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ENVIROPOD

Enviropod LittaTraps

E.T.S.
Management Plan

Brisbane City Council
Enviropod Trial

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Issue C

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INTRODUCTION

The Enviropod™ Total Solution (E.T.S) is a managed approach to implementation and management of stormwater pollution source control. It delivers a package of "Best Management Practices" (BMP's), supplying a treatment device and maintenance system, establishing a framework for site assessments, inspections, record keeping, preventive maintenance, external and internal reporting. It is a unique stormwater treatment approach, in that it supplies more than a stand-alone product or design but rather an on-going system for managing contaminants in stormwater.

The following report details the results of approximately 6 months monitoring of 155 Enviropod LittaTraps™ (LittaTraps) installed in selected gullypits within the Brisbane CBD (see Fig 1 Location Plan). The Enviropod LittaTrap is a gullypit insert, which comprises a supporting framework, overflow system and a replaceable mesh basket, which is routinely serviced.

The Management Plan is an integral component of the E.T.S system. The plan outlines operation of the system, installation / removal of LittaTraps, maintenance requirements and the frequency of maintenance and inspections required. It ensures that the system continues to perform at its optimal performance and allows remote assessment of the LittaTraps performance for the owner and regulatory authority. This is done by way of service receipts (see example included) which lists cleaning procedures and records site-specific data and must be completed by the contractor during each service and then sent to the client. When an E.T.S. has been applied to a catchment as a requirement of a regulatory body, the service receipts can be collated and transferred to them annually, or as required.

There is more to managing a stormwater asset than removal and disposal of the contaminants

Maintenance is an essential component of stormwater management. Surveys in the state of Maryland, USA Showed that 75.2% of existing dry ponds, 24.4% of wet ponds and 33% of infiltration practices were not functioning as designed because of mismanagement[1]. Maintenance will prevent failures such as structural failure (e.g. prevents blocked outlets) or aesthetic failure (e.g. debris accumulation)[2].

Each stormwater treatment device must be inspected and maintained regularly to ensure it is working properly throughout the estimated design life. Unlike traditional treatment devices that require contaminant removal and disposal every few years, the Enviropod LittaTraps™ require servicing every 3 - 6 months depending on site characteristics. Inspections are carried out, recording and reporting removal information every time the LittaTraps™ are serviced. Enviropods' computer tracking system and maintenance procedures ensure inspections and maintenance are performed, eliminating the need for additional inspections.

An essential component of maintaining and inspecting a stormwater treatment device is reporting and record keeping. It is essential that failures are reported to the owner of the treatment device and remedial measures organised and put in place as soon as possible. All maintenance and inspection activities must be recorded and reported back to the owner of the treatment device to ensure they are being undertaken. Reporting and record keeping also allows for easy compliance auditing i.e. desktop auditing as opposed to on site investigations.

The science of stormwater is not fully understood. Many factors of land use effect contaminant loadings in stormwater. By accurate reporting and recording of these factors, maintenance activities and inspections lead to a greater knowledge

[1] J. Kamer, *Urban Stormwater Quality Control,* Project for Masters of Engineering, University of Auckland,1989
[2] J. Kamer, *Urban Stormwater Quality Control,* Project for Masters of Engineering, University of Auckland,1989

of localised stormwater issues and in turn greater efficiency in combating their effects and planning for the future.

Targeting of education to polluters is greatly improved through accurate reporting and record keeping e.g. Illicit discharge of contaminants into the stormwater treatment device can be noted and tracked to the polluter. The polluter can then be educated about their effect on stormwater quality and the consequences, both environmental and financial, that it may have.

It is essential that maintenance (including inspections, recording and reporting) be carried out in a systematic manner and is carried out by qualified and experienced personnel. It is also advisable that the treatment device owner has a nominated person responsible for overseeing the management process.

Enviropod is a specialised stormwater company with trained and experienced staff. The company has a comprehensive database with detailed information on every Enviropod product sold and serviced by Enviropod, collecting site specific data that can be easily accessed and analysed as required.

MONITORING METHODOLOGY

An initial site inspection was carried out prior to the installation of the Enviropod LittaTraps in the Brisbane CBD. This identified the following:

- Pit dimensions.
- Catchment areas.
- Organic loadings.
- Traffic / Pedestrian loadings.
- Potential pollutant generating activities.
- Surrounding land use.
- Specific design requirements.

Following installation of the Enviropod LittaTrap™, monthly inspections were carried out on all 155 LittaTraps™, observing the following:

- Remaining storage capacity for captured material.
- Degree of clogging of the filter media.
- Presence of illicit discharge and polluter if identifiable.
- Evidence of overflow.
- General structural performance.
- General hydraulic performance.

SITE CHARACTERISTICS

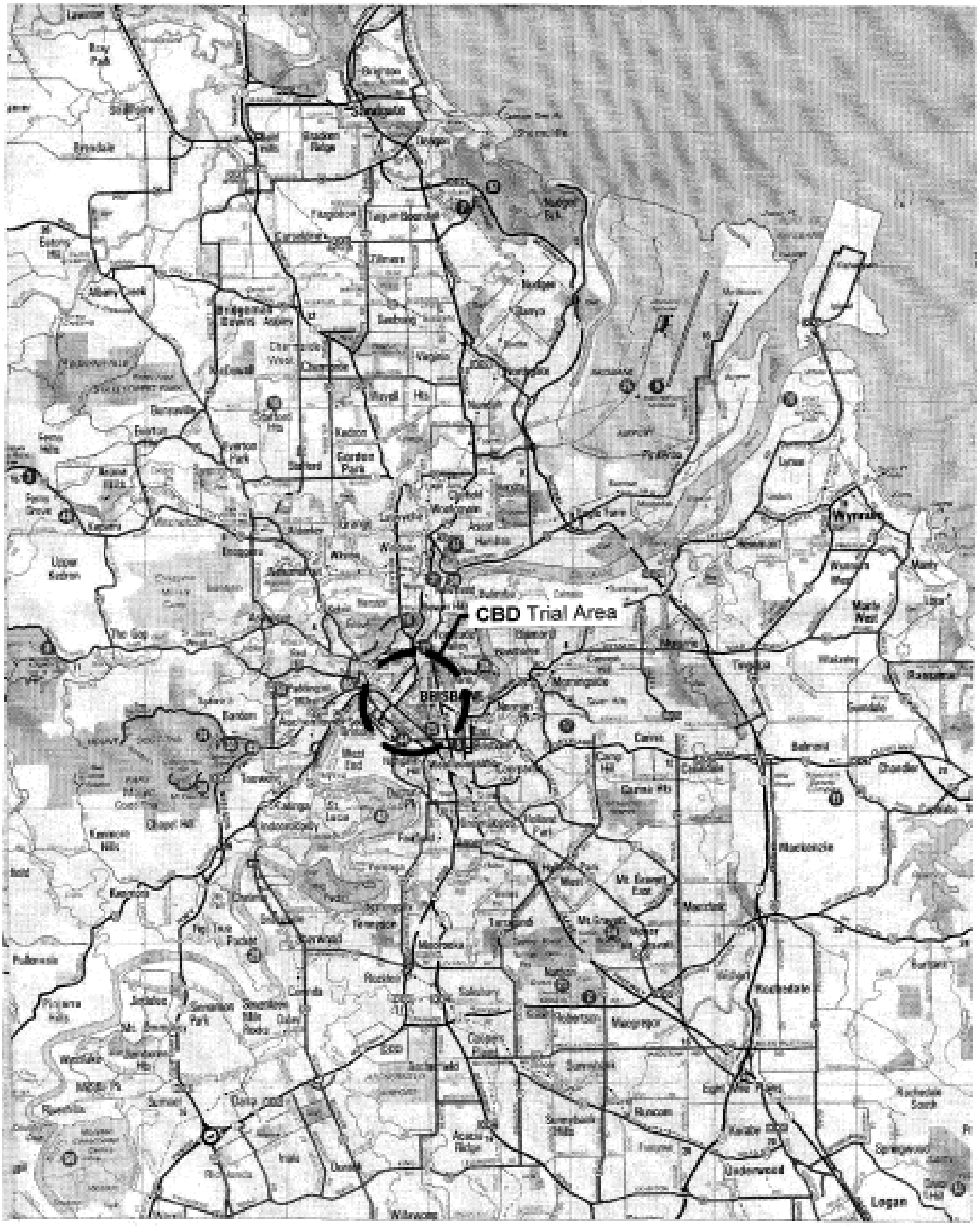
Brisbane CBD

Brisbane City CBD catchment is a highly developed commercial area largely made up of office blocks and retail outlets. Moderate construction and Infrastructure development is presently taking place within the City. Due to the relatively low proportion of inner city living, most inhabitants of the CBD commute to and from the city on a daily basis. This creates a high volume of daily traffic movements and associated pollutant loadings. Public transport is actively used, with the main sources being bus and taxi services. All streets in the CBD are swept and flushed six nights per week. The CBD catchment discharges at numerous points directly into the Brisbane River.

Topography of the City is slight and is predominantly on a gentle grade falling towards the river. The catchment is largely planted in evergreen trees with few deciduous trees and has a varying organic loading. The moderate climate produces approximately 1100mm of rainfall annually, with a higher proportion of storms in the summer months.
Pedestrian activities are seasonal within the CBD, with higher loadings in the warmer summer months.

At the time of installation, the following contaminant-generating activities were noted;

1. High Organic Loading on Alice St. due to its proximity to the Botanic gardens.
2. Construction Site on Howard St.
3. High pedestrian movements along Adelaide St. and Albert St. producing a large amount of litter.



Brisbane CBD Site locality plan

Monitoring

Removal Loads

155 Enviropod LittaTraps™ were installed, treating runoff from 10.1 hectares of road, footpath and car parking areas (road reserve area).

The Enviropod LittaTraps were installed in December 2000. The first part service of the Enviropod LittaTraps was conducted on the 11th of April 2001. The service included 72 units identified as pollutant hotspot areas (numbers shaded on site Plans – see Appendix F) during monitoring conducted on the 10th of April 2001. During the service 3 m3 (1730 kg) of material was removed from the 72 units. All 155 units were serviced on the 18th -19th of June 2001. During the second service 2.6 m3 (1500 kg) of material was removed from the Enviropod LittaTraps. More material was removed from the 72-high loading (Hotspot) Enviropod LittaTraps serviced in April than was removed from all 155 Enviropod LittaTraps serviced in June. However, during the fifth monitoring inspection on the 18th of June it was observed that only 5 Enviropod LittaTraps were in urgent need of servicing. All Enviropod LittaTraps were cleaned following this inspection, as this was the end of the contract monitoring and maintenance period.

The loading rate derived from servicing the Hotspot Enviropod LittaTraps (2.1 m 3/ha/yr) was nearly four times that obtained from servicing all the Enviropods in April. This highlights the benefit of hotspot targeting and appropriate maintenance.

Further Investigation on hotspot loadings will provide data useful in prioritising future insert implementation and appropriate maintenance cycles.

The tables below detail the recorded field data and annual loadings for the Enviropod LittaTraps. Annual loading rates are expressed in m3 (kg) per hectare per annum for the treated area (road, footpath and car parking areas only).

Type of Enviropods Service/Period	No. of Enviropod Serviced	Treated Catchment Area(m2)	Retained Volume(m3)	Retained Load(kg)
High Loading Enviropods Serviced @ 3 months	72	48834	3	1730
All Enviropods Serviced @ 6 months	155	101162	2.6	1500
Total Removed Over 6 Month Period	227	101162	5.6	3230

Table 1: BCC Field Data

Type of Enviropods	Volume/ha m^3/ha	Load/ha kg/ha	Volume/ha/yr m^3/ha/yr	Load/ha/yr kg/ha/yr
High Loading Enviropods (Dec 2000- April 2001)	0.614	354	2.106	1214
All Enviropods Serviced at 6 months	0.257	148	0.514	296
Average Removal Loads Over 6 Mth. Period	0.554	319	1.107	639

Table 2: BCC Enviropod Loading Rates (Treated Area Only)

Performance Comparison

The results for monitoring of the treated catchment area have been extrapolated to total catchment area (road reserve and private property) to allow comparison with other studies (table below).

The 155 Enviropod LittaTraps were installed as a pollutant loading identification trial and therefore only selected gullypits were fitted with Enviropod LittaTraps. There are estimated to be 800 gullypits in the CBD. Enviropod LittaTraps installed equate to approximately 19% of the total. As Enviropod LittaTraps were installed intermittently in selected gullypits throughout the CBD area, it is difficult to determine the total catchment area (road reserve and private property) treated. The Brisbane CBD covers roughly 150 hectares. It is assumed that there is approximately 5.3 publicly owned gullypits per hectare within the Brisbane CBD.

Comparison Loadings	Volume/ha/an	Load/ha/an
	m^3/ha/yr	kg/ha/yr
Brisbane CBD "HotSpot" Enviropod Loading	0.76	439
Brisbane CBD Average Enviropod Loading	0.39	222
Sydney Water GPT Control Devices (Organic + Litter) [3]	0.42	
Hunter Environment Services Load Estimation Program (Organics + Litter) [4]		3305

Table 3: BCC Enviropod LittaaTrap Total Catchment Area Loading Rates and Comparison

Table 3 demonstrates the advantage of hotpot targeting obtaining loading rates in excess of other trial and loading estimates. Prioritizing of hot spot areas will allow cost-effective implementation of stormwater treatment.

The average removal load obtained over the six-month period was comparable to that obtained in the Sydney GPT study. Monitoring was only carried out over a 6-month period. It is predicted that loading rates will increase in the second 6-months due to the increased public use of the CBD during the pre-Christmas period

The BCC litter trap feasibility study estimates 9 tonnes of gross pollutants would be generated from the CBD per year. In 6 months from only 155 Enviropod LittaTraps 3.2 tonnes of material was prevented from discharging into the Brisbane River.

[3] J. Kamer, *Urban Stormwater Quality Control,* Project for Masters of Engineering, University of Auckland,1989

[4] G. Hunter, *Hunter Environmental Services Load Estimation Program,* 2001

Monitoring Observations

High Loading LittaTraps

The high loading (Hot Spot) Enviropod LittaTraps™ have been identified in the Site Plans. The following table lists the streets with a high number of hotspot pits. It is suggested that gullypits without Inserts on these streets be retrofitted.

Hot Spot Locations
Edward Street
Adelaide Road
Howard Street
Albert Street
Alice Street

Table 4: BCC CBD Hot Spot Streets

Appendix C identifies certain LittaTraps around which an education campaign could be implemented and easily monitored. Appendix D identifies other hotspots with in Brisbane City.

High levels of Cigarette Butts

LittaTraps located near bus stops, taxi stands and outside office blocks had a high loading of discarded Cigarette Butts.

Research [5] has shown that cigarette butts increase phosphorous, suspended sediment, conductivity and COD levels. The amount of cigarette butts retained in BCC LittaTraps™ was high in comparison with Enviropod Trials in other Australian Cities.

Fine Sediments Hotspots

Enviropod LittaTraps located near bus stops, motorway off ramps and highly trafficked streets with steep grades had fine sediments retained in them. Fine sediments tend to have higher heavy metal concentrations. Vehicles generate fine particulates through engine, brake, clutch and tyre wear. The level of fine sediments is a function of high traffic movement, catchment area and grade as these factors affect the deposition and transportation of contaminants. Heavy vehicles generate larger quantities of fine particulate through greater wear. Busses accelerating and braking at bus stops deposit heavy localised contaminant loadings.

[5] Aboom M. And Riely S.J. (1997) "Impact on water Quality of Gross Pollutants" Research Report No 121 Urban water Research Association of Australia. June 1997.

The table below lists the pits where fine sediments were identified;

Pit Number	Location
97	George Street
98	George Street
61	Adelaide Street
62	Macrossan Street
60	Queen Street
105	Elizabeth Street
106	Elizabeth Street
29	Ann Street
41	Adelaide Street
49	Adelaide Street
50	Edward Street

Table 5: LittaTraps™ Filter locations with Fine Sediments

The Enviropod LittaTraps can be fitted with a range of liners. To target fine sediments Enviropod suggest the use of EnviroPod Filters with a finer mesh. For further information on the performance of finer mesh filters please refer to the North Shore City Council Enviropod Filter Trial Management Plan.

Reduction in Contaminant Build Up

Material retained in the Enviropod LittaTraps greatly reduced in the second 3-month period. Three possible explanations for this are;

1. Increased public awareness. Retention of gross pollutants in gullypits increases awareness of stormwater pollution and intern discourages people from discarding litter. It was observed that in numerous Enviropod LittaTraps™ located in high profile areas e.g. Roma St and Adelaide St, the volume of retained contaminates reduced despite consistently high pedestrian movements. During the monitoring period residents of Brisbane took an active interest in the litter trap project and praised the council for their initiative.

2. Reduction in rainfall. In the first three months (January to April) 634mm of rain fell in the CBD. In the second 3 months April to June 31mm fell. Street Cleaning and Flushing Activities were maintained on pedestrian and kerb and channel areas throughout the monitoring period, however sediment and litter on roadways was not manually removed, and is likely to accumulate with lower rainfall levels.

3. Reduced Pedestrian Movements. Warmer temperatures and longer daylight hours in the summer months encourages more people to enter the city to visit restaurants and bars, generating higher litter loadings.

Construction and Road Work Activities

During the monitoring period it was observed that 9 Enviropo LittaTraps had retained construction debris from neighbouring sites. A further 10 LittaTraps had retained asphalt, hotmix and sediment from road and footpath maintenance activities. Construction and Roading pollutants not only contain visual pollutants but may also contain carcinogens and other toxicants that can greatly harm receiving waterways. High sediment loadings from Roading and Construction activities can smother aquatic life depriving it of sunlight and oxygen.

2000-micron screens were installed in all Enviropod LittaTraps in the trial. Although this system can retain a certain amount of sediment, Enviropod does not recommend this grade of filter to be used for the purpose of targeting sediments. During the monitoring period, sediment levels varied in the LittaTraps effected by Construction and Road Work activities. A percentage of fine sediment trapped in the LittaTraps washed through the LittaTraps in subsequent rainstorms.

The tables below lists the location of LittaTraps effected from construction and roading activities.

Pit Number	Location	Possible Source
14	Intersection Turbot St and Upper Albert St	Neighbouring Construction Site
15	Intersection Turbot St and Upper Albert St	Neighbouring Construction Site
16	Intersection Turbot St and Upper Albert St	Neighbouring Construction Site
33	550 Queen Street	Construction Activity in lot behind pit
84	Low point Howard Street	Construction Activity
116	119 Charlotte Street	Construction Activity
118	Cnr of Charlotte and Edward Street	Landscaping at Vicory Tavern
139	46 Edwards Street	Unknown Source
155	Garden Point	Construction Pedestrian Footpath

Table 6: LittaTraps Effected by Neighbouring Construction Activity

Pit Number	Location	Possible Source
39	Cnr Adelaide and Albert	Paving work at intersect ion
73	Wharf Street	Pipe work in Footpath
74	Wharf Street	Pipe work in Footpath
75	Wharf Street	Pipe work in Footpath
76	Wharf Street	Pipe work in Footpath
56	Adelaide Street	Pipe work in footpath Hutton Lane
57	Hutton Lane	Pipe work in footpath Hutton Lane
58	Adelaide Street	Pipe work in footpath Hutton Lane
130	William Street	Footpath work
94	Queens Wharf Rd	Concrete cutting and pipe work at Int of William St and Queen Street

Table 7: LittaTraps Effected by Road or Footpath works

High Level of Organic Material

A high level of organic matter was observed in the material retained in the LittaTraps. Although organic matter is not toxic in it natural form, research[6] [7]has indicated that tree leaves have the ability to absorb dissolved metals and hydrocarbons from storm water passing through and over them.

If organic matter and sediments are allowed into the watercourses, they settle out as deposits in riverbed and estuarine areas. Organic matter as it decomposes creates greater Biological Oxygen Demand (BOD) reducing dissolved oxygen (DO) levels in receiving water bodies. The rate of DO reduction is dependent on many factors i.e. Type of organic material, time of exposure and existence of anaerobic conditions.

Settled organic material with associated heavy metals can easily turn anaerobic in a low DO environment, turning the sediment acidic and in-turn releasing the attached metals.

It is advisable to minimise organic loading on receiving water bodies.

[6] S Clark, P Brown & R Pit, *Wastewater Treatment using low cost adsorbents and waste material,* University of Alabama, USA,
[7] Enviropod, *North Shore City Council Enviropod Trial Management Plan*, Enviropod NZ Ltd, 2001

Monitoring Recommendations

Through the installation, monitoring and maintenance of 155 Enviropod LittaTraps in Brisbane CBD, it is recommended that:

- Enviropod LittaTraps in the Hotspot locations are maintained at three-month intervals.
- Education programs are put in place at Bus Stops and Taxi Stands to promote disposal of cigarette butts into rubbish bins.
- Enforcement of fines for littering of cigarette butts.
- Ensure the provision and relevant placement of rubbish bins and cigarette disposal bins.
- Continued monitoring of the seasonal nature of contaminant loadings is carried out in order to allow efficient maintenance programs.
- Education programs for pollutant prevention for construction activities are put in place.
- Enviropod 'Construction Pod' temporary gullypit filters are used during the duration of construction activities, or that Enviropod geotextile filter bags be placed in existing Enviropods during construction works.
- Enviropod Filters with finer mesh filters be installed in fine sediment "Hot Spot" locations.
- Streets identified as hot spot streets (see above) are completely retrofitted with inserts. These can be prioritised and implementation staged to suit budgetary requirements.
- Installing Enviropods in streets where regular flushing occurs will prevent discharge of contaminants into the Brisbane River. Street flushing is the most cost-effective way to clean the streets. Installation of Enviropods will mitigate some of the adverse effects associated with it.

OPERATIONS

Cleaning of Enviropod LittaTraps is a specialist activity. Material collected can be harmful if not handled correctly. Sediments can contain heavy metals and carcinogenic substances as well as harmful objects such as hypodermic syringes. It is essential that Occupational Safety and Health guidelines are followed at all times, and that the following steps are carried out to ensure safe and successful maintenance operations.

Two methods of maintenance can be used for the servicing of LittaTraps:

1. **Cleaning using Inductor Truck**
2. **Hand Maintenance**

Cleaning using Inductor Truck

Maintenance utilising a vacuum Inductor truck is the recommended option for cleaning a large Enviropod LittaTraps. Large LittaTraps are capable of storing a large weight of material. Cleaning using an inductor truck is reduces the health and safety issues associated with lifting heavy objects.,

Traffic Control

Traffic control must be well planned when maintaining LittaTraps. All standards, rules and regulations governing Traffic Control and Safety while Working on the Road must be rigidly followed at all times. All potential hazards must be identified and control methods put in place prior to maintaining LittaTraps.

Health and Safety

All contractors should comply with all current Health and Safety Legislation and take all practicable steps to:

- Comply with all applicable Laws, Regulations and Standards.
- Ensure that all Employees, Contractors and Visitors are informed of and understand their obligations in respect of current Health and Safety Legislation.
- Ensure that employees understand and accept their responsibility to practice and promote a safe and healthy working environment.

All relevant precautions must be taken to prevent contact with sediment and litter when maintaining LittaTraps. The following safety equipment must be worn:

- Puncture resistant gloves.
- Steel capped safety boots.
- Fluorescent safety vest.
- Safety apron (optional).
- Overalls or similar skin protection.
- Eye protection if necessary.
- Where there is a need to proceed in a confined space, the space shall be inspected for gas/fumes. Safety equipment must be worn where deemed necessary and where gas or oxygen hazard occurs, BA gear will be used by staff trained in its use. Non-trained staff must not go into confined spaces.

Operation

1. Steel Gullypit grate is to be lifted open to allow access to Enviropod LittaTrap.

2. Sediment is to be extracted from the filter bag by the inductor truck.

3. Sediment retained in the gullypit grate is to be removed.

4. Back opening channels are to be cleared of any debris to ensure flow is not hindered.

5. Care is to be taken by the operator not to damage the filter.

6. All gullypit waste is to be removed from the pit.

7. Gullypit sediments under no circumstances are to be backwashed into the gullypit.

A visual examination of the Filter structure and filter media is then to be carried out.

1. Structure is to be visually checked for failure or movement and that filter boxes are sealing sufficiently.
2. If any structural failure has occurred it is to be remedied, or reported to the filter owner for remedial works.
3. Filter media is to be examined for permeability. If the pores in the filter fabric are clean, the filter bag is placed back into the frame and the service is complete.
4. If the filter media has become blocked or hindered in performance, the filter bag must be rejuvenated. This is achieved by either lifting the bag and ring out of the pit, placing over a frame and water blasting, or alternately by turning the bag inside out and placing back into the frame and water blasting within the pit.

All gullypit wastes from the site are to be taken off site and disposed of at a transfer station or similar approved disposal site. Stormwater Sediments can contain Lead, Copper, Zinc, Mercury and PCBs, which are harmful to both humans and the receiving environment.

Hand Maintenance

Maintenance of Enviropod LittaTraps by hand is an alternate option. This option is only to be used if cleaning by inductor truck is not feasible for the particular application. Health and Safety measures must be followed at all times. Where possible hydraulic lifting gear such as a Hi-Ab lifter should be utilised, or a lifting frame positioned over the pit. Hand maintenance allows accurate examination of weight and content of retained materials, or may be required where access by inductor truck is not possible.

Traffic Control

Traffic control must be well planned when maintaining Enviropod LittaTraps by hand. All standards, rules and regulations governing Traffic Control and Safety while Working on the Road must be rigidly followed at all times.

All potential hazards must be identified and control methods put in place prior to maintaining LittaTraps.

Health and Safety

All contractors should comply with all current Health and Safety Legislation and take all practicable steps to:

- Comply with all applicable Laws, Regulations and Standards.
- Ensure that all Employees, Contractors and Visitors are informed of and understand their obligations in respect of current Health and Safety Legislation.
- Ensure that employees understand and accept their responsibility to practice and promote a safe and healthy work environment.

All relevant precautions must be taken to prevent contact with sediment and litter when maintaining LittaTraps by Hand. The following safety equipment must be worn:

- Puncture resistant gloves.
- Steel capped safety boots.
- Fluorescent safety vest.
- Safety apron (optional).
- Overalls or similar skin protection.
- Eye protection if necessary.
- Where there is a need to proceed in a confined space, the space shall be inspected for gas/fumes. Safety equipment must be worn where deemed necessary and where gas or oxygen hazard occurs, BA gear will be used by staff trained in its use. Non- trained staff must not go into confined spaces.

Operation

1. Steel Gullypit grate is to be lifted open to allow access to Enviropod LittaTrap.
2. Lifting gear or manuals lifting hooks are to be attached to expose lifting loops on filter bag.
3. Bag is to be lifted vertically out of cage, ensuring no undue pressure is placed on filter bag.
4. When bag is lifted clear of the pit and positioned over truck or other depository, loops at the base of the filter bag are lifted to empty the contents.
5. If hydraulic lifting gear cannot be used and manual hand lifting is required, a minimum of two people is required (one on either side of bag).

A visual examination of the Filter structure and filter media is then to be carried out.

1. Structure is to be visually checked for failure or movement and that filter boxes are sealing sufficiently.
2. If any structural failure has occurred it is to be remedied, or reported to the filter owner for remedial works.
3. Filter media is to be examined for permeability. If the pores in the filter fabric are clean, the filter bag is placed back into the frame and the service is complete.
4. If the filter media has become blocked or hindered in performance, the filter bag must be rejuvenated.
5. This is achieved by either lifting the bag and ring out of the pit, placing over a frame and water blasting, or alternately by turning the bag inside out and placing back into the frame and water blasting within the pit.

All gullypit wastes from the site are to be taken off site and disposed of at a transfer station or similar approved disposal site. Stormwater Sediments can contain Lead, Copper, Zinc, Mercury and PCBs, which are harmful to both humans and the receiving environment.

MAINTENANCE AND INSPECTION FREQUENCY

Maintenance of the 155 Enviropod LittaTraps is divided into two service frequencies. 72 LittaTrap incorporating 'hotspot' locations (as detailed earlier in this Management Plan) require servicing at three-monthly intervals. The remaining 83 LittaTraps are to be serviced at six-monthly intervals. All LittaTraps have been monitored at monthly intervals during the initial monitoring period for a total period of six months. It is suggested that Enviropod monitors the LittaTraps for a further six-month period (twelve-month total monitoring period) to quantify seasonal variances in pollutant loadings and to refine maintenance programs to incorporate these variances. All LittaTraps are to be inspected at monthly intervals for the first year of operation following this Management Plan.

Attached in Appendix E is an example of an Enviropod Service Receipt to be completed by the Cleaning Contractor when servicing any LittaTraps. Relevant information is recorded and forwarded to the client following each maintenance clean.

It is recommended that this Management Plan be reviewed after the first 12 months to account for any seasonal variations that may not have occurred during the monitoring period.

Maintenance and inspection frequencies should be reviewed if there is a change of land use in an area that may affect the contaminant generation e.g. A new vehicle entrance to a shopping centre that would create high traffic movements.

EMERGENCY PROCEDURES

Spill Procedure

In the event of a spill discharging into any gullypit all sediment is to be removed from gullypit and filter bags are to be removed and replaced with rejuvenated filter bags. Normal operation procedures apply to additional cleaning as a result of spills.

Blockages

In the unlikely event of surface flooding around a gullypit fitted with an Enviropod Filter or LittaTrap the following steps should be carried out:

1. Check the over flow bypass. The Enviropod LittaTrap has been designed with an overflow mechanism built into the filter box. If surface flooding existing check the overflow slots underneath the rubber seal. If debris is lodged in the overflow slots these can be easily cleared by hand or steel rod.

2. If overflow is clear and surface flooding still exists remove Enviropod LittaTrap and check outlet pipe for blockages.

Removal of the LittaTrap may be difficult if the screen is clogged and the system is holding water. If the filter is clogged, brush the source of the filter with a yard broom or similar. This will dislodge particles trapped at the interface allowing contained water to flow through the filter.

If the outlet pipe is blocked, it is likely that a gully sucker truck will be required to unblock it. Debris should be removed from the device with the gully sucker truck before removal of the Enviropod LittaTrap.

AUDIT PROCEDURES

The maintenance contractor is to complete the attached Service Receipt and submit it to the client every 12 months.

Appendix A
Removal Load Calculations

Removal Load Calculation - Brisbane City Council- December 2000 - June 2001

December 2000 - June 2001

Field Data

Type of Enviropod LittaTraps	Service/Period (months)	No of Enviropod Serviced	Treated Catchment Area (m^2)	Retained Volume (m^3)	Retained Load (kg)
High Loading LittaTraps serviced at 3 months	3.5	72	48834	3	1730
All LittaTraps Serviced at 6 months	6	155	101162	2.6	1500
Total Removed Over 6 Mth Period	6	227	101162	5.6	3230

Estimate of Loading Based on Time for Treated Area only

Type of Enviropod LittaTraps	Volume/ha m^3/ha	Load/ha kg/ha	Volume/ha/an m^3/ha/yr	Load/ha/an kg/ha/an
High Loading LittaTraps (Dec 2000- April 2001)	0.614	354.261	2.106	1214.610
All LittaTraps Serviced at 6 months	0.257	148.277	0.514	296.554
Total Removal Load over 6 Mth Period	0.554	319.290	1.107	638.580

Estimate of Loading Based for Total Catchment Area (Assuming Gullypits Per Hectare)

Brisbane CBD Total Catchment Area (ha)	150
Estimate Number of gullypits in CBD	800
Gullypits per hectare of CBD	5.333333333

Type of Enviropod LittaTraps	Volume/Pod m^3/Pod	Kg/Pod kg/Pod	Volume/ha/an m^3/ha/yr	Load/ha/an kg/ha/an
High Loading LittaTraps (Dec 2000- April 2001)	0.042	24.028	0.762	439.365
All LittaTraps Serviced at 6 months	0.017	9.677	0.179	103.226
Total Removal Load over 6 Mth Period (155 Enviropods)	0.036	20.839	0.385	222.280

Comparison Loadings	m^3/ha/an (Treated Area Only)	kg/ha/an (Treated Area Only)	m^3/ha/an (Total Catchment Area)	kg/ha/an (Total Catchment Area)
Brisbane CBD "HotSpot" LittaTraps Loading	2	1215	0.76	439
Brisbane CBD Average LittaTraps Loading	1.11	638.58	0.39	222
Sydney Water GPT Control Devices (Organic + Litter)*			0.42	
Hunter Environment Services Load Estimation Program (Organics + Litter)				330

* No account has been made for the level of compaction on the retained material. Debris retained in the Enviropod filter is compacted by incoming water

** Assumed present maintenance cycles to continue

*** Total Catchment Area = Road Reserve Area + Private Property Area

Appendix B
Contaminant Loading Estimation

ESTIMATED LOADING RATES (kgs/ha/an)

Site: Brisbane CBD
Av.An.Rain. 1100 (mm)

Loading Rates for use in the City of Penrith applied for Brisbane CBD in the Absence of Site Specific Data

Land Use	SS mg/L	TP mg/L	TN mg/L	Org M mg/L	Litter mg/l	Cv	Av.An.Roff. m^3/ha	SS kg/ha/an	TP kg/ha/an	TN kg/ha/an	Org M kg/ha/an	Litter kg/ha/an
Natural	10	0.02	0.4	25	0	0.15	1650	17	0.03	0.66	41	0
Rural *	50	0.09	0.7	10	1	0.2	2200	110	0.20	1.54	22	2
Residential	150	0.25	1.5	50	10	0.35	3850	578	0.96	5.78	193	39
Commercial	200	0.35	1.8	20	40	0.5	5500	1100	1.93	9.90	110	220
Industrial	200	0.35	2	15	30	0.52	5720	1144	2.00	11.44	86	172

* Improved pasture left fallow for a number of years. These values represent the lowest estimates for any Rural activity, all other activities require higher concentrations &/or Cv values. Data represents the average of the medians from 2 years of comprehensive monitoring by The Sydney Water Corporation of >20 catchments in the Sydney region.

Note:
~ Data adapted from NSW EPA "Council Handbook" and subject to interpretation with respect to site specific landforms/vegetation/soils and constraints.

~ Generically TP for developed residential could be expected to be between 0.5 & 1.5 kg/ha/an, & loads from a Natural catchment about 0.05 to 0.15 kgs/ha/an. Rural loads are dependent on type & intensity of the activity & the potential for pollutants to be locked up in farm dams, causing a shock load downstream. They should fall between Natural & Residential loading rates.

~ SS may increase by a factor of 5 during development with an associated increase in attached P

~ Once the catchment is developed and stable SS may be less than Rural *.

~ SWC av. 0.30 m^3/ha/an of rubbish - 78% O.M. and 22% litter; & 230 kg/ha/an of sediment in South Sydney - Approximate vols. for OM = 400 kgs /m^3 & Sediment = 1500 kgs/m^3.

~ Fine Sediments (<0.5 mm) off roads; see Williamson's work (Table 10.1 p.40) for kg/ha/mm of runoff, an estimation can be made as to 1st Flush discharges i.e. 32 mm = 110 kg/ha/an & 13 mm = 45 kg/ha/an see CRCCH July 97 (Fig. 17 p.9) where floatable & fine particulates mobilised in rising limb of hydrograph while coarse sediment continues to be mobilised in receding limb.

~ 6-month critical storm should capture the peak of the hydrograph whilst the 3-month critical storm should capture a portion of the rising limb of the hydrograph.

Appendix C
Hot Spots for Education

Pit:	Type of Discharge:	Comment:
6	Excessive litter	Bus Stop
12	Excessive litter	Bus Stop
33	Excessive litter/ Cigarettes	Outside Pub
62	Excessive litter/ Cigarettes	Outside Pub
88	Excessive litter/ Cigarettes	Downhill from Pub
80	Excessive litter	Taxi Stand
78	Excessive Cigarettes	Outside Offices
78	Excessive Cigarettes	Outside Offices
35	Excessive litter/ Cigarettes	Bus Stop
36	Excessive litter/ Cigarettes	Bus Stop
37	Excessive litter/ Cigarettes	Bus Stop
38	Excessive litter/ Cigarettes	Bus Stop
39	Excessive litter	High Pedestrian Area
40	Excessive litter	High Pedestrian Area/ Bus Stop
41	Excessive litter	High Pedestrian Area/ Bus Stop
42	Excessive litter	High Pedestrian Area/ Bus Stop
43	Excessive litter	High Pedestrian Area/ Bus Stop
44	Excessive litter	High Pedestrian Area/ Bus Stop
45	Excessive litter	High Pedestrian Area/ Bus Stop
46	Excessive litter	High Pedestrian Area/ Bus Stop
47	Excessive litter	High Pedestrian Area/ Bus Stop
48	Excessive litter	High Pedestrian Area
49	Excessive litter	High Pedestrian Area
50	Excessive litter	High Pedestrian Area
51	Excessive litter	High Pedestrian Area
52	Excessive litter	High Pedestrian Area
64	Excessive litter	High Pedestrian Area
65	Excessive litter	High Pedestrian Area
110	Excessive litter/ Cigarettes	High Pedestrian Area/Cafés
111	Excessive litter/ Cigarettes	High Pedestrian Area/Cafés
112	Excessive litter/ Cigarettes	High Pedestrian Area/Cafés
113	Excessive litter/ Cigarettes	High Pedestrian Area/Cafés
114	Excessive litter/ Cigarettes	High Pedestrian Area/Cafés
115	Excessive litter/ Cigarettes	High Pedestrian Area/Cafés
119	Excessive litter/ Cigarettes	High Pedestrian Area/Cafés
120	Excessive litter/ Cigarettes	High Pedestrian Area/Cafés
125	Excessive litter/ Cigarettes	High Pedestrian Area/Cafés
147	Excessive leaves	Beside Botanical Gardens
148	Excessive leaves	Beside Botanical Gardens
149	Excessive leaves	Beside Botanical Gardens
145	Excessive leaves	Beside Botanical Gardens

Appendix D
Hotspots for Future Stormwater Treatment implementation

Site No.	Location	Roads affected	Activity	Comments	Pollutants present
1	Fortitude Valley Retail, Business		Pubs, Cafes, Restaurants,	High pedestrian movements	Litter
			Cafes		Cigarette Butts
2	Spring Hill Retail Business		Apartments		
3	South Bank movements		Exhibition Centre	High pedestrian	Litter
			Art Gallery		Cigarette Butts
			Parkland Baths		

Appendix E
Service Receipt

Enviropod Service Receipt

Job: _____ **Job Number:** _____

Contractor: _____ **Pit Numbers:** _____

Location: _____ **Date Serviced:** _____

Known Industrial/Commercial uses in the area: **Photo #** _____

Describe _____

Service Frequency: _____ Cleans per year

No. Enviropods on Site: _____

Tonnage Removed: _____ Kilograms

Debris Cleaned Out:		**(Y)**	**(N)**
	-Sediment & Debris removed from Filter.	__	__
	-Sediment & Debris removed from Grate and Inlet.	__	__
	-Bag Water blasted/cleaned.	__	__
	-Overflow slots clear of debris.	__	__

Physical Observations

Solids:	-Illegal dumping of solids e.g. Bitumen/Concrete.	__	__
	-Estimate % Litter.	_____	
Vegetation:	-Estimate % Organic loading.	_____	
Oil & Grease:	-Are Oil/Grease/Hydrocarbons present?	__	__
Spills:	-Evidence of Chemical/Particulate spills _____		

Structure:

	-Evidence of Structural Deterioration/Corrosion.	__	__
	Describe _____		
	-Grates/Kerbs are in good condition.	__	__
	-Rubber sealing effectively.	__	__

Overall Filter Function:	**(Y)**	**(N)**
-Filter is performing satisfactorily.	__	__
-Evidence of flow bypassing/Overflow engaging.	__	__
-Any Evidence of blocked soakage system/flooding.	__	__
-Any Bag damage, cuts or rips	__	__

Comments:

This service has been performed in accordance with Enviropod Management Plan (EMP) for above site. Please file this receipt with EMP and keep on site for Brisbane City Council compliance inspections.

Name: _____

Signature: _____

Position: _____

Appendix F
Location Plans