Peel Main Drain Off-line water treatment pilot project

Project Status – April 2020

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We acknowledge the Noongar people as Traditional Custodians of this land and pay our respects to all Elders past and present

This project is supported by the Peel-Harvey Catchment Council through funding from the Australian Government's National Landcare Programme.

Australian Government

National Landcare Programme

Introduction

The Peel MD project planned to use the insitu clay soils of the Serpentine floodplain to strip phosphorous from the flow in Peel MD. Since 2010, levels of Total Nitrogen have been Moderate (1.5–2.0mg/L), while levels of Total Phosphorous have generally been High (0.25–0.40mg/L).

Project History

The project was initially envisaged in 2015 to divert flow from PeelMD through a series of swales where clay lining would strip phosphorous out of the water column. The resultant outflow would discharge into wetlands along the western side of the lower Peel MD before re-entering PeelMD at its confluence with the Serpentine River. After key stakeholder negotiations between PHCC, DWER, WCorp and DBCA under the guidance of the REI Steering Committee, a stage 1 proposal was simplified to a project that would divert water from the PeelMD into six 200m long swales before allowing the treated water back into PeelMD immediately downstream.

Oct-Dec 16:	Feasibility investigations commenced
July 2017:	Jim Davies & Assoc engaged to undertaken Swale hydraulic design
August 2017:	Staged approach to swale construction decided with treated flow going to PeelMD
Nov 2017:	Technical Working Group endorses Swale design principles
Feb 2018:	Detailed design undertaken (by GHD) and RFQ sent out for weir and swales
March 2018:	Quotes for design of swales received and contract awarded May 2018, however: **no quotes received for design of weir**; GHD engaged to undertake more feasible design for this and then rework the design to fit budget
June 2018:	Swale and access track contracts commenced construction
August 2018:	Swale construction 80% complete when deemed too wet to continue
Nov 2018:	**Design contract for weir awarded to Jsteel**
	Design complete Feb 2019, however, **design not suitable to WCorp**
March 2019:	Construction of Swales and access complete incl security fencing
April 2019:	**Vonmac engaged to undertake weir design** (design received May 2019);
May 2019:	WCorp take on perpetual liability for weir structures;
	WCorp provided $26k for several rounds of their design changes to culverts
	GHD reviews previous designs including design of in/outlet culverts
June 2019:	WCorp having issues with Vonmac weir design
August 2019:	More changes to In/Outlet culverts submitted to WCorp
Sept 2019:	**WCorp deemed GHD culvert designs not suitable**
	Issues on **weir design between Vonmac and WCorp at impasse**
	WCorp agree to undertake design and construct of the weir and in/outlet culverts and have construction complete by end of FY19/20
Nov 2019:	David Wills & Assoc (DWA) engaged by WCorp to undertake weir/culvert design;
Jan/Mar 2020:	multiple discussions between DWA, WCorp and PHCC re design
31 Mar 2020:	DWA produces final weir/culvert design
April 2020:	Continued discussion between WCorp and DWA re design;
	as at 28 April, this is still unresolved

Current Infrastructure

As at 30 April 2020, the following have been constructed for the Project:

- a Headwater Pool, 135m long with a 5m wide base at an invert of 1.60m AHD,
- six swales, each of 225m long x 12.5m wide and sloping between 1.60m AHD upstream to 1.15m AHD downstream (~0.45m fall @ a slope of 1:500),
- swale inflow structures (6 box culverts: 1200Wx1200Hx2400mmL) feeding off the Pool, with each culvert at an invert of 1.55–1.60m AHD and culverts linked by a causeway at 2.8m AHD,
- a Tailwater Pool, 135m long by 5m wide at an invert of 1.15m AHD,
- major embankments were constructed in the swale area, with the outer embankment top at 3.4m AHD and minor embankments between swales with tops at 2.4m AHD,
- works also included constructing an all-weather access road (unsealed) of 950m between Karnup Road and the Swales site with a heavy gate and security fencing around the swales,
- The swales are located 2.0km upstream of the confluence between PeelMD and Serpentine Drain and 750m downstream of the current DWER Peel MD gauging station [614-121].
- Although no works have been undertaken on Peel MD itself yet, it lies immediately adjacent and to the east of the swales as a trapezoidal drain with an invert of approximately 0.5m AHD. The Drain also contains a 40m wide floodplain at 2.0m AHD and a Flood Levee between PeelMD and Serpentine Drain to the East with a top at about 4.8m,

While, the current works are extensive, there are still additional works required to allow the system to function and provide quantitative assessment of its operation. The current infrastructure needs:

- A connection to the PeelMD to provide and control inflow and outflow,
- A weir in PeelMD that will raise the water level so that water will flow into the swales,
- Infrastructure that will allow empirical assessment the effect of water depth and water velocity on phosphorous striping using the clays in the swales,
- Accurate flow and water quality measurement in PeelMD and individual swales.

Current Planning and Agreements

The 'Current Infrastructure' specified above was complete by April 2019, however, planning, engineering and negotiations have continued since then with the following key items undertaken:

- In a meeting between WCorp, PHCC and DWER on 26/09/2019, WCorp made an offer: "*To assist in delivery of the project, **Water Corporation are prepared to undertake design and construct scheduled for construction within the seasonal constraints of financial year 19/20** on behalf of and funded by the PHCC.*"
- To that end, WCorp contracted David Wills & Assoc (DWA) to undertake the detailed design of PeelMD weir and associated work on Swale inlet and outlet infrastructure,
- Between January and March, discussions were held between David Wills (DW) and Peter Muirden (PDM) about operation of various infrastructure options both in Peel MD and within the swales themselves and various conceptual designs assessed. Key stakeholders were included in these discussions including WCorp, DWER and members of the REI Steering Committee,
- Monitoring discussions were also held between DW, PDM & Andrew Weatherburn (DWER), to determine impacts on state monitoring programs and the synergies between projects.

Up front, it was determined that the proposed PMD weir could be used to significantly improve the accuracy of flow monitoring on PeelMD which has been poor since the monitoring of the Drain first began in 1994. **However, the feasibility of this proposal is being undermined by WCorp insistence on being able to discharge flow through the weir wall, even though the design of the swales already includes this functionality.**

In-principle support from DWER was also obtained to assist with monitoring flows through individual swales. Measurement of the flow through the swales is critical to assessment of the effectiveness of clay lining to strip phosphorous. It is proposed that DWER would monitor the WL in the swale Headwater Pool and that different level on stopboards would govern the flow down each swale and rating curves developed to determine flows.

- The DWA design for PeelMD weir was complete on 31/03/2020, however, it is understood that internal WCorp 'negotiations' have continued with ongoing modifications to the design.
- The earlier GHD weir design (March 2018) had potential for backwater effect from the weir to extend up to Folly Pool (6.5km upstream of swales). With the proposed design of the new DWA weir for PeelMD lowered to 1.75m AHD (from 2.2m), Peter Muirden (PHCC) remodelled (HECRAS) the upstream impact of the weir on water levels in Maramanup Pool (4.0km upstream of weir) and found that there was no impact at all. The modelling was documented and sent to Lyndon Mutter (DBCA) and a letter of consent received 31 March 2020.

  Maramanup Pool has extremely poor WQ and a site visit on 07 February 2020 by PDM had an extensive algae bloom. However, with the construction of the swales, there is potential to modify the hydrology of the Pool and use the swales to treat the water from the Pool at the tail-end of Spring.
- Finally, PDM documented the conceptual design for the swales that had been collaboratively developed over the early part of 2020 (to DRAFT 'A'). This included detailed drawings and works specifications to go to construction.

Proposed SoW

The following works are proposed to still be required for the project to proceed:

WCorp (Weir and In/Outlet culverts)

- Prefabricate and install weir structure (12.5m wide x 6.0m long x2.1m deep), incl energy dissipation and bank protection structures downstream,
- Headwater Pool inlet culvert (1 x 750mm diam x 18.0m long) incl headwalls and aprons,
- Penstock (AWMA) mounted on Headwater Pool headwall, incl operating platform.
- Tailwater Pool outlet culvert (3 x 600mm diam x 14.4m long) incl headwalls, aprons, and non-return flaps

PHCC (Swales and monitoring)

- **Headwater Pool**:
  - Lower the pool base by 0.3m to 1.30m AHD to allow full inflow rate of 500L/s from PMD.
  - add sump (4m W x 2m L) on eastern end 0.5m below existing invert

- **Swale inlet culverts**:
  - add sills on inlet of each culvert (6x1600Wx100x100) to mount stopboards (level tolerance 2mm)
  - on outlet, extent existing apron and fabricate fibreglass structure to provide a flow measurement function
- **Swales (#1–#5)**:

  Flatten existing swales so that the effect of depth of water over whole swale length can be quantified:
  - Flatten existing swale #1 to have base at 1.30m AHD; add low-flow pipe to allow PMD and Headwater Pool to be drained)
  - Flatten swales #2 to #5 to have base at 1.40m AHD.
  - Leave swale #6 as it is with a slope of 1:500 (1.55m to 1.20m AHD)
- **Swale outlet culverts (new)**:
  - Construct a levee at RL 1.80m across the end of swales #1 to #5, to control outflow from the swales.
  - Supply and install box culvert: 1200Wx375Hx1200L in the levee with different level stopboards to control depth of water in the swale
- **Tailwater Pool**:
  - Build a sedimentation sump on western end of tailwater pool to invert of 1.00m AHD
  - Lower base of Tailwater Pool to be 1.10m at West and 1.05m at East end (112m long)
  - add sump (4m W x 2m L) on eastern end at an invert 0.90m (0.25m below existing)
- **Miscellaneous Works**:
  - Supply and install floatwell (FW) and inlet pipes for gauging station on PeelMD upstream of Headwater Pool inlet culverts. Relocate monitoring equipment from existing GS. Embankment at FW is 3.2m AHD, so FW required to be 4.8m high,
  - Supply and install floatwell and inlet pipes for gauging station on eastern end of Headwater Pool. Embankment at this FW is 3.4m AHD, so FW required to be 3.8m high,
  - Make rough paths for winter access around swales (total 500mL x 1000Wx50D)

Costings

The following are estimated costings of the works specified above:

WCorp: PeelMD weir and inlet and outlet works (prelim)	$ 120,000
PHCC:	
• Headwater Pool	$ 5,000
• Swale inlet culvert mods	$ 25,000
• Swale flattening	$32,000
• Swale outlet culverts and levees	$ 30,000
• Tailwater Pool	$ 5,000
• Miscellaneous (FW + DM structures and paths)	$ 10,000
• Contingency (10%)	$11,000
TOTAL (PHCC)	$118,000

Timelines

The current Drawings from WCorp and PHCC are still in draft stage, so at best are unlikely to be complete for a few weeks yet. Much of the works programs are either in the PeelMD itself (which is already flowing) or on the Serpentine floodplain with its heavy clays. With the first winter front of the year crossing WA in the first week of May 2020, that precludes any construction works until PeelMD recedes to minor baseflow and the clays dry out: likely to be early 2021.

Fortunately, that allows time for some of the infrastructure to be prefabricated, so installation can proceed more smoothly.

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Peter Muirden
30 April 2020