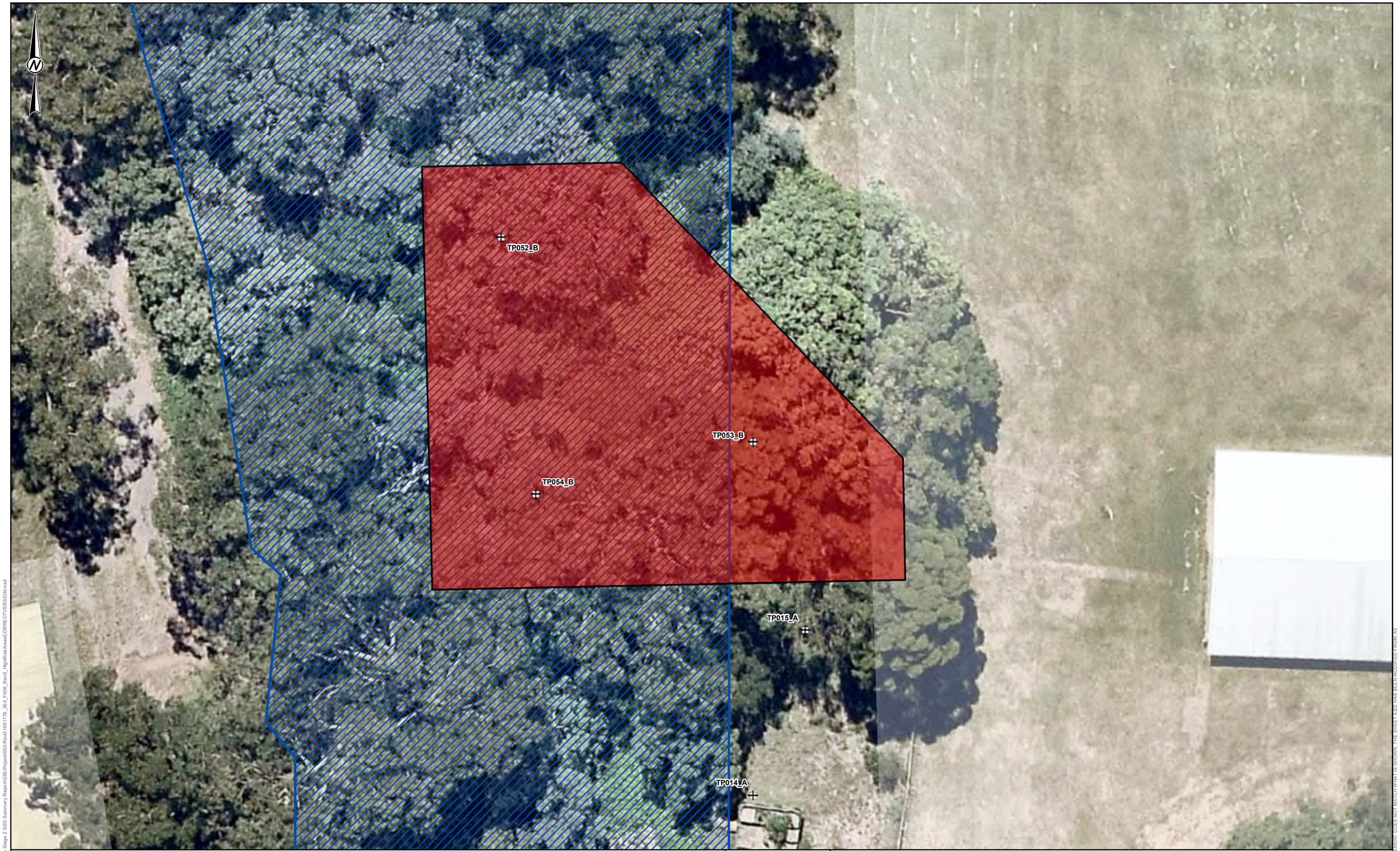


LEGEND

RAP Site Boundary

**Investigation Locations**

Test Pit

Vegetation exclusion area

**Stage 1 and 2 High Risk Areas**

Anthropogenic Fill (confirmed)

## NOTES

1. THE APPROXIMATE SITE BOUNDARY REPRESENTS THE SPATIAL EXTENT OF THE GOLDER POST PHASE 2 ESA PROJECT.

## REFERENCE

1. AERIAL PHOTOGRAPHY COPYRIGHT NEARMAP PTY LTD.

KEY MAP

CLIENT
TACTICAL GROUP

PROJECT
LAND PREPARATION WORKS – REMEDIATION ACTION PLAN

0 2.5 5 7.5 10 12.5
METRES

REFERENCE SCALE: 1:250 (at A3)

PROJECTION: GDA 1994 MGA Zone 56

TITLE
**HIGH RISK AREAS**

CONSULTANT
Golder Associates

| | |
|---|---|
| YYYY-MM-DD | 2016-08-08 |
| PREPARED | KJS / KB |
| DESIGN | - |
| REVIEW | GVS |
| APPROVED | GVS |

PROJECT No. 1651776 | CONTROL 003-R | Rev. 1 | FIGURE **006-G**

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM A3

25mm

0

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MW2007
MW2007
GA-HA01
GA-HA01
TP001_A
TP002_A
TP011_A
MW083
MW2006
MW2006
TP078_B
TP010_A
MW2008
MW2008
GA-SD005
GA-SW 01_GR
TP006_A
TP005_A
GA-S-001
GA-S-001
GA-HA02
GA-HA02
MW1B
MW1B
MW1A
TP115
MW2
TP004_A
TP009_A
GA-SW01
TP114
GA-HA03
GA-HA03
TP079_B
GA-CPT-3113
MW2002
MW2002
TP008_A
MW2004
MW2004
TP007_A
MW2003
MW2003
TP080_B
NOHC-MA1-Pit 3
TP024_B
TP081_B
NOHC-MA1-Pit 1
TP082_A
GA-S-008
GA-S-008

LEGEND

- RAP Site Boundary
- Other

**Investigation Locations**

- Vegetation exclusion area

- CPT
- Hand auger
- Grounwater Well
- Sediment
- Surface Scrape
- Test Pit

**Stage 1 and 2 High Risk Areas**

- Anthropogenic Fill (confirmed)

## NOTES

1. THE APPROXIMATE SITE BOUNDARY REPRESENTS THE SPATIAL EXTENT OF THE GOLDER POST PHASE 2 ESA PROJECT.

## REFERENCE

1. AERIAL PHOTOGRAPHY COPYRIGHT NEARMAP PTY LTD.

KEY MAP

CLIENT
TACTICAL GROUP

PROJECT
LAND PREPARATION WORKS – REMEDIATION ACTION PLAN

0 5.5 11 16.5 22 27.5
METRES

REFERENCE SCALE: 1:500 (at A3)
PROJECTION: GDA 1994 MGA Zone 56

TITLE
**HIGH RISK AREAS**

CONSULTANT
Golder Associates

| | |
|---|---|
| YYYY-MM-DD | 2016-08-08 |
| PREPARED | KJS / KB |
| DESIGN | - |
| REVIEW | GVS |
| APPROVED | GVS |

PROJECT No. 1651776 | CONTROL 003-R | Rev. 1 | FIGURE **006-H**

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IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM A3

25mm
0

PB_BH21

PB_HA10
PB_HA10

TP103

CPT103A
CPT103

STPGC06
STPGC07
STPGC08
STPGC05
STPGC04
STPGC03
STPGC09
STPGC02
STPGC01

CPT103D
CPT103C
CPT103B

PB_HA14
PB_HA14

CPT-27
PB_TP35

LEGEND

RAP Site Boundary

**Investigation Locations**

- Borehole
- CPT
- Hand auger
- Test Pit

Vegetation exclusion area

**Stage 1 and 2 High Risk Areas**

Anthropogenic Fill (potential)

## NOTES

1. THE APPROXIMATE SITE BOUNDARY REPRESENTS THE SPATIAL EXTENT OF THE GOLDER POST PHASE 2 ESA PROJECT.

## REFERENCE

1. AERIAL PHOTOGRAPHY COPYRIGHT NEARMAP PTY LTD.

KEY MAP

CLIENT
TACTICAL GROUP

PROJECT
LAND PREPARATION WORKS – REMEDIATION ACTION PLAN

0 5.5 11 16.5 22 27.5
METRES

REFERENCE SCALE: 1:500 (at A3)
PROJECTION: GDA 1994 MGA Zone 56

TITLE
**HIGH RISK AREAS**

CONSULTANT
Golder Associates

| | |
|---|---|
| YYYY-MM-DD | 2016-08-08 |
| PREPARED | KJS / KB |
| DESIGN | - |
| REVIEW | GVS |
| APPROVED | GVS |

PROJECT No. 1651776 | CONTROL 003-R | Rev. 1 | FIGURE **006-I**

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM A3

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# APPENDIX B

## Field and Laboratory Quality Assurance and Quality Controls

# 1.0 FIELD AND LABORATORY QUALITY ASSURANCE AND QUALITY CONTROLS (QA/QC)

It is important that the data collected in the proposed site remediation validation program is of a quality suitable to meet the objectives of the validation works. Possible sources of error in the collection of soil and soil vapour data can arise in the collection, handling and analysis of samples. An effective field QA/QC program aims to minimise these sources of error and increase the reliability of the results.

## 1.1 Field Quality Assurance

The sampling fieldwork will be completed in accordance with Golder's standard operating procedures (SOPs).

Surface and sub-surface characteristics and field observations will be fully documented, including photographic records. Samples will be labelled in the field with a unique sample identification code using waterproof indelible ink. CoC documentation will be used for the transport of samples from the field to the laboratory.

## 1.2 Field Quality Control

QC samples for the proposed soil and groundwater sampling programs will include duplicate samples and (for soil) blank samples. Duplicate samples consist of media collected at the same place and time and split into two samples. Blank samples are artificial samples designed to monitor the introduction of artefacts into the equipment cleaning and sample handling process.

The following duplicate and blank samples will be collected:

- ***Inter-laboratory duplicates (soil, groundwater and vapour)***: Individual samples are split into two sub portions in the field and placed into two separate containers. One sample is sent to the primary project laboratory and the other sample to an independent, secondary, check laboratory. The purpose of the inter-laboratory duplicates is to assess the analytical accuracy of the primary project laboratory and other factors including sampling methodology and the heterogeneity of the sample medium. Inter-laboratory samples will be collected and analysed at a rate of no less than 1 in 20 of total samples analysed.
- ***Intra-laboratory duplicates (soil, groundwater and vapour):*** Individual samples are split into two sub portions in the field and placed into two separate containers. Both samples are forwarded to the primary project laboratory with no communication on the relationship between the duplicate and the primary sample. The purpose of the intra-laboratory duplicates is to assess the analytical accuracy of the laboratory process and other factors including sampling methodology and the heterogeneity of the sample medium. Intra-laboratory soil and soil vapour samples should be collected and analysed at a rate of no less than 1 in 10 of total samples analysed.
- ***Equipment Blanks (soil and groundwater):*** These samples are prepared from the collection of the rinsate water used to complete the final rinse of the sampling equipment following decontamination. The collected water is then transferred to an appropriate sample bottle. Equipment blanks are a check on the equipment and decontamination process. A minimum of one equipment blank should be collected per day (when sampling is being undertaken) for the duration of the project.
- ***Trip Blanks (soil and groundwater):*** Trip blanks should be included in each batch where TPH ($C_6$ to $C_9$) and BTEX are being analysed in soil and groundwater.

## 1.3 Laboratory Quality Control

Laboratory analyses should be conducted in accordance with the standard test methods outlined in NEPC (2013) NEPM. The Practical Quantification Limits (PQLs) should be established at levels below the site adopted validation criteria. Laboratories selected for analysis are to be NATA Australia accredited for the analyses required.

Laboratory quality control procedures typically include analysis of the following:

- ***Laboratory duplicate samples:*** The laboratory collects duplicate sub-samples from a sample submitted for analysis. Analysis of these duplicate pairs is completed at a rate of 1 sample per 20 samples submitted for analysis, or one sample per batch. The purpose of the laboratory duplicate is to assess the analytical precision (repeatability) of the test result.
- ***Spiked samples:*** Samples submitted to the laboratory are spiked by adding a volume of known concentration of the target analyte prior to extraction and analysis. A spike documents the effect of the sample matrix on the extraction and analytical techniques.
- ***Surrogate spikes:*** Samples submitted to the laboratory are spiked with an organic compound, which is similar to the analyte of interest in terms of chemical composition and extractability. These organic compounds are not normally found in environmental samples. The surrogates spiked samples are used to assess if any gross error has occurred during a particular stage of the test method.
- Reported percent for continuing calibration verifications (CCV) samples for summa canisters for vapour samples.

## 1.4 Assessment of Quality Control

The validity of all analytical data will be performed in general accordance with:

- USEPA (June 2008). USEPA Contract Laboratory Program National Functional Guidelines for Organic Methods Data Review, EPA-540-R-08-01.

Accuracy and precision measurements from the appropriate QC check samples will be compared with the analytical Data Quality Objectives (DQOs) to assess the quality of the analytical data. Should data be found to fall outside acceptable limits of precision and accuracy, appropriate corrective actions will be implemented.

### 1.4.1 Field QC

An assessment of field quality control samples is completed by calculating the relative percent difference of duplicate samples.

The relative percent difference (RPD) of each duplicate set is calculated to assess overall precision, where:

$$\mathrm{RPD} = (C1 - C2)/((C1 + C2)/2)) \times 100\%$$

where; C1 = primary sample concentration C2 = duplicate sample concentration

Guidelines for the assessment of quality control results are provided in the NEPC (1999) NEPM. An acceptable RPD limit is 30%, however, this can be expected to be higher for concentrations near the PQL. A result exceeding this guideline does not necessarily mean that the data is invalid, but rather the effect of the difference needs to be considered.

### 1.4.2 Laboratory QC

Assessment of laboratory QC is undertaken internally by the laboratory. Laboratory QC includes:

- Relative Percent Differences – assessed as described above, but between internal laboratory duplicate pairs;
- Percent Recovery (PR) is used to assess the accuracy, where:

$$\mathrm{PR} = \frac{CS - C}{S} \times 100\%$$

where; CS = spiked sample result C = sample result S = spike added.

### 1.4.3 Field Methods

#### *Sample Labelling*

The sample labels will include the sample identification number, place of collection, date of collection and initials of the sampling personnel. Each sample will be labelled with a unique sample identification number that will facilitate tracking and cross referencing of sample information.

Soil samples should be identified and labelled in the format of VX_Y.Y-Y.Y_date, where X is the soil validation sample location number, Y.Y is sample interval depth (m bgl) and 'date' is the sampling date. QAQC samples should be identified and labelled in the format of QC1XX and QC2XX for intra- and inter-laboratory duplicate samples, respectively, where XX is the sequential QAQC number.

#### *Field Logs*

A summary of activities performed at the site will be recorded in a field log book. Entries for each day will commence on a new page, which will be dated. Corrections will be made by marking through the error with a single line, to remain legible, and initialling this action followed by writing the correction.

The following types of information will be recorded for each sample collected:

- Unique sample identification number;
- Date of sample collection;
- Initials of the sampling personnel;
- Type of sample and sampling method;
- Analyses to be performed on sample; and
- Any other relevant comments (odour, colour, sheen, etc).

The following types of information will be recorded for each soil vapour well installed:

- Weather conditions;
- Date of installation;
- Type of equipment used;
- Length of time to complete the installation;
- Depth of the well;
- Well installation geological bore log;
- Well construction log; and
- Any other relevant comments.

#### *Chain of Custody Records*

Chain-of-Custody (CoC) records will be used to track samples from the time of collection to the arrival of samples at the laboratory. Each sample container being shipped to the laboratory will contain a CoC form. The laboratory, upon receiving the samples, will complete the remaining sample receipt fields and will return a completed CoC to Golder along with the data deliverables package.

#### *Sample Containers and Handling*

Samples will be placed in appropriate sample containers with the appropriate preservative, labelled and properly sealed. Samples will be cushioned within the shipping coolers by the use of bubble pack wrapping. Samples will be kept cool by the use of sealed plastic bags of ice or similar means.

Samples will be shipped to the project laboratory by commercial courier or delivered by hand. The coolers will be sealed, stored in a secure location, and then picked up by the courier or hand delivered on the same or next business day. A security seal will be placed over the lid on the front and back of each shipping cooler. The seal will secure the lid and provide evidence that the samples have not been tampered with en-route to the contracted laboratory.

Once used for sampling, vapour sample containers (6 L Summa canisters) will be sealed and vacuum pressure recorded on the COC. The containers will be couriered to the analytical laboratory.

Upon receipt of the sample containers by the laboratories, the designated custodian will inspect the samples. The sample custodian will note the condition of the samples and seal on the CoC form. The sample custodian will then check the contents against the information noted on the CoC form. If damage or discrepancies are observed, the discrepancies will be duly recorded in the remarks column of the CoC form. The form will then be signed and dated.

All samples will be analysed within analytical holding times.

### *Equipment Calibration*

Equipment used to perform testing or data recording (including the field portable PID) will be calibrated to the manufacturer's specifications by the supplier prior to use. The calibration records will be retained by the field scientist/engineer. Calibration checks and adjustments will be performed as required during field operations. The identification of the specific device or equipment calibrated, date, reference standard, results or adjustments made and the signature of the person performing the calibration will be documented on field data sheets.

### *Equipment Decontamination*

Decontamination of sampling equipment including sampling trowels, hand augers, shovels and augers is conducted to minimise the potential for contamination between sampling locations and cross contamination of samples. Decontamination of equipment is to be completed prior to coming on-site and after contact with potentially contaminated materials.

During decontamination procedures, nitrile (or equivalent) gloves are to be worn throughout and replaced as needed.

Decontamination of sampling equipment (hand augers, sampling trowels etc.) generally follows the procedures outlined below:

- Decontaminate two buckets with clean water, rinse with phosphate-free detergent (Decon 90), and thoroughly rinse again with clean water;
- Fill the first bucket with detergent and clean water;
- Fill the second bucket with clean water;
- Scrape or brush off any soil/product adhering to equipment;
- Clean equipment in detergent water; and
- Rinse twice in the clean water.

Following the final rinse, equipment will be visually inspected to verify that it is free of material that could contribute to possible cross contamination.

# APPENDIX C

## Tier 1 Soil and Groundwater Assessment Criteria

# 1.0 TIER 1 SOIL CRITERIA

Guidance on the assessment of contaminant concentrations on sites is presented in the *National Environment Protection (Assessment of Site Contamination) Measure 1999* (NEPC 2013), herein referred to as the ASC NEPM (NEPC, 2013). Exposure settings considered in the ASC NEPM (NEPC, 2013) are low and high density residential; recreational/open space; and commercial / industrial land uses.

As the site is predominately proposed for commercial / industrial purposes it is considered appropriate to compare the results of soil analysis against the investigation levels for commercial / industrial land. The western portion of the site, immediately adjacent to the Georges River, will be retained and rehabilitated as a natural riparian / conservation zone. At this stage it is not clear if public access to the riparian zone will be allowed. Should public access be allowed the health investigation levels for the recreational/open space exposure setting will be applied to the areas made available to the public.

The following health based criteria have been considered as assessment criteria:

- Health screening levels (HSLs) for petroleum hydrocarbons will be used to assess chronic human health risks of petroleum hydrocarbon impact via the vapour intrusion exposure pathway. The HSLs are also considered to be protective of direct contact. Soil HSLs are provided in the ASC NEPM 2013 for a variety of exposure settings based on land use, depth of impact and soil type. Table 1A(3) in Schedule B1 of ASC NEPM 2013 presents HSLs for the F1 ($C_6$-$C_{10}$) and F2 (>$C_{10}$-$C_{16}$) hydrocarbon fractions and for benzene, toluene, ethylbenzene, xylene and naphthalene (BTEXN). HSLs for F1 and F2 exclude BTEX and naphthalene concentrations respectively. Where appropriate, the health risk of potential exposure via direct contact for F3 (>$C_{16}$-$C_{34}$) and F4 (>$C_{34}$-$C_{40}$) hydrocarbon fractions will be assessed against guidance provided in CRC 2011;
- Health investigation levels (HILs) are generic assessment criteria for a range of metals and organic substances designed to be used in the first stage of the assessment of potential risks to human health from chronic exposure to contaminants. Table 1A(1) in Schedule B1 of ASC NEPM 2013 presents the HILs, which are generic to all soil types; and
- The ASC NEPM (NEPC, 2013), provides HSL for asbestos in soil, which are based on scenario specific likely exposure levels adopted from the Western Australia Department of Health (WA DoH) *Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia* (WA DoH, 2009). Table 7 in Schedule B1 of ASC NEPM 2013 presents the HSLs for asbestos contamination in soil.

Although the majority of the site will be converted to terrestrial ecosystem of limited value (i.e. a commercial/ industrial development), in accordance with Section 2.5.3 in Schedule B1 of the ASC NEPM 2013, consideration should also be given to the ecological investigation levels (EILs) within commercial/industrial land uses and EILs have been derived for commercial/industrial land uses. Furthermore, EILs have been derived for areas of ecological significance, which are considered to be areas where the planning provisions or land use designation is for the primary intention of conserving and protecting the natural environment, and include areas designated conservation areas (ASC NEPM, 2013). As the site is proposed for commercial/industrial purposes it is considered appropriate to compare the results of the soil analysis against the EILs for commercial/industrial land use, and in the riparian zone EILs derived for areas of ecological significance should also be considered. Therefore, the following ecological based criteria have been considered as assessment criteria:

- Ecological screening levels (ESLs) for selected petroleum hydrocarbon compounds and total petroleum hydrocarbon fractions are used for assessment of risk to terrestrial ecosystems. Table 1B(6) in Schedule B1 of NEPC 2013 presents the ESLs. ESLs are provided for coarse and fine soils under urban, residential and public open space, and commercial/ industrial land use scenarios. ESLs are relevant to the root zone and habitation zone in soil, corresponding to the top two metres of the finished level of a site;
- Generic ecological investigation levels (EILs) are provided for lead, arsenic, DDT and naphthalene. The generic EILs, which are presented in Table 1B(5) in Schedule B1 of NEPC 2013, are independent

of soil type. Site specific EILs for chromium (III), copper, nickel and zinc can be calculated from the sum of the ambient background concentration (ABC) of the contaminant and on the added contaminant limit (ACL), which is based on soil specific properties such as pH, cation exchange capacity (CEC) and clay content. The ABC can be determined by measuring the concentration in a soil sample collected at a reference site not impacted by the contaminant. Where a reference site cannot be determined the ABC can be estimated based on urban metal levels or the method from Hamon et al. (Hamon, 2004) as specified in NEPC 2013. Alternatively, where background concentrations cannot be determined, the ACL may be adopted as the EIL as a conservative measure;

The ASC NEPM, 2013 includes management limits (MLs) for petroleum hydrocarbon compounds, which are designed to avoid or minimise the potential effects of petroleum hydrocarbons such as formation of observable light non-aqueous phase liquids (LNAPL), fire and explosive hazards and effects on buried infrastructure e.g. penetration of, or damage to, in-ground services by hydrocarbons. Table 1B(7) in Schedule B1 of ASC NEPM 2013 presents the MLs. The application of the management limits requires consideration of the depth of building basements and services and depth to groundwater.

There are no current Australian guidelines for perfluorooctanic acid (PFOA) and perfluorooctanic sulfonate (PFOS) chemicals in soils, therefore the US EPA regional screening level (RSL) for residential soil will be adopted. It is suggested that the PFOA and PFOS criteria should be reviewed biannually as it is expected that revisions to the national standard and/or Australian criteria will be published within 12 months.

The adopted soil assessment criteria for commercial / industrial settings and recreational / open space settings is summarised in **Table C1** and **Table C2** below.

**Table C10: Summary of Adopted Commercial/Industrial Soil Assessment Criteria (mg/kg)**

| Analyte | HIL – D | HSL-D, Vapour Intrusion Sand 0-1m | HSL-D, Vapour Intrusion Sand 1-2m | ESL*- coarse | EIL^ | Mgt Limits# |
|---|---|---|---|---|---|---|
| **TRH** | | | | | | |
| F1 | - | 260 | 370 | 215* | - | 700 |
| F2 | - | NL/20,000+ | NL | 170* | - | 1,000 |
| F3 | - | NL/27,000+ | NL | 1,700 | - | 3,500 |
| F4 | - | NL/38,000+ | NL | 3,300 | - | 10,000 |
| **BTEXN** | | | | | | |
| Benzene | - | 3 | 3 | 75 | - | - |
| Toluene | - | NL/99,000+ | NL | 135 | - | - |
| Ethylbenzene | - | NL/27,000+ | NL | 165 | - | - |
| Total Xylenes | - | 230 | NL | 180 | - | - |
| Naphthalene | - | NL/11,000+ | NL | - | 370 | - |
| **Inorganics** | | | | | | |
| Arsenic | 3,000 | - | - | - | 160 | - |
| Cadmium | 900 | - | - | - | - | - |
| Chromium (VI) | 3,600 | - | - | - | - | - |
| Chromium (III) | - | - | - | - | 930 | - |
| Copper | 240,000 | - | - | - | 140 | - |
| Lead | 1,500 | - | - | - | 1,800 | - |
| Mercury (inorganic) | 730 | - | - | - | - | - |
| Nickel | 6,000 | - | - | - | 40 | - |

| | | | | | | |
|---|---|---|---|---|---|---|
| Zinc | 400,000 | - | - | - | 430 | - |
| **PAHs** | | | | | | |
| Total PAHs | 4,000 | - | - | - | - | - |
| Benzo(a)pyrene | - | - | - | 1.4 | - | - |
| Carcinogenic PAHs (as B[a]P TEQ)** | 40 | - | - | - | - | - |
| **Phenols** | | | | | | |
| Phenol | 240,000 | - | - | - | - | - |
| Pentachlorophenol | 660 | - | - | - | - | - |
| **OCPs** | | | | | | |
| DDT+DDE+DDD | 3,600 | - | - | - | - | - |
| Aldrin and dieldrin | 45 | - | - | - | - | - |
| Chlordane | 530 | - | - | - | - | - |
| Endosulfan | 2,000 | - | - | - | - | - |
| Endrin | 100 | - | - | - | - | - |
| Heptachlor | 50 | - | - | - | - | - |
| Methoxychlor | 2,500 | - | - | - | - | - |
| Hexachlorobenzene (HCB) | 80 | - | - | - | - | - |
| DDT | - | - | - | - | 640 | - |
| **OPPs** | | | | | | |
| Chlorpyrifos | 2,000 | - | - | - | - | - |
| **PCBs** | | | | | | |
| PCBs | 7 | - | - | - | - | - |
| **Asbestos** | | | | | | |
| Bonded ACM | 0.05% w/w | - | - | - | - | - |
| Friable Asbestos | 0.001% w/w | - | - | - | - | - |

Notes:
NL- non limiting
- No guideline available
+ HSLs for direct contact where HSL for vapour intrusion is NL adopted from CRC Care, 2011.
* ESLs are of low reliability except where indicated by * which indicates the ESL is of moderate reliability
**B[a]P TEQ – Benzo[a]pyrene toxicity equivalency quotient
TRH:

F1 = $C_6$-$C_{10}$ (for HSL and ESL subtract BTEX)
F2 = >$C_{10}$ – $C_{16}$ (for HSL subtract naphthalene)
F3 = >$C_{16}$ – $C_{35}$
F4 = >$C_{34}$ – $C_{40}$

# Management Limits are applied after consideration of relevant HSLs and ESLs
^ Calculated based on CSIRO NEPM EILS Calculation Workbook (http://www.scew.gov.au/node/941) with geo-mean of site wide CEC and pH data of 4.1 and pH of 6.8, respectively. And application of the workbook generic background contaminant concentrations with the site being in NSW and a high traffic environment.

**Table C11: Tier 1 Criteria Open Space Recreational Land Use and Areas of Ecological Significance**

| Analyte | HIL – C | HSL-C, Vapour Intrusion Sand 0-1m | ESL*- Urban residential and public open space | EIL^- Urban Residential and Public Open Space | EIL^ – Areas of Ecological Significance | Mgt Limits Residential, parkland and public open space# |
|---|---|---|---|---|---|---|
| **TRH** | | | | | | |
| F1 | - | NL/5,100+ | 180* | - | - | 700 |
| F2 | - | NL/3,800+ | 120* | - | - | 1,000 |
| F3 | - | NL/5,300+ | 300 | - | - | 2,500 |
| F4 | - | NL/7,400+ | 2,800 | - | - | 10,000 |
| **BTEXN** | | | | | | |
| Benzene | - | NL/120+ | 50 | - | - | - |
| Toluene | - | NL/18,000+ | 85 | - | - | - |
| Ethylbenzene | - | NL/5,300+ | 70 | - | - | - |
| Total Xylenes | - | NL/15,000+ | 105 | - | - | - |
| Naphthalene | - | NL/1,900+ | - | 170 | 10 | - |
| **Inorganics** | | | | | | |
| Arsenic | 300 | - | - | 100 | 40 | - |
| Cadmium | 90 | - | - | - | - | - |
| Chromium (VI) | 300 | - | - | - | - | - |
| Chromium (III) | - | - | - | | - | - |
| Copper | 17,000 | - | - | 100 | 55 | - |
| Lead | 600 | - | - | 1,100 | 470 | - |
| Mercury (inorganic) | 80 | - | - | - | - | - |
| Nickel | 1,200 | - | - | 25 | 8 | - |
| Zinc | 30,000 | - | - | 320 | 170 | - |
| **PAHs** | | | | | | |
| Total PAHs | 300 | - | - | - | - | - |
| Benzo(a)pyrene | - | - | 0.7 | - | - | - |
| Carcinogenic PAHs (as B[a]P TEQ)** | 3 | - | - | - | - | - |
| **Phenols** | | | | | | |
| Phenol | 40,000 | - | - | - | - | - |
| Pentachlorophenol | 120 | - | - | - | - | - |
| **OCPs** | | | | | | |
| DDT+DDE+DDD | 400 | - | - | - | - | - |
| Aldrin and dieldrin | 10 | - | - | - | - | - |
| Chlordane | 70 | - | - | - | - | - |
| Endosulfan | 340 | - | - | - | - | - |
| Endrin | 20 | - | - | - | - | - |
| Heptachlor | 10 | - | - | - | - | - |
| Methoxychlor | 400 | - | - | - | - | - |

| Analyte | HIL – C | HSL-C, Vapour Intrusion Sand 0-1m | ESL*- Urban residential and public open space | EIL^- Urban Residential and Public Open Space | EIL^ – Areas of Ecological Significance | Mgt Limits Residential, parkland and public open space# |
|---|---|---|---|---|---|---|
| Hexachlorobenzene (HCB) | 10 | - | - | - | - | - |
| DDT | - | - | - | 180 | 3 | - |
| **OPPs** | | | | | | |
| Chlorpyrifos | 250 | - | - | - | - | - |
| **PCBs** | | | | | | |
| PCBs | 1 | - | - | - | - | - |
| **Asbestos** | | | | | | |
| Bonded ACM | 0.02% w/w | - | - | - | - | - |
| Friable Asbestos | 0.001% w/w | - | - | - | - | - |

Notes:
NL- non limiting
- No guideline available
+ HSLs for direct contact where HSL for vapour intrusion is NL adopted from CRC Care, 2011.
* ESLs are of low reliability except where indicated by * which indicates the ESL is of moderate reliability
**B[a]P TEQ – Benzo[a]pyrene toxicity equivalency quotient
TRH:

F1 = $C_6$-$C_{10}$ (for HSL and ESL subtract BTEX)
F2 = >$C_{10}$ – $C_{16}$ (for HSL subtract naphthalene)
F3 = >$C_{16}$ – $C_{35}$
F4 = >$C_{34}$ – $C_{40}$

# Management Limits are applied after consideration of relevant HSLs and ESLs
^ Calculated based on CSIRO NEPM EILS Calculation Workbook (http://www.scew.gov.au/node/941) with geo-mean of site wide CEC and pH data of 4.1 and pH of 6.8, respectively. And application of the workbook generic background contaminant concentrations with the site being in NSW and a high traffic environment.

## 2.0 TIER 1 GROUNDWATER ASSESSMENT CRITERIA

The environmental values of groundwater below the site and in the receiving environment of the Georges River and Anzac Creek were considered in the selection of assessment criteria. The consideration of environmental values is summarised as follows:

- With the Project site to be developed for commercial/industrial use, and the surrounding areas serviced by a reticulated water network, the likelihood of groundwater being used for drinking water purposes is considered highly unlikely. Hence, the health-based criteria for the Australian Drinking Water Guidelines (ADWG, 2011) are not considered to be relevant;
- The environmental values of the Georges River, which is considered to be the primary receiving environment for groundwater discharge from the Project site, are considered to be the most relevant. Environmental values of surface water catchments in NSW are defined by water quality objectives (WQOs) for each catchment. A specific set of WQOs have been developed for the Georges River catchment, of which the *Water ways affected by urban development* WQOs are most relevant to the Project site. The WQOs are available at the following web link:

  (http://www.environment.nsw.gov.au/ieo/georgesriver/report-02.htm#P134_16430 – viewed on 24 October 2014).

  These include the protection of:

- Aquatic ecosystems;
- Visual amenity;
- Secondary contact recreation (identified as a short term objective, possibly achievable in 5 years); and
- Primary contact recreation (identified as a long term objective, possibly achievable in 10 years).

On the basis of the WQOs for the Georges River, the relevant assessment criteria for the RAP are considered to be:

- Australian and New Zealand Environment and Conservation Council and Agriculture and Resource Management Council of Australia and New Zealand (ANZECC, 2000) *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*;
- The National Health and Medical Research Council (NHMRC, 2008) *Guidelines for Managing Risks in Recreational Water; and*
- The National Environmental Protection Council (NEPC 2013) National Environmental Protection (Assessment of Site Contamination) Measure 1999 (ASC NEPM).

The ANZECC (2000), NHMRC (2008) and NEPC (2013) criteria are discussed in further detail in the following sections.

### 2.1.1 ANZECC 2000

The ANZECC (2000) guidelines provide trigger values for concentrations of organic and inorganic chemicals in freshwater and marine aquatic environments. The trigger values are generally conservative and contaminant concentrations below the trigger values can be assumed to present a negligible risk to environmental receptors. Where a trigger value is exceeded, it triggers the requirement for more detailed consideration of the potential risks represented by the exceedance. The ANZECC (2000) trigger values were originally developed to assess surface water quality, but they are also applied to groundwater quality at the point of discharge to a surface water environment.

For the purposes of the investigation, groundwater analytical results will be assessed relative to the ANZECC (2000) trigger values for 95% level of protection for fresh water. The 95% level of protection is intended for use in slightly to moderately disturbed environments, which is considered appropriate with regard to the Georges River WQOs.

Due to a lack of reliable data, 95% level of protection trigger levels have not been derived for several of the chlorinated hydrocarbons identified on the Project site. However, interim low reliability criteria have been listed and will be adopted for the following compounds ANZECC (2000);

- Vinyl Chloride (VC) – 100 μg/L;
- TCE – 330 μg/L; and
- 1.1 DCE – 700 μg/L.

### 2.1.2 NHMRC (2008) Assessment Criteria

With respect to chemicals in recreational waters, the NHMRC (2008) guidelines state (s 9.3):

> *Mance et al (1984) suggested that environmental quality standards for chemicals in recreational waters should be based on the assumption that recreational water makes only a relatively minor contribution to intake. They assumed a contribution for swimming of an equivalent to 10% of drinking water consumption. Since most authorities (including WHO) assume consumption of 2 litres of drinking water per day, this would result in an intake of 200 mL per day from recreational contact with water (WHO 2003). This provides for a simple screening approach in which a substance occurring in recreational*

*water at a concentration of 10 times that stipulated in the drinking water guidelines may merit further consideration.*

Hence, for the purpose of assessing risks related to primary contact recreation in Georges River, the groundwater data could be assessed relative to the health-based ADWG (2011) criteria with a factor of 10x applied to account for the limited ingestion potential relative to the drinking water exposure assumptions. However, for the purpose of this assessment this approach may be overly conservative as primary recreational contact (such as swimming) is indicated as a long-term, aspirational recreational activity within the portion of the Georges River in the immediate vicinity of the Project site, and consequently the exposure route (if any) is likely to be dermal rather than oral. Therefore, the method as described by the National Health and Medical Research Council (NHMRC, 2008) *Guidelines for Managing Risks in Recreational Water* are not considered to be relevant to the site.

### 2.1.3 ASC NEPM

The ASC NEPM (NEPC, 2013) incorporates the Health Screening Levels (HSLs) for petroleum hydrocarbons in groundwater based on levels derived by the Cooperative Research Centre for Contamination Assessment and Remediation of the Environment (CRC CARE) (CRC CARE, 2011). The HSLs include criteria for BTEX, naphthalene and unspeciated total recoverable hydrocarbons (TRH).

The HSLs for petroleum contaminants are based on assumed sources of impact being consistent with typical fresh (not weathered or degraded) Australian fuels. These are considered appropriate based on the ongoing use of petroleum contaminants on the Project site.

HSLs have also been derived for BTEX and naphthalene. These values may be used to assess risk from typical and atypical petroleum mixtures. In developing the HSLs for BTEX and naphthalene, they were initially derived independent of solubility and therefore independent of source mixture composition and the presence of other chemicals. It is therefore considered that the HSLs for BTEX and naphthalene can be used to screen the reported groundwater analysis data for assessment of suitability at the Project site.

The groundwater HSLs for vapour intrusion have been developed to assess chronic human health risks and do not consider issues such as aesthetics, explosion risks or environmental considerations. The groundwater HSLs, for vapour intrusion, are also considered to be protective of direct contact and the direct contact pathway has not been assessed separately. HSLs are provided for a variety of exposure settings, soil types and depths.

The groundwater HSL – D (commercial / industrial) is considered the most appropriate for the Project site, however the HSL-C (recreational / open space) should also be considered in the proposed portion of the Project site where public may be permitted to access the riparian zone.

The HSLs are dependent on soil type and depth to groundwater:

- ***Soil Type -*** The investigations completed on the Project site indicate a variety of soil types, therefore the most conservative soil type (sand) has been adopted.
- ***Depth -*** Groundwater beneath the Project site was intercepted at depths between 3 mbgl and 13 mbgl. Therefore, PB (2014b) adopted a depth of 2 - 4 mbgl as a conservative assessment value.

The adopted soil assessment criteria for commercial / industrial settings and recreational / open space settings is summarised in **Table C12** below.

**Table C12: Summary of Groundwater Investigation Levels**

| Analyte | HSL - D Commercial/ Industrial, Sand, 2 -<4 mbgl | HSL - C recreational / open space, Sand, 2 -<4 mbgl | ANZECC/ARMCANZ (2000) Freshwater, 95% |
|---|---|---|---|
| **TRH (µg/L)** | | | |
| F1 | 6,000 | NL | - |
| F2 | NL | NL | - |
| **BTEXN (µg/L)** | | | |
| Benzene | 5,000 | NL | 950 |
| Toluene | NL | NL | - |
| Ethylbenzene | NL | NL | - |
| *para*-xylene | - | - | 200 |
| *ortho*-xylene | - | - | 350 |
| Total xylenes | NL | NL | - |
| Naphthalene | NL | NL | 16 |
| **Inorganics (mg/L)** | | | |
| Arsenic | - | - | 0.013 |
| Cadmium | - | - | 0.0002 |
| Chromium | - | - | 0.001 |
| Copper | - | - | 0.0014 |
| Lead | - | - | 0.0034 |
| Nickel | - | - | 0.011 |
| Zinc | - | - | 0.008 |
| Mercury | - | - | 0.00006 |
| **PAHs (µg/L)** | | | |
| Benzo(a)pyrene | - | - | - |
| Naphthalene | NL | NL | 16 |
| **Phenols (µg/L)** | | | |
| Phenol | - | - | 320 |
| 2-Chlorophenol | - | - | 340 |
| 2.4-Dichlorophenol | - | - | 120 |
| 2.4.6-Trichlorophenol | - | - | 3 |
| Pentachlorophenol | - | - | 3.6 |
| 2,4-Dinitrophenol | - | - | 45 |
| 2,3,4,6-Tetrachlorophenol | - | - | 10 |
| **VOCs (µg/L)** | | | |
| Vinyl chloride | - | - | 100* |
| 1.1-Dichloroethene | - | - | 700* |
| Trichloroethene | - | - | 330* |
| 1.1.2-Trichloroethane | - | - | 6,500 |
| 1.2-Dichlorobenzene | - | - | 160 |
| 1.3-Dichlorobenzene | - | - | 260 |
| 1.4-Dichlorobenzene | - | - | 60 |

| Analyte | HSL - D Commercial/ Industrial, Sand, 2 -<4 mbgl | HSL - C recreational / open space, Sand, 2 -<4 mbgl | ANZECC/ARMCANZ (2000) Freshwater, 95% |
|---|---|---|---|
| 1.2.4-Trichlorobenzene | - | - | 170 |
| 1.2.3-Trichlorobenzene | - | - | 10 |
| **OCPs (µg/L)** | | | |
| DDT | - | - | 0.01 |
| Endrin | - | - | 0.02 |
| Lindane | - | - | 0.2 |
| Heptachlor | - | - | 0.09 |
| Chlordane | - | - | 0.08 |
| **OPPs (µg/L)** | | | |
| Chlorpyriphos | - | - | 0.01 |
| Diazinon | - | - | 0.01 |
| Dimethoate | - | - | 0.15 |
| Malathion | - | - | 0.05 |
| **Phthalates (µg/L)** | | | |
| Diethyl phthalate | - | - | 1,000 |
| Dimethyl phthalate | - | - | 3,700 |
| Di-n-butyl phthalate | - | - | 26 |
| **PCBs (µg/L)** | | | |
| Aroclor 1242 | - | - | 0.6 |
| Aroclor 1254 | - | - | 0.03 |
| **Anilines (µg/L)** | | | |
| Aniline | - | - | 250 |
| **Nitrobenzenes (µg/L)** | | | |
| Nitrobenzene | - | - | 550 |
| **Explosives (µg/L)** | | | |
| 2,4-Dinitrotoluene | - | - | 65 |

Notes:
NL- non limiting
- No guideline available
µg/L - Micrograms per litre
mg/L - Milligrams per litre
* Interim low reliability criteria
TRH:

F1 = $C_6$-$C_{10}$ (for HSL subtract BTEX)
F2 = >$C_{10}$ – $C_{16}$ (for HSL subtract naphthalene)
F3 = >$C_{16}$ – $C_{35}$
F4 = >$C_{34}$ – $C_{40}$

## 3.0 TIER 1 SOIL VAPOUR ASSESSMENT CRITERIA

Where available, soil vapour screening levels have been sourced from the amended NEPM (NEPC, 2013). The soil vapour HSLs for vapour intrusion HSL C (recreation / open space) and D (commercial / industrial land use) are considered the most appropriate for soil vapour analytical results. The HSLs are also soil type

and depth dependant. Based on the soil type encountered, a coarse soil type (sand) has been assumed. This is also the most conservative criteria.

The analytical results will also be initially screened against the interim soil vapour health investigation levels (HILs) for volatile organic chlorinated compounds (VOCCs) published in the ASC NEPM (NEPC, 2013) for recreational (i.e. open space) and commercial / industrial land uses (i.e. Tier 1 screening assessment). Should the vapour monitoring results be consistently below the published Tier 1 screening criteria, a passive management approach, such as the implementation of monitored natural attenuation and an environmental management plan, may be an appropriate response during the future development of the site.

Should the vapour monitoring results exceed the Tier 1 trigger values, the future management of the identified contamination may need to be supported by a Tier 2 quantitative human health risk assessment (HHRA). The approach taken for the quantitative assessment of human health risks would be in accordance with guidelines published by enHealth (2004)[8] and the ASC NEPM (NEPC, 2013), and would assess the long term risks of the identified contamination for workers on site based on the site specific conditions. This assessment would also help determine if an active management approach is required (i.e. remediation) and determine what site specific trigger values (SSTLs) need to be achieved through any future remediation or management actions.

The adopted investigation levels for the soil vapour investigation are summarised in Table C4.

**Table C13: Tier 1 Soil Vapour Criteria**

| Analyte | HSL-C Recreation / Open Space, 1-2m, Sand | HSL-D Commercial / Industrial, 1-2m, Sand |
|---|---|---|
| **TRH** | | |
| F1 | NL | 2,800 |
| F2 | NL | 2,400 |
| **BTEXN** | | |
| Benzene | 2,400 | 10 |
| Toluene | NL | 16,000 |
| Ethylbenzene | NL | 4,600 |
| Total Xylenes | NL | 3,200 |
| Naphthalene | NL | 15 |
| **VOCs*** | | |
| 1,1,1-Trichloroethane | 1200 | 230 |
| cis-1,2-Dichloroethene | 2 | 0.3 |
| Tetrachloroethene | 40 | 8 |
| Trichloroethene | 0.4 | 0.08 |
| Vinyl chloride | 0.5 | 0.1 |

Notes:
- No guideline available
NL: non-limiting
$mg/m^3$ - Milligrams per cubic metre
* Interim soil vapour health investigation levels for volatile organic compounds are independent of soil type and depth. Application of interim HILs is based on a measurement of shallow (0-1m) soil vapour (or deeper where the values are to be applied to a future building with a basement) or sub-slub soil vapour.
TRH:
F1 = $C_6$-$C_{10}$ (for HSL subtract BTEX)
F2 = >$C_{10}$ – $C_{16}$ (for HSL subtract naphthalene)

[8] Guidelines for Assessing Human Health Risks from Environmental Hazards (enHealth, June 2004).

# APPENDIX D

## Laboratory Detection Limits

## Laboratory Reporting Limits

The analytical Limit of Reporting (LOR) for chemicals which have been set as a driver for will be set below the assessment criteria using standard laboratory methodology and instrumentation. Where required, this will include requesting the provision of results with a lower LOR.

However it is recognised that there are a number of chemicals on the site where the proposed criteria are lower than the LOR, and where there are no criteria which may result in uncertainty as to whether a lower LOR is required for the purposes of the validation. There are circumstances where attaining a lower LOR may not be an economically viable or may not add further value to the understanding of the site conditions. For example, if a chemical is co-occurring with other chemicals that are drivers for remediation and therefore is likely to be remediated, further consideration of the chemical at that stage may not be required. Similarly, if a chemical has not been detected at the site and the secondary laboratory has a lower LOR and has also not detected the compound then further consideration may not be required.

The following will be considered with respect to whether lower LOR are required for individual chemicals or for a chemical group:

- is the chemical likely to be present in the soil? (i.e. was it used at the site or is it a breakdown product of known COI).
- has the chemical been detected elsewhere at the site and is it a driver for remediation?
- could a detection of this chemical highlight an area or chemical group which has not previously been identified as requiring remediation?
- if the chemical has not been detected by the primary laboratory, is the secondary laboratory LOR the same of higher?
- is the screening criteria based upon international guidelines?

Using the above screening approach, an assessment will be made as to whether the laboratory may be requested to provide results with a lower LOR, or a review of the appropriateness of the screening criteria may be required or derivation of Risk Based Criteria.

Analytical Methods and LORs for Australian Laboratory Services (ALS) are provided below and those compounds requiring a lower LOR have been highlighted in red. Should an alternative laboratory be adopted, the LORs specific to that laboratory need to be considered using the above mentioned strategy.

### ALS Analytical Methods - Soil Samples

| Parameter | Technique/ Method Reference | Limit of Reporting (mg/kg) (or as indicated) |
|---|---|---|
| Moisture | In-house | 1% |
| TPH (C6-C9) plus TRH(C6-C10) plus BTEXN | USEPA 3510/8015 GC/FID | 10 |
| TPH (C10-C36) plus TRH (>C10-C40) | | 50-100 |
| 8 Metals: As, Cd, Cr, Cu, Ni, Pb, Zn (including digestion) | USEPA 6010 ICP/AES | 1-5 |
| Mercury - Total Recoverable | APHA 3112 Hg-B CV/FIMS | 0.1 |
| PAH - Standard level | USEPA 3510/8270 | 0.5 |

| Parameter | Technique/ Method Reference | Limit of Reporting (mg/kg) (or as indicated) |
|---|---|---|
| OC Pesticides - Std level | | 0.05-0.2 |
| OP Pesticides - Std level | | |
| PCB - Standard level | USEPA 3510/8270 | 0.1 |
| 1:5 Water Leach (* denotes leach required) | In house | NA |
| Phenols - Std level | USEPA 3510/8270 | 0.5-1 |
| PFAS – Full Suite (28 analytes) | LC/MS-MS | 0.0002 – 0.001 |
| Full VOC Scan (includes VHC)* | USEPA 5030/8260 P&T/GC/MS | 0.2-5 |
| Full SVOC Target Scan | USEPA 3510/8270 | 0.5-5 |

## ALS Analytical Methods - Optional Asbestos Samples

| Parameter | Technique/ Method Reference | Limit of Reporting (mg/kg) (or as indicated) | Sample Size |
|---|---|---|---|
| **Asbestos - Quantitation per NEPM 2013 Guidelines** [NN] | | | |
| **Friable Asbestos** (FA+AF[1]) Weight and calculated % as Asbestos in Soil | AS 4964-2004 CRCCARE 2013 NEPM | 0.002g (0.001%) | 500mL (<1kg) pre-sieved to 7mm |
| **Free Fibres** - presence/absence. | | Absence/ Presence | |
| # Additional prep charge for sieving to 2mm (per additional 15 minutes or part thereof) | | | |
| **Bonded ACM** determination plus Asbestos estimation - on wet wt basis including (*Includes sieving to 7mm) plus d*escription & weights | AS 4964-2004 CRCCARE 2013 NEPM | 0.1g (0.01%) | 500mL (<1kg) **NOT** pre- sieved to 7mm |
| **Friable Asbestos** (FA+AF[1]) Weight and calculated % as Asbestos in Soil *plus* | | 0.002g (0.001%) | |
| **Free Fibres** - presence/absence. | | Absence/ Presence | |
| # Additional prep charge for sieving to 2mm (per additional 15 minutes or part thereof) | | | |
| Preparation of large soil samples for subsequent ACM determination | | | |
| Sieving of soil to 7mm for ACM determination | In house/NEPM 2013 | N/A | >1kg or 500ml |

[NN] ALS is accredited by NATA for EA200/AS4964, however this accreditation does not cover Estimates of Asbestos Weight, Dimensions or Percentage Asbestos.

## ALS Analytical Methods - Water Samples

| Parameter | Technique/ Method Reference | Limit of Reporting (mg/L) |
|---|---|---|

| | | (or as indicated) |
|---|---|---|
| pH (generally also performed in the field) | APHA 4500-$H^+$ B | 0.01 pH units |
| Alkalinity - Total as $CaCO_3$ | APHA 2320 B | 1 |
| Major Cations: Ca, Mg, Na, K | APHA 3120 | 1 |
| 8 Metals: As, Cd, Cr, Cu, Ni, Pb, Zn | USEPA 6020, ICP/MS | Cd: 0.0001<br>Zn: 0.005<br>Others: 0.001 |
| Hg | CV/FIMS/ICP/MS | 0.0001 |
| TPH (C6-C9), TRH(C6-C10)/BTEXN plus F1 & F2 | P&T/HS-GC/MS | 20 / 1-5 µg/L |
| TPH (C10-C36) plus TRH (>C10-C40) | USEPA 3510/8015 GC/FID | 50-100 |
| PAHs - Std level | GC/MS – SIM | 0.5-1µg/L |
| PFAS – Full Suite Low Level (28 analytes) | LC/MS-MS | 0.002-0.1 |
| VOC Scan (includes VHC)* | USEPA 5030/8260 P&T-GC/MS | 1-50 µg/L |
| SVOC Scan | USEPA 3510/8270 GC/MS | 2-20 |
| Total Nitrogen as N (incl. NOx & TKN) | APHA 4500 $N_{org}/NO_3$ | 0.1 |

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# Appendix F

# EP Risk; PFAS Stormwater Management Strategy, Moorebank Precinct West

# Per- and Poly-Fluoroalkyl Substances (PFAS) Stormwater Management Strategy

Moorebank Precinct West, Moorebank Ave, Moorebank, NSW

Prepared for: Qube Property Management Services Pty Ltd c/o Tactical Group Pty Ltd

EP0745.018 v2 11 March 2019

APPROVED COMPANY ISO 9001 Quality Management Systems QMS Certification Services

APPROVED COMPANY AS/NZS 4801 OH&S Management Systems QMS Certification Services

APPROVED COMPANY ISO 14001 Environmental Management Systems QMS Certification Services

EP RISK

11 March 2019
Ref: EP0745.018 v2

Qube Property Management Services Pty Ltd ('Qube') c/o Tactical Group Pty Ltd ('Tactical')
Level 15, 124 Walker Street
North Sydney NSW 2060
Via email: mhowley@tacticalgroup.com.au

Attention: Mark Howley

# Per- and Poly-Fluoroalkyl Substances Stormwater Management Strategy v2 Moorebank Precinct West, Moorebank Intermodal Terminal Development

## INTRODUCTION

Qube Property Management Services Pty Ltd ('Qube') c/o Tactical Group Pty Ltd ('Tactical') engaged EP Risk Management Pty Ltd ('EP Risk') to prepare a per- and poly-fluoroalkyl substances ('PFAS') Stormwater Management Strategy at the Moorebank Precinct West ('MPW') portion of the Moorebank Intermodal Terminal Development, Moorebank, NSW (MITD) (the 'Site').

The first stage of construction works known as the Land Preparation Works Demolition and Remediation ('LPWDR') are practically complete. The LPWDR included construction erosion and sediment controls ('ERSED') comprising temporary swales and sediment basins which are to remain in place until further development works are undertaken. Contamination Assessment Treatment Areas ('CATAs') were also constructed to treat soils requiring ex-situ treatment / stabilisation during the LPWDR. The location of the sediment basins at the Site are provided as **Attachment A**.

The design of the sediment basins requires all stormwater to be removed to the extent practicable within ten days of a rainfall event to restore capacity[1].

PFAS impacted soils present at the two source zones (Former Fire-Fighting Training Area ('FFTA') and the Dust Bowl) at the Site are leachable and have resulted in the generation of elevated PFAS stormwater concentrations within a number of the sediment basins.

The concentrations of PFAS in stormwater exceed the adopted Tier 1 investigation levels (based on HEPA 2018[2]) in The Early Works PFAS Management Plan[3] (Rev G) ('PFASMP') triggering the unexpected finds protocol in Section 11.1.5 of the PFASMP, which dictates that:

[1] Liberty Industrial (2018) Moorebank Intermodal Terminal LPWDR Construction Soil and Water Management Plan, dated 24 April 2018 (Rev Q).
[2] PFAS National Environmental Management Plan, The Heads of EPAs Australia and New Zealand, January 2018 (HEPA 2018).
[3] CARAS (2018) Moorebank Precinct West - Early Works Per & Poly-fluoroalkyl Substances (PFAS) Management Plan, dated 27 February 2018 (ref: PFASMP-01, Revision G).

"*If PFAS contamination is detected above the investigation levels in Table 5, a risk-based approach will be implemented and if an unacceptable risk to human health and/or the environment is identified remediation works may be required, as per the remediation strategy and control measures outlined in the RAPs (Golder 2016 and EP Risk 2017c).*"

The purpose of this letter is to review stormwater monitoring results from each sediment basin and to develop a risk-based approach for the management of stormwater on-site. Details of preventative, short-term and long-term strategies have been provided and the objective of the strategy is to ensure the health and ecological risks of PFAS impacted stormwater at the Site are appropriately managed.

## RESULTS OF ANALYTICAL TESTING

The results of sampling and analytical testing of stormwater collected within each sediment basin after recent rainfall events from March 2018 to September 2018 is provided as **Attachment 2** and summarised in **Table 1**.

**Table 1 – Summary of PFAS Stormwater Concentrations in Sediment Basins**

| Basin ID | Basin Design Capacity ($m^3$) | Estimate of Impacted Water Volume as at 13.09.18 ($m^3$) | No. samples | Minimum PFOS + PFHxS concentration (µg/L) | Maximum PFOS + PFHxS concentration (µg/L) | Minimum PFOA concentration (µg/L) | Maximum PFOA concentration (µg/L) | No. Exceedances of the adopted Temporary PFAS Stormwater Discharge Criteria | Estimate of maximum PFOS + PFHxS Mass[4] (g) |
|---|---|---|---|---|---|---|---|---|---|
| Basin 0A | 936 | -[5] | 2 | 0.09 | 0.1 | <0.01 | <0.01 | 0 | - |
| Basin 0B | 1,236 | - | 2 | 0.09 | 0.09 | <0.01 | <0.01 | 0 | - |
| Basin 1A | 170 | - | 2 | 0.06 | 0.07 | <0.01 | <0.01 | 0 | - |
| Basin 1B | 335 | - | 2 | 0.56 | 0.59 | <0.01 | <0.01 | 0 | - |
| Basin 1C | 243 | - | 2 | 0.05 | 0.06 | <0.01 | <0.01 | 0 | - |
| Basin 1D | 97 | 450 | 2 | 1.88 | 1.9 | 0.02 | 0.02 | 2 | 0.86 |
| Basin 2A | 113 | - | 2 | 0.02 | 0.02 | <0.01 | <0.01 | 0 | - |
| Basin 2B | 265 | - | 2 | 0.45 | 0.48 | <0.01 | <0.01 | 0 | - |
| Basin 2D | 657 | - | 2 | 0.16 | 0.16 | <0.01 | <0.01 | 0 | - |
| Basin 2E | 158 | - | 2 | 0.19 | 0.22 | <0.01 | <0.01 | 0 | - |
| Basin 3A | 1,559 | - | 2 | 0.24 | 0.25 | <0.01 | <0.01 | 0 | - |
| Basin 4A | 713 | 142 | 2 | 1.78 | 1.88 | <0.01 | <0.01 | 2 | 0.27 |
| Basin 4B | 875 | 276 | 2 | 0.74 | 0.83 | <0.01 | <0.01 | 2 | 0.23 |
| Basin 4C | - | - | 2 | 0.09 | 0.09 | <0.01 | <0.01 | 0 | - |
| Basin 4D | - | - | 2 | 0.08 | 0.08 | <0.01 | <0.01 | 0 | - |
| Basin 5A | 873 | - | 2 | 0.64 | 0.67 | <0.01 | <0.01 | 0 | - |

[4] Calculation based upon maximum PFOS + PFHxS mass reported.
[5] "-" - No information available.

**Table 1 – Summary of PFAS Stormwater Concentrations in Sediment Basins**

| Basin ID | Basin Design Capacity ($m^3$) | Estimate of Impacted Water Volume as at 13.09.18 ($m^3$) | No. samples | Minimum PFOS + PFHxS concentration (µg/L) | Maximum PFOS + PFHxS concentration (µg/L) | Minimum PFOA concentration (µg/L) | Maximum PFOA concentration (µg/L) | No. Exceedances of the adopted Temporary PFAS Stormwater Discharge Criteria | Estimate of maximum PFOS + PFHxS Mass[4] (g) |
|---|---|---|---|---|---|---|---|---|---|
| Basin 5B | 297 | - | 2 | 0.67 | 0.7 | 0.02 | 0.02 | 0 | - |
| Basin 5C | 591 | - | 4 | 0.245 | 0.28 | <0.01 | 0.005 | 0 | - |
| Basin 5D | 1,063 | - | 6 | 0.247 | 0.56 | 0.009 | 0.02 | 0 | - |
| Basin 6A | 358 | - | 4 | 0.27 | 0.53 | 0.02 | 0.021 | 0 | - |
| Basin 6B | 227 | 20 | 3 | 0.73 | 2.32 | <0.01 | 0.019 | 3 | 0.05 |
| Basin 6D | 376 | 151 | 2 | 2.09 | 2.2 | 0.01 | 0.01 | 2 | 0.33 |
| Basin 6E | 1,418 | 189 | 2 | 3.32 | 3.75 | 0.02 | 0.02 | 2 | 0.71 |
| Basin 6F | 467 | 72 | 8 | 0.49 | 1.34 | 0.49 | 0.98 | 3 | 0.10 |
| Basin 7A | 1532 | 465 | 9 | 4.47 | 7.64 | 0.02 | 0.04 | 9 | 3.55 |
| Basin 7B | 473 | 15 | 2 | 0.77 | 0.77 | <0.01 | <0.01 | 2 | 0.01 |
| Basin 8A | -[6] | 45.6 | 2 | 2.79 | 3.45 | 0.02 | 0.03 | 2 | 0.16 |
| Basin 9A | - | - | 2 | 0.13 | 0.15 | <0.01 | <0.01 | 0 | - |
| Basin 9B | - | - | 2 | 0.04 | 0.04 | <0.01 | <0.01 | 0 | - |
| **Total =** | | **1,826** | | | | | | | **6.26** |

[6] No information on the location or design capacity of Basin 8A was available.

The locations of stormwater PFAS concentrations exceeding the adopted PFAS stormwater disposal criteria are presented in **Figure 1** in **Attachment 3**. Based on the information provided in **Table 1**, ten of the twenty-nine sediment basins reported concentrations above the adopted temporary PFAS stormwater discharge criteria (JBS&G 2018)[7].

The total approximate volume of PFAS impacted stormwater within these sediment basins is 1,826 $m^3$. Based upon the design capacity of the sediment basins, the maximum volume of PFAS impacted water that could accumulate in these sediment basins is 6,178 $m^3$ (excluding Basin 8A).

## PREVENTATIVE MEASURES

Based upon the analytical results, leaching of PFAS from exposed soil has generated PFAS impacted stormwater within ten sediment basin catchments. The following preventative measures to reduce PFAS concentrations in stormwater are recommended:

- Capping of sediment basin catchments where PFAS concentrations have been reported above the recreational criteria (HEPA 2018); and
- Lining of the swales with a geotextile liner where PFAS concentrations have been reported above the recreational criteria (HEPA 2018).

Further details of the capping strategy are provided in a separate technical memo (EP Risk 2018[8]). Given the large catchment area and potential for the generation of a large volume of PFAS impacted stormwater during prolonged rain events, capping of the catchments and lining of the swales is a critical mitigation measure to reduce the volume of PFAS impacted stormwater that will require management on-site over the longer term.

## SHORT-TERM MANAGEMENT

To provide adequate short-term capacity within the sediment basins, the following short-term management actions were proposed to deal with PFAS impacted stormwater:

- Discharge of stormwater that meets the JBS&G (2018) discharge criteria to the Georges River.
- Transfer of stormwater to lined temporary storage locations at the Site that are outside the current ERSED catchments.
- Use of stormwater for dust suppression.

### *Discharge of stormwater to temporary storage locations*

JBS&G (2018) has undertaken a qualitative assessment for PFAS stormwater discharge at the Site and developed the temporary PFAS stormwater discharge criteria provided in **Table 2**.

[7] JBS&G (2018) Qualitative Assessment for PFAS – Stormwater Discharge at Moorebank Intermodal Terminal LPWDR, Moorebank, NSW, dated 18 April 2018 (ref: JBS&G 51997-114957).
[8] EP Risk (2018) Technical Memo - Capping of Sediment Basin Catchments Impacted with PFAS Impacted Stormwater, dated 20 September 2018 (ref: EP0745.017-v2).

| Table 2 – Temporary PFAS Stormwater Discharge Criteria | |
|---|---|
| **Analyte** | **Temporary Stormwater Discharge Criteria** |
| PFOS + PFHxS[9] | 0.7 µg/L |
| PFOA | 5.6 µg/L |

These criteria have been developed by JBS&G (2018) based upon the following:

- Stormwater accumulation is intermittent;
- Stormwater events are temporary phenomena;
- Human health risks to users of the river are considered low;
- A species protection level of 80% is sufficient for a modified urban surface water system such as the Georges River; and
- Discharge of stormwater to the Georges River from the Site will be a temporary requirement, and then only a last resort if the ten-day holding requirement cannot be met and alternative dust suppression is not available.

It was also recommended by JBS&G (2018) that as an added measure to minimise potential impacts, priority is given to re-using accumulated stormwater on-site for dust suppression rather than discharge to the Georges River, and preference is given to the treatment/reuse of water from basins with the highest PFAS concentrations.

EP Risk (2018)[10] undertook a review of the JBS&G (2018) Qualitative Review and was in general agreement with the stormwater disposal criteria that had been developed, however considered that the adoption of the 90% species protection values of 2 µg/L and 632 µg/L for PFOS and PFOA, respectively was more appropriate due to the ability of PFAS to bioconcentrate, bioaccumulate and biomagnify in aquatic food chains. However, as the lower of the human health and aquatic ecosystem criteria was adopted, this difference does not affect the temporary PFAS stormwater discharge criteria provided in **Table 2**.

On the 9 August 2018, the National Health and Medical Research Council ('NHMRC') released Draft Guidance on PFAS in recreational water for public consultation, which closes on 27 September 2018. Based upon the draft guidance, NHMRC is proposing to revise the PFOS + PFHxS and PFOA recreational water criteria to 2 µg/L and 14 µg/L, respectively. It is anticipated that the revision of the guidance levels will be finalised later this year and the temporary PFAS stormwater discharge criteria in **Table 2** should be revised when it is published.

All basins where PFAS concentrations were reported below the adopted stormwater disposal criteria provided in **Table 2** are suitable for discharge to the Georges River, subject to meeting all other applicable discharge criteria for other analytes / physical parameters.

[9] PFOS – perfluorooctane sulfonate; PFHxS – perfluoroheaxane sulfonate.
[10] Review of the Qualitative Assessment for PFAS – Stormwater Discharge at Moorebank Intermodal Terminal LPWDR, Moorebank, NSW, dated 12 July 2018 (ref: EP0745.001).

### *Transfer of stormwater to temporary storage locations*

EP Risk considers temporary storage of stormwater will be required to meet the requirements of the ERSED design to remove stormwater from the sediment basins within ten days of a rainfall event due to:

- Identification of ten sediment basins with PFAS impacted stormwater above the temporary PFAS stormwater discharge criteria (**Table 2**).
- The limited ability of the underlying soils to infiltrate the design capacity volume of water within the ten-day period.
- The design capacity of the PFAS impacted basins (excluding Basin 8A) is 6,187 $m^3$, which is a significant volume of water that will potentially require management during prolonged rain events.

Six existing water bodies at the Site have been identified as potential temporary storage locations. Details of the existing water bodies are provided in **Table 3** and the location of the water bodies are provided as **Attachment 4**.

**Table 3 – Details of Existing Water Bodies**

| Water Body ID | Area ($m^2$) | Depth (m) | Capacity ($m^3$) |
|---|---|---|---|
| WB1 | 2,229 | 1.8 | 4,012 |
| WB1.1 | 1,621 | 0.75 | 1,216 |
| WB2 | 451 | 1.8 | 810 |
| WB3 | 536 | 1.8 | 960 |
| WB4 | 9,500 | 1.8 | 17,100 |
| WB6 | 5,846 | 2.0 | 11,692 |
| **Total capacity** | | | **35,790** |

Based upon a review of the total capacity of the existing water bodies, there is sufficient storage to drain the entire design capacity of the impacted basins six times before the total capacity has been reached.

It is understood the existing water bodies were to be dewatered and filled as part of the proposed development works and would require some modifications to be made suitable for temporary storage as follows:

- Surface water within the water bodies would need to be tested prior to dewatering and either discharged to the Georges River or reused on-site for dust suppression.
- Erosion and sediment controls should be installed to hydraulically isolate each water body from runoff generated by the surrounding catchment. If hydraulic isolation cannot be achieved for a water body, then it should not be deemed fit for the purpose for temporary storage.
- An assessment of the safe fill capacity of each water body should be made to ensure that each water body does not overflow during prolonged rain events.

- The water bodies should be lined with linear low-density polyethylene ('LLDPE') sheeting to ensure hydraulic isolation from surrounding soils and the shallow unconfined aquifer.

### *Re-use of stormwater for dust suppression*

An assessment of the reuse of stormwater which exceeds the adopted PFAS stormwater disposal criteria provided in **Table 2**, has been undertaken with consideration to the following:

- The potential health-risk to construction workers who come into contact with stormwater that exceeds the adopted PFAS stormwater disposal criteria; and
- The effects of the application of stormwater to surface soils, surface water and groundwater which exceeds the adopted PFAS stormwater disposal criteria on the mass flux of PFAS at the Site.

#### Assessment of health-risk to construction workers

EP Risk has prepared an addendum to the EP Risk (2018)[11] health risk assessment to assess the risk to construction workers at the Site who may contact PFAS impacted stormwater via the transport, handling and management of stormwater (including dust suppression).

Based upon the results of the health risk assessment, a potential dermal exposure health risk to workers was identified. EP Risk recommends that the precautionary principle should be applied and the potential health risk to construction workers involved in the transport, handling and management of stormwater should be effectively managed through the mandatory use of waterproof gloves and boots in accordance with the currently adopted work health and safety practices at the Site.

Based on dermal risk to construction workers being managed through mandatory use of waterproof gloves and boots, stormwater at the Site with concentrations less than **270 µg/L (PFOS and PFOS Grouped[12])** and **2,200 µg/L (PFOA and PFOA Grouped[13])**, respectively are considered suitable for transport, handling and on-site management (including dust suppression) from a human health risk perspective.

A copy of addendum to the health risk assessment is provided as **Attachment 5**.

#### Assessment of soil mass flux

This PFAS mass in stormwater was generated by leaching from surface soils within the sediment basin catchment. Therefore, the application of the PFAS impacted stormwater to surface soils via dust suppression will return the PFAS mass to the media from where it was generated. This will result in a zero-net mass flux to soil from a site-wide perspective. PFAS impacted stormwater should preferably be applied to the catchment from where it was generated.

[11] EP Risk (2018a) Literature Review, Criteria for Assessment of PFAS and Risk Assessment
[12] PFOS - Perfluorooctane sulfonate; PFOSA – Perfluorooctanesulfonamide; N-Me-FOSA - N-Methyl perfluorooctane sulphonamide; N-EtFOSA - N-Ethyl perfluorooctane sulphonamide; N-Me-FOSE - N-Methyl perfluorooctane sulfonamidoethanol; N-Et-FOSE - N-Ethyl perfluorooctane sulfonamidoethanol; PFBS - Perfluorobutane sulfonic acid; PFHxS - Perfluorohexane sulfonate; PFDcS – Perfluorodecane sulfonic acid.
[13] PFOA - Perfluorooctanoic acid; PFHxA - Perfluorohexanoic acid; PFHpA - Perfluoroheptanoic acid; PFNA - Perfluorononanoic acid; PFDcA - Perfluorodecanoic acid; PFUnA - Perfluoroundecanoic acid; PFDoA - Perfluorododecanoic acid; PFTnA - Perflouorotridecanoic acid; PFTeA - Perfluorotetradecanoic acid.

### Assessment of groundwater mass flux

Whilst it is considered that a significant portion of PFAS applied to surface soils via dust suppression would sorb to soils and be subject to evaporation, an assessment of the effect on the groundwater mass flux discharging to the Georges River was undertaken. As a conservative measure, it was assumed that no sorption to soil or evaporation occurred to provide a worst-case scenario of the potential effect on the mass flux to groundwater.

Based upon the results provided in **Table 1**, exceedances of the stormwater disposal criteria were only identified for PFOS + PFHxS and therefore the assessment of groundwater mass flux was prepared for these analytes. Based on the calculations prepared in **Table 1**, the actual mass of PFOS + PFHxS in stormwater within the PFAS impacted sediment basins was estimated to be 6.26 g. Assuming a constant PFOS + PFHxS concentration would apply stormwater within PFAS impacted basins at the design capacity, the theoretical maximum PFOS + PFHxS mass has been estimated to be 21.2 g[14].

The calculations of PFOS + PFHxS mass flux for the three most recent groundwater monitoring rounds undertaken in February 2017, March 2017 and June 2018 (EP Risk 2018b[15]) are provided as **Attachment 6** and summarised in **Table 4**.

**Table 4 – PFOS + PFHxS Groundwater Mass Flux**

| Source | PFOS + PFHxS mass flux (g/year) | Additional flux event (g) | % increase in mass flux |
|---|---|---|---|
| Existing groundwater mass flux | 9,378 | - | - |
| Stormwater infiltration from PFAS impacted sediment basins (13.09.18) | - | 6.26 | 0.07% |
| Maximum theoretical infiltration based upon design capacity of PFAS impacted sediment basins. | - | 21.2 | 0.23% |

Based on the data provided in **Table 4**, infiltration of stormwater assuming no adsorption to soil or evaporation would result in a negligible increase in groundwater PFOS + PFHxS mass flux to the Georges River. Given the conservatism in these calculations, infiltration of stormwater from dust suppression activities would present a negligible increase in risk to ecological receptors dependent upon the Georges River from groundwater discharge.

### Assessment of surface water mass flux

Given that stormwater in the PFAS impacted sediment basins was reported above the adopted PFAS stormwater disposal criteria, application to areas outside the ERSED catchment is not recommended. Preference should be given to the application of PFAS stormwater to PFAS impacted catchments where practicable and the application rate of dust suppression should be managed to reduce the risk of runoff.

[14] Calculated by multiplying the PFOS + PFHxS mass of 6.26 g by the ratio of water reported in PFAS impacted sediment basins on 13.09.18 (1,826 $m^3$) to the total design capacity of the PFAS impacted sediment basins (6,178 $m^3$).
[15] EP Risk (2018b) Moorebank Precinct West Site-Wide Per- and Poly-Fluoroalkyl Substances (PFAS) Assessment, dated 22 August 2018 (ref: EP0745.008).

### *Wash down of tanker trucks, pumps and equipment*

EP Risk recommends that tankers pumps and other equipment should be thoroughly rinsed after coming into contact with PFAS impacted surface water. A trial should be undertaken to determine the number of rinses required to reduce rinsate water concentrations below the recreational water criteria provided in **Table 2**.

## LONG-TERM MANAGEMENT

Long-term management of PFAS impacted stormwater can be achieved via:

- Confirmation of the effectiveness of preventative measures; and
- Design and construction of a water treatment system as a contingency measure to deal with large volumes during prolonged rain events.

### *Effectiveness of preventative measures*

EP Risk considers that the preventative measures outlined in EP Risk (2018) should be effective in reducing PFAS stormwater concentrations to below the adopted PFAS stormwater disposal criteria provided in **Table 2**.

To confirm and maintain the effectiveness of the preventative measures the following should be undertaken during construction works:

- Sample stormwater from capped basins after rain events to test the effectiveness of capping in reducing PFAS concentrations.
- Inspect capping layers after storm events to ensure the integrity of the capping layer and liners. Undertake repairs / upgrades to capping layers and liners where required.
- Where new sediment basins are constructed, or significant soil disturbance occurs to existing catchments, additional testing of stormwater should be undertaken to determine if additional preventative measures require implementation.

### *Water Treatment Contingency*

Based upon a review of the storage capacity available within the water bodies (**Table 3**), the total storage capacity of the water bodies is approximately six times greater than the combined design volume of the PFAS impacted sediment basins.

However, it is considered during prolonged rain events, the option to use stormwater for dust suppression will be limited and another contingency to manage large stormwater volumes and diminishing storage capacity should be considered.

Although implementation of the prevention measures will reduce long-term PFAS stormwater concentrations in the sediment basins, as recommended in previous advice (EP Risk 2018c[16]) an on-site water treatment system should be designed and commissioned at the Site as a contingency to

[16] EP Risk (2018c) Preliminary Advice: Risk Based Approach to the Management of Potential Per- and Poly-Fluoroalkyl Substances Contaminated Stormwater, dated 29 June 2018 (ref: EP0745.010_LR).

treat stormwater which exceeds the adopted PFAS stormwater disposal criteria during prolonged rain events. The system should be designed to treat PFAS concentrations to below the adopted PFAS stormwater disposal criteria. The proposed Water Treatment Methodology is in **Attachment 7**.

Priority should be given to treatment of PFAS impacted stormwater with the highest reported concentrations.

### *Water Treatment Plant (WTP) Capacity*

The storage capacity of the Water Treatment Plant ('WTP') must take into account:

- Catchment area of the PFAS CATA.
- Other catchments generating PFAS impacted surface water. Sediment Basins 6B, 6F and 7A are known to accumulate runoff with PFAS concentrations above discharge concentrations outlined in **Table 2**.
- Other basins in the vicinity that may accumulate runoff with PFAS concentrations above the discharge concentrations listed in **Table 2.**
- Run off from unexpected finds of PFAS and dewatering (if required) of any PFAS remediation works.
- All sediment basins must have their design capacity available within 10-days of a significant rainfall event.
- A treatment rate of 2 to 5 litres per second.

### *Water Treatment*

The water treatment plant will be designed to achieve the required flow rate and discharge criteria. The WTP will consist of the following elements:

- Flow Balance Storage Pond;
- pH Adjustment;
- Coagulation & Flocculation;
- Clarifier;
- Ion exchange Adsorption System;
- Granular Activated Carbon Filtration System;
- Treated Water Storage/ Disposal;
- Sludge Management;
- Sludge Thickener; and
- Sludge Dewatering.

### *WTP Compliance Testing*

Compliance testing is to be undertaken to confirm concentration of PFAS are below the adopted HEPA (2018) recreational criteria (**Table 2**). The compliance sampling frequency will involve:

- Batch sampling for a proof of performance period of up to two weeks; and
- Regular sampling during continuous discharge following the proof of performance period, at a frequency to be determined based upon the results from the proof of performance period.

### *Discharging Water*

The environmental consultant must approve in writing the waters are suitable once water has been tested and meets all the criteria for discharge offsite or for reuse on site.

Subsequently, the environment advisor must authorise the discharge by signing the Discharge or Reuse Water Approval. All sediment basins are required to maintain their design capacity, within 10 days following any rainfall event.

Discharge can use a syphon system or a pump, with a priority on delivering low energy flows to downstream drainage lines, watercourses or land. The flow from the outlet must be directed onto a non-erodible surface or material and, for discharges to waters, sufficient energy must be dissipated before the flow enters the natural watercourse to ensure no erosion shall occur. The pump inlet must be placed so it will not disturb or take in any sediment or sediment laden water. The discharge must be monitored throughout to ensure the water being syphoned or pumped:

- Complies with the discharge criteria;
- Does not come into contact with any soil or exposed surfaces before discharging; and
- Does not mix with any sediment laden/untested water at either the inlet or outlet.

Water must never be discharged or reused onsite in a manner that exceeds the capacity of sediment controls and/or generates runoff with the potential to discharge from site.

The discharge location will be established based on the location of the treatment system.

As a contingency, water that does not meet the discharge criteria will be:

- Retreated on site through the treatment plant. The water will then be re-tested to confirm compliance; or
- Disposed of offsite to a licensed facility lawfully able to accept the waste.

### *WTP Waste Management*

Waste streams for the WTP may include sludges, muds and waste carbon. All solid and liquid waste streams from the WTP are to be classified in accordance with the NSW EPA (2014) *Waste Classification Guidelines Part 1: Classifying Waste* and transported by appropriately licensed vehicles.

## CONCLUSION

Recent testing of stormwater within sediment basins at the Site has identified that leaching from surface soils in the catchments has resulted in the generation of PFAS impacted stormwater above the adopted PFAS stormwater disposal criteria.

EP Risk recommends that the following PFAS stormwater strategy including preventative, short-term and long-term strategies is implemented at the Site to manage PFAS impacted stormwater through the construction process. A summary of the proposed management strategy is provided below:

### Prevention

To mitigate leaching of PFAS from soils and the generation of PFAS impacted stormwater, affected catchments should be capped and swales should be lined.

### Short-term Management

Given that significant volumes of PFAS impacted stormwater has been generated, short-term management is required to ensure that the sediment basins are cleared to maintain the design capacity and that the PFAS impacted stormwater is managed to ensure there are no risks to construction workers and off-site ecological receptors.

Additional short-term storage capacity is required to ensure that the sediment basins can be cleared of stormwater within ten days of a rain event. Six existing water bodies at the Site have been identified for temporary storage subject to the implementation of hydraulic isolation controls, dewatering and lining.

An assessment of the human-health risk to construction workers and mass flux to soil, surface water and groundwater from the transport, handling and management of PFAS impacted stormwater (including dust suppression) was undertaken.

EP Risk considers that stormwater from the PFAS impacted sediment basins is suitable to be used for dust suppression in the short-term subject to limited application within the ERSED catchment with preference to PFAS impacted catchments where practicable.

### Long-term Management

Long-term management of PFAS impacted stormwater at the Site can be achieved by implementation and verification of the effectiveness of the adopted preventative measures and the design and construction of a water treatment system as a contingency measure to deal with large stormwater volumes during prolonged rain events.

Yours sincerely

Paul Simpson
Principal Environmental Engineer
EP Risk Management Pty Ltd

Kellie Guenther
Principal Environmental Scientist
EP Risk Management Pty Ltd

## Attachments

**Attachment 1** – Sediment Basin Drawings
**Attachment 2** – Summary Table of Surface Water Sampling, JBS&G (2018)
**Attachment 3** – Figures
*Figure 1 Surface Water Concentrations in Sediment Basins March – September 2018*
**Attachment 4** – Existing Water Bodies
**Attachment 5** – Addendum to the Human Health Risk Assessment
**Attachment 6** – Mass Flux Calculations
**Attachment 7** – Synergy Water Treatment Methodology - Moorebank

**QUALITY CONTROL**

| Version | Author | Date | Reviewer | Date | Quality Review | Date |
|---|---|---|---|---|---|---|
| v1 | P. Simpson | 20.09.2018 | K. Thomas | 20.09.2018 | K. Thomas | 20.09.2018 |
| v2 | K. Guenther | 05.02.2019 | P. Simpson | 11.03.2019 | P. Simpson | 11.03.2019 |

**DOCUMENT CONTROL**

| Version | Date | Reference | Submitted to |
|---|---|---|---|
| v2 | 11.03.2019 | EP0745.018 Qube MPW PFAS Stormwater Management v2 | Qube c/o Tactical |

**LIMITATIONS**

This Per- and Poly-Fluoroalkyl Substances Stormwater Management Strategy v2 was conducted on the behalf of Qube Property Management Services Pty Ltd ('Qube') c/o Tactical Group Pty Ltd ('Tactical') for the purpose/s stated in the **Objective** section.

EP Risk has prepared this document in good faith, but is unable to provide certification outside of areas over which EP Risk had some control or were reasonably able to check. The report also relies upon information provided by third parties. EP Risk has undertaken all practical steps to confirm the reliability of the information provided by third parties and do not accept any liability for false or misleading information provided by these parties.

It is not possible in an Per- and Poly-Fluoroalkyl Substances Stormwater Management Strategy v2 to present all data, which could be of interest to all readers of this report. Readers are referred to any referenced investigation reports for further data.

Inaccessible areas are omitted from the assessment including beneath concrete slabs, beneath the subsurface, within the soil or fill, beneath floorboards, in the crawlspace of the building inside the walls of the structures and inside the roof cavity not in immediate.

Users of this document should satisfy themselves concerning its application to, and where necessary seek expert advice in respect to, their situation.

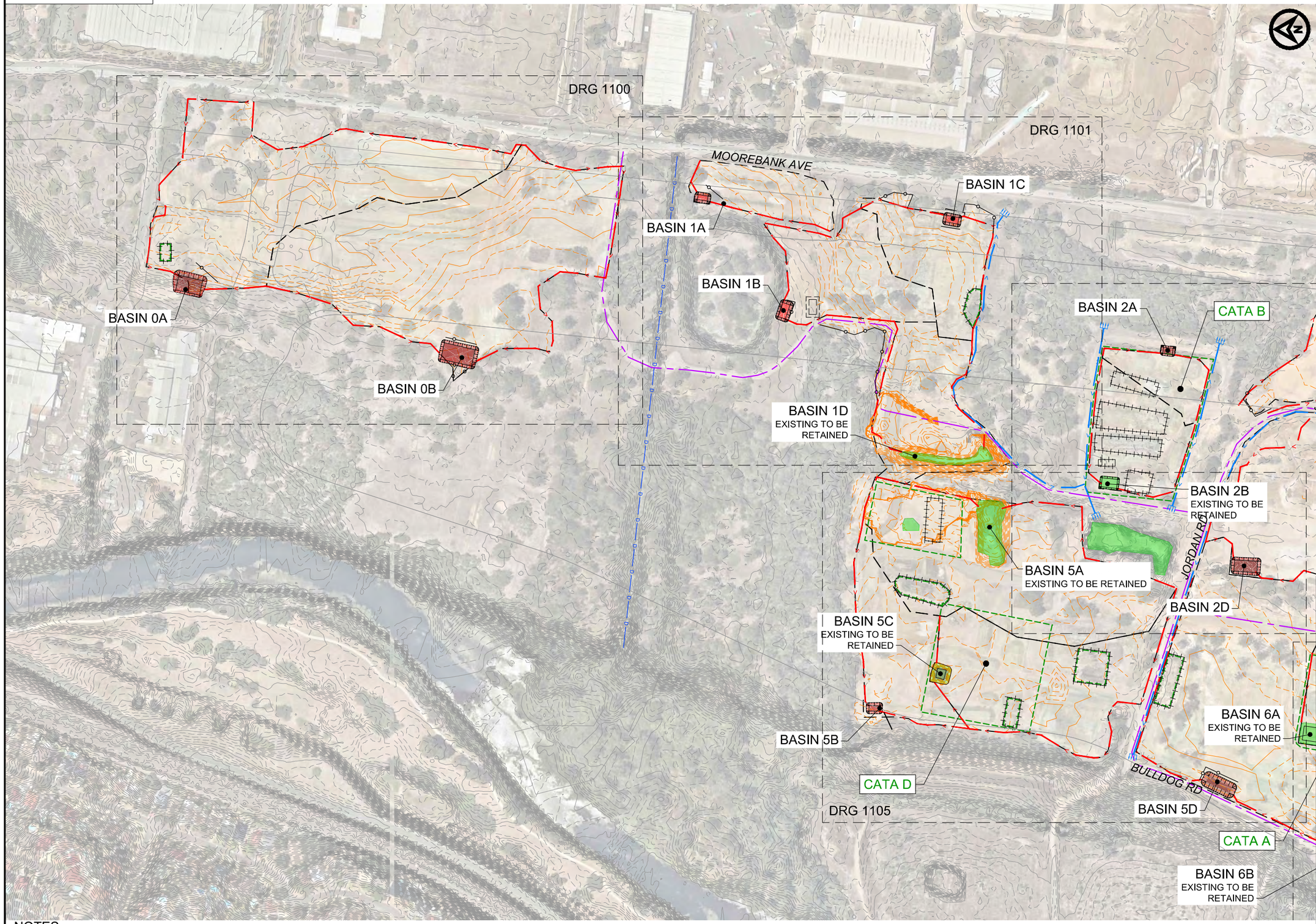
All work conducted and reports produced by EP Risk are based on a specific scope and have been prepared for Per- and Poly-Fluoroalkyl Substances Stormwater Management Strategy v2 and therefore cannot be relied upon by any other third parties unless agreed in writing by EP Risk.

The report(s) and/or information produced by EP Risk should not be reproduced and/or presented/reviewed except in full.

# *Attachment 1 – Sediment Basin Drawings*

DRAWING No.
PA1650/MA/1041

**DO NOT SCALE**




## NOTES

1. REFER DRG 0001 AND DRG 1041 FOR GENERAL NOTES.
2. AERIAL TAKEN FROM NEARMAP, DATED 21/01/2018.
3. ROCK RIP RAP SPILLWAY SWALES TO BE CONSTRUCTED AT LOWEST LEVEL OF BASIN. LOCATION TO BE CONFIRMED ON SITE. REFER DRG 2002 FOR DETAILS AND SPILLWAY LENGTH SCHEDULE.

## LEGEND

- DISTURBED AREA CONTOURS (07/09/2017)
- LIDAR CONTOURS (2013)
- CATCHMENT CREST
- FLOW
- EXISTING ROAD TO BE RETAINED
- STOCKPILE ZONE
- EXISTING SEDIMENT BASIN TO BE RETAINED
- ENDANGERED ECOLOGICAL COMMUNITIES (EEC)
- HOLLOW BEARING TREE

PROPOSED:

- SEDIMENT FENCE
- SEDIMENT CONTROL BUND (TYP. AROUND STOCKPILES)
- DIRTY WATER SWALE (1m WIDE)
- SEDIMENT BASIN
- CLEAN WATER DIVERSION SWALE (1m WIDE)
- LEVEL SPREADER

| REV | DATE | DESCRIPTION | BY | CHK | APPD |
|---|---|---|---|---|---|
| J | 16.04.2018 | ISSUED FOR CONSTRUCTION | BAM | NL | |
| H | 30.01.2018 | ISSUED FOR CONSTRUCTION | BAM | NL | |
| G | 13.12.2017 | ISSUED FOR REVIEW | BAM | NL | |
| F | 08.12.2017 | ISSUED FOR REVIEW | BAM | NL | |
| E | 10.11.2017 | ISSUED FOR REVIEW | BAM | NL | |
| D | 27.10.2017 | ISSUED FOR REVIEW | BAM | NL | |
| C | 10.10.2017 | ISSUED FOR REVIEW | BAM | NL | |
| B | 06.10.2017 | ISSUED FOR REVIEW | BAM | NL | |

REVISIONS

CLIENT
LIBERTY INDUSTRIAL

SURVEY:
TOPOGRAPHIC: TOTAL SURVEYING SOLUTIONS (07/09/2017)
LIDAR: LPI (2013)
HORIZ. DATUM: MGA VERT. DATUM: AHD

PROJECT:
MOOREBANK INTERMODAL TERMINAL (MIT)
PORTION A (WEST)
EROSION AND SEDIMENT CONTROL

DRAWING TITLE:
SITE PLAN
EROSION AND SEDIMENT CONTROL
SHEET 1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| | | | |
|---|---|---|---|
| DRAWN BAM | DATE 15/04/2018 | JOB No. PA1650 | |
| AUTOCAD REF. | PA1650-MA-CIVIL MODEL | | |
| SCALE AT A1 | AS SHOWN | | |
| DRAWING No. PA1650/MA/1041 | | REVISION J | |

## NOTES

1. REFER DRG 0001 FOR GENERAL NOTES
2. ROCK RIP RAP SPILLWAY SWALES TO BE CONSTRUCTED AT LOWEST LEVEL OF BASIN. LOCATION TO BE CONFIRMED ON SITE. REFER DRG 2002 FOR DETAILS AND SPILLWAY LENGTH SCHEDULE.

DIAL BEFORE YOU DIG www.1100.com.au

**AUSTRALIAN HEIGHT DATUM**

**FOR CONSTRUCTION**

40 0 40 80 120 160 200m
1:4000 (A3) 1:2000 (A1)



D:\RHDHV\JOBS\~PA1650 - MOOREBANK SIMTA\E02 WORKING DRAWINGS\PA1650-MA-CIVIL MODEL.DWG 4/15/2018 8:53 PM

DRAWING No.
PA1650/MA/1042

**DO NOT SCALE**

BASIN 2C
DRG 1102
BASIN 2A
CATA B
LITANI RD
JORDAN RD
BASIN 2E
BIRR CROSS RD
CHATHAM AVE
DRG 1103
DRG 1104
BASIN 4A
JACQUINOT RD
CONCRETE AND BRICK
ANZAC CREEK
BASIN 2B
EXISTING TO BE RETAINED
BASIN 4B
SEDIMENT BASIN DESIGN TO BE COMPLETED
BASIN 5A
EXISTING TO BE RETAINED
JORDAN RD
BASIN 3A
BASIN 2D
RIPON RD
BASIN 6A
EXISTING TO BE RETAINED
BASIN 6C
BULLDOG RD
BASIN 5D
CATA A
BASIN 6B
EXISTING TO BE RETAINED
CATA E
BASIN 7A
BASIN 6E
BULLDOG RD
BULLDOG RD
BASIN 7B
APPROX. PROPOSED CARPARK
BASIN 6D
DRG 1106
DRG 1107
BASIN 6F

## NOTES

1. REFER DRG 0001 AND DRG 1041 FOR GENERAL NOTES.
2. AERIAL TAKEN FROM NEARMAP, DATED 21/01/2018.
3. ROCK RIP RAP SPILLWAY SWALES TO BE CONSTRUCTED AT LOWEST LEVEL OF BASIN. LOCATION TO BE CONFIRMED ON SITE. REFER DRG 2002 FOR DETAILS AND SPILLWAY LENGTH SCHEDULE.

## LEGEND

- DISTURBED AREA CONTOURS (07/09/2017)
- LIDAR CONTOURS (2013)
- CATCHMENT CREST
- FLOW
- EXISTING ROAD TO BE RETAINED
- STOCKPILE ZONE
- EXISTING SEDIMENT BASIN TO BE RETAINED
- ENDANGERED ECOLOGICAL COMMUNITIES (EEC)
- HOLLOW BEARING TREE

PROPOSED:

- SEDIMENT FENCE
- SEDIMENT CONTROL BUND (TYP. AROUND STOCKPILES)
- DIRTY WATER SWALE (1m WIDE)
- SEDIMENT BASIN
- CLEAN WATER DIVERSION SWALE (1m WIDE)
- LEVEL SPREADER

| REV | DATE | DESCRIPTION | BY | CHK | APPD |
|---|---|---|---|---|---|
| J | 16.04.2018 | ISSUED FOR CONSTRUCTION | BAM | NL | |
| H | 30.01.2018 | ISSUED FOR CONSTRUCTION | BAM | NL | |
| G | 13.12.2017 | ISSUED FOR REVIEW | BAM | NL | |
| F | 08.12.2017 | ISSUED FOR REVIEW | BAM | NL | |
| E | 10.11.2017 | ISSUED FOR REVIEW | BAM | NL | |
| D | 27.10.2017 | ISSUED FOR REVIEW | BAM | NL | |
| C | 10.10.2017 | ISSUED FOR REVIEW | BAM | NL | |
| B | 06.10.2017 | ISSUED FOR REVIEW | BAM | NL | |

REVISIONS

CLIENT
LIBERTY INDUSTRIAL

SURVEY:
TOPOGRAPHIC: TOTAL SURVEYING SOLUTIONS (07/09/2017)
LIDAR: LPI (2013)
HORIZ. DATUM: MGA VERT. DATUM: AHD

PROJECT:
MOOREBANK INTERMODAL TERMINAL (MIT)
PORTION A (WEST)
EROSION AND SEDIMENT CONTROL

DRAWING TITLE:
SITE PLAN
EROSION AND SEDIMENT CONTROL
SHEET 2


HASKONING AUSTRALIA PTY LTD
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www.royalhaskoning.com Internet


| | | | |
|---|---|---|---|
| DRAWN BAM | DATE 15/04/2018 | JOB No. PA1650 | |
| AUTOCAD REF. | PA1650-MA-CIVIL MODEL | | |
| SCALE AT A1 | AS SHOWN | | |
| DRAWING No. PA1650/MA/1042 | | | REVISION J |

DIAL BEFORE YOU DIG www.1100.com.au

**AUSTRALIAN HEIGHT DATUM**

**FOR CONSTRUCTION**

40 0 40 80 120 160 200m
1:4000 (A3) 1:2000 (A1)



D:\RHDHV\JOBS\~PA1650 - MOOREBANK SIMTA\E02 WORKING DRAWINGS\PA1650-MA-CIVIL MODEL.DWG 4/15/2018 9:46 PM

# *Attachment 2 – Summary Table Surface Water Sampling, JBS&G (2018)*

All Sediment Basin Surface Water PFAS Assessment Results - September 2018
Project Number: 51997
Project Name: Moorebank Remediation

| | PFAS | | | |
|---|---|---|---|---|
| | Perfluorooctanoic acid (PFOA) | Sum of PFHxS and PFOS | Perfluorooctanoic acid (PFOA) | Sum of PFHxS and PFOS |
| | µg/L | µg/L | µg/L | µg/L |
| EQL | 0.0002 | 0.001 | 0.0002 | 0.001 |
| MPW PFAS Management Plan 2018 Surface Water and Groundwater On-site and Off-site | 5.6 | 0.7 | - | - |
| NHMRC Draft Guidance on PFAS in Recreational Water | - | - | 14 | 2 |

| Sample ID | Sample Date | Lab Report Number | | | | |
|---|---|---|---|---|---|---|
| **SEDIMENT BASIN 0A** | | | | | | |
| BASIN0A-01 | 4/07/2018 | 606065 | <0.01 | 0.1 | - | - |
| QC20180704-LL01 | 4/07/2018 | 606065 (duplicate) | <0.01 | 0.1 | - | - |
| QA20180704-LL01 | 4/07/2018 | 195576 (triplicate) | <0.01 | 0.06 | - | - |
| BASIN0A-02 | 4/07/2018 | 606065 | <0.01 | 0.09 | - | - |
| **SEDIMENT BASIN 0B** | | | | | | |
| BASIN0B-01 | 11/09/2018 | 616993 | <0.01 | 0.09 | <0.01 | 0.09 |
| BASIN0B-02 | 11/09/2018 | 616993 | <0.01 | 0.09 | <0.01 | 0.09 |
| **SEDIMENT BASIN 1A** | | | | | | |
| BASIN1A-01 | 4/07/2018 | 606065 | <0.01 | 0.07 | - | - |
| BASIN1A-02 | 4/07/2018 | 606065 | <0.01 | 0.06 | - | - |
| **SEDIMENT BASIN 1B** | | | | | | |
| BASIN1B-01 | 4/07/2018 | 606065 | <0.01 | 0.59 | - | - |
| BASIN1B-02 | 4/07/2018 | 606065 | <0.01 | 0.56 | - | - |
| **SEDIMENT BASIN 1C** | | | | | | |
| BASIN1C-01 | 4/07/2018 | 606065 | <0.01 | 0.05 | - | - |
| BASIN1C-02 | 4/07/2018 | 606065 | <0.01 | 0.06 | - | - |
| **SEDIMENT BASIN 1D (LAKE SISINYAK)** | | | | | | |
| BASIN_1D_01 | 12/07/2018 | 607388 | 0.02[#1] | 2.29 | - | - |
| BASIN_1D_02 | 12/07/2018 | 607388 | 0.02[#1] | 2.28 | - | - |
| BASIN_1D_03 | 12/07/2018 | 607388 | 0.02[#1] | 2.17 | - | - |
| BASIN1D_01 | 10/09/2018 | 616818 | 0.02[#1] | 1.88 | 0.02[#1] | 1.88 |
| BASIN1D_02 | 10/09/2018 | 616818 | 0.02[#1] | 1.9 | 0.02[#1] | 1.9 |
| **SEDIMENT BASIN 2A** | | | | | | |
| BASIN2A-01 | 11/09/2018 | 616993 | <0.01 | 0.02 | <0.01 | 0.02 |
| BASIN2A-02 | 11/09/2018 | 616993 | <0.01 | 0.02 | <0.01 | 0.02 |
| **SEDIMENT BASIN 2B** | | | | | | |
| BASIN2B_01 | 12/09/2018 | 617218 | <0.01 | 0.48 | <0.01 | 0.48 |
| BASIN2B_02 | 12/09/2018 | 617218 | <0.01 | 0.45 | <0.01 | 0.45 |
| **SEDIMENT BASIN 2C** | | | | | | |
| BASIN2C-01 | 4/07/2018 | 606065 | 0.02[#1] | 0.57 | - | - |
| BASIN2C-02 | 4/07/2018 | 606065 | 0.02[#1] | 0.58 | - | - |
| **SEDIMENT BASIN 2D** | | | | | | |
| BASIN2D-01 | 11/09/2018 | 616993 | <0.01 | 0.16 | <0.01 | 0.16 |
| BASIN2D-02 | 11/09/2018 | 616993 | <0.01 | 0.16 | <0.01 | 0.16 |
| **SEDIMENT BASIN 2E** | | | | | | |
| BASIN2E_01 | 12/09/2018 | 617218 | <0.01 | 0.22 | <0.01 | 0.22 |
| BASIN2E_02 | 12/09/2018 | 617218 | <0.01 | 0.19 | <0.01 | 0.19 |
| **SEDIMENT BASIN 3A** | | | | | | |
| BASIN3A_01 | 10/09/2018 | 616818 | <0.01 | 0.24 | <0.01 | 0.24 |
| BASIN3A_02 | 10/09/2018 | 616818 | <0.01 | 0.25 | <0.01 | 0.25 |
| **SEDIMENT BASIN 4A** | | | | | | |
| BASIN4A_01 | 12/09/2018 | 617218 | <0.01 | 1.88 | <0.01 | 1.88 |
| BASIN4A_02 | 12/09/2018 | 617218 | <0.01 | 1.78 | <0.01 | 1.78 |
| QC20180912 | 12/09/2018 | 617218 (duplicate) | <0.01 | 1.88 | <0.01 | 1.88 |
| QA20180913 | 12/09/2018 | 201001 (triplicate) | <0.02 | 1.3 | <0.01 | 1.3 |
| **SEDIMENT BASIN 4B** | | | | | | |
| BASIN4B_01 | 12/09/2018 | 617218 | <0.01 | 0.83 | <0.01 | 0.83 |
| BASIN4B_02 | 12/09/2018 | 617218 | <0.01 | 0.74 | <0.01 | 0.74 |
| **SEDIMENT BASIN 4C** | | | | | | |
| BASIN4C-01 | 4/07/2018 | 606065 | <0.01 | 0.09 | - | - |
| BASIN4C-02 | 4/07/2018 | 606065 | <0.01 | 0.09 | - | - |
| **SEDIMENT BASIN 4D** | | | | | | |
| BASIN4D_01 | 12/09/2018 | 617218 | <0.01 | 0.08 | <0.01 | 0.08 |
| BASIN4D_02 | 12/09/2018 | 617218 | <0.01 | 0.08 | <0.01 | 0.08 |
| **SEDIMENT BASIN 5A** | | | | | | |
| BASIN5A_01 | 12/09/2018 | 617218 | <0.01 | 0.67 | <0.01 | 0.67 |
| BASIN5A_02 | 12/09/2018 | 617218 | <0.01 | 0.64 | <0.01 | 0.64 |

All Sediment Basin Surface Water PFAS Assessment Results - September 2018
Project Number: 51997
Project Name: Moorebank Remediation

| | PFAS | | | |
|---|---|---|---|---|
| | Perfluorooctanoic acid (PFOA) | Sum of PFHxS and PFOS | Perfluorooctanoic acid (PFOA) | Sum of PFHxS and PFOS |
| | µg/L | µg/L | µg/L | µg/L |
| EQL | 0.0002 | 0.001 | 0.0002 | 0.001 |
| MPW PFAS Management Plan 2018 Surface Water and Groundwater On-site and Off-site | 5.6 | 0.7 | - | - |
| NHMRC Draft Guidance on PFAS in Recreational Water | - | - | 14 | 2 |

| Sample ID | Sample Date | Lab Report Number | | | | |
|---|---|---|---|---|---|---|
| **SEDIMENT BASIN 5B** | | | | | | |
| BASIN5B_01 | 8/06/2018 | 602295 | 0.02[#1] | 0.65 | - | - |
| BASIN5B_01F | 8/06/2018 | 602295 (filtered) | 0.02[#1] | 0.62 | - | - |
| BASIN5B_02 | 8/06/2018 | 602295 | 0.02[#1] | 0.68 | - | - |
| BASIN5B_02F | 8/06/2018 | 602295 (filtered) | 0.02[#1] | 0.64 | - | - |
| **SEDIMENT BASIN 5C** | | | | | | |
| SB5C-01 | 14/03/2018 | 589286 | 0.005[#1] | 0.254 | - | - |
| SB5C-01F | 14/03/2018 | 589286 (filtered) | 0.005[#1] | 0.044 | - | - |
| SB5C-02 | 14/03/2018 | 589286 | 0.005[#1] | 0.245 | - | - |
| SB5C-02F | 14/03/2018 | 589286 (filtered) | 0.004[#1] | 0.041 | - | - |
| BASIN5C-01 | 8/06/2018 | 602308 | <0.01 | 0.28 | - | - |
| BASIN5C-01F | 8/06/2018 | 602308 (filtered) | <0.01 | 0.29 | - | - |
| BASIN5C-02 | 8/06/2018 | 602308 | <0.01 | 0.27 | - | - |
| BASIN5C-02F | 8/06/2018 | 602308 (filtered) | <0.01 | 0.26 | - | - |
| **SEDIMENT BASIN 5D** | | | | | | |
| SB5D-01 | 13/03/2018 | 589047 | 0.009[#1] | 0.247 | - | - |
| SB5D-01F | 13/03/2018 | 589047 (filtered) | 0.007[#1] | 0.0273 | - | - |
| SB5D-02 | 13/03/2018 | 589047 | 0.009[#1] | 0.286 | - | - |
| SB5D-02F | 13/03/2018 | 589047 (filtered) | 0.009[#1] | 0.095 | - | - |
| BASIN5D_01 | 8/06/2018 | 602294 | 0.02[#1] | 0.55 | - | - |
| BASIN5D_01F | 8/06/2018 | 602294 (filtered) | 0.02[#1] | 0.52 | - | - |
| BASIN5D_02 | 8/06/2018 | 602294 | 0.02[#1] | 0.53 | - | - |
| BASIN5D_02F | 8/06/2018 | 602294 (filtered) | 0.02[#1] | 0.52 | - | - |
| BASIN5D_01 | 10/09/2018 | 616818 | <0.01 | 0.56 | <0.01 | 0.56 |
| BASIN5D_02 | 10/09/2018 | 616818 | <0.01 | 0.5 | <0.01 | 0.5 |
| QC20180910-01 | 10/09/2018 | 616818 (duplicate) | <0.01 | 0.69 | <0.01 | 0.69 |
| QA20180910-01 | 10/09/2018 | 200460 (triplicate) | <0.01 | 0.53 | <0.01 | 0.53 |
| **SEDIMENT BASIN 6A** | | | | | | |
| SB6A-01 | 14/03/2018 | 589286 | 0.02[#1] | 0.27 | - | - |
| SB6A-01F | 14/03/2018 | 589286 (filtered) | 0.016[#1] | <0.001 | - | - |
| QC20180314 | 14/03/2018 | 589286 (duplicate) | 0.02[#1] | 0.25 | - | - |
| QC20180314-F | 14/03/2018 | 589286 (duplicate - filtered) | 0.019[#1] | 0.058 | - | - |
| QA20180314 | 14/03/2018 | 187213 (triplicate) | 0.02 | 0.22 | - | - |
| QA20180314-F | 14/03/2018 | 187213 (triplicate - filtered) | 0.02 | 0.072 | - | - |
| SB6A-02 | 14/03/2018 | 589286 | 0.021[#1] | 0.27 | - | - |
| SB6A-02F | 14/03/2018 | 589286 (filtered) | 0.014[#1] | <0.001 | - | - |
| BASIN6A_01 | 8/06/2018 | 602307 | 0.02[#1] | 0.53 | - | - |
| BASIN6A_01F | 8/06/2018 | 602307 (filtered) | 0.02[#1] | 0.49 | - | - |
| BASIN6A_02 | 8/06/2018 | 602307 | 0.02[#1] | 0.53 | - | - |
| BASIN6A_02F | 8/06/2018 | 602307 (filtered) | 0.02[#1] | 0.52 | - | - |
| **SEDIMENT BASIN 6B** | | | | | | |
| SB6B-01 | 14/03/2018 | 589286 | 0.019[#1] | 2.32 | - | - |
| SB6B-01F | 14/03/2018 | 589286 (filtered) | 0.016[#1] | 0.704 | - | - |
| BASIN6B_01 | 10/09/2018 | 616818 | <0.01 | 0.84 | <0.01 | 0.84 |
| BASIN6B_02 | 10/09/2018 | 616818 | <0.01 | 0.73 | <0.01 | 0.73 |
| **SEDIMENT BASIN 6C** | | | | | | |
| Not excavated | | | | | | |
| **SEDIMENT BASIN 6D** | | | | | | |
| BASIN6D_01 | 10/09/2018 | 616818 | 0.01[#1] | 2.09 | 0.01[#1] | 2.09 |
| BASIN6D_02 | 10/09/2018 | 616818 | 0.01[#1] | 2.2 | 0.01[#1] | 2.2 |
| **SEDIMENT BASIN 6E** | | | | | | |
| BASIN6E_01 | 10/09/2018 | 616818 | 0.02[#1] | 3.75 | 0.02[#1] | 3.75 |
| BASIN6E_02 | 10/09/2018 | 616818 | 0.02[#1] | 3.32 | 0.02[#1] | 3.32 |

All Sediment Basin Surface Water PFAS Assessment Results - September 2018
Project Number: 51997
Project Name: Moorebank Remediation

| | PFAS | | | |
|---|---|---|---|---|
| | Perfluorooctanoic acid (PFOA) | Sum of PFHxS and PFOS | Perfluorooctanoic acid (PFOA) | Sum of PFHxS and PFOS |
| | µg/L | µg/L | µg/L | µg/L |
| EQL | 0.0002 | 0.001 | 0.0002 | 0.001 |
| MPW PFAS Management Plan 2018 Surface Water and Groundwater On-site and Off-site | 5.6 | 0.7 | - | - |
| NHMRC Draft Guidance on PFAS in Recreational Water | - | - | 14 | 2 |

| Sample ID | Sample Date | Lab Report Number | | | | |
|---|---|---|---|---|---|---|
| **SEDIMENT BASIN 6F** | | | | | | |
| SB6F-01 | 14/03/2018 | 589286 | 0.016[#1] | 1.34 | - | - |
| SB6F-01F | 14/03/2018 | 589286 (filtered) | 0.016[#1] | 0.98 | - | - |
| SB6F-02 | 14/03/2018 | 589286 | 0.016[#1] | 1.33 | - | - |
| SB6F-02F | 14/03/2018 | 589286 (filtered) | 0.014[#1] | 0.62 | - | - |
| BASIN6F-01 | 8/06/2018 | 602296 | <0.01 | 0.68 | - | - |
| BASIN6F-01F | 8/06/2018 | 602296 (filtered) | <0.01 | 0.69 | - | - |
| BASIN6F-02 | 8/06/2018 | 602296 | <0.01 | 0.79 | - | - |
| BASIN6F-02F | 8/06/2018 | 602296 (filtered) | <0.01 | 0.74 | - | - |
| BASIN6F-INT-01 | 8/06/2018 | 602296 (inter-flocculant agent) | <0.01 | 0.57 | - | - |
| BASIN6F-INT-01F | 8/06/2018 | 602296 (inter-flocculant agent - filtered) | <0.01 | 0.42 | - | - |
| BASIN6F-PRO1 | 20/06/2018 | 603869 | <0.01[#1] | 0.69 | - | - |
| BASIN6F-PRO1F | 20/06/2018 | 603869 (filtered) | <0.01[#1] | 0.47 | - | - |
| BASIN6F-PRO2 | 20/06/2018 | 603869 | <0.01[#1] | 0.49 | - | - |
| BASIN6F-PRO2F | 20/06/2018 | 603869 (filtered) | <0.01[#1] | 0.42 | - | - |
| BASIN6F_01 | 10/09/2018 | 616818 | <0.01 | 0.54 | <0.01 | 0.54 |
| BASIN6F_02 | 10/09/2018 | 616818 | <0.01 | 0.62 | <0.01 | 0.62 |
| **SEDIMENT BASIN 7A** | | | | | | |
| SB7A-01 | 14/03/2018 | 589286 | 0.044[#1] | 7.64 | - | - |
| SB7A-01F | 14/03/2018 | 589286 (filtered) | 0.034[#1] | 0.0511 | - | - |
| SB7A-02 | 14/03/2018 | 589286 | 0.04[#1] | 6.5 | - | - |
| SB7A-02F | 14/03/2018 | 589286 (filtered) | 0.029[#1] | 0.006 | - | - |
| BASIN7A-01 | 7/06/2018 | 602074 | 0.04[#1] | 6.8 | - | - |
| BASIN7A-01F | 7/06/2018 | 602074 (filtered) | 0.04[#1] | 6.92 | - | - |
| QC20180607-LL01 | 7/06/2018 | 602074 (duplicate) | 0.04[#1] | 6.1 | - | - |
| QC20180607-LL01F | 7/06/2018 | 602074 (duplicate - filtered) | 0.04[#1] | 5.7 | - | - |
| QA20180607-LL01 | 7/06/2018 | 193633 (triplicate) | 0.04 | 6.52 | - | - |
| QA20180607-LL01F | 7/06/2018 | 193633 (triplicate - filtered) | 0.05 | 6.23 | - | - |
| BASIN7A-02 | 7/06/2018 | 602074 | 0.04[#1] | 7.5 | - | - |
| BASIN7A-02F | 7/06/2018 | 602074 (filtered) | 0.05[#1] | 8.09 | - | - |
| BASIN7A-03 | 7/06/2018 | 602074 | 0.04[#1] | 6.11 | - | - |
| BASIN7A-03F | 7/06/2018 | 602074 (filtered) | 0.04[#1] | 5.78 | - | - |
| BASIN7A_INT_01 | 8/06/2018 | 602298 (no settlement occurred) | 0.04[#1] | 5.42 | - | - |
| BASIN7A_INT_01F | 8/06/2018 | 602298 (filtered - no settlement occured) | 0.04[#1] | 5.05 | - | - |
| BASIN7A-PRO1 | 20/06/2018 | 603869 | 0.04[#1] | 5.13 | - | - |
| BASIN7A-PRO1F | 20/06/2018 | 603869 (filtered) | 0.037[#1] | 5.75 | - | - |
| BASIN7A-PRO2 | 20/06/2018 | 603869 | 0.04[#1] | 4.92 | - | - |
| BASIN7A-PRO2F | 20/06/2018 | 603869 (filtered) | 0.035[#1] | 5.45 | - | - |
| QC20180620-PR | 20/06/2018 | 603869 (duplicate) | 0.04[#1] | 4.94 | - | - |
| QC20180620-PRF | 20/06/2018 | 603869 (duplicate - filtered) | 0.036[#1] | 5.05 | - | - |
| QA20180620-PR | 20/06/2018 | 194493 (triplicate) | 0.05 | 4.93 | - | - |
| QA20180620-PRF | 20/06/2018 | 194493 (triplicate - filtered) | 0.03 | 2.51 | - | - |
| BASIN7A_01 | 10/09/2018 | 616818 | 0.02[#1] | 4.85 | 0.02[#1] | 4.85 |
| BASIN7A_02 | 10/09/2018 | 616818 | 0.03[#1] | 4.47 | 0.03[#1] | 4.47 |
| **SEDIMENT BASIN 7B** | | | | | | |
| BASIN7B_01 | 10/09/2018 | 616818 | <0.01 | 0.77 | <0.01 | 0.77 |
| BASIN7B_02 | 10/09/2018 | 616818 | <0.01 | 0.77 | <0.01 | 0.77 |
| **SEDIMENT BASIN 8A** | | | | | | |
| BASIN8A_01 | 10/09/2018 | 616818 | 0.02[#1] | 2.79 | 0.02[#1] | 2.79 |
| BASIN8A_02 | 10/09/2018 | 616818 | 0.03[#1] | 3.45 | 0.03[#1] | 3.45 |
| **SEDIMENT BASIN 9A** | | | | | | |
| BASIN9A-01 | 11/09/2018 | 616993 | <0.01 | 0.13 | <0.01 | 0.13 |
| BASIN9A-02 | 11/09/2018 | 616993 | <0.01 | 0.15 | <0.01 | 0.15 |
| **SEDIMENT BASIN 9B** | | | | | | |
| BASIN9B-01 | 11/09/2018 | 616993 | <0.01 | 0.04 | <0.01 | 0.04 |
| BASIN9B-02 | 11/09/2018 | 616993 | <0.01 | 0.04 | <0.01 | 0.04 |

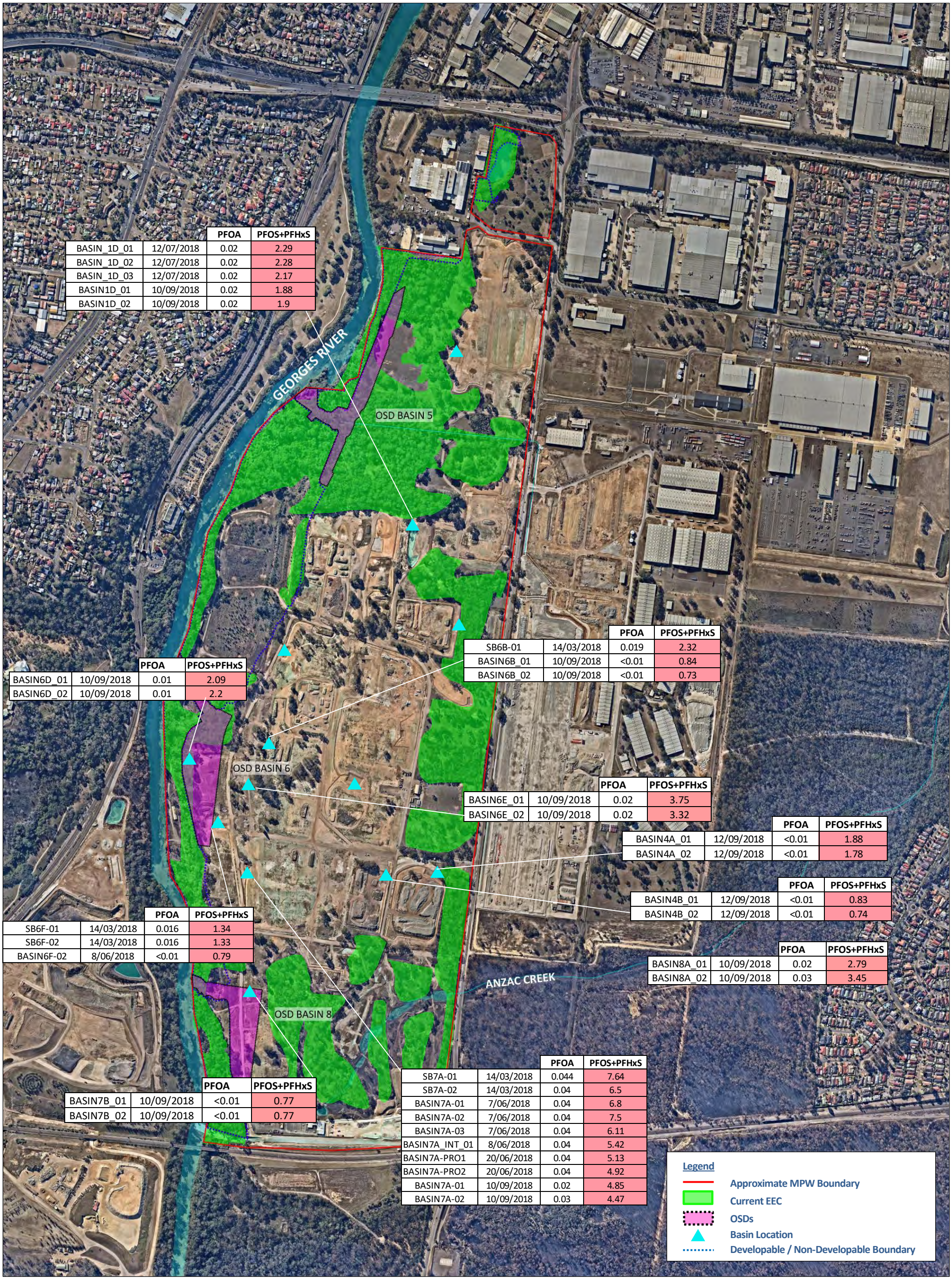
All Sediment Basin Surface Water PFAS Assessment Results - September 2018
Project Number: 51997
Project Name: Moorebank Remediation

| | PFAS | | | |
|---|---|---|---|---|
| | Perfluorooctanoic acid (PFOA) | Sum of PFHxS and PFOS | Perfluorooctanoic acid (PFOA) | Sum of PFHxS and PFOS |
| | µg/L | µg/L | µg/L | µg/L |
| EQL | 0.0002 | 0.001 | 0.0002 | 0.001 |
| MPW PFAS Management Plan 2018 Surface Water and Groundwater On-site and Off-site | 5.6 | 0.7 | - | - |
| NHMRC Draft Guidance on PFAS in Recreational Water | - | - | 14 | 2 |
| **Sample ID** | **Sample Date** | **Lab Report Number** | | | | |
| **RINSATE** | | | | | | |
| RINSATE1303 | 13/03/2018 | 589047 | <0.001 | <0.001 | - | - |
| RINSATE1403 | 14/03/2018 | 589286 | <0.001 | <0.001 | - | - |
| RINSATE 20180608 | 8/06/2018 | 602295 | <0.01 | <0.01 | - | - |
| RINSATE20180704 | 4/07/2018 | 606065 | <0.01 | <0.01 | - | - |
| RINSATE20180712 | 12/07/2018 | 607388 | <0.01 | <0.01 | - | - |
| RINSATE 20180910 | 10/09/2018 | 616818 | <0.01 | <0.01 | <0.01 | <0.01 |
| RINSATE 20180912 | 12/09/2018 | 617218 | <0.01 | <0.01 | <0.01 | <0.01 |
| **REAGENT BLANK** | | | | | | |
| BLANK20180620 | 20/06/2018 | 603869 | <0.01 | <0.01 | - | - |
| BLANK20180704 | 4/07/2018 | 606065 | <0.01 | <0.01 | - | - |
| BLANK20180912 | 12/09/2018 | 617218 | <0.01 | <0.01 | <0.01 | <0.01 |

**Data Comments**

#1 Quantification of linear and branched isomers has been conducted as a single total response using the relative response factor for the corresponding linear/branched standard.

# *Attachment 3 – Figures*




| | | PFOA | PFOS+PFHxS |
|---|---|---|---|
| BASIN_1D_01 | 12/07/2018 | 0.02 | 2.29 |
| BASIN_1D_02 | 12/07/2018 | 0.02 | 2.28 |
| BASIN_1D_03 | 12/07/2018 | 0.02 | 2.17 |
| BASIN1D_01 | 10/09/2018 | 0.02 | 1.88 |
| BASIN1D_02 | 10/09/2018 | 0.02 | 1.9 |

| | | PFOA | PFOS+PFHxS |
|---|---|---|---|
| SB6B-01 | 14/03/2018 | 0.019 | 2.32 |
| BASIN6B_01 | 10/09/2018 | <0.01 | 0.84 |
| BASIN6B_02 | 10/09/2018 | <0.01 | 0.73 |

| | | PFOA | PFOS+PFHxS |
|---|---|---|---|
| BASIN6D_01 | 10/09/2018 | 0.01 | 2.09 |
| BASIN6D_02 | 10/09/2018 | 0.01 | 2.2 |

| | | PFOA | PFOS+PFHxS |
|---|---|---|---|
| BASIN6E_01 | 10/09/2018 | 0.02 | 3.75 |
| BASIN6E_02 | 10/09/2018 | 0.02 | 3.32 |

| | | PFOA | PFOS+PFHxS |
|---|---|---|---|
| BASIN4A_01 | 12/09/2018 | <0.01 | 1.88 |
| BASIN4A_02 | 12/09/2018 | <0.01 | 1.78 |

| | | PFOA | PFOS+PFHxS |
|---|---|---|---|
| BASIN4B_01 | 12/09/2018 | <0.01 | 0.83 |
| BASIN4B_02 | 12/09/2018 | <0.01 | 0.74 |

| | | PFOA | PFOS+PFHxS |
|---|---|---|---|
| SB6F-01 | 14/03/2018 | 0.016 | 1.34 |
| SB6F-02 | 14/03/2018 | 0.016 | 1.33 |
| BASIN6F-02 | 8/06/2018 | <0.01 | 0.79 |

| | | PFOA | PFOS+PFHxS |
|---|---|---|---|
| BASIN8A_01 | 10/09/2018 | 0.02 | 2.79 |
| BASIN8A_02 | 10/09/2018 | 0.03 | 3.45 |

| | | PFOA | PFOS+PFHxS |
|---|---|---|---|
| BASIN7B_01 | 10/09/2018 | <0.01 | 0.77 |
| BASIN7B_02 | 10/09/2018 | <0.01 | 0.77 |

| | | PFOA | PFOS+PFHxS |
|---|---|---|---|
| SB7A-01 | 14/03/2018 | 0.044 | 7.64 |
| SB7A-02 | 14/03/2018 | 0.04 | 6.5 |
| BASIN7A-01 | 7/06/2018 | 0.04 | 6.8 |
| BASIN7A-02 | 7/06/2018 | 0.04 | 7.5 |
| BASIN7A-03 | 7/06/2018 | 0.04 | 6.11 |
| BASIN7A_INT_01 | 8/06/2018 | 0.04 | 5.42 |
| BASIN7A-PRO1 | 20/06/2018 | 0.04 | 5.13 |
| BASIN7A-PRO2 | 20/06/2018 | 0.04 | 4.92 |
| BASIN7A-01 | 10/09/2018 | 0.02 | 4.85 |
| BASIN7A-02 | 10/09/2018 | 0.03 | 4.47 |

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# PFAS Stormwater Management Technical Memo

## Figure 1 – Surface Water Concentrations in Sediment Basins March – September 2018

Job No: EP0745.018
Date: 18/09/2018
Drawing Ref: EP0745.018_Fig 1
Version No: v1

N

0 100 200 400
Approximate Scale Only (m)

Co-ordinate system: MGA 56
Drawn by: PP Checked by: PS
Scale of regional map not shown
Source: Near Maps

# *Attachment 4 – Existing Water Bodies*


TOTAL SURVEYING
SOLUTIONS
SUITE 5 / 21 ELIZABETH STREET, CAMDEN NSW 2570
Ph. (02) 4655 4035 Fax. (02) 46 55 7094 Email: tss@totalsurveying.com.au



| | | |
|---|---|---|
| DRAWING: EXISTING WATER BODIES | JOB No.: 161451 | LGA: LIVERPOOL |
| | PLAN No.: 1015 | DATUM: N/A |
| CLIENT: LIBERTY INDUSTRIAL | DATE: 12/09/2018 | SCALE: NTS |
| PROJECT: MOOREBANK | DRAWN: NJ | CONT. INTERVAL: NA |
| ADDRESS: MOOREBANK AVE, MOOREBANK | CHK: | SHEET : 1 OF 1 |

11 March 2019
Ref: EP0745.018 v2

# *Attachment 5 – Addendum to Health Risk Assessment*

# Addendum #2 to the Human Health Risk Assessment - Construction Workers Handling PFAS Containing Stormwater

Moorebank Precinct West, Moorebank Ave, Moorebank, NSW

Prepared for: Qube Property Management Services Pty Ltd c/o Tactical Group Pty Ltd

EP0745.019 19 September 2018

APPROVED COMPANY ISO 9001 Quality Management Systems QMS Certification Services

APPROVED COMPANY AS/NZS 4801 OH&S Management Systems QMS Certification Services

APPROVED COMPANY ISO 14001 Environmental Management Systems QMS Certification Services

EP RISK

19 September 2018
Ref: EP0745.019

Qube Property Management Services Pty Ltd ('Qube') c/o Tactical Group Pty Ltd ('Tactical')
Level 15, 124 Walker Street
North Sydney NSW 2060
Via email: wcourtenay@tacticalgroup.com.au

Attention: William Courtenay

# Addendum #2 to the Human Health Risk Assessment - Construction Workers Handling PFAS Containing Stormwater Moorebank Precinct West, Moorebank Intermodal Terminal Development

## INTRODUCTION

Qube Property Management Services Pty Ltd ('Qube') c/o Tactical Group Pty Ltd ('Tactical') engaged EP Risk Management Pty Ltd ('EP Risk') to provide risk-based maximum allowable per- and poly-fluoroalkyl substances ('PFAS') concentrations of stormwater for handling by construction workers at the Moorebank Precinct West ('MPW') portion of the Moorebank Intermodal Terminal Development, Moorebank NSW (MITD) (the 'Site').

## PURPOSE

Stormwater is collected in sediment basins at the Site and the concentrations of the PFAS has been analysed. The design of the sediment basins required that all stormwater is removed, as far as reasonably practicable, within 10 days of a rainfall event to restore adequate stormwater capacity on-site. After a recent storm event, the collected stormwater now requires transfer into temporary storage locations on-site. This was necessary to provide adequate capacity for future storm events. It is understood that some of the stormwater is also proposed to be used for dust suppression on-site via a water cart.

The purpose of this assessment was to assess risk of construction workers to stormwater during transfer to temporary storage locations and dust suppression at the Site. In order to provide a safe working environment, this assessment calculated the maximum allowable PFAS concentrations in stormwater before its transport, management and handling.

## OBJECTIVE

The objective of the assessment was to provide Qube c/o Tactical with risk based maximum allowable PFAS stormwater concentrations to facilitate the safe handling /management of on-site stormwater by construction workers.

## METHODOLOGY

The assessment methodology and procedures adopted in this report are in line with guidance provided in:

- Environmental Health Risk Assessment: *Guidelines for Assessing Human Health Risks from Environmental Hazards* (enHealth, 2012)[1];
- NEPC (2013) *Guideline on Health Risk Assessment Methodology, Schedule B4*[2];
- NEPC (2013) *Guideline on Derivation Health Based Investigation Levels, Schedule B7*; and
- US EPA Risk Assessment Guidance for Superfund: *Volume I – Human Health Evaluation Manual, Part A* (US EPA, 1989)[3].

This assessment is an addendum to the previous risk assessment report titled "Literature Review, Criteria for Assessment of PFAS and Risk Assessment" prepared by EP Risk (2018)[4] and the EP Risk (2018a)[5] Addendum to Qualitative Human Health Risk Assessment. The maximum allowable PFAS stormwater concentrations are calculated using the back calculation of RISC5 software program with the same assessment criteria, receptors, exposure pathways, exposure parameters as those reported in the EP Risk's previous risk assessment report. Therefore, this report should be read together with the EP Risk's previous risk assessment report.

## RESULTS

The maximum allowable PFAS stormwater concentrations for the identified complete exposure pathways of incidental ingestion and dermal contact are presented in **Table 1** for construction workers. The input parameters are presented as **Attachment A**.

**Table 1 – Maximum Allowable Stormwater Concentrations for Identified Receptors**

| Receptors and Exposure Scenarios | PFOS and PFOS Grouped[6] µg/L | PFOA and PFOA Grouped[7] µg/L |
|---|---|---|
| ***Construction Worker*** | | |
| *Ingestion* | 270 | 2,200 |
| *Dermal Contact* | 0.67 | 5.4 |

[1] Environmental Health Risk Assessment: Guidelines for Assessing Human Health Risk from Environmental Hazards. Department of Health and Ageing and enHealth Council Australia (2012).
[2] NEPC (2013) National Environmental Protection Measure (Assessment of Site Contamination) 1999 (April 2013), Schedule B(1) to Schedule B(7), National Environment Protection Measure, National Environment Protection Council.
[3] US EPA (1989), Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual Interim Final, OSWER Directive 9285.7-0/a, Office of Emergency and Remedial Response, United States Environment Protection Agency, Washington DC.
[4] EP Risk (2018) Literature Review, Criteria for Assessment of PFAS and Risk Assessment, dated 16 March 2018 (ref: EP0488.001_v4).
[5] EP Risk (2018) Addendum to Qualitative Human Health Risk Assessment, dated 5 September 2018 (ref: EP0745.016_v1).
[6] PFOS - Perfluorooctane sulfonate; PFOSA – Perfluorooctanesulfonamide; N-Me-FOSA - N-Methyl perfluorooctane sulphonamide; N-Et-FOSA - N-Ethyl perfluorooctane sulphonamide; N-Me-FOSE - N-Methyl perfluorooctane sulfonamidoethanol; N-Et-FOSE - N-Ethyl perfluorooctane sulfonamidoethanol; PFBS - Perfluorobutane sulfonic acid; PFHxS - Perfluorohexane sulfonate; PFDcS - Perfluorodecane sulfonic acid.
[7] PFOA - Perfluorooctanoic acid; PFHxA - Perfluorohexanoic acid; PFHpA - Perfluoroheptanoic acid; PFNA - Perfluorononanoic acid; PFDcA - Perfluorodecanoic acid; PFUnA - Perfluoroundecanoic acid; PFDoA - Perfluorododecanoic acid; PFTnA - Perflouorotridecanoic acid; PFTeA - Perfluorotetradecanoic acid.

## SENSITIVITY ANALYSIS

Based upon a review of available literature, no dermal absorption data has been published for PFOS and PFOS grouped chemicals. There was limited published information available for dermal absorption of PFOA, prior to 2005, which indicated negligible absorption through the skin. Fasano et al. (2005)[8] estimated that only 0.048 % of PFOA in aqueous solution penetrated human skin after a 48-hour exposure period, and estimated a dermal permeability coefficient through human skin of the order of $1x10^{-6}$ cm/hr.

Adopting the permeability coefficient value derived by Fasano et al. (2005) in the health risk assessment would reduce the calculated dermal risk by at least 50,000 times. Based on the reduced risk, the maximum allowable stormwater concentration for dermal exposure for PFOS and PFOS Grouped chemical would increase to **33.5 mg/L** for construction workers. Based on an assessment of the health risks adopting data from Fasano et al. (2005), dermal exposure is negligible.

However, the findings of Fasano et al. (2005) are inconsistent with a subsequent study by Franko et al. (2012)[9], which demonstrated through in-vivo and in-vitro studies that the dermal absorption was much greater than the findings of Fasano et al. (2005). Franko et al. (2012) found that blood serum levels of PFOA in mice ranged from 152 ±14 µg/mL in the low concentration exposure group (0.5 % PFOA) to 226 ±14 µg/mL in the high exposure group (2 % PFOA). The in-vitro study, both in human and mouse skin, found that the total absorbable amount of PFOA was approximately 69 % and 48 % of the applied dose, respectively. Franko et al. (2012) also confirmed that PFOA is a corrosive substance to the skin and eyes.

Therefore, based upon the emerging nature of toxicological studies, this assessment considers that the dermal exposure to PFAS is not negligible, but acknowledges the conservatism in the maximum allowable stormwater concentrations provided in **Table 1**.

## DISCUSSION

If comparisons are made between the reported PFAS concentrations of stormwater and the above calculated maximum allowable concentrations, the followings can be summarised:

- The reported stormwater concentrations of PFOS and PFOS grouped chemicals are approximately three orders of magnitude less than the calculated maximum allowable concentrations for the incidental ingestion exposure indicating that the risk to workers is at an acceptable level for the incidental ingestion. Therefore, no extra management is necessary for the incidental ingestion pathway of exposure.
- The reported stormwater concentrations of PFOS and PFOS grouped chemicals are approximately an order of magnitude greater than the calculated maximum allowable concentrations for the dermal exposure indicating that the risk to workers is not acceptable for the dermal exposure. Therefore, prevention of dermal exposure through use of water-

[8] Fasano, W. J., Kennedy, G. L., Szostek, B., Farrar, D. G., Ward, R. J., Haroun, L., and Hinderliter, P. M. 2005. Penetration of ammonium perfluorooctanoate through rat and human skin in vitro. Drug Chem. Toxicol. 28: 79–90.
[9] Franko, et al. (2012). Dermal Penetration Potential of Perfluorooctanoic Acid (PFOA) in Human and Mouse Skin. Journal of toxicology and environmental health. Part A. 75. 50-62.

poof gloves and boots are necessary as management of dermal exposure. However, this dermal exposure risk in calculations is related to the adoption of highly conservative dermal penetration coefficient factor. It should be noted here that the current industry practice assumes the dermal exposure to PFAS is negligible.

- The reported stormwater concentrations of PFOA and PFOA grouped chemicals are approximately 5 to 7 orders of magnitude less than the calculated maximum allowable concentrations for the incidental ingestion and dermal exposure indicating that the risk to workers are in acceptable level for the both exposure pathways. Therefore, no extra management is necessary for the incidental ingestion and dermal exposure regarding to the PFOA and PFOA grouped chemicals in stormwater.

## CONCLUSION

Maximum allowable stormwater concentrations protective of the health of constructions workers have been prepared for site activities including transport, management and handling of PFAS containing stormwater including dust suppression on-site. Based on the most recent toxicological data available, a dermal risk exposure to construction workers was identified. However, a sensitivity analysis using the current industry standard permeability coefficient value identified a negligible risk to construction workers.

Notwithstanding the uncertainty in the emerging nature of toxicological PFAS studies, the precautionary principle should be adopted to the potential human health risk to construction worker groups involved in the handling of stormwater on-site, through mandatory use of waterproof gloves and boots.

Based on dermal risk to construction workers being managed through mandatory use of waterproof gloves and boots, stormwater at the Site with concentrations less than **270 µg/L (PFOS and PFOS Grouped)** and **2,200 µg/L (PFOA and PFOA Grouped),** respectively are considered suitable for transport, handling and on-site management (including dust suppression) from a human health risk perspective.

## RECOMMENDATIONS

EP Risk recommends that the precautionary principle should be applied and the potential health risk to construction workers involved in the transport, handling and management of stormwater should be effectively managed through the mandatory use of waterproof gloves and boots in accordance with the currently adopted work health and safety practices at the Site.

## CLOSURE

If any further information is required or if you have any queries regarding this information, please do not hesitate to contact me on 0428 365 245.

Yours sincerely

Dr Ismail Gulec
Principal Toxicologist and Risk Assessor
EP Risk Management Pty Ltd

## Attachments

**Attachment**– RISC5 Output Tables

**QUALITY CONTROL**

| Version | Author | Date | Reviewer | Date | Quality Review | Date |
|---|---|---|---|---|---|---|
| v1 | I. Gulec | 19.09.2018 | P. Simpson | 19.09.2018 | K. Thomas | 19.09.2018 |

**DOCUMENT CONTROL**

| Version | Date | Reference | Submitted to |
|---|---|---|---|
| *v1* | *19.09.2018* | *EP0745.019_Qube MPW_Allowable Stormwater_v1* | *Qube c/o Tactical* |

**LIMITATIONS**

This Addendum #2 to the Human Health Risk Assessment - Construction Workers Handling PFAS Containing Stormwater was conducted on the behalf of Qube Property Management Services Pty Ltd ('Qube') c/o Tactical Group Pty Ltd ('Tactical') for the purpose/s stated in the **Objective** section.

EP Risk has prepared this document in good faith, but is unable to provide certification outside of areas over which EP Risk had some control or were reasonably able to check. The report also relies upon information provided by third parties. EP Risk has undertaken all practical steps to confirm the reliability of the information provided by third parties and do not accept any liability for false or misleading information provided by these parties.

It is not possible in an Addendum #2 to the Human Health Risk Assessment - Construction Workers Handling PFAS Containing Stormwater to present all data, which could be of interest to all readers of this report. Readers are referred to any referenced investigation reports for further data.

Inaccessible areas are omitted from the assessment including beneath concrete slabs, beneath the subsurface, within the soil or fill, beneath floorboards, in the crawlspace of the building inside the walls of the structures and inside the roof cavity not in immediate.

Users of this document should satisfy themselves concerning its application to, and where necessary seek expert advice in respect to, their situation.

All work conducted and reports produced by EP Risk are based on a specific scope and have been prepared for Addendum #2 to the Human Health Risk Assessment - Construction Workers Handling PFAS Containing Stormwater and therefore cannot be relied upon by any other third parties unless agreed in writing by EP Risk.

The report(s) and/or information produced by EP Risk should not be reproduced and/or presented/reviewed except in full.

19 September 2018
Ref: EP0745.019

# *Attachment–RISC5 Output Tables*

19 September 2018
Ref: EP0745.019

# Construction Worker Ingestion Pathway

## Summary of Input Data for Risk Calculation

| | |
|---|---|
| **Description:** | **Morebank Remediation worker** |
| **Date:** | **05-04-2017 16:12:40** |

| **Receptors:** |
|---|
| Construction Worker - Upper Percentile |

| **Routes:** |
|---|
| Ingestion of Surface Water |

| **Chemicals:** |
|---|
| PFOA |
| PFOS |

## Exposure Parameters

| **Exposure Pathway** | **Units** | **Construction Worker - Upper Percentile** |
|---|---|---|
| Body weight | kg | 75 |
| Averaging time for carcinogens | yr | 70 |
| Exposure duration | yr | 1 |

| **Ingestion of Surface Water** | **Units** | **Construction Worker - Upper Percentile** |
|---|---|---|
| Exposure frequency for surface water/sediment | events/yr | 90 |
| Time spent swimming or in contact with surface wat | hr/d | 8 |
| Ingestion rate of surface water | ml/hr | 2.5 |

**Slope Factors and Reference Doses**

| **Chemical** | **Units** | **PFOA** | **PFOS** |
|---|---|---|---|
| Ingestion Slope Factor | 1/(mg/kg-day) | ND | ND |
| Ingestion Reference Dose | mg/kg-day | 1.44E-04 | 1.80E-05 |

**Exposure Point Concentrations**

--- Used to calculate risk and hazard index.

| **Concentrations in Surface Water (mg/L)** | |
|---|---|
| PFOA | 2.19 |
| PFOS | 0.274 |

## Summary of Daily Doses (Intake) for Risk Calculation

| Description: | Morebank Remediation worker |
|---|---|
| Date: | 05-04-2017 16:12:40 |

| Daily Dose and Risk for: PFOA<br>Ingestion of Surface Water | Construction Worker - Upper Percentile |
|---|---|
| CADD (mg/kd-d) | 1.4E-04 |
| LADD (mg/kd-d) | 2.1E-06 |
| Cancer Risk (-) | ND |
| Hazard Index (-) | 1.0E+00 |

| Daily Dose and Risk for: PFOS<br>Ingestion of Surface Water | Construction Worker - Upper Percentile |
|---|---|
| CADD (mg/kd-d) | 1.8E-05 |
| LADD (mg/kd-d) | 2.6E-07 |
| Cancer Risk (-) | ND |
| Hazard Index (-) | 1.0E+00 |

## Summary of Clean-up Levels

Analysis based on Individual Constituent Levels

| Clean-up Levels in Surface Water | Clean-up Levels | | Solubility |
|---|---|---|---|
| Receptor used when carcinogenic risk is limiting: Construction Worker - Upper Percentile | mg/L | | |
| Receptor used when non-carcinogenic risk is limiting: Construction Worker - Upper Percentile | mg/L | mg/L | |
| PFOA | 2.2E+00 | Hazard Index | 9.5E+03 |
| PFOS | 2.7E-01 | Hazard Index | 5.7E+02 |

| The exposure routes that depend on this source are: |
|---|
| Ingestion of Surface Water |

19 September 2018
Ref: EP0745.019

# Construction Worker Dermal Contact Pathway

## Summary of Input Data for Risk Calculation

| | |
|---|---|
| **Description:** | **Morebank Remediation Dermal Contact** |
| **Date:** | **09-18-2018 11:41:39** |

| **Receptors:** |
|---|
| Construction Worker - Upper Percentile |

| **Routes:** |
|---|
| Dermal Contact with Surface Water |

| **Chemicals:** |
|---|
| PFOA |
| PFOS |

## Exposure Parameters

| **Exposure Pathway** | **Units** | **Construction Worker - Upper Percentile** |
|---|---|---|
| Body weight | kg | 75 |
| Averaging time for carcinogens | yr | 70 |
| Exposure duration | yr | 1 |

| **Dermal Contact with Surface Water** | **Units** | **Construction Worker - Upper Percentile** |
|---|---|---|
| Exposure frequency for surface water/sediment | events/yr | 90 |
| Time spent swimming or in contact with surface wat | hr/d | 8 |
| Skin surface area exposed to surface water | cm2 | 6.80E+03 |

| **Absorption Adjustment Factors** | **Dermal Permeability Coefficient cm/hour** |
|---|---|
| PFOA | 0.15 |
| PFOS | 0.15 |

**Slope Factors and Reference Doses**

| **Chemical** | **Units** | **PFOA** | **PFOS** |
|---|---|---|---|
| Ingestion Slope Factor | 1/(mg/kg-day) | ND | ND |
| Ingestion Reference Dose | mg/kg-day | 1.44E-04 | 1.80E-05 |

**Exposure Point Concentrations**

--- Used to calculate risk and hazard index.

| **Concentrations in Surface Water (mg/L)** | |
|---|---|
| PFOA | 5.37E-03 |
| PFOS | 6.71E-04 |

## Summary of Daily Doses (Intake) for Risk Calculation

| | |
|---|---|
| **Description:** | **Morebank Remediation Dermal Contact** |
| **Date:** | **09-18-2018 11:41:39** |

| **Daily Dose and Risk for: PFOA**<br>**Dermal Contact with Surface Water** | **Construction Worker - Upper Percentile** |
|---|---|
| CADD (mg/kd-d) | 1.4E-04 |
| LADD (mg/kd-d) | 2.1E-06 |
| Cancer Risk (-) | ND |
| Hazard Index (-) | 1.0E+00 |

| **Daily Dose and Risk for: PFOS**<br>**Dermal Contact with Surface Water** | **Construction Worker - Upper Percentile** |
|---|---|
| CADD (mg/kd-d) | 1.8E-05 |
| LADD (mg/kd-d) | 2.6E-07 |
| Cancer Risk (-) | ND |
| Hazard Index (-) | 1.0E+00 |

## Summary of Clean-up Levels

Analysis based on Individual Constituent Levels

| **Clean-up Levels in Surface Water** | **Clean-up Levels** | | **Solubility** |
|---|---|---|---|
| **Receptor used when carcinogenic risk is limiting: Construction Worker - Upper Percentile** | **mg/L** | | |
| **Receptor used when non-carcinogenic risk is limiting: Construction Worker - Upper Percentile** | **mg/L** | **mg/L** | |
| PFOA | 5.4E-03 | Hazard Index | 9.5E+03 |
| PFOS | 6.7E-04 | Hazard Index | 5.7E+02 |

| **The exposure routes that depend on this source are:** |
|---|
| Dermal Contact with Surface Water |

# *Attachment 6 – Mass Flux Calculations*

# EP0745.018

## Table 6.1 - Groundwater Mass flux calculations for monitoring events - western boundary

$$Md = \sum_{i=1}^{i=n} Ci \quad Ai \quad qi \quad CF$$

**Where:**

Md = total mass flux from the source zone [g/day]
Ci = concentration of constituent at flow area in transect [g/L]
A = flow area [$m^2$]
q = specific discharge [m/day]
CF = conversion factor [$L/m^3$]

| | Minimum | Average | Maximum |
|---|---|---|---|
| Effective Porosity | 15% | 26% | 32% |

| | | | | | 28/02/2017 | 27/03/2017 | 25/06/2018 | 28/02/2017 | 27/03/2017 | 25/06/2018 | 28/02/2017 | 27/03/2017 | 25/06/2018 | 28/02/2017 | 27/03/2017 | 25/06/2018 | 28/02/2017 | 27/03/2017 | 25/06/2018 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Well ID** | **Chainage** | **Grid width (m)** | **Thickness of Aquifer (m)** | **Hydraulic conductivity (average) (m/day)** | **Hydraulic gradient (m/m)** | **Hydraulic gradient (m/m)** | **Hydraulic gradient (m/m)** | **Groundwater flux (kL/day)** | **Groundwater flux (kL/day)** | **Groundwater flux (kL/day)** | **Horizontal seepage velocity (m/day)** | **Horizontal seepage velocity (m/day)** | **Horizontal seepage velocity (m/day)** | **PFOS +PFHxS concentration (µg/L)** | **PFOS +PFHxS concentration (µg/L)** | **PFOS +PFHxS concentration (µg/L)** | **PFOS +PFHxS flux (g/year) (average)** | **PFOS +PFHxS flux (g/year) (average)** | **PFOS +PFHxS flux (g/year) (average)** |
| BHB2 | 2300 | 180 | 3 | 21 | 0.0038 | 0.0038 | 0.0038 | 43 | 43 | 43 | 0.31 | 0.31 | 0.31 | 0.189 | 0.189 | 0.1062 | 3.0 | 3.0 | 1.7 |
| MW2A | 2120 | 500 | 6 | 21 | 0.0038 | 0.0038 | 0.0038 | 239 | 239 | 239 | 0.31 | 0.31 | 0.31 | 0.048 | 0.048 | 0.0135 | 4.2 | 4.2 | 1.2 |
| MW108 | 1620 | 120 | 6 | 6.3 | 0.0074 | 0.0069 | 0.0062 | 33 | 32 | 28 | 0.18 | 0.17 | 0.15 | 1.494 | 3.601 | 2.1 | 18.2 | 41.4 | 21.4 |
| MW3001 | 1500 | 200 | 6 | 15.4 | 0.0074 | 0.0069 | 0.0062 | 136 | 128 | 114 | 0.44 | 0.41 | 0.36 | 0.984 | 1.706 | 0.337 | 48.9 | 80.0 | 14.0 |
| MW2019 | 1300 | 125 | 6 | 17.6 | 0.0027 | 0.0026 | 0.0024 | 36 | 34 | 32 | 0.18 | 0.17 | 0.16 | 14.38 | 6.717 | 2.81 | 188.3 | 83.3 | 32.8 |
| MW2018 | 1175 | 100 | 1.5 | 17.8 | 0.0027 | 0.0026 | 0.0024 | 7 | 7 | 6 | 0.19 | 0.18 | 0.17 | 3.946 | 4.006 | 3.7 | 10.5 | 10.1 | 8.7 |
| MW2014 | 1075 | 85 | 1.5 | 13.5 | 0.0027 | 0.0026 | 0.0024 | 5 | 4 | 4 | 0.14 | 0.13 | 0.13 | 61.64 | 61.64 | 61.64 | 105.3 | 99.7 | 93.8 |
| MW2012 | 990 | 40 | 5 | 7 | 0.0027 | 0.0026 | 0.0024 | 4 | 4 | 3 | 0.07 | 0.07 | 0.07 | 69.359 | 205.779 | 7.41 | 96.3 | 270.8 | 9.2 |
| MW3002 | 950 | 60 | 5 | 3 | 0.0100 | 0.0097 | 0.0096 | 9 | 9 | 9 | 0.12 | 0.11 | 0.11 | 0.01 | 0.064 | 0.0022 | 0.0 | 0.2 | 0.0 |
| MW3003 | 890 | 100 | 5 | 3 | 0.0100 | 0.0097 | 0.0096 | 15 | 15 | 14 | 0.12 | 0.11 | 0.11 | 4.371 | 3.739 | 7.15 | 24.0 | 19.8 | 37.7 |
| MW3004 | 790 | 100 | 5 | 15 | 0.0100 | 0.0097 | 0.0096 | 75 | 73 | 72 | 0.58 | 0.56 | 0.56 | 19.388 | 515.82 | 14.6 | 532.0 | 13685.4 | 384.6 |
| MW109B | 690 | 120 | 5 | 10 | 0.0100 | 0.0097 | 0.0096 | 60 | 58 | 58 | 0.39 | 0.37 | 0.37 | 12.171 | 7.137 | 31.3 | 267.2 | 151.5 | 659.7 |
| MW3012 | 570 | 50 | 4 | 5.5 | 0.0055 | 0.0080 | 0.0088 | 6 | 9 | 10 | 0.12 | 0.17 | 0.19 | 2.491 | 54.759 | 23.6 | 5.5 | 176.3 | 83.0 |
| MW3013 | 520 | 80 | 4 | 15 | 0.0055 | 0.0080 | 0.0088 | 26 | 38 | 42 | 0.31 | 0.46 | 0.51 | 0 | 4.908 | 2.55 | 0.0 | 68.9 | 39.1 |
| MW3014 | 440 | 120 | 4 | 22.25 | 0.0055 | 0.0080 | 0.0088 | 58 | 86 | 94 | 0.47 | 0.69 | 0.75 | 10.319 | 9.954 | 14.2 | 219.6 | 311.1 | 485.1 |
| MW3015 | 320 | 70 | 4 | 16 | 0.0035 | 0.0047 | 0.0028 | 16 | 21 | 12 | 0.22 | 0.29 | 0.17 | 576.96 | 428.55 | 377.4 | 3301.9 | 3267.7 | 1718.0 |
| MW2002 | 250 | 70 | 4 | 16 | 0.0035 | 0.0047 | 0.0028 | 16 | 21 | 12 | 0.22 | 0.29 | 0.17 | 86.008 | 59.302 | 93 | 492.2 | 452.2 | 423.4 |
| MW2001B | 180 | 100 | 8 | 19.4 | 0.0016 | 0.0019 | 0.0033 | 25 | 29 | 52 | 0.12 | 0.14 | 0.25 | 0.45 | 0.967 | 0.89 | 4.1 | 10.4 | 16.7 |
| MW3011 | 80 | 80 | 8 | 14 | 0.0016 | 0.0019 | 0.0033 | 14 | 17 | 30 | 0.09 | 0.10 | 0.18 | 0.314 | 0.603 | 1.71 | 1.6 | 3.7 | 18.6 |
| MW3010 | 0 | 70 | 8 | 12.7 | 0.0016 | 0.0019 | 0.0033 | 11 | 13 | 24 | 0.08 | 0.09 | 0.16 | 1.451 | 1.335 | 1.335 | 6.0 | 6.5 | 11.5 |
| **Minimum =** | | | | | **0.0016** | **0.0019** | **0.0024** | | | | **0.073** | **0.069** | **0.065** | | | | | | |
| **Maximum =** | | | | | **0.0100** | **0.0097** | **0.0096** | | | | **0.578** | **0.686** | **0.750** | | | | | | |
| **Sum =** | | | | | | | | **835** | **879** | **898** | | | | | | | **5329** | **18746** | **4060** |

**Average PFOS + PFHxS mass flux (g/year) = 9378**

**Notes:**

The grid width is determined based upon the distance from the mid point between two wells in Figure 2
Aquifer thickness based upon nested well logs from EP Risk (2017b)
Effective porosity literature values reported by Fetter (1988) Applied Hydrogeology, 2nd Edition, Table 4.3, p74.

# Appendix G

# NSW EPA: Environmental Protection Licence 21054 - Moorebank Precinct

Section 58(5) Protection of the Environment Operations Act 1997

# Licence Variation

Licence - 21054

QUBE RE SERVICES (NO.2) PTY LIMITED
LEVEL 27/45 CLARENCE STREET
SYDNEY NSW 2000

Attention: Daryle Mckone

| | |
|---|---|
| Notice Number | 1605300 |
| File Number | EF18/686 |
| Date | 04-Jun-2021 |

## NOTICE OF VARIATION OF LICENCE NO. 21054

### BACKGROUND

A. QUBE RE SERVICES (NO.2) PTY LIMITED ("the licensee") is the holder of Environment Protection Licence No. 21054 ("the licence") issued under the *Protection of the Environment Operations Act 1997* ("the Act"). The licence authorises the carrying out of activities at MOOREBANK AVENUE, MOOREBANK, NSW, 2170 ("the premises").

B. On 27-Jan-2021 the Environment Protection Authority (EPA) received an application for the variation of the licence.

C. The licence variation requested that the discharge point known as EPA identification point 5 (DP5) is removed from the licence as it is situated in the proposed construction footprint of the Moorebank Avenue diversion/upgrade works.

D. DP5 is located in Moorebank Precinct West, as previously shown in licence condition A2.2.

E. The licensee has proposed to vary the licence to enable discharges which were previously discharged from DP5 to be discharged and monitored through the discharge point known as EPA identification point 7 (DP7).

F. The licensee has demonstrated that environmental controls are in place to prevent scouring of the creek from the additional flow at this point, although it is not expected that flows will exceed previous levels.

G. The licensee has advised that DP5 has been decommissioned and backfilled.

H. Discharges through DP5 were previously subject to 100 percentile concentration limits. These included concentration limits for per- and poly-fluoroalkyl substances (PFAS): perfluorooctane sulphonate (PFOS), perfluorohexane sulphonate (PFHxS) and perfluorooctanoic acid (PFOA).

I. The 100 percentile concentration limits were derived from health-based guideline values for recreational water in the *PFAS National Environmental Management Plan, Heads of the EPAs Australia and New Zealand (HEPA), January 2018*.

J. Concentration limits for PFAS are to be applied to DP7 to ensure that discharges from this point are subject to concentration limits for the same contaminants as previously on DP5.

K. In 2020, the *PFAS National Environmental Management Plan Version 2.0', Heads of EPA Australia and New Zealand 2020* was released. This document contains updated guideline values for some PFAS chemicals.

L. As a result, the EPA has reviewed the concentration limits for PFAS checmicals PFOS, PFHxS and PFOA listed in L2.4.

M. Limits for these contaminants have been updated on the licence to align with the *PFAS National Environmental Management Plan Version 2.0', Heads of EPA Australia and New Zealand 2020.* The EPA has adopted the lower guideline value of the Ecological water quality guideline value for freshwater 95% species protection and Human health guidelines value for recreational water quality.

N. The following limits will apply to discharge points 3, 4 and 7:

- PFOS 0.13 µg/L from the Ecological water quality guideline value for freshwater 95% species protection;
- Sum of PFOS and PFHxS 2 µg/L from the Human health guidelines value for recreational water quality; and
- PFOA 10 µg/L from the Human health guidelines value for recreational water quality.

O. Based on the sampling data for these contaminants provided by the licensee to the EPA, the EPA considers that compliance with the new PFAS limits are achievable.

P. On 30 April 2021, the EPA sent the licensee a draft version of this licence variation to allow the licensee to comment on the proposed changes. The licensee responded on 14 May 2021, requesting that PFOS concentration limits for EPA Identification Points 3, 4 and 7 remain at 0.7 µg/L, rather than the updated 0.13 µg/L. The licensee contended that the Georges River is a highly disturbed system as per ANZECC 2000 Guidelines and as a result, guideline values should reflect this and be set at the 90% species protection level.

Q. On 28 May 2021, the EPA and representatives of the licensee met to discuss the licensee's 12 May response. During this meeting, the licensee expressed that the water treatment system would be able to accommodate the lower PFOS limits that the EPA were proposing.

R. The EPA maintains that a PFOS concentration limit of 0.13 µg/L for EPA Identification Points 3, 4 and 7 will apply. The justification for adopting the PFOS guideline value for freshwater 95% species protection are as follows:

- The advice provided in the National Water Quality Management Strategy and Water Quality Guidelines when assessing bioaccumulative contaminants is to use a higher degree of protection than would normally be used. The bioaccumulating nature of PFAS and the risk to ecology within the Georges River and potential to exacerbate direct and indirect risks to ecological receptors through discharge of surface water warrants a higher level of protection.
- The ANZECC 2000 Guidelines state that an overriding principle of continual improvement should guide management of water resources and that guideline values for slight-to-moderately disturbed systems be applied to highly disturbed systems where possible.

**VARIATION OF LICENCE NO. 21054**

# Licence Variation

4. By this notice the EPA varies licence No. 21054. The attached licence document contains all variations that are made to the licence by this notice.
5. The following variations have been made to the licence:
   - Condition A2.2 - premises map updated with map provided by licensee
   - Condition P1.1 - removal of EPA identification point 5
   - Condition L2.4 - removal of point 5 from concentration limit tables
   - Condition L2.4 - addition of point 7 to PFOS, PFHxS and PFOA concentration limit tables
   - Condition L2.4 - change of note to reflect revised concentration limit for PFOS and PFHxS
   - Condition L2.5 - removal of reference to point 5 from condition
   - Condition L2.6 - removal of reference to point 5 from condition
   - Condition M2.2 - removal of point 5 from monitoring requirement tables
   - Condition M2.2 - addition of point 7 to PFOS, PFHxS and PFOA monitoring requirements table
   - Condition G2.1 - removal of reference to point 5 from condition

.....

**Elizabeth Watson**

**Acting Unit Head**

**Environment Protection Authority**

(by Delegation)

## INFORMATION ABOUT THIS NOTICE

- This notice is issued under section 58(5) of the Act.
- Details provided in this notice, along with an updated version of the licence, will be available on the EPA's Public Register (http://www.epa.nsw.gov.au/prpoeo/index.htm) in accordance with section 308 of the Act.

### Appeals against this decision

- You can appeal to the Land and Environment Court against this decision. The deadline for lodging the appeal is 21 days after you were given notice of this decision.

### When this notice begins to operate

- The variations to the licence specified in this notice begin to operate immediately from the date of this notice, unless another date is specified in this notice.
- If an appeal is made against this decision to vary the licence and the Land and Environment Court directs that the decision is stayed the decision does not operate until the stay ceases to have effect or

the Land and Environment Court confirms the decision or the appeal is withdrawn (whichever occurs first).

# Environment Protection Licence

Licence - 21054

| Licence Details | |
|---|---|
| Number: | 21054 |
| Anniversary Date: | 04-June |

**Licensee**

QUBE RE SERVICES (NO.2) PTY LIMITED

LEVEL 27/45 CLARENCE STREET

SYDNEY NSW 2000

**Premises**

MOOREBANK PRECINCT

MOOREBANK AVENUE

MOOREBANK NSW 2170

**Scheduled Activity**

Crushing, grinding or separating

| Fee Based Activity | Scale |
|---|---|
| Crushing, grinding or separating | > 100000-500000 T annual processing capacity |

**Contact Us**

NSW EPA

4 Parramatta Square

12 Darcy Street

PARRAMATTA NSW 2150

Phone: 131 555

Email: info@epa.nsw.gov.au

Locked Bag 5022

PARRAMATTA NSW 2124

# Environment Protection Licence

Licence - 21054

# Environment Protection Licence

# Environment Protection Licence

Licence - 21054

## Information about this licence

### Dictionary

A definition of terms used in the licence can be found in the dictionary at the end of this licence.

### Responsibilities of licensee

Separate to the requirements of this licence, general obligations of licensees are set out in the Protection of the Environment Operations Act 1997 ("the Act") and the Regulations made under the Act. These include obligations to:

- ensure persons associated with you comply with this licence, as set out in section 64 of the Act;
- control the pollution of waters and the pollution of air (see for example sections 120 - 132 of the Act);
- report incidents causing or threatening material environmental harm to the environment, as set out in Part 5.7 of the Act.

### Variation of licence conditions

The licence holder can apply to vary the conditions of this licence. An application form for this purpose is available from the EPA.

The EPA may also vary the conditions of the licence at any time by written notice without an application being made.

Where a licence has been granted in relation to development which was assessed under the Environmental Planning and Assessment Act 1979 in accordance with the procedures applying to integrated development, the EPA may not impose conditions which are inconsistent with the development consent conditions until the licence is first reviewed under Part 3.6 of the Act.

### Duration of licence

This licence will remain in force until the licence is surrendered by the licence holder or until it is suspended or revoked by the EPA or the Minister. A licence may only be surrendered with the written approval of the EPA.

### Licence review

The Act requires that the EPA review your licence at least every 5 years after the issue of the licence, as set out in Part 3.6 and Schedule 5 of the Act. You will receive advance notice of the licence review.

### Fees and annual return to be sent to the EPA

For each licence fee period you must pay:

- an administrative fee; and
- a load-based fee (if applicable).

# Environment Protection Licence

Licence - 21054

The EPA publication “A Guide to Licensing” contains information about how to calculate your licence fees. The licence requires that an Annual Return, comprising a Statement of Compliance and a summary of any monitoring required by the licence (including the recording of complaints), be submitted to the EPA. The Annual Return must be submitted within 60 days after the end of each reporting period. See condition R1 regarding the Annual Return reporting requirements.

Usually the licence fee period is the same as the reporting period.

**Transfer of licence**

The licence holder can apply to transfer the licence to another person. An application form for this purpose is available from the EPA.

**Public register and access to monitoring data**

Part 9.5 of the Act requires the EPA to keep a public register of details and decisions of the EPA in relation to, for example:

- licence applications;
- licence conditions and variations;
- statements of compliance;
- load based licensing information; and
- load reduction agreements.

Under s320 of the Act application can be made to the EPA for access to monitoring data which has been submitted to the EPA by licensees.

## This licence is issued to:

| |
|---|
| **QUBE RE SERVICES (NO.2) PTY LIMITED** |
| **LEVEL 27/45 CLARENCE STREET** |
| **SYDNEY NSW 2000** |

subject to the conditions which follow.

# Environment Protection Licence

Licence - 21054

## 1 Administrative Conditions

### A1 What the licence authorises and regulates

A1.1 This licence authorises the carrying out of the scheduled activities listed below at the premises specified in A2. The activities are listed according to their scheduled activity classification, fee-based activity classification and the scale of the operation.

Unless otherwise further restricted by a condition of this licence, the scale at which the activity is carried out must not exceed the maximum scale specified in this condition.

| Scheduled Activity | Fee Based Activity | Scale |
|---|---|---|
| Crushing, grinding or separating | Crushing, grinding or separating | > 100000 - 500000 T annual processing capacity |

### A2 Premises or plant to which this licence applies

A2.1 The licence applies to the following premises:

| Premises Details |
|---|
| **MOOREBANK PRECINCT** |
| **MOOREBANK AVENUE** |
| **MOOREBANK** |
| **NSW 2170** |
| **PART LOT 100 DP 1049508, LOT 101 DP 1049508, PART LOT 1 DP 1197707, LOT 2 DP 1197707, PART LOT 4 DP 1197707, LOT 13 DP 1251885, PART LOT 27 DP 1253673** |
| **PART MOOREBANK AVENUE, MOOREBANK (SOUTH M5 MOTORWAY) AND PART ANZAC ROAD, MOOREBANK** |

A2.2 The premises location is shown on the map below.

# Environment Protection Licence

Licence - 21054


| Drainage Points | Easting | Northing |
|---|---|---|
| DP1 | 308709.29 | 6241550.33 |
| DP2 | 308101.76 | 6241694.48 |
| DP3* | 307525.2 | 6241807.6 |
| DP4 | 307111.41 | 6240597.16 |
| DP6 | 308571.2 | 6240443.6 |
| DP7 | 308243.73 | 6240278.99 |

## A3 Information supplied to the EPA

A3.1 Works and activities must be carried out in accordance with the proposal contained in the licence application, except as expressly provided by a condition of this licence.

In this condition the reference to "the licence application" includes a reference to:
a) the applications for any licences (including former pollution control approvals) which this licence replaces under the Protection of the Environment Operations (Savings and Transitional) Regulation 1998; and
b) the licence information form provided by the licensee to the EPA to assist the EPA in connection with the issuing of this licence.

# 2 Discharges to Air and Water and Applications to Land

## P1 Location of monitoring/discharge points and areas

P1.1 The following points referred to in the table are identified in this licence for the purposes of the monitoring and/or the setting of limits for discharges of pollutants to water from the point.

***Water and land***

| EPA Identification no. | Type of Monitoring Point | Type of Discharge Point | Location Description |
|---|---|---|---|
| 1 | DP1 Moorebank Precinct East | DP1 Moorebank Precinct East | DP1 as shown in condition A2.2 |
| 2 | DP2 Moorebank Precinct East | DP2 Moorebank Precinct East | DP2 as shown in condition A2.2 |
| 3 | DP3 Moorebank Precinct West | DP3 Moorebank Precinct West | DP3 as shown in condition A2.2 |
| 4 | DP4 Moorebank Precinct West | DP4 Moorebank Precinct West | DP4 as shown in condition A2.2 |
| 6 | DP6 Moorebank Precinct East | DP6 Moorebank Precinct East | DP6 as shown in condition A2.2 |
| 7 | DP7 Moorebank Precinct East | DP7 Moorebank Precinct East | DP7 as shown in condition A2.2 |

# 3 Limit Conditions

## L1 Pollution of waters

L1.1 Except as may be expressly provided in any other condition of this licence, the licensee must comply with section 120 of the Protection of the Environment Operations Act 1997.

## L2 Concentration limits

L2.1 For each monitoring/discharge point or utilisation area specified in the table\s below (by a point number), the concentration of a pollutant discharged at that point, or applied to that area, must not exceed the concentration limits specified for that pollutant in the table.

# Environment Protection Licence



L2.2 Where a pH quality limit is specified in the table, the specified percentage of samples must be within the specified ranges.

L2.3 To avoid any doubt, this condition does not authorise the pollution of waters by any pollutant other than those specified in the table\s.

L2.4 Water and/or Land Concentration Limits

**POINT 1,2,3,4,6,7**

| Pollutant | Units of Measure | 50 Percentile concentration limit | 90 Percentile concentration limit | 3DGM concentration limit | 100 percentile concentration limit |
|---|---|---|---|---|---|
| Oil and Grease | Visible | | | | 0 |
| pH | pH | | | | 6.5-8.5 |
| TSS | milligrams per litre | | | | 50 |
| Turbidity | nephelometric turbidity units | | | | 25 |

**POINT 3,4,7**

| Pollutant | Units of Measure | 50 Percentile concentration limit | 90 Percentile concentration limit | 3DGM concentration limit | 100 percentile concentration limit |
|---|---|---|---|---|---|
| Perfluorohexane sulphonate (PFHxS) | micrograms per litre | | | | 2 |
| Perfluorooctane sulphonate (PFOS) | micrograms per litre | | | | 0.13 |
| Perfluorooctanoic acid (PFOA) | micrograms per litre | | | | 10 |

Note: PFHxS and PFOS must not exceed a total combined concentration limit of 2 micrograms per litre

L2.5 The total suspended solids and turbidity limits specified under Condition L2.4 for the discharge points identified as EPA licence discharge points 1, 2, 3, 4, 6 and 7 do not apply when the discharge occurs solely as a result of rainfall measured at the premises which exceeds;
- a total of 24.4 millimetre of rainfall over any consecutive 5 day period.

Note: A 24.4mm rainfall depth is defined by the publication Managing Urban Stormwater: Soils and Construction

(Landcom 2004) as the rainfall depth in millimetres for a 80th percentile 5 day rainfall events for the Liverpool area.

L2.6 The concentration limit for Total Suspended Solids (TSS) and turbidity under condition L2.4 for licence discharge points 1, 2, 3, 4, 6 and 7 is deemed not to have been breached where:

(a) the sample complies with the turbidity limit at the time of the discharge; and
(b) the EPA is advised within three (3) working days of completion of the TSS testing, of any TSS results above the licence limit.

Note: The purpose of this condition is to expediate the assessment and subsequent discharge of the clarified water from the sediment basins.

### L3 Waste

L3.1 The licensee must not cause, permit or allow any waste to be received at the premises, except the wastes expressly referred to in the column titled “Waste” and meeting the definition, if any, in the column titled “Description” in the table below.
Any waste received at the premises must only be used for the activities referred to in relation to that waste in the column titled “Activity” in the table below.
Any waste received at the premises is subject to those limits or conditions, if any, referred to in relation to that waste contained in the column titled “Other Limits” in the table below.
This condition does not limit any other conditions in this licence.

| Code | Waste | Description | Activity | Other Limits |
|---|---|---|---|---|
| NA | General or Specific exempted waste | Waste that meets all the conditions of the resource recovery exemption under Clause 91 and Clause 92 Protection of the Environment Operations (Waste) Regulation 2014 | As specified in each particular resource recovery exemption | |

## 4 Operating Conditions

### O1 Activities must be carried out in a competent manner

O1.1 Licensed activities must be carried out in a competent manner.
This includes:
a) the processing, handling, movement and storage of materials and substances used to carry out the activity; and
b) the treatment, storage, processing, reprocessing, transport and disposal of waste generated by the activity.

# Environment Protection Licence



## O2 Maintenance of plant and equipment

O2.1 All plant and equipment installed at the premises or used in connection with the licensed activity:
a) must be maintained in a proper and efficient condition; and
b) must be operated in a proper and efficient manner.

## O3 Dust

O3.1 Activities must be carried out in a manner that minimises the generation or emission of dust.

O3.2 The premises must be maintained in a condition which minimises or prevents the emission of dust from the premises.

O3.3 The licensee must ensure that no material, including sediment or oil, is tracked from the premises.

O3.4 Trucks entering and leaving the premises that are carrying loads must be covered at all times, except during loading and unloading.

## O4 Effluent application to land

O4.1 Wastewater application must not occur in a manner that causes surface runoff.

O4.2 Spray from wastewater application must not drift beyond the boundary of the premises or into a watercourse.

O4.3 The quantity of wastewater applied to the utilisation area(s) must not exceed the capacity of the utilisation area(s) to effectively utilise the wastewater.

Note: *For the purpose of this condition, "effectively utilise" includes the ability of the soil to absorb the nutrient, salt, hydraulic load and organic material without causing harm to the environment.*

Note: *For the purpose of this condition "utilisation area(s)" include all areas within the premises where wastewater from the sediment basin(s) is applied:*

*(a) for the purpose of dust suppression; and*
*(b) where water is discharged to vegetation for the purpose of maintaining the biodiversity offset area(s).*

## O5 Emergency response

O5.1 The licensee must prepare, maintain and implement as necessary, a current Pollution Incident Response Management Plan (PIRMP) for the premises.

Note: The licensee must develop their PIRMP in accordance with the requirements in Part 5.7A of the Act and the POEO Regulations.

# Environment Protection Licence



### O6 Processes and management

O6.1 All chemicals, fuels and explosives must be handled and stored in a bunded area which complies with the specifications of the relevant Australian Standard and legislative requirements.

O6.2 Contingency and emergency management plans must be developed and implemented for the spill of any chemical and fuel.

## 5 Monitoring and Recording Conditions

### M1 Monitoring records

M1.1 The results of any monitoring required to be conducted by this licence or a load calculation protocol must be recorded and retained as set out in this condition.

M1.2 All records required to be kept by this licence must be:
a) in a legible form, or in a form that can readily be reduced to a legible form;
b) kept for at least 4 years after the monitoring or event to which they relate took place; and
c) produced in a legible form to any authorised officer of the EPA who asks to see them.

M1.3 The following records must be kept in respect of any samples required to be collected for the purposes of this licence:
a) the date(s) on which the sample was taken;
b) the time(s) at which the sample was collected;
c) the point at which the sample was taken; and
d) the name of the person who collected the sample.

### M2 Requirement to monitor concentration of pollutants discharged

M2.1 For each monitoring/discharge point or utilisation area specified below (by a point number), the licensee must monitor (by sampling and obtaining results by analysis) the concentration of each pollutant specified in Column 1. The licensee must use the sampling method, units of measure, and sample at the frequency, specified opposite in the other columns:

M2.2 Water and/ or Land Monitoring Requirements

**POINT 1,2,3,4,6,7**

| Pollutant | Units of measure | Frequency | Sampling Method |
|---|---|---|---|
| pH | pH | Monthly during discharge | Grab sample |
| Total suspended solids | milligrams per litre | Monthly during discharge | Grab sample |
| Turbidity | nephelometric turbidity units | Monthly during discharge | Grab sample |

# Environment Protection Licence

Licence - 21054

**POINT 3,4,7**

| Pollutant | Units of measure | Frequency | Sampling Method |
|---|---|---|---|
| Perfluorohexane sulphonate (PFHxS) | micrograms per litre | Monthly during discharge | Grab sample |
| Perfluorooctane sulphonate (PFOS) | micrograms per litre | Monthly during discharge | Grab sample |
| Perfluorooctanoic acid (PFOA) | micrograms per litre | Monthly during discharge | Grab sample |

## M3 Testing methods - concentration limits

M3.1 Subject to any express provision to the contrary in this licence, monitoring for the concentration of a pollutant discharged to waters or applied to a utilisation area must be done in accordance with the Approved Methods Publication unless another method has been approved by the EPA in writing before any tests are conducted.

## M4 Recording of pollution complaints

M4.1 The licensee must keep a legible record of all complaints made to the licensee or any employee or agent of the licensee in relation to pollution arising from any activity to which this licence applies.

M4.2 The record must include details of the following:
a) the date and time of the complaint;
b) the method by which the complaint was made;
c) any personal details of the complainant which were provided by the complainant or, if no such details were provided, a note to that effect;
d) the nature of the complaint;
e) the action taken by the licensee in relation to the complaint, including any follow-up contact with the complainant; and
f) if no action was taken by the licensee, the reasons why no action was taken.

M4.3 The record of a complaint must be kept for at least 4 years after the complaint was made.

M4.4 The record must be produced to any authorised officer of the EPA who asks to see them.

## M5 Telephone complaints line

M5.1 The licensee must operate during its operating hours a telephone complaints line for the purpose of receiving any complaints from members of the public in relation to activities conducted at the premises or by the vehicle or mobile plant, unless otherwise specified in the licence.

M5.2 The licensee must notify the public of the complaints line telephone number and the fact that it is a complaints line so that the impacted community knows how to make a complaint.

M5.3 The preceding two conditions do not apply until August 2018, 3 months after the date of the issue of this

licence.

# 6 Reporting Conditions

## R1 Annual return documents

R1.1 The licensee must complete and supply to the EPA an Annual Return in the approved form comprising:

1. a Statement of Compliance,
2. a Monitoring and Complaints Summary,
3. a Statement of Compliance - Licence Conditions,
4. a Statement of Compliance - Load based Fee,
5. a Statement of Compliance - Requirement to Prepare Pollution Incident Response Management Plan,
6. a Statement of Compliance - Requirement to Publish Pollution Monitoring Data; and
7. a Statement of Compliance - Environmental Management Systems and Practices.

At the end of each reporting period, the EPA will provide to the licensee notification that the Annual Return is due.

R1.2 An Annual Return must be prepared in respect of each reporting period, except as provided below.

Note: The term "reporting period" is defined in the dictionary at the end of this licence. Do not complete the Annual Return until after the end of the reporting period.

R1.3 Where this licence is transferred from the licensee to a new licensee:
a) the transferring licensee must prepare an Annual Return for the period commencing on the first day of the reporting period and ending on the date the application for the transfer of the licence to the new licensee is granted; and
b) the new licensee must prepare an Annual Return for the period commencing on the date the application for the transfer of the licence is granted and ending on the last day of the reporting period.

Note: An application to transfer a licence must be made in the approved form for this purpose.

R1.4 Where this licence is surrendered by the licensee or revoked by the EPA or Minister, the licensee must prepare an Annual Return in respect of the period commencing on the first day of the reporting period and ending on:
a) in relation to the surrender of a licence - the date when notice in writing of approval of the surrender is given; or
b) in relation to the revocation of the licence - the date from which notice revoking the licence operates.

R1.5 The Annual Return for the reporting period must be supplied to the EPA via eConnect *EPA* or by registered post not later than 60 days after the end of each reporting period or in the case of a transferring licence not later than 60 days after the date the transfer was granted (the 'due date').

R1.6 The licensee must retain a copy of the Annual Return supplied to the EPA for a period of at least 4 years after the Annual Return was due to be supplied to the EPA.

R1.7 Within the Annual Return, the Statements of Compliance must be certified and the Monitoring and

Complaints Summary must be signed by:
a) the licence holder; or
b) by a person approved in writing by the EPA to sign on behalf of the licence holder.

## R2 Notification of environmental harm

R2.1 Notifications must be made by telephoning the Environment Line service on 131 555.

Note: The licensee or its employees must notify all relevant authorities of incidents causing or threatening material harm to the environment immediately after the person becomes aware of the incident in accordance with the requirements of Part 5.7 of the Act.

R2.2 The licensee must provide written details of the notification to the EPA within 7 days of the date on which the incident occurred.

## R3 Written report

R3.1 Where an authorised officer of the EPA suspects on reasonable grounds that:
a) where this licence applies to premises, an event has occurred at the premises; or
b) where this licence applies to vehicles or mobile plant, an event has occurred in connection with the carrying out of the activities authorised by this licence,
and the event has caused, is causing or is likely to cause material harm to the environment (whether the harm occurs on or off premises to which the licence applies), the authorised officer may request a written report of the event.

R3.2 The licensee must make all reasonable inquiries in relation to the event and supply the report to the EPA within such time as may be specified in the request.

R3.3 The request may require a report which includes any or all of the following information:
a) the cause, time and duration of the event;
b) the type, volume and concentration of every pollutant discharged as a result of the event;
c) the name, address and business hours telephone number of employees or agents of the licensee, or a specified class of them, who witnessed the event;
d) the name, address and business hours telephone number of every other person (of whom the licensee is aware) who witnessed the event, unless the licensee has been unable to obtain that information after making reasonable effort;
e) action taken by the licensee in relation to the event, including any follow-up contact with any complainants;
f) details of any measure taken or proposed to be taken to prevent or mitigate against a recurrence of such an event; and
g) any other relevant matters.

R3.4 The EPA may make a written request for further details in relation to any of the above matters if it is not satisfied with the report provided by the licensee. The licensee must provide such further details to the EPA within the time specified in the request.

# Environment Protection Licence



## 7 General Conditions

### G1 Copy of licence kept at the premises or plant

G1.1 A copy of this licence must be kept at the premises to which the licence applies.

G1.2 The licence must be produced to any authorised officer of the EPA who asks to see it.

G1.3 The licence must be available for inspection by any employee or agent of the licensee working at the premises.

### G2 Signage

G2.1 The location of point number(s) 1, 2, 3, 4, 6 and 7 must be clearly marked by signage that indicates the point identification number used in this licence and be located as close as practically possible to the point.

## 8 Special Conditions

### E1 Crushing, Grinding or Separating Activities

E1.1 Prior to the processing of materials, generated and intended for reuse at the premises, by crushing, grinding or separating, the licensee must investigate the material for contamination and prepare a written report of the findings.
The investigation must:
a) consider potential contamination resulting from historical storage, handling or use of industrial or hazardous chemicals, waste or asbestos containing materials at the premises;
b) include sampling and analysis of contaminants of concern in the materials; and
c) assess the risk to human health or the environment associated with processing or reuse of any contaminated materials on the premises.

E1.2 The written report/s detailed in Condition E1.1 must be prepared, or reviewed and approved, by a contaminated land consultant, certified under a scheme recognised by the EPA. The report/s must be submitted to the Director Regulatory Operations Metropolitan at RegOps.MetroRegulation@epa.nsw.gov.au prior to the crushing, grinding or separating of the materials.

E1.3 Processing of materials by crushing, grinding or separating authorised by this licence must not occur until the licensee has received written confirmation from the Site Auditor, that the materials are suitable for processing and reuse on the premises.

Note: In condition E1.3 Site Auditor means the NSW EPA accredited contaminated site auditor appointed to prepare any Site Audit Report or Site Audit Statement required by a condition of consent or approval issued by the relevant planning authority for the premises.

### E2 Schedule of Works

E2.1 The Licensee must provide a written estimate of the date of commencement, duration, location and

# Environment Protection Licence



volume of scheduled activities authorised under this licence in the following 24 months. The written estimate must be provided with the annual return required by Condition R1 and must include plans of the location the activities are to be carried on.

# Environment Protection Licence

Licence - 21054

## Dictionary

### General Dictionary

| | |
|---|---|
| **3DGM [in relation to a concentration limit]** | Means the three day geometric mean, which is calculated by multiplying the results of the analysis of three samples collected on consecutive days and then taking the cubed root of that amount. Where one or more of the samples is zero or below the detection limit for the analysis, then 1 or the detection limit respectively should be used in place of those samples |
| **Act** | Means the Protection of the Environment Operations Act 1997 |
| **activity** | Means a scheduled or non-scheduled activity within the meaning of the Protection of the Environment Operations Act 1997 |
| **actual load** | Has the same meaning as in the Protection of the Environment Operations (General) Regulation 2009 |
| **AM** | Together with a number, means an ambient air monitoring method of that number prescribed by the *Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales*. |
| **AMG** | Australian Map Grid |
| **anniversary date** | The anniversary date is the anniversary each year of the date of issue of the licence. In the case of a licence continued in force by the Protection of the Environment Operations Act 1997, the date of issue of the licence is the first anniversary of the date of issue or last renewal of the licence following the commencement of the Act. |
| **annual return** | Is defined in R1.1 |
| **Approved Methods Publication** | Has the same meaning as in the Protection of the Environment Operations (General) Regulation 2009 |
| **assessable pollutants** | Has the same meaning as in the Protection of the Environment Operations (General) Regulation 2009 |
| **BOD** | Means biochemical oxygen demand |
| **CEM** | Together with a number, means a continuous emission monitoring method of that number prescribed by the *Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales*. |
| **COD** | Means chemical oxygen demand |
| **composite sample** | Unless otherwise specifically approved in writing by the EPA, a sample consisting of 24 individual samples collected at hourly intervals and each having an equivalent volume. |
| **cond.** | Means conductivity |
| **environment** | Has the same meaning as in the Protection of the Environment Operations Act 1997 |
| **environment protection legislation** | Has the same meaning as in the Protection of the Environment Administration Act 1991 |
| **EPA** | Means Environment Protection Authority of New South Wales. |
| **fee-based activity classification** | Means the numbered short descriptions in Schedule 1 of the Protection of the Environment Operations (General) Regulation 2009. |
| **general solid waste (non-putrescible)** | Has the same meaning as in Part 3 of Schedule 1 of the Protection of the Environment Operations Act 1997 |

# Environment Protection Licence

Licence - 21054

| | |
|---|---|
| **flow weighted composite sample** | Means a sample whose composites are sized in proportion to the flow at each composites time of collection. |
| **general solid waste (putrescible)** | Has the same meaning as in Part 3 of Schedule 1 of the Protection of the Environmen t Operations Act 1997 |
| **grab sample** | Means a single sample taken at a point at a single time |
| **hazardous waste** | Has the same meaning as in Part 3 of Schedule 1 of the Protection of the Environment Operations Act 1997 |
| **licensee** | Means the licence holder describe d at the front of this licence |
| **load calculation protocol** | Has the same meaning as in the Protection of the Environment Operations (General) Regulation 2009 |
| **local authority** | Has the same meaning as in the Protection of the Environment Operations Act 1997 |
| **material harm** | Has the same meaning as in section 147 Protection of the Environment Operations Act 1997 |
| **MBAS** | Means methylene blue active substances |
| **Minister** | Means the Minister administering the Protection of the Environment Operations Act 1997 |
| **mobile plant** | Has the same meaning as in Part 3 of Schedule 1 of the Protection of the Environment Operations Act 1997 |
| **motor vehicle** | Has the same meaning as in the Protection of the Environment Operations Act 1997 |
| **O&G** | Means oil and grease |
| **percentile [in relation to a concentration limit of a sample]** | Means that percentage [eg.50%] of the number of samples taken that must meet the concentration limit specified in the licence for that pollutant over a specified period of time. In this licence, the specified period of time is the Reporting Period unless otherwise stated in this licence. |
| **plant** | Includes all plant within the meaning of the Protection of the Environment Operations Act 1997 as well as motor vehicles. |
| **pollution of waters [or water pollution]** | Has the same meaning as in the Protection of the Environment Operations Act 1997 |
| **premises** | Means the premises described in condition A2.1 |
| **public authority** | Has the same meaning as in the Protection of the Environment Operations Act 1997 |
| **regional office** | Means the relevant EPA office referred to in the Contacting the EPA document accompanying this licence |
| **reporting period** | For the purposes of this licence, the reporting period means the period of 12 months after the issue of the licence, and each subsequent period of 12 mo nths. In the case of a licence continued in force by the Protection of the Environment Operations Act 1997, the date of issue of the licence is the first anniversary of the date of issue or last renewal of the licence following the commencement of the Act. |
| **restricted solid waste** | Has the same meaning as in Part 3 of Schedule 1 of the Protection of the Environment Operations Act 1997 |
| **scheduled activity** | Means an activity listed in Schedule 1 of the Protection of the Environment Operations Act 1997 |
| **special waste** | Has the same meaning as in Part 3 of Schedule 1 of the Protection of the Environment Operations Act 1997 |
| **TM** | Together with a number, means a test method of that number prescribed by the *Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales*. |

# Environment Protection Licence

Licence - 21054

| | |
|---|---|
| **TSP** | Means total suspended particles |
| **TSS** | Means total suspended solids |
| **Type 1 substance** | Means the elements antimony, arsenic, cadmium, lead or mercury or any compound containing one or more of those elements |
| **Type 2 substance** | Means the elements beryllium, chromium, cobalt, manganese, nickel, selenium, tin or vanadium or any compound containing one or more of those elements |
| **utilisation area** | Means any area shown as a utilisation area on a map submitted with the application for this licence |
| **waste** | Has the same meaning as in the Protection of the Environment Operations Act 1997 |
| **waste type** | Means liquid, restricted solid waste, general solid waste (putrescible), general solid waste (non-putrescible), special waste or hazardous waste |

Ms Erin Barker

Environment Protection Authority

(By Delegation)

Date of this edition: 04-June-2018

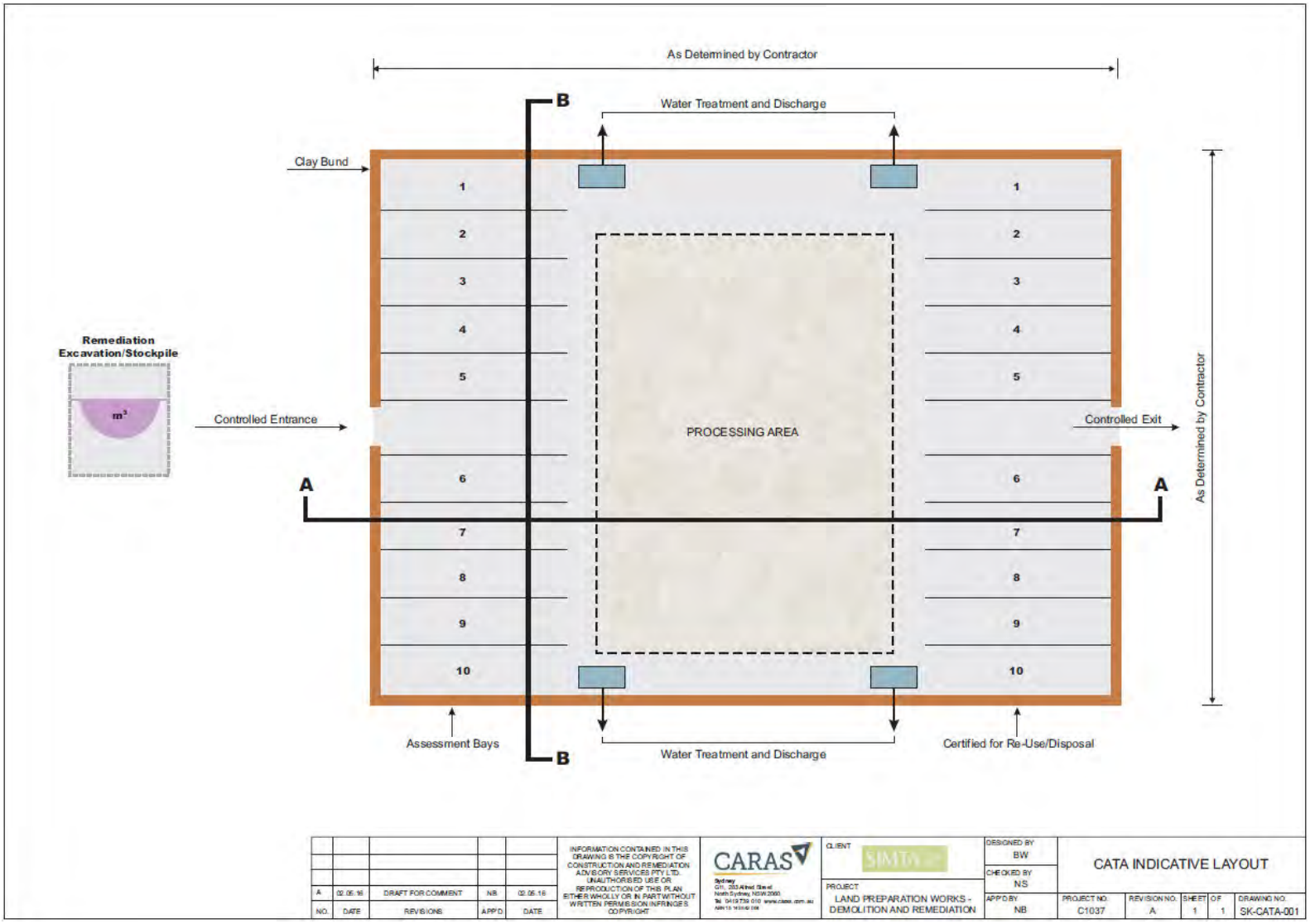
## End Notes

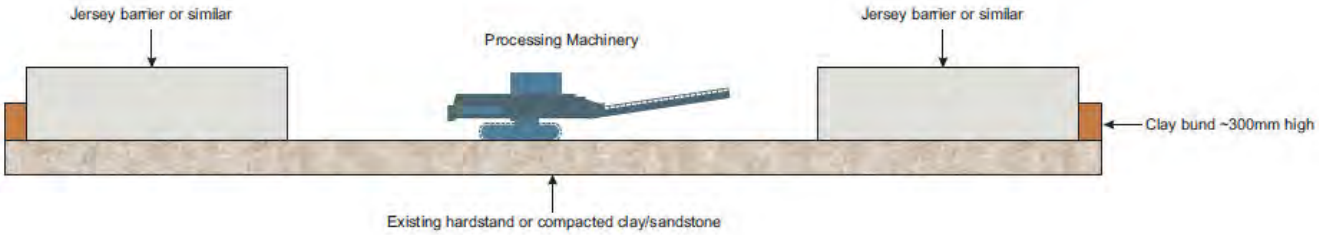
| | |
|---|---|
| 2 | Licence varied by notice 1571681 issued on 18-Apr-2019 |
| 3 | Licence varied by notice 1582348 issued on 01-Aug-2019 |
| 4 | Licence varied by notice 1597271 issued on 22-Oct-2020 |

# Appendix H

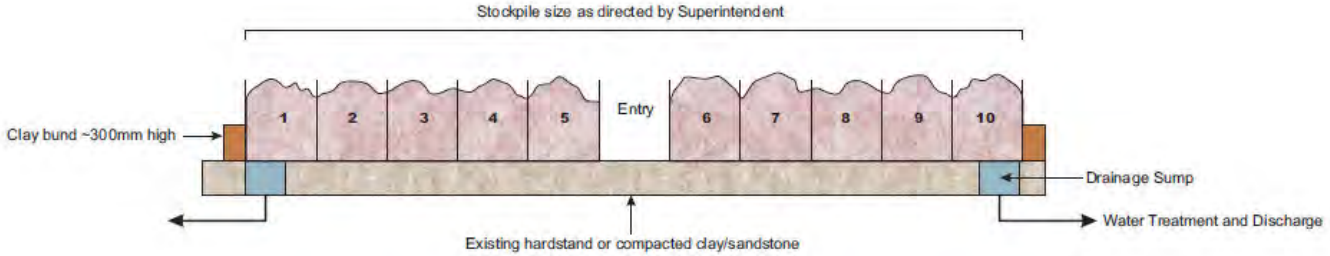
# Stockpile Management Schematic Layout

## APPENDIX G – CATA INDICATIVE LAYOUT PLANS






**Section A-A**




**Section B-B**

| | | | | | |
|---|---|---|---|---|---|
| | | | | | INFORMATION CONTAINED IN THIS DRAWING IS THE COPYRIGHT OF CONSTRUCTION AND REMEDIATION ADVISORY SERVICES PTY LTD. UNAUTHORISED USE OR REPRODUCTION OF THIS PLAN EITHER WHOLLY OR IN PART WITHOUT WRITTEN PERMISSION INFRINGES COPYRIGHT |
| | | | | | |
| | | | | | |
| A | 02.05.16 | DRAFT FOR COMMENT | NB | 02.05.16 | |
| NO. | DATE | REVISIONS | APP'D | DATE | |

CARAS
Sydney
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ABN 15 163 642 094

CLIENT: SIMTA

PROJECT: LAND PREPARATION WORKS - DEMOLITION AND REMEDIATION

| | |
|---|---|
| DESIGNED BY | BW |
| CHECKED BY | NS |
| APP'D BY | NB |

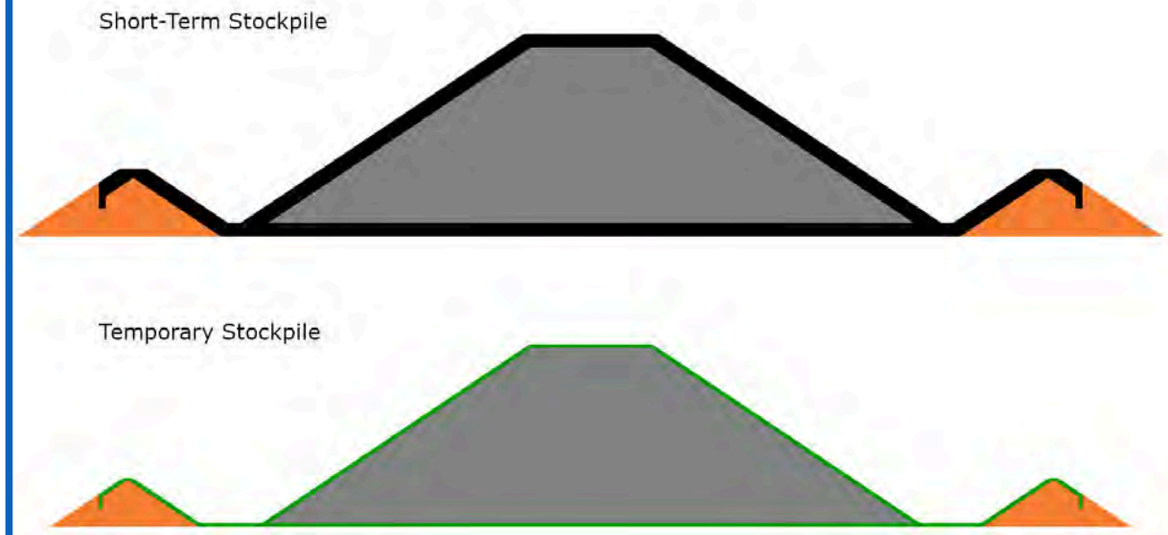
CATA INDICATIVE LAYOUT
CROSS SECTIONS A-A & B-B

| PROJECT NO. | REVISION NO. | SHEET | OF | DRAWING NO. |
|---|---|---|---|---|
| C1037 | A | 1 | 1 | SK-CATA-002 |

## Proposed Stockpile Location (WH12)


Note: All locations are approximate

## Proposed Stockpile Cross Sections




| Key: | | | |
|---|---|---|---|
| | Impacted Material | | Clay Liner |
| | Bund | | Plastic Liner |

Designs for the stockpiles are based off information taken from Table of 6 of Section 10.1 of '*PFAS National Environmental Management Plan Version 2.0*', Heads of EPA Australia and New Zealand 2020'.

51,02

| REV: | DESCRIPTION: | BY: | DATE: |
|---|---|---|---|
| AMENDMENTS: | | | |

| | | | | |
|---|---|---|---|---|
| SITE: Moorebank Logistics Park | DRAFT DRAWING NO. | | C2004 PROJECT NO. | 02/07/20 DATE. |
| TITLE: Location and Cross Section of Short-Term & Temporary PFAS Storage Stockpiles | | JK DRAWN. | NS CHECKED. | 0 REVISION. |

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## APPENDIX H – PFAS STOCKPILE INDICATIVE LAYOUT