TOWNSVILLE PORT EXPANSION PROJECT

Additional Information to the Environmental Impact Statement

TOWNSVILLE PORT EXPANSION PROJECT

SECTION 13

Greenhouse Gas Emissions

AECOM BMT WBM

13.0 Greenhouse Gas Emissions

13.1 Introduction

Greenhouse gas emissions from the Port Expansion Project (PEP) construction and operational activities are discussed in Chapter B.11 (Greenhouse Gas) of the Environmental Impact Statement (EIS). Emissions generated by the PEP will contribute to existing concentrations of greenhouse gases in the atmosphere such as carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O). This has secondary consequences through its contribution to climate change impacts. This section provides information to address submissions received in response to the PEP EIS relevant to greenhouse gas emissions arising from the construction and operation of the PEP and assesses the impacts of the revised design.

Key matters raised during the submission process include:

- greenhouse gas flow-on impacts associated with the export of coal through the PEP
- cumulative impact contributions as a result of the PEP on the Great Barrier Reef.

One submission raised the potential emissions as a result of anoxic organic sediment disturbance during the construction process. This is addressed in Section 3.2.8 of the Additional Information to the Environmental Impact Statement (AEIS).

13.2 Response to Submissions

13.2.1 Greenhouse gas flow-on impacts associated with the export of coal through the PEP

Four submissions raised the matter of future coal exports through the PEP contributing to global climate change through the combustion of coal at its final destination.

The Port of Townville is a multi-cargo port which imports and exports cargo to support North Queensland and the broader development initiatives of Northern Australia. The Port currently is not, and is not proposing to become a dedicated coal port such at Abbot Point, as referenced in one submission. Whilst the PEP EIS has identified coal as one potential future trade depending on industry demand, any such cargo export will be subject to separate assessment and approvals process and is not specifically addressed in this EIS.

In accordance with the Terms of Reference, the greenhouse gas assessment for the EIS focused on the construction and operation of the infrastructure itself, and not emissions associated with increased trade volumes likely to be enabled by the PEP as a transport linkage.

Emissions associated with increased cargo flows through the Port during operation are difficult to quantify, given the uncertainties regarding future cargo volumes and types. Emissions associated with these cargos will be addressed through other statutory processes (e.g. emissions from new coal mines will be covered by approvals processes associated with those mines).

In line with Section 9 of the *National Greenhouse and Energy Reporting Act 2007,* emissions associated with cargo passing through the Port are outside the scope of this Project.

13.2.2 Cumulative impact contributions as a result of the PEP on the Great Barrier Reef

Two submissions raised the matter of the PEP contributing to cumulative impacts on the Great Barrier Reef, including through the flow-on impacts resulting from the burning of coal cargo at international locations.

Whilst the EIS does not consider cargo flows through the Port as discussed above, Section 25.0 of the AEIS documents a comprehensive cumulative impact assessment that has been undertaken to assess the potential impacts of the PEP on sensitive ecological receptors. The cumulative impact assessment was undertaken in accordance with the *Framework for Understanding Cumulative Impacts Supporting Environmental Decisions and Informing Resilience-Based Management of the Great Barrier Reef World Heritage Area*.

13.3 Revised Environmental Impact Assessment

13.3.1 Legislation and policy

On 17 July 2014, the *Clean Energy Act 2011* was repealed by the Commonwealth government. This meant that from 1 July 2014, the Carbon Pricing Mechanism was abolished. The Commonwealth government replaced it with the *Direct Action Plan*, a policy consisting of programs such as the Emissions Reduction Fund directed at reducing carbon emissions.

The Emissions Reduction Fund came in to effect on 13 December 2014. The government has provided $2.55 billion to establish the Fund and support businesses pursuing emissions reduction activities. It involves the use of a 'reverse auction' mechanism, where businesses can sell their carbon abatement, with the government purchasing the lowest cost per tonne of abatement. This is targeted at encouraging businesses to invest in the most cost-efficient emissions reduction methods and will be monitored by the Clean Energy Regulator. The Fund utilises mechanisms associated with the existing *National Greenhouse and Energy Reporting Act 2007* to evaluate carbon emissions from business and industrial entities. The first Emissions Reduction Fund auction was held in April 2015. At the first auction, the average price per tonne of abatement was $13.95. The second auction was held in November 2015, with the average price per tonne of abatement being $12.25.

The PEP is not likely to be directly affected by costs from a carbon price as outlined in Section B.11.2.3 of the EIS. Port tenants are likely to be responsible for the majority of future operational emissions.

The updated National Greenhouse Accounts Factors (August 2015) were used to undertake the AEIS revised greenhouse gas impact assessment.

13.3.2 Design refinement

The Project design has been refined as described in Section 2.0 of the AEIS. The revised design has increased the greenhouse gas emissions footprint of the PEP.

13.3.3 Supporting studies

Aside from the revised assessment provided below, no additional studies were required to adequately address comments received from submissions in relation to greenhouse gas.

13.3.4 Revised assessment

13.3.4.1 Impact assessment

The design refinement expands the reclamation area by approximately 50 ha to the north east to avoid sea placement of dredged material. The revised design and construction staging is expected to result in increased emissions. The peak intensity of greenhouse gas emissions of the PEP will be reduced by spreading the emissions profile over a longer duration.

All construction emissions were re-assessed, including:

- fuel use for the transport of construction materials from the quarry to site
- fuel use for onsite machinery
- fuel use for the capital dredging operations
- embodied emissions of the construction materials.

Emissions from stationary energy sources (e.g. lighting for night works) was not assessed due to a lack of specific data.

The revised design has comparable operational capabilities to the EIS. As a result, operational emissions calculated in Chapter B.11 (Greenhouse Gas) of the EIS are considered to remain unchanged. Whilst not able to be captured and presented, it is noted that overall emissions within the outer harbour will be reduced. This is as a result of Berth 12 being incorporated within the PEP, thereby reducing the overall berth number in the outer harbour from 8 to 7.

Table 13.1 summarises the reassessed greenhouse gas emissions produced for each source of emissions in the construction phase of the PEP.

Table 13.1 Revised AEIS Greenhouse Gas Emissions for the Construction Phase of the revised design

Scope	Source of Emissions	t/CO_2-e			
		Stage 1	Stage 2	Stage 3	Total
1	Transportation of materials	23,451	22,895	24	**46,369**
1	Onsite machinery	24,554	26,923	23,370	**74,847**
1	Capital dredging	33,717	15,731	38,300	**87,748**
3	Embodied energy emissions	12,404	40,135	29,021	**81,560**
	Total	**94,126**	**105,684**	**90,714**	**290,524**

Transportation of Materials

Almost all greenhouse gas emissions from the transportation of materials occur in Stages 1 and 2, where all of the breakwater and revetment core material and rock armour is delivered from the quarry/s to the Project site. Table 13.2 shows the greenhouse gas emissions from transportation activities for each stage of the Project.

Table 13.2 Emissions from transportation activities by stage

Stage	Activity	Total emissions (CO_2-e)
1	Delivery of breakwater and revetment core material and armour	23,427
	Earthworks, pavement formation layers, delivery of materials, civil works for trunk services and utilities	24
2	Delivery of breakwater and revetment core material and armour	22,825
	Earthworks, pavement formation layers, delivery of materials, civil works for trunk services and utilities	71
3	Earthworks, pavement formation layers, delivery of materials, civil works for trunk services and utilities	24
	All stages	46,369

Onsite Construction Plant and Machinery

Onsite machinery is required for construction works associated with the development of the reclamation (excluding emissions relating to transportation of materials outside of the new reclamation footprint or emissions related to dredging). As shown in Table 13.1, greenhouse gas emissions from onsite machinery will be greatest in Stage 2. The mechanical handling of the dredged materials and compaction into the reclamation along with the construction of revetments and breakwater structures during each stage will be the main contributors to the total emissions from onsite machinery. The increase of emissions in Stage 2 is as a result of the marine structure, deck and pavement construction associated with the development of Berth 14, Berth 15 and Berth 16, in addition to the mechanical handling.

Table 13.3 shows the fuel consumption rates for each type of onsite machinery. The most energy intensive (i.e. least fuel efficient) onsite machinery are likely to be bulldozers. Although when total hours of use are considered, the onsite machinery that contributes the most greenhouse gas emissions are likely to be the on-road dump trucks. On-road dump trucks are being used to transport good quality engineering fill from land sources to form the capping layer over the reclamation and pavement sub-base.

Table 13.3 Onsite machinery fuel consumption rates

Onsite Machinery	Fuel consumption (L/hr)
Barge mounted pile drivers	15
Bobcats	8
Bulldozers	80
Concrete trucks	25
Cranes – mobile	15
Cranes – large	30
Excavators	40
Graders	36
Off-road dump trucks	40
On-road dump trucks	20
Paving machines	20
Stone column or wick drain rigs	20
Track machines	20

Onsite Machinery	Fuel consumption (L/hr)
Tugs for barge	50
Utility vehicles	10
Workboats	50

Capital Dredging

Of the four emissions sources listed in Table 13.1, capital dredging contributes the most greenhouse gas emissions. The energy intensity of the dredging machinery is a key factor driving this (refer to Table 13.4). The majority of emissions from capital dredging works are from Stages 1 and 3, where the channel is widened and deepened. The dredging machinery that accounts for the most greenhouse gas emissions are the hopper barges due to the number required as well as being required over most of the project duration to support the mechanical dredging operations.

Despite the small Trailer Suction Hopper Dredge having the greatest fuel consumption, it contributes less total greenhouse gas emissions than either the hopper barges or the mechanical dredge because it is working for far fewer hours in total (dredging work will be approximately 6 months).

Table 13.4 Dredging machinery fuel consumption rates

Dredging Machinery	Fuel consumption (L/hr)
Hopper barges	200 and 250
Large mechanical dredge	215
Small hopper barges	125
Small mechanical dredge	107.5
Small Trailer Suction Hopper Dredge	1,500
Small tug	50
Survey boat	50
Work boat	50

Embodied Energy Emissions

Embodied energy emissions are those released during the production and manufacture of construction materials. These emissions are mainly associated with the construction of structural elements of the Project, particularly wharves and other landside and terminal infrastructure. Geotextile, concrete and steel were the construction materials considered in this greenhouse gas emissions assessment.

Table 13.5 shows the emissions associated with each of these materials for each stage of the Project. Steel is the primary source of embodied energy emissions. This is due to both the quantities of steel required and steel's high emissions intensity (2.23 tonnes $CO_{2\text{-}e}$ / tonne) compared to concrete (0.209 $CO_{2\text{-}e}$ / tonne). Emissions from embodied energy will be greatest for Stages 2 and 3, mostly due to the development of wharves for Berth 14, Berth 15 and Berth 16 in Stage 2 and Berth 17 and Berth 18 in Stage 3.

Table 13.5 Embodied energy emissions by stage

Stages	Emissions (t/CO_2-e)			
	Stage 1	Stage 2	Stage 3	Total
Geotextiles	268	172	0	**440**
Concrete	3,662	12,088	8,728	**24,478**
Steel (reinforcement and piles)	8,474	27,875	20,293	**56,642**
Total	**12,404**	**40,135**	**29,021**	**81,560**

Emissions Intensity

The emissions intensity of each stage of the Project is directly associated with the intensity of construction activities. Stage 3 is likely to be the most emissions intensive stage with approximately 30% of Stage's emissions due to capital dredging. Table 13.6 below shows the overall stage duration, total emissions and approximate emissions intensity of each Project stage.

Table 13.6 Emissions intensity by each construction stage

Stage	Construction Start Date	Stage Duration (years)	Total Emissions (t/CO_2-e)	Emissions Intensity (t/CO_2-e /year)
1	2017	4.5	94,126	20,916
2	2023	4.5	105,684	23,485
3	2030	2.5	90,714	36,285

AEIS and EIS Greenhouse Gas Emissions Profile comparison

Predicted emissions from the construction phase of the PEP have changed due to the design refinement. Table 13.7 compares the previous greenhouse gas emissions with the re-assessed emissions produced from each source in the construction phase.

Table 13.7 Comparison of EIS and AEIS Greenhouse Gas Emissions for the Construction Phase

Scope	Source of Emissions	t/CO_2-e		
		EIS	AEIS*	% Change
1	Transportation of materials	39,788	46,369	17%
1	Onsite machinery	31,555	74,847	137%
1	Capital dredging	80,591	87,748	9%
3	Embodied energy emissions	85,940	81,560	-5%
	Total	237,874	290,524*	+22%

*Changes to the emissions factor for diesel fuel resulted in overall AEIS emissions being 8% higher than the EIS (refer to Errata List Appendix C3).

Overall the design change is anticipated to increase greenhouse gas emissions. The increase from the EIS is approximately 22%, with the largest changes in emissions originating from the transport of materials to site and in onsite machinery. Changes to emissions from each source are explained below.

- Emissions from transportation of materials to the site have increased from the EIS by approximately 17%. Construction of the larger reclamation area requires additional good quality material for capping and pavements to be transported to the larger reclamation area from onshore sources.
- Onsite machinery emissions have increased substantially, by 137%. The expansion of the reclamation area, from approximately 100 ha to approximately 150 ha, requires more trips by onsite machinery to deliver material to the reclamation area, increasing overall emissions.
- Capital dredging emissions have increased, by approximately 9%. Capital dredging works are taking place over a longer period of time, requiring more energy consumption from dredgers. Additionally, as all dredging material is being delivered to the reclamation area, more delivery of dredged material via hopper barges will be required.
- Embodied energy emissions have reduced by 5%. This is because the total provision of berth length has reduced by approximately 6% since the EIS following the inclusion of Berth 12 in the Project.

Figure 13.1 provides a breakdown by source of greenhouse gas emissions from the construction phase for all stages of the PEP.

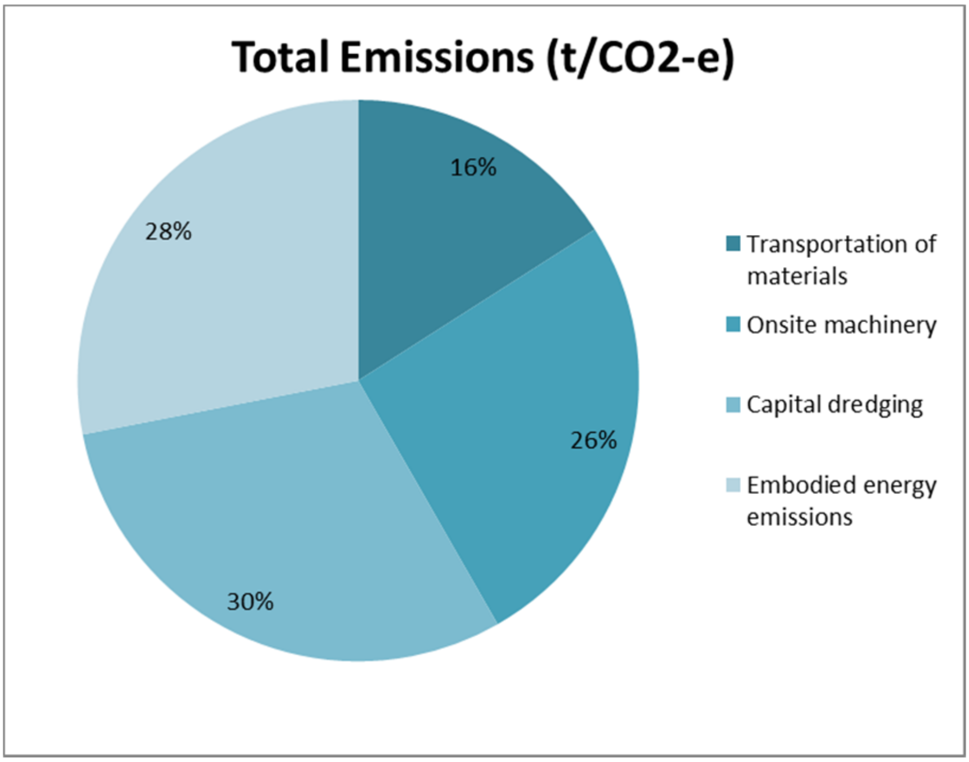

Figure 13.1 AEIS Greenhouse Gas Emissions from the Construction Phase by Source

13.3.4.2 Mitigation measures

There has been no change to the mitigations measures as a result of the AEIS. Mitigation measures to reduce the impact of greenhouse gas emissions from the construction and operation of the PEP are outlined in the updated Construction Environmental Management Plan (Appendix B2) and Operational Environmental Management Plan (Appendix B3).

13.3.5 Summary

Greenhouse gas emissions have increased compared to the EIS as documented in the revised assessment. Whilst the greenhouse gas emissions have increased in scale, the mitigation measures provided in Section B.11.5 of the EIS remain relevant for the revised design.

13.4 Conclusion

The design refinement is anticipated to increase greenhouse gas emissions by approximately 22% compared to the EIS, with the largest changes in emissions originating from onsite machinery as a result of the larger reclamation area. Whilst the greenhouse gas emissions have increased in scale, the mitigation measures provided in the EIS remain relevant for the revised design.

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