additional sampling and analysis is required before dredged material can be stored or re-used on land. - If too contaminated the dredged material should be proper treated or disposed of.. - Temporary storage, awaiting the results of sampling or awaiting disposal, should provide sufficient coverage to avoid entrance of sea water into the ground, and entrance of rain water in the stored material	Minor negative impact
Buildings and Structures	Impacts from waste generation	Major negative impact	- Develop waste management plan for construction period - Apply principles of re-use recycle treat and dispose - On-site control of waste management practices - Proper final waste disposal site or facility should be arranged - Rubble and waste from demolishing buildings should preferably be re-used or otherwise disposed of properly	Minor negative impact
	Impacts on local society and economy	Minor negative	- Monitoring of the planned relocation and compensation should be ensured	No impact
Paving, drainage and lighting	Impacts from soil contamination	Major negative impact	- Develop waste management plan for construction period - Proper final waste disposal site or facility should be arranged	Minor negative impact.
	Impacts from leakage or spillage		- Consider whether fuel storage is needed on-site, how much is to be stored and how - Check whether sub-contractors have adequate fuel storage facilities. - Fuel and oil stores must be located away from the site drainage system and the shoreline. - Fuel and oil stores should be kept away from vehicle access routes to prevent collisions.	Minor negative impact.

Project Phase / Activities	Potential Impacts	Significance of the impact	Mitigating Measures	Residual Impact
			- Fuel and oil storage should be sited on an impermeable base within a bund to contain at least 110 per cent of the maximum capacity - All ancillary equipment (e.g., valves, hoses) should be contained securely within the bund when not in use. - Ensure that tanks are correctly marked/labelled as to their contents and capacities. - Keep a store of spill response equipment at the fuel facility and bowsers.	
Operational Phase				
Increase in economic activity	Impact on local economy	Major positive impact		Major positive impact
	Impact from waste water, sewage and run off	Major negative impact	- Incorporate storm water detention/ retention to retain solid particles before discharging into surface water - The system should be designed in such a way that the system may be closed off in case of an accident - Terminal areas that impact storm to be equipped with oil/water separators. - Good housekeeping measures - The sewage collected from the office buildings and the passenger terminal should be collected and treated in a small sewage treatment system or a septic tank.	Minor negative impact.
	Impact on sea water quality from ships	Major negative impact	- Proper oil spill contingency plan and equipment - Ballast water management risk assessment and appropriate measures - Request arriving ships to submit reporting forms. - Conduct biological surveys/monitoring in the port and alert ships of outbreak of harmful species	Minor (general) to major (emergency) negative impact- ALARP

Project Phase / Activities	Potential Impacts	Significance of the impact	Mitigating Measures	Residual Impact
	Impacts on air quality	Minor negative impact	-	
	Impacts resulting from maintenance dredging	Minor negative impact	-	Minor negative impact
	Impact on marine life	Moderate negative impact	- Code of conduct, such as maintaining a constant course and speed upon approaching the port to avoid collisions with whales and turtles - Avoiding discharges when ships are docked - Proper oil spill contingency measures and equipment	Minor negative impact- ALARP
	Impacts from ship generated waste	Major negative impact	- Port waste reception management handling plan and facilities - Collection and treatment equipment - Proper disposal procedures and facilities for the waste - Introduce smart regulations and fee system to promote the discharge of waste by the ships to the ports	Minor negative impact
	Impacts from cargo handling and port generated waste	Major negative impact	- •Apply the common principles of “reduce” waste, “re-use” waste, “recycle” waste, “treat” waste and eventually if the previous options are considered non-viable “dispose” of waste to landfill - Raise awareness with port employees via informative talks and a series of reminders in the form of informative posters placed in strategic places in the port. - Prepare a “Waste Management Plan - On site control of waste in enclosed bins and normal waste streams separated from hazardous (sometime referred to as “special” wastes). - Hazardous wastes storage in a secured, covered area - Provisions with Municipality of Sal and a local contractor to remove general refuse from the port several times - Collection of floating refuse - Daily site litter patrols to keep the port tidy and professional.	Minor negative impact

Project Phase / Activities	Potential Impacts	Significance of the impact	Mitigating Measures	Residual Impact
			- Choosing a Proper waste disposal site in co-operation with the Municipality of Sal - Temporary provisions in case municipal facilities are not ready yet	
	Impacts from increased energy consumption	Unable to assess	- Increase the use of renewable energy (solar and wind) - Use modern and well maintained equipment - Execute a energy use self-assessment which can provide quick and simple opportunities to reduce energy	Minor negative impacts
	Impacts on health and safety	Moderate negative impact	- Preparation and updating of Safety Management Plan - Implementation of Plan and ensure that standard health and safety measures are taken. - Applying fire safety provisions - Safety instructions and equipment for workers. - Preparation and implementation of a Port Security Plan	Minor negative impact
Cement handling	Impact on sea water quality	Major negative impact	- Precautions and equipment should be such that spillage resulting of the loading/unloading of cement is prevented	Minor negative impact
Oil terminal/ oil handling	Impact from accidents, spills, fires and other disasters	Major negative impact	- Development and implementation of oil spill contingency plan - Adequate stockpiles of spill contingency equipment - Applying standard operating procedures that reduce or eliminate the chance of a spill - Determining routine maintenance and testing schedules - Establishing guidelines for operating in poor weather and high sea state conditions - Regular inspections and audits of the facilities. - Reporting of all spills, contained or not - Increasing awareness of all workers through training and safety meetings.	Minor (general) to major (emergency) negative impact
Ro-ro ramp	Impacts from air and	Minor negative	-	Minor negative

Project Phase / Activities	Potential Impacts	Significance of the impact	Mitigating Measures	Residual Impact
Container terminal	noise emissions	impact		impact
	Impacts from noise emissions	Major negative impacts	E.g.: - Container handling during day-time hours - Location and maximum height for stacking of containers	Minor to moderate negative impact

11 ENVIRONMENTAL MONITORING AND MANAGEMENT PLANS

11.1 General

This section presents the environmental management plans in combination with the environmental monitoring plans. The plans are based on the mitigation measures as identified and described in the environmental impact assessment; in some plans some additional information is given. The following plans are presented for:

- dredging in the construction phase
- health and safety, in the construction and operation phase
- natural resources in the construction phase
- relocation in the construction phase
- waste management, in the construction and operation phase
- oil contingency planning in the operation phase

The plans aim at summarizing provisions to be considered for taking up in the tender documents and as a formal basis for the contractor to prepare his detailed plans. In this respect the overall conditions are:

- comply to legislation of Cap Verde
- comply to legislation of European Union
- comply to the EIA permit to be given by the Ministry of Environment
- prepare detailed plans with the above and the EMMP's as basis

Moreover, it is advised to release e.g. 5% of the contractors invoices-fee upon compliance with the main environmental conditions. The contractor can be invited to recommend for specific milestones in his offer. These milestones should be part of the monitoring plan.

Possible provisions in the tender documents may be:

- ENAPOR reserves the right to place observers at Contractor's offices and work locations where Work is conducted to monitor compliance with the relevant waste Management System If in the opinion of ENAPOR the Contractor is executing the Work in a manner which constitutes a breach of any of the requirements of the relevant waste management System ENAPOR shall advise Contractor accordingly by notice in writing and Contractor shall correct the situation by the date specified in the notice.

- The notice shall include Company's reasons for issuing the notice and outline the steps required of Contractor to rectify the said breach. ENAPOR shall have the right, at any time, to stop Contractor or Subcontractor's Work as a result of such breaches.

- ENAPOR shall have the right to withhold payment in case of non compliance of the contractor regarding waste management. This may apply if required plans, reports and performance data or required permits are not in line with contract stipulations and legal requirements. Further this may apply if the contractor is not executing provisions as indicated in the contractors waste management plan or is risking to harm the environment.

11.2 Waste Management – Construction phase

11.2.1 Introduction

Waste management in the construction phase should be mainly the responsibility of the contractor. Therefore provision for waste management should be included in the contracts. In this chapter the general practices and principles are described further in a table an overview is presented of mitigation measures and obligations that should be included in the contract with the contractor. Finally an overview is presented of clauses that could be included in the contracts with the Contractor.

11.2.2 Waste management policies and principles

The main sources of waste in this phase will be the construction workers, the maintenance and operation waste of vehicles and equipment and the general construction waste. Potentially hazardous chemical wastes from machinery use and maintenance, such as fuels and oils and the drums that contained such substances.

Waste management during the construction phase should comply with local and national legislation and the common principles of “reduce” waste, “re-use” waste, “recycle” waste, “treat” waste and eventually to “dispose” of waste to a controlled landfill or incinerator should be applied.
For the construction phase a waste management plan should be developed. The waste management plan should at least include the following:

- Identify expected waste streams and quantities (i.e. general household waste, packaging materials, maintenance waste, oily waste, chemical waste such as batteries etc.)
- Identify collection, storage and disposal methods for all types of waste
- General waste stored in enclosed bins and normal waste streams separated from hazardous
- Hazardous wastes must be stored in a secured area (to prevent vandalism, theft, accidents) and be within a covered area to prevent the ingress of rain. Hazardous waste should be properly disposed of.
- Provision made logistically local contractor to remove general refuse from the site on a daily basis to minimize odour, the attraction of pests and litter impact
- Daily site litter patrols to keep the construction site tidy and professional.
- Actions to be documented in the Waste Management Plan
- Awareness raised on site with workers, sub-contractors, visitors etc. via “toolbox” talks and a series of reminders.

Potential Impacts	Mitigation measures	Responsible Party for implementing mitigation	Monitoring Requirements	Responsible for monitoring and enforcement
Impacts from solid construction waste Impacts from liquid construction waste Impacts from waste water Impacts from demolishing buildings	**Preparation and implementation of a Waste Management Plan for construction**. The waste management plan should at least include the following: - apply the common principles of "reduce" waste, "re-use" waste, "recycle" waste, "treat" waste and eventually to "dispose" of waste to a controlled landfill or incinerator - expected waste streams are: general household waste, packaging materials, maintenance waste, oily waste, chemical waste such as batteries etc. and quantities have to be identified - Identify collection, storage and disposal methods for all types of waste - General waste stored in enclosed bins and normal waste streams separated from hazardous - Hazardous wastes must be stored in a secured area (to prevent vandalism, theft, accidents) and be within a covered area to prevent the ingress of rain. Hazardous waste should be properly disposed of. - Provision made logistically local contractor to remove general refuse from the site on a daily basis to minimise odour, the attraction of pests and litter impact - Daily site litter patrols to keep the construction site tidy and professional. - actions to be documented in the WMP - Awareness raised on site with workers, sub-contractors, visitors etc. via "toolbox" talks and a series of reminders.	Contractor	Include in contracts with the contractor provisions requiring a waste management plan and appropriate handling and disposal of waste include penalties such as delay in payment in case of non compliance with stipulations regarding waste management. Check regularly implementation and execution of waste management plan during construction works	ENAPOR
	On- site control during construction - General waste generated on-site should be stored in enclosed bins and normal waste streams separated from hazardous (sometime referred to as "special" wastes). Hazardous wastes must be stored in a secured area (to prevent vandalism, theft, accidents) and be within a covered area to prevent the ingress of rain. - Waste should be delivered to a dedicated waste disposal site and the objective is to remove general refuse from the site on a daily basis	Contractor	Include in contracts with the contractor provisions requiring a waste management plan and appropriate handling and disposal of waste Agreements to be made with the city council and local contractors for the collection and disposal of waste;	ENAPOR, Municipality of Sal
	Use of fairly new well maintained equipment	Contractor	Include in contracts with the contractor provisions requiring a waste management plan and appropriate handling and disposal of waste	ENAPOR
	Obligation to remove equipment from the island if no longer used or able to reuse	Contractor	Include in contracts with the contractor provisions requiring a waste management plan and appropriate handling and disposal of waste	ENAPOR
	Have all relevant permits and operating procedures in place	Contractor	Check permits and procedures	Ministry of Environment, Municipality of Sal

11.2.3 Waste Management - Contract provisions

Legislation and Standards
Contractor shall be responsible for complying all waste management legislation and standards whether national, regional, local or otherwise relevant to the Work and for obtaining any necessary licences or permits. The contractor will also be responsible for the sub-contractors, if any.

Contractor's Waste Management System
Contractor shall develop a waste management plan for managing waste aspects, which follows the principles outlined in ISO14001 or an equivalent recognised system in Contractor's country of origin. and follow the common principles of "reduce" waste, "re-use" waste, "recycle" waste, "treat" waste and eventually to "dispose" of waste to a controlled landfill or incinerator This Waste Management Plan shall describe the waste management System that will be fully and effectively implemented by the contractor and shall be documented.

Contractor shall be responsible for applying all necessary precautions and control measures relating to or arising out of the performance of the Contract in order to protect the environment.

Contractor shall ensure that responsibilities, authorities accountability and competencies are clearly defined documented communicated and exercised at all levels

Contractor shall act to minimise the total quantity of waste resulting from execution of the Work for which Contractor has responsibility and shall dispose of this in accordance with legal requirements.

Contractor shall monthly provide ENAPOR with performance data for Discharges and Waste. The waste performance data will distinguish the following waste streams:
- demolition waste hazardous (eg asbestos)
- demolition waste non hazardous
- oily waste from maintenance and operations
- hazardous waste (eg batteries, paint)
- household waste
- sewage
- other waste
- describe any current or proposed waste management improvement initiatives or programs relevant to the Work.

Waste management Audit
ENAPOR, or its authorized representatives, shall have unrestricted access at all reasonable times to the facilities, premises, equipment, materials, personnel and records of Contractor and Subcontractor(s) to audit any or all of the waste Management System Contractor shall implement all agreed recommendations from such audits within a timescale mutually agreed between ENAPOR and Contractor. Contractor shall include in all subcontracts rights of access for Company as described herein.

Training and competence
Contractor is responsible for ensuring that only Contractor personnel who are competent shall be provided for the performance of the Work. Contractor shall furnish information

about Contractor's scheme for assuring competence of Contractor personnel when requested to do so by Company. Contractor shall furnish records of training of Contractor personnel when requested to do so by Company. Unless specified otherwise herein, all training of Contractor personnel shall be at Contractor's cost.

Actions in case of non compliance
ENAPOR reserves the right to place observers at Contractor's offices and work locations where Work is conducted to monitor compliance with the relevant waste Management System If in the opinion of ENAPOR the Contractor is executing the Work in a manner which constitutes a breach of any of the requirements of the relevant waste management System ENAPOR shall advise Contractor accordingly by notice in writing and Contractor shall correct the situation by the date specified in the notice.

The notice shall include Company's reasons for issuing the notice and outline the steps required of Contractor to rectify the said breach. ENAPOR shall have the right, at any time, to stop Contractor or Subcontractor's Work as a result of such breaches.

ENAPOR shall have the right to withhold payment in case of non compliance of the contractor regarding waste management. This may apply if required plans, reports and performance data or required permits are not in line with contract stipulations and legal requirements. Further this may apply if the contractor is not executing provisions as indicated in the contractors waste management plan or is risking to harm the environment.

Waste management – operational phase

Potential Impacts	Mitigation measures	Responsible Party for implementing mitigation	Monitoring Requirements	Responsible for monitoring and enforcement
Impact of ship generated waste and cargo residues	**Preparation and implementation of a Waste Management Plan for operational phase.** The waste management plan should at least include the following: - an assessment of the need for port reception facilities - an assessment of the need for facilities of port related waste - a description of the type and capacity of port reception facilities; - a detailed description of the procedures for the reception and collection of ship-generated waste and cargo residues; - description of the charging system; - type and quantities of ship-generated waste and cargo residues received and handled The waste management plan should at least cover following waste streams: - Oily waste and bilge water; - General household waste (ship generated solid waste) from ships; - Hazardous waste - Wastes related to (un)loading and storage of goods. The expected quantities for the waste will be limited as the number of ships entering the port is relatively low. Depending on the size and the duration of the voyage of the vessel different types and quantities of waste will be delivered to the port reception facilities.	ENAPOR	- Check regularly implementation and execution of waste management plan -	Ministry of Environment, Municipality of Sal
Impact from waste collection	**Purchase of necessary equipment/facilities for the collection of waste which will at least comprise of:** - Collection truck or collection boat for liquid (oily) waste; - Containers for the collection of solid waste; - Truck for the transport to the disposal side of port-generated waste; - Treatment facility for the treatment of oily liquid waste; Agreement with oil companies has to be arranged for the delivery of oily waste.	ENAPOR		
Impact of waste on seawater	**Retention of run-off** As a minimum it is required to incorporate storm water detention/ retention to retain solid particles before discharging into surface water: - The first flush pond will trap suspended solids. - Maintenance areas and equipment fuelling areas should be equipped with drip trays and oil water separators	ENAPOR	- check of first flush ponds' and oil water separators have been incorporated into the design	Ministry of Environment, Municipality of Sal

11.3 Contingency planning– Construction phase

11.3.1 Introduction

During the construction phase incidents may occur that cause pollution of the land or at sea. The contractor should be prepared to contain these incidents as soon as possible and remediate within due time. Prevention is a first priority as described in the EIA.

Dredgers and other marine equipment carry fuel and oil, which may be accidentally spilt. High pressure hydraulic systems are also prone to possible failure leading to spillages. Construction activities on the reclamation areas will require plant and fuel storage areas, which constitute a spillage risk. Good operational practices and proper maintenance of plant and equipment will minimise impacts associated with spillages.

11.3.2 Contingency planning policies and principles

The key to protecting water quality during construction is careful storage and usage of fuels and oils. However in case of a spill there should be a proper spill contingency plan. The plan to be prepared should cover all incidents that may occur as cause of the construction activities. Therefore the expected size of the incidents will be relatively small. The contractor however should be prepared to combat a spill that may be caused by its activities. Hence equipment and materials should be available and ready for operation.

Potential Impacts	Mitigation measures	Responsible Party for implementing mitigation	Monitoring Requirements	Responsible for monitoring and enforcement
Impact from marine and soil pollution	**Preparation of contingency plan for incidents at land and sea** The plan as a minimum should contain the following information - area covered - risk assessment - establishing level of response - roles and responsibilities (command structure, communications) - options for clean up operations - exercises (tabletop, equipment deployment exercises) - shoreline and shore response - Response Options o Chemical Dispersant Spraying o Mechanical Containment and Recovery o Mechanical Dispersion o Sorbents o Shore Clean-up	Contractor	-Check Contingency plan and procedures - Check response equipment availability - Organise exercises regarding oil spill contingency plan	ENAPOR

11.3.3 Contingency planning - Contract provisions

Legislation and Standards
Contractor shall be responsible for complying with all related legislation and standards whether national, regional, local or otherwise relevant to the Work and for obtaining any necessary licences or permits. The contractor will also be responsible for the sub-contractors, if any.

Contingency plan
The establishment and implementation of a contingency plan should be presented to ENAPOR before the commencement of the work. The contractor should prepare a spill contingency and preparedness plan. The minimum content as follows:

- area covered
- risk assessment
- establishing level of response
- roles and responsibilities (command structure, communications)
- options for clean up operations
- exercises (tabletop, equipment deployment exercises)
- shoreline and shore response

Further, incidents should be reported immediately to the relevant authorities.

Preparedness in case of a spill
The contractor should ensure that materials and spill containment equipment is available and can be deployed immediate.

Incident reporting
In case of an incident likely to imperil life or property the company representative shall be informed immediately. Contractor shall submit a written report within 24 hours of the incident occurring. The report should contain the following information: nature of incident, cause of incident, details of action taken to date, follow up and status of the incident.

11.4 Contingency planning - operational phase

11.4.1 Introduction

Ships are required to report incidents of pollution to coastal authorities, and the Convention details the actions that are then to be taken. The Convention calls for the establishment of stockpiles of oil spill combating equipment (e.g. at ports and harbours), the holding of oil spill combating exercises and the development of detailed plans for dealing with pollution incidents. A protocol to the Convention on Incidents by Hazardous and Noxious Substances was adopted in 2000 (the HNS Protocol).

11.4.2 Contingency planning at port level

ENAPOR is preparing a National Contingency Plan for Cape Verde, there should be decided at what level spills require local or national action. The Port of Palmeira however needs to be prepared to undertake action at local level in case of an accident. The port should therefore make a port contingency plan and make cooperation agreements with private oil companies in the port. The port should assess types and

quantities of oil spill combating equipment should be purchased and kept at the port. These stockpiles may be available as well for spills at port level as at national level. The appropriateness of different measures and chemicals should be assessed at a national level, taken into account coral reefs and sensibility of the ecosystem, this risk assessment will be part of the National Contingency Plan.

Further it should be decided what will be the organisational model that will be used in case of a spill (on scene commander, etc) and which organisations and people should be alerted. The contingency plan should cover as a minimum the following:

- legal basis
- area covered
- risk assessment
- establishing level of response (initiating local regional or national response)
- roles and responsibilities (SOSREP, roles harbour master, command and control centre e.a.)
- options for clean up operations and introduction of fishing restrictions
- finance
- shoreline and shore response
    - Response Options
    - Surveillance and Monitoring
    - Chemical Dispersant Spraying
    - Mechanical Containment and Recovery
    - Mechanical Dispersion
    - Sorbents
    - Shore Clean-up

Actions for the level of response mentioned here are classified as a Level 1 response to such spills, where oil terminal and port administration have necessary resources and people in place for immediate response and liquidation. Level 1 response may be defined as oil spill of less than 10 tons, this will however depend on the national contingency plan. However calculations for necessary resources for the terminal and port shall be done on the basis of site specific risk assessment.

The list of necessary resources shall be included into the relevant Terminal or Port Administration Oil Spill Response Plan which must be approved by the Competent National Authority. The Local On-Scene Commander of the terminal or Port Administration will mobilize local personnel and resources as required. ENAPOR will act as the Local On Scene Command Post

Potential Impacts	Mitigation measures	Responsible Party for implementing mitigation	Monitoring Requirements	Responsible for monitoring and enforcement
Impact of marine pollution	**Contingency planning and preparedness** - legal basis - area covered - risk assessment - establishing level of response (initiating local regional or national response) - roles and responsibilities (SOSREP, roles harbour master, command and control centre e.a.) - options for clean up operations and introduction of fishing restrictions - finance - shoreline and shore response o Response Options o Surveillance and Monitoring o Chemical Dispersant Spraying o Mechanical Containment and Recovery o Mechanical Dispersion o Sorbents o Shore Clean-up	ENAPOR	Check contingency plan of the port	Ministry of Environment / Ministry of Infrastructure
Impact of marine pollution	**Purchase of Equipment and materials** ENAPOR should have available the equipment and if appropriate stockpiling of adsorbents or other materials in case of a spill. The need for materials and equipment will depend on the agreements that may be made with oil companies and the provisions that are part of the National Contingency Plan		Check availability of equipment and materials	Ministry of Infrastructure

11.5 Dredging – Construction Phase

Monitoring measures as described in the EIA should be implemented in practice and monitored under the responsibility of certain parties such as the contractor, ENAPOR, Municipality of Sal.

Therefore Environmental Management and Monitoring Plans for the construction and operational phase have been developed for the topics of waste management, dredging, contingency, health and safety, and natural resources.

11.5.1 Introduction

During phase 1 of construction it is expected that in phase 1 a volume of 4000 m^3 will have to be dredged at the location of the (to be) extended quay wall, of which circa 500 m^3 is comprised of rock and 3500 m^3 of sand and granular material. This may contribute to a temporary reduction in water quality and possibly sediment quality from the re-suspension of dredged material (especially fine particulates - “fines”).

South of the extended quay a shallow point will be dredged with a volume of circa 6,500 m^3, mainly consisting of rock (basalt, circa 2,5000 m^3) and boulders / pebbles (circa 4,500 m^3).

Also during phase 2 part of the port basin for new quay will have to be dredged. The volumes of dredging are expected to be limited to 3000 m^3 of rocks and 1500 m^3 of granular material.

This would result in a total dredging volume of 15,000 m^3, comprising of 8,500 m^3 of sandy / granular material and 6,500 m^3 of rock.

Dredging at and near the location of the (to be) extended quay is planned to be carried out by means of dredger with pneumatic hammer and clamp shell or backhoe on a floating pontoon or barge, by which the hammer will be used to release a layer of rock and the clamp shell or backhoe to grab and remove these rocks.

In Pameira bay a number of corals, sponges and other invertebrates, cephalopods, gastropods, crustaceans, demersal and pelagic fish species and other marine life are present. Especially corals are very sensitive to disturbances, such as smothering from suspended particles. Whale and turtle species pass by at short distance from the bay during certain times of the year. Sediment re-suspension and sediment plumes should therefore be limited to minimise the negative impacts on marine ecology.

If the dredging activities are to involve significant (underwater) noise, the impacts on whales (cetaceans) and turtles should be taken into account. A noise level of 140 dB or more for whales and 175 db or more for turtles can result in avoidance behaviour in a range within one kilometre from the noise source and other impacts, such as female whales possibly loosing track of their young as their communication can temporarily be severely restricted. A jackhammer will produce noise emission that peak up to 200 dB, with an average around 161 dB, backhoe produce an average 161 dB, and hopper dredge produce an average 188 dB.

Therefore the following measures will have to be taken into account:

Mitigating the impact of noise on cetaceans and turtles

The impact from underwater noise on ceteaceans and turtles can be serious. Due to the presence of ceteaceans (whales) and turtles near Palmeira the following mitigation measures should be adhered to:

- Noise mitigation for marine works would typically involve the choice of dredging equipment. An inherent mitigation in this case would be that cutter suction dredgers produce the least noise in comparison with other types, such as bucket dredgers; and they minimise the disturbance of sediment resulting in siltation of the water column and potential (re)mobilisation of contaminants. However considering the limited volumes of to be dredged material and high mobilisation costs, it is not likely that a contractor will choose for a cutter section but will apply the dredgers as mentioned earlier.
- Further noise mitigation involves avoiding noisy events through well-planned timing and programming outside sensitive whale and turtle seasons (e.g. avoiding the migration seasons of whales and turtles; humpback whales visit Cape Verde waters mostly during the European winter period, although all year round a variety of whales species can be spotted near Sal; turtles are mainly present between May to September).
- Any particularly noisy activities (e.g. piling) should be programmed for daytime rather than at sunrise or sunset. If there are opportunities for doing so, the contractor should slowly ramp-up levels.
- As whales might be present at any time of the year, visual and vocal checks on the presence of cetaceans should be executed prior to dredging works. Therefore a qualified person should be appointed by the contractor to act as an observer on board the seismic survey vessel. If possible, such an observer should be an experienced cetacean biologist. As a minimum, it is recommended that the observer should have attended an appropriate training course.
- The contractor should allow adequate time (at least 30 minutes) for sightings to be made prior to commencement of any use of dredging equipment. Observers should carefully make a visual check from a suitable high observation platform to see if there are any marine mammals within 500 metres. Hydrophones may provide additional information on the presence of inconspicuous species or submerged animals, and should be used whenever possible. They can detect cetaceans at a distance up to several kilometres[11].
- If marine mammals are present in the area, the start of the dredging activities should be delayed until they have moved away. Therefore allow adequate time after the last sighting (at least 20 minutes) for the animals to move well out of range.
- The visual presence of cetaceans might be indicated by the following signs:
    - Dolphins and porpoises generally surface 2-3 times per minute in order to breathe. Dive times and surfacing behaviour are more erratic when they are feeding, but most dives are unlikely to exceed 5 minutes. Large whales surface less often and may remain submerged for some time.
    - Splashes may be a cue to the presence of cetaceans.
    - Blows of large whales may be more obvious, but still may be difficult to detect in strong winds.

[11] Guidelines for minimising acoustic disturbance to marine mammals from seismic survey, April 1998, Joint Nature Conservation Committee

- Some species may be attracted to boats from some distance away, probably by engine noise. If possible, look over the bow of the ship to check for cetaceans close to the ship, which may be hidden from view from the normal vantage points.
- Feeding seabirds can sometimes be evidence of the presence of cetaceans.

Mitigating the impact of re-suspension of sediments on corals
The impact on aquatic ecology due to re-suspension of sediments and sediment plumes can be serious. Due to the coarse nature of the seabed and the weak currents experienced in Palmeira Bay however sediment transport from the construction of the breakwater is likely to be small and localised.

Due to the presence of coral species present in the bay and their susceptibility to disturbance especially from smothering, the following mitigation measures are recommended:

- The extent and concentration of the sediment plume can be controlled by good dredging practices to reduce the rates at which fines are released. This may include measures such as optimisation of trailing/cutting speeds and pump/suction discharge rates, reducing water intake and using return flow, and limiting the overflow period
- Programming the works at a time when local wind and wave patterns are not likely to transport suspended sediment in the direction of sensitive areas.
- The aim is to re-use the dredged material rather than to dispose of it on land. To ensure that a suitable dredge spoil discharge system will be put in place, clauses should be included in the Tender Documents issued to construction contractors, stipulating that bidders propose in their offer how they will meet the requirement to dispose of dredged material to prevent distribution of suspended solids in the waters outside the re-use or disposal site.

To ensure that a suitable dredging method and dredge spoil discharge system will be put in place, clauses should be included in the Tender Documents, stipulating that contractors must propose in their bidding documents how they will meet the requirement to dredge the materials and –if applicable- dispose of them, both in a matter to prevent distribution of suspended solids beyond the bay / in the waters outside the disposal site.

Five sediment samples were already taken from the bay area near the port. These indicate the possibility of limited pollution below maximum allowable levels. Further sampling of the dredged material will be required to identify any significant contamination. The aim is to reuse the dredged material rather than to dispose it on land. However if the material is too polluted to be re-used, it shall be treated adequately, as required under international regulations for disposal, such as the London and OSPAR Conventions.

Dredging Plan
Prior to dredging, the contractor should submit a dredging plan, stating at least the following items:

11.5.2 Dredging activity

- The proposed depth of dredging

- The estimated volume of material to be dredged
- The analytical results of sampling conducted on the sediment to be dredged
- A description of the proposed dredging method, type of dredging equipment to be used, and an estimate of the length of time (proposed starting and completion dates) necessary to complete the dredging project
- A description of aquatic resources in the area to be dredged
- Evaluation of the impact of dredging on the (aquatic) environment
- A plan for monitoring water quality and dredged sediment parameters during dredging activities

In case of (off-shore) disposal of dredged materials

- A description of aquatic resources in the proposed disposal area
- Information on the past history of the proposed disposal area, including prior disposal activity, historical spills and analytical test data
- An analysis of alternatives describing alternatives to the proposed disposal location that were investigated
- A description of how the dredged material will be deposited at the proposed disposal location, including the frequency and quantity, and measures to control dispersion
- An evaluation of the impact of the dredged material disposal on the (aquatic) environment
- A plan for monitoring water quality impacts from the disposal activities

In case of on-land disposal or storage of dredged material

- A description of handling techniques of the dredged material (i.e. stockpiling, transporting, etc.)
- The disposal/storage area
- Estimate of the proposed volume of runoff water expected from the material
- A sediment and erosion control Plan
- The proposed method of collecting and treating stormwater runoff from disposal or storage area
- An evaluation of the impact of the disposed or stored dredged material on the environment

In case of re-use of dredged material in land reclamation

- The volume of dredged material and the volume capacity of the beneficial use location
- Analytical results of dredged material sampling, where applicable
- The method of placement of dredged material
- Evaluation of any disturbance to the (aquatic) environment that the placement may cause (e.g. sediment re-suspension, turbidity)
- A sediment and erosion control plan

11.5.3 Monitoring

Monitoring by ENAPOR should take place on at least the following aspects:

- Periodic inspections of dredging activities in accordance with the agreed methods, equipment and time period
- Periodic monitoring of sea water parameters, including turbidity and suspended solids
- Monitoring of dredged sediment chemical parameters

Potential Impacts	Mitigation measures	Responsible Party for implementing mitigation	Monitoring Requirements	Responsible agency for Monitoring and Enforcement
Impacts on marine life	Appropriate dredging technique; Optimisation of cutting speed and discharge rates; Monitoring of sea water parameters such as Total Suspended Solid, pH, O2, heavy metals; Monitoring of the dredged sediment chemical parameters (e.g. heavy metals, % of organic matter); Re-use of dredged materials for construction or if not possible, proper treatment and disposal, according to London and OSPAR conventions.	Contractor;	Periodic inspections of dredging activities including dredging equipment and techniques; periodic checks on execution and outcomes of sea water and sediment sampling; inspection on activities of storage, treatment, disposal and/or re-use of dredged material.	ENAPOR as responsible party; with the Municipality of Sal and Ministry of Environment to receive periodic reports and for regular evaluation
Impacts on water quality	Appropriate dredging technique; Monitoring of sea water parameters such as Total Suspended Solid, pH, O2, heavy metals; If re-use is not possible, proper treatment and disposal, according to London and OSPAR conventions.	Contractor	Periodic inspections of dredging activities including dredging equipment and techniques; periodic checks on execution and outcomes of sea water sampling; inspection on activities of storage, treatment and disposal of dredged material.	ENAPOR as responsible party; with the Municipality of Sal and Ministry of Environment to receive periodic reports and for regular evaluation

11.5.4 Dredging - Contract provisions

Payment conditions and penalties should be related to the environmental performance. The environmental performance can be measured by:

Re-suspension Control

- Turbidity & water quality standards
- Contamination of new areas
- Recontamination of old areas

Water Handling

- Discharge
- Debris handling
- Effects on water quality & sediment handling

Re-use, storage or disposal

- Sampling and analysis of sediments
- Options considered for re-use
- Disposal method and location
- Re-suspension control
- Leachate and run-off control

Disturbance of aquatic ecology

- Noise levels and period
- Footprint of dredged area

11.6 Health and Safety – Construction Phase

11.6.1 Introduction

The Health and Safety Plan presents the procedures that the contractor should follow during construction to protect the health and safety of all employees and other that working or residing in or around the construction site.

A basic HSE plan for the design phase has been developed by the Engineer of the Palmeira port expansion project, including a tabular analysis of main project elements, materials and activities, containing:

- the nature of key hazards and their possible effects
- people at risk from the hazard
- design measures taken to eliminate the hazard or to reduce the risk
- the nature of significant residual hazards and risks
- the item owner
- the document in which these should be recorded

This document will serve as input to and as minimum requirements for the HS plan that the constructor will make.

11.6.2 Health and Safety Plan for construction works

Prior to the construction works, the contractor should therefore submit a Health and Safety management plan. The Plan should set out the arrangements for securing the health and safety of everyone carrying out the construction works and all others who may be affected by it.

The HS plan should follow a systematic approach, designed to:

- ensure compliance with the law
- demonstrate that all hazards are adequately managed
- achieve continuous improvement in HS performance

The management system of the HS plan should be structured around the standard sequence of: plan, do, check, provide feedback.

The HS plan should at least include:
- risk management
- incident management (incl. incident analysis)
- emergency preparedness (incl. emergency drills)
- HSE safeguarding (incl. proactive safety measures)

The risk assessment should provide a:
- systematic identification of the risks and hazards
- assessment of associated risks and hazards
- identification of all affected and how
- evaluate of the risks and hazards
- identification and priorisation of required actions to manage the hazards and reduce the risks

Training of health and safety practices should be provided to all employees on site prior to the start of the construction works, with periodic rehearsals during the construction period and additional trainings where required, such as with the start of new, major components of the construction works. The employees should also be provided with written instructions and sufficient equipment.

A dedicated HS manager should be assigned for day-to-day implementation and management of the Plan and arising health and safety issues.

11.6.3 Monitoring

ENAPOR should –through the construction supervisor- periodically monitor the Health and Safety measures taken and conditions provided by the contractor. Monitoring can take the form of:
- active monitoring, to prevent, incidents and emergencies and to reduce risks (inspections on facilities, equipment, etc.; observing work practices and employee behaviour; monitoring of health of employees)
- reactive monitoring, which provides information on safety incidents, health problems, and insights for future prevention

Potential Impacts	Mitigation measures	Responsible Party for implementing mitigation	Monitoring Requirements	Responsible agency for Monitoring and Enforcement
Impact on health and safety	**Health and Safety Plan** Prior to the construction works, the contractor should submit a health and safety management plan. The Plan should contain the elements and structure as mentioned. Concrete action and procedures, as well as good housekeeping should be implemented as laid down in the approved HS plan. Training of health and safety practices should be provided to all employees on site prior to the start of the construction works, with periodic rehearsals. A dedicated HS manager should be assigned for day-to-day implementation and management of the Plan and arising health and safety issues.	contractor	Review of the contractor's HS plan, update if required and final approval prior to construction works Periodic inspections on the construction site Analysis of incidents and health problems if and when they occur	ENAPOR

11.6.4 Health and Safety Management - Contract Provisions

Responsibility
The contractor is, in accordance with conditions of contract, responsible for the safety of site operations.

The contractor shall comply with all the requirements described herein without detraction from his responsibilities under the contract.

The contractor shall throughout the progress of the works comply with his duties under all approved codes and all relevant health and safety legislation. Where no specific legislative requirements exist, the contractor shall comply with guidance provided by codes of practice or industry standards as a minimum standard of safety.

The contractor shall be responsible for ensuring compliance with this document throughout the project including the activities of his appointed sub-contractors or temporary visitors.

The contractor shall submit a:
- Company safety policy document if available
- Health and Safety management plan, including a risk assessment
- Copies of employers liability insurance certificates
- Monthly incident and near-incident report

Training
The contractor shall ensure that all employees (including sub-contractors) are adequately trained to carry out their particular duties or tasks including driving plant and operating equipment.

Risk assessment
Before any work commences on site the contractor shall nominate a competent person to be responsible for coordinating risk assessments of all operations where risk is foreseeable and ensuring that appropriate control measures are established and incorporated into safe systems of work. The contractor shall use these safe systems of work as the basis for health and safety method statements, which shall be developed in reasonable time to allow coordination of hazardous works.

All risk assessments shall be reviewed and revised as necessary to accommodate any changes in methods of working, plant, equipment, material and/or site development. The contractor will be available to liase on all matters of health and safety relevant to these risk assessments.

Site housekeeping
Contractors shall set down a system for maintaining a clean, tidy and safe site. Contractors shall ensure the site is continuously monitored to ensure standards are maintained.

11.7 Health and Safety – Operational Phase

11.7.1 Health and Safety plan for port operations

A draft Health and Safety management plan for port operations has been prepared by the director of Palmeira port.

- The Plan should be checked against HS plan standards in order to make sure it contains all the necessary elements and follows an internationally accepted approach
- The Plan should clearly assign among other roles and responsibilities, the resources available and emergency procedures
- The Plan should be finalized and approved by ENAPOR
- The Plan should be integrated in a Safety and Health Management System
- The Plan should be regularly revised and updated where and when necessary

After final approval of the Health and Safety management plan, concrete action and procedures, as well as good housekeeping should be implemented as laid down in the plan. Training of health and safety practices should be provided to all employees in the port, with periodic rehearsals (at least every 6 months). The employees should also be provided with written instructions and sufficient equipment. A dedicated HS manager should be assigned for day-to-day implementation and management of the Plan and arising health and safety issues.

A Port Security plan is also currently being prepared for the ports in Cape Verde. The same remarks apply to this Plan.

Potential Impacts	Mitigation measures	Responsible Party for implementing mitigation	Monitoring Requirements	Responsible agency for Monitoring and Enforcement
Impact on the health	Port Administration should ensure that standard health care are taken; Port operators should apply the health provisions according to applicable national and international standards;	ENAPOR	Periodic health inspection ; Monitor health care plans; Monitoring health care plan should be designed and implemented by accredited professional; Operations should maintain a systematic record of diseases and health dangerous occurrences.	State Sanitary Inspection; Ministry of Health, Municipality of Sal
Impact on the Safety	Update and final approval of HS plan and Port Security Plan Implementation of the plans Training of employees and providing them with written instructions and equipment Assignment of a HS and Security manager	ENAPOR	Periodic inspection; Periodic inspection of integrity of bunded areas; Periodic inspection of machinery to ensure it is a good state of repair; Monitor safety plans; Monitoring safety plans should be designed and implemented by accredited professional; Systematic records of accident occurred during operations.	Ministry of Infrastructure & Transport; Maritime and Port Institute

11.8 Natural Resources – Construction Phase

11.8.1 Extraction and transport of rocks from quarry

First phase
For the first construction phase, rocks can be extracted from a licensed quarry at Sal (currently only BBS seems to have a (50-year) license for commercial rock extraction in a defined 400-hectare area at Sal;).

Second phase
For the second construction phase rocks could probably be sourced from the same quarry. However in order to assure sufficient quantities of rock from quarry, assess the following aspects -in cooperation with the quarry- well in advance:

- total production capacity of the quarry at Sal minus current obligations to other parties, such as hotel industry (currently an installed production capacity of 300,000 tons of rock per year day is available at the BBS quarry, which will be expanded in 2008 to a production capacity of about 1 million ton of rock per year)
- maximum daily production rate of rocks for the port, of sufficient size (the port requires boulders up to a maximum of 3 tonnes, with the majority of rocks between 1 – 500 kg; at 1 million ton of rock extraction per year and an estimated 6 production days per week the quarry would have a daily production of 3200 ton of rock per day);
- required transport capacity for overland transport of rock by trucks from quarry to port (and back);

A rough calculation for the second phase is provided below as an example:

1. There is an estimated total demand of of 495,000 m^3 of rock, aggregates (e.g. gravel) and quarry run from quarry (with the largest quantity to be sources in phase 2) for the port expansion;
2. The land reclamation (new quay) which will be constructed in the second phase will have a volume of an estimated **300,000 m^3**;
3. A regular-sized dump truck transporting about 25 tons is assumed. One m^3 of solid rock weighs an average 2.5 ton. However taking into account porosity and air holes between rocks stocked in a pile, one m^3 of rock transported by truck would weigh about 1.8 ton. This would allow one truck to transport nearly 14 m^3 of rock per run;
4. The rock will have to be supplied to the port for land reclamation during a period of about one year;
5. Considering the transportation of rock during 5 days a week, excluding holidays and vacation periods as well as some off-days as a result of insufficient quarry production or muddy tracks after downpours, a rough 200 working days per year would be available for transportation of rock from quarry;
6. Requiring 300,000 m^3 to be transported from quarry in 200 working days would require **1500 m^3 of rock to be transported per working day** (this would come down to a requirement of roughly 50% of estimated daily production capacity at the quarry);
7. At 14 m^3 (25 tons) transport capacity per truck this would require 108 runs per day from quarry to port (and back);
8. At 8 working hours a day this would come down to **14 truck runs (and on/off-loadings) per 1 hour**, each truck delivering 14 m^3 of rock at the port;
9. This would result in one truck passing by just over every 4 minutes in each direction on the route between quarry to port;
10. Assuming that one truck will require more than 1 hour to be loaded with rock at the quarry, to drive to the port, unload, and drive back to the quarry for the next run, and taking 1.5 hour as the average length of time required for a truck to complete a full

run including loading and off-loading, a total of 21 trucks would be required to be able to continuously transport rocks at 14 runs per hour and up to a total of 1500 m^3 of rock over an 8-hour working day;
11. Taking into account that not all trucks will constantly be available as a result of possible breakdowns, required repairs and maintenance, a **minimum of 25 trucks of 25 ton capacity** would be required to execute this operation.

Alternatives
In case insufficient rocks would be available at the quarry for the second phase, alternatives will have to be considered. This could be by means of import of rock from other Cape Verde islands, such as from Sao Vicente, Santiago or San Nicolau. Or by replacing part of the rocks with cement tripods. In the case of import of rock from other islands, the possible environmental and economic implications to these islands will have to be carefully considered. If for this purpose a new rock quarry would have to be established, a full Environmental Impact Assessment is required under Cape Verdean law.

Transport routes
For measures regarding transport routes of rock materials from the quarry to the port, see the overland transport section.

11.8.2 Extraction and transport of sand

Import of sand
Sand extraction from Sal island for port construction purposes is forbidden by the government. Therefore sand will have to be sourced outside the island. The most likely option is the import of sand from Mauritania.

Mooring of ships
1. As the ships that will transport the sand from Mauritania are probably too long and too deep to land at the quay of Palmeira port, they will have to moor in a different location with sufficient water depth. Such a location might be found north of the port;
2. From there the sand can be pumped from the ship to the island by means of a floating pipeline and buoys;
3. Thereafter it can be transported to the port by truck
4. Or it can be temporarily stored on land, with sufficient precautions to avoid dispersal by wind (coverage, or protection by means of wall);
5. Care should be taken that exotic species, such as snakes and scorpions, are not accidentally introduced. Therefore the sand should be checked before export from Mauritania and upon arrival in Cape Verde.

11.8.3 Overland transport routes of construction materials (such as rocks)

For overland transport of construction materials, equipment and heavy machinery during the first and second phase of port construction special provisions will have to be taken to minimize disturbance and risks to the villages of Palmeira and Espargos, as well as to other traffic on the island.

Main road
Avoid to use the main road through Palmeira and Espargos for heavy and/or large construction vehicles from and to the port in order to:
1. limit disturbance by noise, fuel emissions and dust;

2. reduce safety issues (e.g. collisions with other traffic or pedestrians); and
3. avoid damage to surface level of main road

Dirt roads
Use dirt roads/tracks north of Palmeira and Espargos at a distance of at least a few hundred meters north of the villages:
1. for transport of rock from rock quarry and for return of these trucks to the quarry
2. for other construction transport for which there is no real necessity to use the main road

Routing
Use 1 or 2 fixed dirt road routes during construction, such as:
1. 1 route north of Palmeira and Espargos from the port to the rock quarry,
2. 1 route that near Espargos branches off the route to the rock quarry, in order to connect to the town of Espargos and the airport.
3. Driving off-road through the open desert areas should not be allowed

Upgrading of dirt roads
As a minimum, upgrade the road surface of these routes to a level where dust from sand is avoided. Such as applying a layer of (salt and then) gravel, with sufficient coverage to minimize contact between trucks and the natural sand surface.

The road surface should be regularly checked and maintained (repair and supply of additional cover), in order to maintain a very low level of dust generation.

Potential Impacts	Mitigation measures	Responsible Party for implementing mitigation	Monitoring Requirements	Responsible for agency for Monitoring and Enforcement
Impacts from extraction -rock	Identify and propose volumes and sourcing of rock for first and second phase, including details on transport to port	Contractor	Review and approval of proposed rock sourcing and transport to port	ENAPOR as responsible party, Municipality of Sal and Ministry of Environment
Impacts from extraction -sand	Identify and propose volumes and sourcing of sand (from abroad), including details on transport to port	Contractor	Review and approval of proposed sand sourcing and transport to port	ENAPOR as responsible party, Municipality of Sal and Ministry of Environment
Impacts from transport	Identify and propose route(s) north of villages for transport of rocks and other material / equipment, propose type of upgrading of dirt roads routes	Contractor	Review and approval of proposed routes and upgrading of these routes	ENAPOR as responsible party, Municipality of Sal

11.8.4 Natural Resources - Contract provisions

Payment conditions and penalties should be related to the environmental performance regarding:

1) sustainable use of natural resources by
- extraction of rock only from licensed quarries
- no extraction of sand from Sal or any other Cape Verdean island
- proper attention for avoidance of introducing new species to Sal as a result of foreign sand imports
- proper attention to minimize environmental damage in the transport of rock and sand to port

2) minimisation of air and noise emissions by
- use of relatively new trucks
- use of good quality fuel
- adhering to best practice for example maintaining and servicing vehicles and construction machinery
- good housekeeping measures such as preventing engines from idling and running unnecessarily
- upgrading dirt routes to level where dust emission are minimised
- avoidance of main road through Palmeira and Espargos by trucks (as much as possible)
- avoidance of driving off-road

3) implementation of safety measures by
- adhering to traffic rules and maximum speed limits
- avoidance of main road through Palmeira and Espargos by trucks (as much as possible)
- giving proper attention to critical road crossings, such as near the port where tourist vehicles on their way to Burracona might cross the main truck routes
- avoidance of driving off-road
- avoidance of driving in the dark
- not letting truck drivers be on duty for more than 11 cumulative hours, followed by at least 10 consecutive hours of "off duty"; not letting truck drivers be on duty for more than 60 hours in 7 consecutive days; not letting truck drivers drive if they are above the alcohol limit for driving or if under influence of other substances, such as drugs, which can severely impact on their driving ability

11.9 Relocation – Construction Phase

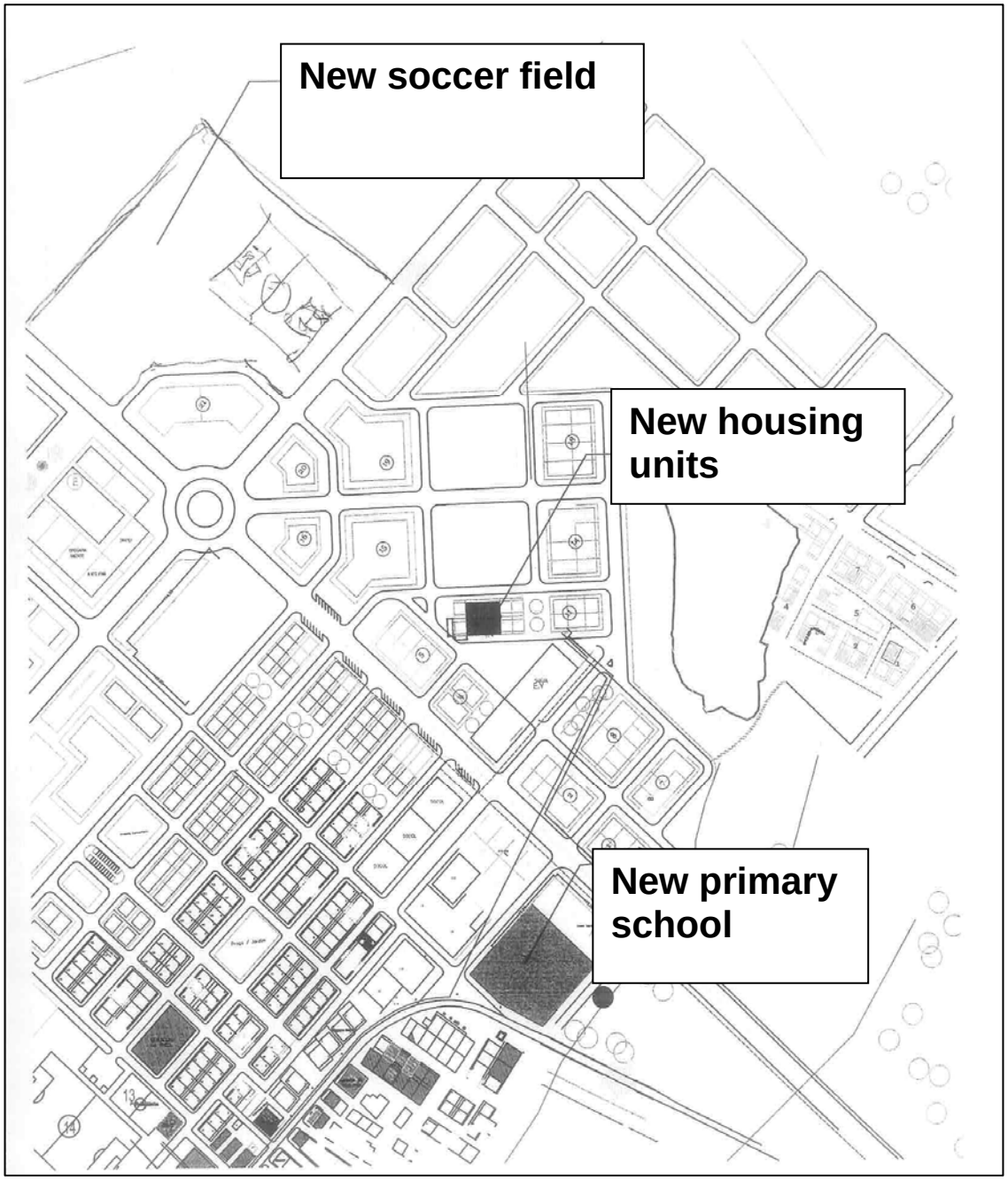
For the realisation of the planned expansion at the landside a small number of houses (6), a primary school and a football field need to be removed and relocated. ENAPOR and the municipality of Sal have already informed and advised the affected stakeholders several times of the required relocation and has considered and discussed with them possible relocation options.

11.9.1 Relocation locations, conditions and agreements

Family houses
For the relocation of the 6 families a new area to be developed at the south-eastern entrance of the village (see map), a few hundred meters from the current location of the to be removed houses, will be provided by the municipality. The families will be provided with new row-houses, which are larger in size as will be of better quality than their current premises. The port will pay for their relocation. The municipality states that the families have agreed with the relocation.

Primary school
For the relocation of the school a plot is foreseen also in the new area, still to be developed at the south-eastern entrance of the village (see map), a few hundred meters from its present location. The school will be enlarged to accommodate for a future increase in the number of pupils, and its entrance will be located on a small quiet street to secure the safety of the children. The port will pay for the relocation. The municipality states that the school has agreed with the relocation.

Football field
The new football field is foreseen in the area still to be developed at the south-eastern entrance of the village as well (see map). The plot would not only allow for a football field, but also for other facilities as the community has requested for the construction of a ‘sports village’. The port will pay for the relocation of the football field, however will not construct other sport facilities at this plot. The community however will have the opportunity to do so. The municipality is still awaiting full agreement with the community on the relocation of the football field (status November 2007).



11.9.2 Monitoring

ENAPOR should assure that there is sufficient agreement between the community and the municipality of Sal on the relocation, especially concerning the football field which might still be pending (status November 2007).

ENAPOR should periodically monitor the resettlement of the houses, school and soccer field by inspecting the resettlement location and stay in contact with (representatives of) the affected, to assure the resettlement takes place according to the agreements made between municipality of Sal and the affected.

If there are indications that the resettlement is not being executed according to plan and according to the satisfaction of the affected, ENAPOR should discuss these issues with the municipality of Sal.

Potential Impacts	Mitigation measures	Responsible Party for implementing mitigation	Monitoring Requirements	Responsible agency for Monitoring and Enforcement
Impacts of relocation (to enable port expansion)	Relocation of 6 houses, a primary school and a football field a new to be developed area at the south-eastern entrance of the village of Palmeira	Municipality of Sal	Periodically monitor the resettlement of the houses, school and soccer field by inspecting the resettlement location, to assure the resettlement takes place according to the agreements made between municipality of Sal and the affected. If there are indications that the resettlement is not being executed according to plan and according to the satisfaction of the affected ENAPOR should discuss these issues with the municipality.	ENAPOR, Municipality of Sal

12 CONCLUSIONS AND RECOMMENDATIONS

Concerning the impacts identified during the course of this EIA, the majority of negative impacts were assessed to be of minor to moderate significance. Many negative impacts can be mitigated to a lower level with relative ease. The identified negative impacts mainly have a local (port vicinities or Sal island) and/or temporary (construction phase) effect.

The main negative impacts of critical concern deal with impacts with regard to:

- Proper waste management during construction and operational phase, including ship-generated waste;
- The prevention of contingencies to avoid major impacts on e.g. sea water quality and marine ecology, including the nearby marine reserve Murdeira Bay;
- The considerate execution of dredging activities, especially dredging of rock, and other construction activities, which may generate significant levels of underwater noise, in order not to impact significantly on cetaceans and turtles;
- The considerate sourcing of rock and sand for construction as well as their transport to port, in order to avoid negative impacts on the environment from their extraction, or on humans by means of dust, noise and safety issues from transport;
- The proper relocation of assets and people to provide sufficient room for the port expansion.

The socio-economic impacts of the port are expected to be positive, even to a major extent with regard to the operation of the extended port which will be a precondition for the future sustainable economic development (of tourism) on the island.

If the mitigation measures for negative impacts as recommended in the EIA and dealt with in more detail in chapter 11 on Environmental Management and Monitoring Plans are properly executed, as well as monitored by the various responsible parties, the expansion of the port of Palmeira should during its construction and operational phase only contribute to a minor extent to deterioration of its environment or of the health and safety of its employees and other nearby sensitive receptors, such as the residents of Palmeira village.

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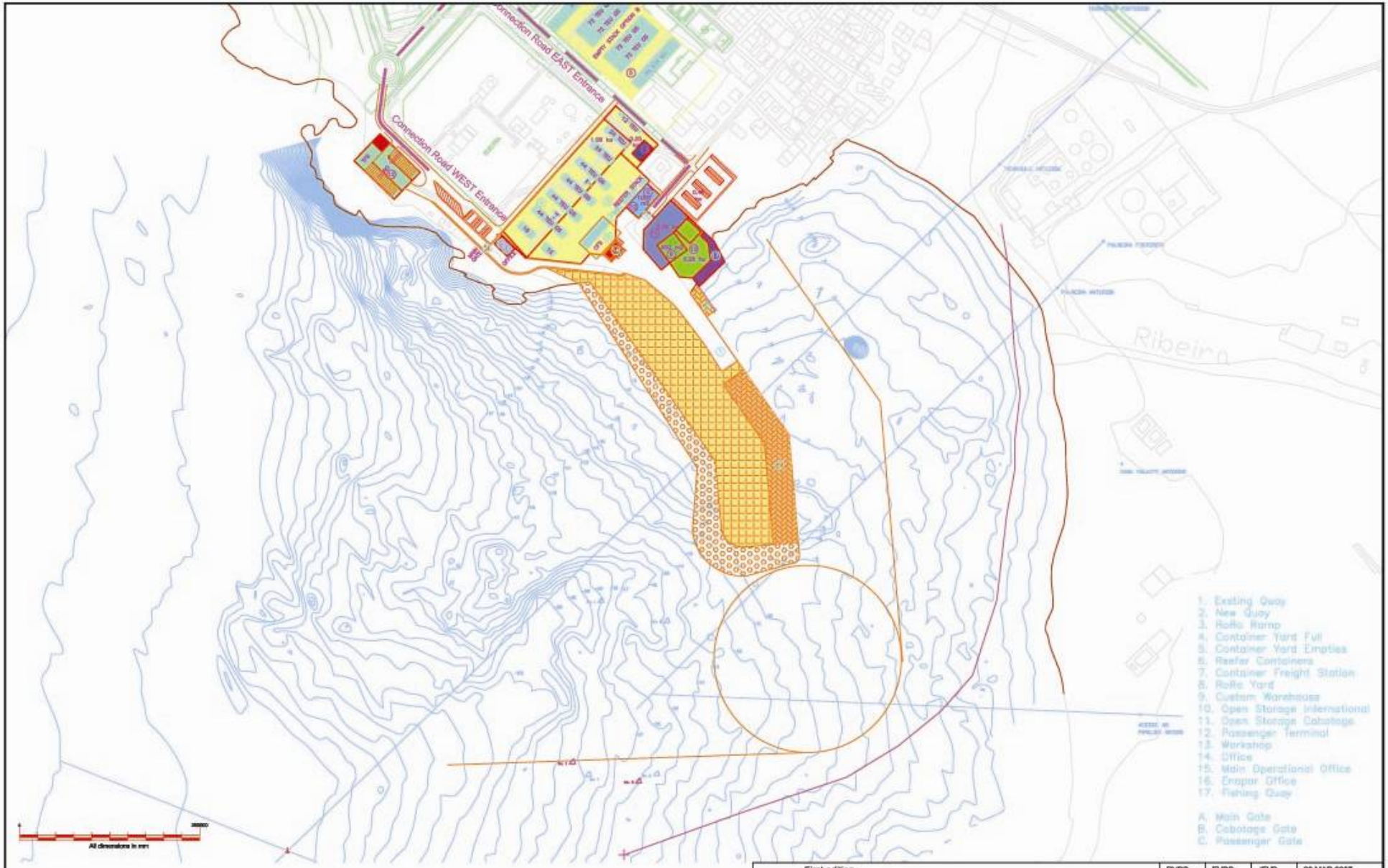
Annex 1
Five Options Marine Structures



revision	description	drawn	chkd	appr.	date
	First edition	RVDB	EVDB	JFVB	20.MAR.2007

client: MITM / ENAPOR

project: Palmeira Port

description: DHV Alternative General Layout

size	scale	phase	project number	drawing number
A3	1:5000	Conceptual design	9R9364.21	/ 03.9305

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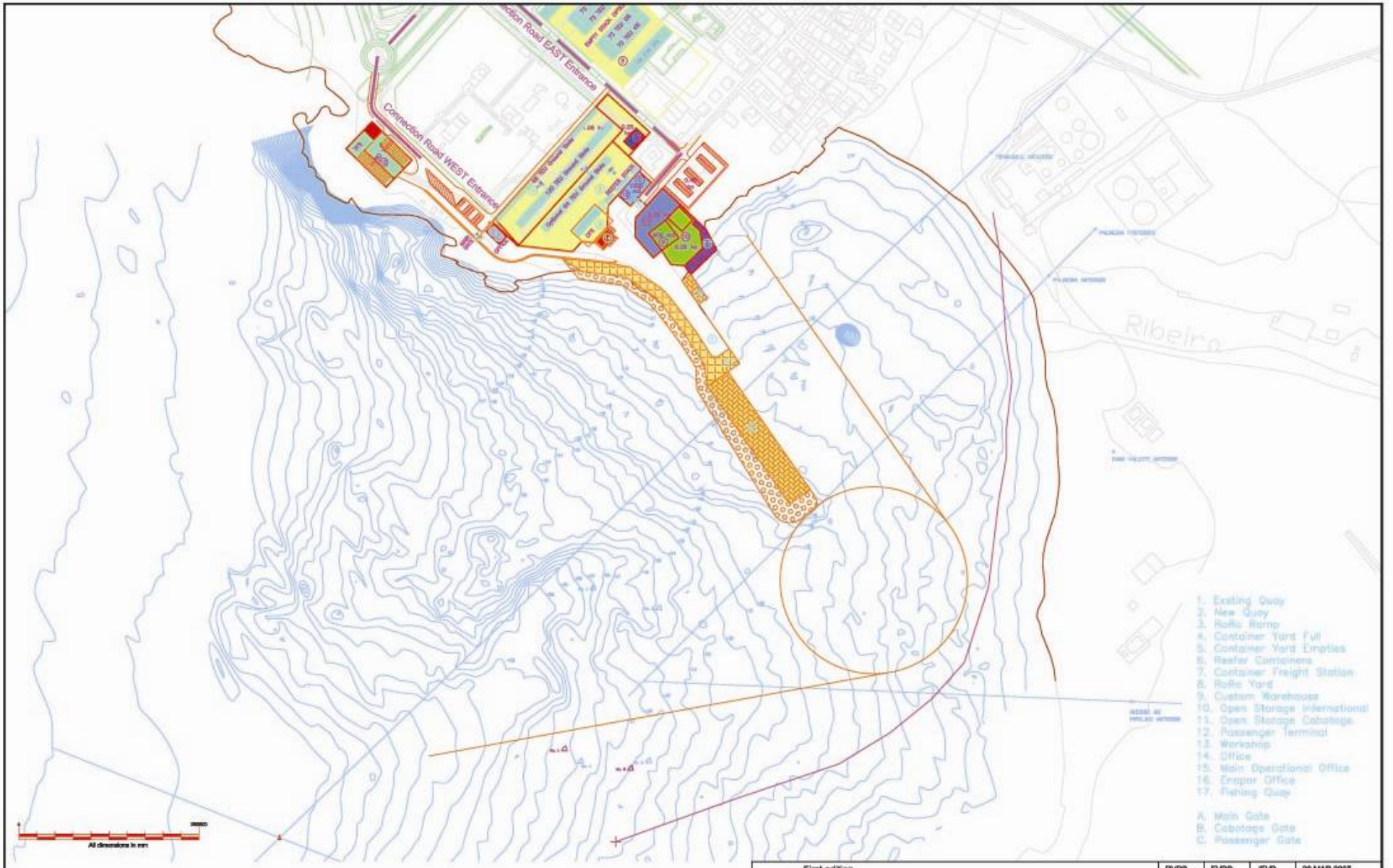

revision	description	drawn	chkd	appr.	date
	First edition	RVDB	EVDB	JFVB	20.MAR.2007

client
MITM / ENAPOR

project
Palmeira Port

description
Quay Alternative 2
General Layout B

size	scale	phase	project number	drawing number
A3	1:5000	Conceptual design	9R9364.21	/ 03.9306

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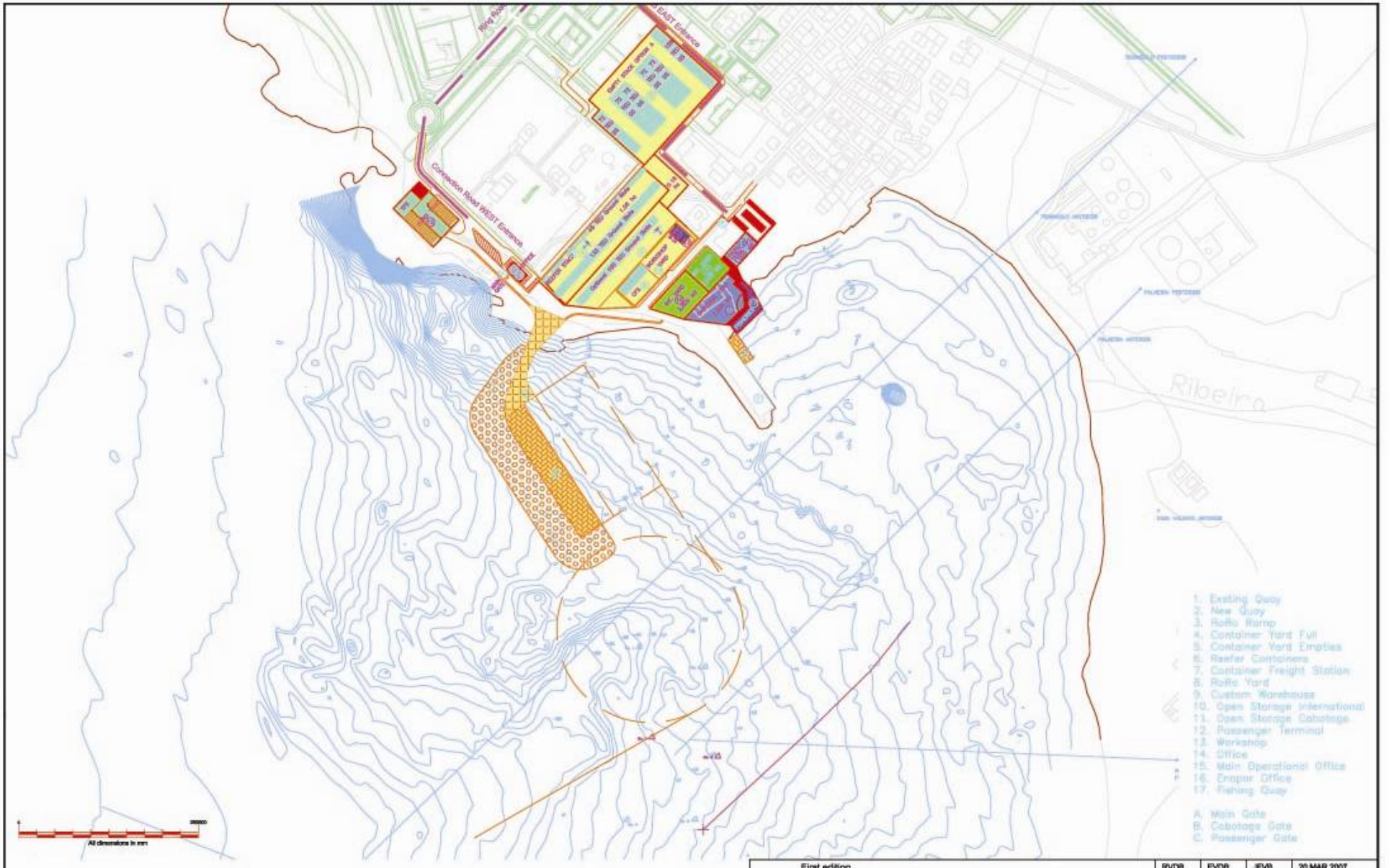

revision	description	drawn	chkd	appr.	date
First edition		RVDB	EVDB	JFVB	20.MAR.2007

client
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project
Palmeira Port

description
Quay Alternative 3
General Layout A

size	scale	phase	project number	drawing number
A3	1:5000	Conceptual Design	9R9364.21	/ 03.9307

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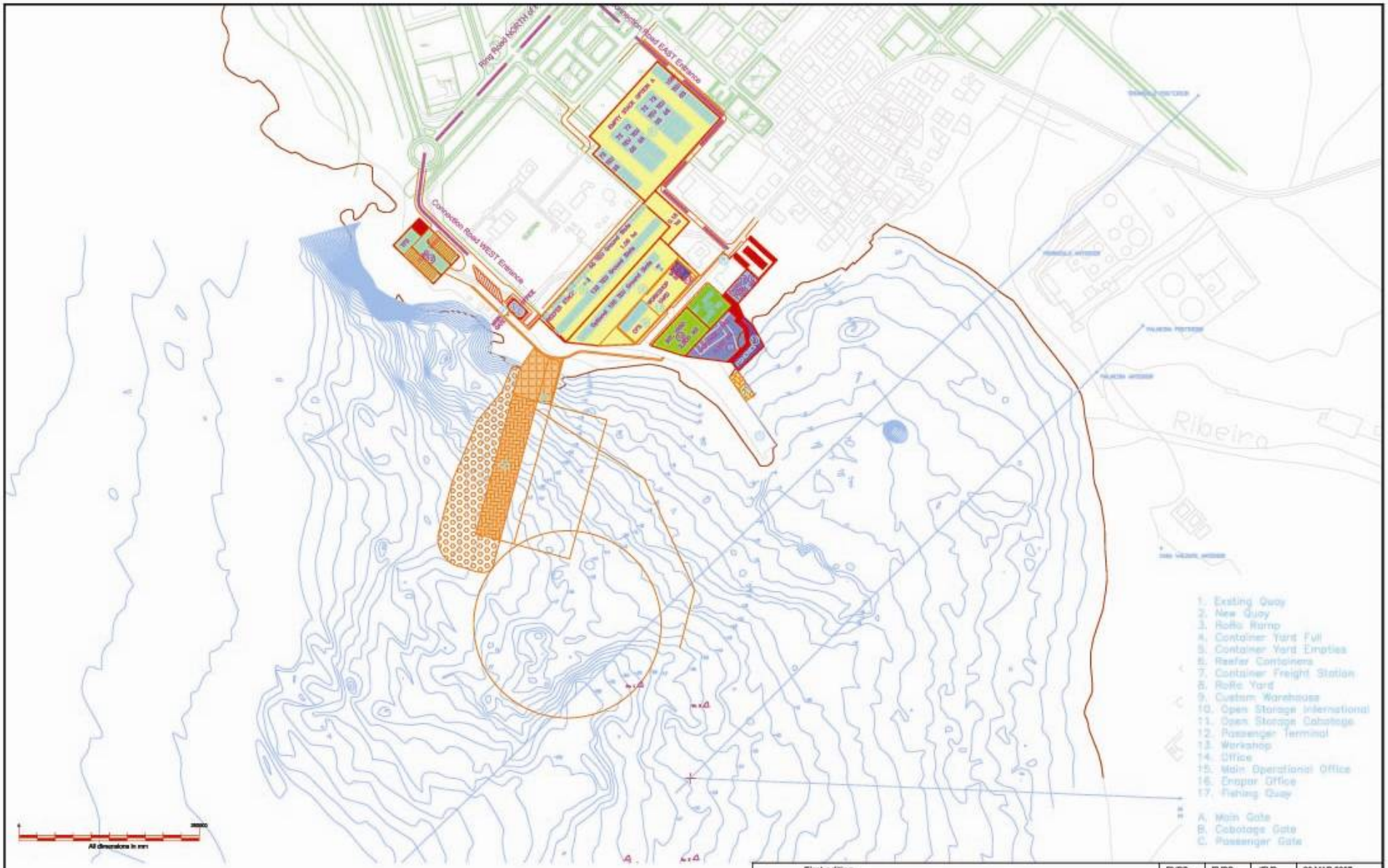

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project
Palmeira Port

description
Quay Alternative 4
General Layout A

size	scale	phase	project number	drawing number
A3	1:5000	Conceptual Design	9R9364.21	/ 03.9308

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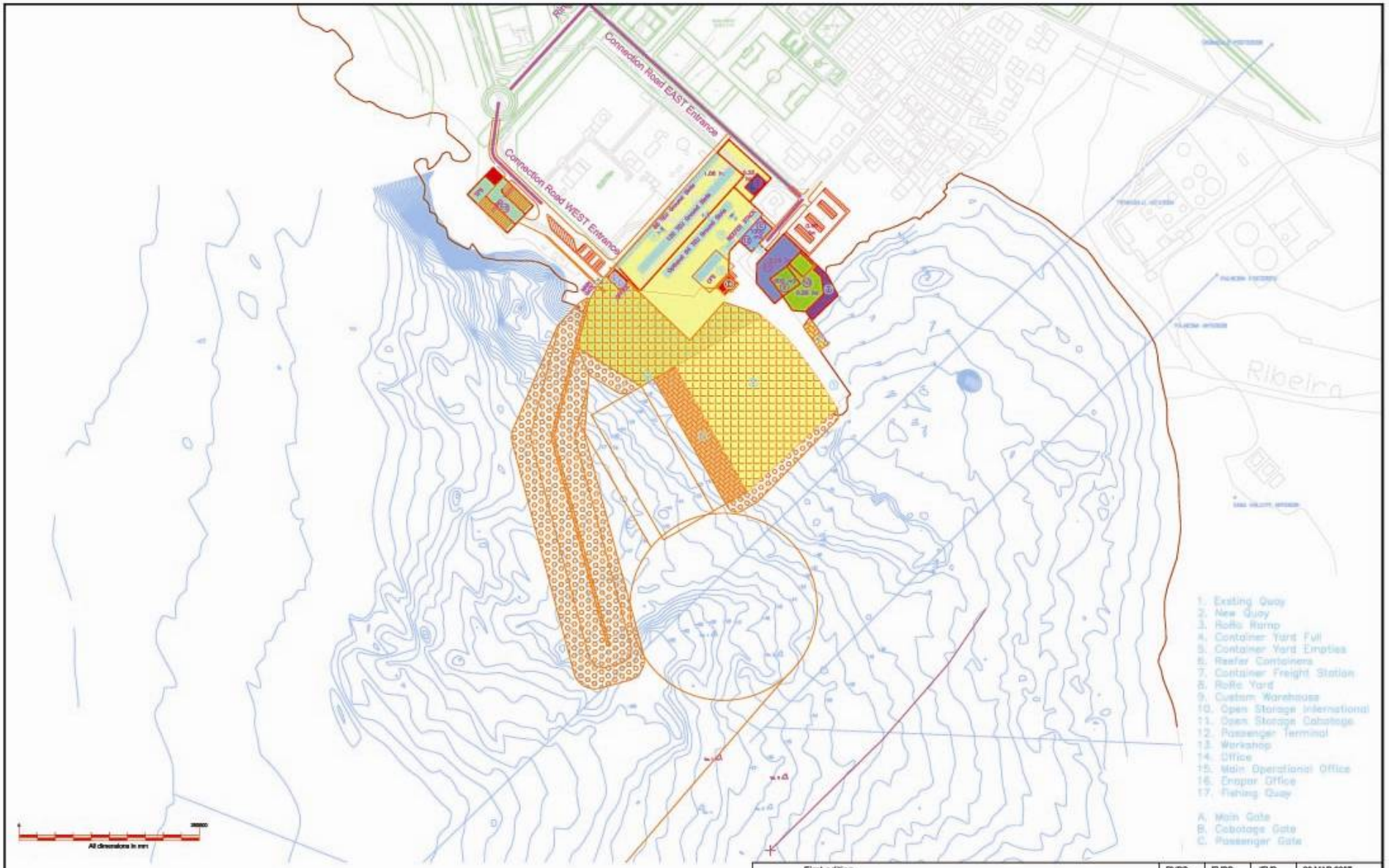

revision	description	drawn	chkd	appr.	date
	First edition	RVDB	EVDB	JFVB	20.MAR.2007

client
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project
Palmeira Port

description
Quay Alternative 5
General Layout B

size	scale	phase	project number	drawing number
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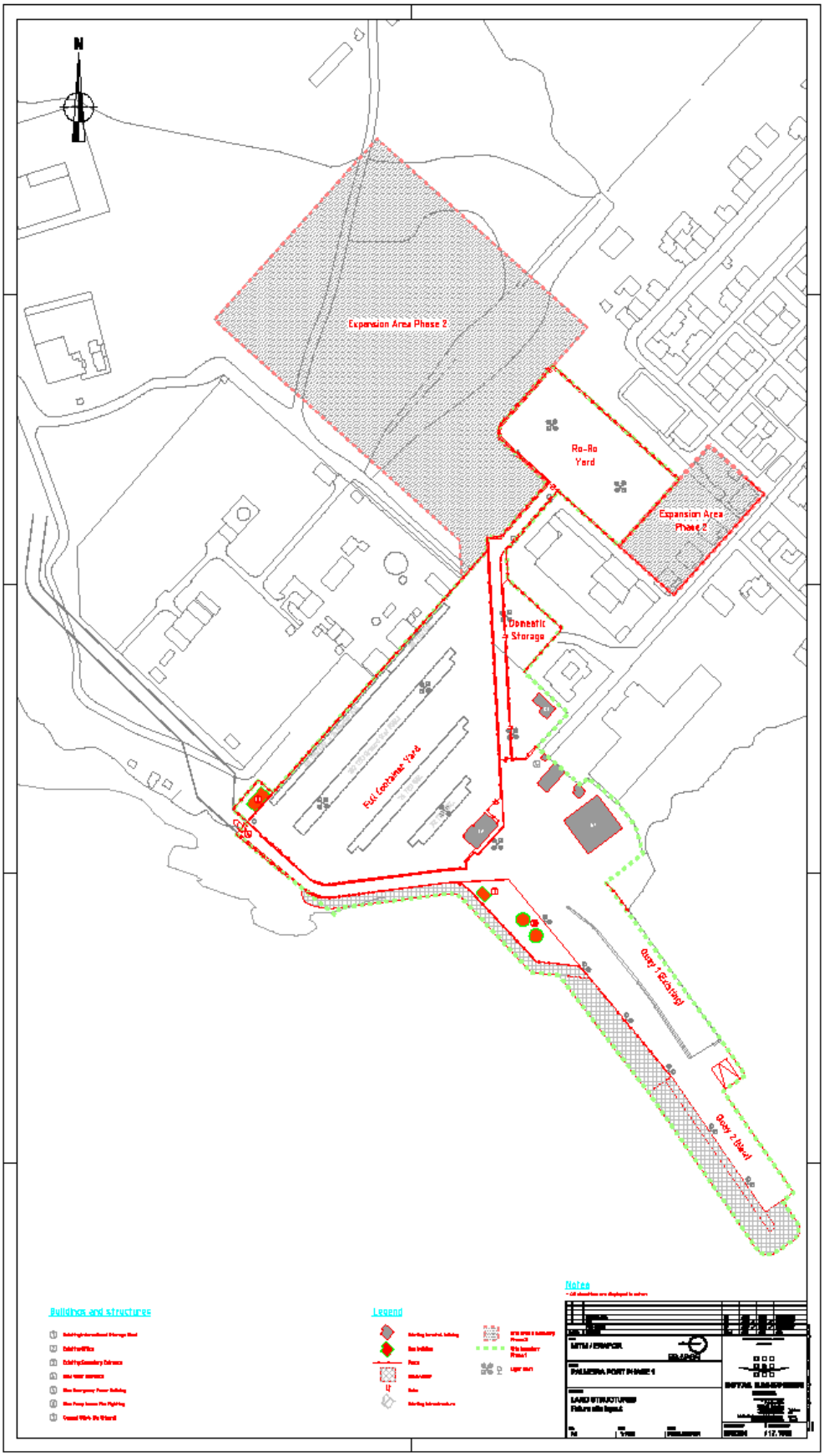
Annex 2
Final Layout option, phase 1 & 2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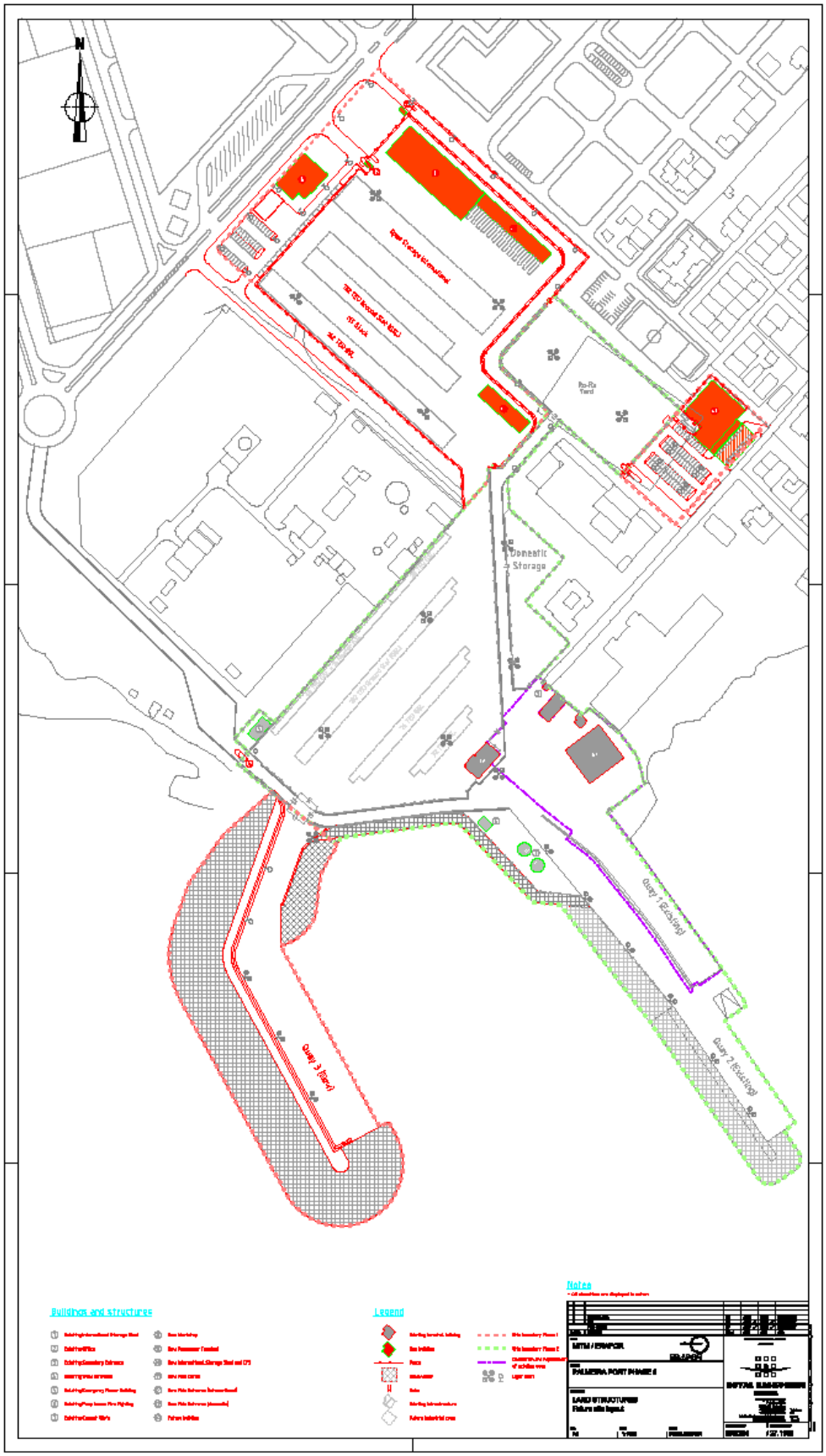
Expansion Area Phase 2
Ro-Ro Yard
Expansion Area Phase 2
Domestic Storage
Full Container Yard
Quay 1 (Existing)
Quay 2 (New)
Buildings and structures
Legend
Notes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Domestic Storage
Quay 2 (Existing)
Quay 3 (New)
Buildings and structures
Legend
Notes

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Annex 3
Dredging locations, phase 1 & 2

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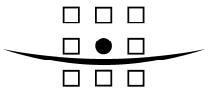

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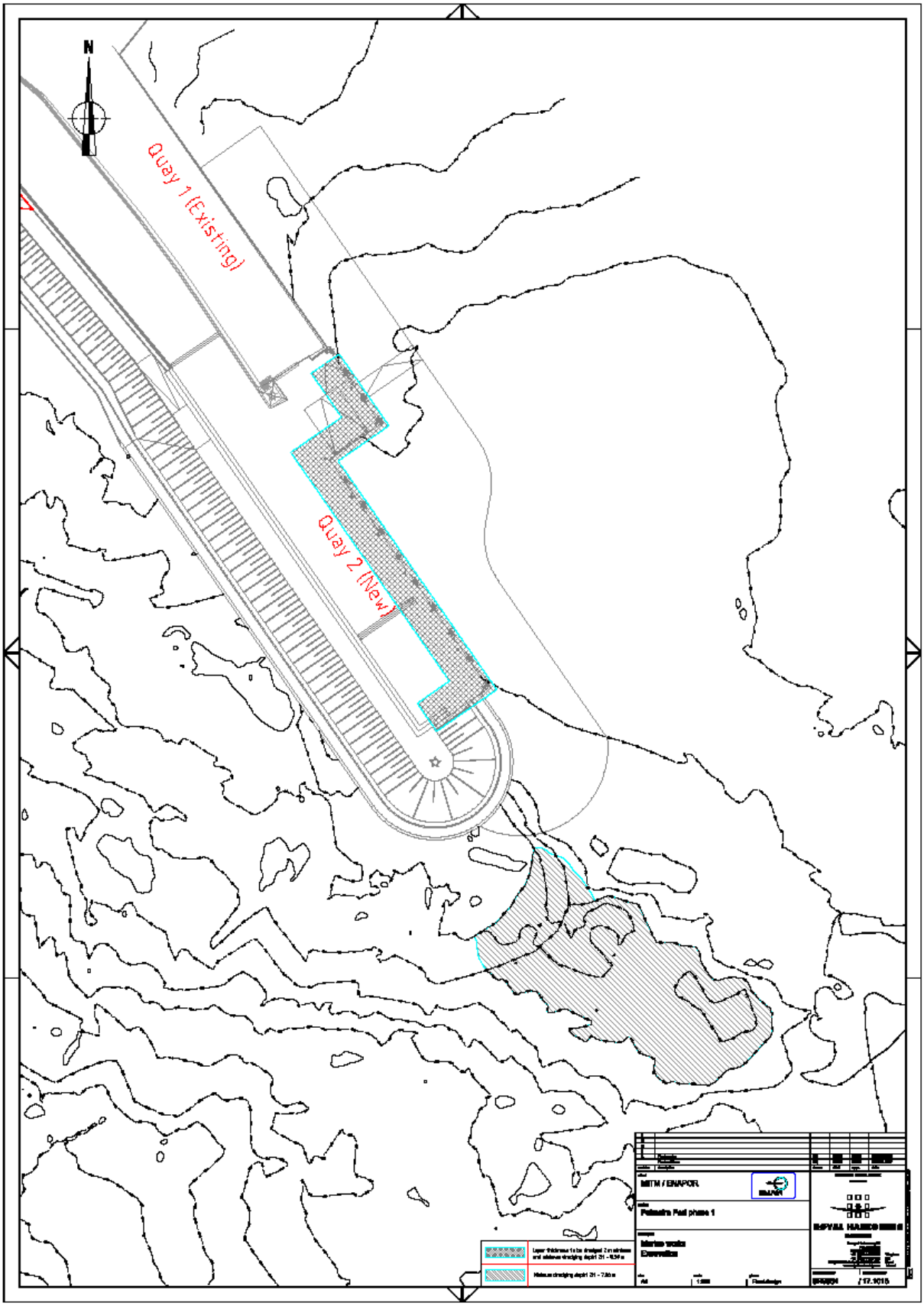
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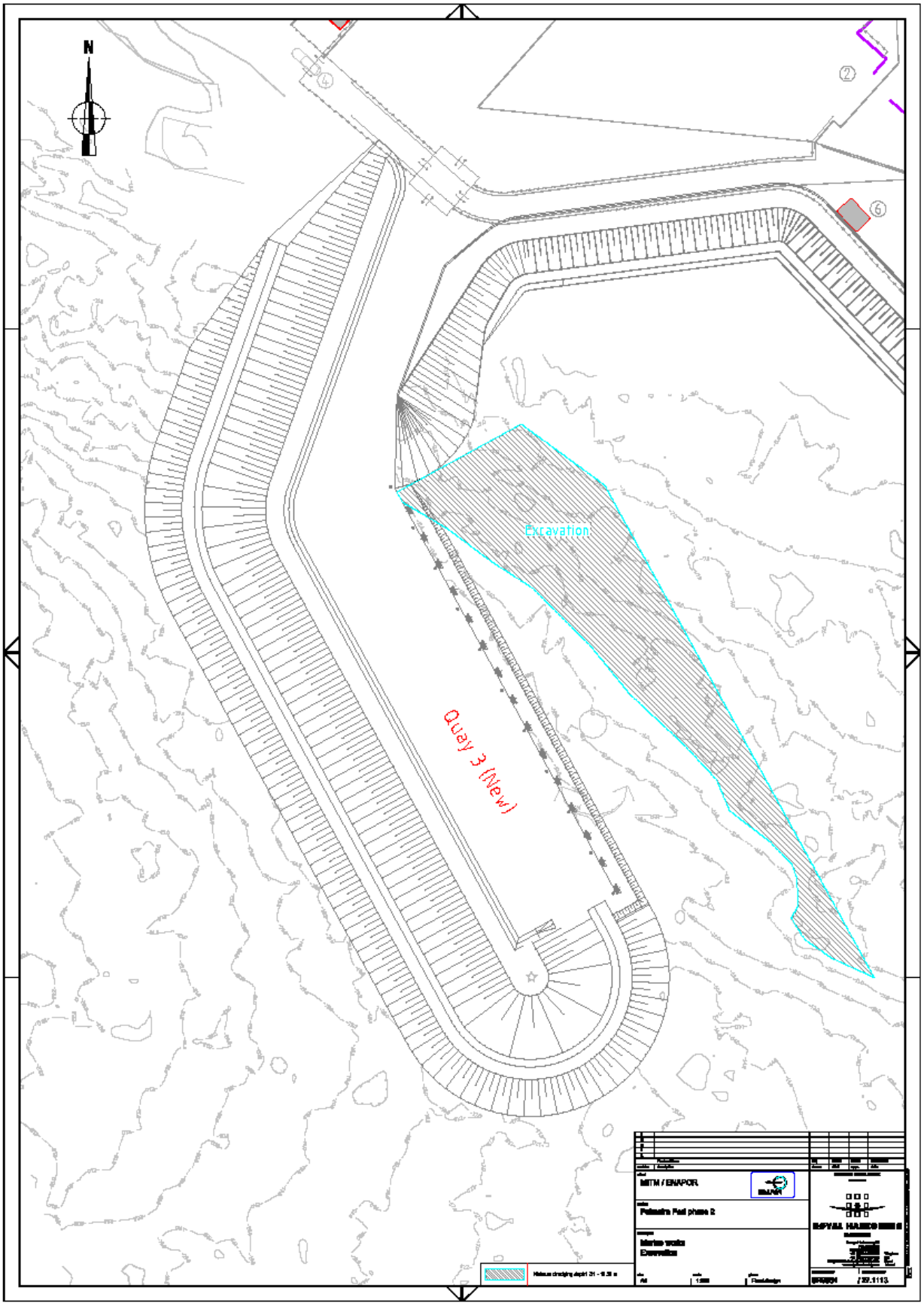
Quay 1 (Existing)
Quay 2 (New)
MITH / ENAPOR
Palmeira Port phase 1
Marine works
Dredging
ROYAL HASKONING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Excavation
Quay 3 (New)
MITM / ENAPOR
Palmeira Port phase 2
Marine works
Excavation