Appendix B.4 Integrated Water Management Plan

Scenic Rim Agricultural Industrial Precinct

Integrated Water Management Plan

Prepared for: Kalfresh Pty Ltd

Date: 21 September 2023

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Revision

Revision	Date	Comment	Prepared By	Approved By
V001	13/12/2019	Draft for Issue	ZM	AP
V002	19/12/2019	Final	ZM	SM
V003	18/02/2022	Updated Layout/Quantity Analysis	ZM	SM
V004	20/01/2023	Updated Layout	SK	ZM
V005	03/02/2023	Final	SK	ZM
V006	21/09/2023	Final	JH	LH

Contents

1. Introduction 1

1.1 Background 1
1.2 Revision 3

2. Site Description and Proposed Development 4

2.1 Site Description 4
2.2 Land Encumbrances 5
2.3 Proposed Development 5
2.4 Lawful Points of Discharge 5

3. Hydrology 6

3.1 Regional Inflows 6

4. Stormwater Quantity Management 6

4.1 Stormwater Quantity Catchments 7
4.2 Hydrology 9
4.3 Hydraulic Assessment 12

5. Stormwater Quality Management 15

5.1 Stormwater Quality Objectives 15
5.2 Proposed Stormwater Quality Treatment 15
5.3 Results 21
5.4 Composting Pad Stormwater Quality 21

6. Operational Phase – Stormwater Management 22

6.1 Objective / Target 22
6.2 Compliance Criteria 22
6.3 Management Measures 22
6.4 Construction and Establishment 22
6.5 Monitoring Schedule 22
6.6 Maintenance Schedule 23
6.7 Reporting 24
6.8 Corrective Action 24

7. Hydraulic Analysis – Regional Flooding 25

Contents

7.1 Background 25

8. Conclusions 26

9. Qualifications 27

LIST OF APPENDICES

APPENIDX A TUFLOW MODEL SETUP

APPENDIX B WATER SURFACE LEVELS

APPENDIX C WATER DEPTHS

APPENDIX D FLOOD IMPACTS

APPENDIX E DESIGN DRAWINGS

APPENDIX F SPEL DEVICES PRELIMINARY DESIGN DETAILS

APPENDIX G CURRENT FLOOD MODEL RESULTS AND FLOOD HAZARD OVERLAY CODE ASSESSMENT

1. Introduction

1.1 Background

Cardno has been engaged by Kalfresh Pty Ltd to prepare an Integrated Water Management Report to support the Development Application (DA) for the proposed Scenic Rim Agricultural Industrial Precinct. The site is located within the Scenic Rim Regional Council local government area. As described in the *Initial Advice Statement, April 2019*, the development is to occur on the following lots:

- Lot 2 on SP192221;
- Lot 3 on SP192221;
- Lot 4 on SP192221;
- Lot 2 on RP20974;
- Lot 2 on RP44024
- Lot 1 on RP216694; and
- Lot 2 on RP44024.

The proposed site is shown in **Figure 1.**

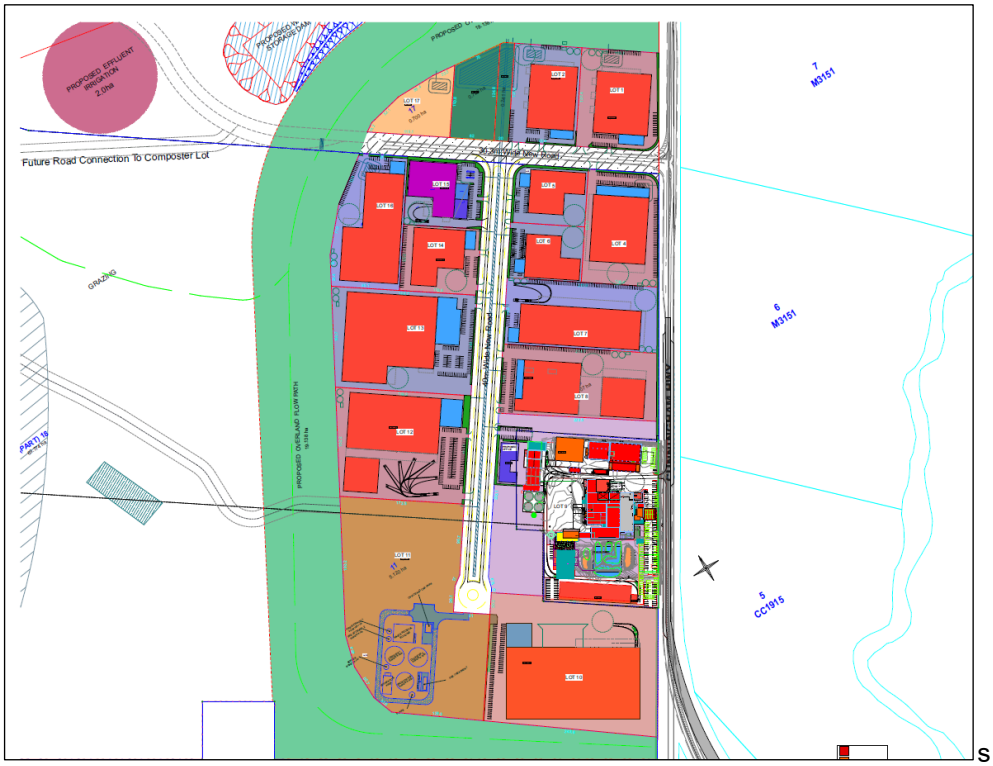
This report provides engineering advice to address issues relating to stormwater quantity and quality, as well as flooding of the subject site.

Figure 1 Site Location

1.2 Revision

This revision of the Integrated Water Management (IWM) Report has been prepared to support an updated layout plan for the subject site, as illustrated in **Figure 2.** The revised lot layout and bulk earthworks strategy for the site has called for the revision of the stormwater strategy and flood impact assessment to be carried out for updated developed conditions. Details around the updated hydraulic assessments are detailed in Sections 4 to 7 of this report.

Figure 2 Updated Lot Layout *(Ref: SRAIP Subdivision MP, SKA2.03 Rev 01)*

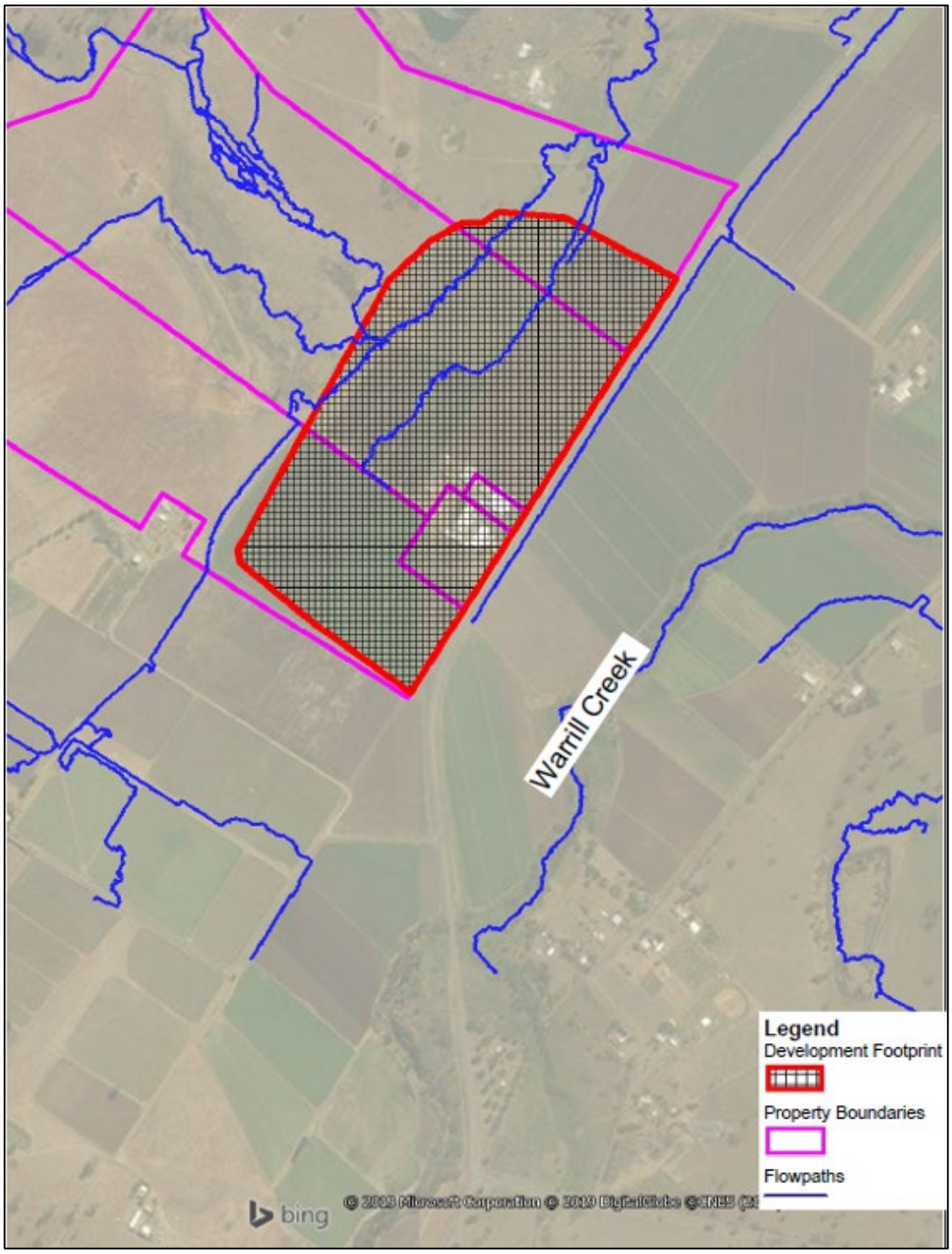


2. Site Description and Proposed Development

2.1 Site Description

The site is located at Kalbar in the Scenic Rim Region alongside the Cunningham Highway approximately 5km North East of Aratula. Generally the site is flat with a slope of approximately 0.5 % to the North West corner. Currently a drainage path cuts through the development area from South to North as shown in **Figure 3.**

Figure 3 Existing flowpaths



The site is located on a floodplain that is inundated by Warrill Creek. Additional to the Warrill Creek flooding there are two catchments located to the West of the site, draining along the western boundary of the development area.

2.2 Land Encumbrances

The site is impacted by the 1% AEP flood inundation mapping, part of the SRRC Flood and Inundation Hazards Overlay.

2.3 Proposed Development

It is proposed to develop the site into a Rural Enterprise Precinct, enabling local food businesses to base themselves where the raw ingredients are grown. A bio energy facility is also proposed as part of the development.

2.4 Lawful Points of Discharge

The Lawful Point of Discharge (LPOD) for the site is the current flow path that exits the site to the North. It is intended that onsite detention will return peak flows to equal or less than existing. Under the proposed development flow from the site at the LPOD occurs via low flow culvert and slipway in high flow events. The low flow culvert is aligned with the alignment of the existing existing drainage channel to the north of the site. in order to maintain the location of regular discharge.

3. Hydrology

3.1 Regional Inflows

Regional inflows were sourced from the existing Warrill Creek Flood study. The Warrill Creek Flood Study was completed in 22 May 2018 by Aurecon and includes the adjacent Reynolds Creek. These two creeks have a combined contributing catchment of approximately 42,000 ha with Warrill Creek catchment approximately 17,000 ha. Major flows (Warrill and Reynolds Creeks) were extracted from the Warrill Creek Flood Study (2018), local catchment flows were sourced directly from the Warrill Creek Flood Study input layers.

Catchments to the west of the site were calculated using the QGIS watershed function on the DEM supplied with the IAS data. Local catchment flows sourced from the Warrill Creek Flood Study were proportioned based on the catchment areas determined above and input to the west of the site area.

To assess the development sites detention requirements a DRAINS model of the site was also developed. This is discussed further in section 4

4. Stormwater Quantity Management

A stormwater quantity assessment has been carried out for the proposed development in accordance with the *Scenic Rim Schedule 6.2.1 Planning Scheme Policy 1, Part 6 – Stormwater*. The objective of the stormwater quantity assessment is to quantify the change in flow regime resulting from the proposed development and to ensure no worsening criteria are achieved.

The following sections of this report will detail the site's approach to satisfying stormwater quantity objectives and will assess the site's pre and post development hydrology and hydraulics to determine any stormwater quantity requirements for the proposed development.

It is noted the stormwater assessment for the site has been carried out only for the proposed building footprint, as illustrated in the red hatched area in **Figure 4.**

Figure 4 Scope of Stormwater Assessment

4.1 Stormwater Quantity Catchments

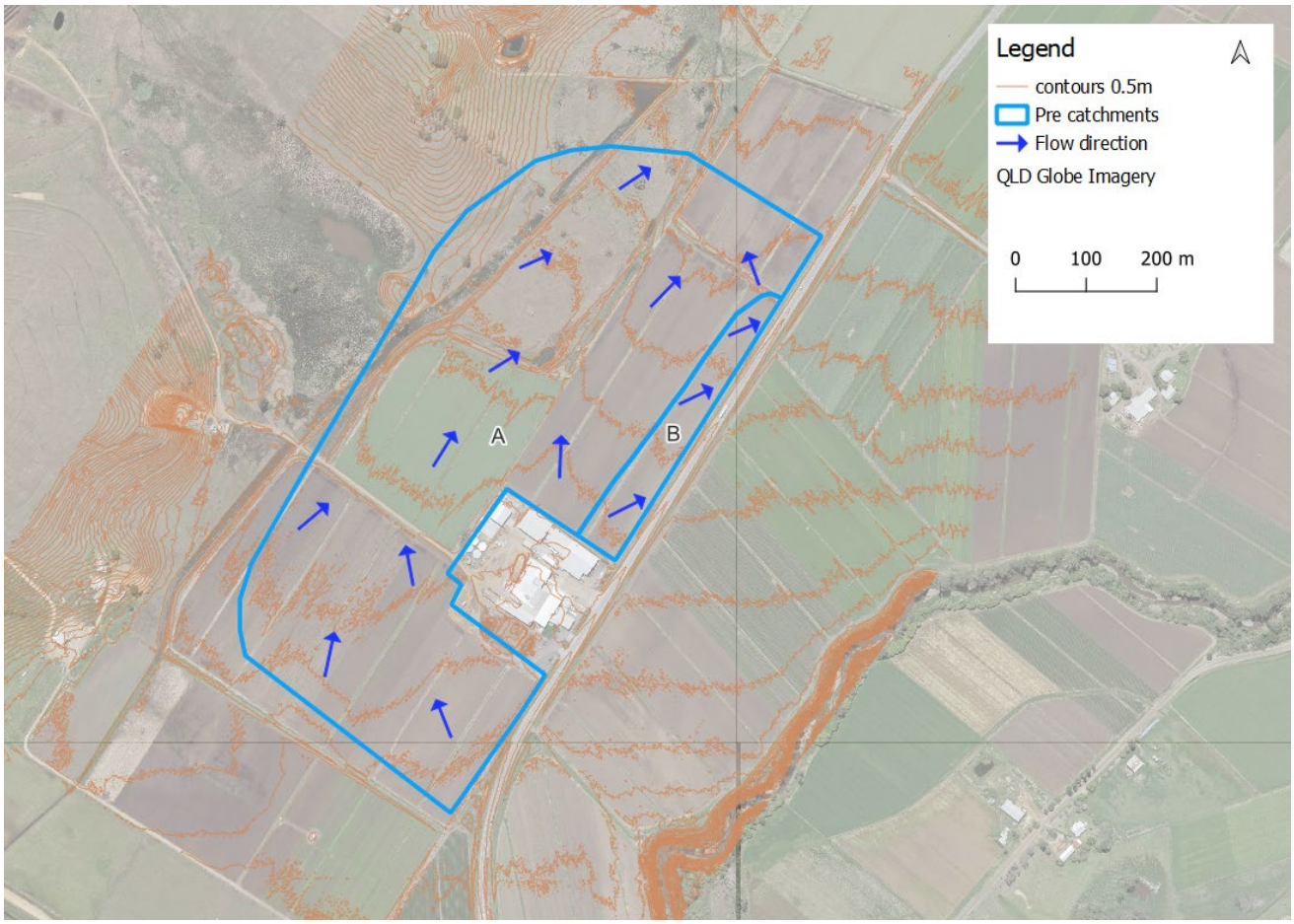
4.1.1 Pre-Development Catchments

The pre-development subject site has been defined as two (2) catchments based on the existing contours and flow regimes on site. As seen in **Figure 5**, Catchment A sheds stormwater to the north of the site towards the existing drainage channel that passes through the site. The Lawful Point of Discharge (LPOD) for Catchment A is the northern drainage channel.

Catchment B runs adjacent to the existing table drain along Cunningham Highway, which is the existing LPOD for the catchment.

The ultimate LPOD for the site is the existing drainage channel to the north of the site.

Figure 5 Pre-Development Catchment Plan



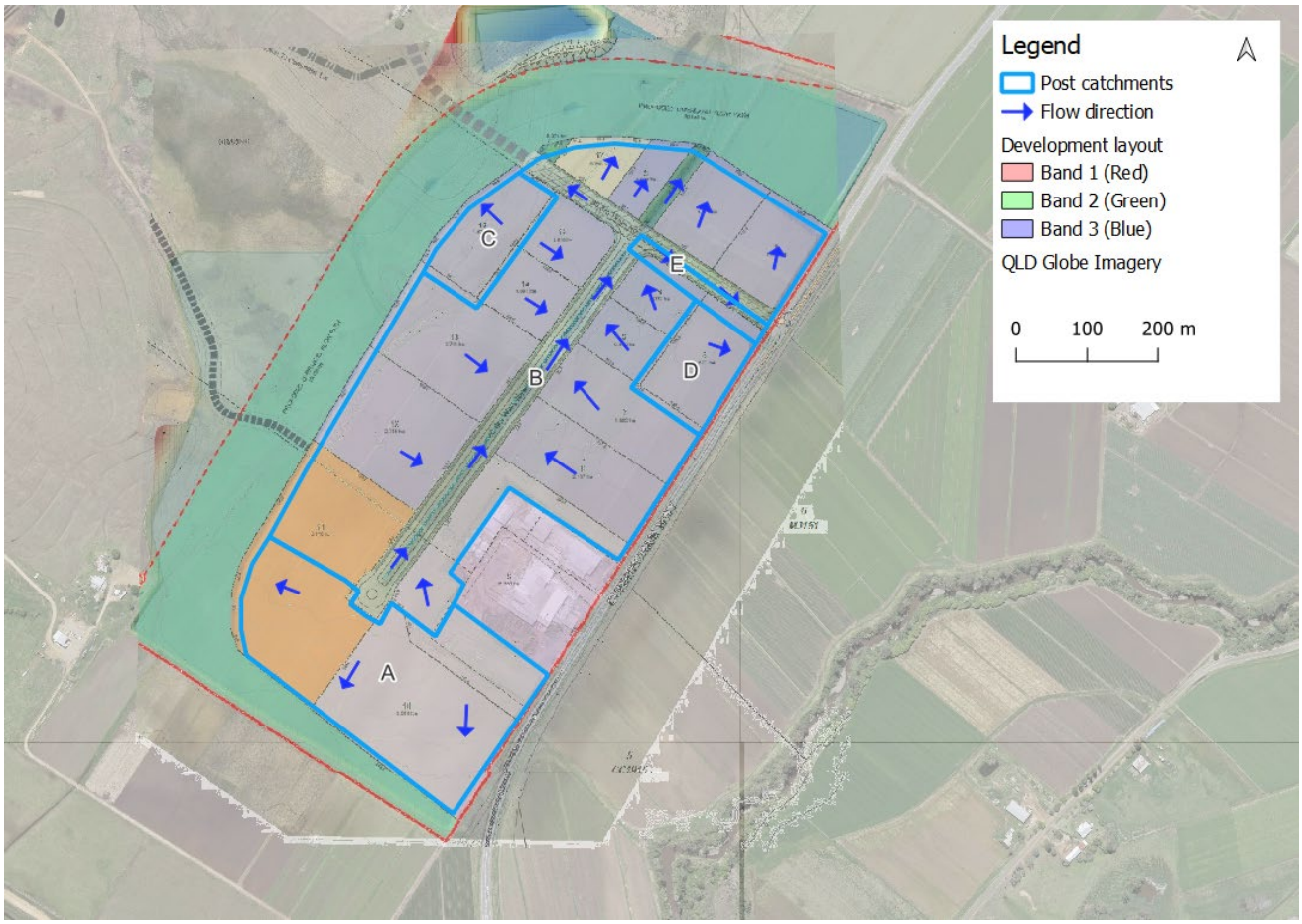
4.1.2 Post-Development Catchments

The post-development catchments have been digitized based on the proposed development layout and bulk earthwork strategy. The post-development sub-catchment split is illustrated in **Figure 6,** showing five (5) catchments for the developed site layout. Catchments A and C discharge stormwater to the west of the site into the proposed flood conveyance channel. Catchment B is conveyed to the north of the site through a proposed drainage swale and discharges into the flood conveyance channel at the northern site extent. Catchment D grades to the east towards Cunningham Highway and will ultimately be conveyed to the north of the site to the flood conveyance channel. The existing drainage channel to the north of the site is maintained as the LPOD for the developed scenario for Catchments A-D.

Catchment E, which comprises the eastern portion of Wagners Road, will discharge directly to the existing table drain running along Cunningham highway.

The ultimate LPOD for the site has been maintained for the post-development site.

Figure 6 Post-Development Catchment Plan



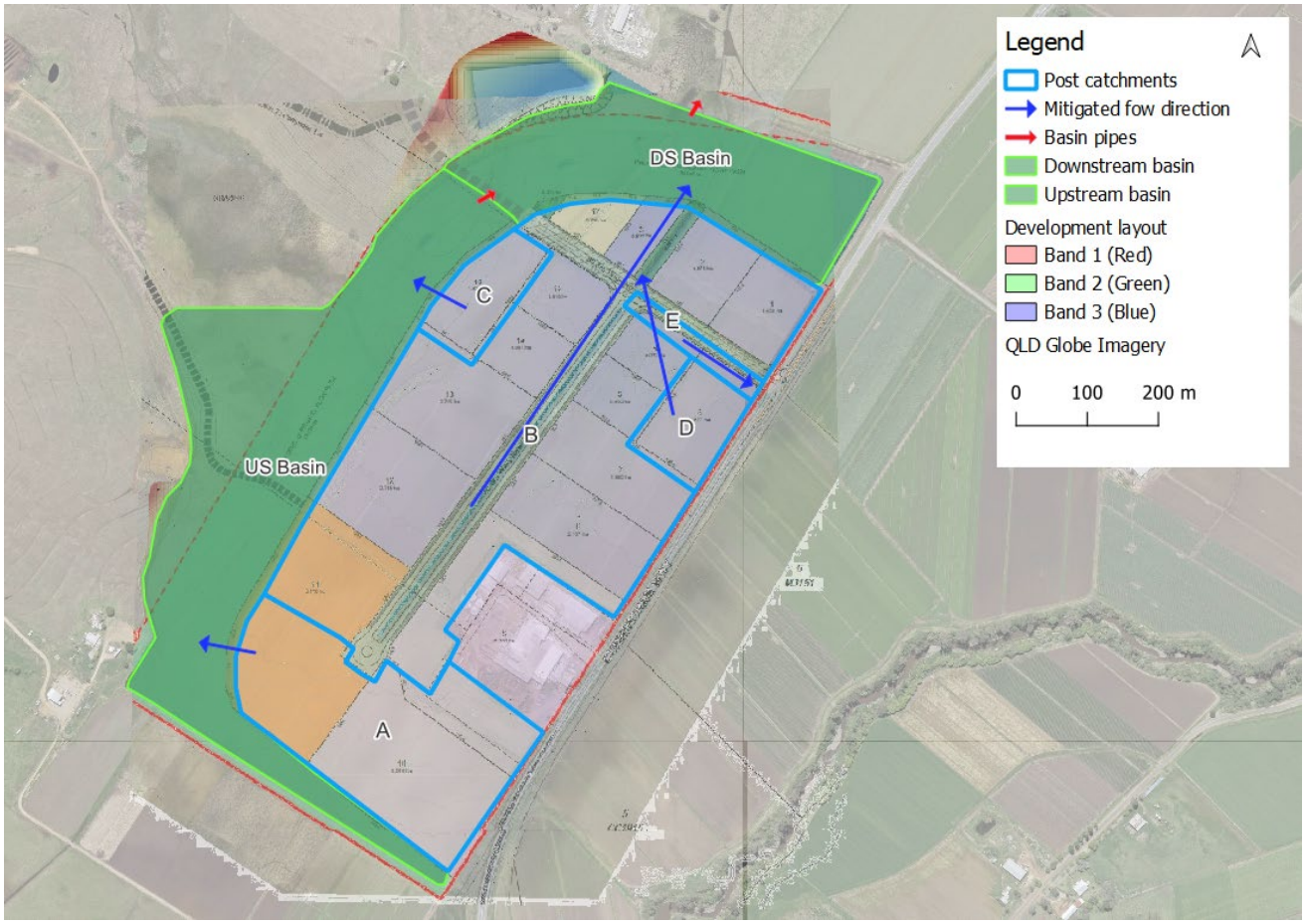
4.1.3 Stormwater Management Strategy

The stormwater management strategy for the site is to detain the runoff generated from the developed site in the proposed flood conveyance channel running along the western site boundary. This conveyance channel will act as a detention basin and has largely been split into two (2) sub-basins. The first basin, defined as the upstream basin, is the portion of the flood conveyance channel located to the south of the internal access road extending from Catchment C (refer **Figure 7**). The second, downstream basin, comprises of the area to the north of the access road and extends to the northern site boundary.

It is proposed that runoff from post-development catchments A-D is conveyed into the flood conveyance channel prior to discharging to the LPOD. Catchments A and C are proposed to discharge into the upstream portion of the basin, with Catchments B and D draining to the downstream basin. The two basins are connected via the culverts undeath the internal access road. Prior to discharging into the detention basins, stormwater in each lot will first be treated within bio-retention basins.

Catchment E will discharge directly to the table drain running along Cunningham highway and is proposed to bypass stormwater quality and quantity basins.

Figure 7 Mitigated Catchment Plan



4.2 Hydrology

A hydrological model was developed for the pre and post-development catchment configurations using Watercom DRAINS. The RAFTS storage routing function was used as the hydrological model to estimate peak flow rates from the catchments.

Design rainfall statistics for the subject site have been obtained from ARR Data Hub. Data has been extracted for the nearest grid cell to our site, located at 27.9375S, 152.5875E.

Values for initial and continuing losses were modified from the default ARR values to be more reflective of the agricultural nature of the catchment and to ensure peak flow rates for the site are not under-estimated.

As per ARR guidance, the Initial losses for pervious areas have been set to 70% of the value from the 'Directly Connected Pervious Areas' value.

The storm losses applied to the DRAINS model are detailed below.

Table 1 Adopted Loss Parameters

Loss Parameter	ARR	Adopted
Pervious Initial Loss (IL) mm	23	16.1
Pervious Continuing Loss (CL) mm/hr	3	2.1
Impervious Initial Loss (IL) mm		2
Impervious Continuing Loss (CL) mm/hr		1

4.2.1 Catchment Details

A DRAINS model was developed to represent the pre and post-development scenarios using the catchment characteristics outlined in the following tables;

Table 2 Pre-Development Catchment Properties

Catchment ID	Area (ha)	Fraction Impervious (%)	Slope (%)	Manning's (n)
A	34.288	0	0.6	0.040
B	2.246	0	0.9	0.040
TOTAL	**36.534**			

Table 3 Post-Development Catchment Properties

Catchment ID	Area (ha)	Fraction Impervious (%)	Slope (%)	Manning's (n)
A	8.010	90	0.5	0.025
B	24.576	90	0.5	0.025
C	1.681	90	0.5	0.025
D	1.627	90	0.5	0.025
E	0.640	90	0.5	0.025
TOTAL	**36.534**			

4.2.2 Peak Flow Estimation

The pre and post-development model was simulated using the catchment information described above.

In accordance with ARR2019 procedures, a full suite of design storms for the 0.5EY, 20%, 10%, 5%, 2% and 1% AEP events were assessed for durations ranging from 5mins to 300mins.

As per ARR guidance, the median temporal pattern (i.e., 6th highest flow rate out of 10 ensemble temporal patterns) was adopted as the critical storm for each AEP. The peak flow rates generated from the critical storms for the pre-development and post-development scenarios are detailed in the following tables.

It is noted that the critical storm duration for the existing site, in the 1% AEP event, is the 120 minute storm.

Table 4 Pre-Development Peak Flow Rates

Catchment ID	0.5EY(m^3)	20%(m^3)	10%(m^3)	5%(m^3)	2%(m^3)	1%(m^3)
A	1.040	1.420	1.990	2.530	3.270	3.930
B	0.140	0.206	0.267	0.339	0.445	0.528
TOTAL	**1.180**	**1.626**	**2.257**	**2.869**	**3.715**	**4.458**

Table 5 Post-Development Peal Flow Rates

Catchment ID	0.5EY(m^3)	20%(m^3)	10%(m^3)	5%(m^3)	2%(m^3)	1%(m^3)
A	1.970	2.590	3.320	3.900	4.650	5.200
B	5.590	7.290	9.400	11.200	13.700	15.400
C	0.427	0.560	0.718	0.872	1.080	1.240
D	0.413	0.545	0.695	0.847	1.050	1.210
E	0.172	0.230	0.286	0.348	0.428	0.488
TOTAL	**8.572**	**11.215**	**14.419**	**17.167**	**20.908**	**23.538**

4.2.3 Flow Validation

Peak flow rates obtained from the DRAINS model were compared against the Rational Method to ensure that flow rates generated from the model provided a reliable estimate of flows from the site.

A summary of the process used to validate flows using the Rational Method is detailed in the following sections.

4.2.4 Rational Method

The Rational Method has been used to estimate peak flow rates for Catchment A in both the pre and post-development scenario for the 0.5 EY and 1% AEP storms.

Times of concentration were estimated using a combination of Friends Equation and *Figure 4.09 of QUDM - flow travel time in pipes and channels.*

For the pre-development conditions, the coefficient of discharge was estimated using an $^1I_{10}$ of 57mm/hr, assuming medium soil permeability and good grass cover.

Input parameters into the Rational Method, and results obtained from this estimation technique are detailed below for all design AEP's.

Table 6 Input Parameters Rational Method

Catchment ID	Contributing Area	Time of concentration (mins)	Fraction Impervious (%)	C_{10}
Pre-Dev A	34.288	107	0	0.53
Post-Dev A	8.010	10	90	0.88

Table 7 Peak Flow Comparison – Pre-Development Catchment A

Catchment ID	Rational	DRAINS	Difference %
Pre-Dev A 0.5EY	1.030	1.040	-1%
Pre-Dev A 1% AEP	3.696	3.930	-6%
Post-Dev A 0.5EY	1.563		-25%
Post-Dev A 1% AEP	5.242		1%

The results indicate that the flows produced by the DRAINS model are within an acceptable tolerance of those calculated from the Rational Method. The pre-development flows generated from the DRAINS model were slightly largely than that of the Rational method, however were still within 10% of the Rational estimates.

In the post-development scenario, the DRAINS model estimated higher flows in the 0.5EY storm, which is conservative for the purpose of sizing on-site detention sizing. The post-development flows generated in DRAINS for the 1% AEP were within 1% of those estimated using the Rational method, providing confidence in the magnitude of runoff calculated in major storm events.

4.3 Hydraulic Assessment

4.3.1 Mitigated Scenario

The proposed development has caused an increase in peak flow rates for all design events analysed. In order to mitigate peak flow rates to the pre-development conditions, stormwater detention is required for the subject site.

The following section of the report provides details for the on-site detention infrastructure proposed for the subject site to achieve the peak flow objectives as listed in the Scenic Rim Planning Scheme Policy.

4.3.2 Detention Configuration

The stormwater quantity strategy for the site consists of attenuating all runoff generated from the site in the proposed flood conveyance channel that runs along the western site boundary.

This conveyance channel will act as a detention basin and has been separated into an upstream and downstream component. Catchments A and C are proposed to discharge into the upstream basin, with Catchments B and D draining to the downstream basin. Catchment E is proposed to discharge directly into the table drain running along Cunningham Highway and bypass any basins.

The hydraulic control for the upstream basin is the set of culverts underneath the proposed access road near Catchment C. The downstream basin is controlled by the culverts discharging underneath the northern bund. The bund and access roads will also act as a high flow weir, allowing water to discharge out of the basin in the major storm events.

The following parameters have been assigned to the detention basins in the hydraulic model in order to achieve mitigated flow rates for all design events.

Table 8 Detention Basin Parameters

Parameter	Upstream Basin	Downstream Basin
Basin base area	285 m^2 at 80.3m AHD	490 m^2 at 80m AHD
Basin top area	69,440 m^2 at 81.3m AHD	63,192 m^2 at 80.8m AHD
Basin height	1.3m	0.8m
Total Volume at top of basin	18,324 m^3	17,250 m^3
Low flow outlet	2 x 2.4m x 0.3m box culverts	2 x 0.9m x 0.3m box culverts
High flow outlet	Access road at 81.3m AHD, acting as a weir	Northern bund at 80.8m AHD, acting as a weir

The proposed low flow configuration may require modification or clarification to suit the detailed requirements of the future Developer(s) / Contractor(s) and the Council for the construction and operational phases of the development. Any changes to this configuration will require modelling to confirm that design objectives are still achieved.

4.3.3 Hydraulic Model Setup

The post development hydrological scenario developed in DRAINS was used to develop a hydraulic model to represent the mitigated catchment arrangement. The mitigated scenario comprised of the post development catchment parameters, with the addition of the detention basin parameters outlined in **Table 8.**

In DRAINS, the post-development catchment nodes were assigned a storage component and a 1d network outlet configuration as specified in **Table 8.**

4.3.4 Results

The full suite of design storms were run through the mitigated catchment model to determine the critical storm for the mitigated flow regime. The peak flow rates for the mitigated model are detailed in **Table 9** and **Table 10**. It is noted that the critical storm duration for the 1% AEP mitigated scenario is the 120 minute storm. As this is the same critical duration as the pre-development scenario, it is not anticipated that there will be any changes to drainage regional regimes within the downstream waterway (e.g. coincident flooding should not occur).

Table 9 Mitigated Site Peak Flow Rates (DRAINS)

Catchment ID	0.5EY(m^3)	20%(m^3)	10%(m^3)	5%(m^3)	2%(m^3)	1%(m^3)
Combined A,B,C,D (LPOD north)	0.886	0.941	0.998	1.050	1.110	2.020
Catchment E (LPOD Cunningham Hwy)	0.172	0.230	0.286	0.348	0.428	0.488
TOTAL (LPOD Ultimate)	1.058	1.171	1.284	1.398	1.538	2.508

Table 10 Change in Peak Flow Rates (Mitigated minus Pre-Development)

Catchment ID	0.5EY(m^3)	20%(m^3)	10%(m^3)	5%(m^3)	2%(m^3)	1%(m^3)
Combined A,B,C,D (LPOD north)	-0.154	-0.479	-0.992	-1.480	-2.160	-1.910
Catchment E (LPOD Cunningham Hwy)	0.032	0.024	0.019	0.009	-0.017	-0.040
TOTAL (LPOD Ultimate)	-0.122	-0.455	-0.973	-1.471	-2.177	-1.950

As demonstrated above, the proposed detention arrangement is seen to effectively mitigate the post-development flow rates to below the pre-development conditions for the Ultimate LPOD and the LPOD to the northern drainage channel.

It is noted that the peak flow discharged to the table drain running along Cunningham Highway is increasing slightly in the minor storm events. Based on the large size of the contributing catchment draining to the table drain from the east of Cunningham Highway, it is not anticipated that the increase in peak flow rates from the proposed development will have an impact on the road trafficability in the minor storm events. In the major storm events, peak flow rates discharged to the table drain are reduced and may assist in alleviating local drainage issues along the highway.

The basin performance in the 1% AEP event is detailed below.

Table 11 Basin Performance 1% AEP Event

Parameter	Upstream Basin	Downstream Basin
1% AEP water level (m)	80.8 mAHD	80.83 mAHD
1% AEP volume	900 m^3	19,000 m^3

Any change to the basin characteristics to what is detailed in **Table 8** will require re-modelling in DRAINS to ensure target flow rates are still achieved.

5. Stormwater Quality Management

5.1 Stormwater Quality Objectives

5.1.1 Operational Phase

The stormwater quality design objectives applicable to the site, as outlined in Table B of the *State Planning Policy (SPP)* (Department of Infrastructure, Local Government and Planning, 2017) are:

- Total Suspended Solids (TSS) 80% removal of mean annual load from unmitigated development.
- Total Phosphorous (TP) 60% removal of mean annual load from unmitigated development.
- Total Nitrogen (TN) 45% removal of mean annual load from unmitigated development.
- Gross Pollutants > 5mm 90% removal of mean annual load from unmitigated development.

5.1.2 Construction Phase

The construction phase stormwater quality design objectives applicable to the site are outlined in Table A of the DILGP *State Planning Policy* (Department of Infrastructure, Local Government and Planning, 2017).

The release values for stormwater captured in a sediment basin are not to exceed the following limits:

- Total Suspended Solids (TSS): 50 mg/L
- pH: 6.5 – 8.0

Appropriate erosion and sediment control measures will be required to be designed, constructed and operated in accordance with the SPP 2017 guidelines during the construction phase of the development.

5.2 Proposed Stormwater Quality Treatment

5.2.1 Stormwater Quality Catchments

The stormwater quality catchments for the site have been assumed in accordance with the lot layout detailed in **Figure 3**.

The MUSIC catchments have largely been based on the individual lot boundaries, with additional catchments being digitized for the road area. The lot catchments have been reflected as lumped industrial as the specified breakdown is still in concept phase.

A 90% fraction impervious has been adopted for the lumped and road catchments. The area as defined as Lot 9 is envisaged to be earthworks only, and has been assigned a fraction impervious of 20%.

Note the drainage swale area has been excluded from the MUSIC model as this will be revegetated.

The catchment breakdown adopted in the developed scenario are summarized in **Table 12.**

Table 12 MUSIC Model Catchment Parameters

Catchment ID	Lumped Industrial (ha)	Road (ha)	Basin Information (m^2)
1	1.439		324
2	1.374		309
3	0.623		140
4	1.627		366
5	0.832		187
6	0.800		180
7	1.982		446
8	2.107		474
10	3.810		857
11	5.120		1,152
12	2.745		618
13	2.749		619
14	1.001		225
15	1.016		229
16	1.681		378
17	0.700		158
9	2.850		Drainage swale
Central Road	NA	2.517	Drainage swale
Wagners Road East	NA	0.605	2 x GPT'S
Wagners Road West	NA	0.7262	136
TOTAL	**32.456 ha**	**3.848 ha**	**6,798 m^2**

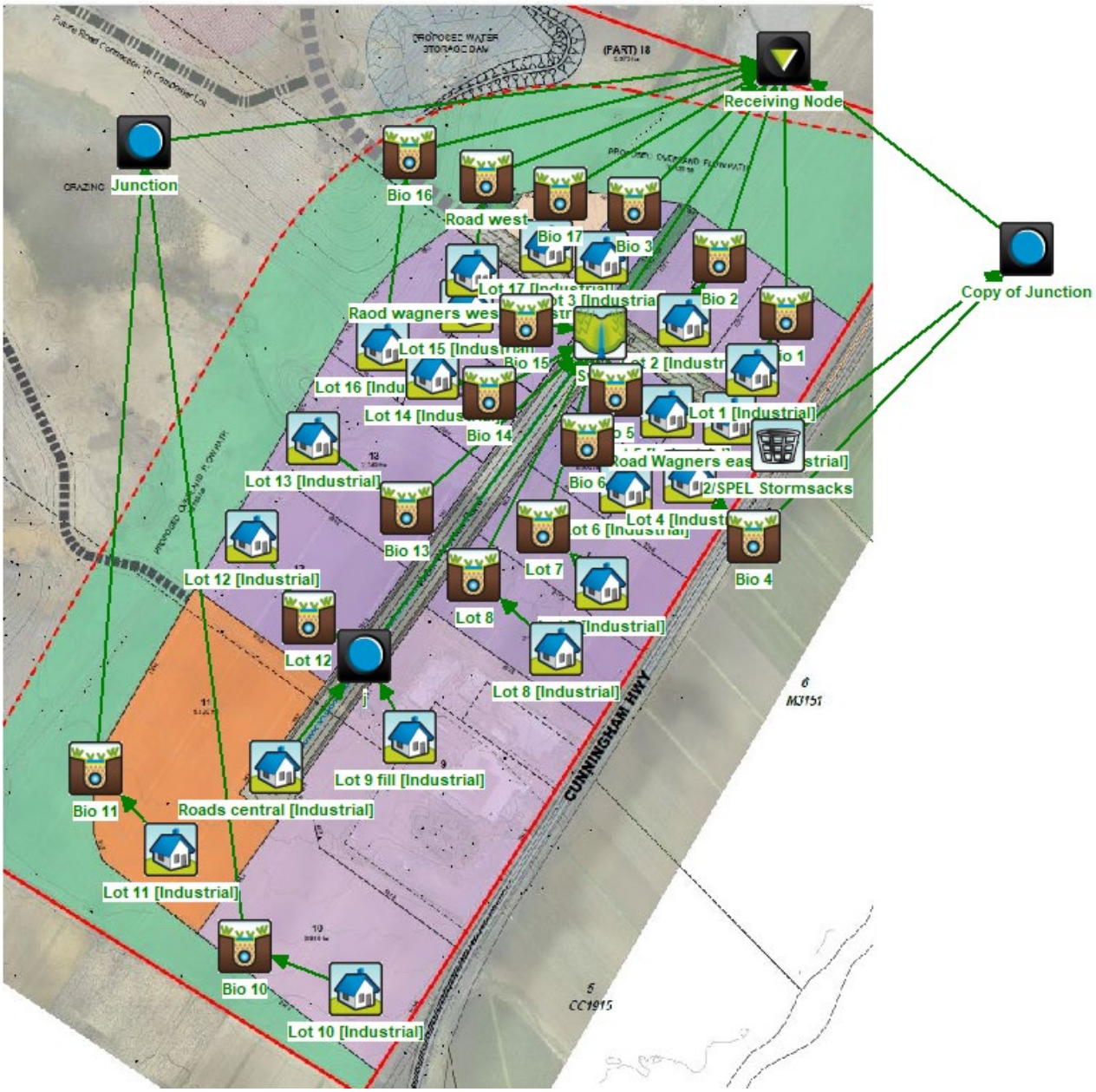
Figure 8 Water Quality Catchments

5.2.2 Treatment train

The proposed stormwater treatment train for the lot areas is to capture stormwater runoff from each individual lot within a lot-based bioretention basin. The central roadway is to be collected by a drainage swale which conveys stormwater to the north of the site. Based on the proposed earthworks strategy, some of the lots will discharge from the lot-based bioretention basins into the central drainage swale. The northern portion of the access road has been split into two catchments based on the site grading strategy, Wagner's Road East and Wagners Road West. Wagners Road west will be treated by a bioretention basin to the west of Lot 17, whereas the Wagners Road east catchment will be treated by in-pit GPT's and bypass any proposed basins, prior to out-letting to the Cunningham Highway table drain.

Treatment nodes for the GPT's were provided by SPEL, and the parameters adopted in the MUSIC model were derived from the values and methods provided by SPEL. Preliminary design details of the proprietary devices are provided in Appendix F.

Figure 9 MUSIC Treatment Train



5.2.3 MUSIC Model Parameters

A MUSIC (Ver. 6.3) model was set up to determine the efficiency of the stormwater quality treatment train proposed for the development. The meteorological data adopted for the site was from the Harrisville Post Office weather station (40094) as recommended in the *MUSIC Modelling Guidelines – Version 1.0 2010* (Water By Design, 2010), for the 11 year period from 01/01/1997 through to 31/12/2006.

The MUSIC source node characteristics were based on the values for industrial developments as outlined in the *MUSIC Modelling Water by Design Guidelines* (Healthy Land and Water (2018) MUSIC Modelling Guidelines), Table 3.9. The adopted source node characteristics are summarised in Table 13 and Table 14.

Table 13 Rainfall Runoff Parameters for Industrial Source Node

Parameter	Value
Rainfall threshold (mm)	1
Soil storage capacity (mm)	18
Initial storage (% capacity)	10
Field capacity (mm)	80
Infiltration capacity coefficient a	243
Infiltration capacity exponent b	0.6
Initial depth (mm)	50
Daily recharge rate (%)	0
Daily baseflow rate (%)	31
Daily deep seepage rate (%)	0

Table 14 Pollutant Export Parameters for Industrial Source Node

Land Use	Flow Type	TSS LOG^{10} VALUES		TP LOG^{10} VALUES		TN LOG^{10} VALUES	
		Mean	St. Dev	Mean	St. Dev	Mean	St. Dev
Lumped Industrial	Baseflow	0.78	0.45	-1.11	0.48	0.14	0.20
	Stormflow	1.92	0.44	-0.59	0.36	0.25	0.32
Industrial Road	Baseflow	0.78	0.45	-1.11	0.48	0.14	0.20
	Stormflow	2.43	0.44	-0.30	0.36	0.25	0.32

5.2.4 Stormwater Improvement Device Parameters

Bioretention basins have been sized for each proposed lot using a treatment area equivalent to 2% of the contributing catchment. A total bioretention area of 6,165 m^2 is required for the site in order to achieve the water quality load reduction targets. In addition to the bioretention basins, two (2) GPT's are required to treat the Wagners Road East catchment and the stormwater swale running through the site is required to convey the central access road some of the lots through to the LPOD.

The parameters of the proposed stormwater quality treatment devices are detailed in the following tables.

Table 15 Bioretention Basin Details

Parameter	Bio-retention Basin
Extended Detention Depth (m)	0.2
Saturated Hydraulic Conductivity (mm/hr)	200
Filter Depth (m)	0.4
Filter Area (m^2)	varies, refer Table 12
TN Content of Filter Media (mg/kg)	400
Orthophosphate Content of Filter Media (mg/kg)	30
Total Required	**6,798 m^2**

Table 16 Swale Details

Parameter	Bio-retention Basin
Length (m)	100
Bed Slope (%)	0.3
Base Width (m)	3.0
Top Width (m)	15.0
Depth (m)	1.50
Vegetation Height (m)	0.250
Exfiltration Rate (mm/hr)	0.00

Table 17 SPEL Stormsacks Properties

Parameter	Bio-retention Basin
Inlet Pit Dimensions	100
High Flow By-pass (m^3/s)	0.011
No. Required	**2**

5.3 Results

Table 18 summarise the MUSIC results for the proposed stormwater treatment train incorporating the bioretention basins and central drainage swale.

Table 18 Stormwater Quality Results

Criteria	Source Loads	Residual Load	% Reduction	% Reduction Target
Total Suspended Solids (kg/yr)	29,700	5,810	80.5%	80%
Total Phosphorus (kg/yr)	68.7	20	70.8%	60%
Total Nitrogen (kg/yr)	401	193	51.9%	45%
Gross Pollutants (kg/yr)	5,000	11.3	99.8%	90%

A review of the load reductions provided in the table above indicated that the inclusion of the bioretention basins, GPT's and drainage swale effectively reduces the pollutant export loads, thereby achieving the nominated load reduction targets for Total Suspended Solids, Total Phosphorus, Total Nitrogen and Gross Pollutants at the outlet of the proposed model. These results indicate that sufficient treatment measures can be provided to reduce the expected increase in pollutant load from the site.

5.4 Composting Pad Stormwater Quality

Stantec has undertaken preliminary stormwater calculations to size leachate ponds and stormwater basins required to capture runoff from the compost pads. Further details on the calculations are contained within the Scenic Rim Agricultural Industrial Precinct Preliminary Engineering Report by Stantec (510357-001-PER-3, 22nd February 2023)

Stormwater quality management for the proposed composting facility consists of the capture of runoff and composting leachate in leachate ponds within each proposed composting pad. The captured runoff and leachate is proposed to be reused through the composting process and bio-digester process. Excess runoff volumes are proposed to be trucked offsite via water tankers.

Standard practice stormwater quality management typically focusses upon capture and reuse of Q3 month flows. The proposed ponds have been sized to capture all rainfall events up to the 3.92% AEP (1 in 25 year ARI).

The concept stage functional layout plan for the composting site and associated ponds is provided in appendix E.

6. Operational Phase – Stormwater Management

6.1 Objective / Target

To implement the principles of environmentally sustainable development (ESD) by controlling the levels of contaminants (sediments and nutrients) entering downstream local water courses or road stormwater drainage systems.

6.2 Compliance Criteria

To comply with Council's Stormwater Quality Management Guidelines, as outlined in **Section 5** of this report, and other relevant Council bylaws and health and safety requirements, treatment devices have been designed to treat runoff generated by the 3 month ARI storm event in accordance with Council's requirements.

6.3 Management Measures

In consideration of the constraints of the proposed development and the space available, the following stormwater treatment measures are proposed to achieve the best practice stormwater management of the expected pollutant export loads from the subject site.

The primary stormwater management measures to be installed to maintain the quality of runoff discharging from the proposed development are vegetated bio-retention systems.

6.3.1 Treatment Devices

Bio-retention Systems

The surface profile of the proposed vegetated bio-retention systems shall be suitable to support vegetation and allow surface runoff to pond up to a maximum of 200 millimetres before flowing into the overflow pit or outlet headwall located in the basin area. It is recommended that the bio-retention areas be filled with a sandy loam filter media, with an effective particle size of 0.45 - 0.50 millimetres and a saturated hydraulic conductivity of 50 - 200mm/hr, to allow the infiltration of stormwater runoff. This filter material will be required to maintain saturated hydraulic conductivity and be suitable to sustain vegetation growth.

A 100 - 150 millimetre diameter slotted pipe drainage system lining the bottom of the infiltration system will be used to convey the filtered runoff to the system outlet before discharging to the downstream drainage network. The slotted pipe should be laid at a minimum grade of 0.5%. The bio-retention systems shall be designed to treat flows generated by a 3 month ARI rainfall event.

The bio-retention system treatment devices will be sized in order to comply with the mean annual pollutant load reduction targets outlined in **Section 5** of this report. The detailed design of these bio-retention system treatment devices should be in accordance with Council's Planning Scheme.

6.4 Construction and Establishment

The construction and establishment of the vegetated stormwater treatment devices, including bio-retention systems, should be undertaken with reference to the *'Construction and Establishment Guidelines: Swales, Bioretention Systems and Wetlands (Version 1.1, April 2010)'*, prepared by Water by Design.

6.5 Monitoring Schedule

A monitoring program should be established for the vegetated stormwater treatment devices as outlined in the *'Maintaining Vegetated Stormwater Assets (February 2012)'* document, prepared by Water by Design. **Table 19** outlines a number of the monitoring activities that may need to be considered as part of the monitoring programs established for these devices.

Table 19 Monitoring Program for Vegetated Bio-retention Systems

Time Frame (after construction)	Monitoring Activity	Frequency
0 – 6 Months	Erosion / scour of invert & batters	After major storm events
	Weed inundation / litter & debris accumulation	3 monthly
	Inappropriate access, excessive wear & damage to invert & batters	3 monthly
	Build-up of sediments and / or clogging of filter media	3 monthly
	Condition of vegetation such as vegetation health & density	3 monthly
	Condition of inlet & outlet structures	After major storm events
> 6 Months	Erosion / scour of invert & batters	3 monthly
	Weed inundation / litter & debris accumulation	3 monthly
	Inappropriate access, excessive wear & damage to invert & batters	3 monthly
	Build-up of sediments and / or clogging of filter media	3 monthly
	Condition of vegetation such as vegetation health & density	3 monthly
	Condition of inlet & outlet structures	After major storm events & / or 3 monthly

The Developer will be responsible for all monitoring activities associated with the operation of the vegetated bio-retention systems for the nominated maintenance periods.

6.6 Maintenance Schedule

The on-going performance of the treatment devices will be dependent on the maintenance conducted. Maintenance programs should be established for the vegetated stormwater treatment devices as outlined in the *'Maintaining Vegetated Stormwater Assets (February 2012)'* document, prepared by Water by Design.

The maintenance program shown in **Table 20** outlines a number of the maintenance activities that may need to be considered as part of the maintenance programs established for the devices.

Table 20 Maintenance Program for Vegetated Bio-retention Systems

Time Frame (after construction)	Monitoring Activity	Frequency
0 – 6 Months	Repairs to basin profile	As required by results of monitoring
	Watering, re-vegetating	As required by results of monitoring
	Removal of litter, debris, weeds & excessive sediment build up	Monthly, or as required by results of monitoring
	Mowing / pruning of basin vegetation to maintain optimal vegetation height	As required by results of monitoring
	Tilling of filter media area if evidence of clogging	As required by results of monitoring
> 6 Months	Repairs to basin profile	As required by results of monitoring

Removal of litter, debris, weeds & excessive sediment build up	3 monthly, or as required by results of monitoring
Mowing / pruning of basin vegetation to maintain optimal vegetation height	As required by results of monitoring
Tilling of filter media area if evidence of clogging	As required by results of monitoring

The Developer will be responsible for all maintenance activities associated with the operation of the vegetated bio-retention systems during the maintenance period.

Lime dosing (or similar) of the bio-retention filter media may be required periodically to 'neutralise' acidity levels within the soil resulting from slightly acidic precipitation and / or runoff. In order to determine the requirement for dosing, pH levels within the soil should be monitored twice a year.

Full bio-retention system filter media soil replacement shall occur when pollutant levels within the soil reach levels toxic to the plants within the filter media or when the system fails to drain adequately after tilling of the filter media surface. Monitoring carried out during the 3 monthly inspections shall be used to monitor pollutant levels.

6.7 Reporting

The Developer shall be notified of any system failure, incidences of non-compliance and corrective actions implemented during the maintenance period, with Council to be notified of any significant failures that have the potential to cause environmental harm during the maintenance period.

6.8 Corrective Action

When the nominated compliance criterion is not met, then an investigation into the cause and source of the pollutants is to be carried out and the appropriate remedial action taken based on the outcomes of this investigation.

7. Hydraulic Analysis – Regional Flooding

7.1 Background

The 1D/2D modelling program TUFLOW, was used to compute the channel and overland flow components of the subject site and surrounding area. TUFLOW is a suite of advanced numerical engines and supporting tools used for simulating free-surface water flow for urban waterways, rivers, floodplains, estuaries and coastlines.

The site is subject to both local and regional flooding. Local flooding is caused by catchments west of the site draining through the North West portion on the proposed development site. Regional flooding from the Warrill Creek catchment impacts the site via overflow from Warrill Creek located East of the development area.

It should be noted that Regional Flooding analysis was documented in section 7.5 of the *B.4 Integrated Water Management Plan.pdf Dated 3rd February 2023.*. Since this report was provided, the flood model has been run with the TUFLOW SGS and HPC functions utilised. This has resulted in a more refined model with higher accuracy. The results discussion and associated mapping of the updated modelling is documented in Appendix G and attachment A.

7.1.1 Flood Hazard Code Overlay Assessment

Refer to appendix G for flood hazard code overlay assessment.

8. Conclusions

This report has investigated the stormwater issues for both the existing and developed cases for the property located at Kalbar on the Cunningham Highway.

Hydraulic modelling of regional flooding has demonstrated that the proposed development will not have significant adverse effects on the surrounding properties with no actionable nuisance. While some areas are showing water level increases these are not considered to be significant due to these areas being currently inundated by depths greater than 1 metre deep in the existing case modelling. In addition to this, it is not anticipated that the trafficability of Cunningham Highway will be influenced by the proposed development works. No significant changes to flooding extents are evident as demonstrated in Appendix D with no changes to the current flood hazard categories.

Hydraulic modelling of the proposed stormwater detention system, as outlined in this report demonstrate that post-development peak flows from the respective site sub-catchments can be mitigated to the pre-development conditions prior to reaching the downstream waterway, for all design storm events modelled, up to and including the 1% AEP event.

MUSIC modelling also demonstrated that the stormwater treatment measures adopted in this study for the proposed development have the ability to reduce the respective pollutant loadings and meet the pollutant reduction objectives (i.e. for TSS, TP, TN and GP).

Whilst the modelling and assessment have demonstrated that the adopted stormwater strategy, as proposed within this IWM report will achieve acceptable stormwater quantity and quality outcomes, the success of such stormwater management strategy during the operational phase is largely dependent on the provision of a regular maintenance regime to the individual detention and treatment system devices to prevent clogging and damages to these systems.

Stormwater quality and quantity devices may require modification or clarification to suit the detailed requirements of the future Developer(s) / Contractor(s) and the Council for the construction and operational phases of the development

9. Qualifications

The analysis and overall approach has been catered to the specific requirements of this assessment, and may not be applicable beyond this scope. For this reason, any other third parties are not authorised to utilise this report without further input and advice from Stantec Australia Pty Ltd. Whilst this report accurately assesses catchment hydrologic and hydraulic characteristics based on design storms using industry standard modelling techniques and engineering practices, the actual future observed flows and water levels may vary from those predicted.

APPENDICES

Appendix A TUFLOW MODEL SETUP

Scenic Rim Agricultural Industrial Precinct

Existing Topography
Project: 304701259 Scenic Rim Agricultural Industrial Precinct

Client: Kalfresh Pty Ltd

Project Code: 304701259

Drawn By: SV,SK, Checked By: AD

Date: (2023-02-22)

Figure No: A - 1

Stantec

Legend

Site Boundary
Cadastre

Kalfresh_E008_100Y_0360m_DEM_Z QLD Globe Imagery

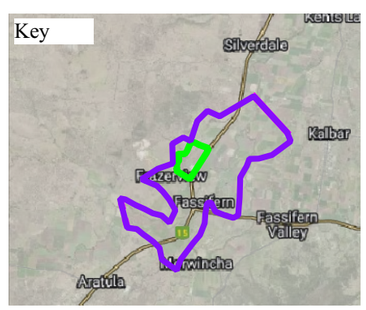
- <= 75.00 mAHD
- 75.00 - 80.00 mAHD
- 80.00 - 85.00 mAHD
- 85.00 - 90.00 mAHD
- 90.00 - 95.00 mAHD
- 95.00 - 100.00 mAHD
- 100.00 - 105.00 mAHD
- > 105.00 mAHD

Notes:
1. Map displayed in EPSG:28356

References:
1. QLD Globe

80 0 80 160 240 320 m

Scale at A3: 1:7000



Scenic Rim Agricultural Industrial Precinct

Developed Topography
Project: 304701259 Scenic Rim Agricultural Industrial Precinct

Client: Kalfresh Pty Ltd
Project Code: 304701259

Drawn By: SV,SK, Checked By: AD
Date: (2023-02-22)
Figure No: A - 2

Stantec

Legend

Site Boundary
Cadastre

Kalfresh_D014_100Y_0360m_DEM_Z QLD Globe Imagery

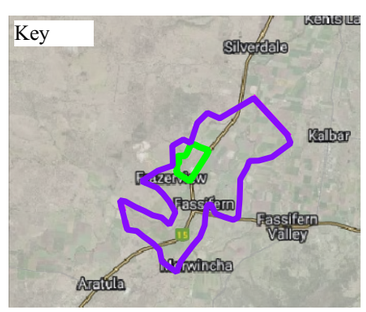
- <= 75.00 mAHD
- 75.00 - 80.00 mAHD
- 80.00 - 85.00 mAHD
- 85.00 - 90.00 mAHD
- 90.00 - 95.00 mAHD
- 95.00 - 100.00 mAHD
- 100.00 - 105.00 mAHD
- > 105.00 mAHD

Notes:
1. Map displayed in EPSG:28356

References:
1. QLD Globe

80 0 80 160 240 320 m

Scale at A3: 1:7000



Scenic Rim Agricultural Industrial Precinct

Topography Difference
Project: 304701259 Scenic Rim Agricultural Industrial Precinct

Client: Kalfresh Pty Ltd

Project Code: 304701259

Drawn By: SV,SK, Checked By: AD

Date: (2023-02-22)

Figure No: A - 3

Stantec

Legend

Site Boundary
Cadastre

Topo_Diff

- <= -1.50m
- -1.50 - -1.00m
- -1.00 - -0.50m
- -0.50 - 0.01m
- 0.01 - 0.02m
- 0.02 - 0.50m
- 0.50 - 1.00m
- 1.00 - 1.50m
- 1.50 - 2.00m
- > 2.00m

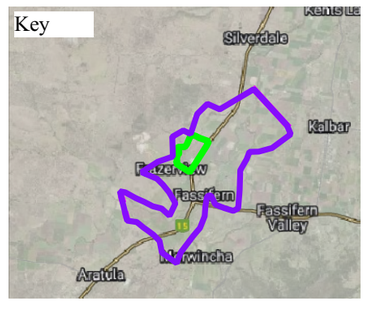
QLD Globe Imagery

Notes:
1. Map displayed in EPSG:28356

References:
1. QLD Globe

80 0 80 160 240 320 m

Scale at A3: 1:7000



Scenic Rim Agricultural Industrial Precinct

Boundary Conditions
Project: 304701259 Scenic Rim Agricultural Industrial Precinct

Client: Kalfresh Pty Ltd

Project Code: 304701259

Drawn By: SV,SK, Checked By: AD

Date: (2023-02-22)

Figure No: A - 4

Stantec

Legend

2d_bc_KAL_E001_Mod
Site Boundary
2d_sa_KAL_Mod
Cadastre
QLD Globe Imagery

Notes:
1. Map displayed in EPSG:28356

References:
1. QLD Globe

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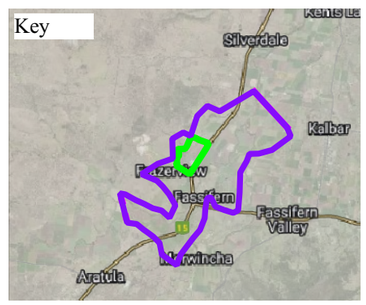
Scale at A3: 1:30000



Scenic Rim Agricultural Industrial Precinct

Existing Manning's
Project: 304701259 Scenic Rim Agricultural Industrial Precinct

Client: Kalfresh Pty Ltd

Project Code: 304701259

Drawn By: SV,SK, Checked By: AD

Date: (2023-02-22)

Figure No: A - 5

Stantec

Legend

- Site Boundary
- Cadastre

Kalfresh_E008_100Y_0360m_DEM_M QLD Globe Imagery

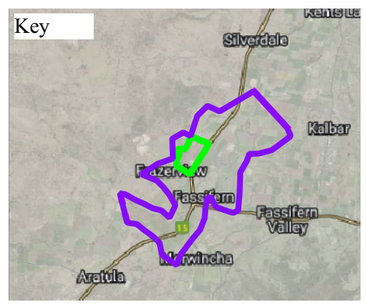
- Open Area
- Roads
- Creek
- Crops

Notes:
1. Map displayed in EPSG:28356

References:
1. QLD Globe

80 0 80 160 240 320 m

Scale at A3: 1:7000



Scenic Rim Agricultural Industrial Precinct

Developed Manning's
Project: 304701259 Scenic Rim Agricultural Industrial Precinct

Client: Kalfresh Pty Ltd

Project Code: 304701259

Drawn By: SV,SK, Checked By: AD

Date: (2023-02-22)

Figure No: A - 6

Stantec

Legend

- Site Boundary
- Cadastre

Kalfresh_D014_100Y_0360m_DEM_M QLD Globe Imagery

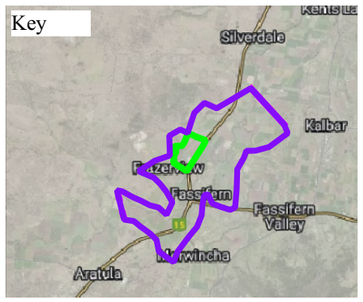
- Open Area
- Channel
- Roads
- Creek
- Crops
- Billabong

Notes:
1. Map displayed in EPSG:28356

References:
1. QLD Globe

80 0 80 160 240 320 m

Scale at A3: 1:7000



Appendix B WATER SURFACE LEVELS

Scenic Rim Agricultural Industrial Precinct

Existing 10% AEP Water Surface Level
Project: 304701259 Scenic Rim Agricultural Industrial Precinct

Client: Kalfresh Pty Ltd

Project Code: 304701259

Drawn By: SV,SK, Checked By: AD

Date: (2023-02-22)

Figure No: B - 1

Stantec

Legend

Site Boundary
Cadastre

E008
Kalfresh_E008_10Y_Max_Max_h
<= 80.50 mAHD
80.50 - 81.00 mAHD
81.00 - 81.50 mAHD
81.50 - 82.00 mAHD
82.00 - 82.50 mAHD
> 82.50 mAHD

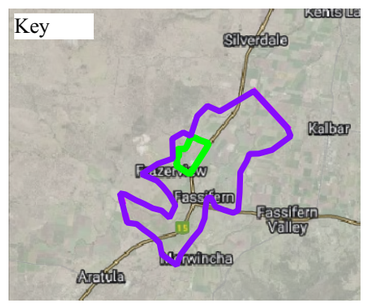
QLD Globe Imagery

Notes:
1. Map displayed in EPSG:28356

References:
1. QLD Globe

80 0 80 160 240 320 m

Scale at A3: 1:7000



Scenic Rim Agricultural Industrial Precinct

Existing 5% AEP Water Surface Level
Project: 304701259 Scenic Rim Agricultural Industrial Precinct

Client: Kalfresh Pty Ltd

Project Code: 304701259

Drawn By: SV,SK, Checked By: AD

Date: (2023-02-22)

Figure No: B - 2

Stantec

Legend

Site Boundary
Cadastre

E008
Kalfresh_E008_20Y_Max_Max_h
<= 80.50 mAHD
80.50 - 81.00 mAHD
81.00 - 81.50 mAHD
81.50 - 82.00 mAHD
82.00 - 82.50 mAHD
> 82.50 mAHD

QLD Globe Imagery

Notes:
1. Map displayed in EPSG:28356

References:
1. QLD Globe

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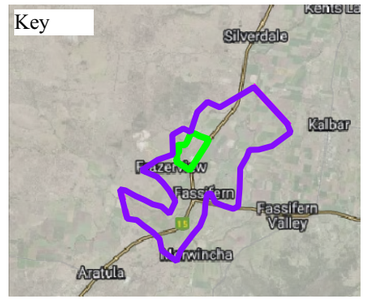
Scale at A3: 1:7000



Scenic Rim Agricultural Industrial Precinct

Existing 2% AEP Water Surface Level
Project: 304701259 Scenic Rim Agricultural Industrial Precinct

Client: Kalfresh Pty Ltd

Project Code: 304701259

Drawn By: SV,SK, Checked By: AD

Date: (2023-02-22)

Figure No: B - 3

Stantec

Legend

Site Boundary
Cadastre

E008
Kalfresh_E008_50Y_Max_Max_h
<= 80.50 mAHD
80.50 - 81.00 mAHD
81.00 - 81.50 mAHD
81.50 - 82.00 mAHD
82.00 - 82.50 mAHD
> 82.50 mAHD

QLD Globe Imagery

Notes:
1. Map displayed in EPSG:28356

References:
1. QLD Globe

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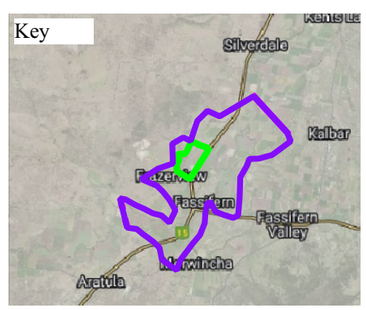
Scale at A3: 1:7000



Scenic Rim Agricultural Industrial Precinct

Existing 1% AEP Water Surface Level
Project: 304701259 Scenic Rim Agricultural Industrial Precinct

Client: Kalfresh Pty Ltd

Project Code: 304701259

Drawn By: SV,SK, Checked By: AD

Date: (2023-02-22)

Figure No: B - 4

Stantec

Legend

Site Boundary
Cadastre

E008
Kalfresh_E008_100Y_Max_Max_h
<= 80.50 mAHD
80.50 - 81.00 mAHD
81.00 - 81.50 mAHD
81.50 - 82.00 mAHD
82.00 - 82.50 mAHD
> 82.50 mAHD

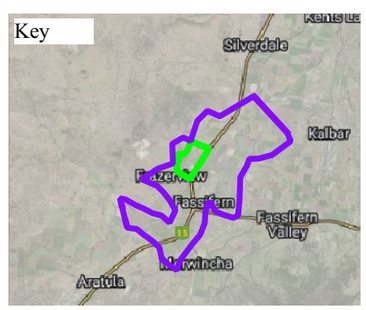
QLD Globe Imagery

Notes:
1. Map displayed in EPSG:28356

References:
1. QLD Globe

80 0 80 160 240 320 m

Scale at A3: 1:7000



Scenic Rim Agricultural Industrial Precinct

Existing 1% AEP CC Water Surface Level
Project: 304701259 Scenic Rim Agricultural Industrial Precinct

Client: Kalfresh Pty Ltd

Project Code: 304701259

Drawn By: SV,SK, Checked By: AD

Date: (2023-02-22)

Figure No: B - 5

Stantec

Legend

- Site Boundary
- Cadastre

E008
Kalfresh_E008_100YCC_Max_Max_h
- <= 80.50 mAHD
- 80.50 - 81.00 mAHD
- 81.00 - 81.50 mAHD
- 81.50 - 82.00 mAHD
- 82.00 - 82.50 mAHD
- > 82.50 mAHD

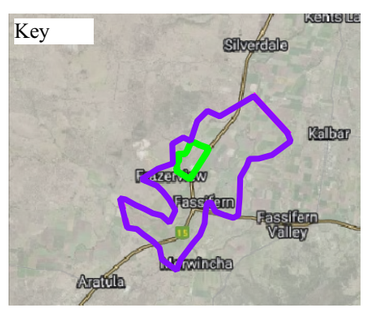
QLD Globe Imagery

Notes:
1. Map displayed in EPSG:28356

References:
1. QLD Globe

80 0 80 160 240 320 m

Scale at A3: 1:7000



Scenic Rim Agricultural Industrial Precinct

Developed 10% AEP Water Surface Level
Project: 304701259 Scenic Rim Agricultural Industrial Precinct

Client: Kalfresh Pty Ltd

Project Code: 304701259

Drawn By: SV,SK, Checked By: AD

Date: (2023-02-22)

Figure No: B - 6

Stantec

Legend

Site Boundary
Cadastre

D014
Kalfresh_D014_10Y_Max_Max_h
- <= 80.50 mAHD
- 80.50 - 81.00 mAHD
- 81.00 - 81.50 mAHD
- 81.50 - 82.00 mAHD
- 82.00 - 82.50 mAHD
- > 82.50 mAHD

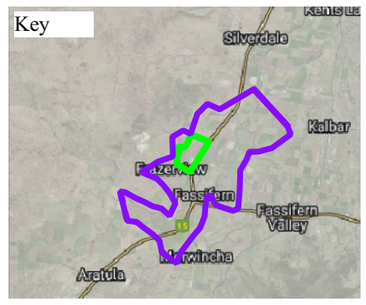
QLD Globe Imagery

Notes:
1. Map displayed in EPSG:28356

References:
1. QLD Globe

80 0 80 160 240 320 m

Scale at A3: 1:7000



Scenic Rim Agricultural Industrial Precinct

Developed 5% AEP Water Surface Level
Project: 304701259 Scenic Rim Agricultural Industrial Precinct

Client: Kalfresh Pty Ltd

Project Code: 304701259

Drawn By: SV,SK, Checked By: AD

Date: (2023-02-22)

Figure No: B - 7

Stantec

Legend

Site Boundary
Cadastre

D014
Kalfresh_D014_20Y_Max_Max_h
<= 80.50 mAHD
80.50 - 81.00 mAHD
81.00 - 81.50 mAHD
81.50 - 82.00 mAHD
82.00 - 82.50 mAHD
> 82.50 mAHD

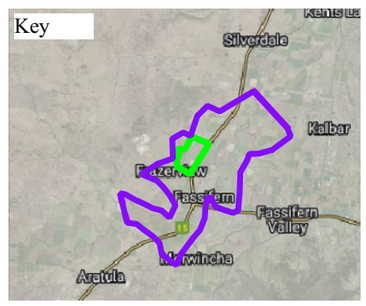
QLD Globe Imagery

Notes:
1. Map displayed in EPSG:28356

References:
1. QLD Globe

80 0 80 160 240 320 m

Scale at A3: 1:7000



Scenic Rim Agricultural Industrial Precinct

Developed 2% AEP Water Surface Level
Project: 304701259 Scenic Rim Agricultural Industrial Precinct

Client: Kalfresh Pty Ltd

Project Code: 304701259

Drawn By: SV,SK, Checked By: AD

Date: (2023-02-22)

Figure No: B - 8

Stantec

Legend

Site Boundary
Cadastre

D014
Kalfresh_D014_50Y_Max_Max_h
<= 80.50 mAHD
80.50 - 81.00 mAHD
81.00 - 81.50 mAHD
81.50 - 82.00 mAHD
82.00 - 82.50 mAHD
> 82.50 mAHD

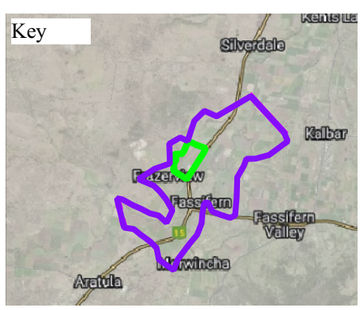
QLD Globe Imagery

Notes:
1. Map displayed in EPSG:28356

References:
1. QLD Globe

80 0 80 160 240 320 m

Scale at A3: 1:7000



Scenic Rim Agricultural Industrial Precinct

Developed 1% AEP Water Surface Level
Project: 304701259 Scenic Rim Agricultural Industrial Precinct

Client: Kalfresh Pty Ltd

Project Code: 304701259

Drawn By: SV,SK, Checked By: AD

Date: (2023-02-22)

Figure No: B - 9

Stantec

Legend

Site Boundary
Cadastre

D014
Kalfresh_D014_100Y_Max_Max_h
<= 80.50 mAHD
80.50 - 81.00 mAHD
81.00 - 81.50 mAHD
81.50 - 82.00 mAHD
82.00 - 82.50 mAHD
> 82.50 mAHD

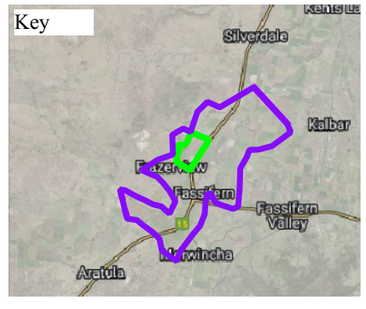
QLD Globe Imagery

Notes:
1. Map displayed in EPSG:28356

References:
1. QLD Globe

80 0 80 160 240 320 m

Scale at A3: 1:7000



Scenic Rim Agricultural Industrial Precinct

Developed 1% AEP CC Water Surface Level
Project: 304701259 Scenic Rim Agricultural Industrial Precinct

Client: Kalfresh Pty Ltd

Project Code: 304701259

Drawn By: SV,SK, Checked By: AD

Date: (2023-02-22)

Figure No: B - 10

Stantec

Legend

Site Boundary
Cadastre

D014
Kalfresh_D014_100YCC_Max_Max_h
<= 80.50 mAHD
80.50 - 81.00 mAHD
81.00 - 81.50 mAHD
81.50 - 82.00 mAHD
82.00 - 82.50 mAHD
> 82.50 mAHD

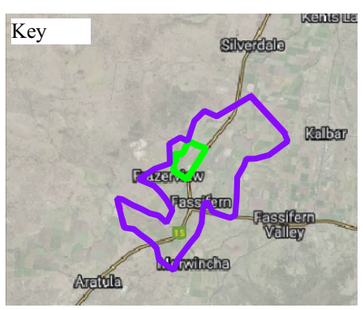
QLD Globe Imagery

Notes:
1. Map displayed in EPSG:28356

References:
1. QLD Globe

80 0 80 160 240 320 m

Scale at A3: 1:7000



Appendix C WATER DEPTHS

Scenic Rim Agricultural Industrial Precinct

Existing 10% AEP Depth
Project: 304701259 Scenic Rim Agricultural Industrial Precinct

Client: Kalfresh Pty Ltd

Project Code: 304701259

Drawn By: SV,SK, Checked By: AD

Date: (2023-02-22)

Figure No: C - 1

Stantec

Legend

Site Boundary
Cadastre

E008
Kalfresh_E008_10Y_Max_Max_d
<= 0.05 m
0.05 - 0.10 m
0.10 - 0.20 m
0.20 - 0.30 m
0.30 - 0.40 m
0.40 - 0.50 m
0.50 - 0.60 m
0.60 - 0.70 m
0.70 - 0.80 m
> 0.80 m

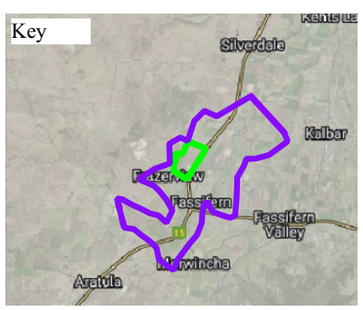
QLD Globe Imagery

Notes:
1. Map displayed in EPSG:28356

References:
1. QLD Globe

80 0 80 160 240 320 m

Scale at A3: 1:7000



Scenic Rim Agricultural Industrial Precinct

Existing 5% AEP Depth
Project: 304701259 Scenic Rim Agricultural Industrial Precinct

Client: Kalfresh Pty Ltd

Project Code: 304701259

Drawn By: SV,SK, Checked By: AD

Date: (2023-02-22)

Figure No: C - 2

Stantec

Legend

Site Boundary
Cadastre

E008
Kalfresh_E008_20Y_Max_Max_d
<= 0.05 m
0.05 - 0.10 m
0.10 - 0.20 m
0.20 - 0.30 m
0.30 - 0.40 m
0.40 - 0.50 m
0.50 - 0.60 m
0.60 - 0.70 m
0.70 - 0.80 m
> 0.80 m

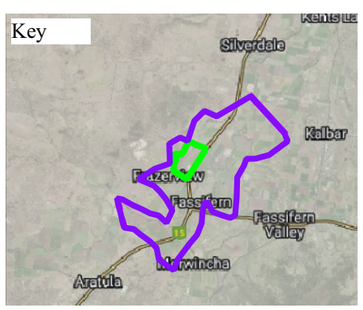
QLD Globe Imagery

Notes:
1. Map displayed in EPSG:28356

References:
1. QLD Globe

80 0 80 160 240 320 m

Scale at A3: 1:7000



Scenic Rim Agricultural Industrial Precinct

Existing 2% AEP Depth
Project: 304701259 Scenic Rim Agricultural Industrial Precinct

Client: Kalfresh Pty Ltd

Project Code: 304701259

Drawn By: SV,SK, Checked By: AD

Date: (2023-02-22)

Figure No: C - 3

Stantec

Legend

Site Boundary
Cadastre

E008
Kalfresh_E008_50Y_Max_Max_d
<= 0.05 m
0.05 - 0.10 m
0.10 - 0.20 m
0.20 - 0.30 m
0.30 - 0.40 m
0.40 - 0.50 m
0.50 - 0.60 m
0.60 - 0.70 m
0.70 - 0.80 m
> 0.80 m

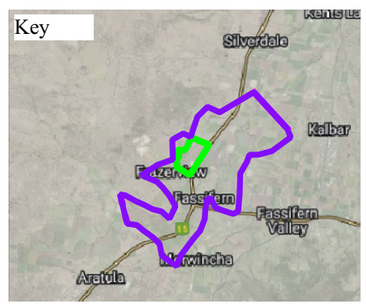
QLD Globe Imagery

Notes:
1. Map displayed in EPSG:28356

References:
1. QLD Globe

80 0 80 160 240 320 m

Scale at A3: 1:7000



Scenic Rim Agricultural Industrial Precinct

Existing 1% AEP Depth
Project: 304701259 Scenic Rim Agricultural Industrial Precinct

Client: Kalfresh Pty Ltd

Project Code: 304701259

Drawn By: SV,SK, Checked By: AD

Date: (2023-02-22)

Figure No: C - 4

Stantec

Legend

Site Boundary
Cadastre

E008
Kalfresh_E008_100Y_Max_Max_d
<= 0.05 m
0.05 - 0.10 m
0.10 - 0.20 m
0.20 - 0.30 m
0.30 - 0.40 m
0.40 - 0.50 m
0.50 - 0.60 m
0.60 - 0.70 m
0.70 - 0.80 m
> 0.80 m

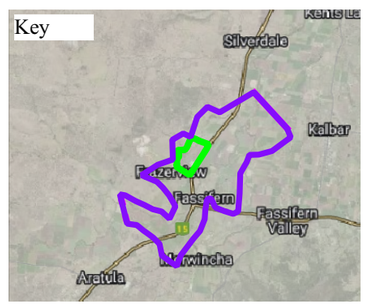
QLD Globe Imagery

Notes:
1. Map displayed in EPSG:28356

References:
1. QLD Globe

80 0 80 160 240 320 m

Scale at A3: 1:7000



Scenic Rim Agricultural Industrial Precinct

Existing 1% AEP CC Depth
Project: 304701259 Scenic Rim Agricultural Industrial Precinct

Client: Kalfresh Pty Ltd
Project Code: 304701259

Drawn By: SV,SK, Checked By: AD
Date: (2023-02-22)

Figure No: C - 5

Stantec

Legend

Site Boundary
Cadastre

E008
Kalfresh_E008_100YCC_Max_Max_d
<= 0.05 m
0.05 - 0.10 m
0.10 - 0.20 m
0.20 - 0.30 m
0.30 - 0.40 m
0.40 - 0.50 m
0.50 - 0.60 m
0.60 - 0.70 m
0.70 - 0.80 m
> 0.80 m

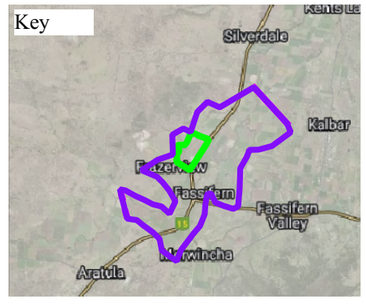
QLD Globe Imagery

Notes:
1. Map displayed in EPSG:28356

References:
1. QLD Globe

80 0 80 160 240 320 m

Scale at A3: 1:7000



Scenic Rim Agricultural Industrial Precinct

Developed 10% AEP Depth
Project: 304701259 Scenic Rim Agricultural Industrial Precinct

Client: Kalfresh Pty Ltd

Project Code: 304701259

Drawn By: SV,SK, Checked By: AD

Date: (2023-02-22)

Figure No: C - 6

Stantec

Legend

Site Boundary
Cadastre

D014
Kalfresh_D014_10Y_Max_Max_d
<= 0.05 m
0.05 - 0.10 m
0.10 - 0.20 m
0.20 - 0.30 m
0.30 - 0.40 m
0.40 - 0.50 m
0.50 - 0.60 m
0.60 - 0.70 m
0.70 - 0.80 m
> 0.80 m

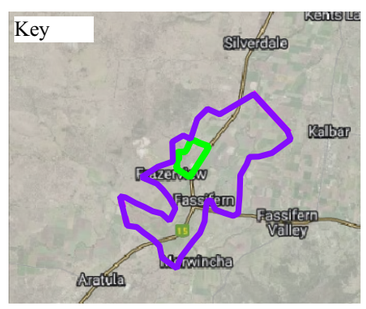
QLD Globe Imagery

Notes:
1. Map displayed in EPSG:28356

References:
1. QLD Globe

80 0 80 160 240 320 m

Scale at A3: 1:7000



Scenic Rim Agricultural Industrial Precinct

Developed 5% AEP Depth
Project: 304701259 Scenic Rim Agricultural Industrial Precinct

Client: Kalfresh Pty Ltd

Project Code: 304701259

Drawn By: SV,SK, Checked By: AD

Date: (2023-02-22)

Figure No: C - 7

Stantec

Legend

Site Boundary
Cadastre

D014
Kalfresh_D014_20Y_Max_Max_d
<= 0.05 m
0.05 - 0.10 m
0.10 - 0.20 m
0.20 - 0.30 m
0.30 - 0.40 m
0.40 - 0.50 m
0.50 - 0.60 m
0.60 - 0.70 m
0.70 - 0.80 m
> 0.80 m

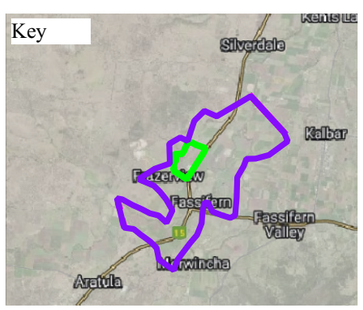
QLD Globe Imagery

Notes:
1. Map displayed in EPSG:28356

References:
1. QLD Globe

80 0 80 160 240 320 m

Scale at A3: 1:7000



Scenic Rim Agricultural Industrial Precinct

Developed 2% AEP Depth
Project: 304701259 Scenic Rim Agricultural Industrial Precinct

Client: Kalfresh Pty Ltd
Project Code: 304701259

Drawn By: SV,SK, Checked By: AD
Date: (2023-02-22)

Figure No: C - 8

Stantec

Legend

Site Boundary
Cadastre

D014
Kalfresh_D014_50Y_Max_Max_d
<= 0.05 m
0.05 - 0.10 m
0.10 - 0.20 m
0.20 - 0.30 m
0.30 - 0.40 m
0.40 - 0.50 m
0.50 - 0.60 m
0.60 - 0.70 m
0.70 - 0.80 m
> 0.80 m

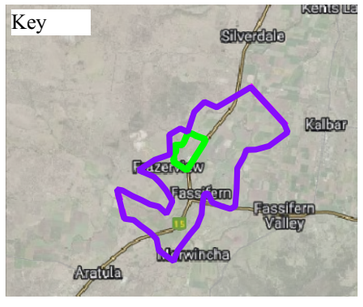
QLD Globe Imagery

Notes:
1. Map displayed in EPSG:28356

References:
1. QLD Globe

80 0 80 160 240 320 m

Scale at A3: 1:7000



Scenic Rim Agricultural Industrial Precinct

Developed 1% AEP Depth
Project: 304701259 Scenic Rim Agricultural Industrial Precinct

Client: Kalfresh Pty Ltd
Project Code: 304701259

Drawn By: SV,SK, Checked By: AD
Date: (2023-02-22)

Figure No: C - 9

Stantec

Legend

Site Boundary
Cadastre

D014
Kalfresh_D014_100Y_Max_Max_d
<= 0.05 m
0.05 - 0.10 m
0.10 - 0.20 m
0.20 - 0.30 m
0.30 - 0.40 m
0.40 - 0.50 m
0.50 - 0.60 m
0.60 - 0.70 m
0.70 - 0.80 m
> 0.80 m

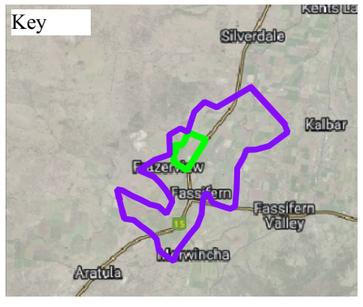
QLD Globe Imagery

Notes:
1. Map displayed in EPSG:28356

References:
1. QLD Globe

80 0 80 160 240 320 m

Scale at A3: 1:7000



Scenic Rim Agricultural Industrial Precinct

Developed 1% AEP CC Depth
Project: 304701259 Scenic Rim Agricultural Industrial Precinct

Client: Kalfresh Pty Ltd

Project Code: 304701259

Drawn By: SV,SK, Checked By: AD

Date: (2023-02-22)

Figure No: C - 10

Stantec

Legend

Site Boundary
Cadastre

D014
Kalfresh_D014_100YCC_Max_Max_d
<= 0.05 m
0.05 - 0.10 m
0.10 - 0.20 m
0.20 - 0.30 m
0.30 - 0.40 m
0.40 - 0.50 m
0.50 - 0.60 m
0.60 - 0.70 m
0.70 - 0.80 m
> 0.80 m

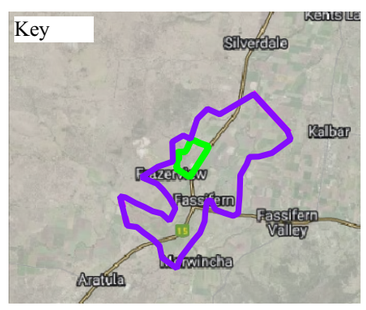
QLD Globe Imagery

Notes:
1. Map displayed in EPSG:28356

References:
1. QLD Globe

80 0 80 160 240 320 m

Scale at A3: 1:7000



Appendix D FLOOD IMPACTS

Scenic Rim Agricultural Industrial Precinct

10% AEP Impacts
Project: 304701259 Scenic Rim Agricultural Industrial Precinct

Client: Kalfresh Pty Ltd

Project Code: 304701259

Drawn By: SV,SK, Checked By: AD

Date: (2023-02-22)

Figure No: D - 1

Stantec

Legend

Site Boundary
Cadastre

Impacts D014
10Y_D014-E008_Impact_h
<= -0.10m
-0.10 - -0.05m
-0.05 - -0.01m
-0.01 - 0.01m
0.01 - 0.02m
0.02 - 0.03m
0.03 - 0.04m
0.04 - 0.05m
0.05 - 0.06m
> 0.06m

10Y_D014-E008_Impact_h_wd
Was Wet Now Dry
Was Dry Now Wet

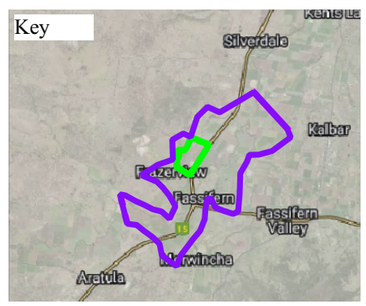
QLD Globe Imagery

Notes:
1. Map displayed in EPSG:28356

References:
1. QLD Globe

100 0 100 200 300 400 m

Scale at A3: 1:11000



Scenic Rim Agricultural Industrial Precinct

5% AEP Impacts
Project: 304701259 Scenic Rim Agricultural Industrial Precinct

Client: Kalfresh Pty Ltd

Project Code: 304701259

Drawn By: SV,SK, Checked By: AD

Date: (2023-02-22)

Figure No: D - 2

Stantec

Legend

Site Boundary
Cadastre

Impacts D014
20Y_D014-E008_Impact_h
<= -0.10m
-0.10 - -0.05m
-0.05 - -0.01m
-0.01 - 0.01m
0.01 - 0.02m
0.02 - 0.03m
0.03 - 0.04m
0.04 - 0.05m
0.05 - 0.06m
> 0.06m

20Y_D014-E008_Impact_h_wd
Was Wet Now Dry
Was Dry Now Wet

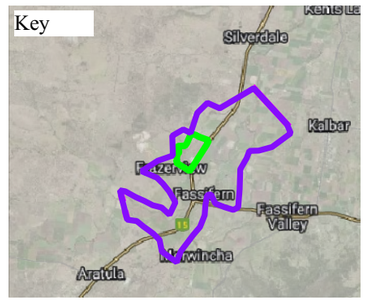
QLD Globe Imagery

Notes:
1. Map displayed in EPSG:28356

References:
1. QLD Globe

100 0 100 200 300 400 m

Scale at A3: 1:11000



Scenic Rim Agricultural Industrial Precinct

2% AEP Impacts
Project: 304701259 Scenic Rim Agricultural Industrial Precinct

Client: Kalfresh Pty Ltd

Project Code: 304701259

Drawn By: SV,SK, Checked By: AD

Date: (2023-02-22)

Figure No: D - 3

Stantec

Legend

- Site Boundary
- Cadastre

Impacts D014
50Y_D014-E008_Impact_h
- <= -0.10m
- -0.10 - -0.05m
- -0.05 - -0.01m
- -0.01 - 0.01m
- 0.01 - 0.02m
- 0.02 - 0.03m
- 0.03 - 0.04m
- 0.04 - 0.05m
- 0.05 - 0.06m
- > 0.06m

50Y_D014-E008_Impact_h_wd
- Was Wet Now Dry
- Was Dry Now Wet

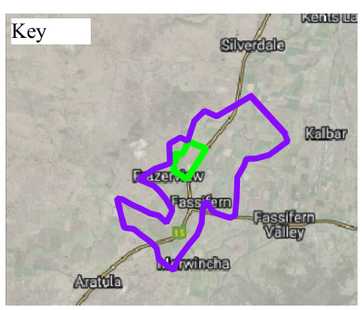
QLD Globe Imagery

Notes:
1. Map displayed in EPSG:28356

References:
1. QLD Globe

100 0 100 200 300 400 m

Scale at A3: 1:11000



Scenic Rim Agricultural Industrial Precinct

1% AEP Impacts
Project: 304701259 Scenic Rim Agricultural Industrial Precinct

Client: Kalfresh Pty Ltd

Project Code: 304701259

Drawn By: SV,SK, Checked By: AD

Date: (2023-02-22)

Figure No: D - 4

Stantec

Legend

Site Boundary
Cadastre

Impacts D014
100Y_D014-E008_Impact_h
<= -0.10m
-0.10 - -0.05m
-0.05 - -0.01m
-0.01 - 0.01m
0.01 - 0.02m
0.02 - 0.03m
0.03 - 0.04m
0.04 - 0.05m
0.05 - 0.06m
> 0.06m

100Y_D014-E008_Impact_h_wd
Was Wet Now Dry
Was Dry Now Wet

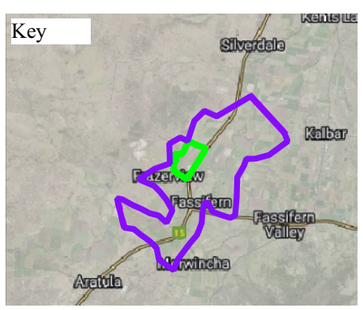
QLD Globe Imagery

Notes:
1. Map displayed in EPSG:28356

References:
1. QLD Globe

100 0 100 200 300 400 m

Scale at A3: 1:11000



Scenic Rim Agricultural Industrial Precinct

1% AEP CC Impacts
Project: 304701259 Scenic Rim Agricultural Industrial Precinct

Client: Kalfresh Pty Ltd
Project Code: 304701259

Drawn By: SV,SK, Checked By: AD
Date: (2023-02-22)

Figure No: D - 5

Stantec

Legend

Site Boundary
Cadastre

Impacts D014
100YCC_D014-E008_Impact_h
<= -0.10m
-0.10 - -0.05m
-0.05 - -0.01m
-0.01 - 0.01m
0.01 - 0.02m
0.02 - 0.03m
0.03 - 0.04m
0.04 - 0.05m
0.05 - 0.06m
> 0.06m

100YCC_D014-E008_Impact_h_wd
Was Wet Now Dry
Was Dry Now Wet

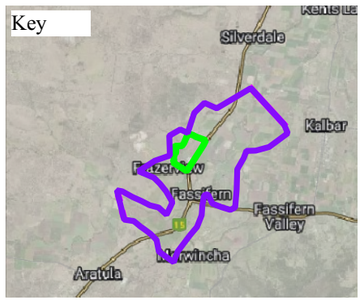
QLD Globe Imagery

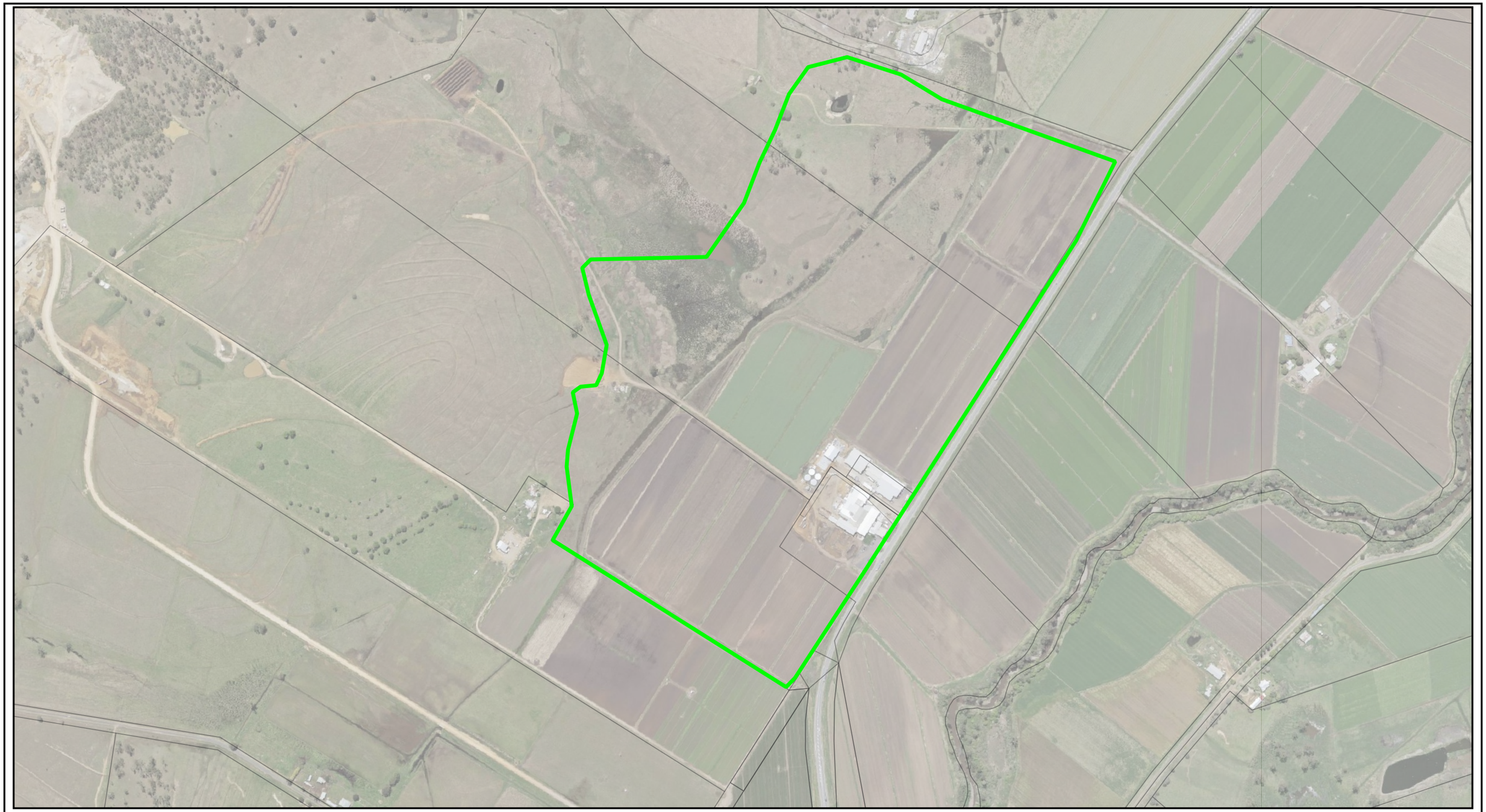
Notes:
1. Map displayed in EPSG:28356

References:
1. QLD Globe

100 0 100 200 300 400 m

Scale at A3: 1:11000





Scenic Rim Agricultural Industrial Precinct

Site location
Project: 304701259 Scenic Rim Agricultural Industrial Precinct

Client: Kalfresh Pty Ltd

Project Code: 304701259

Drawn By: SV,SK, Checked By: AD

Date: (2023-02-22)

Figure No: E - 1

Stantec

Legend

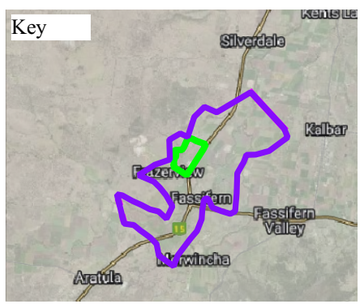
Site Boundary Cadastre **QLD Globe Imagery**

Notes:
1. Map displayed in EPSG:28356

References:
1. QLD Globe

80 0 80 160 240 320 m

Scale at A3: 1:7000



Scenic Rim Agricultural Industrial Precinct

Existing Flow Paths
Project: 304701259 Scenic Rim Agricultural Industrial Precinct

Client: Kalfresh Pty Ltd

Project Code: 304701259

Drawn By: SV,SK, Checked By: AD

Date: (2023-02-22)

Figure No: E - 2

Stantec

Legend

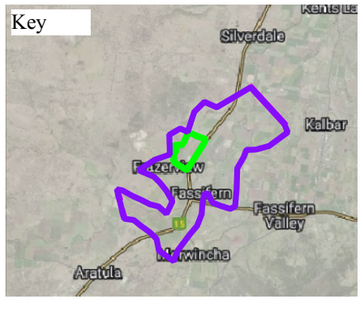
Site Boundary
Streamlines
Cadastre
QLD Globe Imagery

Notes:
1. Map displayed in EPSG:28356

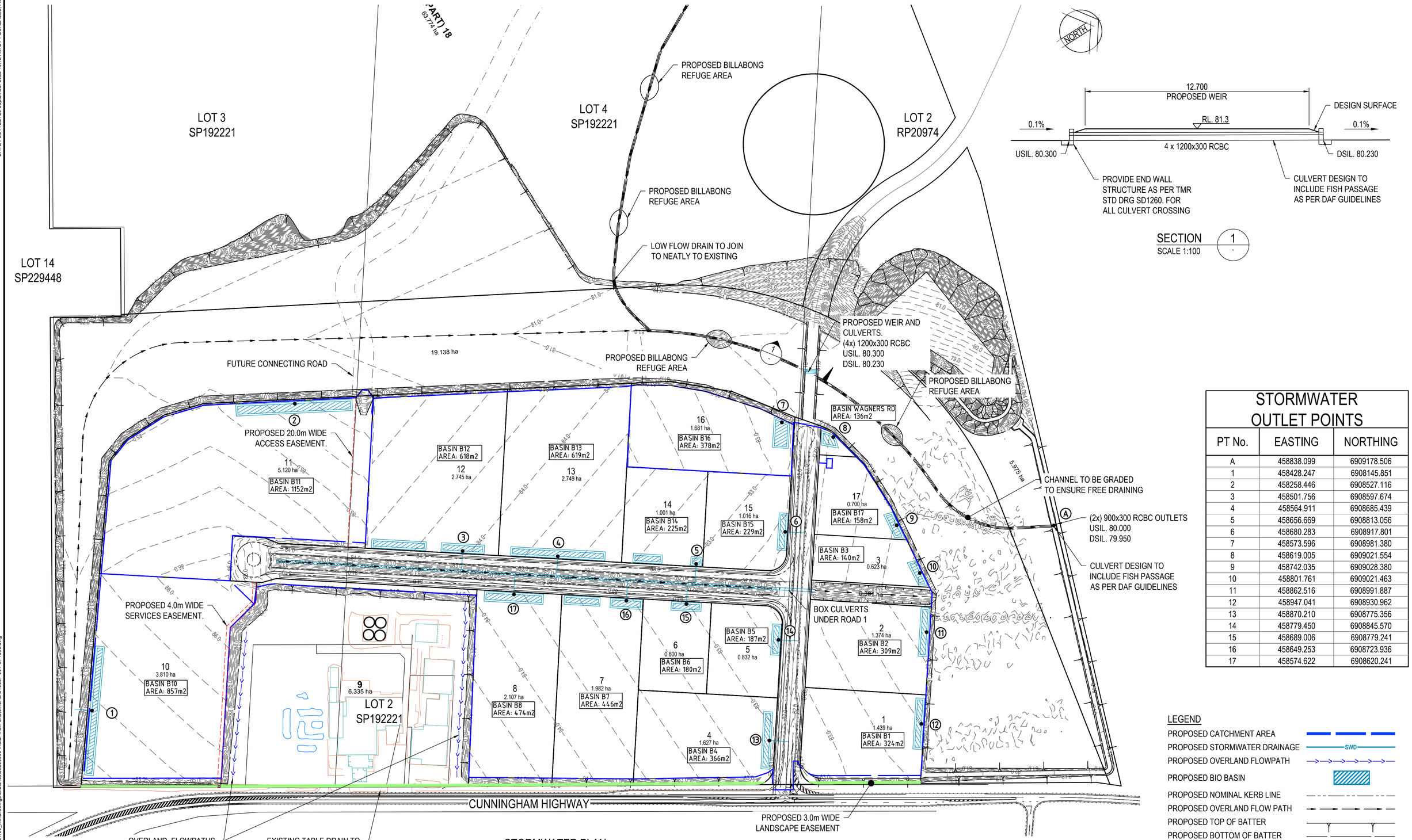
References:
1. QLD Globe

100 0 100 200 300 400 m

Scale at A3: 1:10000



Appendix E DESIGN DRAWINGS



SECTION 1
SCALE 1:100

STORMWATER OUTLET POINTS

PT No.	EASTING	NORTHING
A	458838.099	6909178.506
1	458428.247	6908145.851
2	458258.446	6908527.116
3	458501.756	6908597.674
4	458564.911	6908685.439
5	458656.669	6908813.056
6	458680.283	6908917.801
7	458573.596	6908981.380
8	458619.005	6909021.554
9	458742.035	6909028.380
10	458801.761	6909021.463
11	458862.516	6908991.887
12	458947.041	6908930.962
13	458870.210	6908775.356
14	458779.450	6908845.570
15	458689.006	6908779.241
16	458649.253	6908723.936
17	458574.622	6908620.241

LEGEND

- PROPOSED CATCHMENT AREA
- PROPOSED STORMWATER DRAINAGE (SWD)
- PROPOSED OVERLAND FLOWPATH
- PROPOSED BIO BASIN
- PROPOSED NOMINAL KERB LINE
- PROPOSED OVERLAND FLOW PATH
- PROPOSED TOP OF BATTER
- PROPOSED BOTTOM OF BATTER
- PROPOSED CONTOURS (0.25m) (36.5)

STORMWATER PLAN
SCALE 1:2000

0 1 2 4 6 8 10m
SCALE 1:100 @A1

0 50 100 150 200m
SCALE 1:2000 @A1

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KALFRESH PTY LTD

STORMWATER PLAN

DATUM	Date	Scale	Size
AHD	25/09/2023	AS SHOWN	A1

Drawing Number: 510357-001-CI-1300
Revision: 5

PROPOSED EFFLUENT IRRIGATION 2.0ha

PROPOSED V... STORAGE DAM

PROPOSED O...

Future Road Connection To Composter Lot

30.3m Wide New Road

40m Wide New Road

LOT 1

LOT 2

LOT 4

LOT 5

LOT 6

LOT 7

LOT 8

LOT 9

LOT 10

LOT 11
11
5.120 ha

LOT 12

LOT 13

LOT 14

LOT 15

LOT 16

LOT 17
17
0.700 ha

0.241 ha

0.206 ha

PROPOSED OVERLAND FLOW PATH
19.138 ha

GRAZING

(PART) 18
63.774 ha

7
M3151

6
M3151

5
CC1915

OFFICE AND CAR PARK

PRE-STORAGE 1

PRE-STORAGE 2

WASTE RECEIVAL BUILDING

DIGESTER 1

DIGESTER 2

BIOFILTER

BIOFILTER

INFRASTRUCTURE AREA

DIGESTATE STORAGE TANK

PRE-TREATMENT

FLARE

PROPOSED OFFICE

WEIGHBRIDGE

WEIGHING PLANT

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REV ID	DESCRIPTION	ISSUE DATE	ISSUED BY
01	Subdivision update	01	01

Revisions and Amendments

Kalfresh

rps

Project Name
KALFRESH MASTERPLAN

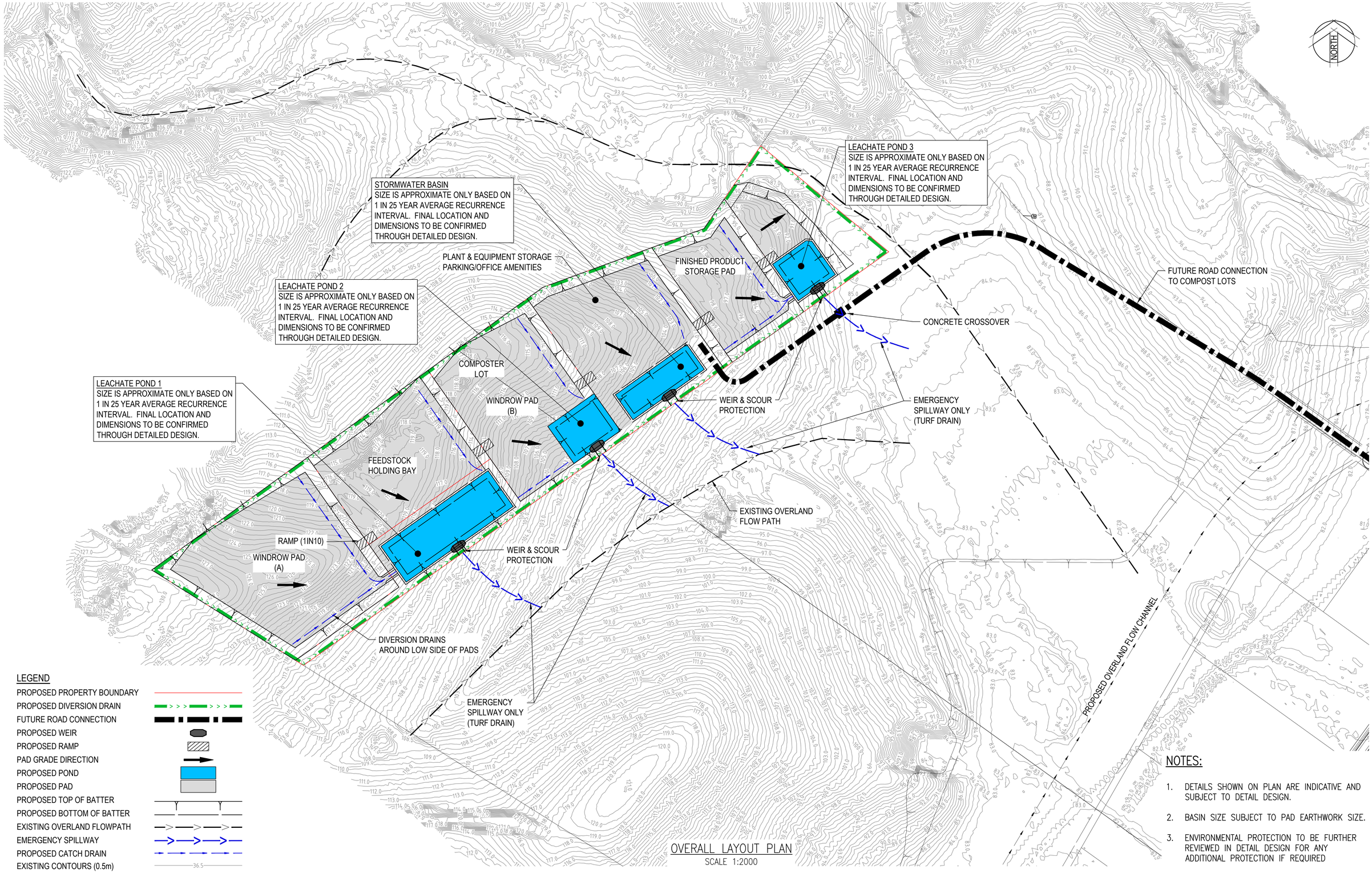
Client
#Client Full Name

Project Address
#Site Full Address

Drawing Title
SRAIP SUBDIVISION MP

MP

Coordinated by	Verified by	Scale @ A1:
RB	RB	
Project No:	**Drawing No.:**	**Revision**
875	SKA2.03	01



LEGEND

- PROPOSED PROPERTY BOUNDARY
- PROPOSED DIVERSION DRAIN
- FUTURE ROAD CONNECTION
- PROPOSED WEIR
- PROPOSED RAMP
- PAD GRADE DIRECTION
- PROPOSED POND
- PROPOSED PAD
- PROPOSED TOP OF BATTER
- PROPOSED BOTTOM OF BATTER
- EXISTING OVERLAND FLOWPATH
- EMERGENCY SPILLWAY
- PROPOSED CATCH DRAIN
- EXISTING CONTOURS (0.5m) 36.5

OVERALL LAYOUT PLAN
SCALE 1:2000

NOTES:

1. DETAILS SHOWN ON PLAN ARE INDICATIVE AND SUBJECT TO DETAIL DESIGN.
2. BASIN SIZE SUBJECT TO PAD EARTHWORK SIZE.
3. ENVIRONMENTAL PROTECTION TO BE FURTHER REVIEWED IN DETAIL DESIGN FOR ANY ADDITIONAL PROTECTION IF REQUIRED

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NOT FOR CONSTRUCTION

0 20 40 60 80 100 120 140 160m
SCALE IN METRES (1:2000 BEFORE REDUCTION)

KALFRESH PTY LTD
SCENIC RIM
AGRICULTURAL INDUSTRIAL PRECINCT

PROPOSED COMPOSTER FUNCTIONAL LAYOUT PLAN

Date	Scale	Size
26-09-2023	1:2000	A1

510357-007-SK001 (Drawing Number) — 2 (Revision)

Appendix F SPEL DEVICES PRELIMINARY DESIGN DETAILS

Model Number

Job Number

SPEL StormSack

OPERATIONS & MAINTENANCE

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SPEL ENVIRONMENTAL
INTEGRATED WATER SOLUTIONS

Manual Introduction

CHAPTER 1

Maintenance of the SPEL StormSack is essential to preservation of its condition to ensure lifetime operational effectiveness.

The SPEL StormSack is a highly engineered water quality device that is deployed directly in the stormwater system as primary treatment to capture contaminants close to the surface. To ensure full operational capacity, it is vital to ensure that the pollutants it captures are periodically removed, and filtration components are thoroughly cleaned.

Maintenance frequencies and requirements of the SPEL StormSack are dependent on the biological factors of the site in which it is situated. These factors can include excessive sediment loading or occurrence of toxic chemicals due to the natural and unnatural factors such as site erosion, chemical spills or extreme storms.

This manual has been designed by the SPEL StormSack Manufacturer the client or device owner in the maintenance of the SPEL StormSacks.

This manual should be used in conjunction with the relevant site traffic management and safety plans, as well as any other provided documentation from SPEL.

SPEL StormSack Specifications/Features

CHAPTER 2

1. General Description

The SPEL StormSack provides effective filtration of solid pollutants and debris typical of urban runoff, while utilising the existing or new storm drain infrastructure. The StormSack is designed to rest on the flanges of conventional catch basin frames and is engineered for most hydraulic and cold climate conditions.

Components:

a. Adjustable Flange and Deflector: Aluminium Alloy 6063-T6
b. Splash Guard: neoprene rubber
c. StormSack: woven polypropylene geotextile with US Mesh 20
d. Corner Filler: Aluminium Allow 5052-H32
e. Lifting Tabs: Aluminium Allow 5052-H32
f. Replaceable Oil Boom: polypropylene 3 inch (76 mm) diameter
g. Mesh Liner: HDPE, diamond configuration
h. Support Hardware: CRES 300 Series

Sizes:

STANDARD SPEL STORMSACK TO SUIT PIT SIZES

- 450x450mm
- 600x600mm
- 900x600mm
- 900x900mm

Custom sizes (i.e. 1200x900mm) can be manufactured on short lead times.

Health and Safety

CHAPTER 3

1. Personal Health & Safety

When carrying out maintenance operations of the SPEL StormSack all contractors and staff personnel must comply with all current workplace health and safety legislation.

The below measures should be adhered as practically as possible:

- Comply with all applicable laws, regulations and standards
- All those involved are informed and understand their obligations in respect of the workplace health and safety legislation.
- Ensure responsibility is accepted by all employees to practice and promote a safe and healthy work environment.

2. Personal Protective Equipment

When carrying out maintenance operations of the SPEL StormSack, wearing the appropriate personal protective equipment is vital to reducing potential hazards. Personal protective equipment in this application includes:

- Eye protection
- Safety apron
- Fluorescent safety vest
- Form of skin protection
- Puncture resistant gloves
- Steel capped safety boots

3. Maintenance of the SPEL StormSacks is a specialist activity.

When carrying out maintenance operations of the SPEL StormSack, factors such as equipment handling methods, pollutants and site circumstances can impose potential risks to the maintainer and nearby civilians.

4. Captured Pollutants

The material captured by the SPEL StormSack can be harmful and needs to be handled correctly. The nature and amount of the captured pollutants depends on the characteristics of the site. Pollutants can include from organic material such as leaves and sticks through to debris such as plastics, glass and other foreign objects such as syringes.

5. Site Circumstances

It is essential that Occupational Safety and Health guidelines and site specific safety requirements are followed at all times. It is important that all following steps specified by SPEL are carried out to ensure safety in the entire maintenance operation. The general workplace hazards associated with working outdoors also need to be taken into account.

6. Equipment Handling

Handling activities such as a removing the drain grate a well as managing pedestrians and other non-worker personnel at the site should be exercised in accordance with specified safety procedures and guidelines.

CHAPTER 3

7. Confined Spaces

Confined space entry procedures are not covered in this manual. It is requested that all personnel carrying out maintenance of the SPEL StormSack must evaluate their own needs for confined space entry and compliance with occupational health and safety regulations

When maintenance operations cannot be carried out from the surface and there is a need to enter confined space, only personnel that currently hold a Confined Space Entry Permit are allowed to enter the confined space. All appropriate safety equipment must be worn, and only trained personnel are permitted to use any required breathing apparatus gear. Necessary measures and controls must always be exercised to meet the confined space entry requirements. Non trained staff are not permitted to participle in any confined space entries.

8. Traffic Management

Typically stormwater gully pits are situated on roads and carparks, or adjacent to roads in a footpath or swale. As traffic requirements vary depending on the circumstance of the site, separate traffic control plans should be prepared for each site.

The specific road safety requirements for each site can be obtained from the relevant road authority to ensure all maintenance operations comply with the laws and regulations. State government publications can also be useful to find out the signage requirements, placement of safety cones and barricades that are required when working on public roads.

Operations

CHAPTER 4

1. General Monitoring

The SPEL Stormsack must be checked on a regular basis to analyse whether it requires maintenance or cleaning.

As gully pit grates are usually quite heavy, it is vital to exercise the correct lifting techniques and also ensure that the area surrounding the open pit is shielded from access of non-work personnel.

To ensure optimal performance of the SPEL Stormsack, the material collected by the filter bag should not exceed the level of approximately a half to two thirds of the total bag depth. When this material collected is showing signs of exceeding this level they should be scheduled to be emptied.

It is also recommended that additional monitoring is conducted following moderate to extreme rainfall events, especially when previous months have had little or no rainfall.

2. Gully Pit Cover Removal

CHAPTER 4

Opening a Hinged Pit Cover

A. Insert the lifting hooks beneath the grate

B. Check hinge points are not damaged and debris is not caught in the hinge area

C. Fully open pit grate, ensuring that the grate will stay in the open position without any external forces applied. Grates that do not remain open without being held, should be removed or secured during maintenance activities.

Opening a Non-Hinged Pit Cover

A. Place lifting hooks beneath grate, where possible in the four corners of the grate. Concrete lids may have Gatic lifting points, a key arrangement or holes in the lid, which may require special equipment such as Gatic lifters. Alternatively if safe to do so grip the grade with your hands.

B. Position each person on either side of the grate.

C. Lift the grate, ensuring that good heavy lifting posture is used at all times.

D. Place the grate on angle on the gutter, to allow for the lifting hooks to be removed.

E. For extremely heavy one-piece grates and concrete Gatic covers, insert the lifters in place and slide the lids back.

CHAPTER 4

3. Cleaning Methods

Cleaning using an inductor truck

A. Open Gully pit
B. Place the indicator hose, suck out all of the sediment, organic leaf material, litter and other materials that were collected in the filter bag
C. Allow the filter bag to be sucked up in the inductor hose for a few seconds to allow for the filter mesh pores to be cleaned.
D. Use the inductor hose to remove any build-up of material around the overflows and in the bottom of the pit.
E. Remove filter back from pit
F. Remove any sediment and litter caught in the Gully pit grate
G. Back opening channels are to be cleared of any debris to ensure flow is not hindered.
H. Thoroughly examine the structural integrity of the filter bag and frame.
I. Reinstate filter bag and gully pit covers

Hand Maintenance

A. Open Gully pit
B. Using the correct lifting technique, lift the StormSack out by the diagonal lifting corners fitted to the frame.
C. For extremely heavy and overfilled bags either use a hydraulic lifting arm to lift the StormSack, or remove excess material using a shovel or etc. Take care not to damage the bag when removing litter form the bag.
D. Lift the StormSack clear of the stormwater pit.



E. Position the StormSack over the collection bin or vehicle.
F. Lift and empty the bag by holding the bottom lifting loops only.
G. Brush the StormSack with a stiff brush to remove the sediment from the filter pores.
H. Thoroughly examine the structural integrity of the filter bag and frame.
I. Reinstate StormSack and gully pit covers.



CHAPTER 4

4. SPEL StormSack Post Maintenance Inspection

After the SPEL Stormsack has been removed, emptied and cleaned, it should be thoroughly examined to sure that:

- There is no movement or damage to the Cage
- There is no movement or damage to the plastic pit seals
- Structural integrity is in good condition including all fixings, joints and connections.
- The filter bag pores are not clogged
- The filter bag is not damaged in anyway.

The gully pit, pipe inlet/outlets and its cover should also be inspected to ensure there is no damage, debris build up or any potential to cause the SPEL StormSack to operate inefficiently.

5. Material Disposal

Collected materials can be potentially harmful to humans and the environment.

Once all captured material from the SPEL Stormsack has been removed, it must be taken off site and disposed of at a transfer station or a similar approved disposal site.

CHAPTER 4

6. SPEL StormSack Repairs

Depending on the extent of the damage to the SPEL StormSack unit, it can usually be repaired.

Small tears to the filter bag can be repaired by either sewing the tear back together with additional fabric to increase the strength of the stitching, or by sewing a patch of filter material onto the filter bag.

If large tears or irreparable damage to the frame and structure are present, it is advisable to replace the components.

All required spare parts can be sourced from SPEL Environmental at a cost to the owner of the SPEL Stormsack.

7. Emergency Procedures

Spills and blockages can be detrimental to the performance of a stormwater management system, potentially damaging the surrounding built infrastructure, waterways and environment.

Spill Procedures

In the event of a spill discharging into a gully pit, all effected sediment must be removed from the filter bags and the filter bags are to be removed and replaced with new filter bags. All additional cleaning as a result of the spill should also be carried out in accordance with the normal operation procedures.

Blockages

In the unlikely event of surface flooding around a gully pit which has a SPEL StormSack fitted, the following steps should be carried out:

A. Check the overflow bypass.

B. If overflow is clear and surface flooding still exists remove the SPEL StormSack and check the outlet pipe for blockages. Removal of the SPEL StormSack can be difficult if clogged with sediment and holding water.

C. If the filter is clogged brush the side walls to dislodge particles trapped at the interface allowing water to flow through the filter.

D. If the outlet pipe is blocked, it is likely that a gully sucker truck will be required to unblock it. Litter can be removed from the SPEL StormSack using the gully sucker truck before the SPEL StormSack is removed. If a gully sucker truck is not available and the SPEL StormSacks need to be removed by hand follow the below steps.

   i. Remove excess debris by hand or brush the side of the filter bag

   ii. Remove entire SPEL Stormsack by taking hold of the inside of the frame.

   iii. Unblock the outlet pipe

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Northern Territory	61 2 8705 0255
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SPEL ENVIRONMENTAL
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Appendix G Current Flood Model Results and Flood Hazard Overlay Code Assessment

Stantec

Memo

To:	Rebecca Collins, Project Manager, Office of the Coordinator General	From:	Zac McCosker Maroochydore
Project/File:	304701259_flood_hazard_overlay_code_response	Date:	4 September 2023

Reference: flood hazard code overlay assessment

Summary of Flooding

Readers of this summary should refer to section 7.5 of the *B.4 Integrated Water Management Plan.pdf Dated 3rd February 2023 for further details.* Since this report was provided, the flood model has been run with the TUFLOW SGS and HPC functions utilised. This has resulted in a more refined model with higher accuracy. As such mapping provided in Attachment A may show some slight differences when compared to previous reporting.

Maps of the anticipated flooding are shown in the Appendix of the *B.4 Integrated Water Management Plan* for the 10%, 5%, 2%, 1% and 1% CC AEP events. Generally consistent with the previous findings presented in the February 2023 RDAIR, minor increases to flood levels result in some areas. These increases are associated with the earthworks required to achieve the required flood immunity (1% AEP CC) of the Industry Precinct. These earthworks encroach on the flood plain extents and ultimately reduces flood storage capacity in this instance.

In the 10%,5% and 2% AEP events, increases in flood levels are localised to the north of the subject site (Attachment A), adjacent to the Cunningham Highway. The impacts are up to 60mm in magnitude and do not appear to encroach on the highway or any building footprints. Flooding adjacent to the highway has decreased in the 5% AEP event by up to 40mm. There are also decreases of up to 20mm upstream of the proposed development.

Minor impacts in the swale drains adjacent to the highway are also noted during the 2% AEP event. These increases occur in locations where the existing 2% AEP flood depth is greater than 500mm deep.

In the 1% AEP and 1% AEP CC events, increases in peak flood levels are observed directly in the area to the north of the site and are up to 80mm in magnitude. About this area, the developed case water level is approximately 4 metres below the nearest structure located at 85.2 mAHD and 5.5 metres below the nearest residence located at 86.8 mAHD. Existing flood depths at this location are in excess of 1m during the 1% AEP climate change event. This can be seen in Figure 1 below with blue representing the pre-development scenario and red representing the postdevelopment scenario. The location of the profile is shown in Figure 2. Impact maps for peak water surface and velocities is contained in Attachment A.

Reference: flood hazard code

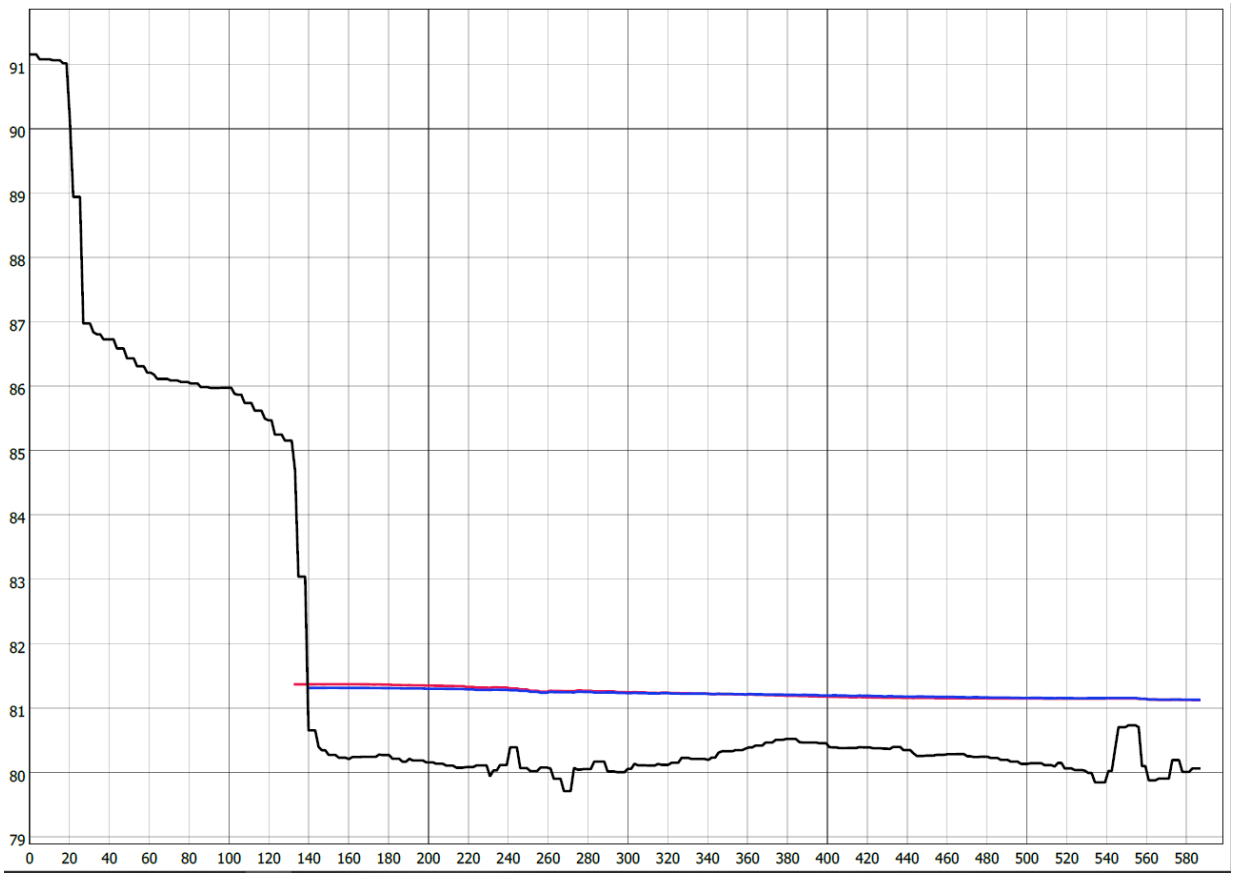


Figure 1 Surface profiles

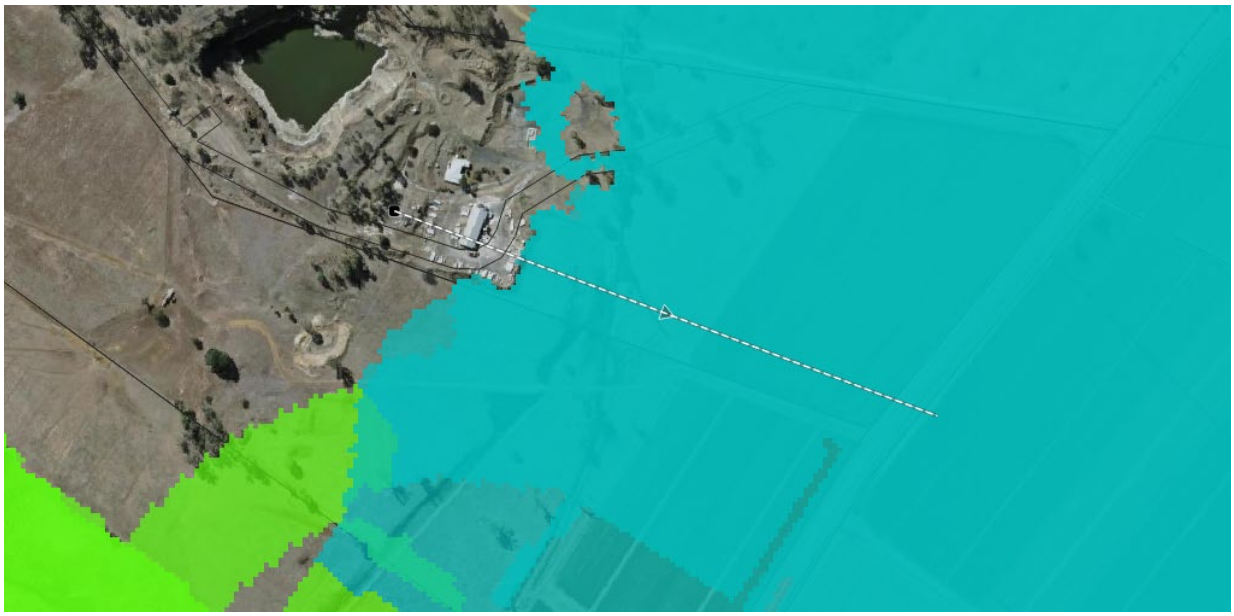


Figure 2 Profile Location

Increases shown on the east side of the highway during the 1% AEP, and 1% AEP CC event are a result of flows across the highway being restricted in the developed case. In the pre-developed case floodwater in events greater than the 5% AEP flow from East to West across the highway. This movement is restricted in the developed case due to the proposed lot filling.

During the 1% AEP CC event, peak increases shown on the Eastern side of the highway (Attachment A.17) are approximately 60 mm adjacent to the Eastern swale drain. Water depths at this location are up to 700 mm deep during the existing case events with extensive flooded areas surrounding it. No changes to flood extents are noted as a result of the increases shown. The nearest dwelling is located approximately 3m above the 1% AEP CC developed flood level, as such no loss of amenity is anticipated.

Reductions in peak flood impacts are also observed in all AEP's along the western site boundary which can be attributed to the increased storage and conveyance provided by the proposed flood channel.

Pre-Development Scenario

Maps of the peak flood levels for the pre-development scenario are shown in Appendix B of the *B.4 Integrated Water Management Plan* for the 10% to 1% CC AEP events with peak flood depths shown in Appendix C. Peak depths for the existing and developed 1% AEP CC event are also shown in Appendix A of this memo.

The existing case results show that approximately half of the proposed development area is inundated in all AEP events. Depths of up to 1 metre on the Northern portion of the site are shown in Appendix C of the *B.4 Integrated Water Management Plan*. As shown in Appendix B the majority of the Eastern portion of the site remains flood free during smaller events (10, 5% AEP) with extensive inundation during larger events. During the 1%CC event the site is completely covered. This flooding is caused by overland flow from Warrill Creek and flows from the western catchments. During flood events the water flows from the South to the North via the Western areas of the site, exiting into the existing "creek" line. In events greater than the 5% AEP floodwaters also cross the highway from East to West, onto the proposed development site.

Post Development Scenario

Maps of the peak flood levels for the post-development scenario are shown in Appendix B of the *B.4 Integrated Water Management Plan* for the Q10 to Q100CC events with peak flood depths shown in Appendix C. Appendix D confirms that topography modifications have resulted in minor changes to water surface levels.

As a result of filling and earthworks proposed, flood waters no longer encroach onto the proposed development area. Flows that previously covered the Western portion of the site are now diverted along the western boundary via the proposed overland flow path. Flows from Warrill Creek enter this drain at the South West corner of the site, discharging to the North West. Flows from the western catchments including the development footprint, discharge into the proposed overland flow path as per the stormwater strategy outlined in Section 4 of the *B.4 Integrated Water Management Plan*, and exit the site as per the existing case. Impact maps for peak water surface and velocities are contained in Attachment A figure A.1 to figure A.10.

Reference: flood hazard code

Summary - Impacts of Development at key locations

While it is acknowledged that the proposed development has minor off site impacts, these impacts are considered inconsequential due to the following points:

- There has been no change to the frequency or duration of flooding
- Impacts on neighbouring properties is confined to existing floodplains
- No buildings will be impacted
- Buildings external to the subject site maintain in excess of 3m freeboard during the developed case 1% AEP CC event
- Impact to land is confined to rural land (grazing / cropping). The area impacted will not alter the way that land is currently being used and will not constrain or restrict the use of land into the future.
- While there are increased impacts on the Highway (250 mm during 1% AEP event), during these events the highway is inundated by depths exceeding 1m

Assessment Against Flood Hazard Overlay Code

The purpose of the Flood Hazard Overlay Code is to ensure that development in a flood hazard area is compatible with the risk of the flood hazard and protects life and property. The purpose of the code is achieved through 9 overall outcomes stated in section 8.2.6.2 of the code. An assessment against the overall outcomes is provided in Table 1.

Table 1 – Summary assessment against Overall Outcomes

Overall Outcome	Response / commentary
Development that potentially increases the exposure of people and property to flood hazards: (i) avoids areas of significant flood hazard risk; or (ii) where areas of flood hazard risk cannot be practicably avoided, development is designed, located and managed to ensure the risk to people and property is mitigated to an acceptable or tolerable level, during and after a flood event;	Development is generally sited to avoid areas of high risk. Development is also designed to be flood free in events up to and including the 1% AEP CC. Development is designed and sited to ensure the risk to people and property is mitigated to an acceptable level, during and after a flood event with mitigations proposed to reduce flood flow velocities.
(b) The development siting, layout, and access responds to the risk of the flood hazard, including flood hazard category, and minimises risk to personal safety;	Development has been designed to have minimal obstruction to the existing flow paths. Personal safety has been minimised by providing the appropriate freeboard.
(c) The development is resilient to flood events by ensuring siting, design and materials stored on site accounts for the potential risks of flood hazards;	Pad level of the SRAIP Industrial Precinct is above Defined Food Events (DFE) which accounts for 1% AEP CC scenarios. Earthworks are designed to withstand expected velocities and flood levels will not affect anything stored or

	sited within the Industry Precinct. No materials will be stored within the post-development 1% AEP CC flood extent.
(d) The development supports, and does not unduly burden disaster management response or recovery capacity and capabilities;	A Flood Emergency Management Plan has been developed. It is intended that this be further refined with the Local Disaster Management Group.
(e) The development directly, indirectly and cumulatively does not materially increase the severity of the flood hazard and does not significantly increase the potential for damage on the site or to other properties;	It is considered that the proposed development is highly unlikely to significantly increase the flood hazard or potential for damage to other properties. As outlined in this memo, flood increases are shown to be minor and are not expected to materially increase severity of the existing flood hazard.
(f) The development avoids the release of hazardous materials as a result of a flood event;	Pad level of the SRAIP Industrial Precinct is above the DFE which accounts for 1% AEP CC scenarios. Flooding above this scenario is unlikely and release of contaminants in flood events is not expected to occur. Again, no materials will be stored within the post-development 1% AEP CC flood extent.
(g) Natural processes and the protective function of landforms and/or vegetation are maintained in flood hazard areas;	The development has maintained existing flow paths/streamlines and discharge points.
(h) Development in flood hazard areas supports and does not hinder disaster management capacity and capabilities;	A Flood Emergency Management Plan has been developed. It is intended that this be further refined with the LDMG.
(i) Community infrastructure is located and designed to maintain the required level of functionality during and immediately after a flood event.	The SRAIP Industrial Precinct does not propose 'community infrastructure'. Shared private infrastructure is proposed to be developed within the SRAIP Industrial Precinct including electrical generation infrastructure associated with the operation of the AD Facility, water and sewage treatment. The pad level of the SRAIP Industrial Precinct is above DFE which accounts for 1% AEP CC scenarios. Flooding above these scenarios is unlikely and therefore functionality and operations are not expected to be impacted during or immediately after regional flood events – including up to the 1% AEP CC scenarios.

Discussion on PO8 – Flood Storage

As assessed above, the primary perceived conflict with the Overlay Code relates to Overall Outcome (e) which correlates to performance outcome 8 (PO8).

"The development directly, indirectly and cumulatively avoids any increase in water flow, velocity or flood level and does not increase the potential for damage on site or on other properties."

Reference: flood hazard code

In this instance Acceptable Outcomes (AO) 08.1 – 08.4 are not able to be achieved as compensatory earthworks to balance flood storage on site is not proposed.

Instead, the development has mitigated impacts where considered most practical with several measures implemented. These include the proposed construction of a bund on the north boundary and low flow culverts to be installed across the proposed overland flow path. The proposed bund is to redistributeflows to replicate existing flow conditions while also providing some additional on-site detention.

The measures proposed to reduce off site flooding impacts include:

- Design of culverts to reduce velocities and flows
- Bund to redistribute flows and provide additional on-site detention
- Design of proposed overland flow path to achieve minimum gradient and provide additional flood storage capacity to partially compensate for the earthworks within the flood plain
- Proposed plantings of aquatic vegetation in the proposed overland flow path to reduce velocities
- Establishing the Industry Precinct at the optimum locations to avoid high hazard locations as much as practicable.

Reference: flood hazard code

Conclusion

Given the limited potential for the development to induce significant off-site impacts in its current form, balancing on site flood storage is considered impracticable due to the following points;

- All reported impacts occur in areas where regional flooding events already occur.
- Impacts occur where existing flood depths in these events are more than 700mm.
- Limited development potential on balance of floodplain as it is inundated to depths exceeding 2m.
- Additional earthworks required to balance flood storage will be substantial.
- Additional environmental impacts associated with additional clearing required for earthworks.
- Financial implications of additional earthworks

As discussed previously, the current impacts of the development with a deficit in flood storage are considered inconsequential. Therefore, the ecological, financial and time impacts of providing flood storage which will provide little benefit are not considered practicable in this instance.

Regards,

STANTEC AUSTRALIA PTY LTD

Zac McCosker B Eng
Team Leader, Water Resources
Phone: +61 7 31002187
zac.mccosker@stantec.com

Reference: flood hazard code

ATTACHMENT A UPDATED FLOOD IMPACTS

D015 - E012 10% AEP Impact (WSL)

Project: Kalfresh Precinct
Project Code: 304701259

Drawn By: AL, Checked By: ZM
Date: (2023-09-05)

Figure No: A.1

Stantec

Legend

- Site_Boundary
- Model_Extent
- Cadastre

D015-E012_10Y_Impact_h
Band 1 (Gray)

- Area with Improved Flood Level
- -0.02 - 0.02 m
- 0.02 - 0.02 m
- 0.02 - 0.05 m
- 0.05 - 0.15 m
- 0.15 - 0.25 m
- Greater than 0.25 m

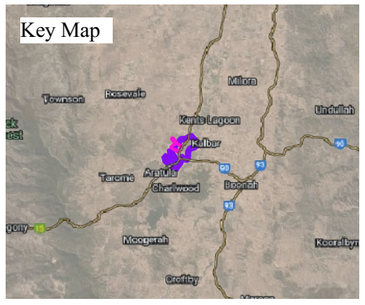
QLD Globe Imagery

Notes:
1. Map displayed in EPSG:28356

References:
1. QLD Globe Imagery

Results Layer:
1. D015-E012_10Y_Impact_h

0 200 400 600 800 m



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D015 - E012 5% AEP Impact (WSL)

Project: Kalfresh Precinct
Project Code: 304701259

Drawn By: AL, Checked By: ZM
Date: (2023-09-05)

Figure No: A.2

Stantec

Legend

- Site_Boundary
- Model_Extent
- Cadastre

D015-E012_20Y_Impact_h
Band 1 (Gray)
- Area with Improved Flood Level
- -0.02 - 0.02 m
- 0.02 - 0.02 m
- 0.02 - 0.05 m
- 0.05 - 0.15 m
- 0.15 - 0.25 m
- Greater than 0.25 m

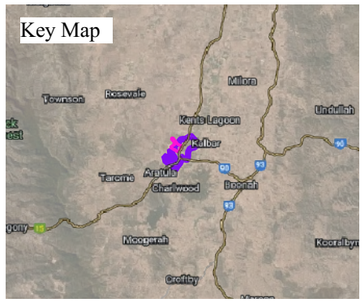
QLD Globe Imagery

Notes:
1. Map displayed in EPSG:28356

References:
1. QLD Globe Imagery

Results Layer:
1. D015-E012_20Y_Impact_h

0 200 400 600 800 m



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D015 - E012 2%AEP Impact (WSL)

Project: Kalfresh Precinct
Project Code: 304701259

Drawn By: AL, Checked By: ZM
Date: (2023-09-05)

Figure No: A.3

Stantec

Legend

- Site_Boundary
- Model_Extent
- Cadastre

D015-E012_50Y_Impact_h
Band 1 (Gray)
- Area with Improved Flood Level
- -0.02 - 0.02 m
- 0.02 - 0.02 m
- 0.02 - 0.05 m
- 0.05 - 0.15 m
- 0.15 - 0.25 m
- Greater than 0.25 m

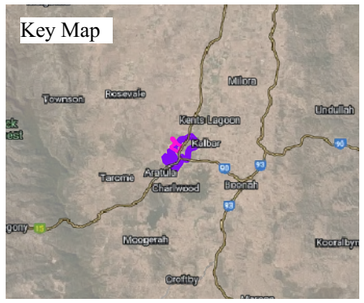
QLD Globe Imagery

Notes:
1. Map displayed in EPSG:28356

References:
1. QLD Globe Imagery

Results Layer:
1. D015-E012_50Y_Impact_h

0 200 400 600 800 m



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D015 - E012 1% AEP Impact (WSL)

Project: Kalfresh Precinct
Project Code: 304701259

Drawn By: AL, Checked By: ZM
Date: (2023-09-05)

Figure No: A.4

Stantec

Legend

- Site_Boundary
- Model_Extent
- Cadastre

D015-E012_100Y_Impact_h
Band 1 (Gray)
- Area with Improved Flood Level
- -0.02 - 0.02 m
- 0.02 - 0.02 m
- 0.02 - 0.05 m
- 0.05 - 0.15 m
- 0.15 - 0.25 m
- Greater than 0.25 m

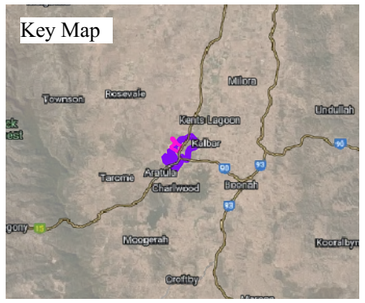
QLD Globe Imagery

Notes:
1. Map displayed in EPSG:28356

References:
1. QLD Globe Imagery

Results Layer:
1. D015-E012_100Y_Impact_h

0 200 400 600 800 m



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D015 - E012 1% AEP CC Impact (WSL)

Project: Kalfresh Precinct
Project Code: 304701259

Drawn By: AL, Checked By: ZM
Date: (2023-09-05)

Figure No: A.5

Stantec

Legend

- Site_Boundary
- Model_Extent
- Cadastre

D015-E012_100YCC_Impact_h
Band 1 (Gray)
- Area with Improved Flood Level
- -0.02 - 0.02 m
- 0.02 - 0.02 m
- 0.02 - 0.05 m
- 0.05 - 0.15 m
- 0.15 - 0.25 m
- Greater than 0.25 m

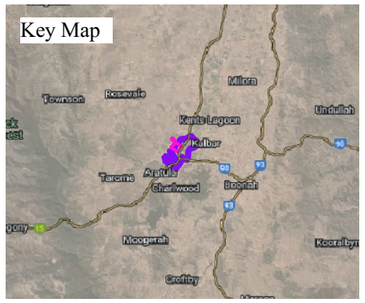
QLD Globe Imagery

Notes:
1. Map displayed in EPSG:28356

References:
1. QLD Globe Imagery

Results Layer:
1. D015-E012_100YCC_Impact_h

0 200 400 600 800 m



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D015 - E012 10% AEP Impact (Velocity)

Project: Kalfresh Precinct
Project Code: 304701259

Drawn By: AL, Checked By: ZM
Date: (2023-09-05)

Figure No: A.6

Stantec

Legend

- Site_Boundary
- Model_Extent
- Cadastre

D015-E012_10Y_Impact_V
Band 1 (Gray)

- <= -0.50 m/s
- -0.50 - -0.10 m/s
- -0.10 - 0.10 m/s
- 0.10 - 0.50 m/s
- 0.50 - 1.00 m/s
- 1.00 - 1.50 m/s
- > 1.50 m/s

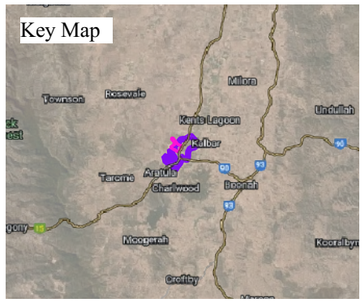
QLD Globe Imagery

Notes:
1. Map displayed in EPSG:28356

References:
1. QLD Globe Imagery

Results Layer:
1. D015-E012_10Y_Impact_V

0 200 400 600 800 m



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D015 - E012 5% AEP Impact (Velocity)

Project: Kalfresh Precinct
Project Code: 304701259

Drawn By: AL, Checked By: ZM
Date: (2023-09-05)

Figure No: A.7

Stantec

Legend

- Site_Boundary
- Model_Extent
- Cadastre

D015-E012_20Y_Impact_V
Band 1 (Gray)

- <= -0.50 m/s
- -0.50 - -0.10 m/s
- -0.10 - 0.10 m/s
- 0.10 - 0.50 m/s
- 0.50 - 1.00 m/s
- 1.00 - 1.50 m/s
- > 1.50 m/s

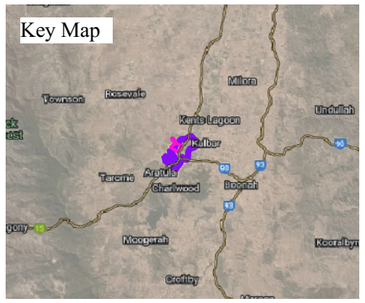
QLD Globe Imagery

Notes:
1. Map displayed in EPSG:28356

References:
1. QLD Globe Imagery

Results Layer:
1. D015-E012_20Y_Impact_V

0 200 400 600 800 m



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D015 - E012 2%AEP Impact (Velocity)

Project: Kalfresh Precinct
Project Code: 304701259

Drawn By: AL, Checked By: ZM
Date: (2023-09-05)

Figure No: A.8

Stantec

Legend

- Site_Boundary
- Model_Extent
- Cadastre

D015-E012_50Y_Impact_V
Band 1 (Gray)

- <= -0.50 m/s
- -0.50 - -0.10 m/s
- -0.10 - 0.10 m/s
- 0.10 - 0.50 m/s
- 0.50 - 1.00 m/s
- 1.00 - 1.50 m/s
- > 1.50 m/s

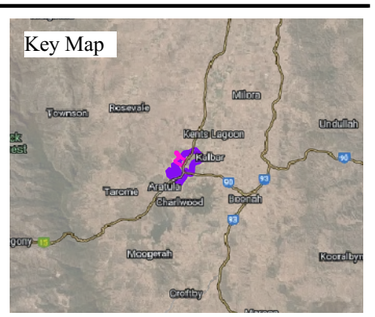
QLD Globe Imagery

Notes:
1. Map displayed in EPSG:28356

References:
1. QLD Globe Imagery

Results Layer:
1. D015-E012_50Y_Impact_V

0 200 400 600 800 m



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D015 - E012 1% AEP Impact (Velocity)

Project: Kalfresh Precinct
Project Code: 304701259

Drawn By: AL, Checked By: ZM
Date: (2023-09-05)

Figure No: A.9

Stantec

Legend

- Site_Boundary
- Model_Extent
- Cadastre

D015-E012_100Y_Impact_V
Band 1 (Gray)

- <= -0.50 m/s
- -0.50 - -0.10 m/s
- -0.10 - 0.10 m/s
- 0.10 - 0.50 m/s
- 0.50 - 1.00 m/s
- 1.00 - 1.50 m/s
- > 1.50 m/s

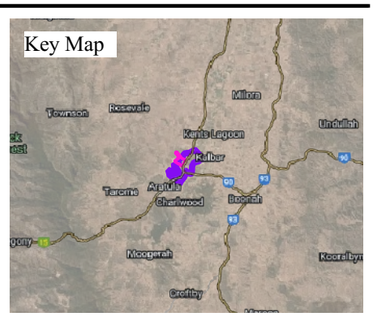
QLD Globe Imagery

Notes:
1. Map displayed in EPSG:28356

References:
1. QLD Globe Imagery

Results Layer:
1. D015-E012_100Y_Impact_V

0 200 400 600 800 m



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D015 - E012 1% AEP CC Impact (Velocity)

Project: Kalfresh Precinct
Project Code: 304701259

Drawn By: AL, Checked By: ZM
Date: (2023-09-05)

Figure No: A.10

Stantec

Legend

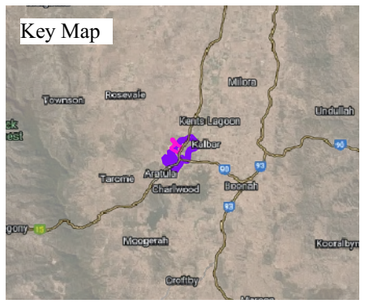
- Site_Boundary
- Model_Extent
- Cadastre
- D015-E012_100YCC_Impact_V
  - Band 1 (Gray)
  - <= -0.50 m/s
  - -0.50 - -0.10 m/s
  - -0.10 - 0.10 m/s
  - 0.10 - 0.50 m/s
  - 0.50 - 1.00 m/s
  - 1.00 - 1.50 m/s
  - > 1.50 m/s
- QLD Globe Imagery

Notes:
1. Map displayed in EPSG:28356

References:
1. QLD Globe Imagery

Results Layer:
1. D015-E012_100YCC_Impact_V

0 200 400 600 800 m



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E012 1% AEP CC Depth

Project: Kalfresh Precinct
Project Code: 304701259

Drawn By: AL, Checked By: ZM
Date: (2023-09-05)

Figure No: A.11

Stantec

Legend

- Site_Boundary
- Model_Extent
- Cadastre

Kalfresh_E012_100YCC_Max_Max_d
Band 1 (Gray)

- <= 0.10 m
- 0.10 - 0.30 m
- 0.30 - 0.50 m
- 0.50 - 1.00 m
- 1.00 - 1.50 m
- 1.50 - 2.00 m
- > 2.00 m

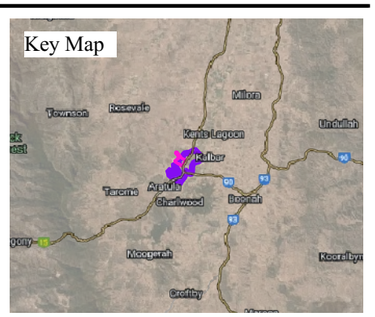
QLD Globe Imagery

Notes:
1. Map displayed in EPSG:28356

References:
1. QLD Globe Imagery

Results Layer:
1. Kalfresh_E012_100YCC_Max_Max_d

0 200 400 600 800 m



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D015 1% AEP CC Depth

Project: Kalfresh Precinct
Project Code: 304701259

Drawn By: AL, Checked By: ZM
Date: (2023-09-05)

Figure No: A.12

Stantec

Legend

Site_Boundary
Model_Extent
Cadastre

Kalfresh_D015_100YCC_Max_Max_d
Band 1 (Gray)
<= 0.10 m
0.10 - 0.30 m
0.30 - 0.50 m
0.50 - 1.00 m
1.00 - 1.50 m
1.50 - 2.00 m
> 2.00 m

QLD Globe Imagery

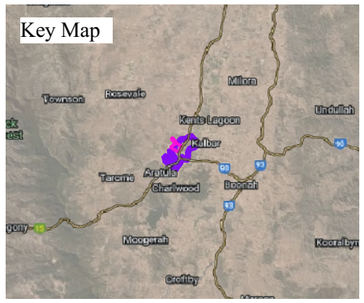
Notes:
1. Map displayed in EPSG:28356

References:
1. QLD Globe Imagery

Results Layer:
1. Kalfresh_D015_100YCC_Max_Max_d

0 200 400 600 800 m

Key Map



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D015 - E012 10% AEP Impact (WSL)

Project: Kalfresh Precinct
Project Code: 304701259

Drawn By: AL, Checked By: ZM
Date: (2023-09-05)

Figure No: A.13

Stantec

Legend

- Site_Boundary
- Model_Extent
- Cadastre

D015-E012_10Y_Impact_h
Band 1 (Gray)

- Area with Improved Flood Level
- -0.02 - 0.02 m
- 0.02 - 0.02 m
- 0.02 - 0.05 m
- 0.05 - 0.15 m
- 0.15 - 0.25 m
- Greater than 0.25 m

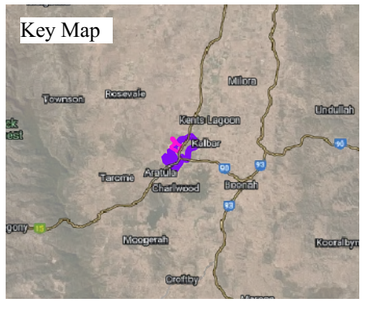
QLD Globe Imagery

Notes:
1. Map displayed in EPSG:28356

References:
1. QLD Globe Imagery

Results Layer:
1. D015-E012_10Y_Impact_h

0 100 200 300 400 m



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D015 - E012 5% AEP Impact (WSL)

Project: Kalfresh Precinct
Project Code: 304701259

Drawn By: AL, Checked By: ZM
Date: (2023-09-05)

Figure No: A.14

Stantec

Legend

- Site_Boundary
- Model_Extent
- Cadastre

D015-E012_20Y_Impact_h
Band 1 (Gray)
- Area with Improved Flood Level
- -0.02 - 0.02 m
- 0.02 - 0.02 m
- 0.02 - 0.05 m
- 0.05 - 0.15 m
- 0.15 - 0.25 m
- Greater than 0.25 m

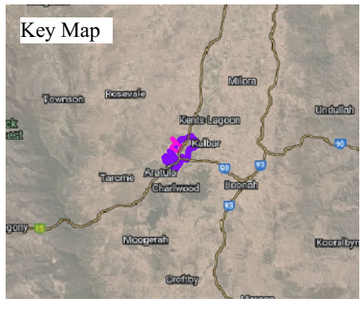
QLD Globe Imagery

Notes:
1. Map displayed in EPSG:28356

References:
1. QLD Globe Imagery

Results Layer:
1. D015-E012_20Y_Impact_h

0 100 200 300 400 m



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D015 - E012 2%AEP Impact (WSL)

Project: Kalfresh Precinct
Project Code: 304701259

Drawn By: AL, Checked By: ZM
Date: (2023-09-05)

Figure No: A.15

Stantec

Legend

- Site_Boundary
- Model_Extent
- Cadastre

D015-E012_50Y_Impact_h
Band 1 (Gray)

- Area with Improved Flood Level
- -0.02 - 0.02 m
- 0.02 - 0.02 m
- 0.02 - 0.05 m
- 0.05 - 0.15 m
- 0.15 - 0.25 m
- Greater than 0.25 m

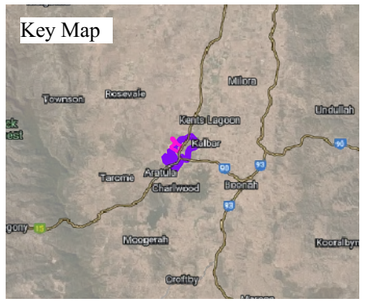
QLD Globe Imagery

Notes:
1. Map displayed in EPSG:28356

References:
1. QLD Globe Imagery

Results Layer:
1. D015-E012_50Y_Impact_h

0 100 200 300 400 m



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D015 - E012 1% AEP Impact (WSL)

Project: Kalfresh Precinct
Project Code: 304701259

Drawn By: AL, Checked By: ZM
Date: (2023-09-05)

Figure No: A.16

Stantec

Legend

- Site_Boundary
- Model_Extent
- Cadastre

D015-E012_100Y_Impact_h
Band 1 (Gray)
- Area with Improved Flood Level
- -0.02 - 0.02 m
- 0.02 - 0.02 m
- 0.02 - 0.05 m
- 0.05 - 0.15 m
- 0.15 - 0.25 m
- Greater than 0.25 m

QLD Globe Imagery

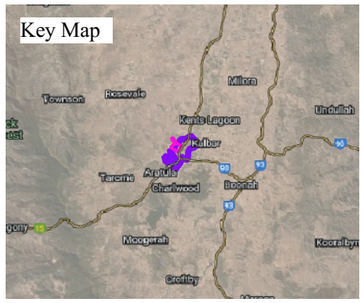
Notes:
1. Map displayed in EPSG:28356

References:
1. QLD Globe Imagery

Results Layer:
1. D015-E012_100Y_Impact_h

0 100 200 300 400 m

Key Map



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D015 - E012 1% AEP CC Impact (WSL)

Project: Kalfresh Precinct
Project Code: 304701259

Drawn By: AL, Checked By: ZM
Date: (2023-09-05)

Figure No: A.17

Stantec

Legend

- Site_Boundary
- Model_Extent
- Cadastre

D015-E012_100YCC_Impact_h
Band 1 (Gray)
- Area with Improved Flood Level
- -0.02 - 0.02 m
- 0.02 - 0.02 m
- 0.02 - 0.05 m
- 0.05 - 0.15 m
- 0.15 - 0.25 m
- Greater than 0.25 m

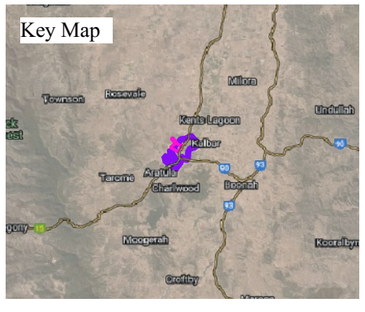
QLD Globe Imagery

Notes:
1. Map displayed in EPSG:28356

References:
1. QLD Globe Imagery

Results Layer:
1. D015-E012_100YCC_Impact_h

0 100 200 300 400 m



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D015 - E012 10% AEP Impact (Velocity)

Project: Kalfresh Precinct
Project Code: 304701259

Drawn By: AL, Checked By: ZM
Date: (2023-09-05)

Figure No: A.18

Stantec

Legend

- Site_Boundary
- Model_Extent
- Cadastre

D015-E012_10Y_Impact_V
Band 1 (Gray)

- <= -0.50 m/s
- -0.50 - -0.10 m/s
- -0.10 - 0.10 m/s
- 0.10 - 0.50 m/s
- 0.50 - 1.00 m/s
- 1.00 - 1.50 m/s
- > 1.50 m/s

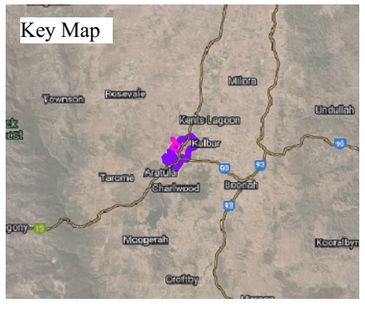
QLD Globe Imagery

Notes:
1. Map displayed in EPSG:28356

References:
1. QLD Globe Imagery

Results Layer:
1. D015-E012_10Y_Impact_V

0 100 200 300 400 m



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D015 - E012 5% AEP Impact (Velocity)

Project: Kalfresh Precinct
Project Code: 304701259

Drawn By: AL, Checked By: ZM
Date: (2023-09-05)

Figure No: A.19

Stantec

Legend

- Site_Boundary
- Model_Extent
- Cadastre

D015-E012_20Y_Impact_V
Band 1 (Gray)

- <= -0.50 m/s
- -0.50 - -0.10 m/s
- -0.10 - 0.10 m/s
- 0.10 - 0.50 m/s
- 0.50 - 1.00 m/s
- 1.00 - 1.50 m/s
- > 1.50 m/s

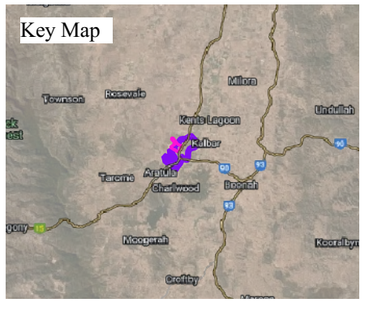
QLD Globe Imagery

Notes:
1. Map displayed in EPSG:28356

References:
1. QLD Globe Imagery

Results Layer:
1. D015-E012_20Y_Impact_V

0 100 200 300 400 m



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D015 - E012 2%AEP Impact (Velocity)

Project: Kalfresh Precinct
Project Code: 304701259

Drawn By: AL, Checked By: ZM
Date: (2023-09-05)

Figure No: A.20

Stantec

Legend

- Site_Boundary
- Model_Extent
- Cadastre

D015-E012_50Y_Impact_V
Band 1 (Gray)

- <= -0.50 m/s
- -0.50 - -0.10 m/s
- -0.10 - 0.10 m/s
- 0.10 - 0.50 m/s
- 0.50 - 1.00 m/s
- 1.00 - 1.50 m/s
- > 1.50 m/s

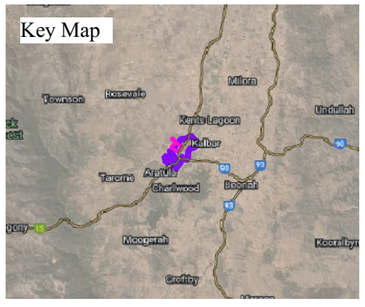
QLD Globe Imagery

Notes:
1. Map displayed in EPSG:28356

References:
1. QLD Globe Imagery

Results Layer:
1. D015-E012_50Y_Impact_V

0 100 200 300 400 m



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D015 - E012 1% AEP Impact (Velocity)

Project: Kalfresh Precinct
Project Code: 304701259

Drawn By: AL, Checked By: ZM
Date: (2023-09-05)

Figure No: A.21

Stantec

Legend

- Site_Boundary
- Model_Extent
- Cadastre

D015-E012_100Y_Impact_V
Band 1 (Gray)

- <= -0.50 m/s
- -0.50 - -0.10 m/s
- -0.10 - 0.10 m/s
- 0.10 - 0.50 m/s
- 0.50 - 1.00 m/s
- 1.00 - 1.50 m/s
- > 1.50 m/s

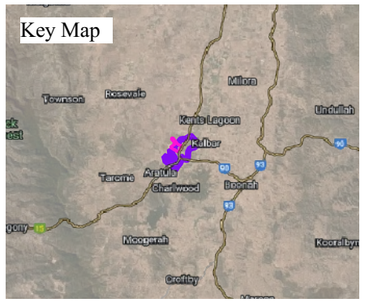
QLD Globe Imagery

Notes:
1. Map displayed in EPSG:28356

References:
1. QLD Globe Imagery

Results Layer:
1. D015-E012_100Y_Impact_V

0 100 200 300 400 m



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D015 - E012 1% AEP CC Impact (Velocity)

Project: Kalfresh Precinct
Project Code: 304701259

Drawn By: AL, Checked By: ZM
Date: (2023-09-05)

Figure No: A.22

Stantec

Legend

Site_Boundary
Model_Extent
Cadastre

D015-E012_100YCC_Impact_V
Band 1 (Gray)
<= -0.50 m/s
-0.50 - -0.10 m/s
-0.10 - 0.10 m/s
0.10 - 0.50 m/s
0.50 - 1.00 m/s
1.00 - 1.50 m/s
> 1.50 m/s

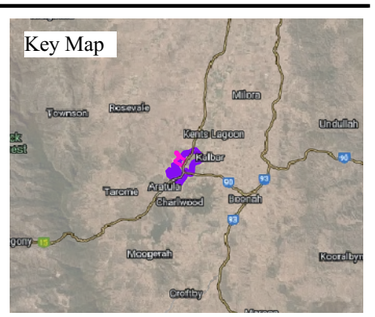
QLD Globe Imagery

Notes:
1. Map displayed in EPSG:28356

References:
1. QLD Globe Imagery

Results Layer:
1. D015-E012_100YCC_Impact_V

0 100 200 300 400 m



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E012 1% AEP CC Depth

Project: Kalfresh Precinct
Project Code: 304701259

Drawn By: AL, Checked By: ZM
Date: (2023-09-05)

Figure No: A.23

Stantec

Legend

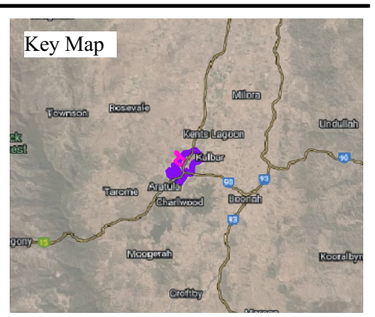
- Site_Boundary
- Model_Extent
- Cadastre
- Kalfresh_E012_100YCC_Max_Max_d
  - Band 1 (Gray)
  - <= 0.10 m
  - 0.10 - 0.30 m
  - 0.30 - 0.50 m
  - 0.50 - 1.00 m
  - 1.00 - 1.50 m
  - 1.50 - 2.00 m
  - > 2.00 m
- QLD Globe Imagery

Notes:
1. Map displayed in EPSG:28356

References:
1. QLD Globe Imagery

Results Layer:
1. Kalfresh_E012_100YCC_Max_Max_d

0 100 200 300 400 m



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D015 1% AEP CC Depth

Project: Kalfresh Precinct
Project Code: 304701259

Drawn By: AL, Checked By: ZM
Date: (2023-09-05)

Figure No: A.24

Stantec

Legend

- Site_Boundary
- Model_Extent
- Cadastre

Kalfresh_D015_100YCC_Max_Max_d
Band 1 (Gray)

- <= 0.10 m
- 0.10 - 0.30 m
- 0.30 - 0.50 m
- 0.50 - 1.00 m
- 1.00 - 1.50 m
- 1.50 - 2.00 m
- > 2.00 m

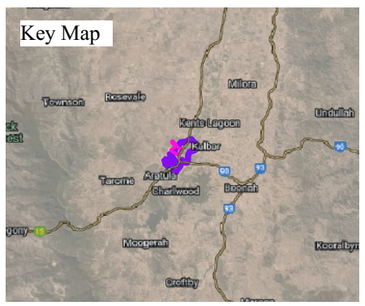
QLD Globe Imagery

Notes:
1. Map displayed in EPSG:28356

References:
1. QLD Globe Imagery

Results Layer:
1. Kalfresh_D015_100YCC_Max_Max_d

0 100 200 300 400 m



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Design with
community in mind

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