Scour Design for WA Transport Infrastructure Projects

It’s not that straightforward

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When Does Scour Occur ?

‘Scour occurs when sediment such as sand and silt are mobilised due to hydrodynamic water forces’

- Weak hydrodynamic forces will mobilise fine grained sediment
- Strong hydrodynamic forces will mobilise coarse grained materials

Low energy conditions

Earthworks Batters – low flow, steep gradient

Minor drainage line – low flow, fine grained materials

High energy conditions

Great Northern Highway – turbulent conditions over floodway, appears unserviceable

Fortescue River – Turbulent conditions, flow constriction and increased velocity through bridge

Typical Scour Design Considerations

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Culvert outlets

Open drains

Steep batters

Floodways

Bridges

Scour Mitigation Measures

Flexible Protection	Rigid Protection	Other Measures
Dumped graded rock	Grouted rock	Drop structures
Rock mattresses	Concrete slabs	Selective use of granular materials and compaction methods
Flexible mats (Jute Matting)	Concrete block mattreses	Designing structures beyond scour limits
Vegetation Cover		

Why is Scour Hard to Design For ?

- Material variation – non-uniform
- Dynamic flow conditions
- Vegetation stabilization challenges
- Construction methodology
- Lack of maintenance
- Hydrologic uncertainty
- Modelling limitations

Infrstructure Projects Ultimately Disturb the Natural Balance, or Equilibrium

Typical Design Approach & Considerations

Inputs	Modelling Approach	Scour Design
Terrain / topography	Hydrologic assessment	Selection of scour prevention measure
Site survey	Hydraulic assessment (1D vs 2D)	Consideration for site conditions
Guiding standards / documents	Generate design velocities	Engineering judgement
Historical performance		Cost

Design Outcomes

Contract clauses that are tricky to navigate….

Prevent scour, erosion and sediment transportation

Maintain the existing flow regimes, water balance and stormwater quality of the project works site, as much as possible;

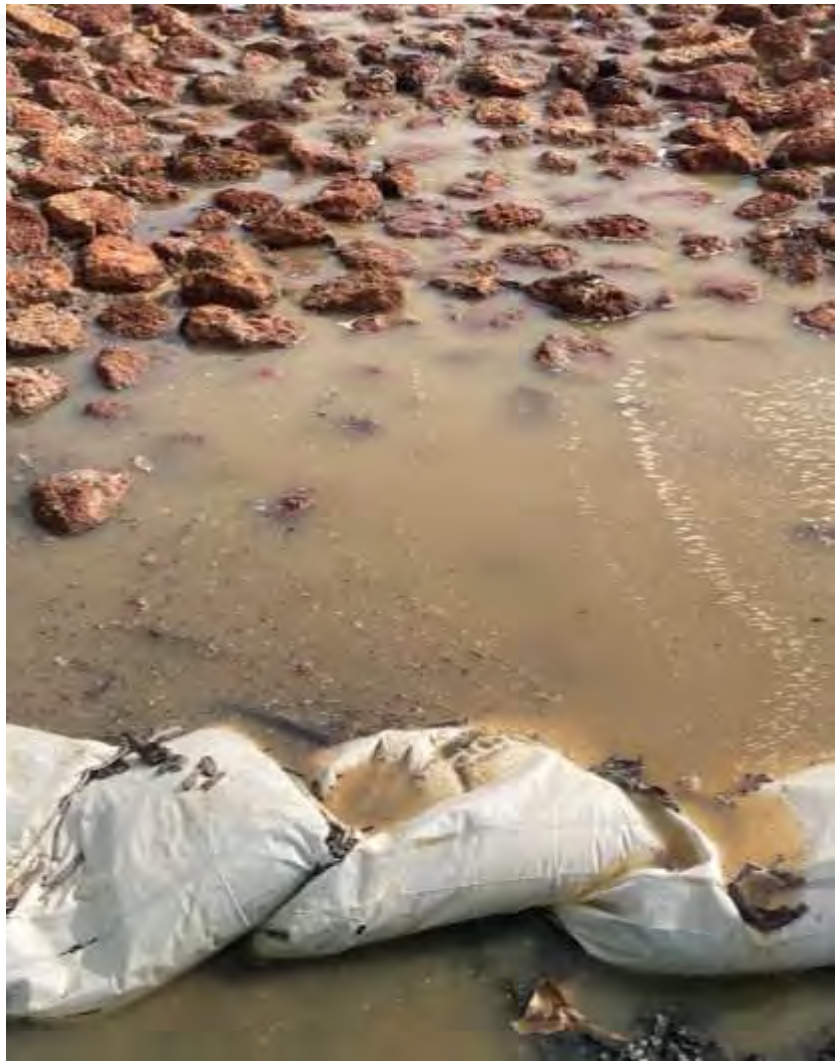
Avoid adverse impacts on the environment

Minimise the need for maintenance, such as scour repair and the removal of sediment deposits;

Minimise flow across track, paths and roads from adjacent landscaped areas

Stormwater and drainage management systems shall be designed to intercept and treat (if required) pollutants and maintain the quality and quantity of runoff entering the receiving environments such as groundwater, waterways/rivers, tributaries, wetlands and other existing drainage facilities.

Managing Risk and Expectations



Safe Scour Design

For Designers

Education

Limiting Liability

Covering clauses within legal contracts

Scour protection is expensive is better and more cost effectively managed through observations during and after the construction period

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