Teys Australia Beenleigh Pty Ltd

Transitional Environmental Program

Stormwater Management

MILESTONE 3 REPORT

31 July 2015

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1. Introduction

As outlined in Milestone 3 of the approved Transitional Environmental Program (TEP MAN17840), Teys Australia committed to investigating and adopting the most feasible option(s) to separate 'clean' stormwater run-off from holding pens. Teys engaged the services of GHD to undertake an investigative preliminary design for managing a 1 in 20 year, 24 hour storm event, with the assistance of previous Milestone Reports.

This report details the investigation performed and outlines potential options identified by GHD. As outlined in the TEP, Teys will consider all options to achieve compliance which may include implementing a combination of options that are cost effective, low risk to the business and result in improved environmental outcomes, and deliver compliance to the conditions in the Environmental Authority.

Milestone 3 and accompanying deliverables from modified TEP MAN 17840 (page 7), as approved by the Department on 21 July 2015, following a request for amendment, are included below:

Phase 1
Milestone 3
Action
Based on the findings from milestone two and after internal discussions, the most feasible option(s) to separate any 'clean' stormwater run-off from cattle holding pens will be adopted by Teys.

Teys are currently investigating the following options for dealing with contaminated water from the holding pens (these options may form future actions under the TEP, subject to completion of the phase 1 investigative phase);

- *Contaminated water to be pumped from the stormwater catchment pond to the decommissioned storage ponds on site, at a rate that complies with the agreed design standard. Once the storm event has cleared, this water can be discharged to Logan City Council trade waste at a rate that poses no risk to any waste water infrastructure.*
- *Contaminated water to be pumped from the stormwater catchment pond to the upgraded waste water treatment system, at a rate that complies with the agreed design standard. This contaminated water will pass through an anaerobic pond and/or Biological Nutrient Removal system before discharging to Logan City Council trade waste.*
- *Contaminated water to be directed to a passive wetland treatment system that complies with DEHP regulations and requirements. In addition, Teys will explore possible applications of DEHP's Market Based Mechanism for managing nutrient inputs to the environment. This will be completed by Teys in reviewing site storm water management; it is not a milestone deliverable under this TEP.*

Options will satisfy and consider proposed amended EA conditions. Preliminary investigations do not indicate that the entire stormwater catchment currently reporting to the site storm water pond can be managed as a clean water catchment.

Deliverable
A report will be issued as outlined in the milestone 3, detailing the investigations performed and the decision making process that led to the adopted methods of separating stormwater run-off from the cattle holding pens. Teys will consider all options to achieve compliance. This includes implementing a combination of options that are cost effective, low risk to the business and result in

improved environmental outcomes (e.g. alternative wetland treatment technologies in combination with hard engineering solutions). The option/s selection report, for contaminated stormwater management, will be submitted to DEHP, by 31 July 2015.

This milestone report is intended to satisfy the deliverable for Milestone 3 of TEP MAN 17840, and builds upon the findings noted in Milestone 1 and Milestone 2 reports, submitted 28 February 2015 and 31 March 2015 respectively.

2. Methodology

The methodology followed by GHD to undertake the conceptual design options analysis process included the following steps:

- Baseline Assessment of the site;
  - Hydrological Assessment, and
  - Identification of pollutants;
- Identification of measures to formalise drainage across the site;
- Identification of any water quality guidelines that must be met;
- Design and size an upgrade of the current stormwater ponds to meet the required quality guidelines
  - Modelling using Model for Urban Stormwater Improvement Conceptualisation (MUSIC) Version 6.1 (*eWater*) software, and
  - Modelling using XPRAFTS software; and
- Detail possible solutions to stormwater management.

3. Options Summary

GHD have undertaken preliminary design work and proposed a number of potential solutions to achieve compliance under the TEP. A summary of GHD's options has been provided below:

- Option 1A – Capacity of holding ponds remain at 1000KL with potentially contaminated stormwater through GHD's Passive Water Treatment System, before release to overland flow.
- Option 1B – Capacity of holding ponds remain at 1000KL with potentially contaminated stormwater removed at a rate that will prevent an overflow up to a 1 in 20 year, 24 hour storm event.
- Option 2A – Increase capacity of holding ponds to 2000KL with potentially contaminated stormwater through GHD's Passive Water Treatment System, before release to overland flow.
- Option 2B – Increase capacity of holding ponds to 2000KL with potentially contaminated stormwater removed at a rate that will prevent an overflow up to a 1 in 20 year, 24 hour storm event.
- Option 3 – Increase the capacity of holding ponds for full containment of any storm event up to a 1 in 20 year, 24 hour storm event.

4. Catchment Areas

As noted in TEP Milestone 2 Report, Teys has defined stormwater management into two catchment areas, the Western Catchment and the Eastern Catchment. References throughout this report are as outlined in Figure 1.

Figure 1. Separation of Eastern Catchment Area and Western Catchment Area

5. Passive Storm water Treatment System

Options 1 and 2 include an option for the construction of an active barrier filter to remove targeted pollutants from the stormwater pond overflows prior to discharge to overland flow. The filter beds have been sized in a preliminary manner based on expected pollutants loads, as well as the design flow rates and mean annual run-off volumes.

The current concept for the filter beds involves layers of treatment media in a rectangular concrete basin, with baffles and flow cells designed to convey stormwater through the filter in a bottom to top fashion. The filter bed can be located at the outlet of each stormwater pond, although there is significant flexibility in terms of its final location and configuration (refer to Figure 2 for a conceptual design).

The two filter media types selected for the current application are clinoptilolite and granular ferric hydroxide (GFH). Each media works through an ion exchange process, with each targeted towards a certain class of expected pollutants. The media have been demonstrated to successfully remove pollutants from a variety of stormwater sources.

The specifications of the filter beds for both Option 1 and 2 are provided below in Table 1. The size of the filter beds are consistent between both options as the system is designed on loading and not concentrations. The filter will treat all storm events up to and including the 20 year, 24 hour storm event.

Table 1. Passive Treatment System Filter Bed Specification		
Parameter	**Western Pond**	**Eastern Pond**
Surface Area (m²)	40	20
Total Depth (m)	1.6	1.5
Clinoptilolite Layer (m)	0.8	0.8
GFH Layer (m)	0.6	0.5
Flow-Cell Layer (m)	0.2	0.2

GHD have successfully trailed and installed this treatment system at another DEHP licenced facility in Queensland, targeting zinc removal from contaminated stormwater. A pilot study was undertaken over three years which resulted in significant load reductions and a compliant system with DEHP approval for discharge. A research paper on the pilot was published by the Australian Water Association.

The passive treatment system has a number of advantages and disadvantages associated with it:

- Passive Treatment allows treated stormwater to discharge via overland flow instead of being integrated into the existing wastewater treatment system. Integration to the existing wastewater treatment system can potentially impact on the treatment performance by negatively impacting on the biology of the wastewater treatment system.
- Passive treatment allows Teys to treat and discharge stormwater on-site without increasing trade waste costs to the business and increasing the volumetric burden on Logan City Council trade waste infrastructure.
- Potentially high CAPEX and OPEX costs may make the technology infeasible.
- If Teys' decides that a passive treatment system is a preferred final option, a full consultation/approval process with DEHP will occur.

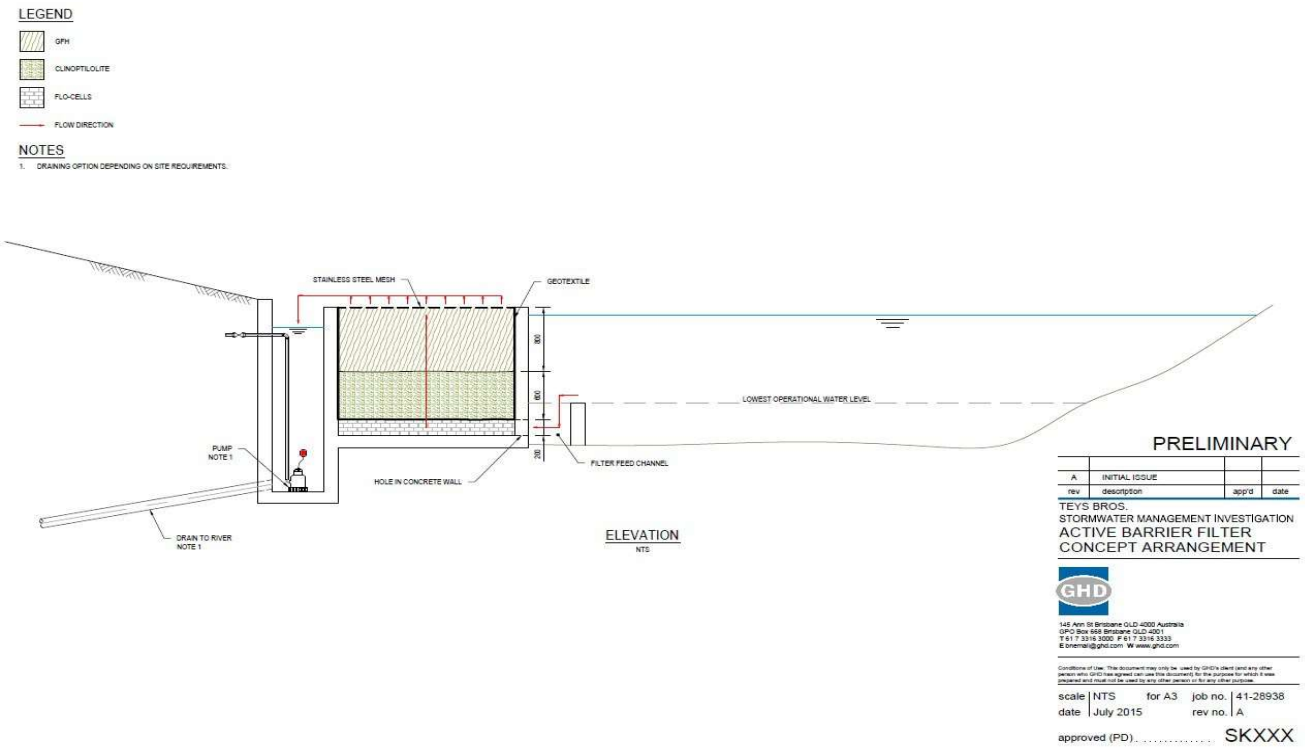

Figure 2. GHD Conceptual Design of Passive Treatment System

6. Stormwater Management: Option 1

The first option proposed by GHD details the following preliminary design and can be seen in Figure 3.

- The rehabilitation of existing stormwater catchment ponds in both catchments
- The installation of a 500KL sedimentation pond to prevent solids from entering the main 1000KL ponds.
- Construction/rehabilitation of upstream grassed swales with sediment trap weirs.
- Construction of diversion drains where necessary, to prevent potential for contamination of 'clean' stormwater.
- Construction of overflow weirs/spillways, for inlet and outlet of the pond.
- Option 1A - To direct potentially contaminated stormwater through GHD's Passive Water Treatment System, before release to overland flow.
- Option 1B - To remove stormwater from the pond at a rate that will prevent an overflow up to a 1 in 20 year, 24 hour storm event.

Included in the preliminary design is the installation of two diversion drains on the southern side of the feedlot pens, to divert 'clean' stormwater around the holding pens and prevent potential contamination. A swale drain on the northern side of the yards has also also been proposed to capture and direct all potentially contaminated stormwater to sedimentation basin and subsequent catchment pond. It should be noted that the scope of final solution may exclude certain aspect of the preliminary design proposal.

As the fall is significantly less on the eastern holding pens compared with the western feedlot pens, no diversion drains are required. The design proposal included a swale drain to direct potentially contaminated stormwater to a preliminary sedimentation basin before discharging to the existing stormwater pond.

GHD have performed conservative preliminary designs on the installation of the Passive Water Treatment System based on water quality data obtained from respective holding ponds. As stated previously, a passive treatment process allows the site to managed potentially contaminated stormwater separately to process wastewater, which the upgraded wastewater treatment system is designed for.

The option of removing stormwater from the ponds at a rate that will prevent an overflow up to a 1 in 20 year, 24 hour storm event, provides a number of significant challenges to the site. With the estimated run-off volume, the estimated removal rate is significant and may if integrated into the wastewater treatment system upgrade, may pose significant risks to the treatment performance of the wastewater treatment system.

The proposal to pump stormwater from the feedlot pond to the wastewater upgrade at a significantly high flow rate provides a significant risk to the biology and treatment performance of the system. The cool stormwater temperatures combined with minimal contaminant loadings, is not the designed feed source of the wastewater treatment system and may inhibit treatment performance if large volumes enters the system in a short timeframe. The introduction of potentially contaminated stormwater into the wastewater treatment system also means Teys will inherit a significant additional cost to discharge to trade waste.

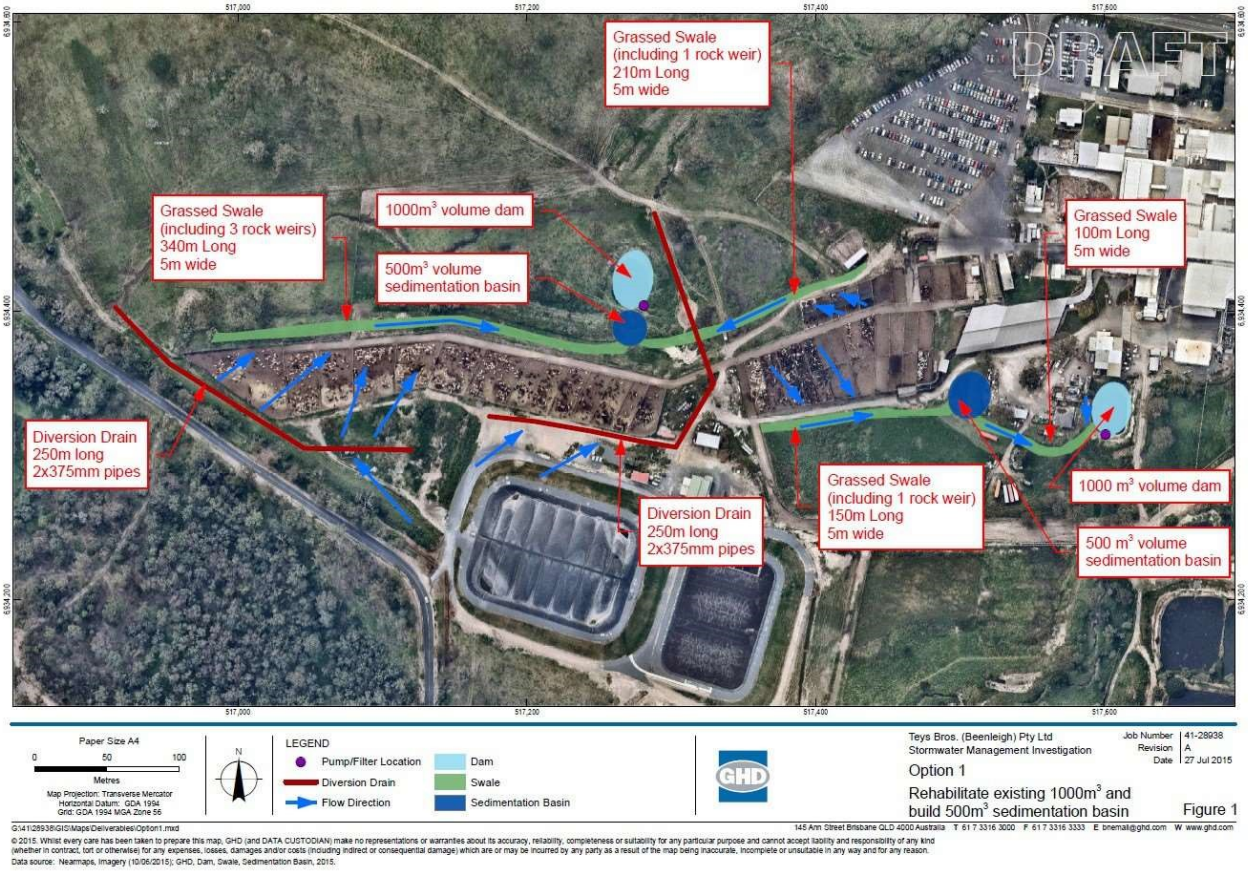

Figure 3. GHD Proposed Option 1

7. Stormwater Management: Option 2

The second option proposed by GHD details the following preliminary design and can be seen in Figure 4.

- Construction of a 2000KL storage pond for the Western Catchment
- Construction of an additional 1000KL pond for the Eastern Catchment, upstream of the existing 1000KL installation.
- Construction/rehabilitation of upstream grassed swales with sediment trap weirs.
- Construction of diversion drains where necessary to prevent potential for contamination of 'clean' stormwater.
- Construction of overflow weirs/spillways for inlet and outlet of the pond.
- Option 2A - To direct potentially contaminated stormwater through GHD's Passive Water Treatment System before release to overland flow.
- Option 2B - To remove stormwater from the pond at a rate that will prevent an overflow up to a 1 in 20 year, 24 hour storm event.

The increase volume of 2000KL reduces the pumping rate required to prevent an overflow however is not capable of full containment of a 1 in 20 year, 24 hour storm event. This option may be appropriate for the the eastern catchment, if a high flow rate pump is capable of pumping to decommissioned lagoons for storage and eventual discharge. The concept is less feasible for the western catchment with potential integration into the wastewater system risking negative impacts on

the wastewater treatment system performance (same risk as Option 1). If this options is further explored, advice from wastewater experts will be sought with regards to a low risk integration rate.

By increasing the pond size in each catchment, the rate of stormwater removal by pump is significantly reduced therefore reducing potential CAPEX cost for pumping infrastructure. This option still requires a significant amount of hydraulic volume to be removed, at a high flow rate, to prevent an overflow of the ponds.

GHD have again included the proposed passive treatment for Option 2A, with the increased storage to potentially reduce the flow rate through the system and increase beneficial contact time. Although the increase is pond storage volumes reduced the peak flow rates through a potential passive treatment system, the filter system is limited by annual pollutant loads and therefore sizing of the passive filter will not vary considerably.

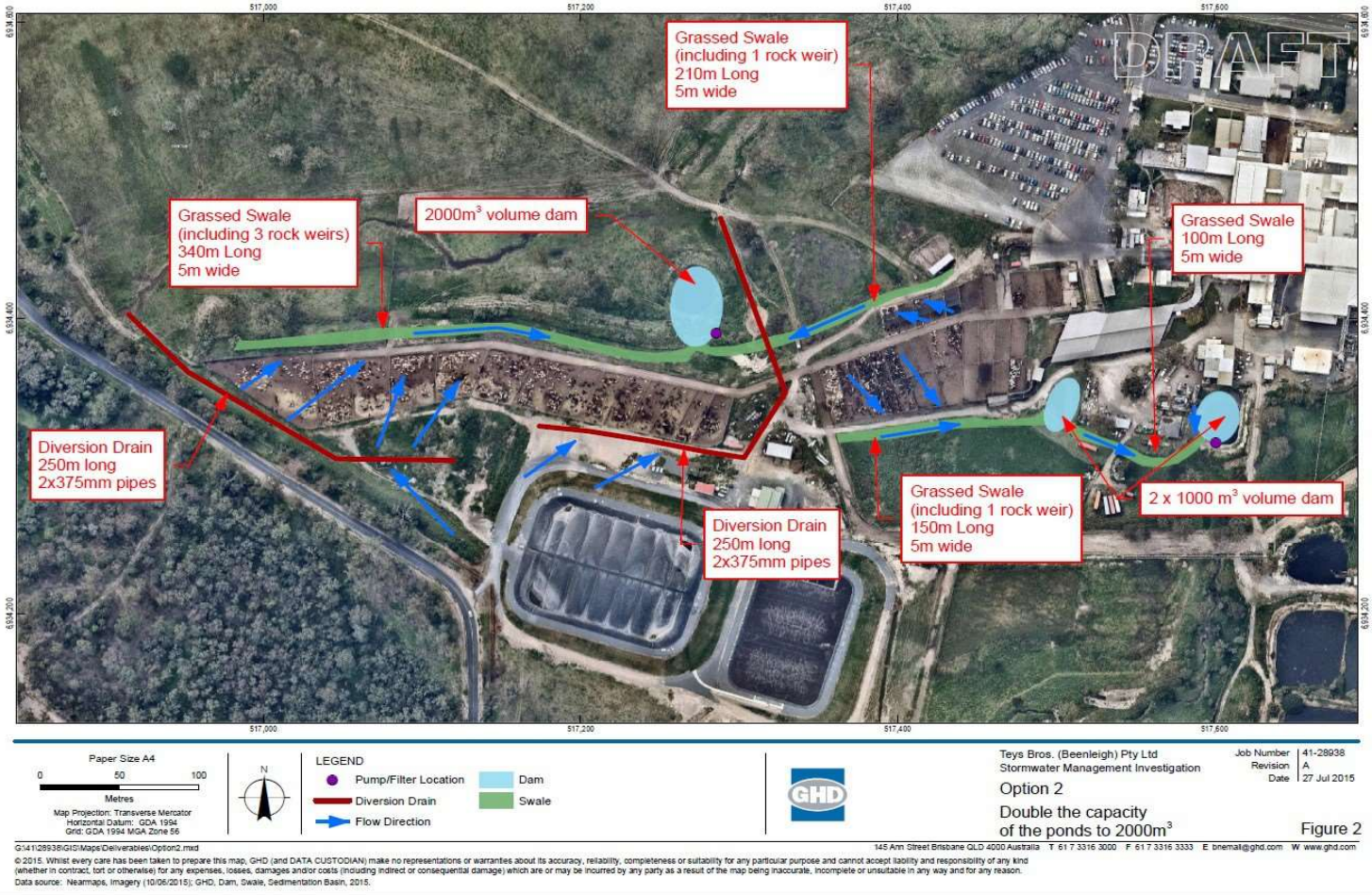

Figure 4. GHD Proposed Option 2

8. Stormwater Management: Option 3

The third option proposed by GHD details the following preliminary design and can be seen in Figure 5.

- Construction of a 5075KL storage pond for the Western Catchment
- Construction of an additional 2402KL pond for the Eastern Catchment, upstream of the existing 1000KL installation.

- Construction/rehabilitation of upstream grassed swales with sediment trap weirs.
- Construction of diversion drains where necessary to prevent potential for contamination of 'clean' stormwater.
- Construction of overflow weirs/spillways for inlet and outlet of the pond.
- System is design for full containment of up to a 1 in 20 year, 24 hour storm event.

The third option proposed by GHD, is to increase the size of the storage ponds to 5075KL in the Western Catchment and 3402KL in the Eastern Catchment to fully contain up to a 1 in 20 year 24 hour storm event.

A full containment system would remove the requirement for rapid extraction from the stormwater ponds to prevent an overflow. Any proposed integration of potentially contaminated stormwater into the wastewater treatment system would need to occur at a rate proved to be very low risk to the wastewater treatment system biology and be practicable for site operations. The current wastewater treatment system is designed for an average of 3.5ML of flow per day and with the generation of 8.5ML of potentially contaminated stormwater during at 24 hour period, any proposed integration would need to occur over an extended period of time, to mitigate risk of a wastewater treatment system failure.

Whilst GHD have not proposed a passive treatment system in option 3, Teys may consider it as part of a final option after further discussions with GHD.

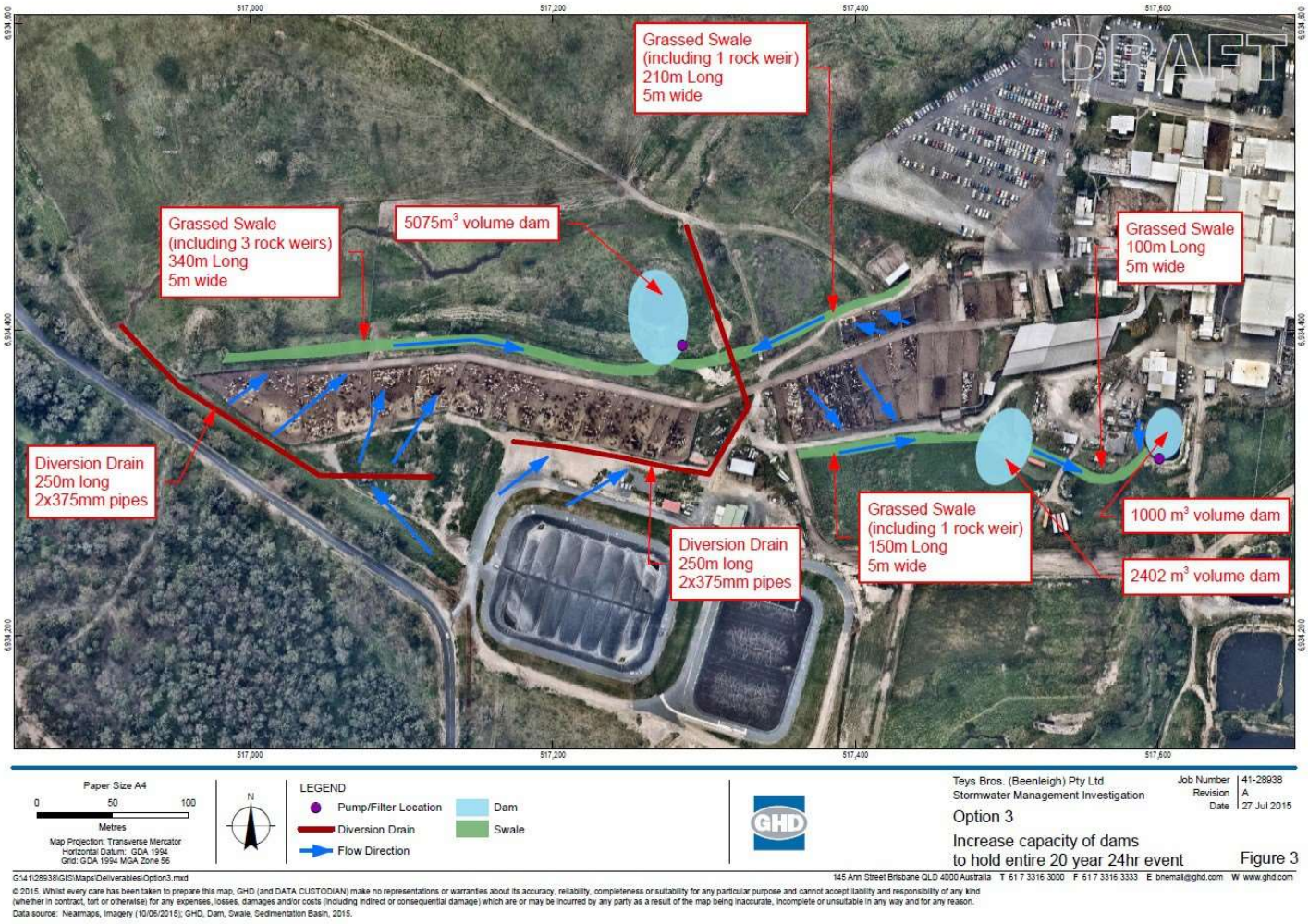

Figure 5. GHD Proposed Option 3

9. Milestone 3 Report Summary

As DEHP are aware, Teys are exploring all possible options to address compliance under the TEP process, including alternative passive treatment technologies. Throughout the duration of the TEP, and in addition to the prescribed milestone activities, we are continuing to investigate further solutions or variations which could potentially be combined with options outlined in this milestone report. Any relevant updates on these investigations will be provided to DEHP in future milestone reports on an ongoing basis throughout the duration of the TEP.

GHD have advised that passive treatment systems have been successfully implemented at other DEHP licenced facilities in Queensland and this system has the capability to meet DEHP requirements. Teys will review the Capital expenditure and Operational expenditure for the passive treatment system to determine whether an the installation is a feasible option for further consideration. If a passive treatment system, in any combination with additional solutions, proves to be the most feasible solution to stormwater management, Teys will engage DEHP to commence the pre-lodgement process for a future EA amendment.

Of the options proposed by GHD, Teys is evaluating all relevant considerations to ensure a robust final solution can be implemented. Further discussions with GHD and internal stakeholders are to be undertaken before the ultimate solution is determined.

Whilst Teys is yet to fully adopt the ultimate combination, we note that Option 3 removes the requirement for a high flow rate de-watering pump to prevent an overflow of the stormwater ponds. The potential for integration into the wastewater treatment system will be determined by wastewater experts in combination with a responsible and practicable flow rate. A combination of ideas from GHD's proposals may make up part of the final solution to managing stormwater. After further internal discussions regarding proposed options, Teys will engage DEHP to discuss the conceptual stormwater management plan.

10. TEP Progress Update

Teys are progressing with plans to divert 'clean' stormwater away from potential contamination sources to better stormwater under the hierarchy of stormwater management.

- One potentially contaminated stream has already been diverted to the wastewater treatment system.
- A new $9000 heavy duty diesel pump was purchased for the site to assist in de-watering of the existing stormwater ponds.
- Stormwater infrastructure relating to the plate freezer upgrade will initiate the sites diversion of 'clean' roof water away from the stormwater pond. This will significantly reduce the volumetric load reporting to the stormwater pond under current conditions.

As mentioned in TEP Milestone 2 Report, Teys invited members from Industry and DEHP to attend the 'Grand Opening' of the Beenleigh Wastewater Treatment System Upgrade held Tuesday the 25 June 2015. Teys are very appreciative of the attendance of both William Inonda and Chris Mooney from DEHP's Brisbane Office in attending the tour on DEHP's behalf. Additional guests included; Hon Shannon Fentiman MP, Logan City Council, Inghams, Ecobiz, Meat and Livestock Australia, Australia Meat Processing Corporation, AusIndustry, National Australia Bank and Dr Mike Johns

from *Johns Environmental*. The guests had a chance to have a look at the facility and ask questions prior to the barbecue.

Overall, the TEP is tracking to schedule and, at this stage, there are no expected delays for the delivery of future milestones and overall completion. Teys will keep DEHP updated on progress and remain transparent with regards to any potential milestone completion constraints, if they arise.

Figure 6. Grand Opening of Teys Australia Beenleigh Wastewater Treatment System Upgrade