

## 5.0 CONSTRUCTION

Unregulated or thoughtless construction techniques often represent the greatest potential for environmental damage from a marina development. Impacts which may occur during the construction of the marina should be identified early in the planning process. Careful planning for unavoidable impacts should be undertaken to minimise them and their effects. Consideration should be given prior to the letting of any construction contracts, as to an appropriate set of contract conditions that will protect the marina environment from careless or destructive construction practices.

Note that, certainly for works in the GBRMP, an officer will be appointed to act as Environmental Supervisor for GBRMPA and QDEH interests. This person will be empowered to stop or suspend works in certain specified circumstances. This person's salary, on-costs and reasonable expenses will be paid for by the developer.

### 5.1 Dredging and Excavation

**Consult Commonwealth and State authorities on legislation governing dredging and reclamation.**

Dredging, excavation and reclamation are often involved in marina construction. Dredging and excavation can be very destructive activities and are closely controlled by various articles of legislation. Early consultation is strongly recommended with all authorities involved in the legislation.

**Assess natural turbidity levels and local environmental parameters to determine likely impacts of dredging.**

Impacts from excavation, dredging and construction activities may be environmentally significant, depending upon the physical and biological characteristics of the surrounding water body. The degree of impact depends on the type of material excavated; the health of the existing environment; the character of site-specific habitats, wildlife, water quality, and adjacent developments; and the manner in which the dredging and disposal is conducted. Dredging may increase natural turbidity levels by resuspending silt or by introducing spoil material into the water column. Wave action, erosion of unstabilised dredged canal banks, and leaching of unconsolidated spoil mounds can also increase turbidity. Natural turbidity may be relatively high due to sediment from rivers and elevated turbidity levels from dredging can be temporary and localised.

The dredge-related effects of siltation, however, can have a prolonged and serious impact through seagrass destruction, shoaling and circulation changes, stress on coral reefs and burial of organisms (see Section 3.6).

The abatement of dredging effects initially involves assessing the need for dredging or excavation. Ideally, a marina should be sited in a well flushed, protected, deep water, natural harbour with high circulation that does not require dredging for navigation or require spoil filling of submerged wetland areas. Realistically, such areas are not always available or economically feasible. However, minimising the amount (area and volume) of material dredged and the frequency of dredging activities will reduce the environmental impact as well as the cost of maintaining the marina.

**Site marina to minimise dredging, excavation and reclamation.**

Dredging needs can be reduced by placing deep draught boat access points or slips in areas that are closest to the entrance or are naturally deeper.

When dredging or excavation is required, the following issues should be addressed:

*Written permission of the Authority required for maintenance dredging.*

- Dredging is to be undertaken only in a manner which uses the best practicable available technology to minimise impacts on the site. No maintenance dredging is to commence without the prior written permission of the GBRMPA.

**Minimise dredging.**

- Minimise the amount of material dredged and the frequency of dredging.

**Choose appropriate dredging method.**

- Choose an appropriate dredging method. A wide range of techniques exist. Each is suited to particular localities and geotechnical conditions. Environmental impacts differ markedly between methods, and differ for each method according to the conditions the dredge is working in.

**Use silt containment techniques.**

- Use silt screens or similar containment methods around excavation if appropriate. Screening can lead to a dramatic reduction in resuspended sediments in adjacent areas.

**Dredge when dissolved oxygen levels are higher.**

- Dredge during colder months when dissolved oxygen levels are higher (cold water has a greater capacity for dissolved oxygen than does warm water).

**Minimise dredge or fill operations in wetlands.**

- Dredging and filling in wetland areas should be undertaken only if the proposed activity is water-dependent and there are no feasible alternatives.

**Reduce dredging in bay habitats or at key times of wildlife breeding.**

- To the maximum extent feasible, dredging and filling activities should be restricted in nursery areas and shellfish grounds and during critical periods in the life of important sport and commercial species.

**Dredge in such a way as to minimise water quality degradation.**

- Dredging and excavation should not enclose mangroves; create stagnant water conditions, lethal fish entrapments, or deposit sumps; or otherwise contribute to water quality degradation.

**Prevent dispersal of silty water.**

- Designs for dredging and excavation projects should, where feasible, include protective measures such as silt curtains and bunds to protect water quality in adjacent areas during construction by preventing the dispersal of silt materials.

In determining what is done with the dredge spoil generated by marina construction, the following process should be undertaken:

**Reduce dredge spoil.**

- All opportunities to reduce the need to dredge and to reduce the production of dredge spoil are to be investigated and adopted if feasible.

**Productive uses of dredge soil to be sought.**

- All productive uses of the dredge spoil and opportunities to re-use or recycle it are to be investigated and adopted if feasible. Note that dredging specifically carried out for the purpose of obtaining material for other purposes (beaches, reclamation) is defined as mining and is specifically forbidden in the GBRMP by law. Dredge spoil can however be used for beach nourishment (if suitable material) if this is not the primary purpose of the dredging.

**Investigate terrestrial disposal sites.**

- If no productive uses are feasible then terrestrial disposal sites are to be investigated and adopted if feasible.

**Consult with QDEH and other Queensland agencies for land sites.**

- Selection of terrestrial disposal sites should be undertaken in close consultation with QDEH and other Queensland agencies, and may require permission under various relevant legislation.

**Upland disposal preferred.**

- Upland disposal of dredge spoil is preferred. Wetlands and mudflats should not be utilised unless there are no feasible alternatives.

**Existing dumping sites favoured.**

- Existing disposal sites should be utilised to the fullest extent possible (where feasible).

**Hazardous materials cannot be dumped in wetlands.**

- Dredged materials containing hazardous levels of toxic materials shall never be disposed of in wetland areas.

**Vegetate bunds to minimise silt loss.**

- Bunds surrounding disposal areas should be shaped and vegetated immediately, with outfalls positioned to empty into non-wetland areas.

**Consider public health implications.**

- Attention must be given to possible adverse impacts of alternative deposition sites on public health and welfare.

**Dredge only after disposal sites acquired.**

- In all cases, dredging activities shall not be approved until satisfactory disposal sites have been acquired.

**Confine discharges.**

- Confine discharges to the smallest practicable deposition zone to protect adjacent substrates.

**Prefer public permitted disposal sites.**

- Use currently permitted public disposal sites.

**Dedicated upland sites are viable alternative.**

- Dedicating permanent upland disposal sites as part of the marina specifications would help eliminate future problems related to disposal of maintenance dredging material. These sites can be sites that have been previously used or represent an environmentally satisfactory alternative.

**Maximise fill potential of existing sites.**

- The carrying capacity at existing disposal areas could be increased by raising the height of containment embankments.

**Use impervious basins for contaminated spoil.**

- Disposal of toxic and organic materials is required in impervious containment basins. Settling of contaminated suspended particles may be enhanced by the addition of a cationic polyelectrolyte with further treatment using sand filters and activated charcoal before discharge.

**Use runoff retention systems to minimise water quality impacts.**

- Upland retention or treatment of runoff from the discharged material is desired to remove dissolved pollutants before they reach the aquatic environment. A simple treatment such as ozonisation or aeration can be adequate for reduction of BOD and COD before the discharge of supernatant liquid from spoil areas enters into receiving waters.

**Plan for possible odour problems.**

- Consider the potential odour problems from spoil during the selection of the disposal site and site preparation.

**Ensure dumping grounds are not filled to interfere with flushing and hydrodynamics.**

- When dumping spoil, maintain the same elevation as marshes and other contiguous areas to promote natural tidal flooding and flushing.

**Consider creation of 'spoil islands' for habitat replacement.**

The creation of 'artificial' islands of spoil in a nearshore area may be acceptable in some instances, particularly if re-vegetation is used to replace lost wetland areas. Spoil islands would be best placed up-drift of dredged areas, since stabilised islands will then intercept further material and reduce ongoing dredging requirements.

**Sea dumping of spoil is undesirable.**

Should no productive uses or terrestrial disposal sites be feasible then sea dumping of the spoil may be considered.

**Sea dumping site selection must be done in conjunction with the authorities.**

Selection of sea dumping sites should be undertaken in close consultation with GBRMPA, DEST (CEPA) and QDEH. Permission will be required under the Environment Protection (Sea Dumping) Act and/or the GBRMP Act.

5.2 Mitigation of Siltation

No sediment laden material to wash into the Marine Park.

All works, including on-land works, are to be carried out in a manner that ensures sediment laden material does not wash into the Marine Park. Excavation should be conducted during the drier months of the year. Silt capture curtains may be required if wet excavation is proposed and water currents are below 1.5 knots. Wet excavation of clay material is to be minimised as far as practicable, unless the site can be effectively bunded.

Erosion and sediment controls required.

Install erosion and sediment controls before upland construction begins.

Pile driving is preferred to jetting.

A temporary increase in turbidity may occur during emplacement of marina structures. This may be alleviated by the use of pile driving rather than jetting.

Use a drilling and tamping method of blasting.

If blasting cannot be avoided, the preferred method is drilling and tamping using multiple small charges rather than single large ones. Staggered detonation times or explosives with slower detonation velocities should be employed. Remember that GBRMPA regards blasting as the technique of last resort in the Marine Park, and will not approve it unless it is demonstrated that other techniques are not feasible.

Marina basin dewatering, floor stabilisation and reflooding to be carried out to the Authority's satisfaction.

Dewatering of the marina basin and the disposal of dredge tail water may be by pumping to an agreed offshore location after settlement and filtering to remove suspended particles as far as practicable (see Section 5.1). The floor of the marina basin is to be stabilised to the Authority's satisfaction. Reflooding of the marina basin is to be carried out in an agreed controlled manner over several tidal cycles prior to the removal of temporary bund walls.

### 5.3 Scheduling of Activities

**Do not schedule dredging during critical life stages of local aquatic organisms.**

Schedule dredging and other construction activities at times other than during spawning, migration or critical life stages of fish and other aquatic organisms. Critical periods may vary with geographic location, tidal cycles, or seasonal rainfall patterns.

**Table 5.1 Environmental Concerns during construction phases of marina development: short-term concerns (Adapted from Carpenter et al. SPREP)**

Activity	Consequence to Environment	Environmental Impacts	Human Health and Welfare Impacts	Mitigation
Dredging/disposal of dredge spoils	<ul style="list-style-type: none"><li>• Turbidity</li><li>• Sedimentation</li><li>• Benthic destruction</li><li>• Dredge spoil</li></ul>	<ul style="list-style-type: none"><li>• Water quality degradation</li><li>• Habitat destruction and species loss</li><li>• Toxicity<ol style="list-style-type: none"><li>1. Ocean disposal<ul style="list-style-type: none"><li>- species loss</li></ul></li><li>2. Land disposal<ul style="list-style-type: none"><li>- leachate damage</li></ul></li></ol></li></ul>	<ul style="list-style-type: none"><li>• Public health risk</li><li>• Welfare losses<ol style="list-style-type: none"><li>1. Subsistence</li><li>2. Recreation</li><li>3. Economic (fisheries, tourism)</li></ol></li><li>• Loss of potentially productive land</li><li>• Aesthetics</li></ul>	<ul style="list-style-type: none"><li>• Design and siting<ul style="list-style-type: none"><li>- avoid high quality areas</li></ul></li><li>• Siltation controls<ol style="list-style-type: none"><li>1. Silt curtains</li><li>2. Settling ponds</li><li>3. Appropriate technology</li></ol></li><li>• Productive use of dredge spoil</li><li>• Compensatory habitat creation</li></ul>
Blasting	<ul style="list-style-type: none"><li>• Concussion</li><li>• Noise</li><li>• Seismic shock</li></ul>	<ul style="list-style-type: none"><li>• Destruction of corals</li><li>• Fish kills</li><li>• Disturbance of endangered species</li></ul>	<ul style="list-style-type: none"><li>• Property damage</li><li>• Welfare losses<ol style="list-style-type: none"><li>1. Subsistence</li><li>2. Recreation</li><li>3. Economic (fisheries, tourism)</li></ol></li></ul>	<ul style="list-style-type: none"><li>• Timing to avoid migratory or spawning seasons</li><li>• Minimise charge size placement/configuration of charges</li><li>• Use air curtains</li></ul>
Site clearance/grading	<ul style="list-style-type: none"><li>• Denuded landscape</li><li>• Altered soil profile</li><li>• Altered topography</li><li>• Noise</li></ul>	<ul style="list-style-type: none"><li>• Soil erosion</li><li>• Water quality degradation</li><li>• Habitat destruction and species loss</li><li>• Increased runoff</li><li>• Increased risk of land slippage</li></ul>	<ul style="list-style-type: none"><li>• Destruction of cultural resources<ol style="list-style-type: none"><li>1. Archaeological sites</li></ol></li><li>• Welfare losses<ol style="list-style-type: none"><li>1. Subsistence</li><li>2. Recreation</li><li>3. Economic (fisheries, tourism)</li></ol></li><li>• Loss of potentially productive land</li><li>• Cultural displacement</li><li>• Aesthetics</li></ul>	<ul style="list-style-type: none"><li>• Design and siting<ul style="list-style-type: none"><li>- avoid sensitive areas</li></ul></li><li>• Archaeological survey/excavation</li><li>• Grading controls<ol style="list-style-type: none"><li>1. Drainage berms</li><li>2. Settling basins</li></ol></li><li>• Relocation of displaced population</li></ul>
Construction activities	<ul style="list-style-type: none"><li>• Fugitive dust</li><li>• Machinery emissions</li><li>• Congestion/traffic</li><li>• Structural addition to coast and landscape</li><li>• Fertiliser/pesticides</li></ul>	<ul style="list-style-type: none"><li>• Disturbance of endangered species</li><li>• Toxicity; species/habitat loss</li><li>• Water quality degradation</li><li>• Eutrophication</li></ul>	<ul style="list-style-type: none"><li>• Worker safety</li><li>• Public health risk<ol style="list-style-type: none"><li>1. Respiratory irritation</li></ol></li><li>• Welfare losses<ol style="list-style-type: none"><li>1. Quality of life</li><li>2. Subsistence</li><li>3. Recreation</li></ol></li><li>• Aesthetics</li></ul>	<ul style="list-style-type: none"><li>• Noise and emission control ordinances</li><li>• Toxic substance controls</li><li>• Timing to avoid migratory or spawning season</li><li>• Compensatory enhancement</li></ul>