



TRANSITIONAL ENVIRONMENTAL PROGRAM FOR Mareeba Landfill - Surface Waters

Section 330 of the *Environmental Protection Act 1994*

Individual or Company Responsible:	Mareeba Shire Council (MSC)
	65 Rankin Street MAREEBA QLD 4880
	39 114 383 874
Environmental Authority number (if relevant)	EPPR01792213
Environmental Authority holder names (if relevant)	NA
Development Approval number (if relevant)	NA
Title:	Mareeba Landfill - Surface Waters
Date:	31 May 2017
Reason for TEP:	section 330(c): <i>Comply with a condition of an environmental authority (EA)</i>
Site details:	Mareeba Landfill
	Vaughan Street, Mareeba, Qld 4880
	Lot 517 Plan SP171524
Period of TEP:	13 months
Start date:	May 2017
Finish date:	30 June 2018

Content of Program:

To comply with conditions 3-W2, 3-W3, 3-W5, 3-W7, 3-W8 and 3-W9 of Environmental Authority EPPR01792213: (section 331(e))

The Mareeba Landfill is authorised to be operated by Mareeba Shire Council (MSC) under Environmental Authority EPPR1792213. That Authority requires surface waters to be discharged in accordance with stringent conditions for the protection of water quality.

The Mareeba Landfill presents difficult environmental circumstances to control erosion and minimise the release of sediment laden waters. At the time of submitting the original Program Notice in February 2017, MSC was unable to meet Environmental Authority conditions relating to surface waters; in particular the limits for water quality characteristics and the implementation of a Surface Waters Monitoring Program.

Surface Water Release Limits (Conditions 3-W2)

The site sits on the watershed boundary between the Barron and the Mitchell catchments. There are no upstream waters for this site. Granite Creek is the closest permanent surface water which is located approximately 560 m to the south of the landfill and flows in an easterly to north-east direction towards the Barron River (Figure 1).

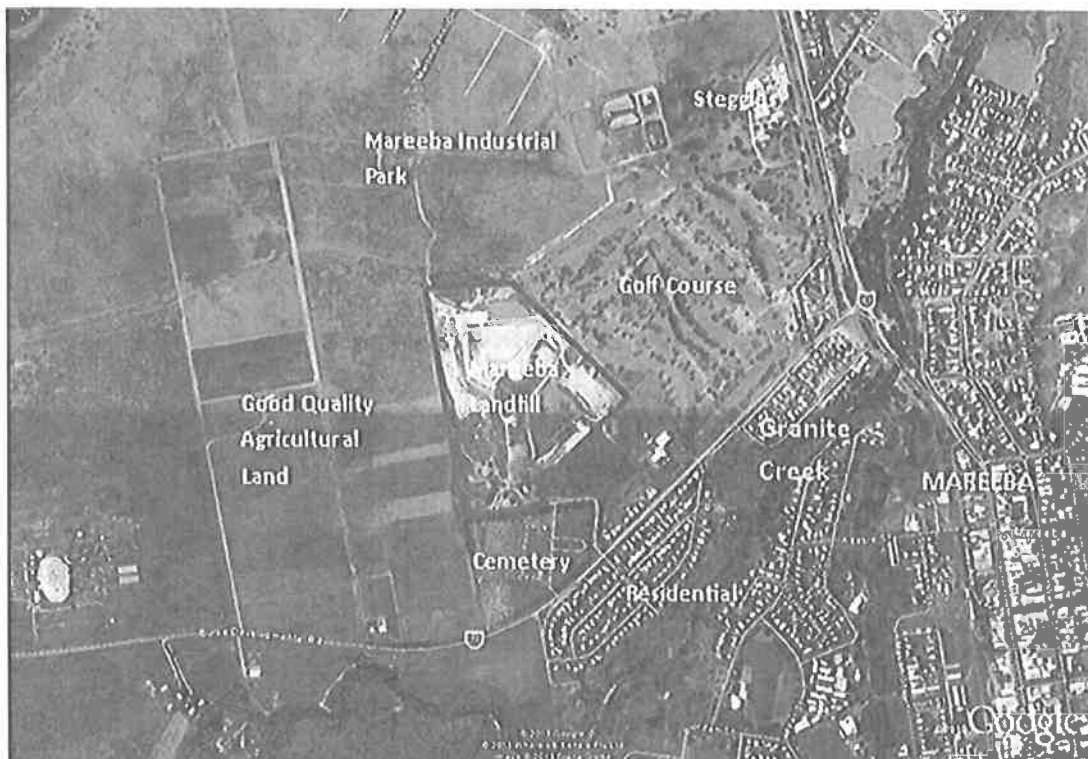


Figure 1 Location of Mareeba Landfill (Source: Google 2013)

The majority of storm waters on site are drained to the north-west corner where surface waters exit the site via a seasonal gully. This is the authorised release point for surface waters onsite. After exiting the landfill site, the gully intercepts sheet flows from the Mareeba Industrial Park and lease land and directs them to a small dam located adjacent to Baiada Enterprises Poultry Abattoir and Rendering Facility. Waters exit the dam and flow to an ephemeral tributary of Granite Creek. Waters

in this tributary flow to Granite Creek after passing under the Mulligan Highway and rail tracks.

Environmental Authority EPPR1792213 imposes both maximum limits and trigger levels on the water quality released to the downstream environment. On several occasions, MSC has not been able to meet the stringent suspended solids limit and has exceeded the turbidity and electrical conductivity trigger levels reproduced in Table 1 below. Water quality results for surface waters monitoring are attached (Attachment 1).

Release Pt Name	Quality Characteristic (units)	Trigger Level	Maximum
Surface Waters	Total Suspended Solids (mg/L)	-	50
	Turbidity NTU	80 th percentile of reference or 6 NTU whichever is higher	-
	Electrical Conductivity	80 th percentile of reference or 250 uS/cm whichever is higher	-

Table 1 Environmental Authority EPPR01792213 Surface Water Quality Characteristic Limits

The release of stormwaters from the site occurs during the wetter months of the years only. Mareeba is located in Australia's sub-tropical zone where the region has an average annual rainfall of approximately 841mm (<http://www.bom.gov.au>). This region has a distinct dry winter with the greatest volume of rainfall and frequency of rainfall generally occurring between January and March. Consequently, releases from the site mainly occur from January to April. Release waters during these months typically contain elevated suspended solids, turbidity and electrical conductivity; the degree of elevation dependant on the amount of rainfall received. The suspended solids have been recorded as high as 400 times the limit during release during the rainy season. No stormwater is released during the dry months.

The source of the elevated suspended solids, turbidity and electrical conductivity in the stormwaters released from site is directly influenced by the topography, drainage, the geology and soils at the site. The landfill property and surrounding area has minimal topographic relief. The site grades gently from a maximum natural ground elevation of approximately 405m AHD in the south west to a low of approximately 401.5 AHD in the north east of the site (Golder, 2015).

The topography and drainage of the site has been heavily modified over time from the initial sand extraction activities, construction of the Old Mareeba Landfill through to the newer engineered waste cells of the operational landfill. Surface waters are directed to a series of constructed drains around the site intended to separate clean and potentially contaminated stormwaters. Run off from the drains around the newer cells are directed to a sediment basin prior to being discharged offsite in the north western corner of the property, whilst drainage adjacent to the Old Mareeba Landfill drains directly to the North West corner. The southern and central areas of the site (old stockpile area and bunded pad) drain to the south eastern corner to a shallow gully that runs through the golf course. The site as a whole is prone to poor drainage and waterlogging after heavy rainfall.

Golder (2015) summarises the underlying geological conditions for the site:

Geological Unit	Typical Depth Range	Description
Recent Alluvial Soils	Surface to 7m	- Variable clay, sandy clay and clayey sand materials. - Localised sand lenses
Atherton Basalt	7m to 15m	Weathered basalt
Hodgkinson Formation	>15m	Weathered metasediments

Soil testing conducted on the soils in the surface to 7mbg found that they are highly sodic and deficient of major nutrients including Calcium, Nitrogen, Phosphorus, Potassium, Sulphur as well as Zinc. They also have near zero organic matter, making them quite unstable. The soil up to 7mbg is typically the soil that has been excavated for the new landfills and has been reused as interim capping on cell batters. Soils extracted and used on Cell 2 were also found to be highly alkaline. The soils also present cation imbalance, where the structure was particularly low in calcium and high in sodium. Exposed soils require amelioration with gypsum to create soil stability.

The elevated suspended solids in the release waters are therefore a function of the topography, drainage, nature of the soils onsite, and the soil protection controls onsite. The latter is described in further detail below (Condition 3-W5).

Investigation into releases from the sediment pond exceeding trigger values (Condition 3-W3)

An investigation, in accordance with ANZECC 2000 methodology is required to be submitted when quality characteristics in release waters from the sediment pond exceed authorised trigger limits. These reports have not been completed as reference sites (as required by condition 3-W2) have not been established and the Surface Waters Monitoring Program requires updating to enable detection of environmental harm from releases.

The Release of Stormwater From Site (Condition 3-W5)

Stormwater released from the site is required to not cause re-suspension of particles, erosion, landscape or vegetation damage or ponding of waters downstream. This condition relates to the protection of soils onsite which is directly influenced by the sites history and current operational activities.

Prior to use as a landfill, the site was subject to sand extraction. This sand extraction resulted in depressions across the site in a south-west to north-east direction. Previous investigations by Golder Associates have indicated that the south-western extent of this extraction was used as an ad hoc waste tip once sand mining ceased. This historical landfill, the Old Mareeba Landfill (OML), was filled to approximately 2-3m above ground level. The OML is currently receiving the final cover which incorporates appropriate stormwater treatment which has been the subject of review by EHP previously. Therefore the soil protection measures for the OML are not considered further other than the stormwater drain that will receive the stormwaters shedding from the OML mound.

The new Mareeba Landfill has been in operation since 2007, aligning with MSC accepting process

residual waste and contingency waste from the ARRF under a Waste Disposal Agreement (WDA) with the then CEC (now SUEZ Recycling & Recovery Regional Queensland). Under that contract, SUEZ is responsible for the design and construction of the new cells and the final cover system, whilst MSC is the Environmental Authority holder and is responsible for the day to day operation of the site.

The original Site Development Plan developed for Mareeba Landfill at that time, outlined the design philosophy for treating sediment laden waters in two sediment ponds. However only one sediment pond was constructed by CEC at the time that landfilling in the newer engineered cells commenced. It is unclear from construction drawings as to what standard the sediment pond was built to or what design guidelines were used. However, the pond does not adequately treat sediment laden waters currently unless waters are flocculated. The sediment pond, over its operational life has been predominantly treated as storage for fire-fighting purposes rather than for the treatment of sediment. Accordingly, the pond has never been desludged.

In recent years, MSC (responsible under the contract for the day to day operation) has been building upon a mixture of drainage, erosion and sediment operational controls consistent with the Site Based Management Plan including:

- ensuring separation of stormwaters that come into contact with waste ,
- identified areas of disturbance and integrating pre wet season erosion and sediment control planning,
- installing appropriate drainage controls,
- removing accumulated sediment from drains,
- installing check dams in drains and sediment fencing around stockpiles where appropriate, and
- hydro mulching landfill batters with standard and bonded fibre matrix.

Despite the implementation of the operational measures and the earlier installation of the sediment pond, stormwater continues to be sediment laden after rain fall events and continues downstream offsite. After dedicating significant operational funding in recent years towards this issue, it is apparent further measures are still required.

The obvious source of sediment in recent years has been from the operational landfill interim cap and considerable effort and progress has been made in protecting these batters. The batters would, each year in the wetter months, erode significantly exposing waste in rills or gullies. The use of temporary diversion drains, hydro-mulching and bonded fibre matrix hydro-mulching and batter chutes has largely rectified this issue.

Council believes that the erosion and sediment control may now need to focus on protecting the surface of drains and site access roads, reducing areas of disturbance such as stockpiles and rehabilitating those areas in order to ensure stormwaters are not erosive and do not cause suspension and resuspension of sediment in waters.

In any case, Council will seek the advice from a Certified Practitioner in Erosion and Sediment Control (CPESC) to advise on the source of the issues and measures to rectify. The resultant recommended measures may consist of a mix of operational and capital expenditures depending on whether the work to be undertaken is considered to be an upgrade, replacement or renewal of an infrastructure asset (eg sediment pond).

No further capital expenditure in relation to erosion and sediment control at the landfill is approved for this financial year (2016-2017), however Council is set to adopt the 2017-2018 capital works budget including significant funding for the resolution of this issue at the 07 June 2017 Ordinary Meeting. These funds will not be released for procurement until the new financial year has

commenced and therefore the design and construct of any capital works required will not be able to commence until then.

Surface Waters Monitoring Program (Conditions 3-W7, W8 and W9)

A Surface Waters Monitoring Program (SWMP) is required by the Environmental Authority. Although Council has been sampling surface waters at the authorised release point for the required water quality characteristics and frequency for many years, the current SWMP requires review and redesign to measure the environmental impact of the landfill's operation on the environmental values of the receiving surface waters as described above (see Surface Water Release Limits (Conditions 3-W2) p3).

The SWMP will identify appropriate and representative monitoring sites including reference sites to enable Council to detect the impact on surface waters from landfilling operations. The program will also inform Council's response to environmental management and the development of protection measures at the landfill into the future. It will include direction for including the quality characteristics and sampling frequency as per the licence conditions.

Description of transition:

MSC proposes to meet compliance with the conditions before the program ends by setting objectives, actions based on best practice environmental management standards and risk assessment, performance indicators and monitoring and reporting mechanisms. Table 1 details the contents of this program.

The actions devised to bring MSC back into compliance have been devised to ensure best practice environmental management. Specifically, MSC will engage a specialised environmental management consultancy that has specific site knowledge, a CPESC to advise and design, and who has specialist knowledge in water quality protection to:

- Prepare a Surface Waters Monitoring Program in accordance with Environmental Authority requirements; and
- Prepare a report on the completion of an investigation in accordance with ANZECC (2000) methodology, or any updated ANZECC guidelines into the potential for environmental harm for the surface waters exceedances thus far.
- Review the effectiveness of the current erosion and sediment control measures; and
- Prepare a Surface Waters Management Plan including design drawings for the construction of drainage, erosion and sediment control measures to be constructed or implemented, design philosophy behind the proposed suite of measures, and a program of works including measures to be implemented by 01 December 2017, 30 January 2018, 30 February 2018.

The Mareeba Landfill Surface Waters Management Plan will be prepared by a CPESC to meet the current Institute of Engineers guidelines on erosion and sediment control or a more appropriate standard as deemed applicable by the CPESC, and will bring MSC back into compliance with the Environmental Authority conditions.

The actions devised in this program have also been based on risk assessment to ensure the scope and timing for implementation of controls reflect the associated risk. The risk assessments of the non-compliances with the Environmental Authority are included in Attachment 2.

Interim measures that will complement the selection of CPESC recommended measures to address the erosion and sediment control issues on site and assist in reducing harm in the receiving environment during the life of the TEP will include:

- Implementing the operational controls as mentioned above.
- Using a flocculant in the sediment pond onsite or in the old borrow pit pond behind Baiada chicken abattoir as required.
- Any areas of disturbance are minimised and any new areas of disturbance are in consultation with the CPESC (eg. new borrow pit for day cover material)

TABLE 1

Objective(s) [section 331(a)]

1. To reduce the concentration and level of total suspended solids, turbidity and electrical conductivity being released to surface waters from the authorised discharge point (as described in Environmental Authority EPPR01792213) and prevent environmental harm being caused to waters by suspended solids contamination.
2. To investigate (in accordance with ANZECC (2000) methodology) the potential for environmental harm from the sediment pond discharge waters containing contaminants that have exceeded the trigger levels for turbidity and electrical conductivity.
3. To control onsite stormwater flows through drainage, erosion and sediment control measures that have been designed to a standard endorsed by a CPESC to ensure stormwater does not cause re-suspension of particles, erosion, landscape or vegetation damage or ponding of waters downstream, and to bring MSC back into compliance with the water quality limits outlined in Environmental Authority EPPR01792213.
4. To develop and implement a Surface Waters Monitoring Program to:
 - establish the reference quality of surface waters and
 - to detect any impact on surface waters as a consequence of landfill operations and
 - provides for the development of proposed interim trigger levels by 30 November 2018 as per condition 3-W4
 - monitor and record the quality of surface water for the quality characteristics nominated in the Environmental Authority for the months January, April, July and October (or if unobtainable during the next period of flow of the watercourse).

Actions [section 331(b)]	Commencement date	Completion date
1. Prepare and implement a Surface Waters Monitoring Program in accordance with Environmental Authority requirements.	17 May 2017	30 June 2017
2. Prepare a report on the completion of an investigation in accordance with ANZECC (2000) methodology, or any updated ANZECC guidelines into the potential for environmental harm for the surface waters water quality and trigger level exceedances.	01 July 2017 ^{*1}	30 July 2017
3. Prepare a Surface Waters Management Plan endorsed by a Certified Practitioner in Erosion and Sediment Control (CPESC) to: - identify the source and cause of sediment laden waters discharging from the landfill site and review current erosion and sediment control measures, - design drainage, erosion and sediment control measures for implementation that meet current best practice environmental management standards (such as the latest version of IEAust Erosion and Sediment Control Guidelines) - include design drawings and technical specification of drainage, erosion and sediment control measures for construction. - provide a staging for the implementation of capital works control measures before the 2017-2018 wet season months, including measures to be completed by the following dates^{*2}: 30 November 2017, 22 December 2017, and 19 January 2018. - a program for monitoring and maintenance of control measures. - prepare interim suspended solids (mg/L), electrical conductivity and turbidity (NTU) limits for the life of the TEP and provide reasons for those limits. - provide a CPESC endorsed report stating to the effect that the implementation of control measures will bring MSC back into compliance with condition 3-W2.	01 July 2017 ^{*1}	30 Aug 2017
4. Implement CPESC recommended control measures.	01 Sept 2017	19 January 2018 ^{*2}
5. Engage a CPESC to review the improved control measures against the objectives and certify that the system meets Condition 3-W2 & 3-W5. The CPESC must prepare a report detailing the review and certification and any necessary recommendations to ensure compliance with Conditions 3-W2 and 3-W5.	30 Oct 2017	30 March 2018

6. If recommendations have been made, detail a schedule of works to action the recommendations and implement the schedule of works.	30 Oct 2017	30 June 2018
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Notes:

*¹ The date proposed has been selected as it corresponds to the start of the 2017-2018 financial year. Council funding for ANZECC 2000 investigation and CPESC work is dependent on capital works budget adoption and release of funding.

*² A staged approach to the implementation of control measures was agreed by EHP and MSC in a meeting 21 April 2017 to reflect the drier conditions experienced in Mareeba during November and December as opposed to coastal areas. 80% construction completion is to be achieved by 22 December 2017.

Performance indicators [section 331(g)]	Commencement date	Completion date
1. Receipt of the finalised Surface Waters Monitoring Program.	May 2017	01 July 2017
2. Engagement of environmental monitoring services or set up water testing program with CRC Water Laboratory to implement the Surface Waters Monitoring Program.	01 July 2017	Ongoing
3. Receipt of the report detailing the investigation in accordance with ANZECC (2000) methodology, or any updated ANZECC guidelines into the potential for environmental harm for the surface waters water quality and trigger level exceedances.	01 July 2017	30 Jul 2017
4. Receipt of the Surface Waters Management Plan endorsed by a Certified Practitioner in Erosion and Sediment Control (CPESC) that contains: - design drawings for construction - supporting information including the design philosophy of the control measures for drainage, erosion and sediment control that is in accordance with applicable industry guidelines and a program of works; and - a statement that the measures will bring MSC back into compliance with the surface water conditions of the Environmental Authority.	01 July 2017	30 August 2017
5. Construction completion compliant with specification and the program of works.	01 December 2017	19 January 2018
6. Results for surface waters monitoring conducted in accordance with the Surface Waters Monitoring Program for suspended solids, turbidity and electrical conductivity are compliant with the CPESC derived interim water quality characteristic limits during the life of the TEP.	01 July 2017	30 June 2018
7. Results of any additional monitoring demonstrate a reduction in SS, turbidity and EC contamination.	01 July 2017	30 June 2018
8. The review of the implemented measures includes a statement of compliance with the Surface Waters Management Plan.	30 Oct 2017	30 June 2018

Monitoring [section 331(h)]	Commencement date	Completion date
1. All monitoring must be undertaken by a suitably qualified person and water quality samples analysed at a NATA accredited laboratory	01 July 2017	ongoing
2. All water quality sampling must be undertaken in accordance with the Queensland's Government Monitoring and Sampling Manual 2009.	01 July 2017	ongoing
3. All erosion and sediment controls are to be monitored for sediment accumulation or damage in accordance with the program for maintenance as determined by the CPESC.	01 July 2017	ongoing
4. Surface Water quality samples must be collected from sample points in accordance with the surface Monitoring program at least in January, April, July and October of each year or in the event of no sample being obtainable in ephemeral systems at this time, during the next period of flow in the watercourse.	01 July 2017	ongoing

Reporting [section 331(h)]	Commencement date	Completion date
1. Quarterly progress report will be prepared detailing the actions taken, milestones achieved and the forecasted actions to be undertaken for the following 3 months, and will be provided to EHP by the end of each of the months July, October, January and April. Quarterly progress reports will also include any water quality monitoring results taken as part of the surface waters monitoring program and monitoring of CPESC endorsed measures.	31 July 2017	30 April 2018
2. A final report describing how the objectives of the TEP were achieved will be provided to EHP on or before 30 June 2018.	1 May 2018	30 June 2018

Declaration

As per section 481 of the *Environmental Protection Act 1994*, it is an offence to state anything to an authorised person that you know is false or misleading in a material particular or omit from a statement made to an authorised person anything without which the statement is, to your knowledge, misleading in a material particular.

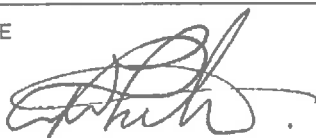
I declare that:

- I do solemnly and sincerely declare that the information provided is true and correct to the best of my knowledge. I understand that it is an offence under section 480 of the *Environmental Protection Act 1994* to give to the administering authority, or an authorised person, a document containing information that I know is false, misleading or incomplete in a material particular¹.
- I understand that information supplied on or with this application form may be disclosed publicly in accordance with the *Right to Information Act 2009* and the *Evidence Act 1977*.

INDIVIDUAL OR IF COMPANY, EXECUTIVE OFFICER NAME

Pat White

SIGNATURE

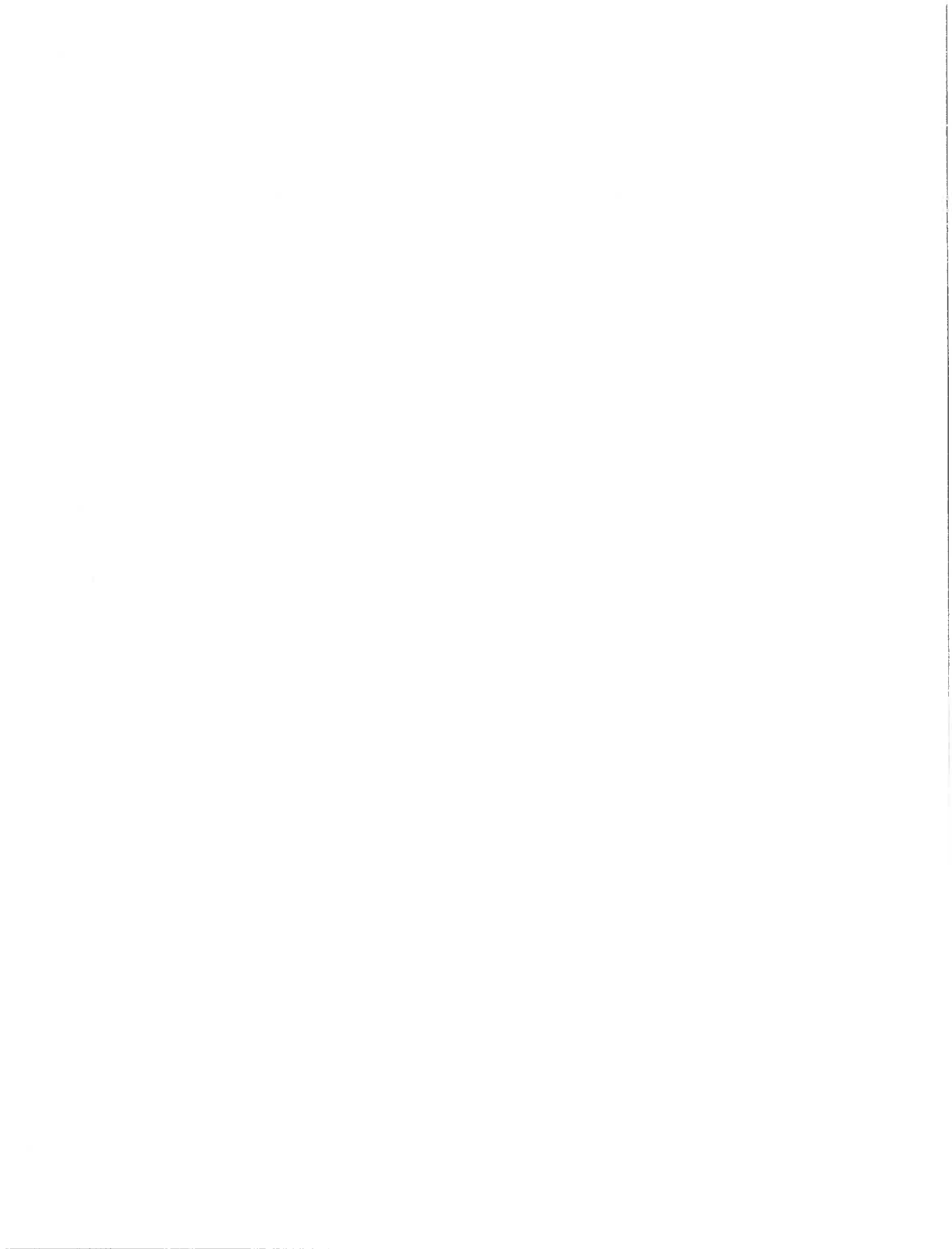


POSITION OF SIGNATORY (IF RELEVANT)

DIRECTOR INFRASTRUCTURE SERVICES

DATE

31 MAY 2017



Attachment 1 - Water Quality Results



Cairns Regional Council Water & Waste
Laboratory Services
38 MacNamara Street
MAHUNDA, QLD 4870
Australia

Tel: (07) 4044 8344
Fax: (07) 4044 8333
email: laboratory@cairns.qld.gov.au

Certificate of Analysis Final Report

Project No: 082752
Report ID: 21491

Attention: Amy Yates
Client: Mareeba Shire Council
Address: Kowa St
MAREEBA QLD 4880

Date Received: 18/01/2017 11:45am
Date Issued: 27-Jan-2017

The sample(s) referred to in this report were analysed by the following method(s):

Analysis	Method	Laboratory	NATA Accredited
Anions	TPA280	Cairns Regional Council Water & Waste (Accreditation # 14206)	✓
Biochemical Oxygen Demand	TPM100	Cairns Regional Council Water & Waste (Accreditation # 14206)	✓
Chemical Oxygen Demand	TPM110	Cairns Regional Council Water & Waste (Accreditation # 14206)	✓
Dissolved Oxygen	TPP171	Cairns Regional Council Water & Waste (Accreditation # 14206)	✓
ICPMS Metals - Total	TPC015	Cairns Regional Council Water & Waste (Accreditation # 14206)	✓
ICPOES Metals - Total	TPC360	Cairns Regional Council Water & Waste (Accreditation # 14206)	✓
Free Nutrients	TPA200 / 371 / 372 / 373	Cairns Regional Council Water & Waste (Accreditation # 14206)	✓
EC, pH, Alkalinity, Turbidity, VFA	TPP030 / 050 / 010 / 090 / TPM140	Cairns Regional Council Water & Waste (Accreditation # 14206)	✓
Solids - Total Dissolved	TPP060	Cairns Regional Council Water & Waste (Accreditation # 14206)	✓
Solids - Volatile & Suspended	TPP060	Cairns Regional Council Water & Waste (Accreditation # 14206)	✓
BTEX	EP080	Australian Laboratory Services (Accreditation # 825)	✓
Hexavalent Chromium	EG050	Australian Laboratory Services (Accreditation # 825)	✓
Organochlorine Pesticides	EP088A	Australian Laboratory Services (Accreditation # 825)	✓
Organophosphate Pesticides	EP088B	Australian Laboratory Services (Accreditation # 825)	✓
Polycyclic Aromatic Hydrocarbons	EP075BWE	Australian Laboratory Services (Accreditation # 825)	✓
Total Petroleum Hydrocarbons	EP080/071	Australian Laboratory Services (Accreditation # 825)	✓

External Laboratory Analyses are included in the attached Report(s).

External Laboratory
Australian Laboratory Services
External Lab's Report Number
EB1701108

The result(s) in this report were authorised by:

Name	Title	Qualifications
Dr. Francoise Pieltain	Laboratory Coordinator	Ing Agr., Ph.D MRACI C Chem
Melissa Aalbers	Scientist (Chemistry)	B. Sc (Chemistry/Zoology) MRACI CChem
Mark Buller	Scientist (Chemistry)	undertaking B. Sc.

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Principal Contact for this Report:

Dr. Francoise Pieltain
Laboratory Coordinator
Ing Agr., Ph.D MRACI C Chem

Pieltain



14206
On-site &
Off-site
Accredited for
compliance with
ISO / IEC 17025.



Client: Mareeba Shire Council

Project No: 082752

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Date Issued: 27-Jan-2017

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LRN: 436460

Date Sampled: 18-01-2017 7:30am

Mareeba LF - Surface Water

Received at Lab: 18-01-2017 11:49am

Method	Analyte	Result	LOR	Guideline	Date Started
Organics					
43646 BTEX	Benzene	<1 µg/L			
BTEX	Toluene	<2 µg/L			
BTEX	Ethylbenzene	<2 µg/L			
BTEX	meta- & para-Xylene	<2 µg/L			
BTEX	ortho-Xylene	<2 µg/L			
BTEX	Total Xylenes	<2 µg/L			
BTEX	Sum of BTEX	<1 µg/L			
BTEX	Naphthalene	<5 µg/L			
43646 Organophosphate Pesticides	Dichlorvos	<0.5 µg/L			
Organophosphate Pesticides	Demeton-S-methyl	<0.5 µg/L			
Organophosphate Pesticides	Monocrotophos	<2.0 µg/L			
Organophosphate Pesticides	Dimethoate	<0.5 µg/L			
Organophosphate Pesticides	Diazinon	<0.5 µg/L			
Organophosphate Pesticides	Chlorpyrifos-methyl	<0.5 µg/L			
Organophosphate Pesticides	Parathion-methyl	<2.0 µg/L			
Organophosphate Pesticides	Malathion	<0.5 µg/L			
Organophosphate Pesticides	Fenthion	<0.5 µg/L			
Organophosphate Pesticides	Chlorpyrifos	<0.5 µg/L			
Organophosphate Pesticides	Parathion	<2.0 µg/L			
Organophosphate Pesticides	Pirimphos-ethyl	<0.5 µg/L			
Organophosphate Pesticides	Chlorfenvinphos (Z)	<0.5 µg/L			
Organophosphate Pesticides	Bromophos-ethyl	<0.5 µg/L			
Organophosphate Pesticides	Fenamiphos	<0.5 µg/L			
Organophosphate Pesticides	Prothiofos	<0.5 µg/L			
Organophosphate Pesticides	Ethion	<0.5 µg/L			
Organophosphate Pesticides	Carbophenothion	<0.5 µg/L			
Organophosphate Pesticides	Azinphos Methyl	<0.5 µg/L			
43646 Organochlorine Pesticides	α/phe-BHC	<0.5 µg/L			
Organochlorine Pesticides	Hexachlorobenzene (HCB)	<0.5 µg/L			
Organochlorine Pesticides	beta-BHC	<0.5 µg/L			
Organochlorine Pesticides	gamma-BHC	<0.5 µg/L			
Organochlorine Pesticides	delta-BHC	<0.5 µg/L			

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LRN: 438460

Date Sampled: 18-01-2017 7:30am

Received at Lab: 18-01-2017 11:49am

Mareeba LF - Surface Water

Method	Analyte	Result	LOR	Guideline	Date Started
438460 Organochlorine Pesticides	Heptachlor	<0.5 µg/L			
Organochlorine Pesticides	Aldrin	<0.5 µg/L			
Organochlorine Pesticides	Heptachlor epoxide	<0.5 µg/L			
Organochlorine Pesticides	trans-Chlordane	<0.5 µg/L			
Organochlorine Pesticides	alpha-Endosulfan	<0.5 µg/L			
Organochlorine Pesticides	cis-Chlordane	<0.5 µg/L			
Organochlorine Pesticides	Dieldrin	<0.5 µg/L			
Organochlorine Pesticides	4,4'-DDE	<0.5 µg/L			
Organochlorine Pesticides	Endrin	<0.5 µg/L			
Organochlorine Pesticides	beta-Endosulfan	<0.5 µg/L			
Organochlorine Pesticides	4,4'-DDD	<0.5 µg/L			
Organochlorine Pesticides	Endrin aldehyde	<0.5 µg/L			
Organochlorine Pesticides	Endosulfan sulfate	<0.5 µg/L			
Organochlorine Pesticides	4,4'-DDT	<2.0 µg/L			
Organochlorine Pesticides	Endrin ketone	<0.5 µg/L			
Organochlorine Pesticides	Methoxychlor	<2.0 µg/L			
Organochlorine Pesticides	Total Chlordane (sum)	<0.5 µg/L			
Organochlorine Pesticides	DDT (total)	<0.5 µg/L			
438465 Polycyclic Aromatic Hydrocarbons	Naphthalene	<1.0 µg/L			
Polycyclic Aromatic Hydrocarbons	Acenaphthylene	<1.0 µg/L			
Polycyclic Aromatic Hydrocarbons	Acenaphthene	<1.0 µg/L			
Polycyclic Aromatic Hydrocarbons	Fluorene	<1.0 µg/L			
Polycyclic Aromatic Hydrocarbons	Phenanthrene	<1.0 µg/L			
Polycyclic Aromatic Hydrocarbons	Anthracene	<1.0 µg/L			
Polycyclic Aromatic Hydrocarbons	Fluoranthene	<1.0 µg/L			
Polycyclic Aromatic Hydrocarbons	Pyrene	<1.0 µg/L			
Polycyclic Aromatic Hydrocarbons	Benz(a)anthracene	<1.0 µg/L			
Polycyclic Aromatic Hydrocarbons	Chrysene	<1.0 µg/L			
Polycyclic Aromatic Hydrocarbons	Benzo(b)fluoranthene	<1.0 µg/L			
Polycyclic Aromatic Hydrocarbons	Benzo(k)fluoranthene	<1.0 µg/L			
Polycyclic Aromatic Hydrocarbons	Benzo(a)pyrene	<0.5 µg/L			
Polycyclic Aromatic Hydrocarbons	Indeno(1,2,3-cd)pyrene	<1.0 µg/L			
Polycyclic Aromatic Hydrocarbons	Dibenz(a,h)anthracene	<1.0 µg/L			
Polycyclic Aromatic Hydrocarbons	Benzo(g,h,i)perylene	<1.0 µg/L			

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LRN: 436460

Date Sampled: 18-01-2017 7:30am

Received at Lab: 18-01-2017 11:49am

Mareeba LF - Surface Water

Method	Analyte	Result	LOR	Guideline	Date Started
436405 Polycyclic Aromatic Hydrocarbons	Sum of PAHs	<0.5 µg/L			
Polycyclic Aromatic Hydrocarbons	Benzo(a)pyrene TEQ(WHO)	<0.5 µg/L			
436405 Total Petroleum Hydrocarbons	C6 - C8 Fraction	<20 µg/L	<20		
Total Petroleum Hydrocarbons	C10 - C14 Fraction	<50 µg/L	<50		
Total Petroleum Hydrocarbons	C15 - C28 Fraction	120 µg/L	<100		
Total Petroleum Hydrocarbons	C29 - C36 Fraction	<50 µg/L	<50		
Total Petroleum Hydrocarbons	^ C10 - C36 Fraction (sum)	120 µg/L	<50		
Metals					
436451 ICPOES Metals - Total	Calcium	4.7 mg/L	<0.20		20-01-2017
436453 Hexavalent Chromium		<0.01 mg/L			
436454 ICPMS Metals - Total	ICPMS Cadmium	<0.001 mg/L	<0.001		18-01-2017
ICPMS Metals - Total	ICPMS Copper	0.029 mg/L	<0.01		19-01-2017
ICPMS Metals - Total	ICPMS Lead	0.036 mg/L	<0.01		19-01-2017
ICPMS Metals - Total	ICPMS Manganese	0.653 mg/L	<0.01		19-01-2017
ICPMS Metals - Total	ICPMS Zinc	0.094 mg/L	<0.05		19-01-2017
436454 ICPOES Metals - Total	ICPOES Iron	38.1 mg/L	<0.2		20-01-2017
General Chemistry					
436452 Dissolved Oxygen		4.9 mg/L	<0.1		18-01-2017
436451 Chemical Oxygen Demand		30 mg/L	<25		20-01-2017
436451 Biochemical Oxygen Demand	BOD	6.7 mg/L	<2		18-01-2017
436451 Solids - Total Dissolved	Total Dissolved Solids	980 mg/L	<1		19-01-2017
Physical Properties					
436451 EC, pH, Alkalinity, Turbidity, VFA	Electrical Conductance	170 uS/cm	<1		18-01-2017
EC, pH, Alkalinity, Turbidity, VFA	pH	7.6	<0.1		18-01-2017
EC, pH, Alkalinity, Turbidity, VFA	Bicarbonate Alkalinity	44 mg CaCO3 / L	<1.5		18-01-2017
EC, pH, Alkalinity, Turbidity, VFA	Carbonate Alkalinity	<1.5 mg CaCO3 / L	<1.5		18-01-2017
EC, pH, Alkalinity, Turbidity, VFA	Total Alkalinity	44 mg CaCO3 / L	<1.5		18-01-2017
Nutrients and Anions					
436451 Anions	Sulphate	3.4 mg/L	<1		18-01-2017
Anions	Chloride	21 mg/L	<0.1		18-01-2017
436451 Free Nutrients	Ammonia	0.24 mg/L N	<0.02		20-01-2017
Free Nutrients	Total Oxidised Nitrogen	0.75 mg/L N	<0.01		20-01-2017

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Mareeba LF - Surface Water

Date Sampled: 18-01-2017 7:30am

Received at Lab: 18-01-2017 11:49am

Method	Analyte	Result	LOR	Guideline	Date Started
LRN: 436466					
Mareeba LF - Sediment Pond					
Date Sampled:	18-01-2017 7:30am				
Received at Lab:	18-01-2017 11:49am				

Method	Analyte	Result	LOR	Guideline	Date Started
General Chemistry					
436467 Solids - Volatile & Suspended	Total Suspended Solids	28 mg/L	<1		18-01-2017
436468 Dissolved Oxygen		0.1 mg/L	<0.1		18-01-2017
Physical Properties					
436467 EC, pH, Alkalinity, Turbidity, VFA	Electrical Conductance	240 µS/cm	<1		18-01-2017
EC, pH, Alkalinity, Turbidity, VFA	pH	7.4	<0.1		18-01-2017
EC, pH, Alkalinity, Turbidity, VFA	Turbidity	31 NTU	<0.1		18-01-2017

Explanatory Notes for this Project

Responsibility for sampling lies with the CUSTOMER. Samples analysed as received.

[illegible]

Attachment 2 Risk Assessments



Mareeba
SHIRE COUNCIL

Environmental Risk Assessment - Use this form to risk assess any activity proposed to be conducted onsite that does not have a procedure developed for it.

Completed By: Amy Yates	Unit: Infrastructure Services
Date: 04/05/17	Location: Kowa St Depot

Activity: Mareeba Landfill
Aspect of Environmental Concern (stormwater, odour, waste management, land contamination, water quality, noise etc): Noncompliance with EA - Surface Waters Monitoring Program
Impact: Unable to measure potential for environmental harm in the receiving waters and therefore unable to determine appropriate level of environmental protection measures onsite.
Service Delivery Standard (eg environmental licence, MSC std): Environmental Authority

Assessment (please circle):

Likelihood	Consequence				
	Insignificant -1	Minor 2	Moderate 3	Major 4	Catastrophic 5
E Almost Certain	Moderate	High			
D Likely	Moderate	High	High		
C Possible	Low	Moderate	High		
B Unlikely	Low	Low	Moderate	High	
A Rare	Low	Low	Moderate	High	High

Likelihood	Descriptor
A	Rare
B	Unlikely
C	Possible

D	Likely
E	Almost Certain

Consequence	Descriptor	Guide
1	Insignificant	Little to no disruption to neighbours or habitat
2	Minor	Temporary, no lasting impact, very small area of impact.
3	Moderate	Nuisance caused to neighbours and habitat, noticeable disturbance caused, some costs associated with clean up.
4	Major	Nuisance to material environmental harm, maybe reversible damage with intervention, costs associated with clean up, large area of disturbance, limited health impacts to neighbours or flora and fauna, fish kill.
5	Catastrophic	Material to serious environmental harm, irreversible change to environment, health impacts on neighbours and flora and fauna, fish kill.

Control Measures Proposed:

To develop and implement a program to establish the reference quality of surface waters and to detect any impact on surface waters as a consequence of landfill operations and that provides for the development of proposed interim trigger levels by 30 November 2018 as per condition 3-W4. The program is to provide for monitoring and recording the quality of surface water for the quality characteristics nominated in the Environmental Authority for the months January, April, July and October (or if unobtainable during the next period of flow of the watercourse).

Authorised:

Date:

Inductee Sign Off:

Date:



Environmental Risk Assessment - Use this form to risk assess any activity proposed to be conducted onsite that does not have a procedure developed for it.

Completed By: Amy Yates	Unit: Infrastructure Services
Date: 04/05/17	Location: Kowa Street Depot
Activity: Mareeba Landfill	
Aspect of Environmental Concern (stormwater, odour, waste management, land contamination, water quality, noise etc): • Noncompliance with conditions 3-W2, 3-W3, 3-W5. • Stormwater contamination downstream by sediment laden waters	
Impact: Deposit of sediment in receiving waters Temporary loss of water quality and habitat quality in receiving waters Erosion onsite requires rehabilitation.	
Service Delivery Standard (eg environmental licence, MSC std): 1. Environmental Authority (SS<50mg/L) 2. Site Based Management Plan (procedure WAS-P10 Preventing adverse changes to aquatic water quality caused by discharge of contaminated stormwater runoff; and Preventing the release of stormwater runoff to any waters, roadside gutters or stormwater drains that has been in contact with contaminants.)	

Assessment (please circle):

Likelihood	Consequence				
	Insignificant -1	Minor 2	Moderate 3	Major 4	Catastrophic 5
E Almost Certain	Moderate	High	Very High	Very High	Very High
D Likely	Moderate	High	High	Very High	Very High
C Possible	Low	Moderate	High	Very High	Very High
B Unlikely	Low	Low	Moderate	High	Very High
A Rare	Low	Low	Moderate	High	High

Likelihood	Descriptor
A	Rare
B	Unlikely
C	Possible
D	Likely
E	Almost Certain

Consequence	Descriptor	Guide
1	Insignificant	Little to no disruption to neighbours or habitat
2	Minor	Temporary, no lasting impact, very small area of impact.
3	Moderate	Nuisance caused to neighbours and habitat, noticeable disturbance caused, some costs associated with clean up.
4	Major	Nuisance to material environmental harm, maybe reversible damage with intervention, costs associated with clean up, large area of disturbance, limited health impacts to neighbours or flora and fauna, fish kill.
5	Catastrophic	Material to serious environmental harm, irreversible change to environment, health impacts on neighbours and flora and fauna, fish kill.

Control Measures Proposed:	
Prepare a report on the completion of an investigation in accordance with ANZECC (2000) methodology, or any updated ANZECC guidelines into the potential for environmental harm for the surface waters water quality and trigger level exceedances.	
Engage a specialised environmental management consultancy that has specific site knowledge, a CPESC to advise and design, and who has specialist knowledge in water quality protection to:	
- Review the effectiveness of the current erosion and sediment control measures; and - Design and construct erosion and sediment control measures in a Surface Waters Management Plan including design drawings for construction, design reasoning behind the proposed suite of measures, and a program of works.	
Continue implementing and maintaining operational controls deemed appropriate by the CPESC.	
Using a flocculant in the sediment pond onsite or in the old borrow pit pond behind Baiada chicken abattoir as required.	

Authorised:

Date:

Inductee Sign Off:

Date:

