

Fremantle Ports Inner Harbour Deepening Project: Predictions, Perceptions and Outcomes

Fremantle Ports' Inner Harbour Deepening Project involved the dredging of approximately 3.1 million m³ of sand and limestone, of which approximately two thirds was reused in land reclamation and the remaining one third placed in an offshore spoil disposal area approximately 8km offshore of Fremantle, Western Australia. Dredging was undertaken to deepen the Inner Harbour, Entrance Channel and Deep Water Channel to allow larger ships to utilise the Fremantle Inner Harbour. A combination of a Trailing Suction Hopper Dredge and a Cutter Suction Dredge were used to remove the majority of the dredge material. Minor backhoe works were also required to remove rock from along the berth face. The dredging was largely completed in two main phases; January 2010 to March 2010 and August 2010 to November 2010. Minor backhoe works were conducted between December 2010 and April 2011 and the duration of dredging operations totalled 29 weeks in aggregate.

A Water Quality Monitoring Program (WQMP) was implemented to achieve the following environmental quality objectives (EQO's) for the protection of four relevant environmental values (EV's), as defined in *Perth's Coastal Waters: Environmental Values and Objectives (EPA 2000)*. Monitoring sites were located based mainly on the plume extent predicted during the environmental impact assessment process and the presence of sensitive environmental receptors seagrass, coral, macroalgae and recreational beaches.

Environmental Value (EV)	Environmental Quality Objectives (EQOs)
Ecosystem Health	<i>EQO1: Maintenance of Ecosystem Integrity</i> Ecosystem integrity, considered in terms of structure and function, will be maintained throughout Perth's coastal waters. The level of protection of ecosystem integrity shall be high (E2) throughout Perth's coastal waters, except in areas designated E3 (moderate protection) and E4 (low protection).
Fishing and Aquaculture	<i>EQO2: Maintenance of Aquatic life for human consumption</i> Seafood will be safe for human consumption when collected or grown in all of Perth's coastal waters except areas designated S2.
Recreation and Aesthetics	<i>EQO3: Maintenance of primary contact recreation values</i> Primary contact recreation (e.g. Swimming) is safe in all of Perth's coastal waters except areas designated S3.
	<i>EQO4: Maintenance of secondary contact recreation values</i> Secondary contact recreation (e.g. Boating) is safe in all of Perth's coastal waters except areas designated S4.
	<i>EQO5: Maintenance of aesthetic values</i> The aesthetic values of Perth's coastal waters will be protected except in those areas designated S5.
Industrial Water Supply*	<i>EQO6: Maintenance of industrial water supply values</i> Perth's coastal waters will be of suitable quality for industrial water supply purposes except in areas designated S6.

* - No industrial water supply uses are known to occur within the immediate vicinity of project activities. Management of water quality for EQO1 will also address EQO6.

The WQMP outlined a tiered range of management triggers for most indicators; for example, a Level 1 trigger defined "low level" management such as further investigation; Level 2 and 3 triggers defined increasing levels of dredge management; and a Level 4 trigger defined habitat monitoring. Management triggers were

conservative and exceedance of a low level trigger did not necessarily imply that an environmental quality objective had not been met, rather that a management action was required. While consistent with the environmental quality criteria framework of the EPA, the key lesson learned was that this was not understood by the community, non-scientific stakeholders or - more importantly - the media.

The predicted extent of plumes and level of toxicant concentrations within the plume were key elements of public concern and media reporting prior to and during early phases of Inner Harbour dredging works. This focus on toxicants occurred despite less than 10% of all dredge material potentially containing toxicant concentrations at or near screening levels for the protection of ecosystem health toxicant concentrations and levels being significantly below guideline levels that are protective of public health (most toxicant concentrations were below detection levels).

The adoption of conservative threshold criteria for impacts on seagrass also contributed to substantial public concern and adverse media in relation to perceived environmental impacts from the project. Assessment of the direct and indirect losses of BPPH potentially resulting from the dredging was undertaken as part of the Public Environmental Review (PER) process based on habitat mapping conducted in 2007, dredge plume modelling and minimum light requirements for seagrass. This initially predicted potential losses of seagrass of up to 99 Ha and no loss of coral or macroalgae habitat within a defined management unit. Ministerial Statement 801 included a condition Fremantle Ports ensure no loss of coral or macroalgal habitat within this management unit caused by the dredging and that losses seagrass habitat were not to exceed 50 hectares.

Immediately prior to commencement of the project a revised baseline habitat map was prepared incorporating further ground truthing to the originally acquired satellite imagery and the areas of BPPH that were predicted to be lost or affected by dredging and disposal activities were revised. The updated mapping showed significantly greater amounts of BPPH which led to higher absolute loss estimates for seagrass and macroalgae, however the estimated cumulative loss as a percentage of total habitat decreased.

The presentation will discuss the key outcomes from the monitoring program and compare these to the predictions and perceptions prior to and during early phases of Fremantle Inner Harbour Deepening dredging works.