Abstract: **Lessons Learned from a Pittwater Council GPT Audit**

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In early 2011, Pittwater Council in Sydney's north engaged a consultant to carry out an audit on the status of all Gross Pollutant Traps (GPTs) in the LGA (excluding those on community titles), with a view to optimising their cleaning regime, and identify efficiencies in the overall cleaning and maintenance costs.

Council engaged an experienced consultant, Murray Powell (from Optimal Stormwater) to:

1. assist in validating the size, type, storage capacity, and expected cleaning frequency for each device;
2. to confirm the operational status of each device in regards to current cleaning procedures;
3. identify any rectification works required;
4. identify any other issues to ensure optimum environmental outcomes from these stormwater treatment assets maintained and operated by Council.

The audit turned up some interesting results, that will allow Pittwater and other Councils to improve the management and design of GPTs. These included issues relating to: blocked inlets; holes in GPTs; bad hydraulics; poor installation; broken lids; previously unidentified backwater issues; lack of access; buried devices; lack of developer maintenance; sediment behind screens; devices that could not be monitored; and some poorly designed privately certified stormwater solutions.

The first step in optimising the cleaning regime was to re-confirm and validate that all records were correct, and confirm GPT catchment areas. Based on the type of device, its storage volume and expected loads, an inspection schedule and cleaning frequency could be determined. Finally, knowing the approximate cleaning costs, an annual budget could be determined for the correct cleaning of all devices. It was also valuable to get a list of rectification works and recommendations to develop a programme to improve the performance and operation of existing devices. The audit also includes devices not yet handed over by developers.

Council is now able to inspect the devices, assess their performance, and monitor the performance of the cleaning contractor as a result of the audit.

This paper details the experiences of the auditor and Council during this interesting and valuable process, and shares the lessons learned for other Councils to consider.

1 Background

Most Councils across Australia, especially in our major cities, have substantial funds invested in gross pollutant traps (GPTs) protecting the environment. General comments, typical for most Councils from many cleaning contractors mention holes in screens, blockages, poor access, and the need for more efficient, inspection based cleaning schedules.

Pittwater Council, like many other Councils, has seen several changes in staff since they first started installing GPTs in the 1990s. As the knowledge tends to move on when these staff leave/retire, it was essential Council create a permanent and accessible register/database of all their stormwater treatment assets.

Some stormwater GPTs were installed by Pittwater Council, and these tended to be carefully designed, larger devices located strategically, and usually funded by a grant or levy. Additional to these were devices installed as part of the conditions for new subdivisions or developments designed and installed by developers they are generally smaller and less

strategic – located only in the sub development. Some of these GPTs end up in Council ownership, and some still remain in private hands.

With a limited maintenance budget, like every other Council, Pittwater Council decided to audit all their existing devices, to make sure the money spent on cleaning was appropriate, and that all their devices were working to their full potential, as well as assessing if anything more can be done to further improve the water quality of the stormwater within the Pittwater LGA.

2 Step 1: Getting Started

Pittwater Council gathered all the information they could find on their devices, and entered into a spreadsheet. Pittwater already had a list of GPTs for cleaning, and these were cleaned by a reputable GPT cleaning company. They marked each GPT location on a series of maps (Figure 1), and then conducted a site visit where a photograph of the lid was taken (Figure 2 and 3), to assist the auditor to find each device.

Figure 1: An aerial Map with marked location of Councils GPTs

Figure 2 & 3: Two examples of the type of GPT lids identified in Pittwater

This process highlighted straight away that there are issues, several relating to lids on the ground that may or may not have been for the GPTs on the records. This problem was noted by the auditor and cleaning contractors to be quite common, where generic gatic lids are used for many purposes. This creates confusion and leads to Units being missed.

3 The Audit Process

The auditor met with Council on numerous occasions during the audit to investigate things together or to allow the auditor to show Council important issues and examples discovered during the course of the audit. This interaction helped to build knowledge within Council by demonstrating to Council staff how to access and monitor the different GPTs and what to look out for.

This paper does not go into detail about the GPTs audit process, but focuses on the important outcomes and potential for efficiencies. Whilst it was anticipated that about 8 GPTs per day would be audited, the reality was closer to 4 or 5 as the problems were identified and improved access coordinated with Council staff.

4 Issues Raised

Through Pittwater Council's own experiences with maintaining its GPTs and the lessons learnt from the GPT audit, a number of key issues were discovered that could have the potential to influence the effectiveness of GPTs. These issues have been listed, as well as what Council currently does to rectify these issues and key messages for other Councils to note and ensure that these issues do not effect the performance and maintenance of their GPTs.

4.1 Blocked inlets

The majority of Pittwater Council GPTs are underground, with diversion chambers that needed to be inspected during the audit to confirm they were clear and working as desired. One particular CDS unit inspected during the audit, was found to have its diversion chamber completely blocked with an unidentifiable obstruction (Figure 4) (the audit took place in-between the regularly scheduled inspections by the stormwater cleaning company).

Figure 4: The 'unidentified obstruction' (newspaper bundle) located in one of the GPTs

The obstruction was removed and found to be a large stack of newspapers, still held together with plastic tape. Whilst the system upstream is fully closed, it does not mean that someone can not open a grate and dump something in it. This indicates that regular monitoring is essential for efficient operation.

Key Message: Always insure that there is an inspection of the diversion chambers. Also inspect, if time permits, on a regular clean, and ensure to enter and inspect diversion chambers as part of each GPTs "Annual Cleaning".

Key Message: Recording pollution removal rates sequentially into a database or spreadsheet will generally show up anomalies such as blocked inlets, hence, the cleaning company information is put it into a useable spreadsheet for exposing trends and anomalies.

4.2 Holes in Screens

Underground GPT have many advantages; however one disadvantage they can have is that the screens are always submerged so you can not see them.

Holes are possible, when:

- heavy impact has occurred during the developer installation (and the contractor has installed it anyway). (out of Council control until developer handover of the device),
- during its operation (large timber with nails in it is great for damaging screens),
- corrosion or structural failure has occurred, and/or
- the screen has been impacted by a grab during cleaning operations (and not been reported or fixed)

The inspection for holes can be carried out by the cleaning contractor, during the "Annual Cleaning via suction". Figure 5 was not from Pittwater Council devices, but provides an example of what can be found when the screens are cleaned and exposed.

Screen impact damage will obviously affect the GPTs functionality and its performance. This is however easy to see and address when the devices are pumped down.

Key Message: At least once per year, during the "annual cleaning", contracts for all GPTs will include the requirement to be pumped down to inspect the state of the screens, for holes, corrosion, structural failures, etc.

Figure 5: Illustrating the type of holes that may be found in GPT screens once cleaned

4.3 Bad Hydraulics

There are small GPTs located on the end of very long, very steep pipes. The high velocity flow that resulted was not conducive to the type of GPT the developer installed. Devices using direct filtration, that store pollution in the screening area, are not suited to high velocity sites that just resuspend their existing pollutants and make them block up and bypass.

One GPT was noted to have a backwater from Narrabeen Lakes whenever the tide was up or the lake levels were high (Figure 6). Since the only cleaning method is suction cleaning, the timing needs to coincide with low tides and low lake levels. This valuable information is noted on the Data Sheet, and included in cleaning contractors scheduling.

Figure 6: The outlet pipe from the GPT which is heavily influenced by tidal movement

Key Message: Councils need to review all GPTs hydraulically before they are installed, so any issues are known up front, and designs can be done to minimise the hydraulic impacts. If Councils do not have an “expert” on staff, they might consider hiring external expertise.

4.4 Poor Installation

It is primarily up to the installation contractor to get it right when installing GPTs. However this does not always happen in practice (Figure 7) and Councils need to be vigilant in ensuring that the installation is correct before hand over of the device.

Figure 7: Example of poorly installed GPT

Key Message: Council staff need to inspect the installations during all stages. Developers should be required to provide Certification from suitably qualified Stormwater expert.

4.6 Missing GPTs

A couple of the GPTs had very complicated access routes (Figure 8), not really designed for a maintenance vehicle, and without any landmark or street numbers to go by. This can lead to devices being missed or lost.

Key Message: Ensure Council get Works-As-Executed drawings for the stormwater system, and the stormwater quality improvement devices they contain, especially from developers. Also ensure that the GPTs are added to Councils existing list and the location of the GPT is mapped.

Figure 8: Complicated access route to a GPTs can lead to some going missing over time

4.5 Broken Lids

Several different types of lids were noted on the GPTs. However one type of lid required a unique tool to open it. Since most cleaning contractors do not have that tool, the locking mechanisms had been bent or broken off (Figure 9). This becomes an issue because access to the GPT is then possible for almost anyone.

Key Message: Where possible use standard lids that do not require special openers or special keys. It is also good to have the name of the GPT on the lid, so everyone knows what it is. Commence a program of lid replacement with standard type lids where possible.

Figure 9: Broken locking mechanism on one particular type of GPT lid.

4.6 Previously unidentified backwater issues

Having one of the largest waterway foreshore areas of any Council in Sydney, it is not surprising that several GPTs have tidal or backwater issues (Figure 10). These include GPT weirs underwater, oyster build up, massive corrosion, etc, which are all signs of backwater, from elevated creeks, tidal impacts or downstream detention facilities.

Some were already known and easily identified, and some now have backwater issues that did not exist when the device was installed.

Figure 10: Backwater from an elevated creek downstream impacts one of the GPTs

Key Message: Devices identified to have permanent backwater issues need to be addressed. Those that have tidal backwater generally have lower effectiveness at high tide. So if at all possible, GPTs should be designed free of backwater (both permanent and periodical). If they have to have backwater, design for it. If it is saltwater, ensure the design addresses the higher potential for corrosion and things like oyster build up.

4.7 Lack of Access

One particular GPT was unfortunately located under a low hanging tree and cubby house, within a resident's backyard, within a security estate, that had an access that could not handle the weight of the maintenance vehicle (Figure 11).

Figure 11: GPT with poor access for maintenance

Council was well aware of the device and its access problems, but as part of the audit, all the options to address it were discussed. Whilst a final outcome needs to be further investigated financially, and discussed with residents the audit was an opportunity to take a fresh and independent look at the problem.

Some GPTs had overgrown access routes, and others had lids buried (Figure 12).

Figure 12: Buried GPT lid under mulch/new plantings

Key Message: Ease of access is critical for the long term cost effective maintenance of any and every GPT and must be considered during the design stage.

4.8 Buried Devices

Two specific examples were noted (both were still under developer control). In one example, the access to the diversion chamber was completely covered with earth, had creepers growing all over it, and it needed to be uncovered (Figure 13).

One other GPT still under developer ownership, had to be dug up. There was a small piece of lid showing underneath the landscaping which had been done too high and right to the edge of the device (Figure 14). This questions the amount and frequency of maintenance cleaning by developers and the need for them to provide data to Council on GPT performance.

Figure 13: Example One of a buried GPT

Figure 14: Example Two of another buried GPT

Key Message: Whilst it is a good idea to "screen" ugly GPTs from the public, they also need to be able to be found and accessible for monitoring and cleaning. Better planning should make finding them and accessing them both easy and practical.

4.9 Lack of developer maintenance

The auditor inspected 14 GPTs that were still under developer control, and NOT ONE was operational. Figures 15 to 20 illustrate some of the issues discovered whilst inspecting the GPTs still under developers' control

Key Message: Assume developers are not cleaning their devices (since historically that is the case), put a system in place to check on them, and put in a system to ensure the devices

are cleaned on a regular base. Conditions must be included in all future developments requiring GPTs that developers provide:

- Work as executed for installation
- Details of cleaning schedules and inspections that allow for adequate maintenance, and
- Detailed information (data sheets) on all cleaning and maintenance prior to handover from developer to council.

Figures 15 and 16: high sediment build up due to lack of appropriate maintenance

Figures 17 and 18: High sediment build up due to lack of appropriate maintenance

Figures 19 and 20: High sediment build up due to lack of appropriate maintenance

4.10 Sediment behind screens

Most devices have some form of screen or barrier to prevent pollution going through it. However, this also commonly provides an area of lower velocity flows, which can encourage the deposition of sands and silts that have passed the screen. This sediment then builds up behind the screen, decreasing the treatable flowrate, and decreasing the device's pollution removal ability.

In this developer maintained GPT (Figure 21), the sediment sump collection area, underneath the baskets, is almost full to invert level.

Key Message: Some devices are easy to access behind the screens, others are not. It is a requirement of the "Annual Clean" that once a year, every device should be pumped down, and the area behind the screens inspected and cleaned if required.

Figure 21: Poorly maintained developer controlled GPT

4.11 Devices that could not be monitored

There is a design problem with one specific device type and size (Figure 22).

Until this audit was started, this type of GPT that Council operated, plus the ones in developer control, were unable to be monitored by normal means. The lid was not able to be accessed or removed without a specialised machine.

The cost to get a hiab or small crane, just to lift the lid and inspect inside were excessive. Devices must be able to be monitored by a single person, using hand tools only.

All other types of this GPT have a removable manhole access, but this type did not.

Pittwater Council and Optimal Stormwater approached the manufacturer about making a new lid for this product, with a view to changing the 900mm diameter solid concrete lid, with one that had a manhole in it like the others.

To their credit, the manufacturer took this feedback on board, and now have available replacement lids – that CAN be monitored.

Key Message: Don't accept or approve devices with difficult access to the site, or heavy lids that need a machine to open them. If you do inherit them, you can always discuss options with the device manufacturer, and they just might surprise you.

Figure 22: GPT with difficult access due to the weight of the lid

4.12 Tidal GPTs

GPTs can be located in tidal locations, but the use of galvanized steel in these applications is not ideal. The aggressive and corrosive potential in these locations that get blasted with sand and salt, can dramatically reduce the life of galvanized steel.

In saltwater locations, the steel should all be 316 stainless steel.

In some locations, such as this trashrack (Figure 23), oyster spawn from the downstream system have come upstream on a rising tide, and the oysters have fastened themselves to every surface they can find and are affecting the operation of the trashrack.

Figure 23: Oyster build up on one of the trashracks heavily influenced by tidal movement

Key Message: In tidal locations with oysters, an anti-fouling paint should be part of the annual cleaning process, use 316 Stainless Steel, and if at all possible, relocated upstream to a non-tidal or less tidal location.

5 Conclusion:

Pittwater Council engaged Optimal Stormwater to do an audit of all their GPTs, to ensure they were operating as effectively as possible.

The audit process raised several other important matters to consider. It identified issues that Council can now address (especially regarding developer controlled devices). Some of these were in the design and the ability to monitor and clean, and some in the cleaning itself.

As a side benefit, the individuals at Council involved in the audit, were able to get a greater insight and knowledge of the problems of each type of GPT within the LGA, and the capacity to operate and manage Council's GPTs has greatly improved.

Pittwater Council will now be able to review the current cleaning regime, and make appropriate adjustments, to ensure a continued optimal environmental outcome for their expenditure, as well as assessing if anything more can be done to further improve the water quality of the stormwater within Pittwater LGA utilising Councils current resources. A maintenance program has also been developed to improve the inefficiencies in devices, replace inadequate devices and schedule works.

Through the key messages in this paper it is anticipated that other Councils can use the knowledge gained by Pittwater Council on the key issues affecting their GPTs. It is expected that through these key messages and recommendations from the Audit, that other Councils can make sure that their GPTs are working at optimal performance, as well as ensuring that Councils are making the most out of the limited funding resources to maintain their Gross Pollutant Traps in order to ensure the GPTs units are still operational and are meeting the water quality objectives of the creeks/stormwater which they are installed on.

Bibliography:

"Pittwater Council SQID Audit Report 2011" by Optimal Stormwater, June 2011.