Albany Motorsport Park – Development Application

Water Management Plan

City of Albany

16 August 2021

→ The Power of Commitment

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Abbreviations

Term	Definition
AHD	Australian Height Datum
AMP	Albany Motorsport Park
AMV Inc.	Albany Motorsport Venue Incorporated
ASS	Acid Sulfate Soil
ATV	All-terrain vehicle
BGL	Below ground level
BMP	Best management practices
BoM	Bureau of Meteorology
CAMS	Confederation of Australian Motor Sport Limited
CEMP	Construction Environmental Management Plan
CEO	Chief Executive Officer
CoA	City of Albany
DPIRD	Department of Primary Industries and Regional Development
DPLH	Department of Planning, Lands and Heritage
DWER	Department of Water and Environmental Regulation
EMP	Environmental Management Plan
ESA	Environmentally Sensitive Areas
FIA	Federation Internationale de l ’Automobile
FIM	Federation Internationale Motocyclisme
GIS	Geographic information system
GoWA	Government of Western Australia
GSMG	Great Southern Motorplex Group Inc.
JDAP	Joint Development Assessment Panel
LGA	Local Government Area
LWMS	Local Water Management Strategy
LGSTWSS	Lower Great Southern Towns Water Supply Scheme
MA	Motorcycling Australia
PDWSA	Public drinking water source area
RIWI Act	*Rights in Water and Irrigation Act 1914*
SMP	Stormwater Management Plan
TN	Total Nitrogen
TP	Total Phosphorus
WQPN	Water quality protection note
WSUD	Water sensitive urban design
4WD	Four-wheel drive

1. Introduction

1.1 Project description

The City of Albany (CoA) has engaged GHD Pty Ltd (GHD) to prepare an Application for Planning Approval for the staged construction of the Albany Motorsport Park (AMP) at Lot 5780 (No. 54) Down Road South, Drome (the Site) (Figure 1, Appendix A). The project Proponent is the Great Southern Motorplex Group Inc. (GSMG).

At full development, the proposed AMP will consist of:

– Sealed, configurable multi-use track (3.5 km long × 12 m wide) for motor car racing, motorcycle racing, drifting, driver training and cycling:
  - Designed to comply with Motorsport Australia *Track Operator's Safety Guide*[1] and Motorcycling Australia (MA) *Track Guidelines*[2].
  - To be licensed by Motorsport Australia for Fédération Internationalé de l'Automobile (FIA) Grade 2 and Fédération Internationalé Motocyclisme (FIM) Grade B (i.e. up to second-tier international motor racing).
– A motocross circuit designed and constructed in association with MA guidelines.
– An off-road four wheel drive (4WD) and all-terrain vehicle (ATV) training area.
– Associated buildings and infrastructure.

Due to the scale and nature of the complex, the works have been broken down into two key stages which comprise of the following:

– Stage 1 (this Development Application):
  - Stage 1A: Construction of motocross track, 4WD driver training area, all-terrain vehicle (ATV) area and associated infrastructure.
  - Stage 1B: Construction of racetrack and associated infrastructure (subject to funding).
– Future Development: Construction and replacement of final permanent structures to support the function of the motorsports complex (subject to funding). Stage 2 will be addressed as a separate Development Application.

A Master Plan, which illustrates the various aspects of the Site and staging areas, has been developed by the GSMG and CoA to support the Development Application for the AMP (Figure 2,Appendix A).

Once operational the AMP will be operated by Albany Motorsport Venue Incorporated (AMV Inc.).

1.2 Site location

Lot 5780 Down Road South, Drome is located approximately 20 km to the north of the Albany CBD and is 192.34 ha in size. The AMP comprises 141.7 ha (including 0.2 ha for crossovers) in the eastern portion of the Site. Two areas within Lot 5780 are excluded from the AMP development and include 49.47 ha at the western end of the Site which is covered with native vegetation and a dam area (1.37 ha) on the northern boundary which is subleased to Plantation Energy.

The site is zoned 'Special Use – SU26' under City of Albany Local Planning Scheme No. 1.

The Site is bounded by Down Road West to the north, Down Road South to the east, Lot 5781 Down Road South to the south (privately owned) and a local road reserve and the Avon-Albany rail reserve to the west. The Site is located adjacent to the Mirambeena Timber Processing Precinct and sits within the industrial buffer area.

[1] CAMS. (2012). *Track Operator's Safety Guide*. Malvern East: Confederation of Australian Motor Sports.
[2] MA. (2011). *Track Guidelines*. South Melbourne: Motorcycling Australia.

1.3 Purpose of this report

This Water Management Plan (WMP) has been prepared to support the Application for Planning Approval. The WMP identifies the principles, criteria and water management strategies to manage water across the Site during construction and operational phases.

1.4 Albany Motorsport Park design

1.4.1 Events and usage

For the purposes of sizing facilities and infrastructure GSMG have provided conceptual usage of the AMP, with an assumed typical /frequent site attendance of 300 persons for the Motocross Precinct and 500 persons for the Race Track Precinct (i.e. competitors + officials + spectators). This was determined through discussion with the GSMG on the nature and size of expected typical events. For special events that anticipate a greater number of site attendees, additional water servicing management measures will need to be implemented (e.g. drinking water carts, port-a-loos).

1.4.2 Elements of AMP design

Key elements of the track design and consideration for Water Sensitive Urban Design (WSUD) are summarised in Table 1.

Table 1 Key AMP design elements and WSUD considerations

Track element	Description	WSUD considerations
AMP facilities	Includes the following: – Facility buildings (clubrooms, first aid, toilets, storage sheds) – Carpark (competitor and spectator) – Pit and garage areas – Refueling area	Considered impervious areas contributing surface runoff. To be protected from flood events. Pit and garage areas and refueling areas are key water quality treatment areas.
Access roads	Entry and exit roads consisting of 7 m wide gravel road, with 2 m wide grassed verges either side.	Road and verge have limited permeability.
Overflow parking	Grassed overflow parking	Considered pervious.
Race Track pavement	The Race Track pavement consists of 12 m wide track.	Considered impervious areas contributing surface runoff.
Race Track verge	The Race Track verge is predominantly grass and gravel with limited asphalt on T11.(recovery area)	Gravel verge is considered permeable.
Run-off areas	Run-off areas occur around the Race Track to enable drivers to dissipate speed during a race. Run-off areas are composed of loose gravel underlain by compacted pavement material.	Pavement layer underneath is considered impervious.
Motocross Track	Compacted clay and sand Motocross track.	Limited permeability.
4WD Driver Training and ATV Precinct	4WD and ATV area comprises finished natural surface after removal of some gravel, sand and clay to build the Motocross track.	Limited permeability.

1.5 Previous studies

Numerous studies and investigations have been undertaken to support development planning for the Albany Motorsports Complex. A summary of key documents of relevance to integrated water management of the Site is provided below:

- **Pavement Investigation Report 4212/1 Albany Motorsport Park Development** (Great Southern Geotechics , 2021)
  - A geotechnical investigation was completed for the proposed Albany Motorsport Park Development including assessment of soil types and profiles, characteristics of selected soil samples and completion of in-situ permeability testing at selected locations.
- **Albany Motorsport Park Local Water Management Strategy** (GHD, 2021)
  - A Local Water Management Strategy (LWMS) was prepared (as part of the Scheme Amendment) that identified the key water management principles, design criteria, and strategies for the proposed development of the Albany Motorsport Park. The water management strategies in the LWMS were developed with reference to the concept track design and with regard to the site characteristics.
- **Albany Motorsport Park Site Feasibility Study – Lot 5780 Down Road South, Drome** (GHD, 2018)
  - A site feasibility assessment was completed as part of preliminary planning investigations for the proposed Albany Motorsport Park. The feasibility assessment included a range of desktop technical investigations including review of servicing requirements and traffic impact assessment, and desktop geotechnical, hydrogeological, noise and water management planning. The feasibility assessment further included a preliminary risk assessment of the key issues identified and identified a suite of recommended remedial actions based on a hierarchy of controls. A number of recommended remedial and control actions were outlined to provide guidance for the various stages of the development.
- **Albany hinterland prospective groundwater resources map; Explanatory notes** (DWER, 2017)
  - Hydrogeological report and map for the Albany hinterland developed by the Department of Water and Environmental Regulation (DWER) as part of the Royalties for Regions South Coast Groundwater Investigation project. The Albany hinterland area in the South Coast is known as an important resource for water supply in the Great Southern region. In 2013, DWER undertook some hydrogeological (surface water and groundwater) investigations (as part of South Coast groundwater investigation by Western Australian Government on groundwater availability) and mapped prospective groundwater resources in the Albany hinterland region in order to support regional developments.
  - The report and map were used to develop a conceptual hydrogeological model for the Site as part of the LWMS, in order to understand the groundwater and surface water sources and pathways.
- **Motorplex Development, Down Road Surface and Groundwater Monitoring 2018 Summary Report** (Bio Diverse Solutions, 2018)
  - Summary reporting of shallow groundwater monitoring bore monitoring program. Monitoring of shallow groundwater bores installed across the Site commenced in February 2018. The 2018 report summarises preliminary results for the 2018 monitoring period, with additional monitoring completed up to November 2019 which were included in the LWMS.
- **Proposed Motorsport Park, Lot 5780 Down Road, Drome Reconnaissance Flora and Level 1 Fauna Survey Report** (Bio Diverse Solutions, 2019)
  - Bio Diverse Solutions completed a desktop assessment and reconnaissance flora survey and Level 1 Fauna survey of the Project Site in Spring 2018. The survey included identification of habitat trees and threatened fauna dependent hollows, and mapping of vegetation communities (GIS mapping, vegetation condition mapping, fauna habitat types and condition).

1.6 Scope and limitations

This report: has been prepared by GHD for City of Albany and may only be used and relied on by City of Albany for the purpose agreed between GHD and City of Albany as set out in section 1.3 of this report. GHD otherwise disclaims responsibility to any person other than City of Albany arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report. GHD disclaims liability arising from any of the assumptions being incorrect.

GHD has prepared this report on the basis of information provided by City of Albany and others who provided information to GHD (including Government authorities), which GHD has not independently verified or checked beyond the agreed scope of work. GHD does not accept liability in connection with such unverified information, including errors and omissions in the report which were caused by errors or omissions in that information.

2. Existing environment

This section summarises key information relating to catchment characteristics for the Site. The LWMS (GHD, 2021) provides a comprehensive overview of environmental characteristics.

2.1 Existing activities

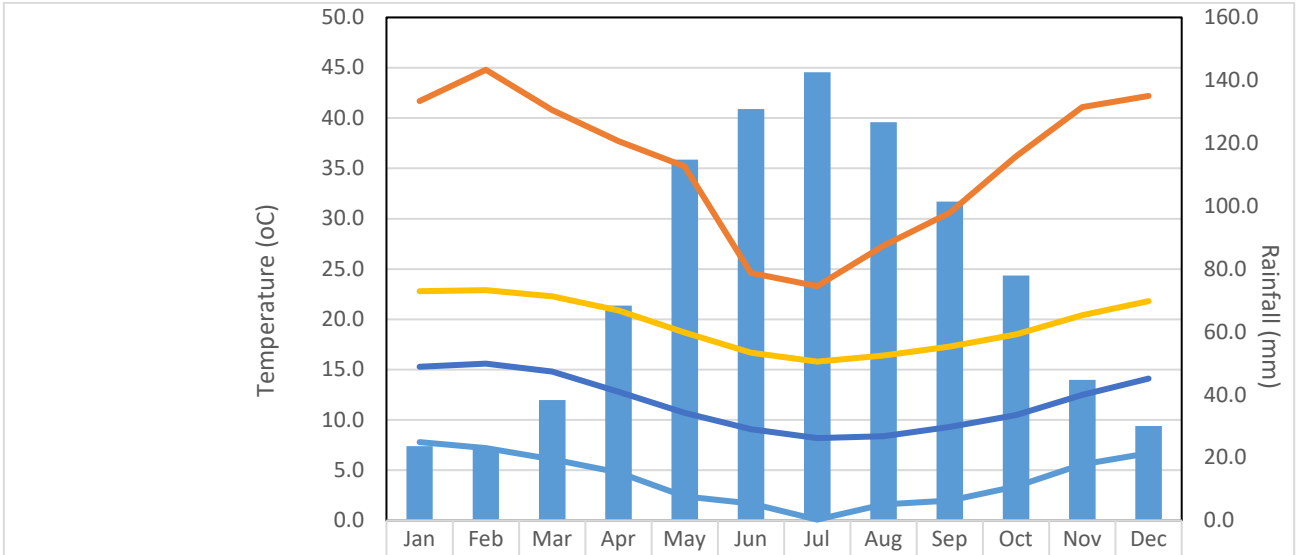
The perimeter of the site is entirely fenced and is currently used for the primary purpose of cattle grazing. Historically the site is likely to also have been used mainly for the purpose of agriculture, as well as some limited resource extraction (sand and gravel). The western end of the site consists of 52 ha of native vegetation that will be retained. A number of small dams are located across the site for stock watering. These will be retained and maintained for the AMP.

2.2 Climate

Albany is located on the south coast of Western Australia and the climate is broadly described as Mediterranean, with warm dry summers and mild wet winters. The nearest Bureau of Meteorology (BoM) official recording station is Albany Airport (Station No. 9500). This station records temperature, rainfall, relative humidity, wind speed and direction and has data available dating back to 1877. Table 2 illustrates recorded average monthly meteorological data for the Bunbury AWS BoM station for years 1877 to 2020 (BoM, 2020).

Temperatures range from a mean maximum of 22.9 °C in summer and drop to a mean maximum of 15.8 °C in winter. Mean minimum temperatures follow a similar trend, reaching 15.6 °C in summer and 8.2 °C in winter. Rainfall is low throughout the summer months and peaks in July, with a monthly average of 142.6 mm. The mean annual rainfall is 925.2 mm, with approximately 103.1 rain days a year. Relative humidity at Albany reflects the Mediterranean climate, demonstrating drier summers and a comparatively high relative humidity of 82 % in the morning in winter (BoM, 2020).

Table 2 Mean rainfall and temperatures in the Albany region (Site No. 9500) (BoM, 2020)



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mean rainfall (mm)	23.7	22.7	38.3	68.4	114.8	130.9	142.6	126.7	101.4	77.9	44.8	30.1
Mean max temperature (oC)	22.8	22.9	22.3	20.9	18.7	16.7	15.8	16.4	17.3	18.5	20.4	21.8
Mean min temperature (oC)	15.3	15.6	14.8	12.8	10.7	9.1	8.2	8.4	9.3	10.5	12.5	14.1
Highest temperature (oC)	41.7	44.8	40.8	37.7	35.2	24.6	23.3	27.3	30.6	36.2	41.1	42.2
Lowest temperature (oC)	7.8	7.2	6.1	4.8	2.4	1.7	0.1	1.6	2.0	3.4	5.6	6.7

2.3 Topography, landform and soils

2.3.1 Topography

The surface elevation of the site ranges from approximately 41 m AHD to 73 m AHD (GoWA, 2021). The lowest elevation is on the southern boundary and extends through the center of the site within a gully (a tributary to Marbelup Brook) that lies in a north-easterly direction. The highest elevation occurs on the eastern boundary of the site.

2.3.2 Surface soils and geology

Regional geology is described with reference to the 1:50,000 Environmental Geology series map (Albany sheet) and the 1:250,000 Geological Series map (Mt Barker – Albany sheet). These indicate the site is underlain by Cainozoic sand of colluvial origin – "*Qc: Colluvium – Sand, silt and clay*" on the slopes and within the low-lying areas of the Marbelup Brook "*QA – Clay, silt, sand and gravel in watercourses*" (Allen & Sofoulis, 1984). The sand is described as pale grey, fine to coarse, angular to sub-rounded quartz that is loose and moderately sorted and contains occasional pebbles of laterite. The thickness of the sand unit is not indicated on the maps, however the 1:250,000 map sheet indicates sand unit generally overlays laterite.

Local soils and geology are further delineated by Department of Primary Industries and Regional Development (DPIRD) Soil Landscape Mapping as summarized in Table 3 and presented in Figure 3 (Appendix A).

Site investigations were completed by Great Southern Geotechnics across the site in March 2021 to assess soil types and profiles and in-situ permeability. Eight test pits were completed, with soil types typically in agreement with DPIRD Soil Landscape Mapping. Gravels were identified on the western slope in the vicinity of the 4WD Driver Training and ATV Area, and deep sands present on the valley slopes and duplex soils in the valley floors.

In-situ soil permeability testing was completed for test pit locations TP4 to TP8, with saturated hydraulic conductivity ranging between 0.41 m/day (TP8) and 3.29 m/day (TP6 and TP7).

The locations of the test pits, soil logs and soil permeability results provided in Appendix B.

Table 3 Soil map units within the Project Site (GoWA, 2021)

Map unit symbol	Name	Landform	Geology	Soil
242KgDMc	Dempster Crest phase	Broad convex crests of sandy and lateritic spurs and ridges	Deeply weathered siltstone	Duplex sandy gravels; Grey deep sandy duplexes; Pale deep sand; Shallow gravels
242KgS7f	Minor Valleys S7 floor phase	Foot slopes and swampy valley floors of minor valleys	Colluvial and alluvial deposits over weathered sedimentary rocks	Wet and semi-wet soils; Pale deep sands; Grey deep sandy duplexes
242KgS7h	Minor Valleys S7 slope phase	Side slopes of minor valleys	Colluvium sedimentary rocks	Pale deep sands; Grey deep sandy duplexes
242ReDMc	Dempster Crest phase	Elongate crests	No information recorded	Sands and laterite

2.3.3 Acid sulfate soils risk mapping

An overlay of the site onto the DWER ASS risk mapping for the Albany-Torbay region (GoWA, 2021) is presented as Figure 4 (Appendix A), which identifies that the site is located outside of the boundary extent of the mapped areas.

Given that tributaries of Marbelup Brook located approximately 750 m to the south of the site are mapped as "Moderate to Low Risk" of ASS occurring, GHD has inferred that where these tributaries of Marbelup Brook extend into the site that they would also be considered to represent the same level of ASS risk. This is also consistent with the more broadly mapped risk areas where there are obvious low lying drainage lines, creeks and tributaries.

To more accurately inform the ASS risk onsite, a preliminary ASS investigation was completed as part of the onsite geotechnical investigation undertaken by Great Southern Geotechnics on 25 March 2021. Based on the ASS assessments to date, inorganic sulfidic sources capable of rapid acid release upon disturbance were not observed. Other, more slow releasing acidity sources were observed in the ASS assessment and will require management if disturbed in volumes greater than 100 m^3.

Any impacts associated with dewatering (if required) during construction will need to be considered in the ASS management plan. Further detail is captured in the associated AMP Environmental Management Plan.

2.4 Hydrology

A summary of desktop searches related to hydrology datasets is provided in Table 4. Further detail is provided in the following sections where relevant.

Table 4 Summary of hydrology dataset queries within the Project Site

Dataset	Details	Result
Public Drinking Water Source Areas (PDWSA)	PDWSA is a collective term used for the description of Water Reserves, Catchment Areas and Underground Pollution Control Areas declared (gazetted) under the provisions of the *Metropolitan Water Supply, Sewage and Drainage Act 1909* or the *Country Area Water Supply Act 1947*.	Site lies within the Priority 2 Marbelup Brook Catchment Area (Section 2.4.1).
Groundwater Areas	Groundwater areas proclaimed under the *Rights in Water and Irrigation Act 1914* (RIWI).	Site lies within Albany Groundwater Area (Section 2.4.2, Figure 5).
Surface Water Areas	Surface water areas proclaimed under the RIWI Act 1914.	None present.
Irrigation District	Irrigation Districts proclaimed under the RIWI Act 1914.	None present.
Rivers	Rivers proclaimed under the RIWI Act 1914.	None present.
Waterways Management Areas	Areas proclaimed under the *Waterway Conservation Act 1976*.	None present within the Site; however, the Albany Waterways Management Area is located approx. 800 m to the north.
Clearing Control Catchments	Country Area Water Supply Act 1947 Part 2A.	None present.
South Coast Significant Wetlands	Represents the regionally significant wetlands of the South Coast.	Site contains the Marbelup Flats, a conservation class wetland (Section 2.4.3).

2.4.1 Public drinking water source area

The site is located within a Priority 2 (P2) area of the Marbelup Brook public drinking water source area (PDWSA) (GoWA, 2021). This PDWSA is gazetted under the *Country Areas Water Supply Act 1947*, however is currently not used. It has been identified as a potential future water source option in the *Great Southern Regional Water Supply Strategy 2014* (DoW, 2014).

The Minister for Water has formally provided advice to the City of Albany (Kelly, 2018) that while a motorsport facility is incompatible with a P2 PDWSA (DoW, 2016), "*there are measures that can be put in place to protect water quality should the City proceed to approve the development*". These measures are further discussed in Section 4.2 (Wastewater servicing), Section 5.2 (Stormwater quantity management), Section 5.3 (Stormwater quality management) and Section 6 (Construction management) and Section 7 (Monitoring).

2.4.2 Groundwater conditions

On a regional scale, the 250K Map Series – Hydrogeology identifies a "*sedimentary aquifer within intergranular porosity – extensive aquifers, major groundwater resources*" underlying the Site (DoW, 2002). Groundwater salinity in the local area is in the range of 500 – 1000 mg/L, which is considered to be marginal for productive uses (GoWA, 2021).

A review of the DWER Water Information Reporting database identified no publicly available groundwater level or groundwater quality data within 2 km from the Site.

2.4.3 Wetlands and groundwater dependent ecosystems

Desktop searches identified no internationally important (Ramsar) or Nationally Important listed wetlands within 5 km of the Site (GoWA, 2021).

The South Coast Significant Wetlands dataset (DBCA-018) identifies the unnamed water course located within the Site as the Marbelup Flats, part of the King River Suite, and a Conservation Class wetland (Figure 4, Appendix A) (GoWA, 2021).

2.4.4 Surface water features

An unnamed creek line runs from the north-east corner of the site through to the south-west corner, from where it joins into Marbelup Brook located approximately 800 m west of the site boundary.

During a site visit (June 2018) the watercourse was observed to be in a modified state, with cattle currently having access to the watercourse. Erosion was evident, particularly in the eastern extent of the watercourse. This area was also mostly devoid of native vegetation, with the exception of some sedges (*Juncus* spp) (GHD, 2018). The western section of the watercourse contains native shrubs / sedges and had a defined bed / banks.

Plate 1 *Eastern extent of the watercourse showing evidence of erosion and cattle access*

2.4.5 Summary of pre-development monitoring (Bio Diverse Solutions)

Bio Diverse Solutions completed quarterly monitoring of surface water and groundwater at the Project Site for the period February 2018 to November 2019. An overview of the key results is provided in the following sections with sampling locations, the 2018 summary report and baseline water quality results for surface water and groundwater provided in Appendix C.

2.4.5.1 Surface water

Field records indicate two surface water sample locations within the unnamed watercourse were flowing for all monitoring dates in 2018 (Feb, May< Sep, Nov 2018), with flow at the downstream site (CS01) on all dates in 2019 (Feb, May, Aug, Nov).

An overview of key surface water quality data include:

- Surface water pH is moderately acidic, ranging from 4.46 to 6.85.
- Total nitrogen (TN) concentrations were typically higher at the upstream surface water location CS02 (TN range of 2 mg/L to 6.5 mg/L) compared to the downstream location CS01 (TN range from 0.5 mg/L to 2 mg/L)
- Total phosphorus (TP) concentrations were higher at the upstream surface water location CS02 (TP range from 0.22 mg/L to 0.55 mg/L) reflecting the TP concentration of bores in proximity to CS02. TP concentrations were typically below detection levels at the downstream surface water location CS01.
- Dissolved metals parameters including aluminium, iron and zinc were elevated in several samples at downstream surface water location CS01. Site CS02 reported isolated elevated aluminium, iron and zinc.
- MBTEXN parameters reported below detection in all surface water samples.
- TRH fractions were detected in some surface water samples.
- PAH parameters reported below detection in all surface water samples.
- Microbial testing detected microbial parameters in the majority of surface water samples.

2.4.5.2 Ground water

A summary of groundwater level records is provided in Table 5.

Table 5 Groundwater levels

Bore ID	Easting (m)	Northing (m)	Ground level – est. RL (mAHD)	Depth to Groundwater (mBGL)							
				Feb 2018	May 2018	Sep 2018	Nov 2018	Feb 2019	May 2019	Aug 2019	Nov 2019
SB01	567179	6133615	58.4	> 2.0	> 2.0	> 2.0	> 2.0	> 2.0	> 2.0	> 2.0	> 2.0
SB02	567404	6133889	49.6	> 2.0	> 2.0	> 2.0	> 2.0	> 2.0	> 2.0	> 2.0	> 2.0
SB03	567519	6134401	56.8	> 2.0	> 2.0	1.21	1.93	> 2.0	> 2.0	1.45	> 2.0
SB04	567700	6134179	48.2	> 2.0	0.91	0.30	1.07	1.66	1.11	0.37	1.48
SB05	568056	6134636	60.0	> 2.0	> 2.0	> 2.0	> 2.0	> 2.0	> 2.0	> 2.0	> 2.0
SB06	568131	6134478	53.6	0.87	0.70	0.00	0.59	1.03	0.73	0.06	0.73
SB07	567939	6134264	51.6	0.64	0.54	0.44	0.64	0.95	0.58	0.52	0.64
SB08	568308	6134637	56.5	> 2.0	1.55	0.18	1.27	1.58	1.42	0.38	1.29
SB09	568032	6134141	50.3	0.66	0.57	0.44	0.78	0.98	0.87	0.61	0.99
SB10	567886	6133756	62.7	> 2.0	> 2.0	> 2.0	> 2.0	> 2.0	> 2.0	> 2.0	> 2.0
SB11	568314	6134267	68.6	> 2.0	> 2.0	> 2.0	> 2.0	> 2.0	> 2.0	> 2.0	> 2.0
SB12	568474	6134781	60.2	> 2.0	> 2.0	1.04	> 2.0	> 2.0	> 2.0	1.1	> 2.0
DB01	-	-	-	-	-	-	-	-	7.10	6.95	6.97
Notes	BGL – below ground level - Where results shown as "> 2.0", this means the groundwater table was not intersected by the shallow groundwater monitoring bore (being only 2 m deep)										
	Results shown in red font - groundwater table was intersected by the groundwater monitoring bore.										
	Deep bore (DB01) monitoring only commenced from May 2019.										

An overview of key groundwater quality data include:

- Groundwater pH is moderately acidic, typically ranging from 3.82 to 7.52. pH at SB06 and SB07 (2.5 and 2.8) were significantly lower in February 2018 sampling event.
- Total nitrogen (TN) concentrations were typically elevated across the Site (range from 2 mg/L to 28 mg/L), which may be attributed to the historic and current farming practices. Significantly elevated TN at some bores (SB06, SB07 and SB08) coincided with sampling following peak groundwater levels. Exceptionally elevated TN concentrations reported in bore SB08 in February and May 2019 (110 and 79 mg/L), and additional sampling is recommended to confirm concentrations.
- Total phosphorus (TP) concentrations were typically elevated in some bores (SB06, SB07 and SB08).
- Dissolved metals parameters including aluminium, iron and zinc were elevated in the majority of samples in all bores, suggesting background concentrations of these metals are elevated due to the local soil and geological profile. Dissolved chromium was also elevated above the default trigger value in some bores.
- With the exception of toluene MBTEXN parameters reported below detection in the majority of groundwater samples. Toluene was detected in bore SB04 on all sampling occasions, and in bores SB06, SB07, SB08, SB09 in some sampling occasions. Toluene was elevated above the ANZG (2018) default toxicant guideline value in samples from SB07 (770 ug/L) and SB08 (210 ug/L, 310 ug/L, 980 ug/L).
- TRH fractions were detected in some groundwater samples. Particularly elevated TRH fractions were reported for bore SB07 and SB08 in February 2019. It is recommended that additional TRH samples are collected, with silica gel cleanup requested from the laboratory where elevated samples are identified.
- With the exception of a single detection for Naphthalene (SB06, Sept 2019) PAH parameters reported below detection in all groundwater samples.
- Microbial testing detected microbial parameters in some groundwater samples at all bores

2.4.6 Conceptual hydrogeological model

A conceptual hydrogeological model was developed for the site to gain an initial understanding of surface and groundwater water flows and potential linkages. Soil landscape mapping and regional geology mapping were used to infer geological units and soil types in the absence of deeper borehole data. The outcomes of the model (see Appendix D) noted:

– The groundwater levels observed in the shallow bores indicate that groundwater is present in the lower lying areas nearer the creek and will be most likely be supplying the creek with groundwater inflow.
– The groundwater levels and gradient, inferred from topography, supports that groundwater discharges into the creek.
– Shallow/perched groundwater may discharge and resurface via sandier layers that sit on top of more impermeable lateritic, coffee rock or clay layers; especially when there is significant slope.
– The discharging groundwater either expresses as surface water, or migrates within the deeper more permeable deposits.

2.4.7 Existing hydrological regime

2.4.7.1 Pre-development hydrology

A catchment analysis was completed using CatchmentSIM to delineate pre-development catchments for the entire site, including upstream areas. Refer to Figure 6 in Appendix A.

A one-dimensional DRAINS model with ILSAX hydrology was used for calculation of runoff. Model parameters included:

– Paved (impervious) area depression storage = 1 mm
– Supplementary area depression storage = 1 mm
– Grassed (pervious) area depression storage = 5 mm
– Soil Type 3 (slow infiltration rates).

The assessment was determined in accordance with Australian Rainfall and Runoff (ARR) 2016 (Geoscience Australia, 2016), with design rainfall data from the ARR 2016 data hub and the Bureau of Meteorology (BoM, 2018). The estimated peak flows for pre-development from various catchments are shown below in Table 6. Further assessment of specific areas impacted by the project works are further detailed in section 5.2.5. These focus on predevelopment areas surrounding the western motocross development and the eastern race track development, where the majority of the changes to the site occur.

Table 6 Estimates of peak flows pre-development

Catchment	Area (ha)	Impervious fraction (%)	Peak flows (m^3/s)			
			1EY (1 yr ARI)	0.5 EY (2 yr ARI)	10% AEP (10 yr ARI)	1% AEP (100 yr ARI)
E1	19.8	3	0.06	0.08	0.43	2.44
E2	17.4	3	0.08	0.10	0.39	2.24
E3	15.3	3	0.01	0.02	0.36	1.97
E4	13.9	0	0.00	0.00	0.45	2.27
E5	36.4	60	0.00	0.00	0.00	0.67
E6	17.4	0	0.00	0.00	0.33	1.81
S1	14.1	0	0.00	0.00	0.31	1.64
S2	23.4	0	0.00	0.00	0.57	3.30
S3	41.6	0	0.00	0.00	1.02	6.07
S4	33.6	0	0.00	0.00	0.65	3.64

Catchment	Area (ha)	Impervious fraction (%)	Peak flows (m^3/s)			
			1EY (1 yr ARI)	0.5 EY (2 yr ARI)	10% AEP (10 yr ARI)	1% AEP (100 yr ARI)
S5	25.1	0	0.00	0.00	0.90	4.18
TOTAL	262.7	-	0.03	0.03	1.82	17.0
Note:	*E denotes an external catchment, S denotes a catchment within the site or with a significant portion of the catchment within the site.*					
	TOTAL denotes the flows leaving the site via the creek/wetland which may be different to the individual catchments due to routing and storage within the site/model.					

2.4.7.2 Flood modelling

To inform the design of site infrastructure, a site-wide modelling of the existing (or pre-development) flood conditions was undertaken. This entailed simulating the 1% AEP storm event over the site using TUFLOW (Build 2020-10-AA), which is a program for simulating depth-averaged, one and two-dimensional free surface flows (such as occurs from floods and tides). Calibration of the model was not performed, as there are no operational streamflow gauges in vicinity and/or relevant to the site.

2.4.7.2.1 Model setup and assumptions

Modelling was done using a 'rainfall-on-grid' approach, in which the design rainfall hyetograph is applied directly to a Digital Elevation Model (DEM) that describes the site topography. The DEM was generated with a 5 m cell resolution using 1 m surface contours from Landgate, which is the finest available topography data that is publicly available for the site.

Routing of surface runoff over the DEM is influenced by the surface roughness, which is characterised by assigning Manning's roughness values to each DEM cell. Characterisation of the surface roughness was done through manual interpretation of the latest aerial imagery, with each identified surface type assuming the roughness values listed in Table 7.

Table 7 Adopted surface roughness values in flood modelling

Surface type	Manning's roughness n*
Cleared and grassed	0.050
Forested	0.070
Bare earth	0.040
Paved/roof areas	0.020

* Note: Values determined based on Table 6.2.2 in Book 6 of ARR 2019.

Catchment hydrological losses were simulated using an initial and continuing loss approach. With the exception of existing impervious areas, an initial and continuing loss values of 27 mm and 3.4 mm/hour were globally applied to the model domain. For paved and roofed areas, the initial loss was set to 1 mm and no continuing loss was applied. The effects of rainfall pre-burst are also accounted for in modelling by subtracting the median pre-burst depths (extracted from the ARR Data Hub) from the initial loss value.

Culverts across Down Road West were simulated as one-dimensional elements within the greater two-dimensional model. In the absence of detailed survey information, the culvert sizes were determined based on manual measurements taken by the Great Southern Motorplex Group on 17 June 2021; whilst culvert levels were set the same as the topographical low spots. Only two of the three culverts identified along the road were modelled. The culvert near the northeast corner of the site (i.e., Culvert E on Figure 7) could not be modelled due to the coarse resolution of the topography dataset, which did not accurately reflect the road geometry and adjacent table drains.

An open flow boundary is assumed along the perimeter of the model domain. This effectively simulates free discharge of flood waters out of the model and towards low lying areas external to the domain.

2.4.7.2.2 Modelling outcomes

The simulated maximum flood depths and flow velocities for the 1% AEP storm event are provided in Figure 7 and Figure 8 in Appendix A. The results demonstrate that majority of the site drains to the central creek line via overland sheet flow and has very shallow or negligible flood depths; other than in obvious gullies or valleys.

Elevated floodwaters are simulated along the main creek that traverses the site, with localised spots where the flood depth and flow velocities exceed 1 m or 1 m/s in the 1% AEP storm event. Nevertheless, the simulated creek flood extents are largely contained within the proposed Protected Exclusion Area (which will be fenced off) and not expected to interfere with future site operations.

Concentrated flows are expected to occur across the centre of the motocross track, as well as the northern and southern portions of the multi-use racetrack. The simulated flood depths at these areas are generally less than 200 mm but will require provisioning of culverts and/or floodways to mitigate standing water on tracks.

Some flooding is simulated at two low spots north of Down Road West, with flood depths of up to 0.6 m at the western low spot and as high as 0.9 m at the eastern one in the 1% AEP storm event. Both low spots are drained via cross-carriageway culverts that discharge directly to the northern boundary of the site. In particular, the western culvert (i.e., Culvert W) discharges directly towards the proposed motocross track and diversion of these flows will need to be considered as part of this site's stormwater management. This is further discussed in Section 5.

Table 8 summarises the simulated flows and velocities through each culvert.

Table 8 Simulated 1% AEP culvert flows and velocities

Culvert details	Culvert W	Culvert C	Culvert E
Diameter (mm)	750	900	1050
Flow (m^3/s)	0.48	1.07	3.54*
Velocity (m/s)	2.04	2.61	NA

* Note: Culvert not modelled. Overland surface flow used as proxy for culvert flow.

Some external catchment runoff from the CBH Mirambeena grain receival site is also expected to flow across Down Road and into the site from the north-east corner, partially through Culvert E. The natural flow path of this external flow cuts across the northern tip of the multi-use track and will need to be diverted accordingly.

2.5 Water users

2.5.1 Surface water

Review of aerial photography identifies numerous small dams located within Marbelup Brook and riparian zone (as demarcated by the DWER South Coast Significant Wetlands coverage), and one potential surface water abstraction (pumping) site downstream of the Site. These locations are summarised in Appendix E.

2.5.2 Groundwater

Groundwater allocation in Western Australia is regulated by DWER. The DWER Water Register notes one groundwater license for the Site and five groundwater licenses downgradient / downstream of the Site along the Marbelup Brook. The groundwater licences are summarised in Appendix E.

2.6 Environmentally sensitive areas

2.6.1 DWER Environmentally sensitive areas

The DWER maintains a dataset of Environmentally Sensitive Areas (ESA). ESAs are areas of land deemed to support conservation, heritage or ecological value, or an area protected through existing State Policy. There are no mapped Environmentally Sensitive Areas (ESA) within 5 km of the Project Site (DWER-046).

As per DWER guidance (DER 2014) a conservation category wetland is "*a defined wetland and the area within 50 m of the wetland"* and is declared to be an ESA under the *Environmental Protection Act 1986.* The Conservation Class wetland within the Project Site (Section 2.4.3, Figure 4) is identified as an ESA.

2.6.2 Groundwater dependent ecosystems

A search of the online *Groundwater Dependent Ecosystems (GDE) Atlas* (BoM 2020) does not identify any terrestrial or aquatic groundwater dependent ecosystems within the Project Site boundary.

2.6.3 Flora and fauna

Bio Diverse Solutions (2019) completed a Level 1 Fauna Survey and a reconnaissance level flora survey in spring 2018. The reconnaissance level flora survey did not identify any EPBC Act, BC Act or State Priority listed flora species within the Project Site.

The Level 1 fauna survey observed four conservation significant fauna species directly and indirectly within the broader survey area including:

– Baudin's Cockatoo (*Calyptohynchus baudinii*) (Vulnerable, Schedule 2)
– Forest Red-tailed Black Cockatoo (*Calyptohynchus banksia naso*) (Vulnerable, Schedule 3)
– Western Brush Wallaby (*Notamacropus irma*) (Priority 4)
– Southern Brown Bandicoot, Quenda (Isoodon fusciventer) (Priority 4).

Marbelup Brook was identified to have high aquatic fauna species richness from monitoring for the study *Ecological values of waterways in the south coast region, Western Australia* (Cook, Janicke, & Maughan, 2008). The high aquatic fauna species richness was partly attributed to the high number of samples collected, comprising 28 sites including three sites (MAR07, MAR08 and MAR09) located within and immediately downstream of the Site.

2.7 Sewage sensitive areas

The Department of Planning Lands and Heritage Map of Sewage Sensitive Areas identifies that the majority of the site is located within a sewage sensitive area (within 1 km of significant wetlands).

3. Design criteria and objectives

This section outlines the design criteria and objectives that the Water Management Plan (WMP) for the site must achieve. The design criteria have been developed with reference to the principles and objectives and guidance in the following:

– AMP Feasibility Study (GHD, 2018)
– *Stormwater Management Manual for Western Australia* (DoW, 2007)
– *Decision process for stormwater management in Western Australia* (DWER 2017)
– *Subdivision and Development Guidelines 2018* (CoA, 2018)
– *WQPN 100: Motor sport facilities near sensitive waters* (DoW, 2007)
– *WQPN 28: Mechanical servicing and workshops* (DoW, 2013)
– *WQPN 52: Stormwater management at industrial sites* (DoW, 2006).

Water and wastewater supply and servicing

This WMP proposes the following water supply design criteria for the site:

– Criteria WS1: Potable water will be supplied through collection and treatment of rainwater to potable standard. Non-potable water will be supplied via bore, site dam and rainwater tanks.
– Criteria WS2: Shortfalls in potable water supply will be imported to the site.

Further detail is provided in Section 4.1.

The wastewater management strategy proposes the following design criteria for the site:

– Criteria WW1 (Stage 1A): Domestic wastewater will be serviced using a combination of transportable toilets (with waste disposal managed by a waste management contractor) and a permanent on-site treatment and disposal system, in accordance with the *Government Sewerage Policy* (DoH, DPLH, DWER, 2019) for a PDWSA and Sewage Sensitive Area.
– Criteria WW1 (Stage 1B): Domestic wastewater will be serviced using transportable toilets (with waste disposal managed by a waste management contractor)
– Criteria WW2: Wastewater from vehicle maintenance, refuelling and washdown areas will be managed in accordance with WQPN 28.

Further detail of domestic wastewater servicing is provided in Section 4.2.1, with detail of vehicular maintenance servicing areas provided in Section 4.2.2.

Stormwater management

This WMP proposes the following stormwater design criteria for the site:

– Criteria SW1: Maintain the hydrological regime of the site and surrounds.
– Criteria SW2: Maintain serviceability of motorsport tracks for the 10% AEP event.
– Criteria SW3: Provide adequate drainage to achieve 300 mm separation from the 1% AEP event for key infrastructure (e.g. vehicle maintenance areas, buildings, wastewater facilities).

Water quality management

This WMP proposes the following water quality design criteria for the site:

– Criteria WQ1: Manage stormwater from the Site to ensure no deterioration in surface and groundwater quality.
– Criteria WQ2: Retain and treat stormwater runoff from constructed impervious surfaces generated by the first 15 mm of rainfall at source, prior to discharge or disposal to groundwater.
– Criteria WQ3: Manage stormwater quality from the Site in accordance with WQPN 100, WQPN 28 and WQPN 52.

4. Water supply and servicing

4.1 Water supply

4.1.1 Potable water

The Water Corporation's Lower Great Southern Towns Water Supply Scheme (LGSTWSS) runs along Albany Highway, with the nearest connection point approximately 4 km to the east at 66 Down Road (fertiliser distribution warehouse) (Water Corporation, 2018). Hence, it is proposed to service Site drinking water needs through a combination of collected rainwater and water carts.

Uncontaminated rainwater from the Site roof runoff (AMP buildings) will be collected in standard 110,000 litre rainwater tanks. At source treatment by household-scale filtration and ultraviolet disinfection will be undertaken. This will allow a safe drinking water supply to the AMP facilities (i.e. clubrooms, canteen, etc.) and ablutions.

A preliminary water balance for the site suggests that rainfall alone will be insufficient to meet expected demand for regular attendance of 500 people. Where there is a shortfall, the venue operator will purchase and cart water to the Site. Similarly for large-scale events, additional potable water will need to be carted to site.

4.1.2 Non-potable

Water demands for other external, non-potable uses (i.e. garden irrigation, toilet flushing, vehicle washdown, dust suppression, etc.) will be met from Site bore, dams and rainwater tanks (where possible). The GSMG is negotiating with Plantation Energy for access to their 4,000 kL Bremer West superficial groundwater allocation (licence number 168308).

4.1.3 Fire water

Fire water supply will be through on-site resources via bore extraction to tank storage and pumped to facilities around the site. Storage of water dedicated for firefighting will be located in the north and the eastern precincts and tanks are to be a minimum of 110,000 L (as shown on Masterplan).

4.2 Wastewater servicing

4.2.1 Domestic wastewater

The Water Corporation's Albany sewerage scheme is not in close proximity to the Site, with the nearest connection point being at Lancaster Road, McKail (being some 10 km distant).

Stage 1A of the development will be serviced by a combination of transportable toilet units (Plate 2) and permanent toilets in the multi-purpose building (sized for 300 patrons). The permanent toilets are connected to an on-site treatment and disposal system, designed in accordance with the *Government Sewerage Policy* (DoH, DPLH, DWER, 2019) for a PDWSA and Sewage Sensitive Area. A full site and soil evaluation report is attached in Appendix H. The transportable toilet units will be maintained and regularly serviced by a local waste disposal contractor. For large-scale events additional portable hire toilet units will be used to accommodate peaks in wastewater production.

Stage 1B of the development will be serviced by transportable toilet units only (Plate 2). The transportable toilet units will be maintained and regularly serviced by a local waste disposal contractor. For large-scale events additional portable hire toilet units will be used to accommodate peaks in wastewater production.

Plate 2 *Example portable toilet unit*

4.2.2 Vehicular maintenance wastewater

The Site is proposed to be used for motor sport activities. All vehicle maintenance and servicing including vehicle washdown and refueling, will be undertaken in dedicated refueling and pit areas.

To minimise the risk of contamination to sensitive receptors the refueling and pit areas will be designed and constructed in accordance with WQPN 100 and WQPN 28, including the following attributes:

– Have a low permeability sealed concrete pad to minimise seepage and assist cleanup of spills.
– Will be covered and weatherproofed to prevent stormwater intrusion.
– Designed with floors graded to a pit and pipe network that will be serviced by a sediment trap and oil water separator, to ensure stormwater and wastewater are managed separately from other parts of the Site.
– Be double bunded to contain water and spills within the internal drainage network.
– No fuel or combustible chemicals will be stored on-site.

On-site personnel will complete regular inspection and maintenance of the vehicle maintenance areas wastewater infrastructure to ensure they are operating as required.

Sediment from the sediment trap will be removed as required and disposed of at a registered waste facility. Any hydrocarbons removed from the oil water separator will collected and stored within appropriate sealed containers for disposal at a registered waste facility.

Spill kits will be held at the vehicle maintenance areas in the event of any hydrocarbon spill. When spill kits are used the material will be disposed of at a registered waste facility.

On-site personnel will be trained in the use and disposal of spill kits.

A separate Hydrocarbon Management Plan is included as part of the Environmental Management Plan.

5. Stormwater management plan

5.1 Overview

Stormwater management across the Site has been developed based on an understanding of the key site risks. The design of the Site and stormwater management elements has been iterative and developed with regard to key site characteristics including nature of the proposed activities, external catchment flows, steep terrain over parts of the Site, shallow groundwater conditions over parts of the Site, high surface/groundwater connectivity and downstream receptors and water users.

The key components of the Stormwater Management Plan for the site include:

– Flows that originate upstream of the site will be diverted around motorsport park infrastructure to maintain pre-development hydrology, and to keep externally generated flows separated from stormwater runoff from the motorsport park infrastructure.
– The Site has been designed to ensure key infrastructure (vehicle maintenance areas, buildings, bioretention basins) are sited outside of the modelled 1% AEP flood area (Section 2.4.7.2).
– Key stormwater management controls and best management practices have been considered for various parts of the Site infrastructure to reduce or minimise risk to surface and groundwater quality.
– Stormwater generated from areas considered to have a higher risk of discharging potential contaminants of concern (vehicle maintenance areas) will be managed separate to stormwater runoff from the remainder of the site.
– The first 15 mm of runoff generated from car parking, hardstand areas, motocross track and race track will be treated in bioretention areas.
– Runoff generated from Site buildings will be directed to rainwater tanks, with overflow infiltrated close to source or diverted to swales.

The following sections provide a further detail of the design of the stormwater management system for Stage 1A and 1B of the proposal, with Section 5.2 detailing the management of stormwater quantity and Section 5.3 detailing the management of stormwater quality.

5.2 Stormwater quantity

5.2.1 Principles and objectives

The management of stormwater quantity is proposed in accordance with the principles and objectives of the technical feasibility study (GHD, 2018), the *Stormwater Management Manual for Western Australia* (DoW, 2007); the *Decision Process for Stormwater Management in Western Australia* (DoW 2017), WQPN and the *Subdivision and Development Guidelines 2018* (CoA, 2018).

For vehicle maintenance areas (refueling, washdown and pit areas) stormwater and wastewater generated in these areas for all events up to the 1% AEP will be managed internally as detailed in Section 4.2.2. The stormwater system within this area is further described in Section 5.2.3.2. Vehicle maintenance areas will not be used during events exceeding the 10 year ARI event (10% AEP).

For all other parts of the Site the following principles apply with detail provided for Stage 1A in Section 5.2.2 and Stage 1B in 5.2.3.

1-year ARI event and smaller (1EY)

To retain and treat the 1-year ARI (1EY) event:

– Runoff from impervious areas will be managed via a range of measures including:
    - Small event runoff from impervious areas will be directed to bioretention basins for treatment, prior to infiltration where there is sufficient separation to groundwater.

- Targeted rainwater (roof water only) capture for potable (i.e. drinking) and non-potable water supply (refer Section 4.1). Overflow from rainwater tanks will be infiltrated close to source using soakage pits or infiltration galleries, or directed to swales.

– Drainage swales will be sited downstream of the tracks, conveying stormwater to bioretention basins and allowing stormwater infiltration as close to source as practical, in accordance with WSUD principles. Vegetation, rock weirs and/or check dams (in steep sloped areas) will slow flows and contribute to achieving WSUD objectives. Culverts will be installed to allow crossings of access tracks, carparking (where required) and racetrack pavement, with some piped sections where site topography doesn't allow overland flow.
– Direction of runoff to bioretention basins targeting peak flow management to pre-development levels, where possible.
– Where possible, bioretention basins are positioned to ensure 2 m vertical clearance from the maximum groundwater level. Where bioretention basins are located within 2 m vertical clearance from maximum groundwater level the base of the basin will be lined with local clay to reduce permeability, with subsoil drains installed to provide drainage function.

10-year ARI event (10% AEP)

To maintain site serviceability in the 10-year ARI (10% AEP) event:

– Drainage swales will convey stormwater to bioretention basins and will allow stormwater to be infiltrated as close to source as practical in accordance with WSUD principles. Vegetation and check dams (in steep sloped areas) will slow flows and contribute to achieving WSUD objectives. Culverts will be installed to allow crossings of access tracks and raceway pavements.
– The bioretention basins are designed to compensate peak flows to pre-development levels, and maximise opportunities for infiltration prior to discharge from the site.
– Appropriate erosion control and energy dissipation will be implemented at the outlet of piped drainage structures.

100-year ARI event (1% AEP)

To protect from flooding in the 100-year ARI (1% AEP) event:

– Key site infrastructure (vehicle maintenance areas, habitable buildings) are sited outside the 1% AEP flood area (Section 2.4.7.2). A minimum freeboard of 300 mm is provided to prevent ingress of water.
– Stormwater flows will exceed the capacity of the internal drainage swales, but will be contained within the swale freeboard, or via overload flow along roadways or grassed flow paths.
– The bioretention basins will compensate peak flows to levels that will not adversely impact the downstream receiving areas, and maximise opportunities for infiltration prior to discharge from the site.
– Overland flow paths are provided to minimise the potential for exposure of publicly accessible areas to flood waters.
– Basins will be designed with appropriate emergency overflow weirs and structures to ensure controlled discharge wherever possible.

5.2.2 Stage 1A

Stage 1A of the Albany Motorsport Park comprises the motocross track and 4WD driver training, ATV area and associated infrastructure. Figure 9 in Appendix A presents the proposed stormwater management plan for Stage 1A. An overview of key stormwater management infrastructure is described in the following sections. Details of the hydraulic and hydrologic modelling, including sizing of key stormwater infrastructure are provided in Section 5.2.4.

5.2.2.1 Diversion of external flows

Flood modelling of the site (Section 2.4.7.2) has identified external flows generated from the catchment of the Albany Plantation Export Company (APEC) site to the north of the Stage 1A area. Under current conditions it is assumed that stormwater runoff passes through existing culverts along Down Road West (refer Table 8), with occasional overtopping of the road in larger events and sheeting across the road verge and down into the existing valley.

It is proposed to divert flow from this external catchment via a vegetated diversion drain that traverses around the western edge of the motocross track. Culverts will be located to convey flows under the carpark area and under the motocross track where required.

A second diversion drain is sited along the central hillslope, on the eastern side of the motocross track, as a cut off drain to divert any flows from the hillslope area away from the track.

It is proposed to direct flows from the diversion drains to the central creekline along gently sloping areas. A level spreader weir is proposed to dissipate flows as sheetflow over a vegetated overland pathway. Where slopes are steep or level spreader weirs are not used, the base of swales will be rock protected and feature regular rock weirs and/or check dams to reduce velocity.

Diversion drains have been sized to manage all runoff from the external catchments in accordance with pre-development discharge.

5.2.2.2 Refuelling and washdown area

All servicing, washdown and refuelling associated with the motocross track will be completed within the designated refuelling and washdown area. This area will be a covered concrete area with double perimeter bund and internally draining pit and pipe network. The pit and pipes will direct all water to a sediment trap and an oil water separator, as described in Section 4.2.2.

Treated water from the oil water separator will be directed into the stormwater drainage system.

5.2.2.3 Access road and carpark

In small runoff events stormwater runoff generated from the access roads and carparks will be directed towards distributed bioretention basins to treat stormwater, and infiltrate where possible. Flow in excess of the capacity of the bioretention basins will connect to surface drainage (e.g. diversion drain, swale drainage).

5.2.2.4 Motocross track

The motocross track is sited across the northern valley of the Site. Fill sourced from the Site is used to provide adequate separation (≥ 2.0 m) of the track from the maximum groundwater level. The track is constructed using locally sourced sandy/clay. Refer to the motocross track drawings (plan and longitudinal sections in Appendix F).

Stormwater runoff from the motocross track is directed to a series of vegetated drainage swales that capture and convey stormwater flows to distributed bioretention basins.

Swale dimensions are summarised in Section 5.2.4.

5.2.2.5 4WD driver training and ATV area

The location of the 4WD driver training and ATV area has been identified as a local source of sand/clay and gravel, which will be used for the construction of the motocross track, access road, carparking areas and race track at the Site.

Following removal of sand/clay and gravel the 4WD driver training and ATV area will comprise the natural surface. No formal stormwater management is proposed in this area. Stormwater runoff from this area will be directed to a bioretention basin at the natural low point to aid settling of sediment, with flow in excess of the bioretention basin volume directed via a vegetated overland flowpath towards the central creekline.

5.2.3 Stage 1B

Stage 1B of the Albany Motorsport Park comprises the race track and associated infrastructure. Figure 10 in Appendix A presents the proposed stormwater management plan for Stage 1B. An overview of key stormwater management infrastructure is described in the following sections. Details of the hydraulic and hydrologic modelling, including sizing of key stormwater infrastructure are provided in Section 5.2.4.

5.2.3.1 Diversion of external flows

Flood modelling of the site (Section 2.4.7.2) has identified external flows generated from the north-east catchment, with flows crossing Down Road West from the APEC site to the north, the CBH Mirambeena site to the north-east, and agricultural land to the east of the Stage 1B area.

Flows from part of the northern part of this external catchment accumulate in a roadside drain on the north side of Down Road West, and flow via a culvert (1050 mm dia.) under Down Road West to the Site. External flows originating along the northern boundary of Stage 1B will follow their natural flowpaths with minor culvert crossings (300 mm culvert) provided under access roads where required. A culvert crossing of the Down Road West roadside drain will be provided at the entry to the Site.

External flow originating from the eastern agricultural land will follow its natural flowpath, with minor culvert crossings provided under the access road and race track where required. This diversion drain will also receive some race track stormwater runoff, and flows will be directed to a bioretention basin prior to discharge from the Site.

The flows originating from the north-east (CBH site) will be diverted around the race track using a cut off drain, with minor culvert crossings provided under the access road and race track where required.

Where slopes are steep or level spreader weirs are not used, the base of swales shall be rock protected and feature regular rock weirs and/or check dams to reduce velocity and provide water treatment.

Diversion drains are sized to manage all runoff from the external catchments in accordance with pre-development discharge.

5.2.3.2 Pit area

All servicing, washdown and refuelling associated with the race track will be completed within the designated pit area. The pit area will be covered and weatherproofed to prevent stormwater intrusion, with an impervious perimeter bund and floors graded to an internally draining pit and pipe network. The pit and pipe drainage network in this area may comprise perimeter trench drains with trafficable covers located within the perimeter bund to prevent egress of any surface water drainage or spills generated within this area.

The pit and pipe drainage network will direct all water to a sediment trap and an oil water separator, as described in Section 4.2.2. Treated water from the oil water separator will be directed into the stormwater drainage system.

5.2.3.3 Access road, spectator carpark, competitor carpark and emergency muster area

Runoff from these areas will be managed as follows:

– Access roads and tracks – stormwater runoff generated from the access roads will drain to vegetated areas alongside the roads. Where this cannot occur, roadside drains will be implemented which will feature regularly spaced rock weirs/check dams to slow flows and promote sedimentation. Where required, suitable culvert pipes or overflow points either under the roadway or over the roadway will be provided to target controlled discharge to the surrounding environment.
– Spectator carpark – small event stormwater runoff generated from carpark area will be directed towards the bioretention swales distributed throughout the carpark. These will be connected via minor culverts under the carpark to the adjacent drainage swales.
– Competitor parking and marshalling area – it is proposed that the emergency muster area will feature a crest to direct stormwater runoff to vegetated swale drains located around the perimeter of the competitor carpark and marshalling area. The southern and eastern portions of the carpark and emergency muster area will be

designed to direct flows to a bioretention basin in the south-east corner of the Site. The north-western portion of the carpark and emergency muster area will divert flows to drainage swales and bioretention basins located to the north and south of the Pit area.

5.2.3.4 Race track

Runoff from the race track is designed to capture and convey stormwater flows in a series of shallow vegetated swales (1V:6H) sited downstream of race track cross-fall (assumed on inside of corners). The shallow vegetated swales will feature regularly spaced interceptor traps, and will convey flows to bioretention basins.

5.2.4 Hydrologic and hydraulic assessment

Sizing of key stormwater infrastructure for Stage 1A and Stage 1B including diversion drains, swales and bioretention basins was completed through development of a post-development hydrologic and hydraulic model, using inputs from the existing site hydrology (Section 2.4.7) and the Site infrastructure plans (Figure 2 in Appendix A).

5.2.4.1 Diversion drains

Design of the diversion drains is based on the following:

– Where space and topography permit the drainage swales will be broad and shallow. Side slopes of 1V:6H are proposed to ensure safe vehicle run-off in proximity to the motocross track and race track, as well as ease of maintenance.
– Maximum side slopes of 1V:3H may be required in areas restricted by space or topography.
– Diversion drains will have a freeboard of 0.3 m (over the 10% AEP design event level) to allow additional storage and conveyance to distributed bioretention basins.
– Drains with typical slopes that are greater than 3% longitudinal grade will require erosion protection surfacing either in the form of rock lining or other similar measures.

Typical diversion drain dimensions are summarised in Table 9. Further information on drains with similar requirements are detailed on Figure 9 and Figure 10.

Table 9 Diversion drain dimensions

Swale example	Shape and side slope (V/H)	Average slope (%)	Max depth* (m)	Length (m)	10% AEP flow (m^3/s)
Stage 1A					
W-EXT02	1:6 swale	0.38	0.542	140	0.172
W-EXT04	1:6 swale	1.56	1.423	100	0.186
Stage 1B					
E-B9-07	1:4 swale	1.64	0.781	350	0.072
E-B9-08	1:4 swale	0.94	0.781	120	0.024

* The max. depth is driven by providing adequate freeboard for the 10% AEP event while also considering the depths in the 1% AEP event. The depth varies along the drain and would generally increase from a minimum depth of 300 mm at the upstream end, unless receiving water from upstream drains or culverts.

5.2.4.2 Drainage swales

Design of the drainage swales is based on the following:

– Where space and topography permit the drainage swales will be broad and shallow. Side slopes of 1V:6H are proposed to ensure safe vehicle run-off in proximity to the motocross track and race track, as well as ease of maintenance.

– Maximum side slopes of 1V:3H may be required in areas restricted by space or topography.
– Drainage swales will have a freeboard of 0.3 m (over the 10% AEP design event level) to allow additional storage and conveyance to distributed bioretention basins.
– Drains with typical slopes that are greater than 3% longitudinal grade will require erosion protection surfacing either in the form of rock lining or other similar measures.

Key swale dimensions are summarised in Table 10, while the modelling results for each swale drain are contained in Appendix G.

Table 10 Swale dimensions

Swale example	Shape and side slope (V/H)	Average slope (%)	Max depth*** (m)	Length (m)	10% AEP flow (m^3/s)
Stage 1A					
W-B4-01	1:6 swale	1.80	0.909	170	0.088
W-B4-02	1:6 swale	4.81	0.909	200	0.110
W-B5-04	1:6 swale	3.00	0.811	40	0.188
W-B5-05	1:6 swale	4.89	0.798	45	0.018
W-S1	1:6 swale	5.07	0.478	300	0.265
Stage 1B					
E-B4-01*	K300**, 0.4 m deep	0.50	0.57	150	0.090
E-B4-02	1:4 swale	0.90	0.586	220	0.248
E-B6-01	1:6 swale	3.87	0.699	150	0.094
E-B9-01	1:6 swale	3.60	0.447	160	0.129

* Further development in detail design will likely require a pit and pipe system to be installed in combination with this trench drain.

** K300 is an assumed 300 mm wide with varying depth Class D Covered Trench Drain

*** The max. depth is driven by providing adequate freeboard for the 10% AEP event while also considering the depths in the 1% AEP event. The depth varies along the drain and would generally increase from a minimum depth of 300 mm at the upstream end, unless receiving water from upstream drains or culverts.

5.2.4.3 Culverts

Different crossing locations were determined to manage discharge to the surrounding environment. Preliminary sizing of proposed culverts was done using DRAINS software and results are shown in Table 11. Further assessment of these culverts are suggested in future design stages to determine structural suitability, should there be reduced cover as limited by resulting earthworks.

Table 11 Culvert dimensions

Culverts	Length (m)	Slope (%)	No. of barrels	Diam (mm)
Stage 1A				
W-B1-CULV1	30	1.17	1	450
W-B5-CULV1	13	2.00	1	450
W-B5-CULV2	12.5	3.00	1	450
W-B5-CULV3	19.2	1.56	2	450
W-B5-CULV4	14.5	2.76	1	450

Culverts	Length (m)	Slope (%)	No. of barrels	Diam (mm)
W-B5-CULV5	12.6	7.06	1	450
W-B5-CULV6	20	1.00	1	450
W-EXT-CULV	150	2.13	1	450
W-EXT-CULV1	20	0.50	1	450
Stage 1B				
E-B5-CULV1	15	6.07	1	450
E-B7-CULV1	55.2	2.55	1	450
E-B7-CULV2	13.4	3.06	1	450
E-B7-CULV3	97.1	0.50	1	450
E-B9-CULV1	13.7	7.30	1	450
E-B9-CULV2	28.3	3.22	1	450
E-B9-CULV3	49	1.86	1	450

5.2.4.4 Bioretention basins

A series of shallow distributed bioretention basins are sited to provide both water quality treatment as well as stormwater compensation/detention/infiltration throughout the Site.

The bioretention basins are sized such that the total post-development flow off the site was equal to or less than the pre-development flow for the minor (10% AEP) design event and targeted appropriate compensation and management of major storms (i.e. the 1% AEP or 100 year ARI). Bioretention basin parameters included:

– Sited outside the 1% AEP event from the major creek through the site.
– Construction should use the natural topography of the Site where possible.
– Basin base levels set to be 2 m above the assumed groundwater level when used for infiltration. If within 2 m of the groundwater the base of the basin is to be lined to prevent infiltration; these basins will require the implementation of a subsoil drainage system.
– Basins equipped with low flow outlet/s (pipe/orifice), high flow bypass pit and a mortared/rock protected overflow spillway that has sufficient capacity to handle 1% AEP flow, where possible.
– Nominal depths ranging from 0.35 m to 1.2 m to spillway levels; and 0.5 m to 1.5 m to top of wall.
– 1V:6H side slopes where space permits to allow for vegetation to stabilise side slopes and reduce erosion risk. Where geotechnical conditions permit, basin side slopes may be increased a max. of 1V:3H to facilitate increased base infiltration surface (may require fencing and/or signage for safety where fencing is not appropriate).
– An average 2 m/day infiltration rate has assumed, noting that testing has found varying rates of between 0.41 and 3.29 m/day across the site. Detailed design of each basin should be informed by the site-specific permeability test results in Appendix B.
– Bioretention basins feature a low flow piped discharge, designed to be:
    - Set above the peak 1EY basin water level, such that no discharge occurs for water quality management, where possible (basins requiring lining will need to discharge the 1EY event).
    - Set and sized so as to ensure that the basin overflow spillway does not activate in events up to and including the 10% AEP.
    - Contributing catchments would be directed into each of the basins as detailed in Section 5.2.2 and Section 5.2.3.
– Post development flows are those of the combined catchment areas that contribute to the basin location and are shown in Appendix G.
– The results of the bioretention basin sizing for Stage 1A and Stage 1B are summarised in Table 12.

*Table 12 Bioretention basin sizing **

Basin	Slope (1V:_H)	Base Elevation (m)	Base Area (m^2)	Top Elevation (m)	Top Surface Area (m^2)	Depth (m)	Max Volume (m^3)	By-pass level (m)	Low Flow Outlet	Overflow weir level (m)
Stage 1A										
West-B1	3	66.0	90	67.0	265	1.0	170	66.60	N/A	66.75
West-B2	6	62.0	150	62.5	640	0.5	180	62.35	3 x 70	62.35
West-B3	3	62.5	160	64.0	475	1.5	450	63.20	N/A	63.70
West-B4	6	59.0	100	60.5	450	1.5	400	59.50	2 x 70, 1 x 100	59.60
West-B5	3	53.5	105	54.5	260	1.0	175	54.00	3 x 90	54.25
West-B6	6	58.0	100	59.0	500	1.0	275	58.50	N/A	58.75
West-B7	3	51.5	430	52.5	980	1.0	700	52.20	3 x 70	52.50
Stage 1B										
East-B1	6	58.0	145	59.5	950	1.5	750	58.75	1 x 90	59.50
East-B2	6	57.0	500	58.0	1150	1.0	800	57.50	1 x 90	57.75
East-B3	6	70.0	350	71	950	1.0	625	70.60	3 x 100	71.00
East-B4	6	71.0	250	71.5	550	0.5	200	71.25	N/A	71.38
East-B5	6	66.0	300	67.5	1300	1.5	1100	67.00	2 x 80, 1 x 100	67.20
East-B6	6	61.0	600	61.5	1000	0.5	400	61.20	3 x 90	61.50
East-B7	6	65.0	300	66.0	850	1.0	550	65.50	180, 1 x 90, 1 x 90	65.75
East-B8	6	70.5	250	71.5	750	1.0	475	71.00	N/A	71.25
East-B9	6	63.0	950	64.0	1800	1.0	1350	63.50	N/A	64.00
East-B10	6	62.0	430	62.5	800	0.5	300	62.25	3 x 110	62.50

* The levels detailed in the above table are subject to change during detailed design however base areas and volumes will need to be generally achieved.

5.2.5 Pre- and post-development discharge

The outlet locations to the downstream watercourse were determined, and the contributing catchments from Stage 1 works assessed for the treatment and management of stormwater runoff within the site. Due to the proposed layout of the tracks, minor changes in catchment areas were present when comparing both pre-development and post-development scenarios. A summary of this comparison is shown in Table 13.

All outlet locations on Stage 1B are shown discharging on a 1EY event and must be treated within the basin prior to discharge, to mitigate any adverse water quality outcomes. The modelling determined it is impractical to manage some flows to below pre-development discharge (i.e. East-3 and East 4) for the 10% AEP. However overall the post-development discharge from all eastern catchments is below pre-development discharge. For the western catchments, the total post-development discharge is only 0.007 m^3/s above pre-development, which is only 1.5% and considered insignificant.

Table 13 Combined site discharge

Discharge location	Pre-development flows (m3/s)				Post Development flows (m3/s)			
	Area (ha)	1EY	10% AEP	1% AEP	Area (ha)	1EY	10% AEP	1% AEP
Stage 1A								
West-1	14.10	0	0.270	1.64	14.10	0	0.263	1.600
West-2	11.17	0	0.214	1.36	6.86	0	0.132	0.286
*West-3	*	*	*	*	4.31	0.013	0.096	0.498
TOTAL	**25.27**	**0**	**0.484**	**3.00**	**25.27**	**0.013**	**0.491**	**2.384**
Stage 1B								
East-1	12.13	0	0.244	1.58	11.04	0.020	0.158	0.450
East-2	13.30	0	0.296	1.83	15.53	0.016	0.290	1.080
East-3	9.76	0	0.177	1.06	10.28	0.031	0.193	0.919
East-4	7.35	0	0.118	0.65	5.72	0.021	0.174	0.494
TOTAL	**42.54**	**0**	**0.835**	**5.12**	**42.57**	**0.088**	**0.815**	**2.943**

**additional outlet location taken from West-2*

5.3 Stormwater quality

5.3.1 Overview

The hydrogeological conceptual model (Appendix D) indicates high surface/ groundwater connectivity within the Site, with potential for impacted groundwater to migrate towards the creekline and off-site towards the major drainage in the area, the Marbelup Brook. If not responsibly managed, the development has the potential to negatively affect stormwater quality discharging from the catchment and impact on the potential receptors and water users.

Based on the proposed site activities the key stormwater quality issues requiring management include:

- **Sediment load**: Erosion caused by high flow velocity can result in a loss of soil, damage to drainage swales, and increased sediment load to the receiving water body.
- **Nutrient load**: Increased nutrient loading to the receiving water body may result from over- application of fertilisers to landscaped areas.
- **Gross pollutants**: Suspended and dissolved pollutants, and rubbish.
- **Toxicants**: Key pollutants associated with motor sport facilities include leaks and spills of chemical or petroleum hydrocarbons from vehicle maintenance areas, hydrocarbon storage areas and racetracks. Other potential toxicants of concern include dissolved metals and pesticides.

5.3.2 Best management practices

Management of stormwater quality is focused on providing appropriate treatment of stormwater runoff generated by the various parts of the Site based on an understanding of the key site risks. A range of key controls and best management practice WSUD elements will be utilised to manage stormwater quality across the site.

Best management practices (BMPs) are design strategies targeted to manage total suspended solids, gross pollutants, nutrients (TP and TN) within stormwater discharged from urban catchments (DoW, 2007). Frequently occurring rainfall events are targeted, using source, in-transit and end-of-pipe controls to improve water quality. BMPs considered appropriate for the Site include:

– The Site stormwater drainage system has been designed to separate good quality stormwater from potentially contaminated stormwater.
– Flows generated from external catchments will be diverted around the Site infrastructure, with external drainage separated from Site drainage where possible.
– Stormwater runoff from hydrocarbon-impacted areas including the refuelling and washdown area (Stage 1A) and pit (Stage 1B) will be isolated from stormwater generated for other parts of the Site. These areas are covered, double bunded, with internal stormwater pit and pipe network connected to sediment trap and oil water separator.
– Maximising infiltration by adopting a stormwater retention system to contain, and as a minimum, treat the first 15 mm of rainfall on site.
– Flows generated from Site buildings are considered to be uncontaminated and will be diverted to rainwater tanks for reuse as discussed in Section 4.1.1, or infiltrated at source.
– Use of suitable soils within swales and compensation basins that target the uptake of nutrients.
– Construction of combined bioretention and compensation basins to allow water quality treatment of small events (including metals and hydrocarbons), encourage infiltration and reduce peak flow rates.
– Swale drains shall be planted with grass for filtering of particulates and uptake of dissolved nutrients. Grass will be mowed with clippings removed from site.
– Additional sediment management measures include regularly spaced interceptor traps on swale drains, with check dams and rock protection used on steeper slopes where required.
– First-flush diversion will be installed for the pit area as well as the adjacent extensive hardstand area of the competitor parking and marshalling area, to capture initial stormwater run-off after an extended dry period.

5.3.3 Spill control and pollution management

To achieve spill control and pollution management in the high risk areas of the AMP, the following practices from WQPN 28: *Mechanical workshops and servicing* (DoW, 2013), *WQPN 52: Stormwater management at industrial sites* (DoW, 2006) and *WQPN 100: Motor sport facilities near sensitive waters* (DoW, 2007) will be implemented:

– Separation of uncontaminated stormwater from potentially contaminated stormwater (particularly roof water from other trafficked hardstands).
– Fuel / chemical handling areas (i.e. pits and maintenance areas) shall be located within secondary containment areas that allow maximum recovery of any spilt materials.
– Paved areas exposed to rainfall where dust, litter or spilt substances accumulate will be regularly cleaned by AMV Inc. personnel with methods that prevent fluid drainage or leaching into the surrounding environment.
– Oil and sediment traps (as appropriate to the site) will be installed at vehicle maintenance areas, and managed by AMV Inc. personnel (Section 4.2.2). First-flush water diversion to be installed for the pit area as well as the adjacent extensive hardstand area of the competitor parking and marshalling area to capture initial stormwater run-off after any extended dry period.
– Wash down of vehicles to occur in vehicle maintenance areas only. These areas feature a bunded impervious pad that is weatherproof to minimise stormwater access. Chemical solvents and non-degradable detergents used to clean equipment or pavements should not be released into stormwater systems. High pressure, steam cleaning, scrubbing or quick break detergents are the preferred methods of cleaning vehicles.

– Spill kits (permanent and mobile) will be located throughout the Site, comprising absorbent materials. AMV Inc. personnel will have necessary training on the handling of, and disposal of, hydrocarbons and spill kits. Any fuel/ chemical spills will be contained and remediated in accordance with the management strategies and actions outlined in the Hydrocarbon Management Plan prepared for the Site (GHD, 2021).

Water contamination barriers

The following water contamination barriers are proposed, to prevent any loss of hydrocarbons and chemicals from the site:

– A 50 m grassed buffer (Development Exclusion Buffer) from the unnamed watercourse and Conservation Class wetland.
– A 200 m buffer from the unnamed water course and Conservation Class wetland to vehicle maintenance areas (as per DoW *WQPN 100*).

  No permanent fuel, oil or chemical storage will occur on the Site. Temporary storage of fuel, oil and chemical solvents within the Site will occur within the bunded vehicle maintenance areas / pits.
– Covered, double bunded impervious vehicle maintenance areas with spill controls in place for hydrocarbon management. Runoff from these areas will be internally draining to a pit and pipe network connected to treatment devices including a sediment trap and pol water separator. Treated water shall outlet to the Site drainage network of swales and bioretention basins. Wastes and oily residue will be disposed to an approved off-site location (Section 4.2.2).
– Interceptor traps shall be installed and maintained throughout the swale network for treatment of track stormwater runoff.

It is noted that a swale exists within 200 m of the vehicle pits in the south-east of the site. Whilst water conveyance through the swale will improve water quality when compared to piped conveyance, it can also be considered a direct connection to the watercourse. It is proposed that all runoff from the pits and maintenance areas in this location should pass through an oil/water separator to remove contaminants before they enter the watercourse. Furthermore, the runoff from this area will pass through a compensating basin before entering the watercourse. This retarding effect on the runoff will allow a chance for the contaminants to settle and/or break down.

5.3.4 Emergency response plan

In the event of a vehicle crash and/or fire, first response extinguishment will be via standard, portable dry chemical fire extinguishers (ABE type). The multipurpose ABE powder is a versatile extinguishant, which is used to extinguish Class A (carbonaceous), Class B (flammable liquid) and Class E (electrical) fires. When dry, the powder may be cleaned up with a vacuum cleaner, or similar. No larger firefighting apparatus are proposed for the AMP, and no firefighting foams are proposed.

As part of Motorsports Australia Regulations, each flag point (attended by a trained marshal) on a racetrack is required to have 2 × 9 kg fire extinguishers available. The AMP racetrack will likely have 5-6 flag points.

In the case of an emergency in the high risk areas of the AMP, the following actions from *WQPN 100: Motor sport facilities near sensitive waters* (DoW, 2007) will be implemented:

– A contingency plan shall be developed before the operational phase and be available on the Site in order to address emergency situations such as accidents, fires and chemical spills that could put local water resources including surface water and groundwater at risk. Relevant AMV Inc. personnel and contractors shall be familiar with the Site emergency response procedures.
– During larger events (potentially up to 20,000 for national race events), adequate emergency response services (e.g. firefighting, security, communications, medical personnel and emergency vehicle access) shall be provided.
– Portable spill kits and containment booms (land socks or similar) shall be kept at various locations, including flag points within the Site with absorbent material to soak up spilt oil, chemicals and/or fuel. Additionally, sand bags or coir logs will be used in the case of a vehicle accident to block flow to drains.

– The plan should be submitted to Water Corporation, City of Albany and Department of Fire and Emergency Services for advice before implementing.

5.3.5 Non-structural measures

There are a number of temporary and non-structural measures are also key management measures for the development and operation of the Site.

Construction

Construction sites can be a major source of silt and other pollutants. Proponents and builders shall be encouraged to undertake good practice on building sites through preparation of a site-specific Construction Environmental Management Plan (Section 6).

A separate Construction Management Plan is also included the in the AMP Environmental Management Plan.

Maintenance

Regular maintenance of the Site drainage system shall be undertaken prior to the start of the wet season. Cleaning of the drainage system, including base of swale drains, interceptor traps in swale drains and bioretention basins will provide an opportunity to remove gross pollutants and silt build up that may enter the receiving water bodies after heavy rainfall. Any vegetation disturbed in the swales and bioretention basins will be re-established to ensure water quality treatment.

In addition to transporting pollutants, drains with accumulated pollutants may also overflow, leading to localised flooding and erosion, and risks to human safety and constructed assets. Maintenance may also include erosion control measures such as rock pitching if required.

Revegetation and landscape management

– Revegetation of the Protected Exclusion Area (Figure 2), which encompasses the Conservation Class wetland and creek line, shall be undertaken as part of the development. Revegetation shall comprise suitable wetland species identified by Bio Diverse Solutions (2019), including Unit 13, Unit 47 and Unit 49 from the *Albany Regional Vegetation Survey Extent* (Sandiford & Barrett, 2010). The proposed native wetland revegetation species will assist in uptake of nutrients and trap sediment in surface runoff and shallow groundwater discharging to the wetland area. These native species include *Baumea juncea* and *Baumea rubiginosa* which are frequently used in bioretention areas for their nutrient uptake abilities.
– A 50 m wide, low fuel ‘Development Exclusion Buffer’ comprising a managed grass area will provide a further buffer for stormwater runoff from the development, and any overflow from bioretention basins. The managed grass buffer will assist to filter and trap sediments and nutrients in overland flow discharged to the unnamed creek line / wetland.
– Use of pesticides and fertilisers shall be limited, and completely excluded within the Protected Exclusion Area and Development Exclusion Buffer. Refer to the Protected Exclusion Area Management Plan in the AMP Environmental Management Plan. Use of herbicides shall be in accordance with the *Use of herbicides in water catchment areas* (Circular No: PSCBB, Department of Health).

Erosion and sediment control

A range of measures will be implemented throughout the Site to minimise erosion and prevent sediment loss from the Site impacting on downstream receptors. Erosion and sediment control measures during construction are detailed in Section 6.

During operation of the Site the erosion and sediment control measures include:

– Sediment traps installed in vehicle maintenance areas.
– Drainage swales that convey stormwater runoff will be vegetated with grass to promote sedimentation and feature regularly spaced interceptor traps.
– The base of drainage swales and diversion drains in higher slope areas will be rock protected and feature regular rock weirs and/or check dams to reduce flow velocity.

6. Construction management

Potential impacts to water resources during construction activities include:

– Soil erosion – construction would result in the exposure of the natural ground surface and subsurface through the removal of vegetation, and excavation and landforming works within the Site which may increase the potential for soil erosion to occur. There is further potential for mobilisation of dust associated with the construction works.
– Surface water quality – construction of the project has the potential to impact surface water quality through the pollution of runoff with sediments, fuel and other hazardous materials from the construction site.
– Disturbance of acid sulfate soils – potential for construction activities to disturb acid sulfate soils.

6.1 Construction Environmental Management Plan

The AMP Environmental Management Plan includes a specific Construction Management Plan, which outlines objectives, broad strategies and actions required to minimise environmental impacts associated with construction of the AMP. The Construction Management Plan applies to the GSMG and all appointed contractors during the construction of the AMP.

It is recommended that a site-specific Construction Environmental Management Plan (CEMP) be prepared for the Site that addresses the management of construction works to ensure no detrimental impacts to the receptors. The CEMP should be referred to DWER for approval. The CEMP shall be maintained during the construction period and Site establishment period and include:

– Temporary bunds, coir logs and silt fences to prevent silt runoff into the drainage system
– Litter and waste storage bins to prevent litter to be blown by wind or washed by rainfall
– Establishing a washing-down area behind the bund or silt fence
– Provide a stabilised entry and exit point to prevent vehicle tracking of soil from the building site onto roads
– Position stockpiles of sand and soil stockpiles to prevent material being tracked, washed, of blown into roads, and then into existing surface drainage or constructed stormwater systems.

6.2 Acid Sulfate Soil Management Plan

Surface and/ or groundwater may also become contaminated through the exposure of ASS during construction (excavation). ASS disturbance may have a range of impacts including enhanced phosphorus leaching, death of vegetation irrigated with affected water, the smothering of benthic aquatic animals by the precipitation of iron, and metal bioaccumulation in aquatic plants and animals. However, based on the ASS assessments to date (refer to Section 2.3.3), inorganic sulfidic sources capable of rapid acid release upon disturbance were not observed. Other, more slow releasing acidity sources were observed in the ASS assessment and will require management if disturbed in volumes greater than 100 m^3.

The following ASS management recommendations are made with regards to the proposed redevelopment:

– Topsoil (0-300 mm) appears acceptable to be stripped and stockpiled for reuse without treatment (pH on average above 4 across the site).
– Neutralisation treatment and validation of soils *will be required* for silty sand soil units disturbed in the proximity of the watercourse area given that there are exceedances of the DWER action criteria (coarse textured soils) *and* if the proposed disturbance of greater than 100 m^3 of soil.
– An ASS management plan will be required (in accordance with DWER guidelines) to enable to the effective excavation, treatment and disposal/reuse of the materials during construction works.
– Soil excavations should only occur during the periods of the year where groundwater is at its lowest point (i.e. outside of winter and post-winter periods) to eliminate the need for temporarily lowering the groundwater table (dewatering). If dewatering is determined to be required, then site specific dewatering risk assessment, management strategies and criteria are required to be developed, approved and implemented.

7. Monitoring

7.1 Monitoring requirements

The objective of the surface water and groundwater monitoring is to assess the operation of the Site against the design criteria (Section 3) and baseline water quality (Section 2.4.5).

Monthly monitoring of surface and groundwater conditions will be completed during the construction and operational period. The monitoring data will be compared to baseline data (Section 2.4.5) to ensure no adverse impacts from construction and operation of the Site on the surface water and groundwater quality and levels.

Event based monitoring will be completed at key locations of drainage infrastructure (bioretention basins) to assess stormwater drainage performance in improving stormwater quality. It is assumed the first flush events will have the highest level of nutrients and chemicals, therefore sampling should occur at the time/after the first significant rainfall event of each wet season, and after extended dry periods. Field notes should include details of the rainfall events, site conditions, time of sampling and time of sample testing.

Additional sampling should also be undertaken in response to any spill events.

A summary of the proposed surface water monitoring program is provided in Table 14. The proposed groundwater monitoring program is provided in Table 15, and the groundwater monitoring sites are shown on Figure 6.

Table 14: Summary of surface water monitoring

Site	Frequency	Duration	Parameters
Surface water - Upstream of the site (TBC) - Mid-stream (CS02) - Downstream of the site (CS01)	Monthly	On-going, with annual reporting	In-situ: pH, EC, temperature Unfiltered sample: pH, EC, TN, FRP, TKN, ammonia, TP, TRH, PAH, BTEXN, surfactants, microbial analysis Filtered sample: Filtered total nitrogen and filtered total phosphorus (to quantify organic component), NO_2/NO_3, PO_4, dissolved heavy metals (As, Cd, Cr, Cu, Pb, Ni, Zn, Hg)
Compensating basin - Inlet (6 No.) and Outlet (6 No.) West-B1 West–B7 East-B3 East-B5 East-B6 East-B10 **Sub-catchment Inlets and Outlets** West 1 Outlet Only (4WD training area) West 3 (DS Culvert W-EXT-CULV & DS Culvert W-CULV1) East 3 Outlet East 1 Outlet (DS of East-E9)	3-4 events per year following 1EY rainfall events or greater		

Table 15: Summary of groundwater monitoring program

Site	Frequency	Duration	Parameters
Monitoring bores (up to 6 bores across the site locations to be confirmed) To include SB04, SB03, SB08, SB09 and 2 others Production bore/s (location to be confirmed)	Monthly	On-going, with annual reporting	Water level In-situ: pH, EC, temperature Unfiltered sample: pH, EC, TN, FRP, TKN, ammonia, TP, TRH, PAH, BTEXN, surfactants, microbial analysis Filtered sample: Filtered total nitrogen and filtered total phosphorus (to quantify organic component), NO_2/NO_3, PO_4, dissolved heavy metals (As, Cd, Cr, Cu, Pb, Ni, Zn, Hg)

7.2 Quality assurance and quality control

A surface and groundwater monitoring plan will be prepared to support ongoing monitoring of the Site for submission and approval by DWER and Water Corporation.

Monitoring will be completed in accordance with the requirements of the *Australian and New Zealand guidelines for fresh and marine water quality* (ANZECC, 2018). Sample collection, processing, transportation, storage, preservation and labelling of water samples will be conducted in accordance with the appropriate industry standards and general water sampling guidance (AS/NZS 5667.1:1998), with collected samples analysed in a NATA accredited laboratory.

Post-development, permanent groundwater monitoring bore locations and sites should be identified and constructed in accordance with industry standards (ASTM D5092/ D5092-16, *Standard practice for design and installation of groundwater monitoring bores*).

7.3 Contingency plan

Should monitoring of groundwater and/ or surface water identify that water quality objectives are not being met the following contingency measures will be implemented:

– Investigate the source or cause of elevated contaminants through site investigation and/or additional monitoring if required.
– Review installation of stormwater management BMPs to ensure they are designed, installed and maintained as required.
– Review implementation of Site procedures for incident management to ensure appropriate measures are undertaken to respond to incidents such as spills and accidents.
– Should further monitoring identify that water quality objectives are not being met, AMV Inc. will notify DWER and the City of Albany to determine requirements further site investigation or remediation actions.

A water quality response and contingency plan will be developed in consultation with the Water Corporation, City of Albany and DWER. The water quality response and contingency plan shall be included in the surface and groundwater monitoring plan.

7.4 Reporting

The AMV Inc. will prepare an annual water quality monitoring report for submission to the DWER and Water Corporation. The annual water monitoring report will summarise surface water and groundwater monitoring results for the calendar year, including comparison to baseline data and previous years of monitoring. The annual report will include summary reporting of any water quality exceedance, including parameters exceeding water quality objectives, measures taken to investigate exceedances, results of additional monitoring and any further actions undertaken.

8. References

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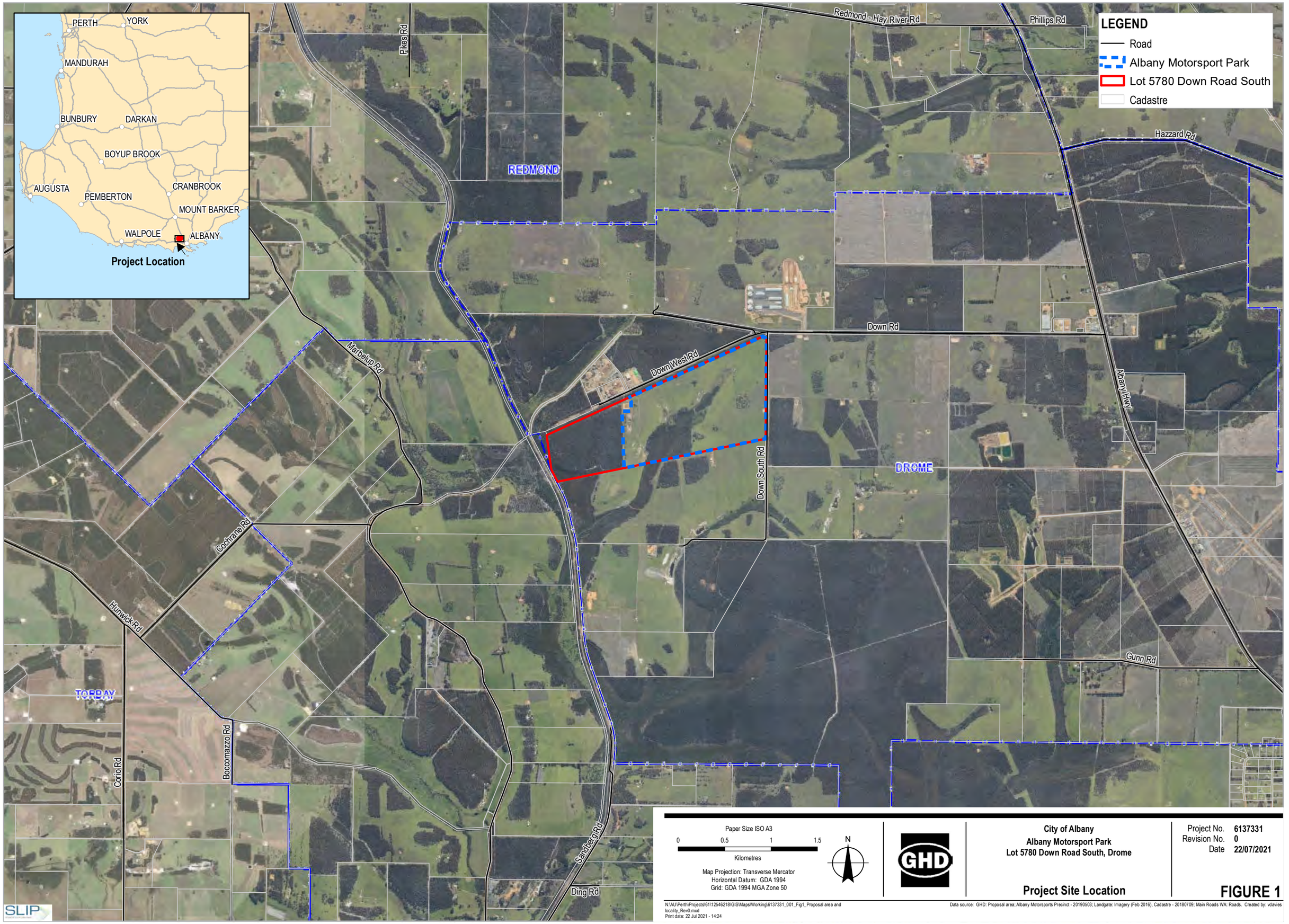
Appendices

Appendix A

Figures



Paper Size ISO A3

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Kilometres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

N

GHD

City of Albany
Albany Motorsport Park
Lot 5780 Down Road South, Drome

Project Site Location

Project No. **6137331**
Revision No. **0**
Date **22/07/2021**

FIGURE 1

N:\AU\Perth\Projects\61\12546218\GIS\Maps\Working\6137331_001_Fig1_Proposal area and locality_Rev0.mxd
Print date: 22 Jul 2021 - 14:24

Data source: GHD: Proposal area; Albany Motorsports Precinct - 20190503; Landgate: Imagery (Feb 2016), Cadastre - 20180709; Main Roads WA: Roads. Created by: vdavies

LEGEND

STAGE 1A

STAGE 1B

MB - MONITORING BORE

DMB - DEEP MONITORING BORE

DOWN ROAD

RT ROAD 7m GRAVEL WITH 2m WIDE VERGES

BOUNDARY AND PRECINCT FENCING - 1.8m HIGH

PROPOSED LEFT TURN LANE OFF DOWN ROAD

ENTRY / EXIT TO PARK

SECURE GATE

SECURITY FENCE

FUTURE RACE TRACK GATEHOUSE

7m WIDE GRAVEL EMERGENCY EXIT (GATED 8m)

POTENTIAL LOCATION WATER SUPPLY FOR FIRE FIGHTING - 110,000L / OR SIMILAR SUITABLE SOURCE

7m WIDE GRAVEL EMERGENCY EXIT (GATED 8m)

POTENTIAL EFFLUENT SYSTEM LOCATION

TRIALS TRACK

BUNDED CONCRETE RE-FUELING & WASHDOWN AREA WITH WASTE WATER TRAP & WATER TANK

AREA FOR SELF-CONTAINED TEMPORARY FOOD VANS

TRANSPORTABLE TOILETS ZONE

PROPOSED SINGLE STOREY MULTIPURPOSE BUILDING (FIRST AID, SCRUTINEERING & STORAGE) BUILDING (~250m² - WOODLAND GREY) WITH WATER TANK & ADJACENT DISABLED BAYS AS REQUIRED

EXISTING DAM

JUNIOR MOTOCROSS AREA

GATE

COVERED CONCRETE BUNDED AREAS FOR GENERATOR (FUEL)

OPEN AIR EMERGENCY MUSTER AREA

NATIVE BUSH

EXISTING FENCE

FENCE - 1.8m HIGH

4WD DRIVER TRAINING & ATV PRECINCT

4m FIRE ACCESS TRACK (GRAVEL) WITH 1m HARDENED SHOULDERS

BOUNDARY

PEDESTRIAN ACCESS

OVERFLOW PARKING SPECTATOR ZONE

MOTOCROSS TRACK 2.1km x 8m WIDE

MOTOCROSS PRECINCT

FENCE - 1.8m HIGH

GRASSED AREA - LOW FUEL MAINTAINED

WETLAND FENCING - 1.2m HIGH

50m WIDE LOW FUEL BUFFER

PROTECTED EXCLUSION AREA

EXISTING VEGETATED CREEK ZONE NO PROPOSED WORK

FUTURE MOTOCROSS GATEHOUSE

4m FIRE ACCESS TRACK (GRAVEL) WITH 1m HARDENED SHOULDERS

WETLAND FENCED IN STAGE 1A

4m FIRE ACCESS TRACK (GRAVEL) WITH 1m HARDENED SHOULDERS

RE-VEGETATED CREEK ZONE

PROTECTED EXCLUSION AREA

GRASSED AREA - LOW FUEL MAINTAINED

GRASSED AREA - LOW FUEL MAINTAINED

RACE TRACK PRECINCT

3.5km x 12m RACE TRACK

TURN 1

TURN 2

TURN 3

TURN 4

TURN 5

TURN 6

TURN 7

TURN 8

TURN 9

TURN 10

TURN 11

SECTION DETAIL REFER A-02

SEALED RECOVERY AREA

GRAVEL BED RUN-OFF

GRAVEL BED RUN-OFF

CONCRETE BARRIER & SAFETY FENCE

SPECTATOR VIEWING AREA (GRASSED & TREES - LOW FUEL)

SPECTATOR PARKING HARDSTAND (250 BAYS) AND FUTURE OVERFLOW PARKING AREA

OVERFLOW PARKING

BOUNDARY (FENCE)

DOWN ROAD SOUTH (GRAVEL)

TRANSPORTABLE SINGLE STOREY CLUBROOMS & TOILETS ~350m²

POTENTIAL EFFLUENT SYSTEM LOCATION

EMERGENCY MUSTER AREA (BITUMEN)

DRIFT TRAINING AREA

COVERED PIT LANE STRUCTURE & HARD STAND

EXISTING WESTERN POWER AERIAL POWER LINE

TRANSPORTABLE FIRST AID / AMBULANCE CONTROL ROOM ~50m²

COMPETITOR PARKING / MARSHALLING

EXISTING GRAVEL ROAD

FUTURE STORAGE SHEDS - NO FUEL OR COMBUSTIBLE MATERIALS STORAGE

WATER SUPPLY FOR FIRE FIGHTING - 110,000L

WATER BORE

TREES ONLY STAGE 1A

EARTH BACKED TYRE / CONCRETE BARRIER AND TREE LINED SHELTER BELT

4m FIRE ACCESS TRACK (GRAVEL) WITH 1m HARDENED SHOULDERS

7m WIDE GRAVEL EMERGENCY EXIT (GATED 8m)

MB

DMB

MASTERPLAN

SCALE 1:2500 @ A1

SCALE 1:5000 @ A3

rev	date	description
A	15-04-2021	ISSUED FOR CLIENT REVIEW
B	27-04-2021	ISSUED FOR CLIENT REVIEW
C	12-05-2021	ISSUED FOR CLIENT REVIEW
D	26-05-2021	ISSUED FOR CLIENT REVIEW
E	05-07-2021	ISSUED FOR DA

p.o. box 1502, albany, western australia 6331
telephone: (08) 9841 5455
email: admin@rgarchitects.com.au

Roberts Gardiner Architects

project
Albany Motorsport Park
Lot 5780 Down Rd, Drome, WA 6330
client
City of Albany

Masterplan - Stage 1

cad file

drawn CB

project number 21-002

scale 1:2500 @A1

date JULY 2021

dwg no. A-01

rev. E

Soil Landscape

242KgDMc - Sands and laterite on elongate crests; Jarrah-Albany Blackbutt-Marri forest.

242KgS7f - Footslopes and swampy valley floors of minor valleys

242KgS7h - Broad valleys in sedimentary rocks; 30 m relief; smooth slopes. Deep sands and iron podzols on slopes; Albany Blackbutt-jarrah-sheoak woodland. Podzols and yellow duplex soils on floors; paperbark woodland, teatree heath.

242ReDMc - Sands and laterite on elongate crests; Jarrah-Albany Blackbutt-Marri forest.

242ReRD - Broadly undulating plateau; scattered lakes and depressions. Yellow duplex soils and laterite on plains. Marri-Jarrah-Albany Blackbutt forest. Yellow solonetzic soils in depressions; Paperbark woodland.

LEGEND

Cadastre

Lot 5780 Down Road South

242ReRD

Down Rd

242ReDMc

Down West Rd

242KgS7h

242KgDMc

242KgS7h

242KgS7f

242KgS7h

242KgDMc

Down South Rd

242KgDMc

242KgS7h

SLIP

Paper Size ISO A3

0 100 200 300

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

N

GHD

City of Albany
Albany Motorsport Park
Environmental Management Plan

DPIRD Soil Landscape Mapping Units

Project No. **61-37331**
Revision No. **0**
Date **21/07/2021**

FIGURE 3

C:\Users\vdavies\Desktop\Motorsports\Data\61\37331_003_Fig10_SoilLandscapeMapping_Rev0.mxd
Print date: 21 Jul 2021 - 20:35

Data source: GHD: Project Site - 20180702; Landgate: Imagery (Feb 2016), Cadastre, Roads - 20180709; DPIRD: Soil Landscape Mapping (Best Available) - 20171220. Created by: vdavies

Paper Size ISO A3

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Metres

Horizontal Datum: GDA 1994
Grid: GCS GDA 1994

N

GHD

City of Albany
Albany Motorsport Park
Environmental Management Plan

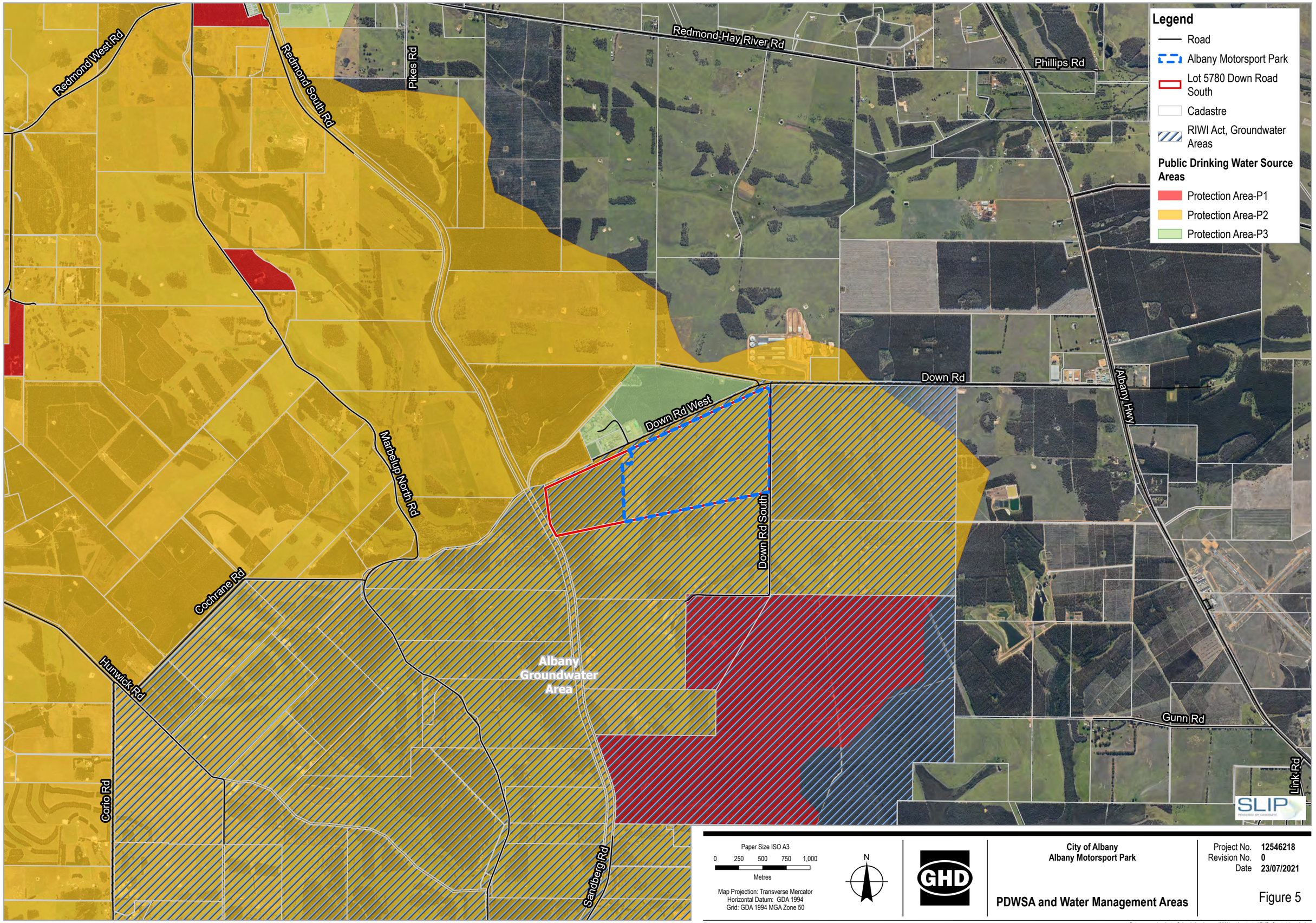
South Coast Significant Wetlands and extrapolated Acid Sulfate Soil risk mapping

Project No. **12546218**
Revision No. **0**
Date **21/07/2021**

Figure 4

N:
\AU\Perth\Projects\61\12546218\GIS\Maps\Working\12546218\12546218_EnvironmentalManagementPlan\12546218_EnvironmentalManagementPlan.aprx\1254
Print date: 21 Jul 2021 - 13:43

Data source: Landgate_Subscription_Imagery\WANow: Landgate / SLIP. Created by: vdavies



Paper Size ISO A3

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Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

N

GHD

City of Albany
Albany Motorsport Park

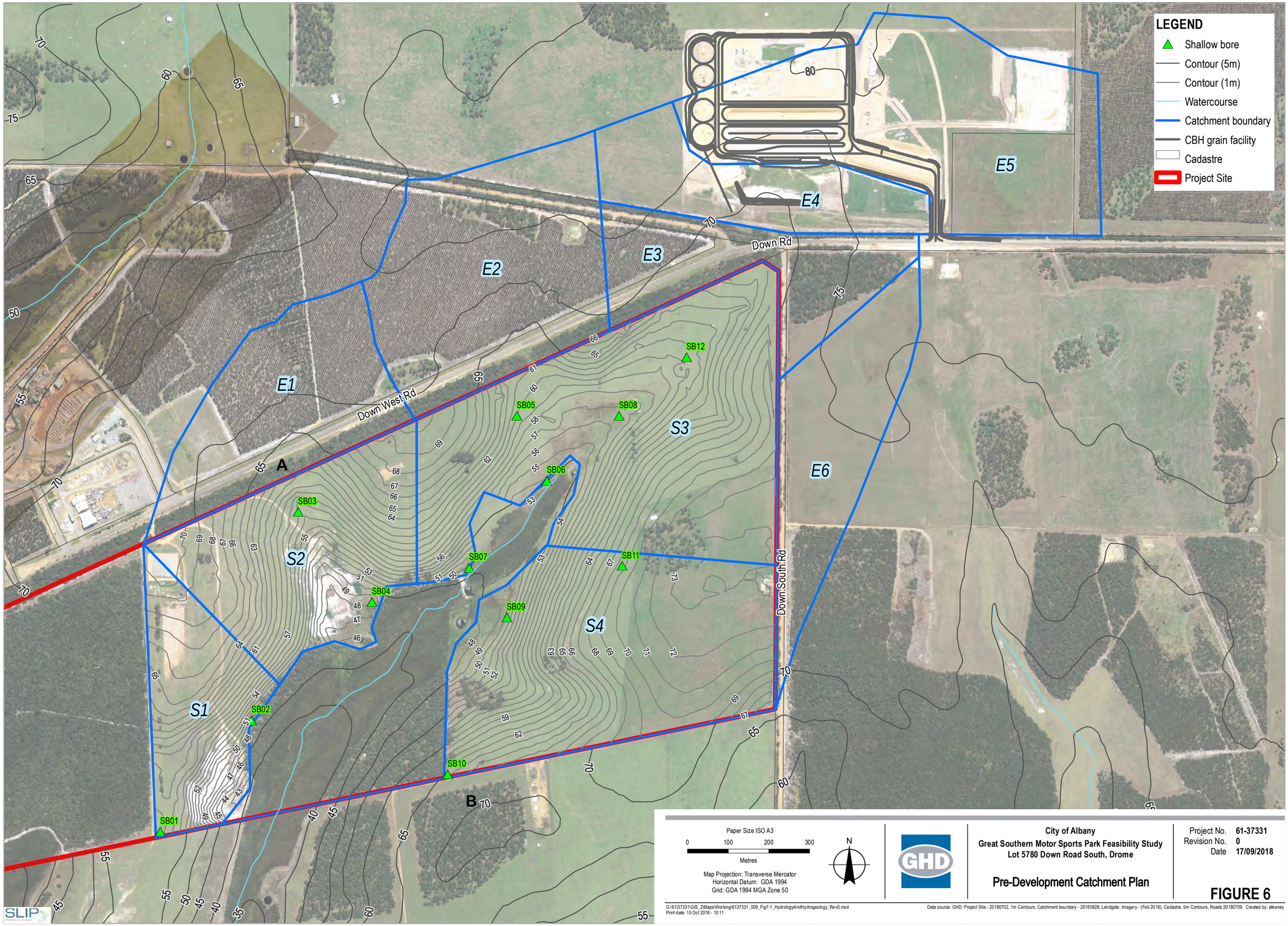
PDWSA and Water Management Areas

Project No. **12546218**
Revision No. **0**
Date **23/07/2021**

Figure 5

N:
\AU\Perth\Projects\61\12546218\GIS\Maps\Working\12546218\12546218_StormwaterManagementPlan\12546218_StormwaterManagementPlan.aprx\12546218
Print date: 23 Jul 2021 - 11:25

Data source: Landgate_Subscription_Imagery\WANow: Landgate / SLIP. Created by: vdavies



Paper Size ISO A3

0 100 200 300

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

N

GHD

City of Albany
Great Southern Motor Sports Park Feasibility Study
Lot 5780 Down Road South, Drome

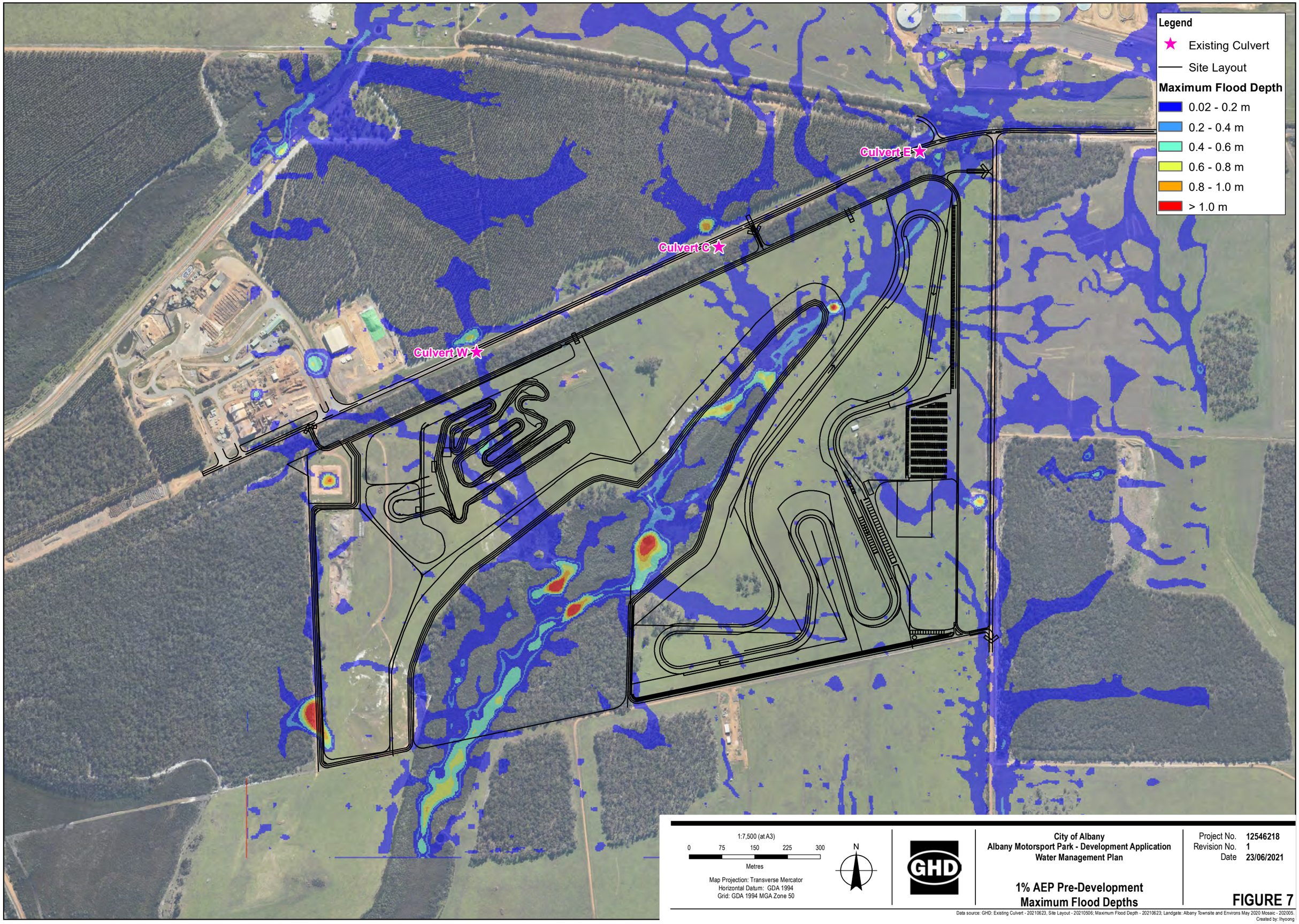
Pre-Development Catchment Plan

Project No. **61-37331**
Revision No. **0**
Date **17/09/2018**

FIGURE 6

G:\61\37331\GIS_2\Maps\Working\6137331_009_Fig7-1_HydrologyAndHydrogeology_Rev0.mxd
Print date: 15 Oct 2018 - 10:11

Data source: GHD: Project Site - 20180702, 1m Contours, Catchment boundary - 20180828; Landgate: Imagery - (Feb 2016), Cadastre, 5m Contours, Roads 20180709. Created by: afeeney



1:7,500 (at A3)

0 75 150 225 300

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

N

GHD

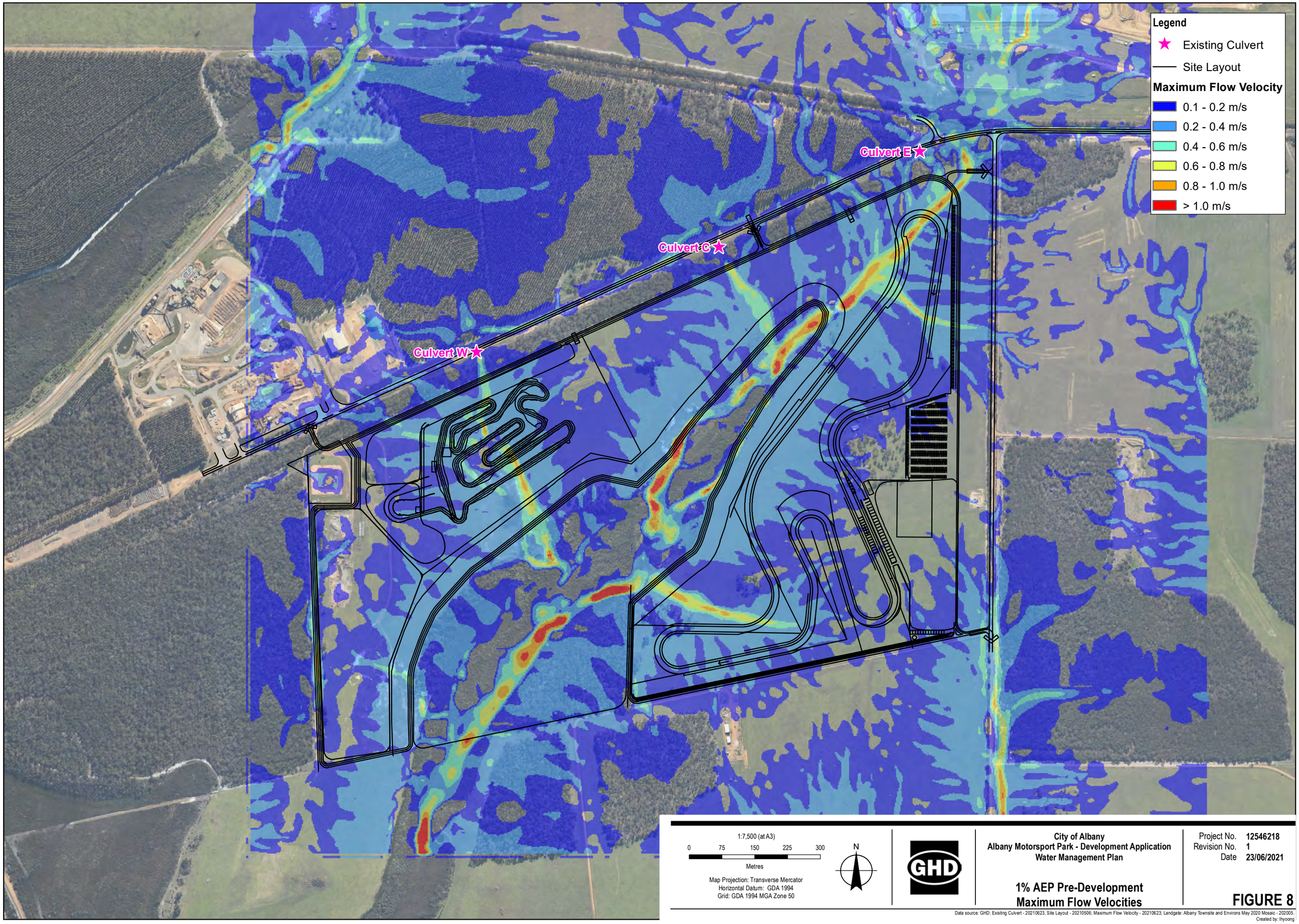
City of Albany
Albany Motorsport Park - Development Application
Water Management Plan

1% AEP Pre-Development Maximum Flood Depths

Project No. **12546218**
Revision No. **1**
Date **23/06/2021**

FIGURE 7

Data source: GHD: Existing Culvert - 20210623, Site Layout - 20210506; Maximum Flood Depth - 20210623; Landgate: Albany Townsite and Environs May 2020 Mosaic - 202005.
Created by: lhyoong



1:7,500 (at A3)

0 75 150 225 300

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

N

GHD

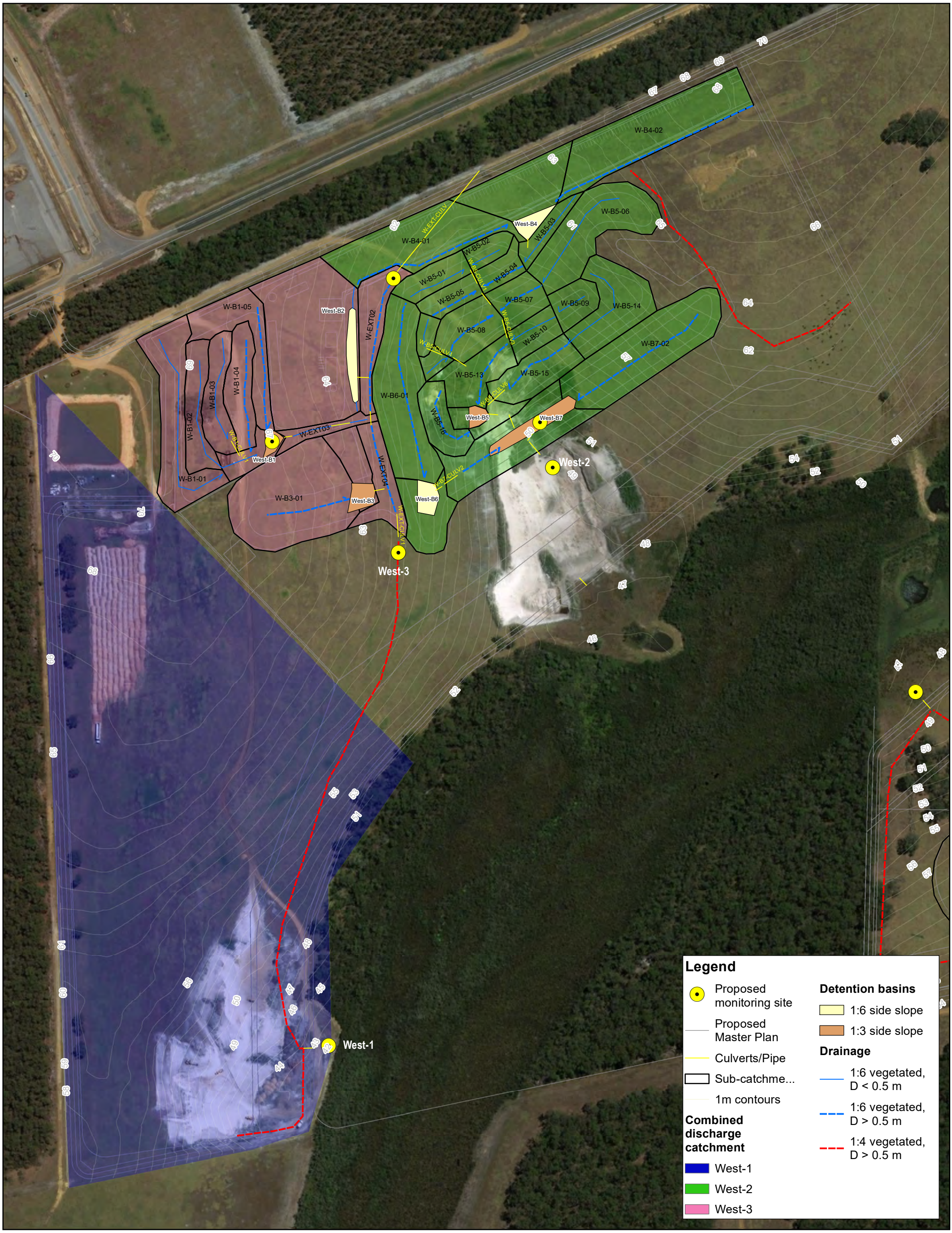
City of Albany
Albany Motorsport Park - Development Application
Water Management Plan

1% AEP Pre-Development
Maximum Flow Velocities

Project No. 12546218
Revision No. 1
Date 23/06/2021

FIGURE 8

Data source: GHD: Existing Culvert - 20210623, Site Layout - 20210506; Maximum Flow Velocity - 20210623; Landgate: Albany Townsite and Environs May 2020 Mosaic - 202005.
Created by: lhyoong



Paper Size ISO A3

0 20 40 60 80

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

N

GHD

City of Albany
Albany Motorsport Park

Stage 1A
Drainage Management Plan

Project No. 12546218
Revision No. A
Date 16/07/2021

FIGURE 9

G:\71\14118\12546218 - Albany\GIS\12546218_Fig9_SWMP-Stage1A.mxd
Print date: 22 Jul 2021 - 17:00

Data source: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community. Created by: bchernandez

Legend

Proposed monitoring site

Proposed Master Plan

Culverts/Pipe

Sub-catchments

1m contours

Detention basins

1:6 side slope

Combined discharge catchment

East-1

East-2

East-3

East-4

Drainage

1:6 vegetated, D < 0.5 m

1:6 vegetated, D > 0.5 m

1:4 vegetated, D < 0.5 m

1:4 vegetated, D > 0.5 m

Trench drain

East-B1

East-B2

East-B3

East-B4

East-B5

East-B6

East-B7

East-B8

East-B9

East-B10

E-B1-01

E-B1-02

E-B1-03

E-B1-04

E-B2-01

E-B2-02

E-B3-01

E-B3-02

E-B4-01

E-B4-02

E-B5-01

E-B5-02

E-B6-01

E-B6-02

E-B6-03

E-B7-01

E-B7-02

E-B7-03

E-B7-04

E-B7-05

E-B7-06

E-B7-07

E-B7-08

E-B7-09

E-B7-10

E-B7-11

E-B8-01

E-B8-02

E-B9-01

E-B9-02

E-B9-03

E-B9-04

E-B9-05

E-B9-06

E-B9-07

E-B9-08

E-B10-01

E-B10-02

E-B10-03

E-B10-04

E-B10-05

E-B1-CULV1

E-B5-CULV1

E-B6-CULV1

E-B7-CULV1

E-B7-CULV2

E-B7-CULV3

E-B9-CULV1

E-B9-CULV2

E-B9-CULV3

E-B10-CULV1

Paper Size ISO A3

0 25 50 75 100

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

N

GHD

City of Albany
Albany Motorsport Park

Stage 1B
Drainage Management Plan

Project No. **12546218**
Revision No. **A**
Date **16/07/2021**

FIGURE 10

G:\71\14118\12546218 - Albany\GIS\12546218_Fig10_SWMP-Stage1B.mxd
Print date: 22 Jul 2021 - 17:27

Appendix B

Albany Motorsport Park Development, Pavement Investigation (Great Southern Geotechics , 2021)

GREAT SOUTHERN GEOTECHNICS

CONSTRUCTION MATERIALS TESTING

Pavement Investigation

Report 4212/1

Friday, 9 April 2021

GHD

Albany Motorsport Park Development

GREAT SOUTHERN GEOTECHNICS

1.0 INTRODUCTION

As authorised by GHD
an ivestigation for the proposed Albany Motorsport Park Development adjacent to Down Rd, Mirambeena
was performed on the 25/03/2021

2.0 GENERAL

The intent of the investigation was to determine the following:

- Soil types and profiles.
- Characteristics of soil properties on select samples including Particle Size and Consistency Limits. (Liquid Limit, Plastic Limit, Plasticity Index & Linear Shrinkage).
- In Situ pearmeability rates. (Where applicable)
- Groundwater levels at time of investigation.

3.0 SITE INVESTIGATION

Site conditions and test pit locations were recorded and are displayed in Appendix A - Maps.
Test pits logs various materials types are noted in Appendix B - Test Pit Logs

The field investigation consisted of 8 Boreholes excavated on-site to depths of up to 2.5 meters using a Kubota KX41-3V mini excavator with a 300mm Auger.

Test pits were spread across the extent of the proposed development and locations were predetermined by GHD.
All soil layers encountered were visually assessed and classified on-site.

Samples gathered from site were the taken back to Great Southern Geotechnics Albany Laboratory For further processing and analysis.

IMPORTANT NOTE: The test pits have been spread so that they are representative of the subsurface materials across the intended reconstruction area, however, soil conditions may change dramatically over short distances and our investigations may not locate all soil variations across the site.

4.0 LABORATORY TESTING

Results of any relevant Laboratory testing preformed are shown in Appendix C. (Test Results Report 4212/2)

This report and associated documentation was undertaken for the specific purpose described in the report and shall not be relied on for other purposes.

This report was prepared solely for the use by GHD any reliance assumed by other parties on this report shall be at such parties own risk.

Appendix A

Maps

Figure 1

Test Pits 1 to 8

Test Pit Locations

GREAT SOUTHERN GEOTECHNICS
CONSTRUCTION MATERIALS TESTING

Job No: 4212
Client: GHD
Project: Albany Motorsport Park Development

Appendix B

Test Pit Logs

GREAT SOUTHERN GEOTECHNICS
CONSTRUCTION MATERIALS TESTING

Job No	Test Pit No.	Sample No.	Sheet		of	
4212	1	4212G1	1		of	16

Client:	GHD	**Date Commenced**	**Operator/Contractor:**	GSG	
Project:	Albany Motorsport Park Development	25/03/2021	**Equipment type:**	Kubota KX41-3V	
Project No.	12546218	**Logged By**	**Excavation Method :**	300mm Auger	
Location:	34°55'58.4"S 117°44'13.1"E	M.Coffey	**Position:**	Refer to site plan	

Depth Below Surface (mm)	Layer Depth (mm)	Material Description SOIL TYPE, Plasticity, Colour, Particle characteristics, Secondary and other minor components	Moist. Condition	Consistency / Strength	Cementation	Water Table	Classification Symbol	Sample/Test
						No water table encountered.		
0 - 200	200	**(Topsoil) SAND with silt:** Dark grey, fine to medium. Roots and root fibres.	M	MD				
200 - 550	350	**SANDY gravel:** Brown, fine to coarse, sub-rounded to sub-angular.	M	MD-D				
		Fine to medium grained sand.						
550 - 2500	1950	**Sandy CLAY:** Low to medium plasticity, light brown/orange mottled red.	M	F				
		Fine to medium grained sand.						

Target Depth	✓	2500
Cave In		
Refusal		
Near Refusal		
Flooding		
Lack of Reach		

Cohesive	Non-Cohesive	Rock	Cementation
VS - Very Soft	VL - Very Loose	EL - Extremely Low	IN - Indurated
S - Soft	L - Loose	VL - Very Low	PC - Poorly Cemented
F - Firm	MD - Medium Dense	L - Low	
St - Stiff	D - Dense	M - Medium	MC - moderately Cemented
VSt - Very Stiff	VD - Very Dense	H - High	
H - Hard	CO - Compact	VH - Very High	WC - Well Cemented
		EH - Extremely High	

General

D - Dry M - Moist W - Wet
N/A - Not Applicable
N/D - Not Determined

Test Pit No.1

Excavation

Spoil

GREAT SOUTHERN GEOTECHNICS CONSTRUCTION MATERIALS TESTING	**Job No:** 4212 **Client:** GHD **Project:** Albany Motorsport Park Development	**Sheet** 2 **of** 16

GREAT SOUTHERN GEOTECHNICS CONSTRUCTION MATERIALS TESTING	Job No 4212	Test Pit No. 2	Sample No. 4212G2	Sheet 3 of 16

Client:	GHD	**Date Commenced**	25/03/2021	**Operator/Contractor:**	GSG
Project:	Albany Motorsport Park Development	**Logged By**	M.Coffey	**Equipment type:**	Kubota KX41-3V
Project No.	12546218			**Excavation Method :**	300mm Auger
Location:	34°56'03.7"S 117°44'12.6"E			**Position:**	Refer to site plan

Depth Below Surface (mm)	Layer Depth (mm)	Material Description SOIL TYPE, Plasticity, Colour, Particle characteristics, Secondary and other minor components	Moist. Condition	Consistency / Strength	Cementation	Water Table	Classification Symbol	Sample/Test
						No water table encountered.		
0 - 100	100	**(Topsoil) SAND with silt:** Dark grey, fine to medium. Roots and root fibres.	M	MD				
100 - 500	400	**SANDY gravel:** Brown, fine to coarse, sub-rounded to sub-angular.	M	MD-D				
		Fine to medium grained sand.						
500 - 2500	2000	**Sandy CLAY:** Low to medium plasticity, light brown/orange mottled red.	M	F				
		Fine to medium grained sand.						

Target Depth	✓	2500
Cave In		
Refusal		
Near Refusal		
Flooding		
Lack of Reach		

Cohesive	Non-Cohesive	Rock	Cementation
VS - Very Soft	VL - Very Loose	EL - Extremely Low	IN - Indurated
S - Soft	L - Loose	VL - Very Low	PC - Poorly Cemented
F - Firm	MD - Medium Dense	L - Low	
St - Stiff	D - Dense	M - Medium	MC - moderately Cemented
VSt - Very Stiff	VD - Very Dense	H - High	
H - Hard	CO - Compact	VH - Very High	WC - Well Cemented
		EH - Extremely High	

General

D - Dry M - Moist W - Wet

N/A - Not Applicable

N/D - Not Determined

Test Pit No.2

Excavation

Spoil

GREAT SOUTHERN GEOTECHNICS CONSTRUCTION MATERIALS TESTING	**Job No:** 4212 **Client:** GHD **Project:** Albany Motorsport Park Development	**Sheet** 4 **of** 16

GREAT SOUTHERN GEOTECHNICS
CONSTRUCTION MATERIALS TESTING

Job No	Test Pit No.	Sample No.	Sheet		of	
4212	3	4212G3	5		16	

Client:	GHD	**Date Commenced**	**Operator/Contractor:**	GSG	
Project:	Albany Motorsport Park Development	25/03/2021	**Equipment type:**	Kubota KX41-3V	
Project No.	12546218	**Logged By**	**Excavation Method :**	300mm Auger	
Location:	34°56'11.6"S 117°44'13.5"E	M.Coffey	**Position:**	Refer to site plan	

Depth Below Surface (mm)	Layer Depth (mm)	Material Description SOIL TYPE, Plasticity, Colour, Particle characteristics, Secondary and other minor components	Moist. Condition	Consistency / Strength	Cementation	Water Table	Classification Symbol	Sample/Test
						No water table encountered.		
0 - 160	160	**(Topsoil) Gravelly SAND with silt:** Grey/brown, fine to medium.	DM	L-MD				
		Fine to medium, sub-rounded to sub-angular, gravel.						
160 - 2100	1940	**(FILL) Sandy GRAVEL with clay**: Low to medium plasticity, brown/red	M	MD				
		Fine to coarse, sub-rounded to sub-angular gravel. Fine to medium grained sand.						
2100 - 2500	400	**SAND with silt:** White, fine.	M	L-MD				

Target Depth	✓	2500
Cave In		
Refusal		
Near Refusal		
Flooding		
Lack of Reach		

Cohesive	Non-Cohesive	Rock	Cementation
VS - Very Soft	VL - Very Loose	EL - Extremely Low	IN - Indurated
S - Soft	L - Loose	VL - Very Low	PC - Poorly Cemented
F - Firm	MD - Medium Dense	L - Low	
St - Stiff	D - Dense	M - Medium	MC - moderately Cemented
VSt - Very Stiff	VD - Very Dense	H - High	
H - Hard	CO - Compact	VH - Very High	WC - Well Cemented
		EH - Extremely High	

General

D - Dry M - Moist W - Wet

N/A - Not Applicable

N/D - Not Determined

Test Pit No.3

Excavation

Spoil

GREAT SOUTHERN GEOTECHNICS CONSTRUCTION MATERIALS TESTING	**Job No:** 4212 **Client:** GHD **Project:** Albany Motorsport Park Development	**Sheet** 6 **of** 16

GREAT SOUTHERN GEOTECHNICS
CONSTRUCTION MATERIALS TESTING

Job No	Test Pit No.	Sample No.	Sheet		of	
4212	4	4212G4	7		16	

Client:	GHD	**Date Commenced**	**Operator/Contractor:**	GSG	
Project:	Albany Motorsport Park Development	25/03/2021	**Equipment type:**	Kubota KX41-3V	
Project No.	12546218	**Logged By**	**Excavation Method :**	300mm Auger	
Location:	34°55'55.3"S 117°44'25.3"E	M.Coffey	**Position:**	Refer to site plan	

Depth Below Surface (mm)	Layer Depth (mm)	Material Description SOIL TYPE, Plasticity, Colour, Particle characteristics, Secondary and other minor components	Moist. Condition	Consistency / Strength	Cementation	Water Table	Classification Symbol	Sample/Test
0 - 50	50	**(Topsoil) SAND with silt:** Grey, fine to medium. Roots and root fibres.	D	L		No water table encountered.		
50 - 850	800	**SAND with silt:** Light grey/white, fine to medium.	D-M	L-MD				
850 - 2500	1650	**SAND with silt:** Brown, fine to medium.	M	D	WC			

Target Depth	✓	2500
Cave In		
Refusal		
Near Refusal		
Flooding		
Lack of Reach		

Cohesive	Non-Cohesive	Rock	Cementation
VS - Very Soft	VL - Very Loose	EL - Extremely Low	IN - Indurated
S - Soft	L - Loose	VL - Very Low	PC - Poorly Cemented
F - Firm	MD - Medium Dense	L - Low	
St - Stiff	D - Dense	M - Medium	MC - moderately Cemented
VSt - Very Stiff	VD - Very Dense	H - High	
H - Hard	CO - Compact	VH - Very High	WC - Well Cemented
		EH - Extremely High	

General

D - Dry M - Moist W - Wet

N/A - Not Applicable

N/D - Not Determined

Test Pit No.4

Excavation

Spoil

GREAT SOUTHERN GEOTECHNICS CONSTRUCTION MATERIALS TESTING	**Job No:** 4212 **Client:** GHD **Project:** Albany Motorsport Park Development	**Sheet** 8 **of** 16

GREAT SOUTHERN GEOTECHNICS
CONSTRUCTION MATERIALS TESTING

Job No	Test Pit No.	Sample No.	Sheet		
4212	5	4212G5	9	of	16

Client:	GHD	**Date Commenced**	**Operator/Contractor:**	GSG
Project:	Albany Motorsport Park Development	25/03/2021	**Equipment type:**	Kubota KX41-3V
Project No.	12546218	**Logged By**	**Excavation Method :**	300mm Auger
Location:	34°55'52.7"S 117°44'34.4"E	M.Coffey	**Position:**	Refer to site plan

Depth Below Surface (mm)	Layer Depth (mm)	Material Description SOIL TYPE, Plasticity, Colour, Particle characteristics, Secondary and other minor components	Moist. Condition	Consistency / Strength	Cementation	Water Table	Classification Symbol	Sample/Test
						No water table encountered.		
0 - 240	240	**(Topsoil) SAND with silt:** Grey, fine to medium. Roots and root fibres.	D	L-MD				
240 - 1100	860	**SAND with silt:** Light grey/white, fine to medium.	M	L-MD				
1100 - 2500	1400	**Gravelly SAND with silt:** Light brown, fine to medium.	M	MD	PC			
		Fine to medium, sub-rounded to sub-angular gravel.						

Target Depth	✓	2500
Cave In		
Refusal		
Near Refusal		
Flooding		
Lack of Reach		

Cohesive	Non-Cohesive	Rock	Cementation
VS - Very Soft	VL - Very Loose	EL - Extremely Low	IN - Indurated
S - Soft	L - Loose	VL - Very Low	PC - Poorly Cemented
F - Firm	MD - Medium Dense	L - Low	
St - Stiff	D - Dense	M - Medium	MC - moderately Cemented
VSt - Very Stiff	VD - Very Dense	H - High	
H - Hard	CO - Compact	VH - Very High	WC - Well Cemented
		EH - Extremely High	

General

D - Dry M - Moist W - Wet

N/A - Not Applicable

N/D - Not Determined

Test Pit No.5

Excavation

Spoil

GREAT SOUTHERN GEOTECHNICS CONSTRUCTION MATERIALS TESTING	**Job No:** 4212 **Client:** GHD **Project:** Albany Motorsport Park Development	**Sheet** 10 **of** 16

GREAT SOUTHERN GEOTECHNICS
CONSTRUCTION MATERIALS TESTING

Job No	Test Pit No.	Sample No.	Sheet		of	
4212	6	4212G6	11		16	

Client:	GHD	**Date Commenced**	**Operator/Contractor:**	GSG	
Project:	Albany Motorsport Park Development	25/03/2021	**Equipment type:**	Kubota KX41-3V	
Project No.	12546218	**Logged By**	**Excavation Method :**	300mm Auger	
Location:	34°55'40.7"S 117°44'59.9"E	M.Coffey	**Position:**	Refer to site plan	

Depth Below Surface (mm)	Layer Depth (mm)	Material Description SOIL TYPE, Plasticity, Colour, Particle characteristics, Secondary and other minor components	Moist. Condition	Consistency / Strength	Cementation	Water Table	Classification Symbol	Sample/Test
0 - 180	180	**(Topsoil) SAND with silt: Grey, fine to medium. Roots and root fibres.**	M	L-MD		No water table encountered.		
180 - 1400	1220	**SAND with silt:** Light grey/white, fine to medium.	M	L-MD				
1400 - 2500	1100	**SAND with silt:** Light brown, fine to medium.	M	MD-D	MC			

***Cobbles noted on outer edge of test pit in shoulder.**

Target Depth	✓	2500
Cave In		
Refusal		
Near Refusal		
Flooding		
Lack of Reach		

Cohesive	Non-Cohesive	Rock	Cementation
VS - Very Soft	VL - Very Loose	EL - Extremely Low	IN - Indurated
S - Soft	L - Loose	VL - Very Low	PC - Poorly Cemented
F - Firm	MD - Medium Dense	L - Low	
St - Stiff	D - Dense	M - Medium	MC - moderately Cemented
VSt - Very Stiff	VD - Very Dense	H - High	
H - Hard	CO - Compact	VH - Very High	WC - Well Cemented
		EH - Extremely High	

General

D - Dry M - Moist W - Wet

N/A - Not Applicable

N/D - Not Determined

Test Pit No.6

Excavation

Spoil

GREAT SOUTHERN GEOTECHNICS CONSTRUCTION MATERIALS TESTING	**Job No:** 4212 **Client:** GHD **Project:** Albany Motorsport Park Development	**Sheet** 12 **of** 16

GREAT SOUTHERN GEOTECHNICS
CONSTRUCTION MATERIALS TESTING

Job No	Test Pit No.	Sample No.	Sheet		of	
4212	7	4212G7	13		16	

Client:	GHD	**Date Commenced**	**Operator/Contractor:**	GSG	
Project:	Albany Motorsport Park Development	25/03/2021	**Equipment type:**	Kubota KX41-3V	
Project No.	12546218	**Logged By**	**Excavation Method :**	300mm Auger	
Location:	34°55'52.2"S 117°44'50.8"E	M.Coffey	**Position:**	Refer to site plan	

Depth Below Surface (mm)	Layer Depth (mm)	Material Description SOIL TYPE, Plasticity, Colour, Particle characteristics, Secondary and other minor components	Moist. Condition	Consistency / Strength	Cementation	Water Table	Classification Symbol	Sample/Test
						No water table encountered.		
0 - 170	170	**(Topsoil) SAND with silt:** Grey, fine to medium. Roots and root fibres.	D	MD				
170 - 450	280	**SAND with silt:** Light grey, fine to medium.	D	L-MD				
450 - 2100	1650	**Sandy GRAVEL:** Brown, fine to coarse, sub-rounded to sub-angular.	D	MD-D				
		Fine to medium grained sand.						
2100 - 2500	400	**Gravelly SAND with silt:** Light brown, fine to medium.	D	MD				
		Fine to medium, sub-rounded to sub-angualr gravel.						

Target Depth	✓	2500
Cave In		
Refusal		
Near Refusal		
Flooding		
Lack of Reach		

Cohesive	Non-Cohesive	Rock	Cementation
VS - Very Soft	VL - Very Loose	EL - Extremely Low	IN - Indurated
S - Soft	L - Loose	VL - Very Low	PC - Poorly Cemented
F - Firm	MD - Medium Dense	L - Low	
St - Stiff	D - Dense	M - Medium	MC - moderately Cemented
VSt - Very Stiff	VD - Very Dense	H - High	
H - Hard	CO - Compact	VH - Very High	WC - Well Cemented
		EH - Extremely High	

General

D - Dry M - Moist W - Wet

N/A - Not Applicable

N/D - Not Determined

Test Pit No.7

Excavation

Spoil

GREAT SOUTHERN GEOTECHNICS CONSTRUCTION MATERIALS TESTING	**Job No:** 4212 **Client:** GHD **Project:** Albany Motorsport Park Development	**Sheet** 14 **of** 16

GREAT SOUTHERN GEOTECHNICS
CONSTRUCTION MATERIALS TESTING

Job No	Test Pit No.	Sample No.	Sheet		of	
4212	8	4212G8	15		16	

Client:	GHD	**Date Commenced**	**Operator/Contractor:**	GSG	
Project:	Albany Motorsport Park Development	25/03/2021	**Equipment type:**	Kubota KX41-3V	
Project No.	12546218	**Logged By**	**Excavation Method :**	300mm Auger	
Location:	34°56'03.5"S 117°44'40.4"E	M.Coffey	**Position:**	Refer to site plan	

Depth Below Surface (mm)	Layer Depth (mm)	Material Description SOIL TYPE, Plasticity, Colour, Particle characteristics, Secondary and other minor components	Moist. Condition	Consistency / Strength	Cementation	Water Table	Classification Symbol	Sample/Test
						No water table encountered.		
0 - 200	200	**(Topsoil) SAND with silt:** Grey, fine to medium. Roots and root fibres.	D	MD				
200 - 950	750	**SAND with silt:** Light grey, fine to medium.	D	MD				
950 - 2500	1550	**Sandy GRAVEL:** Brown, fine to coarse, sub-rounded to sub-angular.	D	MD-D				
		Fine to medium grained sand.						

Target Depth	✓	2500
Cave In		
Refusal		
Near Refusal		
Flooding		
Lack of Reach		

Cohesive	Non-Cohesive	Rock	Cementation
VS - Very Soft	VL - Very Loose	EL - Extremely Low	IN - Indurated
S - Soft	L - Loose	VL - Very Low	PC - Poorly Cemented
F - Firm	MD - Medium Dense	L - Low	
St - Stiff	D - Dense	M - Medium	MC - moderately Cemented
VSt - Very Stiff	VD - Very Dense	H - High	
H - Hard	CO - Compact	VH - Very High	WC - Well Cemented
		EH - Extremely High	

General

D - Dry M - Moist W - Wet

N/A - Not Applicable

N/D - Not Determined

Test Pit No.8

Excavation

Spoil

GREAT SOUTHERN GEOTECHNICS CONSTRUCTION MATERIALS TESTING	**Job No:** 4212 **Client:** GHD **Project:** Albany Motorsport Park Development	**Sheet** 16 **of** 16

Appendix C

Test Results

GREAT SOUTHERN GEOTECHNICS
CONSTRUCTION MATERIALS TESTING

5a 209 Chester Pass Rd, Milpara WA 6330
Phone: 0407 903 297
Email: Info@gsgeotechnics.com
WWW.GSGEOTECHNICS.COM

Client: GHD
Project: Albany Motorsport Park Development
Section: Test Pit 4

Client Number: 12546218
Date of Test: 25/03/2021

Talsma-Hallam Permeameter Test Report

Layer Type	In Situ	Material Description	Refer to Test Pit Logs (Report 4212/1)

Sample No.	4212G9

Saturated Hydraulic Conductivity (cm/min)	0.0913
Saturated Hydraulic Conductivity (m/day)	1.31
Saturated Hydraulic Conductivity (m/sec)	1.52E-05

Site Location

Comments: The Talsma-Hallam Permeameter is not a method covered by Great Southern Geotechnics Scope of Accreditation.

Disclaimer: Great Southern Geotechnics does not warrant data produced by use of this spreadsheet or any interpretation based on that data.

Distribution: Laboratory File / Vicki Davies - GHD
Document ID: WS_1547_TalsmaHallam_Rev2_Mar2020

Name: M.Coffey
Function: Quality Manager
Date: 9/04/2021
Approved By:

GREAT SOUTHERN GEOTECHNICS
CONSTRUCTION MATERIALS TESTING

5a 209 Chester Pass Rd, Milpara WA 6330
Phone: 0407 903 297
Email: Info@gsgeotechnics.com
WWW.GSGEOTECHNICS.COM

Client: GHD
Project: Albany Motorsport Park Development
Section: Test Pit 5

Client Number: 12546218
Date of Test: 25/03/2021

Talsma-Hallam Permeameter Test Report

Layer Type	In Situ	Material Description	Refer to Test Pit Logs (Report 4212/1)

Sample No.	4212G10

Saturated Hydraulic Conductivity (cm/min)	0.0342
Saturated Hydraulic Conductivity (m/day)	0.49
Saturated Hydraulic Conductivity (m/sec)	5.70E-06

Site Location

Comments: The Talsma-Hallam Permeameter is not a method covered by Great Southern Geotechnics Scope of Accreditation.

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Distribution: Laboratory File / Vicki Davies - GHD
Document ID: WS_1547_TalsmaHallam_Rev2_Mar2020

Name: M.Coffey
Function: Quality Manager
Date: 9/04/2021
Approved By:

GREAT SOUTHERN GEOTECHNICS
CONSTRUCTION MATERIALS TESTING

5a 209 Chester Pass Rd, Milpara WA 6330
Phone: 0407 903 297
Email: Info@gsgeotechnics.com
WWW.GSGEOTECHNICS.COM

Client: GHD
Project: Albany Motorsport Park Development
Section: Test Pit 6

Client Number: 12546218
Date of Test: 25/03/2021

Talsma-Hallam Permeameter Test Report

Layer Type	In Situ	Material Description	Refer to Test Pit Logs (Report 4212/1)

Sample No.	4212G11

Saturated Hydraulic Conductivity (cm/min)	0.2282
Saturated Hydraulic Conductivity (m/day)	3.29
Saturated Hydraulic Conductivity (m/sec)	3.80E-05

Site Location

Comments: The Talsma-Hallam Permeameter is not a method covered by Great Southern Geotechnics Scope of Accreditation.

Disclaimer: Great Southern Geotechnics does not warrant data produced by use of this spreadsheet or any interpretation based on that data.

Distribution: Laboratory File / Vicki Davies - GHD
Document ID: WS_1547_TalsmaHallam_Rev2_Mar2020

Name: M.Coffey
Function: Quality Manager
Date: 9/04/2021
Approved By:

GREAT SOUTHERN GEOTECHNICS
CONSTRUCTION MATERIALS TESTING

5a 209 Chester Pass Rd, Milpara WA 6330
Phone: 0407 903 297
Email: Info@gsgeotechnics.com
WWW.GSGEOTECHNICS.COM

Client: GHD
Project: Albany Motorsport Park Development
Section: Test Pit 7

Client Number: 12546218
Date of Test: 25/03/2021

Talsma-Hallam Permeameter Test Report

Layer Type	In Situ	Material Description	Refer to Test Pit Logs (Report 4212/1)

Sample No.	4212G12

Saturated Hydraulic Conductivity (cm/min)	0.2282
Saturated Hydraulic Conductivity (m/day)	3.29
Saturated Hydraulic Conductivity (m/sec)	3.80E-05

Site Location

Comments: The Talsma-Hallam Permeameter is not a method covered by Great Southern Geotechnics Scope of Accreditation.

Disclaimer: Great Southern Geotechnics does not warrant data produced by use of this spreadsheet or any interpretation based on that data.

Distribution: Laboratory File / Vicki Davies - GHD
Document ID: WS_1547_TalsmaHallam_Rev2_Mar2020

Name: M.Coffey
Function: Quality Manager
Date: 9/04/2021
Approved By:

GREAT SOUTHERN GEOTECHNICS
CONSTRUCTION MATERIALS TESTING

5a 209 Chester Pass Rd, Milpara WA 6330
Phone: 0407 903 297
Email: Info@gsgeotechnics.com
WWW.GSGEOTECHNICS.COM

Client: GHD
Project: Albany Motorsport Park Development
Section: Test Pit 8

Client Number: 12546218
Date of Test: 25/03/2021

Talsma-Hallam Permeameter Test Report

Layer Type	In Situ	Material Description	Refer to Test Pit Logs (Report 4212/1)

Sample No.	4212G13

Saturated Hydraulic Conductivity (cm/min)	0.0285
Saturated Hydraulic Conductivity (m/day)	0.41
Saturated Hydraulic Conductivity (m/sec)	4.75E-06

Site Location

Comments: The Talsma-Hallam Permeameter is not a method covered by Great Southern Geotechnics Scope of Accreditation.

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Distribution: Laboratory File / Vicki Davies - GHD
Document ID: WS_1547_TalsmaHallam_Rev2_Mar2020

Name: M.Coffey
Function: Quality Manager
Date: 9/04/2021
Approved By:

GREAT SOUTHERN GEOTECHNICS
CONSTRUCTION MATERIALS TESTING

COLOURS

BLACK – BROWN (bk)	BLUE (bl)	ORANGE (or)
BROWN (br)	BLUE – GREEN (bl/gr)	RED (rd)
GREY – BROWN (gy/br)	GREEN (gr)	RED – BROWN (rd/br)
GREY (gy)	YELLOW (yl)	PINK (pk)
BLUE – GREY (bl/gy)	YELLOW – BROWN (yl/br)	PURPLE (pr)

MOISTURE CONDITION OF SOIL

TERM	DESCRIPTION
Dry	Cohesive soils; hard and friable or powdery, well dry of plastic limit. Granular soils; cohesionless and free-running.
Moist	Soil feels cool, darkened in colour. Cohesive soils can be moulded. Granular soils tend to cohere.
Wet	Soil feels cool, darkened in colour. Cohesive soils usually weakened and free water forms on hands when handling. Granular soils tend to cohere and free water forms on hands when handling.

PARTICLE SHAPES

ANGULAR	SUB-ANGULAR	SUB-ROUNDED	ROUNDED




PARTICLE SIZES

BOULDERS	COBBLES	COARSE GRAVEL	MEDIUM GRAVEL	FINE GRAVEL	COARSE SAND	MEDIUM SAND	FINE SAND	SILT	CLAY
>200mm	63-200mm	20-63mm	6-20mm	2.36-6mm	0.6-2.36mm	0.2-0.6mm	0.075-0.2mm	0.002-0.075mm	<0.002mm

GRAIN SIZE

SOIL TYPE (ABBREV.)	CLAY (CL)	SILT (SI)	←	SAND (SA)	→	←	GRAVEL (GR)	→	COBBLES (CO)
SIZE	< 2µm	2–75µm	Fine 0.075-0.2mm	Medium 0.2-0.6mm	Coarse 0.6-2.36mm	Fine 2.36-6mm	Medium 6-20mm	Coarse 20-63mm	63-200mm
SHAPE & TEXTURE	Shiny	Dull	← angular or sub angular or sub rounded or rounded →						
FIELD GUIDE	Not visible under 10x	Visible under 10x	Visible by eye	Visible at < 1m	Visible at < 3m	Visible at < 5m	Road gravel	Rail ballast	Beaching

GREAT SOUTHERN GEOTECHNICS
CONSTRUCTION MATERIALS TESTING

CLASSIFICATION CHART

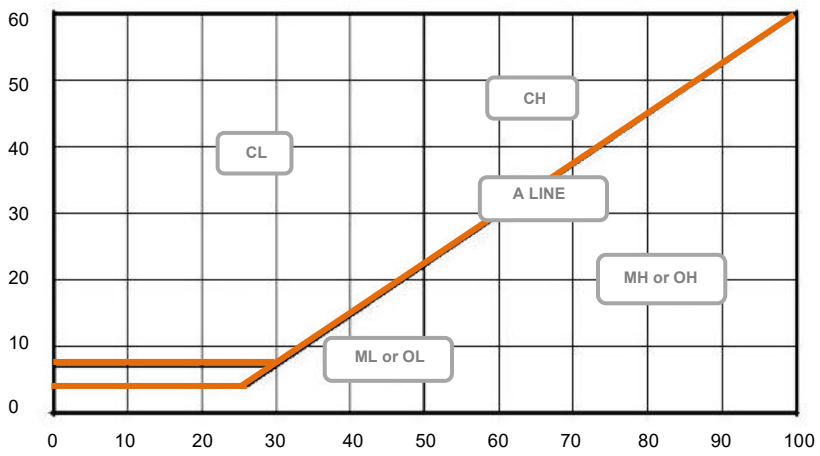
FIELD IDENTIFICATION PROCEDURES (Excluding particles larger than 60mm and basing fractions on estimated mass)				GROUP SYMBOLS	TYPICAL NAMES
COARSE GRAINED SOILS More than 50% of material less than 63 mm is larger than 0.075 mm	GRAVELS More than 50% of coarse fraction is larger than 2.36mm	CLEAN GRAVELS (Little or no fines)	Wide range in grain size and substantial amounts of all intermediate sizes, not enough fines to bind coarse grains, no dry strength	GW	Well graded gravels, gravel-sand mixtures, little or no fines
			Predominantly one size or range of sizes with some intermediate sizes missing, not enough fines to bind coarse grains, no dry strength	GP	Poorly Graded gravels and gravel-sand mixtures, little or no fines, uniform gravels
		GRAVELS WITH FINES (Appreciable amount of fines)	Dirty' materials with excess of non-plastic fines, zero to medium dry strength	GM	Silty gravels, gravel-sand-silt mixtures
			'Dirty' materials with excess of plastic fines, medium to high dry strength	GC	Clayey gravels, gravel-sand-clay mixtures
	SANDS More than 50% of coarse fraction is smaller than 2.36mm	CLEAN SANDS (Little or no fines)	Wide range in grain size and substantial amounts of all intermediate sizes, not enough fines to bind coarse grains, no dry strength	SW	Well graded sands, gravelly sands, little or no fines
			Predominantly one size or range of sizes with some intermediate sizes missing, not enough fines to bind coarse grains, no dry strength '	SP	Poorly graded sands and gravelly sands; little or no fines, uniform sands
		SANDS WITH FINES (Appreciable amount of fines)	Dirty' materials with excess of non-plastic fines, zero to medium dry strength	SM	Silty sands, sand-silt mixtures
			'Dirty' materials with excess of plastic fines, medium to high dry strength	SC	Clayey sands, sand-clay mixtures

FINE GRAINED SOILS More than 50% of material less than 63 mm is smaller than 0.075 mm	IDENTIFICATION PROCEDURES ON FRACTIONS <0.2mm					
		DRY STRENGTH	DILATANCY	TOUGHNESS		
	SILTS AND CLAYS Liquid limit less than 50	None to low	Quick to slow	None	ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands with low plasticity. Silts of low to medium Liquid Limit.
		Medium to high	None to very slow	Medium	CL, CI	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays.
		Low to medium	Slow	Low	OL	Organic silts and organic silt-clays of low to medium plasticity.
	SILTS AND CLAYS Liquid limit greater than 50	Low to medium	Slow to none	Low to medium	MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, silts of high Liquid Limit.
		High to very high	None	High	CH	Inorganic clays of high plasticity.
		Medium to high	None to very slow	Low to medium	OH	Organic clays of high plasticity

HIGHLY ORGANIC SOILS	Readily identified by colour, odour, spongy feel and frequently by fibrous texture	Pt	Peat and other highly organic soils

PLASTICITY CHART

For laboratory classification of fine grained soils



GREAT SOUTHERN GEOTECHNICS
CONSTRUCTION MATERIALS TESTING

PLASTICITY

DESCRIPTIVE TERM	OF LOW PLASTICITY	OF MEDIUM PLASTICITY	OF HIGH PLASTICITY
Range Of Liquid Limit (%)	≤ 35	> 35 ≤ 50	> 50

DESCRIPTION OF ORGANIC OR ARTIFICIAL MATERIALS

PREFERRED TERMS	SECONDARY DESCRIPTION
Organic Matter	Fibrous Peat/ Charcoal/ Wood Fragments/ Roots (greater than approximately 2mm diameter)/ Root Fibres (less than approximately 2mm diameter)
Waste Fill	Domestic Refuse/ Oil/ Bitumen/ Brickbats/ Concrete Rubble/ Fibrous Plaster/ Wood Pieces/ Wood Shavings/ Sawdust/ Iron Filings/ Drums/ Steel Bars/ Steel Scrap/ Bottles/ Broken Glass/ Leather

CONSISTENCY - Cohesive soils

TERM	VERY SOFT	SOFT	FIRM	STIFF	VERY STIFF	HARD
Symbol	VS	S	F	St	VSt	H
Undrained Shear Strength (kPa)	< 12	12 - 25	25 - 50	50 - 100	100 - 200	> 200
SPT (N) Blowcount	0 - 2	2 - 4	4 - 8	8 - 15	15 - 30	> 30
Field Guide	Exudes between the fingers when squeezed	Can be moulded by light finger pressure	Can be moulded by strong finger pressure	Cannot be moulded by fingers. Can be indented by thumb nail	Can be indented by thumb nail	Can be indented with difficulty with thumb nail

CONSISTENCY - Non-cohesive soils

TERM	VERY LOOSE	LOOSE	MEDIUM DENSE	DENSE	VERY DENSE	COMPACT
Symbol	VL	L	MD	D	VD	CO
SPT (N) Blowcount	0 - 4	4 - 10	10 - 30	30 - 50	50 - 100	> 50/150 mm
Density Index (%)	< 15	15 - 35	35 - 65	65 - 85	85 - 95	> 95
Field Guide	Ravels	Shovels easily	Shovelling very difficult	Pick required	Pick difficult	Cannot be picked

MINOR COMPONENTS

TERM	TRACE	WITH
% Minor Component	Coarse grained soils: < 5% Fine grained soils: <15%	Coarse grained soils: 5 – 12% Fine grained soils: 15 – 30%
Field Guide	Presence just detectable by feel or eye, but soil properties little or no different to general properties of primary components	Presence easily detectable by feel or eye, soil properties little different to general properties of primary component

GREAT SOUTHERN GEOTECHNICS
CONSTRUCTION MATERIALS TESTING

GEOLOGICAL ORIGIN

	TYPE	DETAILS
TRANSPORTED SOILS	Aeolian Soils	Deposited by wind
	Alluvial Soils	Deposited by streams and rivers
	Colluvial Soils	Deposited on slopes
	Lacustrine Soils	Deposited by lakes
	Marine Soils	Deposited in ocean, bays, beaches and estuaries
FILL MATERIALS	Soil Fill	Describe soil type, UCS symbol and add 'FILL'
	Rock Fill	Rock type, degree of weathering, and word 'FILL'.
	Domestic Fill	Percent soil or rock, whether pretrucible or not.
	Industrial Fill	Percent soil, whether contaminated, particle size & type of waste product, ie brick, concrete, metal

STRENGTH OF ROCK MATERIAL

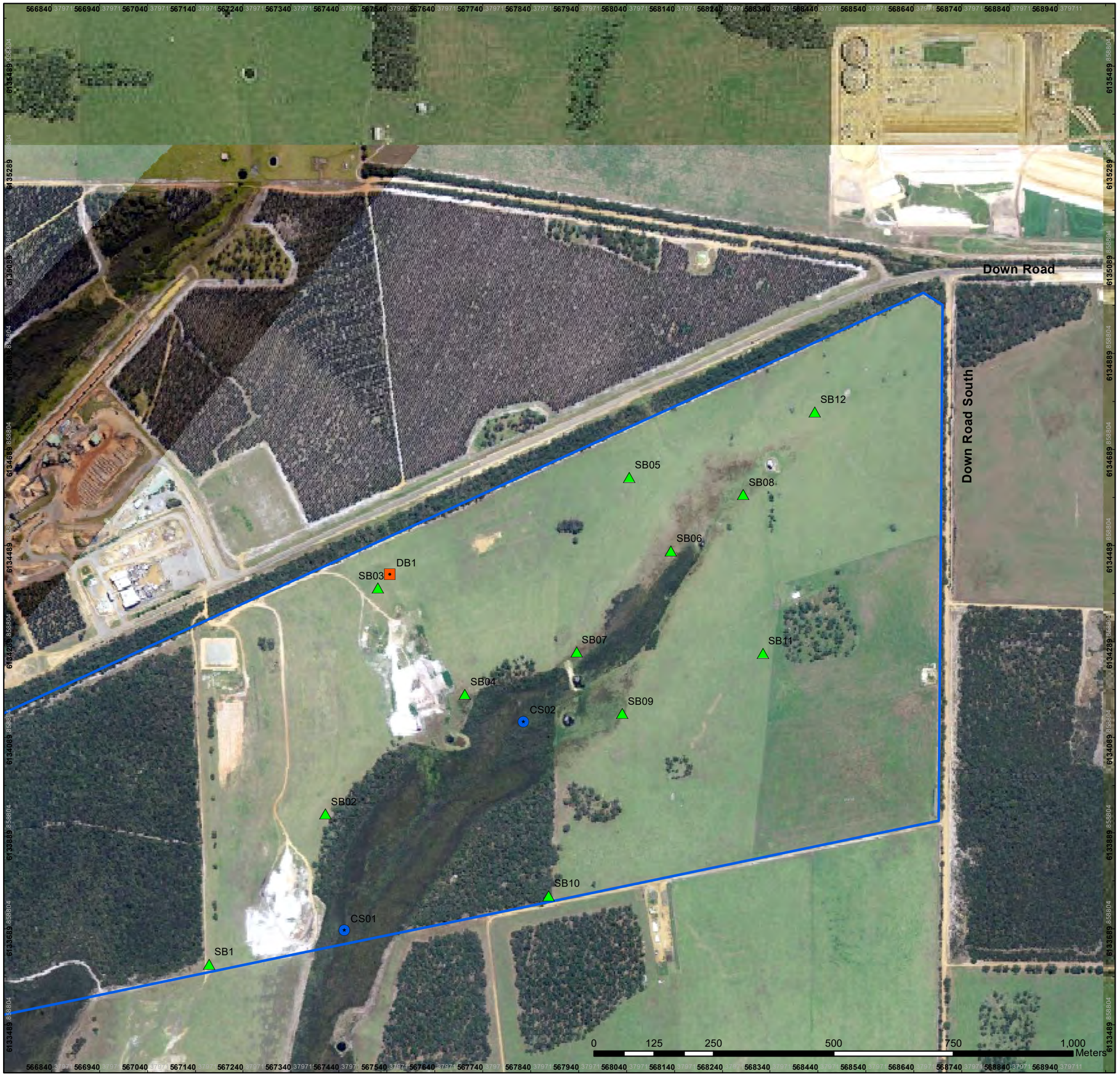
TERM	SYMBOL	IS(50)	(MPA)	FIELD GUIDE TO STRENGTH
Extremely Low	EL	≤0.03		Easily remoulded by hand to a material with soil properties.
Very Low	VL	>0.03	≤0.1	Material crumbles under firm blows with sharp end of pick; can be peeled with knife; too hard to cut a triaxle sample by hand. Pieces up to 3 cm thick can be broken by finger pressure.
Low	L	>0.1	≤0.3	Easily scored with a knife; indentations 1 mm to 3 mm show in the specimen with firm blows of the pick point; has dull sound under hammer. A piece of core 150 mm long by 50 mm diameter may be broken by hand. Sharp edges of core may be friable and break during handling.
Medium	M	>0.3	≤1.0	Readily scored with a knife; a piece of core 150 mm long by 50 mm diameter can be broken by hand with difficulty.
High	H	>1	≤3	A piece of core 150 mm long by 50 mm diameter cannot be broken by hand but can be broken by a pick with a single firm blow; rock rings under hammer.
Very High	VH	>3	≤10	Hand specimen breaks with pick after more than one blow; rock rings under hammer.
Extremely High	EH	>10		Specimen requires many blows with geological pick to break through intact material; rock rings under hammer.

ROCK MATERIAL WEATHERING CLASSIFICATION

TERM	SYMBOL	DEFINITION
Residual Soil	RS	Soil developed on extremely weathered rock; the mass structure and substance fabric are no longer evident; there is a large change in volume but the soil has not been significantly transported
Extremely Weathered Rock	XW	Rock is weathered to such an extent that it has 'soil' properties, i.e. it either disintegrates or can be remoulded, in water.
Distinctly Weathered Rock	DW	Rock strength usually changed by weathering. Rock may be highly discoloured, usually be iron staining. Porosity may be increased by leaching or may be decreased due to deposition of weathering products in pores.
Slightly Weathered Rock	SW	Rock is slightly discoloured but shows little or no change of strength from fresh rock.
Fresh Rock	FR	Rock shows no sign of decomposition or staining.

Appendix C

Bio Diverse Solutions monitoring



Unit 5A, 209 Chester Pass Rd
Albany, WA 6330
Australia
Tel: 08 9842 1575
Fax: 08 9842 1575

Overview Map Scale 1:100,000

Legend

- Subject Site
- Cadastre
- 5m Contours
- Deep Bore
- Shallow Bore
- Creek Sample
- 50m Buffer

Scale
1:7,882 @ A3
GDA MGA 94 Zone 50

Data Sources
Aerial Imagery: SLIP Virtual Mosaic WMS Service, Landgate 2016
Cadastre and Contours: Landgate 2016
Overview Map: World Topographic map service, ESRI 2012

CLIENT
City of Albany
Lot 5780 Down Road
Drome, WA 6330

Monitoring Plan

STATUS	*FILE*	*DATE*
FINAL	**MSC0137**	**28/02/2019**

29 Hercules Cres
Albany WA 6330
98421575
kath@biodiversesolutions.com.au
ABN 48 138 824 272

21st March 2018

Great Southern Motorplex
PO Box 1905
Albany, WA 6330

Lot 5780 Down Road, Drome WA 6330
Water Quality Monitoring

Dear Great Southern Motorplex Group,

On the 27th February 2018 the shallow monitoring bores were installed at Lot 5780 Down Road, Drome. A total of 12 sampling bores were installed to a depth of 2m as per the DoW Approved Monitoring Plan.

A copy of details relating to this supplied:

- Field test bore logs;
- MPL Laboratory results; and
- BDS Field and Laboratory summary sheets.

Preliminary analysis of the land from the site soil testing indicates that the majority of the land will be sand over gravels/laterite rock. Low lying areas adjacent to the creek will have silty sands with coffee rock and will generally be waterlogged. Water table was only encountered at the lower lying bores of SB06, SB07 and SB09 which I would expect in summer conditions this to prevail. The creek was running albeit at a very low level which indicates there is groundwater movement into the creek system year round.

I am expecting given the soil results, that there will be limited groundwater in test pits SB11, SB03, SB02, SB05, and SB10 through the year. Marginal groundwater will most likely appear in SB04, SB08 and SB12. Refer to finalised Test Pit locations mapping.

Due to limited funds available the deep water bore is yet to be done but recommend this is done as soon as the full quote is approved.

Field analysis of the WQ at the creek indicates the creek is gaining acidity through the catchment. A higher pH in the upper reaches with a pH 6.34 at CS02 and lower (more acidic) pH in the lower catchment CS01 of 4.46, which is to be expected when cattle are entering the system to feed, water and defecating (generally disturbing the upper catchment).

Laboratory testing results are partially available, we are still waiting Salinity, hardness/alkalinity. Biological analytes are not available this round. Full analysis has not been undertaken of the laboratory results as yet.

This information is provided as preliminary, if you have any queries regarding this matter, please feel free to contact me via email on kath@biodiversesolutions.com.au or phone/fax on 9842 1575.

Kind regards,

Kathryn Kinnear
Director,
Bio Diverse Solutions

Soil Profile Sampling

BIO DIVERSE SOLUTIONS

Location: Lot 5780 Down Road

Date tested: 27/02/2018

Sampled by: Kathryn Kinnear

Weather: Windy, cool 21 degrees Overcast

Location	Site description	Depth of profile (mm)	Soil Description
SB1	South west corner Open Paddock	0-150 150-300 300-500 500-1200 1200-1500 1500-2000	Dark grey sandy top soil, veg matter. Grey silty sand. Orange, light brown sandy gravel pebbles 10-30mm. Laterite rock . Light brown pebbles 10-30mm, orange sandy silty gravel. Light brown sandy clay, slightly moist. No WT.
SB02	Paddock near creek west side Jarrah/Cas/Marri Forrest adjacent	0-50 50-200 200-800 800-1200 1200-1500 1500-2000 2000-2500	Dark grey sandy top soil, veg matter. Grey sandy silt. Light grey sandy silt, slightly moist. Cream sandy silt, slightly moist Laterite rock. Moist light brown orange sandy silt gravel, pebbles 10-30mm, minor clay. Light grey silty sand. No WT.
SB03	Open paddock North in minor Drainage swale	0-50 50-500 500-1000 1000-1200 1200-1600 1600-1800 1800-2000	Light brown slightly moist silty sand top soil, veg matter. Light brown silty gravel, pebbles 5-10mm. Brown silty gravel pebbles 20-30mm. Dark brown gravelly silt pebbles 20-30mm. Grey silty sand. Light grey moist silty sand. Light brown/orange silty sand, gravel pebbles 10-30mm. No WT.
SB04	Paddock near Creek in Depression area.	0-50 50-200 700-900 900-1300 1300-1500 1500-1800 1800-2000	Dark brown peaty organic matter. Dark grey silty sand slightly moist. Light grey silty sand moist. Laterite rock, moist dark brown gravelly silt (coffee rock) mottled orange. Light brown silty clay wet. Light grey moist clay. White clay not wet. No WT.
SB05	North paddock Area	0-50 50-200 200-700 700-900 900-1500 1500-1800 1800-1900 1900-2000	Slightly moist dark brown peaty sandy silt top soil, veg matter. Dry dark grey silty sand. Dry light grey silty sand. Dry gravelly silty sand orange pebbles. Dry cream quartz gravelly silty sand pebbles 30-50mm. Pink/orange silty sand gravel, cemented compacted gavel pebbles 10-30mm. Moist dark clayey sand. Dry compacted silty gravel orange/pink. No WT.

Location	Site description	Depth of profile (mm)	Soil Description
SB06	Near creek North side In reed beds	0-100 100-400 400-700 700-1800 1800-2000	Dark brown peaty organic matter moist. Dark grey silty sand moist. Grey silty sand moist. Light grey slty sand wet (smell). Wet brown silty sand (smell) WT 870mm BGL
SB07	Near creek Crossing North side	0-200 200-400 400-600 600-1800 1800-2000	Dark brown/black peaty moist. Black/dark grey peaty sand moist. Dark grey silty sand moist. Light brown silty sand smell. Cream wet silty sand smell. WT 640mm BGL
SB08	Mid creek near dam	0-50 50-200 200-500 500-900 900-1200 1200-1400 1400-1800 1800-2000	Slightly moist dark brown peaty silt, veg matter. Dark brown sandy peaty silt moist. Dark grey silty sand moist. Grey slightly moist silty sand. Dark brown cemented silt, coffee rock. Dark grey moist to wet silty sand. Grey silty sand wet. Dark brown silt minor pebbles 10mm. No WT.
SB09	South side of creek	0-50 50-200 200-600 600-700 700-1100 1100-1300 1300-2000	Dark brown peaty organic matter moist. Dark grey silty sand. Grey silty sand. Light brown gravelly silt. Laterite rock. Wet silt pebbles 30-40mm. White moist clayey silt. WT 660mm BGL
SB010	South boundary east of bush line in paddock	0-50 50-300 300-500 500-1200 1200-2000	Brown silty sand organic matter dry. Brown silty sand gravels 40-50mm, boulders 200mm Laterite, dry. Brown/orange silty sandy gravel cemented Laterite. Light brown/orange cemented silt. White mottles sandstone dry. Light brown/orange cemented silt. White mottles sandstone dry. No WT.
SB011	Mid paddock, top of hill eastern side of site	0-50 50-300 300-400 400-1200 1200-1800 1800-2000	Dark brown silty sand dry. Grey silty sand dry. Light brown silty gravel pebble 30-50mm. Light brown cemented silt Laterite. Light brown, mottles pink * white clay dry. Orange mottled red dry clay. No WT.
SB012		0-400 400-1000 1000-1500 1500-1800 1800-2000	Grey sandy silt organic matter dry. Light grey silty sand. Cream silty sand slightly moist. Dark brown sandy silt, slightly moist gravel minor pebbles. Light brown silty clayey slightly moist boulder Laterite gravels 40mm. No WT.

Groundwater Monitoring Data Record Sheet

Date 30/05/2018 Name of recorder Kathryn Kinnear / Bianca Theyer

Location Down Road Project No. MSC0137

BIO DIVERSE SOLUTIONS

Test ID	Time	BCH	WD	WD-BCH	CW	pH	EC	DO	Temp	TDS	Additional Information
SB09	9:15	932	1500	568	N/A	6.28	0.25	4.84	18.13	0.161	Slight smell
SB10	8:30				N/A						Dry
SB11	8:35				N/A						Dry
SB12	8:50				N/A						Dry
SB08	9:45	930	2480	1550	N/A	4.56	0.217	4.68	18.33	0.14	Sediment, tannins and smell
SB06	10:00	955	1653	698	N/A	4.78	0.321	2.24	17.48	0.208	Sediment, tannins and smell
SB07	10:25	965	1500	535	N/A	4.77	0.28	5.34	19.89	0.181	Smell, coloured
SB05	9:22				N/A						Dry
SB04	10:52	920	1830	910	N/A	5.9	0.242	4.79	17.37	0.157	Slight colouration and smell
CS02	10:55				40cm	5.78	1.05	4.66	14.22	0.675	20cm water depth, clear some sediments when disturbed
SB01	10:10				N/A						Dry
SB02	10:20				N/A						Dry
CS01	11:20				1.5m	6.09	0.923	9.54	11.93	0.59	30cm Clear, slight tannin, flowin

BCH = Bore Casing Height WD = Water Depth below casing WD-BCH = Groundwater level BGL

CW = Creek width

Notes:

Groundwater Monitoring Data Record Sheet

Date 27/02/2018 Name of recorder Kathryn Kinnear

Location Down Road Project No. MSC0137

Test ID	Time	BCH	WD	WD-BCH	pH	EC	DO	Temp	TDS	Additional Information
C502	1:10	N/A	N/A	N/A	6.34	0.623	5.14	21.89	0.4	10cm Depth running water.
SB09	1:35	1.0m	1660	660	4.03	0.296	2.22	19.87	0.192	
SB06	3:00	1.0m	1870	870	2.5	0.311	4.53	19.57	0.203	Coloured
SB07	3:10	1.0m	1640	640	2.82	0.337	3.9	19.69	0.224	Smell, coloured
C501	3:30	N/A	N/A	N/A	4.46	0.897	8.78	16.6	0.574	25cm Depth running water, clea

BCH = Bore Casing Height WD = Water Depth below casing WD-BCH = Groundwater level BGL

Notes:

Envirolab Services (WA) Pty Ltd trading as MPL Laboratories
ABN 53 140 099 207
16-18 Hayden Court Myaree WA 6154
ph 08 9317 2505 fax 08 9317 4163
lab@mpl.com.au
www.mpl.com.au

CERTIFICATE OF ANALYSIS 207409

Client Details

Client	Biodiverse Solutions
Attention	Kathyrn Kinnear
Address	

Sample Details

Your Reference	**Biodiverse Solutions**
Number of Samples	5 Water
Date samples received	01/03/2018
Date completed instructions received	01/03/2018

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.

Samples were analysed as received from the client. Results relate specifically to the samples as received.

Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Please refer to the last page of this report for any comments relating to the results.

Report Details

Date results requested by	09/03/2018
Date of Issue	12/03/2018

NATA Accreditation Number 2901. This document shall not be reproduced except in full.

Accredited for compliance with ISO/IEC 17025 - Testing. **Tests not covered by NATA are denoted with ***

Results Approved By
Joshua Lim, Operations Manager
Michael Kubiak, Organics Supervisor

Authorised By

Todd Lee, Laboratory Manager

Nutrients in Water							
Our Reference			207409-1	207409-2	207409-3	207409-4	207409-5
Your Reference	UNITS	PQL	CS01	CS02	SB09	SB06	SB07
Date Sampled			27/02/2018	27/02/2018	27/02/2018	27/02/2018	27/02/2018
Type of sample			Surface Water	Surface Water	Groundwater	Groundwater	Groundwater
Date prepared	-		08/03/2018	02/03/2018	02/03/2018	02/03/2018	02/03/2018
Date analysed	-		08/03/2018	08/03/2018	08/03/2018	08/03/2018	02/03/2018
Total Nitrogen	mg/L	0.1	1.0	3.0	1.1	0.2	0.3
Nitrate as N	mg/L	0.005	0.26	0.007	<0.005	0.024	0.27
Nitrite as N	mg/L	0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Ammonia as N	mg/L	0.005	<0.005	<0.005	0.11	0.70	0.22
Total Phosphorus	mg/L	0.05	<0.05	0.26	<0.05	1.3	0.65
Phosphate as P	mg/L	0.005	<0.005	<0.005	<0.005	1.1	0.52

Dissolved Metals in Water							
Our Reference			207409-1	207409-2	207409-3	207409-4	207409-5
Your Reference	UNITS	PQL	CS01	CS02	SB09	SB06	SB07
Date Sampled			27/02/2018	27/02/2018	27/02/2018	27/02/2018	27/02/2018
Type of sample			Surface Water	Surface Water	Groundwater	Groundwater	Groundwater
Date prepared	-		07/03/2018	07/03/2018	07/03/2018	07/03/2018	07/03/2018
Date analysed	-		07/03/2018	07/03/2018	07/03/2018	07/03/2018	07/03/2018
Aluminium-Dissolved	mg/L	0.01	0.06	0.46	1.2	1.8	0.86
Arsenic-Dissolved	mg/L	0.001	<0.001	0.013	0.006	<0.001	<0.001
Cadmium-Dissolved	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0002
Chromium-Dissolved	mg/L	0.001	<0.001	0.002	0.003	0.002	0.002
Copper-Dissolved	mg/L	0.001	<0.001	<0.001	0.002	<0.001	0.002
Iron-Dissolved	mg/L	0.01	0.86	40	2.8	0.90	1.1
Mercury-Dissolved	mg/L	0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Manganese-Dissolved	mg/L	0.005	<0.005	<0.005	0.007	0.01	0.009
Nickel-Dissolved	mg/L	0.001	<0.001	<0.001	<0.001	0.003	<0.001
Lead-Dissolved	mg/L	0.001	<0.001	<0.001	<0.001	0.006	0.001
Zinc-Dissolved	mg/L	0.001	0.008	0.002	0.069	0.097	0.065

vTRH(C6-C10)/MBTEXN in water							
Our Reference			207409-1	207409-2	207409-3	207409-4	207409-5
Your Reference	UNITS	PQL	CS01	CS02	SB09	SB06	SB07
Date Sampled			27/02/2018	27/02/2018	27/02/2018	27/02/2018	27/02/2018
Type of sample			Surface Water	Surface Water	Groundwater	Groundwater	Groundwater
Date analysed	-		02/03/2018	02/03/2018	02/03/2018	02/03/2018	02/03/2018
TRH C_6 - C_9	µg/L	10	<10	<10	<10	<10	<10
TRH C_6 - C_{10}	µg/L	10	<10	<10	<10	<10	<10
TRH C_6-C_{10} less BTEX (F1)	µg/L	10	<10	<10	<10	<10	<10
MTBE	µg/L	1	<1	<1	<1	<1	<1
Benzene	µg/L	1	<1	<1	<1	<1	<1
Toluene	µg/L	1	<1	<1	<1	<1	<1
Ethylbenzene	µg/L	1	<1	<1	<1	<1	<1
m+p-xylene	µg/L	2	<2	<2	<2	<2	<2
o-xylene	µg/L	1	<1	<1	<1	<1	<1
Naphthalene	µg/L	1	<1	<1	<1	<1	<1
Surrogate Dibromofluoromethane	%		111	110	114	106	112
Surrogate toluene-d8	%		107	103	105	99	105
Surrogate 4-BFB	%		98	97	96	97	96

svTRH(C10-C40) in water							
Our Reference			207409-1	207409-2	207409-3	207409-4	207409-5
Your Reference	UNITS	PQL	CS01	CS02	SB09	SB06	SB07
Date Sampled			27/02/2018	27/02/2018	27/02/2018	27/02/2018	27/02/2018
Type of sample			Surface Water	Surface Water	Groundwater	Groundwater	Groundwater
Date extracted	-		02/03/2018	02/03/2018	02/03/2018	02/03/2018	02/03/2018
Date analysed	-		06/03/2018	06/03/2018	06/03/2018	06/03/2018	06/03/2018
TRH C_{10} - C_{14}	µg/L	50	<50	<50	<50	<50	<50
TRH C_{15} - C_{28}	µg/L	100	<100	<100	<100	<100	<100
TRH C_{29} - C_{36}	µg/L	100	<100	<100	<100	110	330
TRH >C_{10} - C_{16}	µg/L	50	<50	<50	<50	<50	<50
TRH >C_{10} -C_{16} less N (F2)	µg/L	50	<50	<50	<50	<50	<50
TRH >C_{16} - C_{34}	µg/L	100	<100	<100	<100	140	280
TRH >C_{34} - C_{40}	µg/L	100	<100	<100	<100	<100	220
Surrogate o-Terphenyl	%		84	85	94	37	19

PAHs in Water							
Our Reference			207409-1	207409-2	207409-3	207409-4	207409-5
Your Reference	UNITS	PQL	CS01	CS02	SB09	SB06	SB07
Date Sampled			27/02/2018	27/02/2018	27/02/2018	27/02/2018	27/02/2018
Type of sample			Surface Water	Surface Water	Groundwater	Groundwater	Groundwater
Date extracted	-		02/03/2018	02/03/2018	02/03/2018	02/03/2018	02/03/2018
Date analysed	-		07/03/2018	07/03/2018	07/03/2018	07/03/2018	07/03/2018
Naphthalene	µg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	µg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthene	µg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	µg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene	µg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Anthracene	µg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Fluoranthene	µg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Pyrene	µg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(a)anthracene	µg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Chrysene	µg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(b,j+k)fluoranthene	µg/L	0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Benzo(a)pyrene	µg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Indeno(1,2,3-c,d)pyrene	µg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Dibenzo(a,h)anthracene	µg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	µg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(a)pyrene TEQ	µg/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Total +ve PAH's	µg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate p-Terphenyl-D_{14}	%		78	76	88	24	14

Method ID	Methodology Summary
INORG-055	Nitrite - determined colourimetrically. Soils are analysed from a water extract.
INORG-055	Nitrate - determined colourimetrically. Soils are analysed from a water extract.
INORG-055	Total Nitrogen by colourimetric analysis based on APHA 4500-P J, 4500-NO3 F.
INORG-057	Ammonia by colourimetric analysis based on APHA latest edition 4500-NH3 F.
INORG-060	Phosphate- determined colourimetrically. Soils are analysed from a water extract.
METALS-020	Metals in soil and water by ICP-OES.
METALS-021	Determination of Mercury by Cold Vapour AAS.
METALS-022	Determination of various metals by ICP-MS.
ORG-003	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID. F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis.
ORG-004	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS.
ORG-012	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS.
ORG-012	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS. Benzo(a)pyrene TEQ as per NEPM draft B1 Guideline on Investigation Levels for Soil and Groundwater.
ORG-016	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS. F1 = (C6-C10)-BTEX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater.

QUALITY CONTROL: Nutrients in Water						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date prepared	-			02/03/2018					02/03/2018	
Date analysed	-			02/03/2018					02/03/2018	
Total Nitrogen	mg/L	0.1	INORG-055	<0.1					96	
Nitrate as N	mg/L	0.005	INORG-055	<0.005					116	
Nitrite as N	mg/L	0.005	INORG-055	<0.005					117	
Ammonia as N	mg/L	0.005	INORG-057	<0.005					100	
Total Phosphorus	mg/L	0.05	METALS-020	<0.05					103	
Phosphate as P	mg/L	0.005	INORG-060	<0.005					92	

QUALITY CONTROL: Dissolved Metals in Water						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	207409-2
Date prepared	-			07/03/2018	1	07/03/2018	07/03/2018		07/03/2018	07/03/2018
Date analysed	-			07/03/2018	1	07/03/2018	07/03/2018		07/03/2018	07/03/2018
Aluminium-Dissolved	mg/L	0.01	METALS-022	<0.01	1	0.06	0.06	0	109	77
Arsenic-Dissolved	mg/L	0.001	METALS-022	<0.001	1	<0.001	<0.001	0	103	108
Cadmium-Dissolved	mg/L	0.0001	METALS-022	<0.0001	1	<0.0001	<0.0001	0	104	109
Chromium-Dissolved	mg/L	0.001	METALS-022	<0.001	1	<0.001	<0.001	0	105	104
Copper-Dissolved	mg/L	0.001	METALS-022	<0.001	1	<0.001	<0.001	0	103	99
Iron-Dissolved	mg/L	0.01	METALS-022	<0.01	1	0.86	0.87	1	105	#
Mercury-Dissolved	mg/L	0.00005	METALS-021	<0.00005	1	<0.00005	<0.00005	0	102	104
Manganese-Dissolved	mg/L	0.005	METALS-022	<0.005	1	<0.005	<0.005	0	108	107
Nickel-Dissolved	mg/L	0.001	METALS-022	<0.001	1	<0.001	<0.001	0	103	98
Lead-Dissolved	mg/L	0.001	METALS-022	<0.001	1	<0.001	<0.001	0	101	101
Zinc-Dissolved	mg/L	0.001	METALS-022	<0.001	1	0.008	0.008	0	103	104

QUALITY CONTROL: vTRH(C6-C10)/MBTEXN in water						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date analysed	-			02/03/2018					02/03/2018	
TRH C_6 - C_9	µg/L	10	ORG-016	<10					95	
TRH C_6 - C_{10}	µg/L	10	ORG-016	<10					95	
MTBE	µg/L	1	ORG-016	<1						
Benzene	µg/L	1	ORG-016	<1					110	
Toluene	µg/L	1	ORG-016	<1					103	
Ethylbenzene	µg/L	1	ORG-016	<1					89	
m+p-xylene	µg/L	2	ORG-016	<2					86	
o-xylene	µg/L	1	ORG-016	<1					87	
Naphthalene	µg/L	1	ORG-016	<1						
Surrogate Dibromofluoromethane	%		ORG-016	109					106	
Surrogate toluene-d8	%		ORG-016	107					105	
Surrogate 4-BFB	%		ORG-016	99					105	

QUALITY CONTROL: svTRH(C10-C40) in water						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date extracted	-			02/03/2018	2	02/03/2018	02/03/2018		02/03/2018	
Date analysed	-			06/03/2018	2	06/03/2018	06/03/2018		06/03/2018	
TRH C_{10} - C_{14}	µg/L	50	ORG-003	<50	2	<50	<50	0	73	
TRH C_{15} - C_{28}	µg/L	100	ORG-003	<100	2	<100	<100	0	88	
TRH C_{29} - C_{36}	µg/L	100	ORG-003	<100	2	<100	<100	0	81	
TRH >C_{10} - C_{16}	µg/L	50	ORG-003	<50	2	<50	<50	0	78	
TRH >C_{16} - C_{34}	µg/L	100	ORG-003	<100	2	<100	<100	0	88	
TRH >C_{34} - C_{40}	µg/L	100	ORG-003	<100	2	<100	<100	0	75	
Surrogate o-Terphenyl	%		ORG-003	97	2	85	101	17	80	

QUALITY CONTROL: PAHs in Water					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date extracted	-			02/03/2018	2	02/03/2018	02/03/2018		02/03/2018	
Date analysed	-			07/03/2018	2	07/03/2018	07/03/2018		07/03/2018	
Naphthalene	µg/L	0.1	ORG-012	<0.1	2	<0.1	<0.1	0	94	
Acenaphthylene	µg/L	0.1	ORG-012	<0.1	2	<0.1	<0.1	0		
Acenaphthene	µg/L	0.1	ORG-012	<0.1	2	<0.1	<0.1	0		
Fluorene	µg/L	0.1	ORG-012	<0.1	2	<0.1	<0.1	0	108	
Phenanthrene	µg/L	0.1	ORG-012	<0.1	2	<0.1	<0.1	0	115	
Anthracene	µg/L	0.1	ORG-012	<0.1	2	<0.1	<0.1	0		
Fluoranthene	µg/L	0.1	ORG-012	<0.1	2	<0.1	<0.1	0	114	
Pyrene	µg/L	0.1	ORG-012	<0.1	2	<0.1	<0.1	0	112	
Benzo(a)anthracene	µg/L	0.1	ORG-012	<0.1	2	<0.1	<0.1	0		
Chrysene	µg/L	0.1	ORG-012	<0.1	2	<0.1	<0.1	0	100	
Benzo(b,j+k)fluoranthene	µg/L	0.2	ORG-012	<0.2	2	<0.2	<0.2	0		
Benzo(a)pyrene	µg/L	0.1	ORG-012	<0.1	2	<0.1	<0.1	0	72	
Indeno(1,2,3-c,d)pyrene	µg/L	0.1	ORG-012	<0.1	2	<0.1	<0.1	0		
Dibenzo(a,h)anthracene	µg/L	0.1	ORG-012	<0.1	2	<0.1	<0.1	0		
Benzo(g,h,i)perylene	µg/L	0.1	ORG-012	<0.1	2	<0.1	<0.1	0		
Surrogate p-Terphenyl-D_{14}	%		ORG-012	91	2	76	77	1	74	

Result Definitions

NT	Not tested
NA	Test not required
INS	Insufficient sample for this test
PQL	Practical Quantitation Limit
<	Less than
>	Greater than
RPD	Relative Percent Difference
LCS	Laboratory Control Sample
NS	Not specified
NEPM	National Environmental Protection Measure
NR	Not Reported

Quality Control Definitions

Blank	This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate	This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike	A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample)	This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike	Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Australian Drinking Water Guidelines recommend that Thermotolerant Coliform, Faecal Enterococci, & E.Coli levels are less than 1cfu/100mL. The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC & ARMC 2011.

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.

Spikes for Physical and Aggregate Tests are not applicable.

For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: <5xPQL - any RPD is acceptable; >5xPQL - 0-50% RPD is acceptable.

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals; 60-140% for organics (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached.

Measurement Uncertainty estimates are available for most tests upon request.

Report Comments

#4,5 - PAH: Surrogate recovery was low due to sample emulsifying during extraction

Percent recovery not available due to the analyte signal being much greater than the spike amount. An acceptable recovery was achieved for the LCS.

#4,5 for Nox PQL raised due to sample matrix. Very dark samples

Groundwater Monitoring Data Record Sheet

Date 4/09/2018 Name of recorder Bianca Theyer / Chiquita Cramer

Location Down Road Project No. MSC0137

Test ID	Time	BCH (cm)	WD (cm)	WD-BCH (cm)	pH	EC (mg/cm)	DO (mg/L)	Temp (C°)	TDS	Additional Information
SB9	9:35	92.7	136.8	44.1	5.86	0.389		17.2	0.253	Lightly coloured brown
SB12	10:28	85	189	104	7.52	0.077		16.55	0.05	Lots of sediment, lightly coloured brown
SB8	10:48	95	113	18	4.41	1.2	2.57	15.86	0.768	Moderate amount of sediment, brown in colou
SB6	11:17	93	93	0	4.16	1.07	8.95	14.23	0.686	Moderate amount of sediment, brown in colou
SB7	11:35	91	135	44	4.5	0.211		15.55	0.137	Moderate to high amount of sediment, brown in colour
CS1	12:02	N/A	10	N/A	5.68	0.885	3.93	14.91	0.566	Clear water, creek flowing
SB3	12:29	92	213	121	6.09	0.963	2.07	16.73	0.616	Lightly coloured brown
SB4	12:35	90.6	121	30.4	5.38	0.328	1.93	16.12	0.213	Lightly coloured brown
CS2	12:48	N/A	20	N/A	6.09	0.659	7.83	12.35	0.422	clear water, creek flowing

BCH = Bore Casing Height WD = Water Depth below casing WD-BCH = Groundwater level BGL

CW = Creek width

Notes:

Appendix D

Conceptual hydrogeological model

A-4 Conceptual hydrogeological model

A Conceptual Site Model was completed to assess the connectivity between shallow and deeper hydrogeological features of the Site and surrounds, and to identify key pathways for transport of potential contaminants in surface and groundwater, and potential receptors based on site

A-4-1 Sources of information

- Local shallow soil setting from Motorplex Development, Down Road Surface and Groundwater Monitoring 2018 Summary Report (Bio Diverse Solutions 2018)
- Regional hydrogeological setting from Albany hinterland prospective groundwater resources map (Ryan, Yesertener, Maughan, & Thornton, 2017)
- Shallow soil profile descriptions
- Deep groundwater bore

A-4-2 Local shallow hydrogeology

The typical local surficial geology is presented in Plate 3, and shows the following features:

- A thin shallow sandy/silty layer up to 1 meter thick overlies the Pallinup formation in areas leading to the creek, while on the upper-slopes lateritic gravels/cobbles predominate.
- Underlying the sandy/silty layer, the Pallinup formation comprises silty clays which appears to extend to 25 meters blow the ground level.
- Although not tested, the permeability of the upper sandy/silt is likely higher than the underlying Pallinup Formation (silty clays) which may result in temporary perching of shallow groundwater in the sandy/silt (particularly during winter rainfall).
- Shallow groundwater levels derived from the monitoring of the shallow bores indicates that the levels appear to vary seasonally up to 1 meter.
- Shallow groundwater flow within the sandy/silty layer (and upper parts of the Pallinup Formation) are inferred as towards the creek line where groundwater is inferred to discharge.

A-4-3 “Deeper” hydrogeology

The deeper hydrogeology setting is presented on the cross section and shows the following features:

- The site (shallow hydrogeology) is underlain by approximately 25 metres of the Pallinup formation, deemed to comprise silt, sand and clay (Ryan *et al*. 2017). The Pallinup aquifer is inferred to contain minor water resources and exhibits a low permeability.
- The Pallinup Formation is underlain by the Werillup Aquitard described as comprising clay, silt and sand and which is deemed to hydraulically separate the overlying Pallinup Formation with underling units (Ryan et al, 2017). The drilling logs indicates that the thickness of the Werillup aquitard is 31 meters and comprises predominantly clay. Based on map notes (Ryan *et al*. 2017) the Werillup aquitard is inferred as extensive throughout the King River area and likely lies below all areas of the site and beyond.
- Werillup aquitard is probably underlain by granite, based on evidence of minor cuttings returned to the surface exhibiting angular quartz and some mica.
- The groundwater levels of the Pallinup formation appears to be similar to the shallow groundwater levels. That is to say that, excluding times when winter rainfall may perch shallow groundwater, the shallow sandy silts are probably hydraulically connected with the Pallinup Formation.
- The groundwater flow direction of the Pallinup Formation is not well known, however, beneath the Site groundwater it is likely to follow the regional topography, and flow towards the south west where groundwater is likely to discharge into the rivers and creeks, such as dominant surface water feature in areas close to the Site - Marbelup Brook.

A-4-4 Discussion/interpretations on pathway

The hydrogeological setting indicates the following Conceptual Site Model:

- The depth to groundwater plan indicates that in areas adjacent to the surface water creek/ feature, the depth to groundwater is less than 2 metres. In these areas, it is considered that there is an increased risk of impacts to groundwater from surface contaminants and spills given the thin geological profile (e.g. low adsorptive capacity).
- The shallow groundwater migration direction (shallow sands/silt and Pallinup Formation) indicates that any Site based groundwater impacts should migrate towards the creek line (on Site) where groundwater (and any impacted groundwater) is inferred to discharge. Any impacted surface water will migrate towards areas off-site and discharge into the major drainage of the area, the Marbelup Brook.
- Any Site based groundwater impacts should preferentially migrate within shallow sands/silts (towards the creek lines) and not migrate downwards into the deeper levels of the Pallinup Formation given the similar groundwater levels between the Pallinup Formation and the overlying shallow sandy silts, and that the shallow sandy silts have a higher permeability than the Pallinup Formation
- Given the low permeability of the Pallinup Formation, any Site based groundwater impacts, which may migrate downwards into the Pallinup formation should be subject to attenuation processes, which should limit the extent and migration rate of the any impacts.
- It appears from the limited drilling information (one monitoring well) that the Pallinup Formation is underlain by the Werillup Aquitard and granite, which should constrain any potential groundwater impacts to the Pallinup Formation.

A-4-5 Potential receptors

The Conceptual Site Model indicates that Site groundwater impacts will migrate towards the on-site creek, the receptors comprise the following:

- the environment of the onsite creek (flora and fauna)
- creek systems down-gradient of the site (flora and fauna)
- groundwater bore users - where bores are located close to, and are in hydraulic connection, with the creek system
- surface water users/abstraction of surface water; and
- livestock accessing creek.

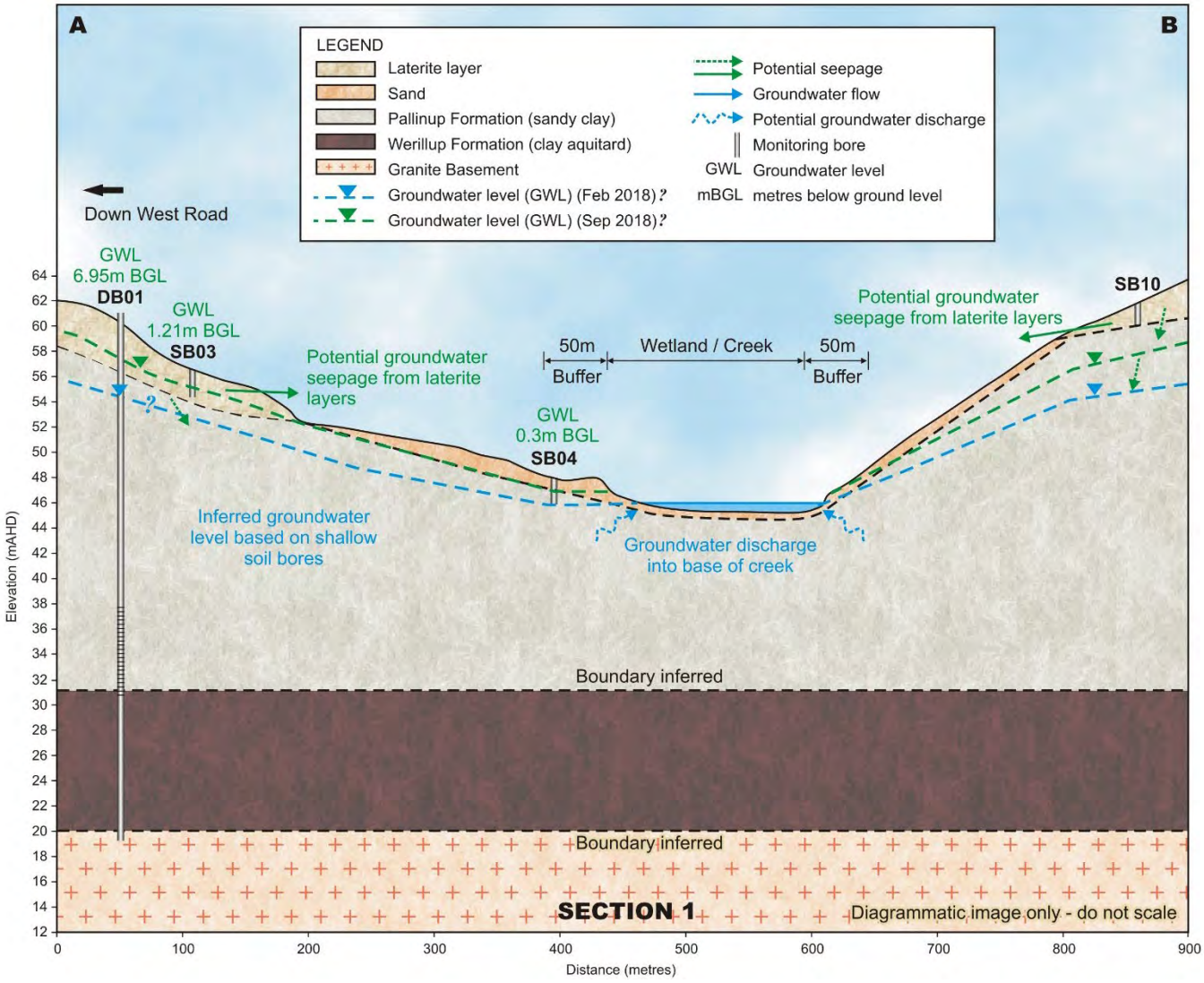


Plate 3 *Preliminary hydrogeological section 1 (A-B)*

Appendix E

Potential water users

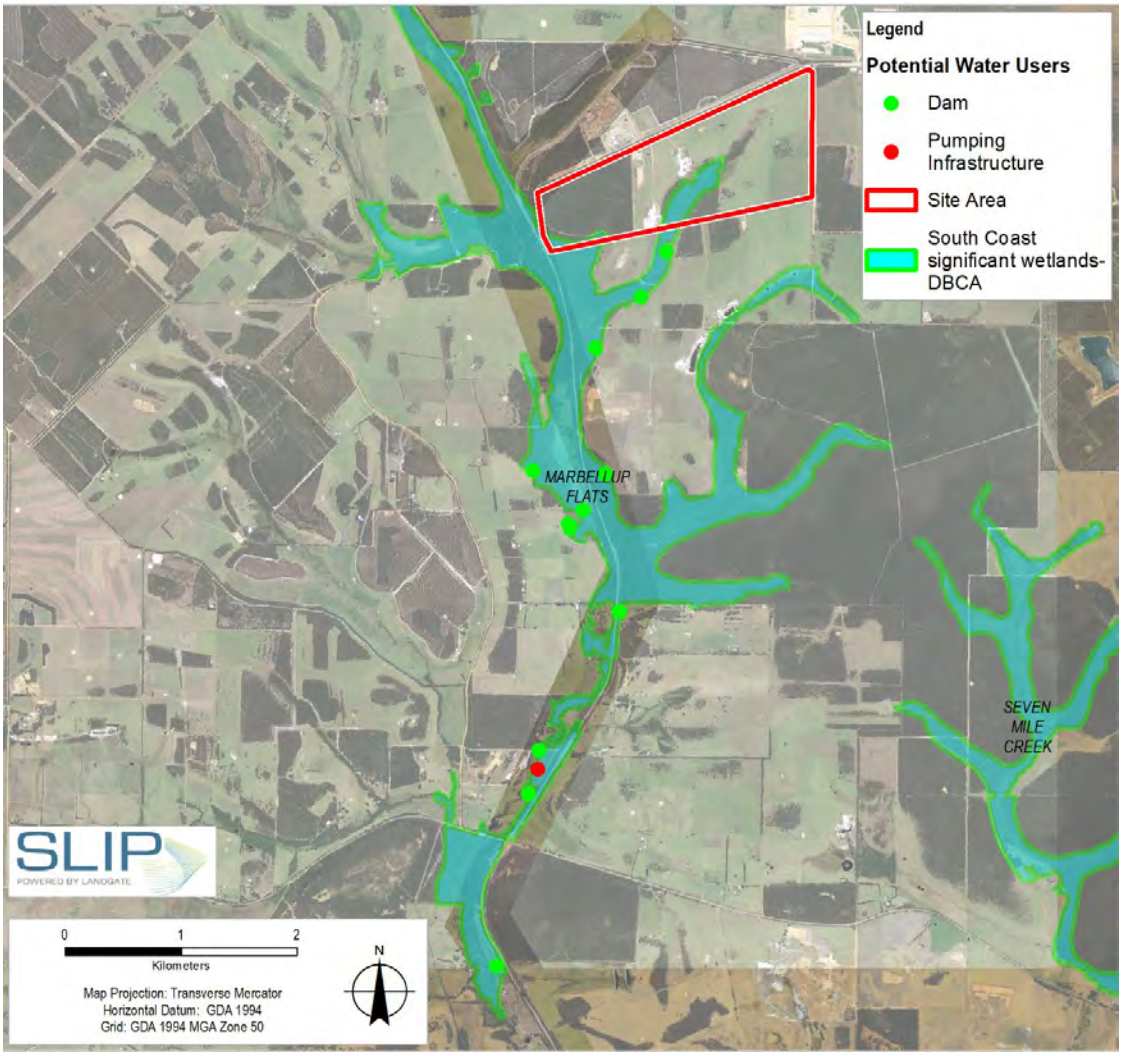


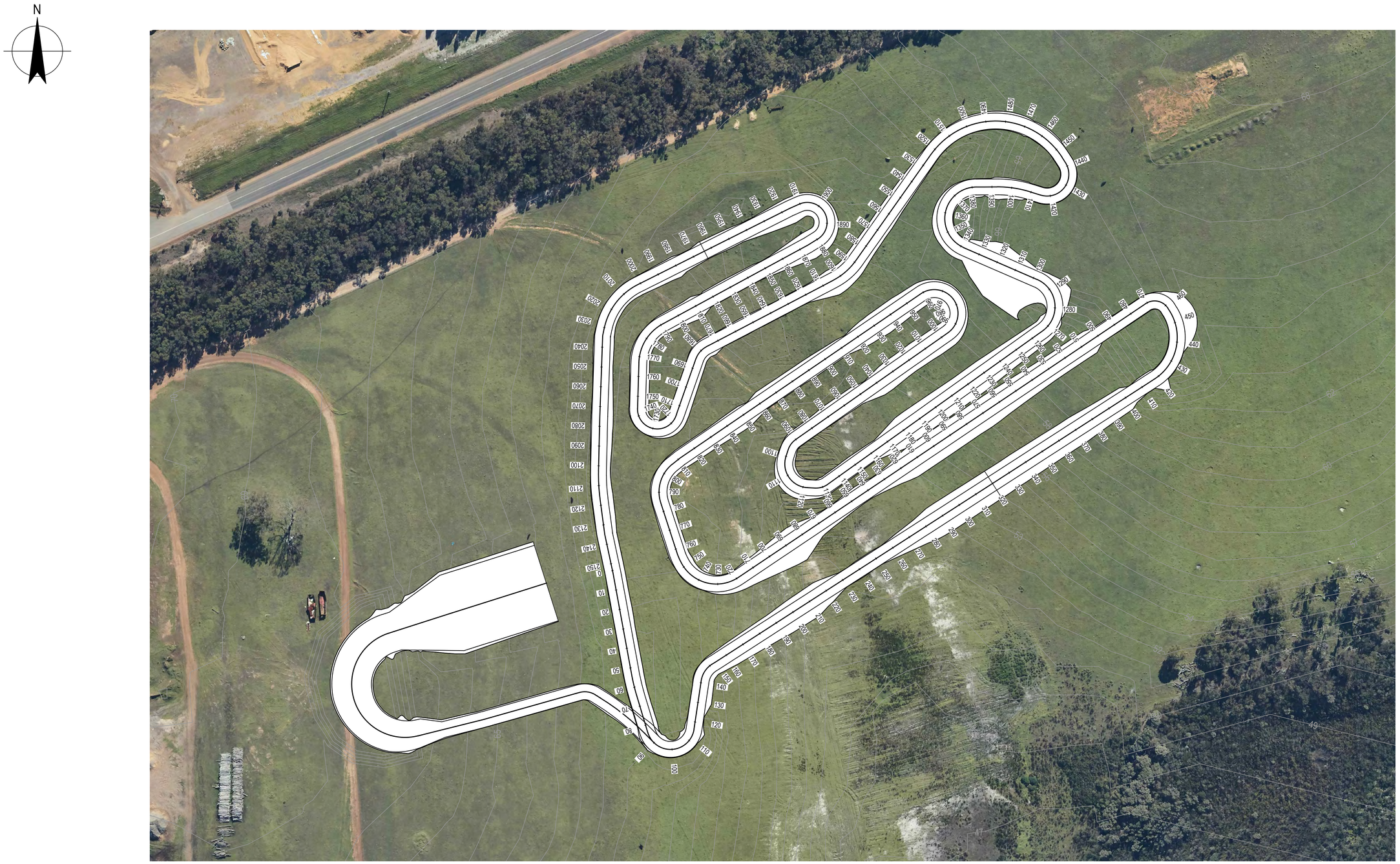
Figure E.1 Potential surface water users

Table E.1 Licensed groundwater abstractions

Licence No.	Licence allocation (kL/yr)	Expiry date	Location	Aquifer
168308	4000	31/8/2028	Project Site Lot 5780 Down Road, Drome	168308
156374	1400	30/09/2024	Lot 7235 Marbelup ~3.5 km downgradient	156374
76457	33200	8/04/2020	Lot 500 Marbelup ~6.5 km downgradient	76457
160280	1000	13/05/2026	Lot 86 Elleker Crown Reserve ~8 km downgradient	Bremer West – Superficial
155130	26000	20/10/2022	Lot 200 Lower Denmark Rd Elleker ~9.5 km downgradient	Bremer West – Sedimentary
173352	2100	16/05/2021	Wilgie Rd, Torbay	Bremer West – Superficial

Appendix F

Motocross track drawings



PLAN

SCALE 1:1000

Rev	Description	Checked	Approved	Date

Author B SHAW **Drafting Check**

Designer B SHAW **Design Check**

0 10 20 30 40 50m

SCALE 1:1000 AT ORIGINAL SIZE

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Project No.

Client CITY OF ALBANY

Project ALBANY MOTORSPORTS PARK MX TRACK

Status PRELIMINARY

Status Code

Drawing Title PLAN

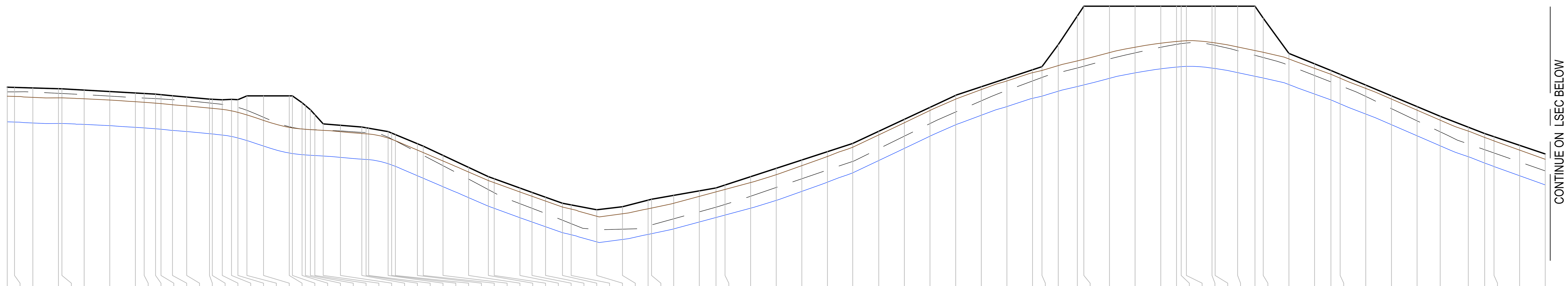
Size A1

Drawing No. 12546218-C001

Rev

Plot Date: 12 August 2021 - 1:34 PM Plotted by: Bradley Shaw

File Name: C:\12d\SW\data\P-00-12D-001\61-12546218 - Albany Motorsport Park DA_1367\CADD\Drawings\12546218-C001.dwg

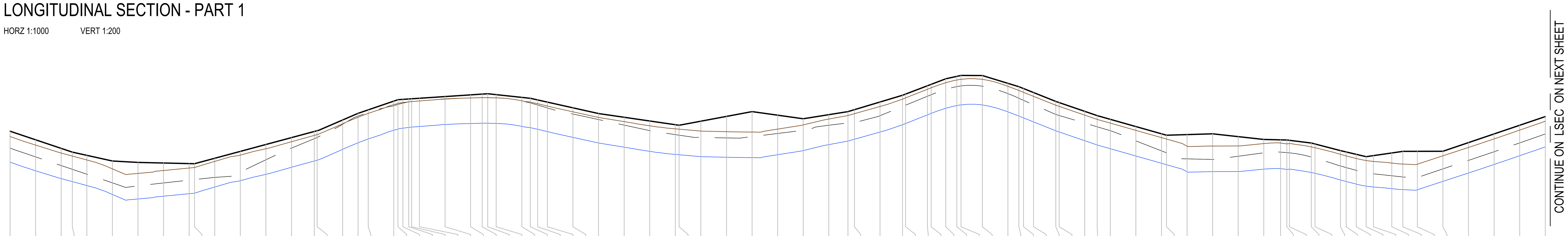


DATUM RL. 45.00

CHAINAGE	GROUNDWATER	BULK EARTHWORKS SURFACE LEVEL	LEVEL DIFFERENCE CUT - / FILL +	TRACK DESIGN SURFACE LEVEL	EXISTING SURFACE LEVEL
0.00	57.98	59.98	0.37	60.681	60.31
2.83	57.96	59.96	0.35	60.664	60.31
10.00	57.89	59.89	0.32	60.620	60.30
20.00	57.85	59.85	0.36	60.559	60.20
21.33	57.85	59.85	0.36	60.551	60.19
30.00	57.78	59.78	0.35	60.452	60.10
40.00	57.68	59.68	0.36	60.339	59.98
50.00	57.55	59.55	0.36	60.225	59.87
53.43	57.50	59.50	0.36	60.186	59.83
57.85	57.44	59.44	0.34	60.136	59.79
60.00	57.40	59.40	0.33	60.096	59.77
64.48	57.31	59.31	0.31	60.012	59.71
70.00	57.22	59.22	0.29	59.912	59.62
78.89	57.05	59.05	0.30	59.751	59.45
80.00	57.03	59.03	0.31	59.739	59.42
83.88	56.95	58.95	0.36	59.699	59.34
87.50	56.84	58.84	0.51	59.736	59.23
90.00	56.72	58.72	0.60	59.709	59.11
93.53	56.52	58.52	1.12	60.000	58.88
100.00	56.09	58.09	1.67	60.000	58.33
110.00	55.54	57.54	2.40	60.000	57.60
111.25	55.50	57.50	2.46	60.000	57.54
115.00	55.42	57.42	2.05	59.467	57.42
116.32	55.40	57.40	1.85	59.247	57.40
118.27	55.37	57.37	1.54	58.921	57.38
120.00	55.35	57.35	1.17	58.538	57.36
123.27	55.31	57.31	0.48	57.814	57.33
130.00	55.21	57.21	0.44	57.704	57.27
138.34	55.07	57.07	0.41	57.569	57.16
140.00	55.05	57.05	0.37	57.512	57.14
141.02	55.03	57.03	0.34	57.476	57.13
148.57	54.72	56.72	0.43	57.217	56.78
150.00	54.62	56.62	0.45	57.099	56.65
151.44	54.50	56.50	0.48	56.980	56.50
160.00	53.78	55.78	0.67	56.272	55.60
162.32	53.58	55.58	0.72	56.080	55.36
170.00	52.92	54.92	0.80	55.360	54.56
180.00	52.06	54.06	0.91	54.423	53.51
187.69	51.40	53.40	1.01	53.703	52.69
190.00	51.23	53.23	1.09	53.536	52.45
200.00	50.51	52.51	1.22	52.813	51.60
204.71	50.17	52.17	1.23	52.473	51.24
210.00	49.80	51.80	1.27	52.099	50.83
216.60	49.33	51.33	1.32	51.633	50.31
220.00	49.17	51.17	1.46	51.503	50.04
229.98	48.62	50.62	1.54	51.120	49.58
240.00	48.81	50.81	1.75	51.361	49.61
250.00	49.20	51.20	2.00	51.873	49.87
251.38	49.25	51.25	2.00	51.944	49.94
260.00	49.63	51.63	1.83	52.244	50.42
270.00	50.17	52.17	1.63	52.593	50.96
276.51	50.52	52.52	1.50	52.820	51.32
280.00	50.71	52.71	1.51	53.048	51.53
290.00	51.25	53.25	1.53	53.700	52.17
300.00	51.86	53.86	1.49	54.352	52.86
310.00	52.56	54.56	1.46	55.005	53.54
320.00	53.28	55.28	1.43	55.657	54.23
329.84	54.00	56.00	1.40	56.298	54.89
340.00	54.96	56.96	1.37	57.246	55.88
350.00	55.91	57.91	1.32	58.178	56.86
360.00	56.87	58.87	1.27	59.110	57.84
370.00	57.75	59.75	1.30	60.043	58.75
380.00	58.49	60.49	1.10	60.715	59.62
390.00	59.17	61.17	0.95	61.377	60.43
400.00	59.81	61.81	0.87	62.038	61.17
403.68	59.98	61.98	0.84	62.281	61.44
410.00	60.36	62.36	2.20	64.000	61.80
417.45	60.73	62.73	4.06	66.235	62.18
420.00	60.85	62.85	4.69	67.000	62.31
430.00	61.37	63.37	4.12	67.000	62.88
440.00	61.80	63.80	3.64	67.000	63.36
450.00	62.11	64.11	3.21	67.000	63.79
456.14	62.25	64.25	2.98	67.000	64.02
457.98	62.28	64.28	2.92	67.000	64.08
460.00	62.31	64.31	2.87	67.000	64.13
470.00	62.17	64.17	3.00	67.000	64.00
471.24	62.13	64.13	3.05	67.000	63.95
480.00	61.82	63.82	3.47	67.000	63.53
486.78	61.53	63.53	3.84	67.000	63.16
490.00	61.40	63.40	3.07	66.063	62.99
500.00	60.88	62.88	0.94	63.315	62.38
510.00	60.15	62.15	0.92	62.506	61.59
516.40	59.69	61.69	0.90	61.988	61.09
520.00	59.38	61.38	0.88	61.686	60.80
530.00	58.58	60.58	0.89	60.847	59.96
540.00	57.76	59.76	1.00	60.008	59.01
550.00	56.89	58.89	1.11	59.168	58.06
559.02	56.11	58.11	1.21	58.412	57.20
570.00	55.26	57.26	1.31	57.558	56.25
576.39	54.76	56.76	1.26	57.061	55.80
580.00	54.49	56.49	1.27	56.818	55.55
590.00	53.77	55.77	1.30	56.145	54.85
600.00	53.06	55.06	1.32	55.471	54.15

LONGITUDINAL SECTION - PART 1

HORZ 1:1000 VERT 1:200



DATUM RL. 47.00

CHAINAGE	GROUNDWATER	BULK EARTHWORKS SURFACE LEVEL	LEVEL DIFFERENCE CUT - / FILL +	TRACK DESIGN SURFACE LEVEL	EXISTING SURFACE LEVEL
600.00	53.06	55.06	1.32	55.471	54.15
610.00	52.38	54.38	1.33	54.798	53.46
620.00	51.77	53.77	1.34	54.125	52.79
624.32	51.53	53.53	1.34	53.833	52.50
630.00	51.23	53.23	1.47	53.584	52.11
640.00	50.53	52.53	1.71	53.143	51.44
650.00	50.18	52.18	1.84	53.037	51.20
660.00	50.40	52.40	1.57	52.990	51.42
670.00	50.59	52.59	1.30	52.942	51.64
672.11	50.63	52.63	1.24	52.932	51.69
680.00	51.11	53.11	1.49	53.357	51.86
690.00	51.61	53.61	1.61	53.896	52.29
700.00	52.10	54.10	1.20	54.435	53.24
710.00	52.65	54.65	0.82	54.973	54.15
718.89	53.14	55.14	0.56	55.452	54.89
720.00	53.20	55.20	0.53	55.512	54.98
730.00	54.06	56.06	0.34	56.350	56.01
736.00	54.57	56.57	0.21	56.866	56.66
740.00	54.87	56.87	0.20	57.141	56.94
750.00	55.55	57.55	0.35	57.826	57.48
751.59	55.64	57.64	0.37	57.935	57.57
753.55	55.71	57.71	0.30	57.961	57.66
755.81	55.77	57.77	0.23	57.991	57.76
756.97	55.79	57.79	0.22	58.007	57.78
760.00	55.84	57.84	0.21	58.047	57.83
770.00	56.00	58.00	0.20	58.179	57.98
780.00	56.07	58.07	0.24	58.311	58.07
784.51	56.10	58.10	0.27	58.371	58.10
786.67	56.10	58.10	0.29	58.399	58.11
790.00	56.08	58.08	0.24	58.329	58.09
800.00	55.85	57.85	0.28	58.119	57.84
803.33	55.75	57.75	0.37	58.048	57.68
806.18	55.62	57.62	0.40	57.920	57.52
810.00	55.44	57.44	0.46	57.749	57.29
820.00	54.99	56.99	0.49	57.299	56.81
830.00	54.55	56.55	0.46	56.849	56.39
840.00	54.22	56.22	0.61	56.558	55.95
850.00	53.90	55.90	0.75	56.267	55.52
860.00	53.66	55.66	0.77	55.976	55.21
861.46	53.63	55.63	0.77	55.934	55.17
870.00	53.48	55.48	1.27	56.255	54.98
880.00	53.44	55.44	1.68	56.630	54.95
890.00	53.40	55.40	1.96	57.006	55.05
900.00	53.64	55.64	1.43	56.724	55.30
910.00	53.96	55.96	0.90	56.442	55.54
920.00	54.42	56.42	0.82	56.762	55.94
927.49	54.70	56.70	0.88	57.002	56.12
930.00	54.84	56.84	0.97	57.152	56.19
940.00	55.41	57.41	1.07	57.751	56.68
948.83	55.98	57.98	0.87	58.280	57.41
950.00	56.07	58.07	0.87	58.369	57.50
958.53	56.75	58.75	0.81	59.020	58.20
960.00	56.87	58.87	0.81	59.132	58.32
965.71	57.27	59.27	0.83	59.567	58.74
970.00	57.48	59.48	0.80	59.756	58.96
971.67	57.53	59.53	0.81	59.830	59.02
980.00	57.52	59.52	0.83	59.825	58.99
990.00	56.98	58.98	0.80	59.215	58.41
994.29	56.65	58.65	0.91	58.953	58.04
996.07	56.51	58.51	0.93	58.811	57.89
1000.00	56.20	58.20	0.96	58.498	57.54
1008.71	55.50	57.50	1.02	57.804	56.78
1010.00	55.42	57.42	1.01	57.715	56.70
1020.00	54.73	56.73	0.92	57.027	56.11
1024.86	54.39	56.39	0.87	56.692	55.82
1030.00	54.10	56.10	0.88	56.401	55.52
1040.00	53.53	55.53	1.11	55.835	54.72
1050.00	52.97	54.97	1.33	55.268	53.93
1051.95	52.86	54.86	1.38	55.158	53.78
1060.00	52.30	54.30	1.90	55.206	53.31
1070.00	52.31	54.31	2.00	55.265	53.26
1080.00	52.32	54.32	1.53	55.047	53.52
1090.00	52.51	54.51	1.04	54.829	53.79
1096.55	52.55	54.55	0.96	54.795	53.84
1098.99	52.48	54.48	0.98	54.782	53.80
1100.00	52.50	54.50	0.97	54.757	53.78
1108.57	52.25	54.25	1.08	54.545	53.46
1110.00	52.18	54.18	1.09	54.472	53.38
1119.95	51.66	53.66	1.20	53.960	52.76
1122.19	51.54	53.54	1.23	53.853	52.63
1126.12	51.34	53.34	1.25	53.665	52.41
1130.00	51.18	53.18	1.25	53.480	52.23
1132.83	51.11	53.11	1.42	53.562	52.15
1140.00	50.99	52.99	1.78	53.769	51.99
1144.32	50.91	52.91	2.00	53.894	51.89
1150.00	50.89	52.89	2.05	53.899	51.84
1160.00	51.55	53.55	1.38	53.907	52.53
1170.00	52.21	54.21	1.39	54.584	53.20
1180.00	52.87	54.87	1.39	55.261	53.87
1190.00	53.56	55.56	1.38	55.938	54.56
1200.00	54.25	56.25	1.35	56.614	55.26

LONGITUDINAL SECTION - PART 2

HORZ 1:1000 VERT 1:200

Rev	Description	Checked	Approved	Date

Author B SHAW — Drafting Check
Designer B SHAW — Design Check

VERTICAL 1:200 AT ORIGINAL SIZE — 0 2 4 6 8 10m
HORIZONTAL 1:1000 AT ORIGINAL SIZE — 0 10 20 30 40 50m

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Client: CITY OF ALBANY
Project: ALBANY MOTORSPORTS PARK MX TRACK
Project No.
Status: PRELIMINARY
Status Code

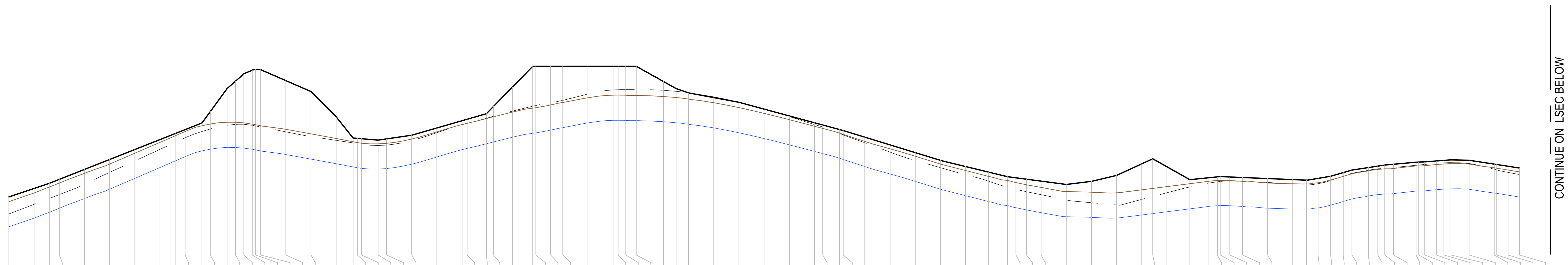
Drawing Title: LONGITUDINAL SECTION SHEET 1 OF 2

Size A1

Drawing No. 12546218-C002

Rev

Plot Date: 12 August 2021 - 11:46 AM Plotted by: Bradley Shaw File Name: C:\12d\SW\data\P-00-12D-001\61-12546218 - Albany Motorsport Park DA_1367\CADD\Drawings\12546218-C002.dwg

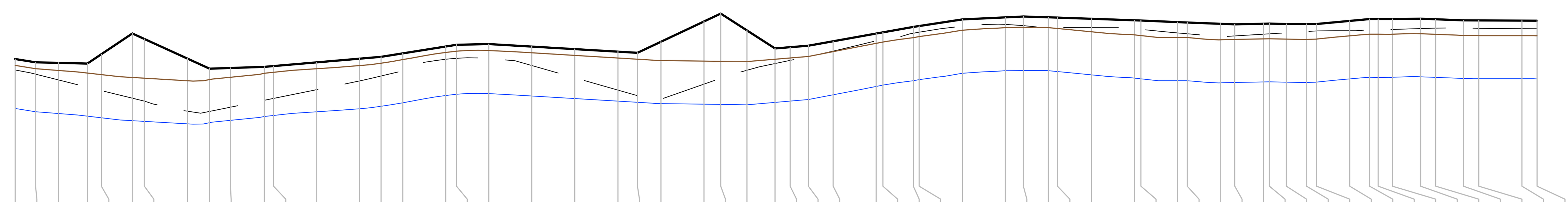


DATUM RL. 51.00

CHAINAGE	EXISTING SURFACE LEVEL	TRACK DESIGN SURFACE LEVEL	LEVEL DIFFERENCE CUT - / FILL +	BULK EARTHWORKS SURFACE LEVEL	GROUNDWATER
1200.00	55.26	56.614	1.35	56.25	54.25
1210.00	56.03	57.291	1.26	56.94	54.94
1216.19	56.51	57.710	1.20	57.41	55.41
1220.00	56.80	58.011	1.21	57.72	55.72
1230.00	57.62	58.802	1.18	58.49	56.49
1240.00	58.56	59.593	1.03	59.23	57.23
1250.00	59.48	60.384	0.90	60.09	58.09
1260.00	60.40	61.175	0.78	60.95	58.95
1266.30	60.97	61.673	0.70	61.50	59.50
1270.00	61.32	61.966	0.65	61.82	59.82
1276.67	61.82	62.493	0.67	62.27	60.27
1280.00	62.02	63.404	1.38	62.41	60.41
1286.67	62.31	65.225	2.91	62.55	60.55
1290.00	62.38	65.812	3.43	62.55	60.55
1293.33	62.39	66.400	4.01	62.50	60.50
1296.67	62.31	66.695	4.39	62.40	60.40
1297.98	62.26	66.752	4.49	62.35	60.35
1300.00	62.18	66.726	4.55	62.27	60.27
1310.00	61.79	65.859	4.07	61.99	59.99
1320.00	61.41	64.992	3.58	61.62	59.62
1330.00	61.11	62.981	1.87	61.26	59.26
1336.70	60.91	61.300	0.39	61.00	59.00
1338.41	60.86	61.271	0.41	60.94	58.94
1340.00	60.81	61.245	0.44	60.89	58.89
1346.67	60.71	61.133	0.43	60.83	58.83
1350.00	60.74	61.229	0.49	60.87	58.87
1360.00	61.10	61.517	0.42	61.22	59.22
1370.00	61.72	62.093	0.37	61.79	59.79
1380.00	62.36	62.669	0.31	62.37	60.37
1382.02	62.46	62.786	0.32	62.47	60.47
1389.67	62.87	63.226	0.36	62.84	60.84
1392.52	63.03	63.811	0.78	62.99	60.99
1400.00	63.43	65.343	1.91	63.36	61.36
1408.09	63.83	67.000	3.17	63.67	61.67
1409.32	63.88	67.000	3.12	63.70	61.70
1415.14	64.10	67.000	2.90	63.92	61.92
1420.00	64.29	67.000	2.71	64.12	62.12
1430.00	64.79	67.000	2.21	64.50	62.50
1440.00	65.12	67.000	1.88	64.70	62.70
1441.97	65.14	67.000	1.86	64.71	62.71
1445.03	65.15	67.000	1.85	64.70	62.70
1449.19	65.15	67.000	1.85	64.68	62.68
1460.00	65.09	65.788	0.70	64.59	62.59
1465.00	65.01	65.227	0.22	64.51	62.51
1470.00	64.88	64.878	0.00	64.39	62.39
1480.00	64.57	64.508	-0.06	64.10	62.10
1490.00	64.14	64.139	-0.00	63.71	61.71
1500.00	63.61	63.596	-0.01	63.26	61.26
1510.00	63.00	63.054	0.05	62.75	60.75
1520.00	62.37	62.511	0.14	62.23	60.23
1523.28	62.18	62.334	0.15	62.06	60.06
1530.00	61.66	61.969	0.31	61.68	59.68
1531.40	61.55	61.893	0.34	61.59	59.59
1540.00	60.92	61.366	0.45	61.03	59.03
1550.00	60.18	60.754	0.57	60.44	58.44
1560.00	59.53	60.142	0.61	59.85	57.85
1570.00	58.94	59.529	0.59	59.23	57.23
1580.00	58.39	59.036	0.65	58.71	56.71
1589.06	57.87	58.597	0.73	58.25	56.25
1596.63	57.39	58.230	0.84	57.93	55.93
1600.00	57.22	58.139	0.92	57.76	55.76
1604.18	57.03	58.027	0.99	57.58	55.58
1610.00	56.79	57.871	1.08	57.37	55.37
1620.00	56.38	57.603	1.22	57.04	55.04
1630.00	56.16	57.854	1.70	56.99	54.99
1640.00	55.98	58.324	2.35	56.95	54.95
1650.00	56.42	59.250	2.83	57.18	55.18
1654.34	56.65	59.652	3.00	57.29	55.29
1660.00	56.95	59.013	2.06	57.44	55.44
1669.09	57.41	57.987	0.58	57.67	55.67
1676.67	57.72	58.141	0.42	57.87	55.87
1680.00	57.82	58.208	0.39	57.93	55.93
1681.14	57.84	58.231	0.39	57.94	55.94
1684.96	57.89	58.200	0.31	57.92	55.92
1690.00	57.85	58.159	0.31	57.86	55.86
1700.00	57.77	58.078	0.31	57.72	55.72
1710.00	57.63	57.996	0.36	57.66	55.66
1715.39	57.56	57.952	0.39	57.65	55.65
1720.00	57.66	58.094	0.43	57.74	55.74
1725.00	57.92	58.263	0.34	57.96	55.96
1730.00	58.29	58.552	0.26	58.25	56.25
1733.48	58.49	58.753	0.26	58.46	56.46
1740.00	58.74	58.952	0.21	58.69	56.69
1743.74	58.85	59.066	0.22	58.80	56.80
1746.51	58.90	59.151	0.25	58.85	56.85
1750.00	58.96	59.215	0.25	58.88	56.88
1758.97	59.14	59.380	0.24	59.08	57.08
1760.00	59.16	59.386	0.23	59.08	57.08
1762.39	59.20	59.399	0.20	59.10	57.10
1767.00	59.29	59.471	0.19	59.19	57.19
1770.00	59.33	59.517	0.19	59.24	57.24
1772.80	59.34	59.560	0.22	59.26	57.26
1780.00	59.28	59.527	0.25	59.23	57.23
1790.00	58.82	59.222	0.40	58.93	56.93
1791.02	58.76	59.191	0.43	58.90	56.90
1795.50	58.57	59.055	0.49	58.75	56.75
1800.00	58.39	58.908	0.51	58.61	56.61

LONGITUDINAL SECTION - PART 3

HORZ 1:1000 VERT 1:200



DATUM RL. 52.00

CHAINAGE	EXISTING SURFACE LEVEL	TRACK DESIGN SURFACE LEVEL	LEVEL DIFFERENCE CUT - / FILL +	BULK EARTHWORKS SURFACE LEVEL	GROUNDWATER
1800.00	58.39	58.908	0.51	58.61	56.61
1804.71	58.20	58.754	0.55	58.45	56.45
1810.00	57.94	58.726	0.79	58.37	56.37
1816.76	57.60	58.689	1.09	58.25	56.25
1820.00	57.44	59.124	1.68	58.18	56.18
1827.18	57.09	60.087	3.00	58.05	56.05
1830.00	56.95	59.830	2.88	58.01	56.01
1840.00	56.48	58.921	2.44	57.90	55.90
1845.14	56.47	58.454	1.98	57.95	55.95
1850.00	56.67	58.487	1.81	58.06	56.06
1857.84	56.99	58.541	1.55	58.24	56.24
1860.00	57.08	58.578	1.50	58.29	56.29
1870.00	57.48	58.750	1.27	58.46	56.46
1880.00	57.89	58.922	1.03	58.60	56.60
1885.00	58.12	59.008	0.89	58.71	56.71
1890.00	58.35	59.168	0.82	58.87	56.87
1900.00	58.90	59.487	0.59	59.21	57.21
1902.50	58.94	59.567	0.63	59.27	57.27
1910.00	58.93	59.602	0.67	59.30	57.30
1920.00	58.60	59.484	0.88	59.19	57.19
1930.00	58.03	59.366	1.33	59.07	57.07
1940.00	57.46	59.249	1.78	58.95	56.95
1944.53	57.21	59.195	1.99	58.90	56.90
1950.00	57.04	59.708	2.67	58.83	56.83
1960.00	57.74	60.645	2.91	58.81	56.81
1963.87	58.01	61.008	3.00	58.80	56.80
1970.00	58.39	60.225	1.84	58.78	56.78
1976.51	58.70	59.393	0.70	58.89	56.89
1980.00	58.84	59.452	0.61	58.95	56.95
1984.26	59.02	59.524	0.50	59.02	57.02
1990.00	59.27	59.730	0.46	59.25	57.25
2000.00	59.75	60.088	0.34	59.63	57.63
2001.56	59.83	60.144	0.32	59.69	57.69
2008.64	60.10	60.398	0.29	59.90	57.90
2010.00	60.15	60.439	0.29	59.94	57.94
2020.00	60.42	60.741	0.32	60.24	58.24
2030.00	60.51	60.835	0.32	60.36	58.36
2034.20	60.46	60.874	0.42	60.37	58.37
2040.00	60.36	60.836	0.47	60.36	58.36
2042.10	60.36	60.822	0.46	60.32	58.32
2050.00	60.37	60.768	0.39	60.17	58.17
2060.00	60.31	60.699	0.39	60.02	58.02
2061.49	60.28	60.688	0.41	59.99	57.99
2070.00	60.12	60.618	0.50	59.90	57.90
2072.26	60.08	60.600	0.52	59.90	57.90
2080.00	59.94	60.539	0.60	59.80	57.80
2083.31	59.98	60.514	0.54	59.81	57.81
2090.00	60.06	60.541	0.48	59.84	57.84
2091.36	60.07	60.547	0.47	59.85	57.85
2095.26	60.12	60.530	0.41	59.83	57.83
2100.00	60.18	60.530	0.35	59.82	57.82
2102.29	60.20	60.531	0.33	59.83	57.83
2110.00	60.22	60.671	0.45	59.98	57.98
2114.62	60.25	60.755	0.51	60.06	58.06
2116.61	60.26	60.755	0.49	60.05	58.05
2119.92	60.28	60.754	0.48	60.05	58.05
2126.49	60.32	60.779	0.46	60.08	58.08
2130.00	60.34	60.750	0.41	60.05	58.05
2136.41	60.34	60.698	0.36	60.00	58.00
2140.00	60.33	60.694	0.37	59.99	57.99
2150.00	60.31	60.685	0.37	59.99	57.99
2153.54	60.31	60.684	0.37	59.98	57.98

LONGITUDINAL SECTION - PART 4

HORZ 1:1000 VERT 1:200

Rev	Description	Checked	Approved	Date

Author B SHAW Drafting Check
Designer B SHAW Design Check

VERTICAL 1:200 AT ORIGINAL SIZE 0 2 4 6 8 10m
HORIZONTAL 1:1000 AT ORIGINAL SIZE 0 10 20 30 40 50m

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Project No.

Client CITY OF ALBANY

Project ALBANY MOTORSPORTS PARK MX TRACK

Status PRELIMINARY Status Code

Drawing Title PLAN LONGITUDINAL SECTION SHEET 2 OF 2

Size A1

Drawing No. 12546218-C003 Rev

Plot Date: 12 August 2021 - 11:46 AM Plotted by: Bradley Shaw

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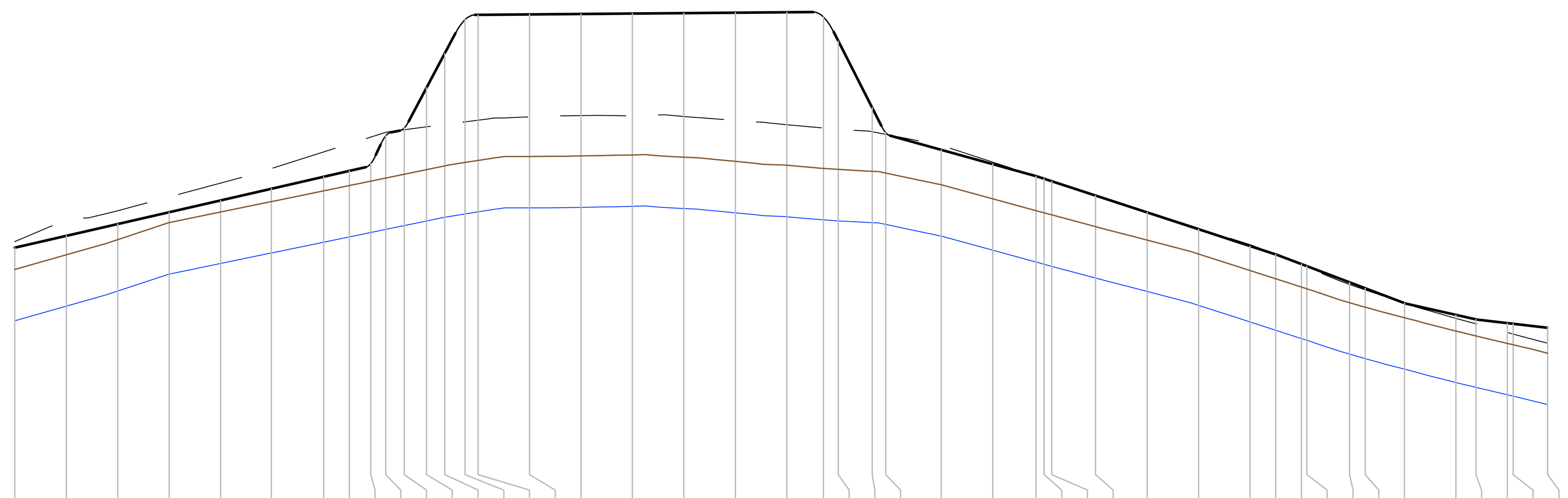

DATUM RL. 53.00

CHAINAGE	GROUNDWATER	BULK EARTHWORKS SURFACE LEVEL	LEVEL DIFFERENCE CUT - / FILL +	TRACK DESIGN SURFACE LEVEL	EXISTING SURFACE LEVEL
0.00	59.98	61.98	-0.24	62.830	63.07
10.00	60.55	62.55	-0.62	63.290	63.91
20.00	61.14	63.14	-0.52	63.750	64.27
30.00	61.80	63.80	-0.59	64.210	64.80
40.00	62.22	64.22	-0.67	64.670	65.34
49.84	62.62	64.62	-0.79	65.122	65.91
60.00	63.04	65.04	-0.96	65.590	66.55
65.00	63.25	65.25	-1.05	65.820	66.87
69.15	63.42	65.42	-1.03	66.098	67.13
72.05	63.54	65.54	-0.14	67.176	67.31
75.65	63.69	65.69	0.07	67.490	67.42
80.00	63.86	65.86	1.53	69.056	67.53
83.53	64.01	66.01	2.76	70.385	67.62
87.50	64.14	66.14	3.98	71.706	67.72
90.00	64.22	66.22	4.10	71.886	67.79
100.00	64.38	66.38	3.98	71.903	67.92
110.00	64.40	66.40	3.95	71.920	67.97
120.00	64.44	66.44	3.97	71.937	67.96
130.00	64.35	66.35	4.02	71.954	67.94
140.00	64.19	66.19	4.19	71.971	67.78
150.00	64.03	66.03	4.38	71.988	67.61
157.11	63.91	65.91	4.32	71.805	67.48
160.00	63.87	65.87	3.42	70.865	67.44
166.58	63.80	65.80	0.94	68.278	67.34
169.23	63.73	65.73	0.07	67.307	67.24
180.00	63.28	65.28	-0.17	66.637	66.81
190.00	62.73	64.73	-0.08	66.082	66.16
198.41	62.27	64.27	-0.00	65.614	65.61
200.00	62.18	64.18	-0.00	65.511	65.51
201.47	62.10	64.10	-0.00	65.414	65.42
210.00	61.65	63.65	-0.01	64.856	64.87
220.00	61.12	63.12	-0.03	64.201	64.23
230.00	60.58	62.58	-0.04	63.546	63.59
240.00	59.94	61.94	-0.05	62.891	62.94
245.00	59.62	61.62	-0.00	62.564	62.56
250.00	59.29	61.29	0.03	62.185	62.15
251.05	59.23	61.23	0.04	62.105	62.07
259.33	58.69	60.69	0.08	61.478	61.40
262.39	58.51	60.51	0.06	61.245	61.19
270.00	58.10	60.10	0.00	60.669	60.67
280.00	57.58	59.58	0.14	60.213	60.08
283.88	57.39	59.39	0.17	60.037	59.86
290.00	57.10	59.10	0.36	59.893	59.53
291.13	57.05	59.05	0.40	59.866	59.47
297.81	56.72	58.72	0.67	59.780	59.11

LONGITUDINAL SECTION - MX ENTRY STAGE

HORZ 1:1000 VERT 1:200

Rev	Description	Checked	Approved	Date

Author B SHAW Drafting Check
Designer B SHAW Design Check

VERTICAL 1:200 AT ORIGINAL SIZE: 0 2 4 6 8 10m
HORIZONTAL 1:1000 AT ORIGINAL SIZE: 0 10 20 30 40 50m

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Project No.

Client: CITY OF ALBANY
Project: ALBANY MOTORSPORTS PARK MX TRACK
Status: PRELIMINARY
Status Code

Drawing Title: LONGITUDINAL SECTION MX ENTRY STAGE

Size A1

Drawing No. 12546218-C005
Rev

Plot Date: 12 August 2021 - 11:46 AM Plotted by: Bradley Shaw File Name: C:\12d\SW\data\P-00-12D-001\61-12546218 - Albany Motorsport Park DA_1367\CADD\Drawings\12546218-C005.dwg

Appendix G

DRAINS modelling results schematics

Summary of DRAINS Results

Basin	Peak Water Level			Peak Inflow			Peak Outflow			Peak Stored Vol			Critical Duration		
	1EY	10% AEP	1% AEP	1EY	10% AEP	1% AEP	1EY	10% AEP	1% AEP	1EY	10% AEP	1% AEP	1EY	10% AEP	1% AEP
East-B1	58.78	58.88	59.06	0.052	0.225	0.635	0.032	0.196	0.464	231	278	385	6hr	2hr	30min
East-B2	57.22	57.55	57.65	0.054	0.241	0.655	0.006	0.055	0.254	121	362	446	9hr	3hr	1hr
East-B3	70.27	70.56	70.75	0.072	0.272	0.647	0	0.031	0.282	110	277	410	3hr	1hr	1hr
East-B4	71.18	71.34	71.41	0.227	0.729	1.088	0	0.111	0.201	53	117	150	25min	25min	15min
East-B5	66.82	67.1	67.23	0.24	0.335	0.792	0.021	0.174	0.464	417	666	791	3hr	2hr	1hr
East-B6	61.19	61.4	61.61	0.032	0.534	1.834	0.018	0.405	0.628	127	300	516	6hr	2hr	30min
East-B7	65.53	65.66	65.97	0.329	0.386	1.241	0.04	0.287	0.679	223	298	528	6hr	2hr	9hr
East-B8	70.58	70.77	71.03	0.024	0.069	0.2	0	0	0.02	21	81	191	1hr	3hr	9hr
East-B9	63.02	63.3	63.65	0.042	0.163	0.499	0	0	0.255	18	314	788	2hr	3hr	2hr
East-B10	62.14	62.36	62.52	0.04	0.286	0.977	0.02	0.189	0.55	64	198	320	2hr	2hr	30min
West-B1	66.21	66.69	66.7	0.014	0.115	0.32	0	0.083	0.113	22	97	100	9hr	9hr	9hr
West-B2	62.3	62.39	62.43	0.137	0.269	0.435	0.014	0.047	0.116	79	121	144	1hr	45min	15min
West-B3	62.91	63.25	63.31	0.057	0.145	0.269	0	0.038	0.146	79	168	186	3hr	3hr	30min
West-B4	59.53	59.61	59.68	0.086	0.198	0.401	0.044	0.173	0.361	77	93	109	1hr	30min	15min
West-B5	53.92	54.13	54.25	0.057	0.296	0.641	0.029	0.242	0.582	55	94	118	3hr	1hr	30min
West-B6	58	58.42	58.57	0	0.044	0.158	0	0	0.069	0	67	106	-	3hr	2hr
West-B7	51.85	52.3	52.44	0.056	0.326	0.724	0	0.138	0.529	181	500	627	6hr	3hr	2hr

Drains/swales	Shape	Slope	Depth	Length	10% flow	Flow			Water Depth					
						1EY	10% AEP	1% AEP	1EY	10% AEP	1% AEP			
E-B1-01	1:6 swale	0.51	0.406	83	0.037	0.01	0.037	0.092	0.065	0.106	0.144			
E-B1-02A	1:6 swale	0.54	0.448	130.5	0.052	0.003	0.052	0.212	0.052	0.148	0.244			
E-B1-02B	1:6 swale	2.78	0.41	28.8	0.057	0.005	0.057	0.233	0.045	0.11	0.186			
E-B1-03A	1:6 swale	2.1	0.501	142.8	0.189	0.077	0.189	0.352	0.149	0.201	0.253			
E-B1-03B	1:6 swale	2.08	0.474	312.1	0.17	0.047	0.17	0.431	0.108	0.174	0.247			
E-B1-04	1:4 swale	0.54	0.44	184.8	0.024	0	0.024	0.104	0	0.14	0.23			
E-B1-04-CONNECT	Dummy OF	3.25	0.428	92.4	0.02	0	0.02	0.077	0	0.128	0.201			
E-B2-01	1:4 swale	4.23	0.459	142	0.125	0.027	0.125	0.338	0.089	0.159	0.231			
E-B2-02	1:6 swale	5.28	0.428	56.8	0.116	0.027	0.116	0.317	0.074	0.128	0.185			
E-B3-01	1:6 swale	1.26	0.437	118.7	0.067	0.023	0.067	0.171	0.092	0.137	0.249			
E-B3-02	1:6 swale	0.53	0.861	112.9	0.132	0.051	0.132	0.291	0.265	0.561	0.749			
E-B4-01	K300, 0.4m deep	0.5	0.57	150.2	0.09	0.046	0.09	0.15	0.161	0.27	0.405			
E-B4-02	1:4 swale	0.9	0.586	211.6	0.248	0.113	0.248	0.436	0.228	0.286	0.348			
E-B5-01	1:4 swale	2.56	1.291	159.6	0.113	0.057	0.113	0.228	0.574	0.991	1.247			
E-B5-02	1:4 swale	1.49	1.291	375.5	0.53	0.256	0.53	0.946	0.574	0.991	1.247			
E-B6-01	1:6 swale	3.87	0.699	142	0.094	0.007	0.094	0.32	0.19	0.399	0.614			
E-B6-02	1:4 swale	5.3	0.699	158.6	0.051	0.005	0.051	0.18	0.19	0.399	0.614			
E-B6-03	1:6 swale	0.8	0.699	310.6	0.158	0.011	0.158	0.655	0.19	0.399	0.614			
E-B7-01	1:4 swale	0.67	0.508	74.5	0.098	0.023	0.098	0.285	0.092	0.208	0.304			
E-B7-02	1:6 swale	0.62	0.408	160.6	0.025	0	0.025	0.128	0	0.108	0.195			
E-B7-03	1:6 swale	1.16	0.435	129.3	0.06	0.021	0.06	0.127	0.091	0.135	0.174			
E-B7-04	1:4 swale	0.97	0.685	61	0.101	0.052	0.101	0.164	0.285	0.385	0.524			
E-B7-05	1:4 swale	1.92	0.685	30.7	0.042	0.022	0.042	0.063	0.287	0.385	0.524			
E-B7-06	1:4 swale	2.67	0.854	149.8	0.13	0.065	0.13	0.289	0.226	0.365	0.854			
E-B7-07	1:4 swale	1.57	0.832	127.4	0.033	0	0.033	0.192	0	0.395	0.832			
E-B7-08	1:6 swale	2.66	0.446	153.8	0.115	0.054	0.115	0.222	0.113	0.146	0.179			
E-B7-09	1:6 swale	1.45	0.463	144.6	0.113	0.053	0.113	0.222	0.128	0.163	0.203			
E-B7-10A	1:6 swale	1.97	0.446	126.8	0.054	0.004	0.054	0.174	0.049	0.146	0.226			
E-B7-10B	1:4 swale	1.12	0.581	133.8	0.05	0.002	0.05	0.193	0.185	0.281	0.431			
E-B7-11	1:4 swale	0.01	0.773	73.1	0.227	0.077	0.227	0.579	0.412	0.473	0.691			
E-B8-01A	1:4 swale	0.56	0.569	126.1	0.037	0.013	0.037	0.113	0.108	0.269	0.53			
E-B8-01B	1:4 swale	2.08	0.569	120.2	0.032	0.011	0.032	0.087	0.083	0.269	0.53			
E-B9-01	1:6 swale	3.6	0.447	152.7	0.129	0.034	0.129	0.255	0.093	0.147	0.211			
E-B9-02	1:6 swale	1.57	0.441	95.6	0.059	0.015	0.059	0.115	0.077	0.141	0.211			
E-B9-03	1:6 swale	3.65	0.802	167	0.03	0	0.03	0.163	0	0.388	0.802			
E-B9-04	1:6 swale	1.85	0.802	113.2	0.019	0	0.019	0.105	0	0.388	0.802			
E-B9-05	1:4 swale	2.78	0.416	165.1	0.04	0.012	0.04	0.132	0.08	0.116	0.203			
E-B9-06	1:4 swale	1.37	0.405	116.3	0.023	0.007	0.023	0.073	0.069	0.105	0.206			
E-B9-07	1:4 swale	1.64	0.781	341.3	0.072	0	0.072	0.402	0	0.322	0.781			
E-B9-08	1:4 swale	0.94	0.781	115.5	0.024	0	0.024	0.125	0	0.322	0.781			
E-B10-01	1:6 swale	0.55	0.658	182.6	0.042	0.005	0.042	0.15	0.135	0.358	0.521			
E-B10-02	1:6 swale	0.49	0.658	306.3	0.181	0.026	0.181	0.617	0.135	0.358	0.521			
E-B10-03A	1:6 swale	3.09	0.41	83.7	0.041	0.012	0.041	0.095	0.062	0.11	0.176			
E-B10-03B	1:6 swale	1.69	0.658	54	0.064	0.01	0.064	0.21	0.135	0.358	0.521			
E-B10-04	1:6 swale	2.44	0.475	82	0.017	0	0.017	0.059	0	0.175	0.319			
E-B10-05	1:4 swale	3.18	0.475	94.3	0.027	0	0.027	0.061	0	0.175	0.319			
W-B1-01	1:6 swale	0.67	0.438	178.5	0.051	0.009	0.051	0.145	0.074	0.138	0.201			
W-B1-02	1:6 swale	0.85	0.417	100	0.029	0.006	0.029	0.073	0.069	0.117	0.178			
W-B1-03	1:6 swale	0.52	0.458	96.6	0.026	0.005	0.026	0.068	0.071	0.158	0.252			
W-B1-04	1:6 swale	0.91	1.003	109.3	0.464	0.001	0.464	0.473	0.248	0.703	0.707			
W-B1-05	1:6 swale	0.35	1.003	140.9	0.721	0.001	0.721	0.725	0.248	0.703	0.707			
W-B3-01	1:6 swale	5.88	1.047	80	0.145	0.057	0.145	0.269	0.41	0.747	0.808			
W-B4-01	1:6 swale	1.8	0.909	166.8	0.088	0.038	0.088	0.183	0.533	0.609	0.684			
W-B4-02	1:6 swale	4.81	0.909	197.5	0.11	0.048	0.11	0.22	0.533	0.609	0.684			
W-B5-01	1:6 swale	4.3	0.473	59.8	0.022	0.002	0.022	0.052	0.055	0.173	0.29			
W-B5-02	1:6 swale	3.34	0.473	32	0.013	0.002	0.013	0.03	0.055	0.173	0.29			
W-B5-03	1:6 swale	9	0.34	77.8	0.005	0	0.005	0.029	0	0.04	0.075			
W-B5-04	1:6 swale	3	0.811	40	0.188	0.044	0.188	0.574	0.224	0.511	0.763			
W-B5-05	1:6 swale	4.89	0.798	45	0.018	0.003	0.018	0.04	0.266	0.498	0.763			
W-B5-06 07	1:6 swale	5.8	0.695	150	0.104	0.025	0.104	0.235	0.218	0.395	0.649			
W-B5-08	1:6 swale	2.01	0.695	59.7	0.038	0.009	0.038	0.082	0.218	0.395	0.649			
W-B5-09	1:6 swale	4.63	0.479	80	0.044	0.01	0.044	0.093	0.153	0.179	0.291			
W-B5-11	1:6 swale	1.85	0.345	27.1	0.004	0	0.004	0.018	0	0.045	0.077			
W-B5-12	1:6 swale	5.19	0.347	28.9	0.007	0.001	0.007	0.016	0.027	0.047	0.063			
W-B5-13A	1:6 swale	1.01	0.935	79.3	0.359	0.054	0.359	0.552	0.419	0.635	0.753			
W-B5-13B	1:6 swale	1.75	0.935	51.9	0.143	0.007	0.143	0.18	0.419	0.635	0.753			
W-B5-16	1:6 swale	3.8	0.935	79	0.021	0	0.021	0.054	0	0.635	0.753			
W-B5-CULV14 15	1:6 swale	4.38	0.665	164.5	0.087	0.015	0.087	0.196	0.124	0.365	0.643			
W-B6-01	1:6 swale	0.69	0.717	175	0.041	0	0.041	0.159	0	0.417	0.569			
W-B7-01	1:6 swale	6.52	0.996	60	0	0	0	0.069	0	0	0.996			
W-B7-02	1:6 swale	7.82	1.101	140.7	0.12	0.031	0.12	0.24	0.354	0.801	0.94			
W-EXT02	1:6 swale	0.38	0.542	132.4	0.172	0.014	0.172	0.524	0.095	0.242	0.363			
W-EXT03	1:6 swale	4.92	0.488	71.1	0.067	0	0.067	0.149	0	0.188	0.293			
W-EXT04	1:6 swale	1.56	1.423	89.7	0.186	0.013	0.186	0.463	0.13	0.538	1.423			
W-S1	1:6 swale	5.07	0.478	296	0.265	0	0.265	1.604	0	0.178	0.341			

Stage 1A (WEST) DRAINS Input Data

PIT / NODE DETAILS

Name	Type	Family	Version 15 Size	Ponding Volume (cu.m)	Pressure Change Coeff. Ku	Surface Elev (m)	Max Pond Depth (m)	Base Inflow (cu.m/s)	Blocking Factor	x	y	Bolt-down lid	id	Part Full Shock Loss	Inflow Hydrograph	Pit is	Internal Width (mm)	Inflow is Misaligned	Minor Safe Pond Depth (m)	Major Safe Pond Depth (m)
dummy1	Node					9		0		567155.35	6133586.62		97367		No					
DUMMY-SCALE2	Node					10.5		0		568871.27	6134218.26		97701		No					
DUMMY-SCALE1	Node					8		0		568934.44	6134070.09		97702		No					
dummy2	Node					9		0		568634.09	6134965.18		1941132		No					
W1-B1-01-US	Node					69		0		567247.6	6134351.25		1941140		No					
W-B1-02-US	Node					68.65		0		567283.36	6134333.08		1941145		No					
W-B1-03-US	Node					68.65		0		567303.68	6134352.02		1941147		No					
W-B1-04-US	Node					67		0		567325.19	6134350.64		1941151		No					
W-B1-05-US	Node					66.5		0		567327.41	6134390.57		1941172		No					
W- B4-01-US	Node					62		0		567425.09	6134403.04		1941186		No					
W-B4-02-US	Node					68.5		0		567753.47	6134550.36		1941189		No					
W-B5-CULV1-HW	Headwall				0.5	57		0		567523.91	6134412.52		1941194							
W-B5-CULV1-DS	Node					56.8		0		567529.43	6134400.71		1941542		No					
W-B5-CULV2-HW	Headwall				0.5	56.5		0		567534	6134391.99		1941195							
W-B5-CULV2-DS	Node					56.3		0		567541.62	6134382.01		1941539		No					
W-B5-CULV3-HW	Headwall				0.5	55.5		0		567550.93	6134370.37		1941196							
W-B5-CULV3-DS	Node					55		0		567555.97	6134352.01		1941462		No					
W-B5-CULV4-HW	Headwall				0.5	58		0		567484.78	6134342.78		1941206							
W-B5-CULV4-DS	Node					57		0		567497.96	6134337.03		1941603		No					
W-B5-CULV5-HW	Headwall				0.5	56.5		0		567508.55	6134334.28		1941207							
W-B5-CULV5-DS	Node					55.5		0		567519.05	6134327.35		1941525		No					
W-B7-CULV2-HW	Headwall				0.5	57		0		567500.04	6134222.19		1941208							
W-B7-CULV2-DS	Node					56.5		0		567512.13	6134230.34		1941585		No					
W-B5-CULV6-HW	Headwall				0.5	53		0		567554.09	6134306.26		1941209							
N87219	Node					52.5		0		567555.25	6134294.11		1942013		No					
W-B1-CULV1-HW	Headwall				0.5	69		0		567311.44	6134260.22		1941258							
W1-01-DS	Node					68		0		567303.57	6134230.49		1941137		No					
N87159	Node					67		0		567351.95	6134262.91		1941612		No					
N87076	Node					65		0		567365.69	6134265.48		1941301		No					
N87168	Node					62.5		0		567431.93	6134391.24		1941676		No					
W-EXT02-US	Node					61		0		567457.51	6134408.33		1941306		No					
W-EXT	Node					60.5		0		567435.24	6134280.49		1941293		No					
W-EXT-CULV1-HW	Headwall				0.5	60.5		0		567458.76	6134194.67		1941315							
W-EXT-CULV1-DS	Node					59.5		0		567459.76	6134172.16		1941324		No					
N87207	Node					63.5		0		567436.12	6134209.03		1941920		No					
N87255	Node					62		0		567445.17	6134204.06		1942245		No					
W-EXT-HW	Headwall				0.5	65		0		567558.06	6134515.78		1941343							
N87181	Node					59.75		0		567578.47	6134448.85		1941726		No					
W-B5-03-DS	Node					57.5		0		567570.59	6134416.59		1941395		No					
W-B5-03-US	Node					62		0		567616.63	6134478.88		1941385		No					
W-B5-06-US	Node					63.5		0		567655.66	6134475.63		1941404		No					
W-B5-01-US	Node					60		0		567469.81	6134388.44		1941414		No					
W-B5-02-US	Node					57.8		0		567549.87	6134430.56		1941417		No					
W-B5-05-US	Node					58		0		567489.72	6134372.11		1941429		No					
W-B5-08-US	Node					56		0		567506.92	6134337.57		1941446		No					
W-B5-09-US	Node					58		0		567625.04	6134389.22		1941468		No					
W-B5-11-US	Node					58		0		567486.18	6134369.22		1941477		No					
W-B5-12-US	Node					57.5		0		567484.87	6134320.15		1941481		No					
N87237	Node					59		0		567488.62	6134214.46		1942096		No					
N87238	Node					58		0		567493.98	6134217.84		1942097		No					
W-B6-01-US	Node					59.2		0		567466.77	6134383.56		1941496		No					
N87225	Node					55		0		567536.39	6134283.98		1942020		No					
N87218	Node					54		0		567542.68	6134283.98		1941998		No					
W-B5-16-US	Node					56.5		0		567497.29	6134305.51		1941508		No					
W-B5-CULV14-US	Node					59.2		0		567629.76	6134409.12		1941554		No					
W-B7-CULV1-HW	Headwall				0.5	53		0		567557.65	6134284.02		1941567							
N87244	Node					51		0		567569.55	6134263.03		1942154		No					
N87245	Node					50		0		567584.56	6134249.28		1942155		No					
W-B7-02-US	Node					62.5		0		567725.21	6134373.43		1941569		No					
HW12	Headwall				0.5	54		0		567468.08	6134017.14		1941577							
N87149	Node					53		0		567471.06	6134003.96		1941579		No					
HW13	Headwall				0.5	48		0		567616.86	6134144.41		1941578							
N87150	Node					47.5		0		567627.43	6134132		1941580		No					
W-B3-01-US	Node							0		567343.78	6134195.82		1941588		No					
N87210	Node					51.5		0		567473.85	6133993.89		1941949		No					
N87250	Node					46.5		0		567640.51	6134115.25		1942192		No					
S1_US	Node					57.5		0		567422.52	6134010.55		2256528		No					
S1	Node					42.5		0		567390.42	6133727.68		2256531		No					

DETENTION BASIN DETAILS

Name	Elev	Surf. Area	Not Used	Outlet Type	K	Dia(mm)	Centre RL	Pit Family	Pit Type	x	y	HED	Crest RL	Crest Length(m)	id
WEST-B1	66	90		Pit/Sump				MR High Flow Catchpit, 3% sideslope, 0.5% grade	WA Main Roads High Flow Catchpit with Single Grate	567344.53	6134261.74	No			1941275
	67	265													
WEST-B2	62	150		Pit/Sump				MR High Flow Catchpit, 3% sideslope, 0.5% grade	WA Main Roads High Flow Catchpit with Single Grate	567415.19	6134384.1	No			1941280
	62.5	640													
WEST-B3	62.5	160		Pit/Sump				MR High Flow Catchpit, 3% sideslope, 0.5% grade	WA Main Roads High Flow Catchpit with Single Grate	567429.26	6134213.14	No			1941336
	64	475													
WEST-B4	59	100		Pit/Sump				MR High Flow Catchpit, 3% sideslope, 0.5% grade	WA Main Roads High Flow Catchpit with Single Grate	567579.28	6134458.86	No			1941374
	60.5	450													
WEST-B6	58	100		Pit/Sump				MR High Flow Catchpit, 3% sideslope, 0.5% grade	WA Main Roads High Flow Catchpit with Single Grate	567483.55	6134211.27	No			1941489
	59	500													
WEST-B5	53.5	105		Pit/Sump				MR High Flow Catchpit, 3% sideslope, 0.5% grade	WA Main Roads High Flow Catchpit with Single Grate	567532.81	6134283.91	No			1941502
	54.5	260													
WEST-B7	51.5	430		Pit/Sump				MR High Flow Catchpit, 3% sideslope, 0.5% grade	WA Main Roads High Flow Catchpit with Single Grate	567565.04	6134266.11	No			1941561
	52.5	980													

SUB-CATCHMENT DETAILS

Name	Pit or Node	Total Area (ha)	Paved Area %	Grass Area %	Supp Area %	Paved Time (min)	Grass Time (min)	Supp Time (min)	Paved Length (m)	Grass Length (m)	Supp Length (m)	Paved Slope(%)	Grass Slope %	Supp Slope %	Paved Rough	Grass Rough	Supp Rough	Lag Time or Factor	Gutter Length (m)	Gutter Slope %	Gutter FlowFactor	Rainfall Multiplier
W-B5-CULV1-CAT	W-B5-CULV1-HW	0.246	0	60	40	0	0	0	-1	16.5	16.5	-1	6.667	6.667	-1	0.05	0.016	0				1
W-B5-CULV2-CAT	W-B5-CULV2-HW	0.221	0	55	45	0	0	0	-1	25	25	-1	6	6	-1	0.05	0.016	0				1
W-B5-CULV3-CAT	W-B5-CULV3-HW	0.934	0	50	50	0	0	0	-1	17	17	-1	6	6	-1	0.05	0.016	0				1
W-B5-CULV3-DS-CAT	W-B5-CULV3-DS	0.266	0	50	50	0	0	0	-1	12	12	-1	7	7	-1	0.05	0.016	0				1
W-B5-CULV4-CAT	W-B5-CULV4-HW	0.058	0	100	0	0	0	0	-1	6	-1	-1	5	-1	-1	0.05	-1	0				1
W-B5-CULV5-CAT	W-B5-CULV5-HW	0.048	0	50	50	0	0	0	-1	15	15	-1	8	8	-1	0.05	0.016	0				1
W-B5-CULV6-CAT	W-B5-CULV6-HW	0.635	0	55	45	0	0	0	-1	14.5	14.5	-1	8.9	8.9	-1	0.05	0.016	0				1
W-B1-03-CAT	W-B1-CULV1-HW	0.219	0	50	50	0	0	0	-1	7	7	-1	2.857	2.857	-1	0.05	0.016	0				1
W-B1-01-CAT	W1-01-DS	0.737	0	50	50	0	0	0	-1	12	12	-1	2.778	2.778	-1	0.05	0.016	0				1
WEST-B1-CAT	WEST-B1	0.682	0	60	40	0	0	0	-1	35	35	-1	4.167	4.167	-1	0.05	0.016	0				1
WEST-B2-CAT	WEST-B2	1.127	100	0	0	0	0	0	75	-1	-1	5.33	-1	-1	0.013	-1	-1	0				1
W-EXT-CAT	W-EXT	0.351	0	100	0	0	0	0	-1	12	-1	-1	7.857	-1	-1	0.05	-1	0				1
W-EXT04-CAT	W-EXT-CULV1-HW	0.218	0	90	10	0	0	0	-1	10	10	-1	10	10	-1	0.05	0.016	0				1
WEST-B3-CAT	WEST-B3	0.979	0	20	80	0	0	0	-1	32	32	-1	1.563	1.563	-1	0.05	0.016	0				1
CulvW_ext	W-EXT-HW	10.5	0	95	5	5	75	2										0				1
WEST-B4-CAT	WEST-B4	1.704	80	20	0	0	0	0	90.5	90.5	-1	5	5	-1	0.013	0.05	-1	0				1
W-B5-03-CAT	W-B5-03-DS	0.106	0	100	0	0	0	0	-1	10	-1	-1	5	-1	-1	0.05	-1	0				1
WEST-B6-CAT	WEST-B6	0.869	0	75	25	0	0	0	-1	20	20	-1	7.8	7.8	-1	0.05	0.016	0				1
WEST-B5-CAT	WEST-B5	0.497	0	70	30	0	0	0	-1	21.3	21.3	-1	8.19	8.19	-1	0.05	0.016	0				1
W-B7-01-CAT	W-B7-CULV1-HW	0.061	0	100	0	0	0	0	-1	16	-1	-1	6.25	-1	-1	0.05	-1	0				1
WEST-B7-CAT	WEST-B7	1.214	0	40	60	0	0	0	-1	23	23	-1	5.217	5.217	-1	0.05	0.016	0				1
S1_catch	S1	14.1	0	100	0	0	0	0	-1	341	-1	-1	3.519	-1	-1	0.05	-1	0				1

PIPE DETAILS

Name	From	To	Length (m)	U/S IL (m)	D/S IL (m)	Slope (%)	Type	Dia (mm)	I.D. (mm)	Rough	Pipe Is	No. Pipes	Chg From	At Chg	Chg (m)	RI (m)	Chg (m)	RL (m)	etc (m)
DUMMY-SCALE	DUMMY-SCALE2	DUMMY-SCALE1	161.044	10	8	1.24	uPVC, under roads, 1% minimum slope	150	154	0.012	New	1	DUMMY-SCALE2	0					
Pipe20525	W-B7-CULV1-HW	WEST-B7	12.2	51.561	51.5	0.5	Concrete, under roads, 0.5% minimum slope	450	450	0.013	NewFixed	2	W-B7-CULV1-HW	0					
Pipe20526	HW12	N87149	13.2	52.91	51.91	7.58	Concrete, under roads, 0.5% minimum slope	450	450	0.013	NewFixed	1	HW12	0					
Pipe20527	HW13	N87150	10	47	46.8	2	Concrete, under roads, 0.5% minimum slope	450	450	0.013	NewFixed	1	HW13	0					
Pipe20528	W-B7-CULV2-HW	W-B7-CULV2-DS	15	55.91	55.41	3.33	Concrete, under roads, 0.5% minimum slope	450	450	0.013	NewFixed	1	W-B7-CULV2-HW	0					
Pipe20532	WEST-B1	N87159	2	65.25	65.15	5	Concrete, under roads, 0.5% minimum slope	450	450	0.013	NewFixed	1	WEST-B1	0					
Pipe20533	N87159	N87076	8	65.15	64.75	5	Concrete, under roads, 0.5% minimum slope	450	450	0.013	New	1	N87159	0					
Pipe20566	WEST-B2	N87168	2	61.3	61.24	3	Concrete, under roads, 0.5% minimum slope	450	450	0.013	NewFixed	1	WEST-B2	0					
Pipe20567	N87168	W-EXT02-US	8	61.24	61	3	Concrete, under roads, 0.5% minimum slope	450	450	0.013	New	1	N87168	0					
Pipe20591	WEST-B4	N87181	2	58.3	58.14	8	Concrete, under roads, 0.5% minimum slope	450	450	0.013	NewFixed	1	WEST-B4	0					
Pipe20597	N87181	W-B5-03-DS	8	58.14	57.5	8	Concrete, under roads, 0.5% minimum slope	450	450	0.013	New	1	N87181	0					
Pipe20702	WEST-B3	N87207	2	61.75	61.65	5	Concrete, under roads, 0.5% minimum slope	450	450	0.013	NewFixed	1	WEST-B3	0					
Pipe20716	N87207	N87255	13	61.65	61	5	Concrete, under roads, 0.5% minimum slope	450	450	0.013	New	1	N87207	0					
Pipe20745	WEST-B5	N87225	2	52.7	52.63	3.5	Concrete, under roads, 0.5% minimum slope	600	600	0.013	NewFixed	1	WEST-B5	0					
Pipe20746	N87225	N87218	8	52.63	52.35	3.5	Concrete, under roads, 0.5% minimum slope	600	600	0.013	New	1	N87225	0					
Pipe20785	WEST-B6	N87237	2	57.3	57.26	2	Concrete, under roads, 0.5% minimum slope	450	450	0.013	NewFixed	1	WEST-B6	0					
Pipe20790	N87237	N87238	8	57.26	57.1	2	Concrete, under roads, 0.5% minimum slope	450	450	0.013	New	1	N87237	0					
Pipe20821	WEST-B7	N87244	2	49.3	49.24	3	Concrete, under roads, 0.5% minimum slope	600	600	0.013	NewFixed	1	WEST-B7	0					
Pipe20830	N87244	N87245	8	49.24	49	3	Concrete, under roads, 0.5% minimum slope	600	600	0.013	New	1	N87244	0					
W-B1-CULV1	W-B1-CULV1-HW	W1-01-DS	30	68.15	67.8	1.17	Concrete, under roads, 0.5% minimum slope	450	450	0.013	NewFixed	1	W-B1-CULV1-HW	0					
W-B5-CULV1	W-B5-CULV1-HW	W-B5-CULV1-DS	13	56.43	56.17	2	Concrete, under roads, 0.5% minimum slope	450	450	0.013	NewFixed	1	W-B5-CULV1-HW	0					
W-B5-CULV2	W-B5-CULV2-HW	W-B5-CULV2-DS	12.5	55.8	55.425	3	Concrete, under roads, 0.5% minimum slope	450	450	0.013	NewFixed	1	W-B5-CULV2-HW	0					
W-B5-CULV3	W-B5-CULV3-HW	W-B5-CULV3-DS	19.2	54.8	54.5	1.56	Concrete, under roads, 0.5% minimum slope	450	450	0.013	NewFixed	2	W-B5-CULV3-HW	0					
W-B5-CULV4	W-B5-CULV4-HW	W-B5-CULV4-DS	14.5	56.91	56.51	2.76	Concrete, under roads, 0.5% minimum slope	450	450	0.013	NewFixed	1	W-B5-CULV4-HW	0					
W-B5-CULV5	W-B5-CULV5-HW	W-B5-CULV5-DS	12.6	55.3	54.41	7.06	Concrete, under roads, 0.5% minimum slope	450	450	0.013	NewFixed	1	W-B5-CULV5-HW	0					
W-B5-CULV6	W-B5-CULV6-HW	N87219	20	52	51.8	1	Concrete, under roads, 0.5% minimum slope	450	450	0.013	NewFixed	1	W-B5-CULV6-HW	0					
W-EXT-CULV	W-EXT-HW	W-EXT02-US	150	64.2	61	2.13	Concrete, under roads, 0.5% minimum slope	450	450	0.013	NewFixed	1	W-EXT-HW	0					
W-EXT-CULV1	W-EXT-CULV1-HW	W-EXT-CULV1-DS	20	59.1	59	0.5	Concrete, under roads, 0.5% minimum slope	450	450	0.013	NewFixed	1	W-EXT-CULV1-HW	0					

DETAILS of SERVICES CROSSING PIPES

Pipe	Chg (m)	Bottom Elev (m)	Height of Service (m)	Chg (m)	Bottom Elev (m)	Height of Service (m)	Chg (m)	Bottom Elev (m)	Height of Service (m)	etc etc

CHANNEL DETAILS

Name	From	To	Type	Length (m)	U/S IL (m)	D/S IL (m)	Slope (%)	Base Width (m)	L.B. Slope (1:?)	R.B. Slope (1:?)	Manning n	Depth (m)	Roofed

OVERFLOW ROUTE DETAILS

Name	From	To	Travel Time (min)	Spill Level (m)	Crest Length (m)	Weir Coeff. C	Cross Section	Safe Depth Major Storms (m)	SafeDepth Minor Storms (m)	Safe DxV (sq.m/sec)	Bed Slope (%)	D/S Area Contributing %		id	U/S IL	D/S IL	Length (m)
OF76225	W1-01-DS	WEST-B1	0.4				Swale with 1:6 sideslopes	0.3	0.2	1	3.91	0		1941169	67.8	66	46
OF76315	W-EXT-CULV1-DS	HW12	1.1				Swale with 1:4 sideslopes	0.45	0.3	1	3.9	0		1941583	59	52.9	156.1
OF76316	W-B7-CULV2-DS	WEST-B7	0.4				Swale with 1:6 sideslopes	0.3	0.2	1	6.52	0		1941587	55.41	51.5	60
OF76323	WEST-B1	N87076	0.1	66.75	5	1.45	4 m wide pathway	0.3	0.15	0.4	20	0		1941648	66.75	65	10
OF76327	WEST-B2	W-EXT02-US	0.1	62.35	5	1.45	Dummy OF	0.3	0.3	0.6	13.5	0		1941663	62.35	61	10
OF76345	WEST-B4	W-B5-03-DS	0.1	59.6	5	1.45	4 m wide pathway	0.3	0.15	0.4	21	0		1941745	59.6	57.5	10
OF76352	W-B5-CULV1-HW	W-B5-CULV1-DS	0.2	57	15	1.45	Overflow across road low point - parabola x = 15, y = 0.3	0.05	0	0.6	1.54	0		1941774	57	56.8	13
OF76354	W-B5-CULV1-DS	W-B5-CULV2-HW	0.1				Swale with 1:6 sideslopes	0.3	0.2	1	3.78	0		1941776	56.17	55.8	9.8
OF76357	W-B5-CULV2-HW	W-B5-CULV2-DS	0.2	56.5	15	1.45	Overflow across road low point - parabola x = 15, y = 0.3	0.05	0	0.6	1.6	0		1941788	56.5	56.3	12.5
OF76359	W-B5-CULV2-DS	W-B5-CULV3-HW	0.1				Swale with 1:6 sideslopes	0.3	0.2	1	4.19	0		1941795	55.425	54.8	14.9
OF76363	W-B5-CULV4-HW	W-B5-CULV4-DS	0.1	58	15	1.45	Overflow across road low point - parabola x = 15, y = 0.3	0.05	0	0.6	6.9	0		1941822	58	57	14.5
OF76364	W-B5-CULV4-DS	W-B5-CULV5-HW	0.1				Swale with 1:6 sideslopes	0.3	0.2	1	4.68	0		1941849	56.51	56	10.9
OF76369	W-B5-CULV5-HW	W-B5-08-US	0.1	56.5	15	1.45	Dummy OF	0.3	0.3	0.6	10	0		1941855	56.5	56	5
OF76373	WEST-B3	N87255	0.1	63.7	5	1.45	4 m wide pathway	0.3	0.15	0.4	16.33	0		1941917	63.7	61.3	15
OF76375	W-EXT-CULV1-HW	W-EXT-CULV1-DS	0.2	60.5	15	1.45	Overflow across road low point - parabola x = 15, y = 0.3	0.05	0	0.6	5	0		1941944	60.5	59.5	20
OF76377	HW12	N87149	0.1	54	15	1.45	Overflow across road low point - parabola x = 15, y = 0.3	0.05	0	0.6	7.52	0		1941959	54	53	13.5
OF76384	N87149	N87210	0.1				Dummy OF	0.3	0.3	0.6	4.14	0		1941970	51.91	51.5	9.9
OF76391	WEST-B5	N87218	0.1	54.25	5	1.45	4 m wide pathway	0.3	0.15	0.4	8.33	0		1941989	54.25	53	15
OF76405	N87218	W-B7-CULV1-HW	0.1				Swale with 1:6 sideslopes	0.3	0.2	1	5.3	0		1942057	52.35	51.6	14.9
OF76407	N87219	W-B7-CULV1-HW	0.1				Swale with 1:6 sideslopes	0.3	0.2	1	2.33	0		1942059	51.8	51.6	10.3
OF76410	W-B7-CULV1-HW	WEST-B7	0.1	53	15	1.45	Dummy OF1	0.3	0.3	0.6	12.3	0		1942082	53	51.5	12.2
OF76413	W-B5-CULV6-HW	N87219	0.3	53	15	1.45	Overflow across road low point - parabola x = 15, y = 0.3	0.05	0	0.6	2.5	0		1942089	53	52.5	20
OF76415	W-B5-CULV3-HW	W-B5-CULV3-DS	0.3	55.5	15	1.45	Overflow across road low point - parabola x = 15, y = 0.3	0.05	0	0.6	2.6	0		1942091	55.5	55	19.2
OF76418	WEST-B6	N87238	0.1	58.75	5	1.45	4 m wide pathway	0.3	0.15	0.4	16.5	0		1942118	58.75	57.1	10
OF76420	N87238	W-B7-CULV2-HW	0.1				Swale with 1:6 sideslopes	0.3	0.2	1	11.9	0		1942121	57.1	55.9	10
OF76424	W-B7-CULV2-HW	W-B7-CULV2-DS	0.2	57	15	1.45	Overflow across road low point - parabola x = 15, y = 0.3	0.05	0	0.6	3.33	0		1942146	57	56.5	15
OF76426	WEST-B7	N87245	0.1	52.5	15	1.45	Dummy OF1	0.3	0.3	0.6	25	0		1942172	52.5	50	10
OF76429	N87245	HW13	1.6				Swale with 1:6 sideslopes	0.3	0.2	1	1.74	0		1942179	49	47	115
OF76432	N87150	N87250	0.1				Dummy OF	0.3	0.3	0.6	3	0		1942193	46.8	46.5	10
OF76434	HW13	N87150	0.2	48	15	1.45	Overflow across road low point - parabola x = 15, y = 0.3	0.05	0	0.6	3.33	0		1942196	48	47.5	15
OF76436	W-B1-CULV1-HW	W1-01-DS	0.4	69	15	1.45	Overflow across road low point - parabola x = 15, y = 0.3	0.05	0	0.6	3.33	0		1942204	69	68	30
OF76444	W-EXT-HW	WEST-B4	0.3	65	15	1.45	Dummy OF	0.3	0.3	0.6	10	0		1942230	65	59	60
OF76451	N87255	W-EXT-CULV1-HW	0.1				Swale with 1:6 sideslopes	0.3	0.2	1	12.67	0		1942264	61	59.1	15
W-B1-01	W1-B1-01-US	W1-01-DS	3.9				Swale with 1:6 sideslopes	0.3	0.2	1	0.67	69.2		1941163	69	67.8	178.5
W-B1-02	W-B1-02-US	W1-01-DS	1.9				Swale with 1:6 sideslopes	0.3	0.2	1	0.85	30.8		1941164	68.65	67.8	100
W-B1-03	W-B1-03-US	W-B1-CULV1-HW	2.4				Swale with 1:6 sideslopes	0.3	0.2	1	0.52	100		1941168	68.65	68.2	96.6
W-B1-04	W-B1-04-US	WEST-B1	2				Swale with 1:6 sideslopes	0.3	0.2	1	0.91	34.6		1941170	67	66	109.3
W-B1-05	W-B1-05-US	WEST-B1	4.3				Swale with 1:6 sideslopes	0.3	0.2	1	0.35	46.77		1941171	66.5	66	140.9
W-B3-01	W-B3-01-US	WEST-B3	0.6				Swale with 1:6 sideslopes	0.3	0.2	1	5.88	83.66		1941591	67.2	62.5	80
W-B4-01	W- B4-01-US	WEST-B4	2.2				Swale with 1:6 sideslopes	0.3	0.2	1	1.8	35.04		1941711	62	59	166.8
W-B4-02	W-B4-02-US	WEST-B4	1.6				Swale with 1:6 sideslopes	0.3	0.2	1	4.81	41.02		1941185	68.5	59	197.5
W-B5-01	W-B5-01-US	W-B5-CULV1-HW	0.5				Swale with 1:6 sideslopes	0.3	0.2	1	4.3	63.41		1941419	59	56.4	59.8
W-B5-02	W-B5-02-US	W-B5-CULV1-HW	0.3				Swale with 1:6 sideslopes	0.3	0.2	1	3.34	36.59		1941422	57.5	56.4	32
W-B5-03	W-B5-03-US	W-B5-03-DS	0.5				Swale with 1:6 sideslopes	0.3	0.2	1	9	100		1941387	62	57.5	77.8
W-B5-04	W-B5-03-DS	W-B5-CULV2-HW	0.4				Swale with 1:6 sideslopes	0.3	0.2	1	3	46.61		1941426	57	55.8	40
W-B5-05	W-B5-05-US	W-B5-CULV2-HW	0.4				Swale with 1:6 sideslopes	0.3	0.2	1	4.89	53.39		1941431	58	55.8	45
W-B5-06 07	W-B5-06-US	W-B5-CULV3-HW	1.1				Swale with 1:6 sideslopes	0.3	0.2	1	5.8	74.2		1941443	63.5	54.8	150
W-B5-08	W-B5-08-US	W-B5-CULV3-HW	0.8				Swale with 1:6 sideslopes	0.3	0.2	1	2.01	25.8		1941448	56	54.8	59.7
W-B5-09 10	W-B5-09-US	W-B5-CULV3-DS	0.7				Swale with 1:6 sideslopes	0.3	0.2	1	4.63	100		1941471	58	54.3	80
W-B5-11	W-B5-11-US	W-B5-CULV4-HW	0.4				Swale with 1:6 sideslopes	0.3	0.2	1	1.85	100		1941479	58	57.5	27.1
W-B5-12	W-B5-12-US	W-B5-CULV5-HW	0.2				Swale with 1:6 sideslopes	0.3	0.2	1	5.19	100		1941484	57.5	56	28.9
W-B5-13A	W-B5-CULV3-DS	WEST-B5	1.4				Swale with 1:6 sideslopes	0.3	0.2	1	1.01	31.11		1941514	54.3	53.5	79.3
W-B5-13B	W-B5-CULV5-DS	WEST-B5	0.7				Swale with 1:6 sideslopes	0.3	0.2	1	1.75	20		1941517	54.41	53.5	51.9
W-B5-16	W-B5-16-US	WEST-B5	0.7				Swale with 1:6 sideslopes	0.3	0.2	1	3.8	36.42		1941510	56.5	53.5	79
W-B5-CULV14 15	W-B5-CULV14-US	W-B5-CULV6-HW	1.4				Swale with 1:6 sideslopes	0.3	0.2	1	4.38	100		1941556	59.2	52	164.5
W-B6-01	W-B6-01-US	WEST-B6	3.8				Swale with 1:6 sideslopes	0.3	0.2	1	0.69	70.89		1941499	59.2	58	175
W-B7-02	W-B7-02-US	WEST-B7	0.9				Swale with 1:6 sideslopes	0.3	0.2	1	7.82	56.92		1941572	62.5	51.5	140.7
W-EXT02	W-EXT02-US	W-EXT	3.8				Swale with 1:6 sideslopes	0.3	0.2	1	0.38	72.36		1941308	61	60.5	132.4
W-EXT03	N87076	W-EXT	0.6				Swale with 1:6 sideslopes	0.3	0.2	1	4.92	27.64		1941303	64	60.5	71.1
W-EXT04	W-EXT	W-EXT-CULV1-HW	1.3				Swale with 1:6 sideslopes	0.3	0.2	1	1.56	100		1941321	60.5	59.1	89.7
W-S1	S1_US	S1	2.3				Swale with 1:6 sideslopes	0.3	0.2	1	5.07	100		2256533	57.5	42.5	296

PIPE COVER DETAILS

Name	Type	Dia (mm)	Safe Cover (m)	Cover (m)	
DUMMY-SCALE	uPVC, under roads, 1% minimum slope	154	0.5	-0.16	Unsafe
W-B5-CULV1	Concrete, under roads, 0.5% minimum slope	450	0.6	0.08	Unsafe
W-B5-CULV2	Concrete, under roads, 0.5% minimum slope	450	0.6	0.21	Unsafe
W-B5-CULV3	Concrete, under roads, 0.5% minimum slope	450	0.6	0.01	Unsafe
W-B5-CULV4	Concrete, under roads, 0.5% minimum slope	450	0.6	0	Unsafe
W-B5-CULV5	Concrete, under roads, 0.5% minimum slope	450	0.6	0.6	
Pipe20528	Concrete, under roads, 0.5% minimum slope	450	0.6	0.6	
W-B5-CULV6	Concrete, under roads, 0.5% minimum slope	450	0.6	0.21	Unsafe
W-B1-CULV1	Concrete, under roads, 0.5% minimum slope	450	0.6	-0.29	Unsafe
Pipe20532	Concrete, under roads, 0.5% minimum slope	450	0.6	0.26	Unsafe
Pipe20533	Concrete, under roads, 0.5% minimum slope	450	0.6	-0.24	Unsafe
Pipe20566	Concrete, under roads, 0.5% minimum slope	450	0.6	0.21	Unsafe
Pipe20567	Concrete, under roads, 0.5% minimum slope	450	0.6	-0.49	Unsafe
W-EXT-CULV1	Concrete, under roads, 0.5% minimum slope	450	0.6	0.01	Unsafe
Pipe20702	Concrete, under roads, 0.5% minimum slope	450	0.6	0.26	Unsafe
Pipe20716	Concrete, under roads, 0.5% minimum slope	450	0.6	0.51	Unsafe
W-EXT-CULV	Concrete, under roads, 0.5% minimum slope	450	0.6	-0.49	Unsafe
Pipe20591	Concrete, under roads, 0.5% minimum slope	450	0.6	0.21	Unsafe
Pipe20597	Concrete, under roads, 0.5% minimum slope	450	0.6	-0.49	Unsafe
Pipe20785	Concrete, under roads, 0.5% minimum slope	450	0.6	0.21	Unsafe
Pipe20790	Concrete, under roads, 0.5% minimum slope	450	0.6	0.41	Unsafe
Pipe20745	Concrete, under roads, 0.5% minimum slope	600	0.6	0.15	Unsafe
Pipe20746	Concrete, under roads, 0.5% minimum slope	600	0.6	1.01	
Pipe20525	Concrete, under roads, 0.5% minimum slope	450	0.6	-0.49	Unsafe
Pipe20821	Concrete, under roads, 0.5% minimum slope	600	0.6	1.11	
Pipe20830	Concrete, under roads, 0.5% minimum slope	600	0.6	0.35	Unsafe
Pipe20526	Concrete, under roads, 0.5% minimum slope	450	0.6	0.6	
Pipe20527	Concrete, under roads, 0.5% minimum slope	450	0.6	0.21	Unsafe

These pipes have non-return valves: Pipe20532, Pipe20566, Pipe20591, Pipe20785

Stage 1A (WEST) DRAINS Results								
DRAINS results prepared from Version 2020.036								
1EY								
PIT / NODE DETAILS				Version 8				
Name	Max HGL	Max Pond	Max Surface	Max Pond	Min	Overflow	Constraint	
		HGL	Flow Arriving	Volume	Freeboard	(cu.m/s)		
			(cu.m/s)	(cu.m)	(m)			
DUMMY-SCALE2	10		0					
DUMMY-SCALE1	8		0					
W1-B1-01-US	69		0					
W-B1-02-US	68.65		0					
W-B1-03-US	68.65		0					
W-B1-04-US	67		0					
W-B1-05-US	66.5		0					
W- B4-01-US	62		0					
W-B4-02-US	68.5		0					
W-B5-CULV1-HW	56.49		0.008		0.51	0	None	
W-B5-CULV1-DS	56.2		0					
W-B5-CULV2-HW	56.02		0.115		0.48	0	None	
W-B5-CULV2-DS	55.52		0					
W-B5-CULV3-HW	54.97		0.112		0.53	0	None	
W-B5-CULV3-DS	54.43		0.013					
W-B5-CULV4-HW	56.91		0		1.09	0	None	
W-B5-CULV4-DS	56.51		0					
W-B5-CULV5-HW	55.35		0.002		1.15	0	None	
W-B5-CULV5-DS	54.44		0					
W-B7-CULV2-HW	55.92		0		1.08	0	None	
W-B7-CULV2-DS	55.42		0					
W-B5-CULV6-HW	52.12		0.028		0.88	0	None	
N87219	51.86		0					
W-B1-CULV1-HW	68.22		0.011		0.78	0	None	
W1-01-DS	67.87		0.032					
N87159	65.15		0					
N87076	64.01		0					
N87168	61.29		0					
W-EXT02-US	61.09		0.002					
W-EXT	60.57		0.016					
W-EXT-CULV1-HW	59.23		0.016		1.27	0	None	
W-EXT-CULV1-DS	59.07		0					
N87207	61.65		0					
N87255	61.01		0					
W-EXT-HW	64.2		0		0.8	0	None	
N87181	58.21		0					
W-B5-03-DS	57.1		0					
W-B5-03-US	62		0					
W-B5-06-US	63.5		0					
W-B5-01-US	59		0					
W-B5-02-US	57.5		0					
W-B5-05-US	58		0					
W-B5-08-US	56		0					
W-B5-09-US	58		0					
W-B5-11-US	58		0					
W-B5-12-US	57.5		0					
N87237	57.26		0					
N87238	57.1		0					
W-B6-01-US	59.2		0					
N87225	52.7		0					
N87218	52.42		0					
W-B5-16-US	56.5		0					
W-B5-CULV14-US	59.2		0					
W-B7-CULV1-HW	51.85		0.093		1.15	0	None	
N87244	49.24		0					
N87245	49.01		0					
W-B7-02-US	62.5		0					
HW12	53.04		0.016		0.96	0	None	
N87149	51.91		0					
HW13	47.01		0.009		0.99	0	None	
N87150	46.8		0					
W-B3-01-US	67.2		0					
S1_US	57.5		0					
SUB-CATCHMENT DETAILS								
Name	Max	Paved	Grassed	Paved	Grassed	Supp.	Due to Storm	
	Flow Q	Max Q	Max Q	Tc	Tc	Tc		
	(cu.m/s)	(cu.m/s)	(cu.m/s)	(min)	(min)	(min)		
W-B5-CULV1-CAT	0.007	0	0.007	0	6.1	2.97	1EY AEP, 2 hour burst, Storm 2	
W-B5-CULV2-CAT	0.008	0	0.008	0	8.08	3.94	1EY AEP, 2 hour burst, Storm 3	
W-B5-CULV3-CAT	0.038	0	0.038	0	5.22	2.54	1EY AEP, 1 hour burst, Storm 1	
W-B5-CULV3-DS-CAT	0.012	0	0.012	0	4.04	1.97	1EY AEP, 1 hour burst, Storm 1	
W-B5-CULV4-CAT	0	0	0	0	1.98	0	1EY AEP, 10 min burst, Storm 5	
W-B5-CULV5-CAT	0.002	0	0.002	0	4.6	2.24	1EY AEP, 1 hour burst, Storm 9	
W-B5-CULV6-CAT	0.025	0	0.025	0	5.18	2.52	1EY AEP, 2 hour burst, Storm 3	
W-B1-03-CAT	0.01	0	0.01	0	3.83	1.87	1EY AEP, 1 hour burst, Storm 1	
W-B1-01-CAT	0.03	0	0.03	0	5.33	2.6	1EY AEP, 1 hour burst, Storm 1	
WEST-B1-CAT	0.012	0	0.012	0	11.03	5.38	1EY AEP, 2 hour burst, Storm 3	
WEST-B2-CAT	0.137	0.137	0	3.8	0	0	1EY AEP, 10 min burst, Storm 10	
W-EXT-CAT	0	0	0	0	2.62	0	1EY AEP, 10 min burst, Storm 5	
W-EXT04-CAT	0	0	0	0	2.18	1.06	1EY AEP, 10 min burst, Storm 5	
WEST-B3-CAT	0.066	0	0.066	0	8.4	4.1	1EY AEP, 15 min burst, Storm 1	
CulvW_ext	0	0	0	5	75	2	1EY AEP, 10 min burst, Storm 5	
WEST-B4-CAT	0.161	0.161	0	4.34	10.08	0	1EY AEP, 10 min burst, Storm 4	
W-B5-03-CAT	0	0	0	0	2.69	0	1EY AEP, 10 min burst, Storm 5	
WEST-B6-CAT	0	0	0	0	3.56	1.74	1EY AEP, 10 min burst, Storm 5	
WEST-B5-CAT	0	0	0	0	3.65	1.78	1EY AEP, 10 min burst, Storm 5	
W-B7-01-CAT	0	0	0	0	3.33	0	1EY AEP, 10 min burst, Storm 5	
WEST-B7-CAT	0.065	0	0.065	0	4.8	2.34	1EY AEP, 15 min burst, Storm 1	
S1_catch	0	0	0	0	24.81	0	1EY AEP, 10 min burst, Storm 5	
PIPE DETAILS								
Name	Max Q	Max V	Max U/S	Max D/S	Due to Storm			
	(cu.m/s)	(m/s)	HGL (m)	HGL (m)				
DUMMY-SCALE	0	0	10	8	1EY AEP, 10 min burst, Storm 5			
W-B5-CULV1	0.002	0.47	56.485	56.199	1EY AEP, 2 hour burst, Storm 9			
W-B5-CULV2	0.042	1.84	56.024	55.515	1EY AEP, 1 hour burst, Storm 1			
W-B5-CULV3	0.05	1.46	54.974	54.574	1EY AEP, 2 hour burst, Storm 3			
W-B5-CULV4	0	0	56.91	56.51	1EY AEP, 10 min burst, Storm 5			
W-B5-CULV5	0.001	0.31	55.347	54.44	1EY AEP, 2 hour burst, Storm 2			
Pipe20528	0	0	55.913	55.416	1EY AEP, 10 min burst, Storm 5			
W-B5-CULV6	0.012	0.87	52.121	51.862	1EY AEP, 2 hour burst, Storm 4			
W-B1-CULV1	0.004	0.23	68.22	67.869	1EY AEP, 2 hour burst, Storm 4			
Pipe20532	0	0	65.25	65.152	1EY AEP, 10 min burst, Storm 5			

Pipe20533	0	0	65.152	64.75	1EY AEP, 10 min burst, Storm 5			
Pipe20566	0	0	61.3	61.294	1EY AEP, 10 min burst, Storm 5			
Pipe20567	0.014	1.3	61.294	61.093	1EY AEP, 1 hour burst, Storm 1			
W-EXT-CULV1	0.013	0.81	59.229	59.072	1EY AEP, 3 hour burst, Storm 7			
Pipe20702	0	0	61.75	61.652	1EY AEP, 10 min burst, Storm 5			
Pipe20716	0	0	61.652	61.005	1EY AEP, 10 min burst, Storm 5			
W-EXT-CULV	0	0	64.2	61.093	1EY AEP, 10 min burst, Storm 5			
Pipe20591	0.02	1.23	58.397	58.211	1EY AEP, 1 hour burst, Storm 1			
Pipe20597	0.044	3.05	58.211	57.566	1EY AEP, 1 hour burst, Storm 1			
Pipe20785	0	0	57.303	57.263	1EY AEP, 10 min burst, Storm 5			
Pipe20790	0	0	57.263	57.105	1EY AEP, 10 min burst, Storm 5			
Pipe20745	0	0	52.7	52.695	1EY AEP, 10 min burst, Storm 5			
Pipe20746	0.029	1.72	52.695	52.425	1EY AEP, 3 hour burst, Storm 6			
Pipe20525	0.032	0.15	51.854	51.854	1EY AEP, 3 hour burst, Storm 6			
Pipe20821	0	0	49.3	49.242	1EY AEP, 10 min burst, Storm 5			
Pipe20830	0	0	49.242	49.008	1EY AEP, 10 min burst, Storm 5			
Pipe20526	0.013	1.58	53.037	51.956	1EY AEP, 3 hour burst, Storm 7			
Pipe20527	0	0	47.003	46.8	1EY AEP, 9 hour burst, Storm 3			
CHANNEL DETAILS								
Name	Max Q	Max V			Due to Storm			
	(cu.m/s)	(m/s)						
OVERFLOW ROUTE DETAILS								
Name	Max Q U/S	Max Q D/S	Safe Q	Max D	Max DxV	Max Width	Max V	Due to Storm
O134039	0.009	0	12.141	3	0	32	0	1EY AEP, 3 hour burst, Storm 6
O134055	0.009	0	12.141	3	0	32	0	1EY AEP, 3 hour burst, Storm 6
O137112	0.005	0	12.141	3	0	32	0	1EY AEP, 1 hour burst, Storm 1
O137116	0.005	0	12.141	3	0	32	0	1EY AEP, 1 hour burst, Storm 1
O137914	0.006	0	12.141	3	0	32	0	1EY AEP, 1 hour burst, Storm 1
O137918	0.012	0	12.141	3	0	32	0	1EY AEP, 1 hour burst, Storm 1
O90392	0	0	12.141	0	0	0	0	
O90396	0	0	12.141	0	0	0	0	
OF76225	0.016	0.016	0.338	0.248	0.04	2.97	0.57	1EY AEP, 2 hour burst, Storm 3
OF76315	0.014	0.014	0.656	0.127	0.05	1.02	0.69	1EY AEP, 3 hour burst, Storm 6
OF76316	0	0	0.436	0	0	0	0	
OF76323	0	0	1.311	0	0	0	0	
OF76327	0	0	19.113	0	0	0	0	
OF76345	0	0	1.305	0	0	0	0	
OF76352	0	0	0	0	0	0	0	
OF76354	0.002	0.002	0.332	0.266	0.01	3.19	0.38	1EY AEP, 2 hour burst, Storm 9
OF76357	0	0	0	0	0	0	0	
OF76359	0.042	0.042	0.35	0.174	0.08	2.09	0.86	1EY AEP, 1 hour burst, Storm 1
OF76363	0	0	0	0	0	0	0	
OF76364	0	0	0.369	0	0	0	0	
OF76369	0	0	19.201	0	0	0	0	
OF76373	0	0	1.322	0	0	0	0	
OF76375	0	0	0	0	0	0	0	
OF76377	0	0	0	0	0	0	0	
OF76384	0.013	0.013	19.15	0.003	0	32	0.13	1EY AEP, 3 hour burst, Storm 7
OF76391	0	0	1.379	0	0	0	0	
OF76405	0.029	0.029	0.393	0.294	0.06	3.53	0.85	1EY AEP, 3 hour burst, Storm 6
OF76407	0.012	0.012	0.261	0.294	0.03	3.53	0.5	1EY AEP, 2 hour burst, Storm 4
OF76410	0	0	19.24	0	0	0	0	
OF76413	0	0	0	0	0	0	0	
OF76415	0	0	0	0	0	0	0	
OF76418	0	0	1.329	0	0	0	0	
OF76420	0	0	0.589	0	0	0	0	
OF76424	0	0	0	0	0	0	0	
OF76426	0	0	19.114	0	0	0	0	
OF76429	0	0	0.225	0	0	0	0	
OF76432	0	0	19.225	0	0	0	0	
OF76434	0	0	0	0	0	0	0	
OF76436	0	0	0	0	0	0	0	
OF76444	0	0	19.201	0	0	0	0	
OF76451	0	0	0.608	0	0	0	0	
W-B1-01	0	0.009	0.14	0.074	0.02	0.89	0.32	1EY AEP, 2 hour burst, Storm 3
W-B1-02	0	0.006	0.157	0.069	0.01	0.83	0.19	1EY AEP, 2 hour burst, Storm 3
W-B1-03	0	0.005	0.123	0.071	0.01	0.86	0.17	1EY AEP, 2 hour burst, Storm 3
W-B1-04	0	0.001	0.163	0.248	0	2.97	0	1EY AEP, 2 hour burst, Storm 9
W-B1-05	0	0.001	0.101	0.248	0	2.97	0	1EY AEP, 9 hour burst, Storm 6
W-B2-O1	0.005	0	12.141	3	0	32	0	1EY AEP, 1 hour burst, Storm 1
W-B3-01	0	0.057	0.414	0.41	0.06	4.92	0.63	1EY AEP, 15 min burst, Storm 1
W-B4-01	0	0.038	0.229	0.533	0.04	6.4	0.43	1EY AEP, 15 min burst, Storm 1
W-B4-02	0	0.048	0.375	0.533	0.06	6.4	0.68	1EY AEP, 15 min burst, Storm 1
W-B4-O1	0.006	0	12.141	3	0	32	0	1EY AEP, 1 hour burst, Storm 1
W-B5-01	0	0.002	0.354	0.055	0.01	0.66	0.13	1EY AEP, 2 hour burst, Storm 9
W-B5-02	0	0.002	0.312	0.055	0.01	0.66	0.09	1EY AEP, 2 hour burst, Storm 9
W-B5-03	0	0	0.512	0	0	0	0	
W-B5-04	0.044	0.044	0.296	0.224	0.07	2.69	0.76	1EY AEP, 1 hour burst, Storm 1
W-B5-05	0	0.003	0.378	0.266	0.01	3.19	0.26	1EY AEP, 2 hour burst, Storm 9
W-B5-06 07	0	0.025	0.411	0.218	0.05	2.62	0.65	1EY AEP, 2 hour burst, Storm 9
W-B5-08	0	0.009	0.242	0.218	0.02	2.62	0.27	1EY AEP, 2 hour burst, Storm 9
W-B5-09 10	0	0.01	0.367	0.153	0.02	1.83	0.36	1EY AEP, 2 hour burst, Storm 9
W-B5-11	0	0	0.232	0	0	0	0	
W-B5-12	0	0.001	0.389	0.027	0.01	0.32	0.4	1EY AEP, 2 hour burst, Storm 2
W-B5-13A	0.055	0.054	0.172	0.419	0.07	5.03	0.53	1EY AEP, 2 hour burst, Storm 3
W-B5-13B	0.001	0.007	0.226	0.419	0.04	5.03	1.72	1EY AEP, 9 hour burst, Storm 6
W-B5-16	0	0	0.333	0	0	0	0	
W-B5-CULV14 15	0	0.015	0.357	0.124	0.03	1.49	0.45	1EY AEP, 2 hour burst, Storm 9
W-B5-O1	0.009	0	12.141	3	0	32	0	1EY AEP, 3 hour burst, Storm 6
W-B6-01	0	0	0.142	0	0	0	0	
W-B7-02	0	0.031	0.478	0.354	0.04	4.25	0.47	1EY AEP, 1 hour burst, Storm 9
W-B7-O1	0	0	12.141	0	0	0	0	
W-EXT02	0.014	0.014	0.105	0.095	0.03	1.14	0.45	1EY AEP, 3 hour burst, Storm 6
W-EXT03	0	0	0.379	0	0	0	0	
W-EXT04	0.013	0.013	0.213	0.13	0.03	1.56	0.44	1EY AEP, 3 hour burst, Storm 6
W-S1	0	0	0.385	0	0	0	0	
DETENTION BASIN DETAILS								
Name	Max WL	MaxVol	Max Q	Max Q	Max Q			
			Total	Low Level	High Level			
WEST-B1	66.25	26.5	0	0	0			
WEST-B2	62.3	78.6	0.014	0	0.014			
WEST-B3	62.91	79.4	0	0	0			
WEST-B4	59.53	77.4	0.043	0.02	0.023			
WEST-B6	58	0	0	0	0			
WEST-B5	53.92	55.4	0.028	0	0.028			
WEST-B7	51.85	181.3	0	0	0			
Run Log for 12546218_AlbanyMotorPark_west run at 14:33:26 on 14/7/2021 using version 2020.036								
The maximum flow in these overflow routes is unsafe: OF76444, OF76410, OF76407, OF76405, OF76377, OF76354, W-B4-01, W-B3-01, OF76316, W-B7-02, W-B5-13B, W-B5-13A, W-B5-16, W-B5-(								

Stage 1A (WEST) DRAINS Results

DRAINS results prepared from Version 2020.036

10% AEP

PIT / NODE DETAILS — Version 8

Name	Max HGL	Max Pond HGL	Max Surface Flow Arriving (cu.m/s)	Max Pond Volume (cu.m)	Min Freeboard (m)	Overflow (cu.m/s)	Constraint
DUMMY-SCALE2	10		0				
DUMMY-SCALE1	8		0				
W1-B1-01-US	69		0				
W-B1-02-US	68.65		0				
W-B1-03-US	68.65		0				
W-B1-04-US	67		0				
W-B1-05-US	66.64		0				
W- B4-01-US	62		0				
W-B4-02-US	68.5		0				
W-B5-CULV1-HW	56.6		0.028		0.4	0	None
W-B5-CULV1-DS	56.31		0				
W-B5-CULV2-HW	56.3		0.314		0.2	0	None
W-B5-CULV2-DS	55.59		0				
W-B5-CULV3-HW	55.19		0.29		0.31	0	None
W-B5-CULV3-DS	54.53		0.032				
W-B5-CULV4-HW	56.98		0.006		1.02	0	None
W-B5-CULV4-DS	56.55		0				
W-B5-CULV5-HW	55.39		0.012		1.11	0	None
W-B5-CULV5-DS	54.47		0				
W-B7-CULV2-HW	55.92		0		1.08	0	None
W-B7-CULV2-DS	55.42		0				
W-B5-CULV6-HW	52.37		0.074		0.63	0	None
N87219	52.36		0				
W-B1-CULV1-HW	68.31		0.026		0.69	0	None
W1-01-DS	67.92		0.087				
N87159	65.27		0				
N87076	64.13		0				
N87168	61.33		0				
W-EXT02-US	61.24		0.093				
W-EXT	60.69		0.371				
W-EXT-CULV1-HW	59.64		0.372		0.86	0	None
W-EXT-CULV1-DS	59.19		0				
N87207	61.73		0				
N87255	61.07		0				
W-EXT-HW	64.63		0.26		0.37	0	None
N87181	58.28		0				
W-B5-03-DS	57.16		0.038				
W-B5-03-US	62		0				
W-B5-06-US	63.5		0				
W-B5-01-US	59		0				
W-B5-02-US	57.5		0				
W-B5-05-US	58		0				
W-B5-08-US	56		0				
W-B5-09-US	58		0				
W-B5-11-US	58		0				
W-B5-12-US	57.5		0				
N87237	57.26		0				
N87238	57.1		0				
W-B6-01-US	59.2		0				
N87225	52.82		0				
N87218	52.52		0				
W-B5-16-US	56.5		0				
W-B5-CULV14-US	59.2		0				
W-B7-CULV1-HW	52.36		0.379		0.64	0	None
N87244	49.39		0				
N87245	49.17		0				
W-B7-02-US	62.5		0				
HW12	53.44		0.317		0.56	0	None
N87149	51.93		0				
HW13	47.42		0.239		0.58	0	None
N87150	46.81		0				
W-B3-01-US	67.2		0				
S1_US	57.5		0				

SUB-CATCHMENT DETAILS

Name	Max Flow Q (cu.m/s)	Paved Max Q (cu.m/s)	Grassed Max Q (cu.m/s)	Paved Tc (min)	Grassed Tc (min)	Supp. Tc (min)	Due to Storm
W-B5-CULV1-CAT	0.04	0	0.04	0	2.63	1.28	10% AEP, 10 min burst, Storm 5
W-B5-CULV2-CAT	0.035	0	0.035	0	3.48	1.69	10% AEP, 10 min burst, Storm 7
W-B5-CULV3-CAT	0.169	0	0.169	0	2.76	1.34	10% AEP, 10 min burst, Storm 5
W-B5-CULV3-DS-CAT	0.053	0	0.053	0	2.14	1.04	10% AEP, 10 min burst, Storm 4
W-B5-CULV4-CAT	0.007	0	0.007	0	1.56	0	10% AEP, 10 min burst, Storm 3
W-B5-CULV5-CAT	0.009	0	0.009	0	2.35	1.14	10% AEP, 10 min burst, Storm 5
W-B5-CULV6-CAT	0.118	0	0.118	0	2.23	1.09	10% AEP, 10 min burst, Storm 5
W-B1-03-CAT	0.044	0	0.044	0	2.02	0.99	10% AEP, 10 min burst, Storm 4
W-B1-01-CAT	0.132	0	0.132	0	2.82	1.37	10% AEP, 10 min burst, Storm 5
WEST-B1-CAT	0.103	0	0.103	0	4.75	2.31	10% AEP, 10 min burst, Storm 3
WEST-B2-CAT	0.269	0.269	0	3	0	0	10% AEP, 10 min burst, Storm 1
W-EXT-CAT	0.043	0	0.043	0	2.06	0	10% AEP, 10 min burst, Storm 3
W-EXT04-CAT	0.029	0	0.029	0	1.72	0.84	10% AEP, 10 min burst, Storm 9
WEST-B3-CAT	0.175	0	0.175	0	6.04	2.94	10% AEP, 10 min burst, Storm 9
CulvW_ext	0.142	0	0.142	5	75	2	10% AEP, 3 hour burst, Storm 6
WEST-B4-CAT	0.335	0.322	0.013	3.42	7.95	0	10% AEP, 10 min burst, Storm 4
W-B5-03-CAT	0.013	0	0.013	0	2.12	0	10% AEP, 10 min burst, Storm 3
WEST-B6-CAT	0.124	0	0.124	0	2.81	1.37	10% AEP, 10 min burst, Storm 9
WEST-B5-CAT	0.073	0	0.073	0	2.88	1.4	10% AEP, 10 min burst, Storm 9
W-B7-01-CAT	0.007	0	0.007	0	2.63	0	10% AEP, 10 min burst, Storm 6
WEST-B7-CAT	0.225	0	0.225	0	3.45	1.68	10% AEP, 10 min burst, Storm 5
S1_catch	0.27	0	0.27	0	39.9	0	10% AEP, 3 hour burst, Storm 2

PIPE DETAILS

Name	Max Q (cu.m/s)	Max V (m/s)	Max U/S HGL (m)	Max D/S HGL (m)	Due to Storm
DUMMY-SCALE	0	0	10	8	10% AEP, 10 min burst, Storm 5
W-B5-CULV1	0.025	0.57	56.603	56.313	10% AEP, 15 min burst, Storm 6
W-B5-CULV2	0.209	2.98	56.12	55.63	10% AEP, 30 min burst, Storm 5
W-B5-CULV3	0.249	2.03	55.046	54.684	10% AEP, 30 min burst, Storm 5
W-B5-CULV4	0.004	0.64	56.982	56.545	10% AEP, 2 hour burst, Storm 3
W-B5-CULV5	0.007	0.61	55.393	54.465	10% AEP, 10 min burst, Storm 3
Pipe20528	0	0	55.913	55.416	10% AEP, 10 min burst, Storm 5
W-B5-CULV6	0.064	0.46	52.365	52.363	10% AEP, 30 min burst, Storm 7
W-B1-CULV1	0.02	0.58	68.308	67.923	10% AEP, 30 min burst, Storm 5
Pipe20532	0.091	2.66	65.459	65.27	10% AEP, 9 hour burst, Storm 5

	Pipe20533	0.101	3.1	65.27	64.866	10% AEP, 9 hour burst, Storm 5			
	Pipe20566	0.029	1.23	61.417	61.333	10% AEP, 45 min burst, Storm 8			
	Pipe20567	0.047	1.95	61.333	61.242	10% AEP, 45 min burst, Storm 8			
	W-EXT-CULV1	0.215	1.75	59.55	59.324	10% AEP, 3 hour burst, Storm 2			
	Pipe20702	0.037	2.08	61.882	61.726	10% AEP, 3 hour burst, Storm 2			
	Pipe20716	0.037	2.33	61.726	61.07	10% AEP, 3 hour burst, Storm 2			
	W-EXT-CULV	0.141	1.62	64.469	61.242	10% AEP, 3 hour burst, Storm 6			
	Pipe20591	0.148	3.44	58.568	58.282	10% AEP, 30 min burst, Storm 7			
	Pipe20597	0.173	4.09	58.282	57.64	10% AEP, 30 min burst, Storm 7			
	Pipe20785	0	0	57.303	57.263	10% AEP, 10 min burst, Storm 5			
	Pipe20790	0	0	57.263	57.105	10% AEP, 15 min burst, Storm 10			
	Pipe20745	0.206	2.72	52.993	52.818	10% AEP, 1 hour burst, Storm 6			
	Pipe20746	0.242	3.26	52.818	52.535	10% AEP, 1 hour burst, Storm 6			
	Pipe20525	0.249	0.78	52.338	52.301	10% AEP, 1 hour burst, Storm 1			
	Pipe20821	0.131	2.33	49.533	49.392	10% AEP, 3 hour burst, Storm 2			
	Pipe20830	0.15	2.66	49.392	49.17	10% AEP, 3 hour burst, Storm 2			
	Pipe20526	0.209	4.16	53.23	52.069	10% AEP, 3 hour burst, Storm 2			
	Pipe20527	0.138	2.28	47.259	46.982	10% AEP, 3 hour burst, Storm 2			
	CHANNEL DETAILS								
	Name	Max Q	Max V			Due to Storm			
		(cu.m/s)	(m/s)						
	OVERFLOW ROUTE DETAILS								
	Name	Max Q U/S	Max Q D/S	Safe Q	Max D	Max DxV	Max Width	Max V	Due to Storm
	O134039	0.012	0	12.141	3	0	32	0	10% AEP, 1 hour burst, Storm 6
	O134055	0.012	0	12.141	3	0	32	0	10% AEP, 1 hour burst, Storm 6
	O137112	0.006	0	12.141	3	0	32	0	10% AEP, 45 min burst, Storm 8
	O137116	0.006	0	12.141	3	0	32	0	10% AEP, 45 min burst, Storm 8
	O137914	0.006	0	12.141	3	0	32	0	10% AEP, 30 min burst, Storm 7
	O137918	0.013	0	12.141	3	0	32	0	10% AEP, 30 min burst, Storm 7
	O90392	0.006	0	12.141	3	0	32	0	10% AEP, 3 hour burst, Storm 2
	O90396	0.006	0	12.141	3	0	32	0	10% AEP, 3 hour burst, Storm 2
	OF76225	0.092	0.092	0.338	0.703	0.13	8.44	1.02	10% AEP, 30 min burst, Storm 5
	OF76315	0.204	0.204	0.656	0.533	0.27	4.27	1.4	10% AEP, 3 hour burst, Storm 2
	OF76316	0	0	0.436	0	0	0	0	
	OF76323	0	0	1.311	0	0	0	0	
	OF76327	0.06	0.06	19.113	0.209	0	32	0.33	10% AEP, 45 min burst, Storm 8
	OF76345	0.006	0.006	1.305	0.003	0.03	0.35	9.26	10% AEP, 30 min burst, Storm 7
	OF76352	0	0	0	0	0	0	0	
	OF76354	0.026	0.026	0.332	0.511	0.03	6.13	0.21	10% AEP, 30 min burst, Storm 7
	OF76357	0	0	0	0	0	0	0	
	OF76359	0.199	0.199	0.35	0.398	0.21	4.77	1.27	10% AEP, 30 min burst, Storm 7
	OF76363	0	0	0	0	0	0	0	
	OF76364	0.003	0.003	0.369	0.038	0.01	0.45	0.39	10% AEP, 2 hour burst, Storm 2
	OF76369	0	0	19.201	0	0	0	0	
	OF76373	0	0	1.322	0	0	0	0	
	OF76375	0	0	0	0	0	0	0	
	OF76377	0	0	0	0	0	0	0	
	OF76384	0.204	0.204	19.15	0.017	0.01	32	0.38	10% AEP, 3 hour burst, Storm 2
	OF76391	0	0	1.379	0	0	0	0	
	OF76405	0.242	0.242	0.393	0.803	0.24	9.64	1.47	10% AEP, 1 hour burst, Storm 6
	OF76407	0.155	0.155	0.261	0.803	0.05	9.64	0.08	10% AEP, 6 hour burst, Storm 6
	OF76410	0	0	19.24	0	0	0	0	
	OF76413	0	0	0	0	0	0	0	
	OF76415	0	0	0	0	0	0	0	
	OF76418	0	0	1.329	0	0	0	0	
	OF76420	0	0	0.589	0	0	0	0	
	OF76424	0	0	0	0	0	0	0	
	OF76426	0	0	19.114	0	0	0	0	
	OF76429	0.148	0.146	0.225	0.423	0.15	5.07	0.86	10% AEP, 3 hour burst, Storm 2
	OF76432	0.138	0.138	19.225	0.015	0	32	0.29	10% AEP, 3 hour burst, Storm 2
	OF76434	0	0	0	0	0	0	0	
	OF76436	0	0	0	0	0	0	0	
	OF76444	0	0	19.201	0	0	0	0	
	OF76451	0.037	0.037	0.608	0.538	0.09	6.45	1.25	10% AEP, 3 hour burst, Storm 2
	W-B1-01	0	0.051	0.14	0.138	0.07	1.66	0.56	10% AEP, 30 min burst, Storm 5
	W-B1-02	0	0.029	0.157	0.117	0.04	1.41	0.35	10% AEP, 15 min burst, Storm 6
	W-B1-03	0	0.026	0.123	0.158	0.03	1.89	0.17	10% AEP, 15 min burst, Storm 6
	W-B1-04	0	0.464	0.163	0.703	1.3	8.44	22.89	10% AEP, 9 hour burst, Storm 5
	W-B1-05	0.011	0.721	0.101	0.703	0.31	8.44	0.84	10% AEP, 9 hour burst, Storm 5
	W-B2-O1	0.006	0	12.141	3	0	32	0	10% AEP, 45 min burst, Storm 8
	W-B3-01	0	0.145	0.414	0.747	0.12	8.97	0.88	10% AEP, 10 min burst, Storm 9
	W-B4-01	0	0.088	0.229	0.609	0.08	7.31	0.55	10% AEP, 10 min burst, Storm 3
	W-B4-02	0	0.11	0.375	0.609	0.11	7.31	0.86	10% AEP, 10 min burst, Storm 9
	W-B4-O1	0.006	0	12.141	3	0	32	0	10% AEP, 30 min burst, Storm 7
	W-B5-01	0	0.022	0.354	0.173	0.03	2.07	0.45	10% AEP, 10 min burst, Storm 3
	W-B5-02	0	0.013	0.312	0.173	0.02	2.07	0.38	10% AEP, 10 min burst, Storm 9
	W-B5-03	0	0.005	0.512	0.04	0.02	0.48	0.56	10% AEP, 2 hour burst, Storm 2
	W-B5-04	0.179	0.188	0.296	0.511	0.18	6.13	1.1	10% AEP, 30 min burst, Storm 7
	W-B5-05	0	0.018	0.378	0.498	0.03	5.98	0.47	10% AEP, 10 min burst, Storm 9
	W-B5-06 07	0	0.104	0.411	0.395	0.11	4.74	0.92	10% AEP, 10 min burst, Storm 3
	W-B5-08	0	0.038	0.242	0.395	0.04	4.74	0.39	10% AEP, 10 min burst, Storm 9
	W-B5-09 10	0	0.044	0.367	0.179	0.05	2.15	0.53	10% AEP, 10 min burst, Storm 9
	W-B5-11	0	0.004	0.232	0.045	0.02	0.54	0.43	10% AEP, 2 hour burst, Storm 3
	W-B5-12	0	0.007	0.389	0.047	0.03	0.56	0.58	10% AEP, 10 min burst, Storm 3
	W-B5-13A	0.139	0.359	0.172	0.635	0.31	7.62	1.7	10% AEP, 9 hour burst, Storm 1
	W-B5-13B	0.004	0.143	0.226	0.635	0.43	7.62	8.42	10% AEP, 9 hour burst, Storm 1
	W-B5-16	0	0.021	0.333	0.635	0.03	7.62	0.38	10% AEP, 10 min burst, Storm 3
	W-B5-CULV14 15	0	0.087	0.357	0.365	0.09	4.39	0.76	10% AEP, 10 min burst, Storm 3
	W-B5-O1	0.012	0	12.141	3	0	32	0	10% AEP, 1 hour burst, Storm 6
	W-B6-01	0	0.041	0.142	0.417	0.02	5.01	0.13	10% AEP, 1 hour burst, Storm 4
	W-B7-02	0	0.12	0.478	0.801	0.1	9.62	0.77	10% AEP, 10 min burst, Storm 9
	W-B7-O1	0.006	0	12.141	3	0	32	0	10% AEP, 3 hour burst, Storm 2
	W-EXT02	0.172	0.172	0.105	0.242	0.16	2.9	0.84	10% AEP, 3 hour burst, Storm 2
	W-EXT03	0.099	0.067	0.379	0.188	0.12	2.25	0.97	10% AEP, 9 hour burst, Storm 5
	W-EXT04	0.185	0.186	0.213	0.538	0.16	6.45	0.87	10% AEP, 9 hour burst, Storm 10
	W-S1	0	0.265	0.385	0.178	0.25	2.13	1.4	10% AEP, 3 hour burst, Storm 2
	DETENTION BASIN DETAILS								
	Name	Max WL	MaxVol	Max Q	Max Q	Max Q			
				Total	Low Level	High Level			
	WEST-B1	66.7	100.5	0.091	0.091	0			
	WEST-B2	62.39	121.3	0.106	0.029	0.077			
	WEST-B3	63.25	167.8	0.037	0.037	0			
	WEST-B4	59.61	92.9	0.179	0.148	0.031			
	WEST-B6	58.42	67	0	0	0			
	WEST-B5	54.13	93.8	0.242	0.206	0.037			
	WEST-B7	52.3	504.5	0.15	0.131	0.019			
	Run Log for 12546218_AlbanyMotorPark_west run at 13:48:04 on 14/7/2021 using version 2020.036								
)8, W-B5-0	The maximum flow in these overflow routes is unsafe: OF76451, OF76444, OF76429, OF76410, OF76407, OF76405, OF76377, OF76359, OF76354, W-B4-01, W-B3-01, OF76316, OF76315, W-								

Stage 1A (WEST) DRAINS Results

DRAINS results prepared from Version 2020.036

1% AEP

PIT / NODE DETAILS

Name	Max HGL	Max Pond HGL	Max Surface Flow Arriving (cu.m/s)	Max Pond Volume (cu.m)	Min Freeboard (m)	Overflow (cu.m/s)	Constraint
DUMMY-SCALE2	10		0				
DUMMY-SCALE1	8		0				
W1-B1-01-US	69		0				
W-B1-02-US	68.65		0				
W-B1-03-US	68.65		0				
W-B1-04-US	67		0				
W-B1-05-US	66.71		0				
W- B4-01-US	62		0				
W-B4-02-US	68.5		0				
W-B5-CULV1-HW	56.72		0.05		0.28	0	None
W-B5-CULV1-DS	56.57		0				
W-B5-CULV2-HW	56.56		0.789		-0.06	0.243	Headwall height/system capacity
W-B5-CULV2-DS	55.66		0.471				
W-B5-CULV3-HW	55.45		0.864		0.05	0	None
W-B5-CULV3-DS	54.61		0.317				
W-B5-CULV4-HW	57.06		0.011		0.94	0	None
W-B5-CULV4-DS	56.57		0				
W-B5-CULV5-HW	55.5		0.032		1	0	None
W-B5-CULV5-DS	54.51		0				
W-B7-CULV2-HW	56.2		0.148		0.8	0	None
W-B7-CULV2-DS	55.51		0				
W-B5-CULV6-HW	52.64		0.129		0.36	0	None
N87219	52.62		0				
W-B1-CULV1-HW	68.4		0.045		0.6	0	None
W1-01-DS	67.98		0.151				
N87159	65.29		0				
N87076	64.14		0.032				
N87168	61.39		0				
W-EXT02-US	61.36		0.252				
W-EXT	60.79		0.912				
W-EXT-CULV1-HW	60.52		1.092		-0.02	0.051	Headwall height/system capacity
W-EXT-CULV1-DS	59.26		0.321				
N87207	61.8		0				
N87255	61.12		0				
W-EXT-HW	65.04		0.694		-0.04	0.176	Headwall height/system capacity
N87181	58.35		0				
W-B5-03-DS	57.25		0.239				
W-B5-03-US	62		0				
W-B5-06-US	63.5		0				
W-B5-01-US	59		0				
W-B5-02-US	57.5		0				
W-B5-05-US	58		0				
W-B5-08-US	56		0				
W-B5-09-US	58		0				
W-B5-11-US	58		0				
W-B5-12-US	57.5		0				
N87237	57.39		0				
N87238	57.19		0				
W-B6-01-US	59.2		0				
N87225	52.93		0				
N87218	52.63		0.134				
W-B5-16-US	56.5		0				
W-B5-CULV14-US	59.2		0				
W-B7-CULV1-HW	52.62		1.016		0.38	0	None
N87244	49.54		0				
N87245	49.27		0.121				
W-B7-02-US	62.5		0				
HW12	54.03		0.745		-0.03	0.107	Headwall height/system capacity
N87149	51.94		0.373				
HW13	48.04		0.805		-0.04	0.153	Headwall height/system capacity
N87150	46.83		0.448				
W-B3-01-US	67.2		0				
S1_US	57.5		0				

SUB-CATCHMENT DETAILS

Name	Max Flow Q (cu.m/s)	Paved Max Q (cu.m/s)	Grassed Max Q (cu.m/s)	Paved Tc (min)	Grassed Tc (min)	Supp. Tc (min)	Due to Storm
W-B5-CULV1-CAT	0.082	0	0.082	0	2.33	1.13	1% AEP, 15 min burst, Storm 8
W-B5-CULV2-CAT	0.074	0	0.074	0	2.82	1.37	1% AEP, 10 min burst, Storm 4
W-B5-CULV3-CAT	0.319	0	0.319	0	2.45	1.19	1% AEP, 15 min burst, Storm 4
W-B5-CULV3-DS-CAT	0.091	0	0.091	0	1.9	0.92	1% AEP, 15 min burst, Storm 4
W-B5-CULV4-CAT	0.018	0	0.018	0	1.38	0	1% AEP, 15 min burst, Storm 8
W-B5-CULV5-CAT	0.016	0	0.016	0	2.08	1.01	1% AEP, 15 min burst, Storm 4
W-B5-CULV6-CAT	0.215	0	0.215	0	1.98	0.96	1% AEP, 15 min burst, Storm 8
W-B1-03-CAT	0.075	0	0.075	0	1.79	0.87	1% AEP, 15 min burst, Storm 4
W-B1-01-CAT	0.252	0	0.252	0	2.5	1.22	1% AEP, 15 min burst, Storm 4
WEST-B1-CAT	0.211	0	0.211	0	3.84	1.87	1% AEP, 10 min burst, Storm 4
WEST-B2-CAT	0.435	0.435	0	2.43	0	0	1% AEP, 10 min burst, Storm 4
W-EXT-CAT	0.107	0	0.107	0	1.83	0	1% AEP, 15 min burst, Storm 8
W-EXT04-CAT	0.068	0	0.068	0	1.53	0.74	1% AEP, 15 min burst, Storm 8
WEST-B3-CAT	0.324	0	0.324	0	4.89	2.38	1% AEP, 10 min burst, Storm 4
CulvW_ext	0.479	0	0.479	5	75	2	1% AEP, 3 hour burst, Storm 8
WEST-B4-CAT	0.589	0.516	0.082	3.03	7.05	0	1% AEP, 15 min burst, Storm 8
W-B5-03-CAT	0.032	0	0.032	0	1.88	0	1% AEP, 15 min burst, Storm 8
WEST-B6-CAT	0.281	0	0.281	0	2.49	1.22	1% AEP, 15 min burst, Storm 8
WEST-B5-CAT	0.162	0	0.162	0	2.55	1.24	1% AEP, 15 min burst, Storm 8
W-B7-01-CAT	0.018	0	0.018	0	2.13	0	1% AEP, 10 min burst, Storm 4
WEST-B7-CAT	0.427	0	0.427	0	2.79	1.36	1% AEP, 10 min burst, Storm 4
S1_catch	1.641	0	1.641	0	19.68	0	1% AEP, 25 min burst, Storm 8

PIPE DETAILS

Name	Max Q (cu.m/s)	Max V (m/s)	Max U/S HGL (m)	Max D/S HGL (m)	Due to Storm
DUMMY-SCALE	0	0	10	8	1% AEP, 10 min burst, Storm 5
W-B5-CULV1	0.069	0.71	56.696	56.566	1% AEP, 15 min burst, Storm 8
W-B5-CULV2	0.286	3.27	56.204	55.668	1% AEP, 15 min burst, Storm 1
W-B5-CULV3	0.517	2.46	55.197	54.783	1% AEP, 30 min burst, Storm 3
W-B5-CULV4	0.017	1.24	57.056	56.575	1% AEP, 15 min burst, Storm 8
W-B5-CULV5	0.033	1.31	55.496	54.507	1% AEP, 15 min burst, Storm 8
Pipe20528	0.069	2.46	56.107	55.515	1% AEP, 2 hour burst, Storm 10
W-B5-CULV6	0.163	1.03	52.637	52.624	1% AEP, 15 min burst, Storm 8
W-B1-CULV1	0.053	0.9	68.389	67.978	1% AEP, 15 min burst, Storm 1
Pipe20532	0.143	3.23	65.513	65.295	1% AEP, 2 hour burst, Storm 10

	Pipe20533	0.143	3.27	65.295	64.894	1% AEP, 2 hour burst, Storm 10				
	Pipe20566	0.097	2.12	61.516	61.388	1% AEP, 15 min burst, Storm 1				
	Pipe20567	0.115	2.53	61.388	61.36	1% AEP, 15 min burst, Storm 1				
	W-EXT-CULV1	0.418	2.72	60.157	59.416	1% AEP, 2 hour burst, Storm 7				
	Pipe20702	0.146	3.12	62.016	61.801	1% AEP, 30 min burst, Storm 5				
	Pipe20716	0.146	3.28	61.801	61.145	1% AEP, 30 min burst, Storm 5				
	W-EXT-CULV	0.303	2.22	64.851	61.36	1% AEP, 3 hour burst, Storm 8				
	Pipe20591	0.334	4.55	58.69	58.351	1% AEP, 15 min burst, Storm 8				
	Pipe20597	0.362	4.94	58.351	57.711	1% AEP, 15 min burst, Storm 8				
	Pipe20785	0.069	1.89	57.482	57.387	1% AEP, 2 hour burst, Storm 10				
	Pipe20790	0.069	1.98	57.387	57.222	1% AEP, 2 hour burst, Storm 10				
	Pipe20745	0.542	3.79	53.181	52.933	1% AEP, 30 min burst, Storm 8				
	Pipe20746	0.583	4.08	52.933	52.652	1% AEP, 30 min burst, Storm 8				
	Pipe20525	0.49	1.54	52.55	52.44	1% AEP, 30 min burst, Storm 8				
	Pipe20821	0.506	3.6	49.764	49.539	1% AEP, 2 hour burst, Storm 2				
	Pipe20830	0.528	3.75	49.539	49.299	1% AEP, 2 hour burst, Storm 2				
	Pipe20526	0.362	4.84	53.309	52.125	1% AEP, 2 hour burst, Storm 7				
	Pipe20527	0.346	2.82	47.498	47.124	1% AEP, 1 hour burst, Storm 6				
	CHANNEL DETAILS									
	Name	Max Q	Max V			Due to Storm				
		(cu.m/s)	(m/s)							
	OVERFLOW ROUTE DETAILS									
	Name	Max Q U/S	Max Q D/S	Safe Q	Max D	Max DxV	Max Width	Max V	Due to Storm	
	O134039	0.014	0	12.141	3	0	32	0	1% AEP, 30 min burst, Storm 8	
	O134055	0.014	0	12.141	3	0	32	0	1% AEP, 30 min burst, Storm 8	
	O137112	0.006	0	12.141	3	0	32	0	1% AEP, 15 min burst, Storm 1	
	O137116	0.006	0	12.141	3	0	32	0	1% AEP, 15 min burst, Storm 1	
	O137914	0.007	0	12.141	3	0	32	0	1% AEP, 15 min burst, Storm 8	
	O137918	0.014	0	12.141	3	0	32	0	1% AEP, 15 min burst, Storm 8	
	O90392	0.007	0	12.141	3	0	32	0	1% AEP, 2 hour burst, Storm 2	
	O90396	0.007	0	12.141	3	0	32	0	1% AEP, 2 hour burst, Storm 2	
	OF76225	0.255	0.255	0.996	0.707	0.24	8.48	1.34	1% AEP, 15 min burst, Storm 8	
	OF76315	0.469	0.469	1.729	1.124	0.45	8.99	1.7	1% AEP, 2 hour burst, Storm 7	
	OF76316	0.069	0.069	1.286	0.996	0.11	11.96	1.14	1% AEP, 2 hour burst, Storm 10	
	OF76323	0	0	1.311	0	0	0	0		
	OF76327	0.173	0.173	19.113	0.348	0.01	32	0.51	1% AEP, 15 min burst, Storm 1	
	OF76345	0.164	0.164	1.305	0.025	0.1	4	3.93	1% AEP, 15 min burst, Storm 8	
	OF76352	0	0	0.357	0	0	0	0		
	OF76354	0.095	0.095	0.979	0.778	0.04	9.34	0.09	1% AEP, 15 min burst, Storm 9	
	OF76357	0.243	0.243	0.364	0.042	0.03	10.86	0.82	1% AEP, 15 min burst, Storm 1	
	OF76359	0.527	0.527	1.031	0.649	0.38	7.79	1.62	1% AEP, 15 min burst, Storm 1	
	OF76363	0	0	0.757	0	0	0	0		
	OF76364	0.017	0.017	1.089	0.065	0.04	0.78	0.7	1% AEP, 15 min burst, Storm 8	
	OF76369	0	0	19.201	0	0	0	0		
	OF76373	0	0	1.322	0	0	0	0		
	OF76375	0.051	0.051	0.644	0.017	0.01	6.66	0.74	1% AEP, 2 hour burst, Storm 7	
	OF76377	0.107	0.107	0.79	0.021	0.02	7.52	1.07	1% AEP, 2 hour burst, Storm 7	
	OF76384	0.469	0.469	19.15	0.028	0.01	32	0.53	1% AEP, 2 hour burst, Storm 7	
	OF76391	0.001	0.001	1.379	0.001	0	0.13	0	1% AEP, 30 min burst, Storm 8	
	OF76405	0.583	0.583	1.159	1.064	0.36	12.77	1.3	1% AEP, 30 min burst, Storm 8	
	OF76407	0.243	0.243	0.769	1.064	0.05	12.77	0.06	1% AEP, 9 hour burst, Storm 10	
	OF76410	0	0	19.24	0	0	0	0		
	OF76413	0	0	0.455	0	0	0	0		
	OF76415	0	0	0.464	0	0	0	0		
	OF76418	0	0	1.329	0	0	0	0		
	OF76420	0.069	0.069	1.737	0.288	0.13	3.45	1.43	1% AEP, 2 hour burst, Storm 10	
	OF76424	0	0	0.526	0	0	0	0		
	OF76426	0	0	19.114	0	0	0	0		
	OF76429	0.528	0.517	0.664	1.046	0.32	12.56	1.18	1% AEP, 2 hour burst, Storm 2	
	OF76432	0.499	0.499	19.225	0.032	0.02	32	0.49	1% AEP, 1 hour burst, Storm 6	
	OF76434	0.153	0.153	0.526	0.029	0.03	9.12	0.92	1% AEP, 1 hour burst, Storm 6	
	OF76436	0	0	0.526	0	0	0	0		
	OF76444	0.176	0.176	19.201	0.684	0.01	32	0.47	1% AEP, 3 hour burst, Storm 8	
	OF76451	0.146	0.146	1.792	1.423	0.21	17.07	1.77	1% AEP, 30 min burst, Storm 5	
	W-B1-01	0	0.145	0.412	0.201	0.14	2.41	0.76	1% AEP, 15 min burst, Storm 8	
	W-B1-02	0	0.073	0.464	0.178	0.07	2.13	0.39	1% AEP, 15 min burst, Storm 8	
	W-B1-03	0	0.068	0.363	0.252	0.05	3.03	0.28	1% AEP, 15 min burst, Storm 8	
	W-B1-04	0	0.473	0.48	0.707	1.17	8.48	19.49	1% AEP, 9 hour burst, Storm 2	
	W-B1-05	0.012	0.725	0.298	0.707	0.29	8.48	0.79	1% AEP, 9 hour burst, Storm 2	
	W-B2-O1	0.006	0	12.141	3	0	32	0	1% AEP, 15 min burst, Storm 1	
	W-B3-01	0	0.269	1.221	0.808	0.18	9.7	1.04	1% AEP, 10 min burst, Storm 4	
	W-B4-01	0	0.183	0.676	0.684	0.13	8.21	0.72	1% AEP, 10 min burst, Storm 6	
	W-B4-02	0	0.22	1.104	0.684	0.18	8.21	1.07	1% AEP, 10 min burst, Storm 10	
	W-B4-O1	0.007	0	12.141	3	0	32	0	1% AEP, 15 min burst, Storm 8	
	W-B5-01	0	0.052	1.044	0.29	0.06	3.47	0.61	1% AEP, 15 min burst, Storm 8	
	W-B5-02	0	0.03	0.92	0.29	0.04	3.47	0.48	1% AEP, 15 min burst, Storm 8	
	W-B5-03	0	0.029	1.511	0.075	0.07	0.89	0.88	1% AEP, 15 min burst, Storm 1	
	W-B5-04	0.551	0.574	0.872	0.763	0.37	9.15	1.45	1% AEP, 15 min burst, Storm 8	
	W-B5-05	0	0.04	1.113	0.763	0.05	9.15	0.59	1% AEP, 15 min burst, Storm 8	
	W-B5-06 07	0	0.235	1.213	0.649	0.19	7.79	1.19	1% AEP, 15 min burst, Storm 8	
	W-B5-08	0	0.082	0.714	0.649	0.04	7.79	0.42	1% AEP, 15 min burst, Storm 8	
	W-B5-09 10	0	0.093	1.083	0.291	0.09	3.49	0.72	1% AEP, 10 min burst, Storm 4	
	W-B5-11	0	0.018	0.685	0.077	0.04	0.92	0.59	1% AEP, 15 min burst, Storm 8	
	W-B5-12	0	0.016	1.147	0.063	0.04	0.75	0.73	1% AEP, 15 min burst, Storm 8	
	W-B5-13A	0.548	0.552	0.506	0.753	0.3	9.03	0.96	1% AEP, 30 min burst, Storm 8	
	W-B5-13B	0.005	0.18	0.666	0.753	0.18	9.03	1.24	1% AEP, 9 hour burst, Storm 5	
	W-B5-16	0	0.054	0.982	0.753	0.06	9.03	0.55	1% AEP, 10 min burst, Storm 4	
	W-B5-CULV14 15	0	0.196	1.054	0.643	0.16	7.72	1	1% AEP, 10 min burst, Storm 9	
	W-B5-O1	0.014	0	12.141	3	0	32	0	1% AEP, 30 min burst, Storm 8	
	W-B6-01	0	0.159	0.418	0.569	0.07	6.82	0.37	1% AEP, 15 min burst, Storm 8	
	W-B7-02	0	0.24	1.408	0.94	0.16	11.28	0.97	1% AEP, 10 min burst, Storm 4	
	W-B7-O1	0.007	0	12.141	3	0	32	0	1% AEP, 2 hour burst, Storm 2	
	W-EXT02	0.521	0.524	0.31	0.363	0.31	4.36	1.1	1% AEP, 30 min burst, Storm 8	
	W-EXT03	0.143	0.149	1.117	0.293	0.17	3.52	1.23	1% AEP, 2 hour burst, Storm 10	
	W-EXT04	0.59	0.463	0.629	1.423	0.34	17.07	1.16	1% AEP, 1 hour burst, Storm 7	
	W-S1	0	1.604	1.134	0.341	0.78	4.1	2.3	1% AEP, 20 min burst, Storm 4	
	DETENTION BASIN DETAILS									
	Name	Max WL	MaxVol	Max Q	Max Q	Max Q				
				Total	Low Level	High Level				
	WEST-B1	66.71	101.3	0.143	0.143	0				
	WEST-B2	62.43	143.9	0.289	0.097	0.192				
	WEST-B3	63.31	186.2	0.146	0.146	0				
	WEST-B4	59.68	109.3	0.526	0.334	0.192				
	WEST-B6	58.57	106.2	0.069	0.069	0				
	WEST-B5	54.25	118.1	0.584	0.542	0.041				
	WEST-B7	52.44	628.9	0.528	0.506	0.022				
	Run Log for 12546218_AlbanyMotorPark_west run at 15:24:01 on 14/7/2021 using version 2020.036									
B7-02, W-B	The maximum flow in these overflow routes is unsafe: W-S1, OF76451, OF76444, OF76429, OF76410, OF76407, OF76405, OF76359, OF76354, W-B4-01, OF76327, W-B3-01, OF76316, OF76315, W-B									

i7-02, W-B5-CULV14 15, W-B5-13B, W-B5-13A, W-B5-16, W-B6-01, W-B5-08, W-B5-06 07, W-B5-05, W-B5-04, W-EXT04, W-EXT02, W-B4-02, W-B1-05, W-B1-04, OF76225

Stage 1B (EAST) DRAINS Inout Data

PIT / NODE DETAILS — Version 15

Name	Type	Family	Size	Ponding Volume (cu.m)	Pressure Change Coeff. Ku	Surface Elev (m)	Max Pond Depth (m)	Base Inflow (cu.m/s)	Blocking Factor	x	y	Bolt-down lid	id	Part Full Shock Los	Inflow Hydrograph	Pit is	Internal Width (mm)	Inflow is Misaligned	Minor Safe Pond Dep (m)	Major Safe Pond Depth (m)		
E-B2-02-US	Node					60.5		0		568175	6133948		97325		No							
dummy1	Node					9		0		567155	6133587		97367		No							
N57	Node					58		0		568106	6133961		97505		No							
N58	Node					56		0		568093	6133965		97516		No							
E-B2-01-US	Node					63.5		0		568158	6134105		97469		No							
E-B5-CULV1-HW	Headwall				0.5	68		0		568616	6133924		97687									
N61643	Node					67.5		0		568663	6133920		1336024		No							
N302	Node					64.5		0		568673	6133907		99131		No							
DUMMY-SCALE2	Node					10.5		0		568871	6134218		97701		No							
DUMMY-SCALE1	Node					8		0		568934	6134070		97702		No							
E-B5-01-US	Node					71		0		568522	6133990		97795		No							
E-B5-02-US	Node					72.5		0		568572	6134258		97815		No							
E-B7-CULV2-HW	Headwall				0.5	73.5		0		568460	6134257		97829									
E-B7-CULV2-DS	Node					72		0		568452	6134269		97831		No							
E-B7-04-US	Node					73		0		568445	6134203		97846		No							
E-B7-05-US	Node					73		0		568490	6134258		97849		No							
E-B9-CULV1-HW	Headwall				0.5	68.5		0		568636	6134618		97880									
E-B9-CULV1-DS	Node					67.5		0		568622	6134619		97882		No							
E-B9-07-US	Node					73		0		568632	6134277		97904		No							
E-B9-08-US	Node					68.5		0		568636	6134734		97910		No							
E-B9-05-US	Node					71		0		568577	6134468		97923		No							
E-B9-06-US	Node					68		0		568622	6134735		97926		No							
E-B9-CULV2-HW	Headwall				0.5	66		0		568578	6134629		97939									
E-B9-CULV2-DS	Node					64		0		568547	6134645		97960		No							
E-B9-03-US	Node					71		0		568560	6134465		97945		No							
E-B9-04-US	Node					67		0		568596	6134741		97951		No							
E-B9-01-US	Node					69.5		0		568513	6134498		97977		No							
E-B9-02-US	Node					65.5		0		568566	6134737		97985		No							
N306	Node					61.5		0		568167	6134243		99152		No							
N297	Node					57		0		568128	6134265		99115		No							
E-B7-07-US	Node					70		0		568465	6134420		98259		No							
N296	Node					62.225		0		568511	6134661		99112		No							
N305	Node					59.5		0		567984	6133886		99135		No							
N304	Node					53.5		0		567968	6133945		99134		No							
N61649	Node					66		0		568245	6134283		1337247		No							
N298	Node					63		0		568227	6134274		99116		No							
N367	Node					62.5		0		568520	6134829		100059		No							
N294	Node					61		0		568485	6134822		99109		No							
E-B9-CULV3-HW	Headwall				0.5	62		0		568491	6134668		98030									
E-B9-CULV3-DS	Node					60		0		568450	6134694		98032		No							
E-B10-01-US	Node					63		0		568467	6134664		98042		No							
E-B10-02-US	Node					63.5		0		568382	6134548		98052		No							
E-B10-03-US	Node					65.5		0		568569	6134752		98066		No							
E-B10-CULV1-HW	Headwall				0.5	65.5		0		568607	6134840		98068									
E-B10-CULV1-DS	Node					64		0		568579	6134834		98071		No							
E-B10-04-US	Node					67		0		568598	6134759		98119		No							
E-B10-05-US	Node					68		0		568622	6134757		98121		No							
E-B6-01-US	Node					66.5		0		568208	6134064		98149		No							
E-B6-02-US	Node					69.5		0		568325	6134226		98154		No							
E-B6-03-US	Node					63.5		0		568373	6134534		98192		No							
E-B7-01-US	Node					69.5		0		568313	6134095		98206		No							
E-B7-02-DS	Node					69.5		0		568333	6134256		98218		No							
E-B7-03-DS	Node					70.5		0		568362	6134242		98221		No							
E-B7-02-US	Node					70.5		0		568365	6134100		98223		No							
E-B7-03-US	Node					72		0		568416	6134125		98225		No							
E-B7-B	Node					68		0		568366	6134360		98245		No							
E-B7-CULV1-HW	Headwall				0.5	69		0		568363	6134359		98248									
Pit1448	Sag	MR High R	WA Main I	0.5	1.5	67.91	0.5	0	0	568360	6134359	No	183745	1 x Ku	No	New	1050	Yes	0.3	0.5		
E-B7-CULV1-DS	Node					65.5		0		568305	6134365		98277		No							
E-B7-08-US	Node					72		0		568418	6134228		98287		No							
E-B7-09-US	Node					70		0		568466	6134433		98294		No							
E-B7-10-US	Node					69.5		0		568503	6134488		98311		No							
E-B7-11-DS	Node					65.1		0		568287	6134298		98326		No							
E-B3-02-US	Node					70.6		0		568368	6134088		98339		No							
E-B3-01-US	Node					72		0		568422	6134111		98341		No							
E-B4-01-DS	Node					71.25		0		568469	6134074		98364		No							
E-B4-01-US	Node					72		0		568406	6134211		98367		No							
E-B4-02-DS	Node					71.1		0		568518	6134004		98381		No							
E-B4-02-US	Node					73		0		568448	6134198		98384		No							
E-B1-01-US	Node					58.5		0		568117	6133936		98398		No							
E-B1-CULV1-DS	Node					58		0		568017	6133910		98405		No							
E-B1-02-US	Node					60.5		0		568147	6133911		98415		No							
E-B1-03-SPLIT	Node					65.5		0		568286	6133938		98443		No							
E-B1-03-US	Node					68.5		0		568265	6134075		98448		No							
E-B1-04-DS	Node					68.5		0		568373	6133909		98452		No							
E-B1-04-US	Node					69.5		0		568317	6134086		98455		No							
Pit8	Sag	MR High R	WA Main I	20	1.5	69	0.5	0	0	568280	6134154	No	98537	1 x Ku	No	New	1050	No	0.15	0.3		
E-B7-CULV3-DS	Node					67		0		568293	6134250		98138		No							
N266	Node					66.75		0		568298	6134276		98633		No							
E-B2-02-DS DUMMY	Node					58		0		568127	6133951		98869		No							
E-BB-01A-US	Node					71.2		0		568622	6134476		98976		No							
E-B8-01B-US	Node					73		0		568508	6134277		98979		No							
N388	Node					56		0		568035	6133940		100415		No							
N511	Node					67		0		568387	6134457		101985		No							
N539	Node					51.5		0		567984	6133984		102852		No							
Pit1296	Sag	MR High R	WA Main I	0.25	1.5	71.8	0.4	0	0	568465	6134072	No	171193	1 x Ku	No	New	1050	No	0.3	0.3		
N61629	Node					71		0		568423	6133978		1334698		No							
N299	Node					68		0		568372	6133891		99125		No							
N38859	Node					64		0		568694	6133865		807388		No							
N38868	Node					47		0		567911	6134045		807705		No							
HW1478	Headwall				0.5	49.5		0		567937	6134017		807769									
N59	Node					48.5		0		567924	6134032		97518		No							
N38875	Node					50		0		568077	6134294		807976		No							
HW1479	Headwall				0.5	53		0		568107	6134281		807978									
N38873	Node					52		0		568094	6134287		807973		No							
HW1480	Headwall				0.5	57.5		0		568328	6134678		808445									
N38880	Node					56.5		0		568308	6134661		808406		No							
N38884	Node					55		0		568292	6134645		808616		No							

DETENTION BASIN DETAILS

Name	Elev	Surf. Area	Not Used	Outlet Typ	K	Dia(mm)	Centre RL	Pit Family	Pit Type	x	y	HED	Crest RL	Crest Leng	id
EAST-B2	57	500		Pit/Sump				MR High R	WA Main I	568120	6133959	No			97460
	58	1150													
EAST-B5	66	300		Pit/Sump				MR High R	WA Main I	568660	6133924	No			97684
	67.5	1300													
EAST-B6	61	600		Pit/Sump				MR High R	WA Main I	568174	6134240	No			97995
	61.5	1000													
EAST-B8	70.5	250		Pit/Sump				MR High R	WA Main I	568489	6134412	No			97998
	71.5	750													
EAST-B9	63	950		Pit/Sump				MR High R	WA Main I	568527	6134653	No			98000
	64	1800													
EAST-B1	58	145		Pit/Sump				MR High R	WA Main I	567988	6133871	No			98006
	59.5	950													
EAST-B7	65	300		Pit/Sump				MR High R	WA Main I	568250	6134286	No			98017
	66	850													
EAST-B10	62	430		Pit/Sump				MR High R	WA Main I	568527	6134830	No			98023
	62.5	800													
Bio-retention	73.1	490		None						568542	6134333	No			98744
	73.5	1750													
EAST-B4	71	250		Pit/Sump				MR High R	WA Main I	568509	6133989	No			98013
	71.5	550													
EAST-B3	70	350		Pit/Sump				MR High R	WA Main I	568430	6133991	No			98011
	71	950													

SUB-CATCHMENT DETAILS

Name	Pit or Node	Total Area (ha)	Paved Area %	Grass Area %	Supp Area %	Paved Time (min)	Grass Time (min)	Supp Time (min)	Paved Length (m)	Grass Length (m)	Supp Length (m)	Paved Slope(%)	Grass Slope %	Supp Slope %	Paved Rough	Grass Rough	Supp Rough	Lag Time or Factor	Gutter Length (m)	Gutter Slope %	Gutter FlowFacto	Rainfall Multiplier
EAST-B2-CAT	EAST-B2	2.568	20	50	30	0		0	0	117.12	117.12	5.746	5.746	5.746	0.013	0.053	0.016	0				1
E-B5	E-B5-CULV1-HW	3.378	100	0	0	0		0	0	93.095	-1	3.37	-1	-1	0.013	-1	-1	0				1
EAST-B5-CAT	EAST-B5	2.338	0	100	0	0		0	0	-1	295.09	-1	2.37	-1	-1	0.053	-1	0				1
E-B7-A	E-B7-CULV2-HW	0.664	100	0	0	0		0	0	64.619	-1	-1	0.889	-1	-1	0.013	-1	0				1
E-B9-A	E-B9-CULV1-HW	3.022	0	100	0	0		0	0	-1	75.763	-1	-1	1.105	-1	-1	0.053	-1	0			1
E-B9-B	E-B9-CULV1-DS	0.63	30	70	0	0		0	0	17.65	17.65	-1	4.27	4.27	-1	0.013	0.053	-1	0			1
E-B9-C	E-B9-CULV2-HW	0.982	0	100	0	0		0	0	-1	33.011	-1	-1	3.799	-1	-1	0.053	-1	0			1
E-B9-D	E-B9-CULV2-DS	1.097	35	30	35	0		0	0	39.502	39.502	39.502	5.326	5.326	5.326	0.013	0.053	0.016	0			1
EAST-B6-CAT	EAST-B6	5.475	10	80	10	0		0	0	64.734	64.734	64.734	7.72	7.72	7.72	0.013	0.053	0.016	0			1
EAST-B8-CAT	EAST-B8	0.838	40	60	0	0		0	0	13.81	13.81	-1	3.32	3.32	-1	0.013	0.053	-1	0			1
EAST-B9-CAT	EAST-B9	0.116	0	100	0	0		0	0	-1	16.962	-1	-1	5.9	-1	-1	0.053	-1	0			1
EAST-B1-CAT	EAST-B1	1.9121	50	40	10	0		0	0	46.71	46.71	46.71	3.178	3.178	3.178	0.013	0.053	0.016	0			1
EAST-B7-CAT	EAST-B7	0.33	0	100	0	0		0	0	-1	103.06	-1	-1	4.85	-1	-1	0.053	-1	0			1
EAST-B10-CAT	EAST-B10	3.7674	20	70	10	0		0	0	31.74	31.74	31.74	4.69	4.69	4.69	0.013	0.053	0.016	0			1
E-B10-A	E-B10-CULV1-HW	0.381	0	80	20	0		0	0	17.21	17.21	17.21	4.238	4.238	4.238	0.013	0.053	0.016	0			1
E-B10-03-CATA	E-B10-CULV1-DS	0.2796	40	50	10	0		0	0	24.61	24.61	24.61	6.095	6.095	6.095	0.013	0.053	0.016	0			1
E-B7-02-CAT	E-B7-02-DS	0.594	0	100	0	0		0	0	-1	46.395	-1	-1	2.155	-1	-1	0.053	-1	0			1
E-B7-03-CAT	E-B7-03-DS	0.384	60	20	20	0		0	0	33.111	33.111	33.111	1.51	1.51	1.51	0.013	0.053	0.016	0			1
E-B7-B-CAT	E-B7-CULV1-HW	1.809	0	100	0	0		0	0	-1	129.98	-1	-1	1.734	-1	-1	0.053	-1	0			1
E-B7-C	Pit1448	1.255	82.5	10	7.5	0		0	0	35.342	35.342	35.342	1.448	1.448	1.448	0.013	0.053	0.016	0			1
E-B7-10-CATB	E-B7-CULV1-DS	0.1624	0	100	0	0		0	0	50.268	50.268	50.268	1.989	1.989	1.989	0.013	0.053	0.016	0			1
E-B7-11-CAT	E-B7-11-DS	0.236	0	100	0	0		0	0	-1	23.373	-1	-1	2.139	-1	-1	0.053	-1	0			1
E-B4-02-CAT	E-B4-02-DS	1.245	100	0	0	0		0	0	67.914	-1	-1	0.736	-1	-1	0.013	-1	-1	0			1
E-B1-02-CATA	E-B1-CULV1-DS	0.8109	10	80	10	0		0	0	40.879	40.879	40.879	4.892	4.892	4.892	0.013	0.053	0.016	0			1
E-B1-03-US-CAT	E-B1-03-SPLIT	1.056	50	10	40	0		0	0	58.809	58.809	58.809	3.401	3.401	3.401	0.013	0.053	0.016	0			1
E-B1-04-CAT	E-B1-04-DS	0.474	0	100	0	0		0	0	-1	19.545	-1	-1	5.116	-1	-1	0.053	-1	0			1
E-B7-01-CAT	Pit8	1.026	20	60	20	0		0	0	50.013	50.013	50.013	1.999	1.999	1.999	0.013	0.053	0.016	0			1
Cat314	N266	0.33	0	100	0	0		0	0	-1	103.06	-1	-1	4.85	-1	-1	0.053	-1	0			1
E-B8-02	Bio-retention	1.772	0	100	0	0		0	0	-1	173.62	-1	-1	1.152	-1	-1	0.053	-1	0			1
E-B1-01-CAT	N388	0.274	40	50	10	0		0	0	34.788	34.788	34.788	5.749	5.749	5.749	0.013	0.053	0.016	0			1
E-B7-10-CATA	N511	0.6496	10	70	20	0		0	0	50.268	50.268	50.268	1.989	1.989	1.989	0.013	0.053	0.016	0			1
E-B4-01-CAT	Pit1296	0.384	100	0	0	0		0	0	21.961	-1	-1	2.277	-1	-1	0.013	-1	-1	0			1
EAST-B4-CAT	EAST-B4	0.182	50	50	0	0		0	0	57.265	57.265	57.265	0.87	0.87	0.87	0.013	0.053	0.016	0			1
EAST-B3-CAT	EAST-B3	2.133	50	40	10	0		0	0	39.23	39.23	39.23	2.2	2.2	2.2	0.013	0.053	0.016	0			1

PIPE DETAILS

Name	From	To	Length (m)	U/S IL (m)	D/S IL (m)	Slope (%)	Type	Dia (mm)	I.D. (mm)	Rough	Pipe Is	No. Pipes	Chg From	At Chg	Chg (m)	Rl (m)	Chg (m)	RL (m)	etc (m)
DUMMY-SCALE	DUMMY-SCALE2	DUMMY-S	161.044	10	8	1.24	uPVC, under roads, 1% minimum	150	154	0.012	New	1	DUMMY-S	0					
E-B5-CULV1	E-B5-CULV1-HW	EAST-B5	15	66.91	66	6.07	Concrete, under roads, 1% minimu	450	450	0.013	NewFixed	1	E-B5-CUL	0					
E-B7-CULV1	Pit1448	E-B7-CUL	55.2	66.91	65.5	2.55	Concrete, under roads, 1% minimu	450	450	0.013	NewFixed	1	Pit1448	0					
E-B7-CULV2	E-B7-CULV2-HW	E-B7-CUL	13.4	72.41	72	3.06	Concrete, under roads, 1% minimu	450	450	0.013	NewFixed	1	E-B7-CUL	0					
E-B7-CULV3	Pit8	E-B7-CUL	97.1	67.485	67	0.5	Concrete, under roads, 1% minimu	450	450	0.013	New	1	Pit8	0					
E-B9-CULV1	E-B9-CULV1-HW	E-B9-CUL	13.7	67.41	66.41	7.3	Concrete, under roads, 1% minimu	450	450	0.013	NewFixed	1	E-B9-CUL	0					
E-B9-CULV2	E-B9-CULV2-HW	E-B9-CUL	28.3	64.91	64	3.22	Concrete, under roads, 1% minimu	450	450	0.013	NewFixed	1	E-B9-CUL	0					
E-B9-CULV3	E-B9-CULV3-HW	E-B9-CUL	49	60.91	60	1.86	Concrete, under roads, 1% minimu	450	450	0.013	NewFixed	1	E-B9-CUL	0					

P13783	EAST-B3	N61629	2	69.3	69.233	3.35	Concrete, under roads, 0.5% minir	600	600	0.013	NewFixed	1	EAST-B3	0
P13826	EAST-B5	N61643	1.5	65.3	65.24	4	Concrete, under roads, 0.5% minir	450	450	0.013	NewFixed	1	EAST-B5	0
P13854	EAST-B7	N61649	2	64.3	64.17	6.5	Concrete, under roads, 0.5% minir	600	600	0.013	NewFixed	1	EAST-B7	0
P21	N57	N58	8.5	56.255	56	3	Concrete, under roads, 1% minimu	450	450	0.013	New	1	N57	0
P3176	E-B7-CULV1-HW	Pit1448	5	68	66.91	21.8	Concrete, under roads, 1% minimu	450	450	0.013	NewFixed	1	E-B7-CUL	0
Pipe10	EAST-B2	N57	1.5	56.3	56.255	3	Concrete, under roads, 1% minimu	450	450	0.013	NewFixed	1	EAST-B2	0
Pipe122	E-B10-CULV1-HW	E-B10-CU	29.4	64.41	62.91	5.1	Concrete, under roads, 1% minimu	450	450	0.013	NewFixed	1	E-B10-CU	0
Pipe177	N61629	N299	58	69.233	68	2.13	Concrete, under roads, 0.5% minir	600	600	0.013	NewFixed	1	N61629	0
Pipe178	EAST-B4	EAST-B3	79.8	70.4	70	0.5	Concrete, under roads, 0.5% minir	450	450	0.013	NewFixed	1	EAST-B4	0
Pipe179	N61643	N302	18.5	65.24	64.5	4	Concrete, under roads, 0.5% minir	450	450	0.013	NewFixed	1	N61643	0
Pipe182	N61649	N298	18	64.17	63	6.5	Concrete, under roads, 0.5% minir	600	600	0.013	NewFixed	1	N61649	0
Pipe183	N306	N297	38	60.155	55.5	12.25	Concrete, under roads, 0.5% minir	600	600	0.013	New	1	N306	0
Pipe184	EAST-B8	E-B7-07-U	10	70.05	70	0.5	Concrete, under roads, 0.5% minir	450	450	0.013	NewFixed	1	EAST-B8	0
Pipe185	EAST-B9	N296	15	62.3	62.225	0.5	Concrete, under roads, 0.5% minir	450	450	0.013	NewFixed	1	EAST-B9	0
Pipe186	N367	N294	48	61.268	60.5	1.6	Concrete, under roads, 0.5% minir	600	600	0.013	New	1	N367	0
Pipe213	EAST-B1	N305	1.5	57	56.915	5.67	Concrete, under roads, 0.5% minir	450	450	0.013	NewFixed	1	EAST-B1	0
Pipe220	N305	N304	60	56.915	53.5	5.69	Concrete, under roads, 0.5% minir	450	450	0.013	New	1	N305	0
Pipe283	EAST-B6	N306	2	60.4	60.155	12.25	Concrete, under roads, 0.5% minir	600	600	0.013	NewFixed	1	EAST-B6	0
Pipe2927	Pit1296	EAST-B4	95.2	71.4	71	0.42	Concrete, under roads, 0.5% minir	375	375	0.013	NewFixed	1	Pit1296	0
Pipe349	EAST-B10	N367	2	61.3	61.268	1.6	Concrete, under roads, 0.5% minir	600	600	0.013	NewFixed	1	EAST-B10	0
Pipe8633	HW1478	N59	20	48.41	47.41	5	Concrete, under roads, 0.5% minir	450	450	0.013	NewFixed	1	HW1478	0
Pipe8646	HW1479	N38873	15	51.91	50.91	6.67	Concrete, under roads, 0.5% minir	900	900	0.013	NewFixed	1	HW1479	0
Pipe8668	HW1480	N38880	25	56.41	55.41	4	Concrete, under roads, 0.5% minir	450	450	0.013	NewFixed	1	HW1480	0

DETAILS of SERVICES CROSSING PIPES

Pipe	Chg	Bottom	Height of S	Chg	Bottom	Height of S	Chg	Bottom	Height of S	etc
	(m)	Elev (m)	(m)	(m)	Elev (m)	(m)	(m)	Elev (m)	(m)	etc

CHANNEL DETAILS

Name	From	To	Type	Length	U/S IL	D/S IL	Slope	Base Widt	L.B. Slope	R.B. Slope	Manning	Depth	Roofed
				(m)	(m)	(m)	(%)	(m)	(1:?)	(1:?)	n	(m)	

OVERFLOW ROUTE DETAILS

Name	From	To	Travel Time (min)	Spill Level (m)	Crest Length (m)	Weir Coeff. C	Cross Section	Safe Dept Major Stor (m)	SafeDepth Minor Stor (m)	Safe DxV (sq.m/sec)	Bed Slope (%)	D/S Area Contributing %	id	U/S IL	D/S IL	Length (m)
E-B10-01	E-B10-01-US	EAST-B10	4.4				Swale with 1:6 sideslopes	0.3	0.2	1	0.55	16.11	98059	63	62	182.6
E-B10-02	E-B10-02-US	EAST-B10	7.8				Swale with 1:6 sideslopes	0.3	0.2	1	0.49	69.04	98055	63.5	62	306.3
E-B10-03A	E-B10-03-US	E-B10-CU	0.9				Swale with 1:6 sideslopes	0.3	0.2	1	3.09	100	99062	65.5	62.91	83.7
E-B10-03B	E-B10-CULV1-DS	EAST-B10	0.7				Swale with 1:6 sideslopes	0.3	0.2	1	1.69	4.95	99069	62.91	62	54
E-B10-04	E-B10-04-US	E-B10-CU	0.9				Swale with 1:6 sideslopes	0.3	0.2	1	2.44	49	98124	67	64.41	82
E-B10-05	E-B10-05-US	E-B10-CU	0.7				Swale with 1:4 sideslopes	0.45	0.3	1	3.18	51	98125	68	64.41	94.3
E-B1-01	E-B1-01-US	N388	2.1				Swale with 1:6 sideslopes	0.3	0.2	1	0.51	100	98401	58.5	55.5	83
E-B1-02A	E-B1-02-US	E-B1-CUL	3.2				Swale with 1:6 sideslopes	0.3	0.2	1	0.54	100	98420	60.5	59.8	130.5
E-B1-02B	E-B1-CULV1-DS	EAST-B1	0.3				Swale with 1:6 sideslopes	0.3	0.2	1	2.78	4.7	98819	59.8	59	28.8
E-B1-03A	E-B1-03-US	E-B1-03-S	1.8				Swale with 1:6 sideslopes	0.3	0.2	1	2.1	100	98463	68.5	65.5	142.8
E-B1-03B	E-B1-03-SPLIT	EAST-B1	3.9				Swale with 1:6 sideslopes	0.3	0.2	1	2.08	66.3	98467	65.5	59	312.1
E-B1-04	E-B1-04-US	E-B1-04-D	3.5				Swale with 1:4 sideslopes	0.45	0.3	1	0.54	100	98459	69.5	68.5	184.8
E-B1-04-CONNECT	E-B1-04-DS	E-B1-03-S	0.7				Dummy OF	0.3	0.3	0.6	3.25	0	98876	68.5	65.5	92.4
E-B2-01	E-B2-01-US	EAST-B2	1				Swale with 1:4 sideslopes	0.45	0.3	1	4.23	50.08	97461	63.5	57.5	142
E-B2-02	E-B2-02-US	EAST-B2	0.4				Swale with 1:6 sideslopes	0.3	0.2	1	5.28	45.25	98482	60.5	57.5	56.8
E-B3-01	E-B3-01-US	EAST-B3	1.9				Swale with 1:6 sideslopes	0.3	0.2	1	1.26	25.69	98348	72	70.5	118.7
E-B3-02	E-B3-02-US	EAST-B3	2.8				Swale with 1:6 sideslopes	0.3	0.2	1	0.53	47.07	98344	70.6	70	112.9
E-B4-01	E-B4-01-US	Pit1296	2.2				K300, 0.4m deep, wall on one side	0.3	0.2	0.6	0.5	100	98369	72.6	71.8	150.2
E-B4-02	E-B4-02-US	E-B4-02-D	3.1				Swale with 1:4 sideslopes	0.45	0.3	1	0.9	100	98386	73	71.1	211.6
E-B5-01	E-B5-01-US	E-B5-CUL	1.4				Swale with 1:4 sideslopes	0.45	0.3	1	2.56	15.7	97787	71	66.91	159.6
E-B5-02	E-B5-02-US	E-B5-CUL	4.2				Swale with 1:4 sideslopes	0.45	0.3	1	1.49	84.3	97818	72.5	66.91	375.5
E-B6-01	E-B6-01-US	EAST-B6	1.3				Swale with 1:6 sideslopes	0.3	0.2	1	3.87	19.7	98156	66.5	61	142
E-B6-02	E-B6-02-US	EAST-B6	1				Swale with 1:4 sideslopes	0.45	0.3	1	5.3	11.25	98164	69.5	61	158.6
E-B6-03	E-B6-03-US	EAST-B6	6.2				Swale with 1:6 sideslopes	0.3	0.2	1	0.8	49.41	98198	63.5	61	310.6
E-B7-01	E-B7-01-US	Pit8	1.3				Swale with 1:4 sideslopes	0.45	0.3	1	0.67	100	98209	69.5	69	74.5
E-B7-02	E-B7-02-US	E-B7-02-D	3.6				Swale with 1:6 sideslopes	0.3	0.2	1	0.62	100	98229	70.5	69.5	160.6
E-B7-03	E-B7-03-US	E-B7-03-D	2.1				Swale with 1:6 sideslopes	0.3	0.2	1	1.16	100	98233	72	70.5	129.3
E-B7-04	E-B7-04-US	E-B7-CUL	0.9				Swale with 1:4 sideslopes	0.45	0.3	1	0.97	70.93	97862	73	72.41	61
E-B7-05	E-B7-05-US	E-B7-CUL	0.3				Swale with 1:4 sideslopes	0.45	0.3	1	1.92	29.07	97866	73	72.41	30.7
E-B7-06	E-B7-CULV2-DS	E-B7-CUL	1.3				Swale with 1:4 sideslopes	0.45	0.3	1	2.67	32.5	98251	72	68	149.8
E-B7-07	E-B7-07-US	E-B7-CUL	1.4				Swale with 1:4 sideslopes	0.45	0.3	1	1.57	67.5	98258	70	68	127.4
E-B7-08	E-B7-08-US	Pit1448	1.7				Swale with 1:6 sideslopes	0.3	0.2	1	2.66	49.8	98290	72	67.91	153.8
E-B7-09	E-B7-09-US	Pit1448	2.1				Swale with 1:6 sideslopes	0.3	0.2	1	1.45	50.2	98296	70	67.91	144.6
E-B7-10A	E-B7-10-US	N511	1.6				Swale with 1:6 sideslopes	0.3	0.2	1	1.97	100	102058	69.5	67	126.8
E-B7-10B	N511	E-B7-CUL	1.7				Swale with 1:4 sideslopes	0.45	0.3	1	1.12	100	102051	67	65.5	133.8
E-B7-11	E-B7-CULV1-DS	E-B7-11-D	10.1				Swale with 1:4 sideslopes	0.45	0.3	1	0.01	100	98325	65.5	65.1	73.1
E-B8-01A	E-B8-01A-US	EAST-B8	2.3				Swale with 1:4 sideslopes	0.45	0.3	1	0.56	41.89	98986	71.2	70.5	126.1
E-B8-01B	E-B8-01B-US	EAST-B8	1.1				Swale with 1:4 sideslopes	0.45	0.3	1	2.08	31.15	99000	73	70.5	120.2
E-B9-01	E-B9-01-US	E-B9-CUL	1.4				Swale with 1:6 sideslopes	0.3	0.2	1	3.6	68.8	97981	69.5	64	152.7
E-B9-02	E-B9-02-US	E-B9-CUL	1.4				Swale with 1:6 sideslopes	0.3	0.2	1	1.57	31.2	97987	65.5	64	95.6
E-B9-03	E-B9-03-US	E-B9-CUL	1.6				Swale with 1:6 sideslopes	0.3	0.2	1	3.65	60.9	97947	71	64.91	167
E-B9-04	E-B9-04-US	E-B9-CUL	1.5				Swale with 1:6 sideslopes	0.3	0.2	1	1.85	39.1	97956	67	64.91	113.2
E-B9-05	E-B9-05-US	E-B9-CUL	1.4				Swale with 1:4 sideslopes	0.45	0.3	1	2.78	64.3	97929	71	66.41	165.1
E-B9-06	E-B9-06-US	E-B9-CUL	1.4				Swale with 1:4 sideslopes	0.45	0.3	1	1.37	35.7	97933	68	66.41	116.3
E-B9-07	E-B9-07-US	E-B9-CUL	3.7				Swale with 1:4 sideslopes	0.45	0.3	1	1.64	75.8	97897	73	67.41	341.3
E-B9-08	E-B9-08-US	E-B9-CUL	1.6				Swale with 1:4 sideslopes	0.45	0.3	1	0.94	24.2	97909	68.5	67.41	115.5
OF139	Pit8	EAST-B6	1.7				Dummy OF	0.05	0	0.6	7.54	0	98548	69.5	61	111.4
OF144	E-B7-03-DS	E-B7-02-D	0.4				Swale with 1:6 sideslopes	0.3	0.2	1	2.83	100	98593	70.5	69.5	35.3
OF153	E-B7-02-DS	N266	0.3				Swale with 1:6 sideslopes	0.3	0.2	1	6.01	50	98614	69.5	66.75	41.6
OF159	E-B7-CULV3-DS	N266	0.5				Swale with 1:6 sideslopes	0.3	0.2	1	0.94	50	98625	67	66.75	26.7
OF165	N266	EAST-B7	0.3				Swale with 1:6 sideslopes	0.3	0.2	1	5	75	98649	66.75	65	40
OF18	N58	N539	0.8				Dummy OF	0.3	0.3	0.6	4.05	0	97517	56	51.5	111.2
OF22	EAST-B2	N58	0.1	57.75	5	1.45	4 m wide pathway	0.3	0.15	0.4	17.5	0	97566	57.75	56	10
OF226	E-B4-02-DS	EAST-B4	0.1				Dummy OF	0.3	0.3	0.6	10	0	98909	71.1	71	1
OF244	E-B7-11-DS	EAST-B7	0.1				Dummy OF	0.3	0.3	0.6	10	0	98967	65.1	65	1
OF262	Pit1296	EAST-B4	1.4				Dummy OF	0.3	0.3	0.6	0.72	0	99025	72.2	71	90
OF266	E-B9-CULV1-DS	E-B9-CUL	0.4				Swale with 1:6 sideslopes	0.3	0.2	1	3.3	0	99033	66.41	64.91	45.4
OF293	Bio-retention	E-B8-01B-	0.2	73.5	4.5	1.45	Dummy OF	0.3	0.3	0.6	2.5	0	99188	73.5	73	20
OF309	N388	N539	0.5				Dummy OF	0.3	0.3	0.6	5.67	0	99431	55.5	51.5	70.6
OF311	EAST-B1	N304	0.4	59.5	15	1.45	Overflow across road low point - pa	0.05	0	0.6	9.76	0	99450	59.5	53.5	61.5
OF315	EAST-B4	N299	0.4	71.5	5	1.45	4 m wide pathway	0.3	0.15	0.4	4.22	0	99544	71.375	68	80
OF320	EAST-B3	N299	0.6	71	15	1.45	Overflow across road low point - pa	0.05	0	0.6	5	0	99564	71	68	60
OF32192	N302	N38859	1.7				Swale with 1:4 sideslopes	0.12	0.05	1	1	0	807389	64.5	64	50
OF32197	N299	HW1478	14.8				Swale with 1:4 sideslopes	0.12	0.05	1	2.69	0	807590	68	48.41	727.8
OF322	EAST-B5	N302	0.1	67.2	5	1.45	4 m wide pathway	0.3	0.15	0.4	13.5	0	99574	67.2	64.5	20
OF32200	N539	HW1478	0.8				Swale with 1:4 sideslopes	0.12	0.05	1	5.7	0	807624	51.5	48.41	54.2
OF32206	HW1478	N59	0.2	49.5	15	1.45	Overflow across road low point - pa	0.05	0	0.6	5	0	807871	49.5	48.5	20
OF32209	N59	N38868	0.2				Dummy OF	0.3	0.3	0.6	2.05	0	807940	47.41	47	20
OF32213	N297	HW1479	0.2				Dummy OF	0.3	0.3	0.6	11.97	0	808322	55.5	51.91	30
OF32216	HW1479	N38873	0.1	53	15	1.45	Overflow across road low point - pa	0.05	0	0.6	6.67	0	808355	53	52	15
OF32218	N38873	N38875	0.3				Swale with 1:4 sideslopes	0.12	0.05	1	4.55	0	808389	50.91	50	20
OF32220	E-B9-CULV3-DS	HW1480	2.5				Swale with 1:4 sideslopes	0.12	0.05	1	2.87	0	808409	60	56.41	125
OF32222	N294	HW1480	5.2				Swale with 1:4 sideslopes	0.12	0.05	1	1.91	0	808427	60.5	56.41	214.1
OF32227	HW1480	N38880	0.3	57.5	15	1.45	Overflow across road low point - pa	0.05	0	0.6	4	0	808567	57.5	56.5	25
OF32229	N38880	N38884	0.5				Swale with 1:4 sideslopes	0.12	0.05	1	2.05	0	808633	55.41	55	20
OF324	EAST-B10	N294	0.6	62.5	15	1.45	Overflow across road low point - pa	0.05	0	0.6	4	0	99602	62.5	60.5	50
OF326	N298	EAST-B6	0.2				Swale with 1:4 sideslopes	0.45	0.3	1	5.71	0	99704	63	61	35
OF330	EAST-B7	N298	0.1	65.75	5	1.45	4 m wide pathway	0.3	0.15	0.4	13.75	0	99715	65.75	63	20
OF334	EAST-B6	N297	0.2	61.5	15	1.45	Overflow across road low point - pa	0.05	0	0.6	15	0	99758	61.5	55.5	40
OF336	E-B5-CULV1-HW	EAST-B5	0.1	68	5	1.45	4 m wide pathway	0.3	0.15	0.4	6.67	0	99781	68	67	15
OF339	E-B7-CULV2-HW	E-B7-CUL	0.1	73.5	5	1.45	4 m wide pathway	0.3	0.15	0.4	11.19	0	99796	73.5	72	13.4
OF341	Pit1448	E-B7-CUL	0.9				Dummy OF	0.05	0	0.6	6.34	0	99806	69	65.5	55.2
OF343	E-B9-CULV2-DS	EAST-B9	0.1				Swale with 1:6 sideslopes	0.3	0.2	1	8.77	0	99836	64	63	11.4
OF345	N296	E-B9-CUL	0.1				Swale with 1:6 sideslopes	0.3	0.2	1	6.32	0	99846	62.225	60.91	20.8
OF351	EAST-B8	E-B7-07-U	0.1	71.25	5	1.45	4 m wide pathway	0.3	0.15	0.4	12.5	0	99919	71.25	70	10
OF360	EAST-B9	N296	0.1	64	5	1.45	4 m wide pathway	0.3	0.15	0.4	11.83	0	99974	64	62.225	15
OF363	E-B9-CULV2-HW	E-B9-CUL	0.2	66	15	1.45	Overflow across road low point - pa	0.05	0	0.6	7.07	0	100011	66	64	28.3
OF365	E-B9-CULV1-HW	E-B9-CUL	0.1	68.5	5	1.45	Overflow across road low point - pa	0.05	0	0.6	15.26	0	100021	68.5	66.41	13.7
OF367	E-B9-CULV3-HW	E-B9-CUL	0.5	62	5	1.45	Overflow across road low point - pa	0.05	0	0.6	4.08	0	100034	62	60	49
OF369	E-B10-CULV1-HW	E-B10-CU	0.4	65.5	5	1.5	Overflow across road low point - pa	0.05	0	0.6	3.4	0	100044	65	64	29.4
OF526	N304	N539	0.3				Swale with 1:4 sideslopes	0.45	0.3	1	4.58	0	102855	53.5	51.5	43.7
OF53403	E-B7-CULV1-HW	Pit1448	0.1	69	5	1.45	4 m wide pathway	0.3	0.15	0.4	21.8	0	1339109	69	67.91	5

PIPE COVER DETAILS

Name	Type	Dia (mm)	Safe Cove	Cover (m)	
Pipe10	Concrete, under roads	450	0.6	0.21	Unsafe
P21	Concrete, under roads	450	0.6	-0.49	Unsafe
E-B5-CULV1	Concrete, under roads	450	0.6	-0.49	Unsafe
P13826	Concrete, under roads	450	0.6	0.21	Unsafe
Pipe179	Concrete, under roads	450	0.6	-0.49	Unsafe
DUMMY-SCALE	uPVC, under roads, 1	154	0.5	-0.16	Unsafe
E-B7-CULV2	Concrete, under roads	450	0.6	-0.49	Unsafe
E-B9-CULV1	Concrete, under roads	450	0.6	0.6	
E-B9-CULV2	Concrete, under roads	450	0.6	-0.49	Unsafe
Pipe283	Concrete, under roads	600	0.6	-0.05	Unsafe
Pipe183	Concrete, under roads	600	0.6	0.7	
Pipe184	Concrete, under roads	450	0.6	-0.49	Unsafe
Pipe185	Concrete, under roads	450	0.6	-0.49	Unsafe
Pipe213	Concrete, under roads	450	0.6	0.51	Unsafe
Pipe220	Concrete, under roads	450	0.6	-0.49	Unsafe
P13854	Concrete, under roads	600	0.6	0.06	Unsafe
Pipe182	Concrete, under roads	600	0.6	-0.65	Unsafe
Pipe349	Concrete, under roads	600	0.6	0.06	Unsafe
Pipe186	Concrete, under roads	600	0.6	-0.15	Unsafe
E-B9-CULV3	Concrete, under roads	450	0.6	-0.49	Unsafe
Pipe122	Concrete, under roads	450	0.6	0.6	
P3176	Concrete, under roads	450	0.6	0.51	Unsafe
E-B7-CULV1	Concrete, under roads	450	0.6	-0.49	Unsafe
E-B7-CULV3	Concrete, under roads	450	0.6	-0.49	Unsafe
Pipe2927	Concrete, under roads	375	0.6	-0.41	Unsafe
Pipe178	Concrete, under roads	450	0.6	-0.49	Unsafe
P13783	Concrete, under roads	600	0.6	0.06	Unsafe
Pipe177	Concrete, under roads	600	0.6	-0.64	Unsafe
Pipe8633	Concrete, under roads	450	0.6	0.6	
Pipe8646	Concrete, under roads	900	0.6	0.12	Unsafe
Pipe8668	Concrete, under roads	450	0.6	0.6	

These pipes have non-return valves: Pipe10, P13826, Pipe283, Pipe213, P13854, Pipe349, P13783

Stage 1B (EAST) DRAINS Results								
DRAINS results prepared from Version 2020.036								
1EY								
PIT / NODE DETAILS				Version 8				
Name	Max HGL	Max Pond	Max Surface	Max Pond	Min	Overflow	Constraint	
		HGL	Flow Arriving	Volume	Freeboard	(cu.m/s)		
			(cu.m/s)	(cu.m)	(m)			
E-B2-02-US	60.5		0					
N57	56.3		0					
N58	56		0					
E-B2-01-US	63.5		0					
E-B5-CULV1-HW	67.48		0.22		0.52	0	Headwall height/system capacity	
N61643	65.3		0					
N302	64.61		0					
DUMMY-SCALE2	10		0					
DUMMY-SCALE1	8		0					
E-B5-01-US	71		0					
E-B5-02-US	72.5		0					
E-B7-CULV2-HW	72.69		0.041		0.81	0	Headwall height/system capacity	
E-B7-CULV2-DS	72.14		0					
E-B7-04-US	73		0					
E-B7-05-US	73		0					
E-B9-CULV1-HW	67.41		0		1.09	0	Headwall height/system capacity	
E-B9-CULV1-DS	66.47		0.014					
E-B9-07-US	73		0					
E-B9-08-US	68.5		0					
E-B9-05-US	71		0					
E-B9-06-US	68		0					
E-B9-CULV2-HW	65.01		0.016		0.99	0	Headwall height/system capacity	
E-B9-CULV2-DS	64.1		0.041					
E-B9-03-US	71		0					
E-B9-04-US	67		0					
E-B9-01-US	69.5		0					
E-B9-02-US	65.5		0					
N306	60.2		0					
N297	55.5		0					
E-B7-07-US	70.01		0					
N296	62.23		0					
N305	56.98		0					
N304	53.59		0					
N61649	64.24		0					
N298	63.09		0					
N367	61.33		0					
N294	60.59		0					
E-B9-CULV3-HW	60.92		0		1.08	0	Headwall height/system capacity	
E-B9-CULV3-DS	60.01		0					
E-B10-01-US	63		0					
E-B10-02-US	63.5		0					
E-B10-03-US	65.5		0					
E-B10-CULV1-HW	64.41		0.003		1.09	0	None	
E-B10-CULV1-DS	62.97		0.008					
E-B10-04-US	67		0					
E-B10-05-US	68		0					
E-B6-01-US	66.5		0					
E-B6-02-US	69.5		0					
E-B6-03-US	63.5		0					
E-B7-01-US	69.5		0					
E-B7-02-DS	69.56		0.027					
E-B7-03-DS	70.57		0.017					
E-B7-02-US	70.5		0					
E-B7-03-US	72		0					
E-B7-CULV1-HW	68.23		0.068		0.77	0	None	
Pit1448	67.18	68	0.077	0	0.73	0	Inlet Capacity	
E-B7-CULV1-DS	65.68		0.007					
E-B7-08-US	72		0					
E-B7-09-US	70		0					
E-B7-10-US	69.5		0					
E-B7-11-DS	65.52		0.109					
E-B3-02-US	70.6		0					
E-B3-01-US	72		0					
E-B4-01-US	72		0					
E-B4-02-DS	71.18		0.075					
E-B4-02-US	73		0					
E-B1-01-US	58.5		0					
E-B1-CULV1-DS	59.83		0.006					
E-B1-02-US	60.5		0					
E-B1-03-SPLIT	65.59		0.05					
E-B1-03-US	68.5		0					
E-B1-04-DS	68.5		0					
E-B1-04-US	69.5		0					
Pit8	67.6	69.04	0.015	0.6	1.4	0	Inlet Capacity	
E-B7-CULV3-DS	67.09		0					
N266	66.83		0.049					
E-B8-01A-US	71.2		0					
E-B8-01B-US	73		0					
N388	55.5		0.008					
N511	67.05		0.005					
N539	51.59		0.056					
Pit1296	71.6	71.86	0.029	0	0.2	0	Inlet Capacity	
N61629	69.24		0					
N299	68		0					
HW1478	48.6		0.044		0.9	0	None	
N59	47.42		0					
HW1479	52.04		0.138		0.96	0	None	
N38873	50.98		0					
HW1480	56.56		0.026		0.94	0	None	
N38880	55.5		0					
SUB-CATCHMENT DETAILS								
Name	Max	Paved	Grassed	Paved	Grassed	Supp.	Due to Storm	
	Flow Q	Max Q	Max Q	Tc	Tc	Tc		
	(cu.m/s)	(cu.m/s)	(cu.m/s)	(min)	(min)	(min)		
EAST-B2-CAT	0.062	0	0	4.85	11.28	5.5	1EY AEP, 10 min burst, Storm 10	
E-B5	0.409	0	0	4.96	0	0	1EY AEP, 10 min burst, Storm 10	
EAST-B5-CAT	0	0	0	0	25.62	0	1EY AEP, 10 min burst, Storm 5	
E-B7-A	0.078	0	0	5.95	0	0	1EY AEP, 10 min burst, Storm 10	
E-B9-A	0	0	0	0	14.24	0	1EY AEP, 10 min burst, Storm 5	
E-B9-B	0.023	0	0	1.7	3.96	0	1EY AEP, 10 min burst, Storm 9	
E-B9-C	0	0	0	0	5.97	0	1EY AEP, 10 min burst, Storm 5	
E-B9-D	0.06	0	0	2.59	6.01	2.93	1EY AEP, 10 min burst, Storm 7	
EAST-B6-CAT	0.066	163.253	0.255	3.11	7.23	3.53	1EY AEP, 10 min burst, Storm 9	
EAST-B8-CAT	0.041	0	0	1.59	3.69	0	1EY AEP, 10 min burst, Storm 9	
EAST-B9-CAT	0	-9999	0	0	3.51	0	1EY AEP, 10 min burst, Storm 5	
EAST-B1-CAT	0.116	0	0	3.34	7.76	3.78	1EY AEP, 10 min burst, Storm 9	
EAST-B7-CAT	0	0.178	0	0	10.99	0	1EY AEP, 10 min burst, Storm 5	
EAST-B10-CAT	0.091	0	0	2.36	5.48	2.67	1EY AEP, 10 min burst, Storm 9	
E-B10-A	0	0	0	1.68	3.91	1.91	1EY AEP, 10 min burst, Storm 5	
E-B10-03-CATA	0.014	0	0	1.87	4.35	2.12	1EY AEP, 10 min burst, Storm 9	
E-B7-02-CAT	0	0	0	0	8.69	0	1EY AEP, 10 min burst, Storm 5	
E-B7-03-CAT	0.029	0	0	3.4	7.89	3.85	1EY AEP, 10 min burst, Storm 9	
E-B7-B-CAT	0	0	0	0	17.2	0	1EY AEP, 10 min burst, Storm 5	
E-B7-C	0.125	0	0	3.58	8.31	4.05	1EY AEP, 10 min burst, Storm 9	
E-B7-10-CATB	0	0	0	4.02	9.34	4.55	1EY AEP, 10 min burst, Storm 5	
E-B7-11-CAT	0	0	0	0	5.77	0	1EY AEP, 10 min burst, Storm 5	
E-B4-02-CAT	0.144	0	0	6.48	0	0	1EY AEP, 10 min burst, Storm 10	
E-B1-02-CATA	0.01	0	0	2.71	6.3	3.07	1EY AEP, 10 min burst, Storm 9	
E-B1-03-US-CAT	0.086	0	0	3.76	8.73	4.26	1EY AEP, 10 min burst, Storm 7	
E-B1-04-CAT	0	0	0	0	3.99	0	1EY AEP, 10 min burst, Storm 5	
E-B7-01-CAT	0.025	0	0	4	9.29	4.53	1EY AEP, 10 min burst, Storm 9	

Cat314	0	0	0	0	10.99	0	1EY AEP, 10 min burst, Storm 5	
E-B8-02	0	0	0	0	23.14	0	1EY AEP, 10 min burst, Storm 5	
E-B1-01-CAT	0.013	0	0	2.34	5.44	2.65	1EY AEP, 10 min burst, Storm 9	
E-B7-10-CATA	0.008	0	0	4.02	9.34	4.55	1EY AEP, 10 min burst, Storm 9	
E-B4-01-CAT	0.047	0	0	2.35	0	0	1EY AEP, 10 min burst, Storm 9	
EAST-B4-CAT	0.011	0	0	5.57	12.94	6.31	1EY AEP, 10 min burst, Storm 10	
EAST-B3-CAT	0.129	0	0	3.36	7.81	3.8	1EY AEP, 10 min burst, Storm 9	
PIPE DETAILS								
Name	Max Q	Max V	Max U/S	Max D/S	Due to Storm			
	(cu.m/s)	(m/s)	HGL (m)	HGL (m)				
Pipe10	0	0	56.303	56.295	1EY AEP, 10 min burst, Storm 5			
P21	0.006	1.09	56.295	56.033	1EY AEP, 9 hour burst, Storm 6			
E-B5-CULV1	0.24	1.51	67.395	66.848	1EY AEP, 15 min burst, Storm 1			
P13826	0	0	65.3	65.3	1EY AEP, 10 min burst, Storm 5			
Pipe179	0.021	1.72	65.3	64.606	1EY AEP, 3 hour burst, Storm 9			
DUMMY-SCALE	0	0	10	8	1EY AEP, 10 min burst, Storm 5			
E-B7-CULV2	0.067	1.66	72.617	72.136	1EY AEP, 10 min burst, Storm 7			
E-B9-CULV1	0	0	67.41	66.471	1EY AEP, 10 min burst, Storm 5			
E-B9-CULV2	0.007	0.29	65.006	64.096	1EY AEP, 1 hour burst, Storm 1			
Pipe283	0	0	60.4	60.202	1EY AEP, 10 min burst, Storm 5			
Pipe183	0.018	3.15	60.202	55.531	1EY AEP, 6 hour burst, Storm 7			
Pipe184	0	0	70.053	70.009	1EY AEP, 10 min burst, Storm 5			
Pipe185	0	0	62.303	62.225	1EY AEP, 10 min burst, Storm 5			
Pipe213	0.021	1.41	57.098	56.981	1EY AEP, 6 hour burst, Storm 1			
Pipe220	0.032	2.18	56.981	53.593	1EY AEP, 6 hour burst, Storm 1			
P13854	0.014	0.85	64.376	64.236	1EY AEP, 6 hour burst, Storm 7			
Pipe182	0.04	2.3	64.237	63.094	1EY AEP, 6 hour burst, Storm 7			
Pipe349	0	0	61.741	61.338	1EY AEP, 10 min burst, Storm 5			
Pipe186	0.02	1.15	61.335	60.591	1EY AEP, 2 hour burst, Storm 8			
E-B9-CULV3	0	0	60.916	60.006	1EY AEP, 10 min burst, Storm 5			
Pipe122	0	0	64.41	62.973	1EY AEP, 10 min burst, Storm 5			
P3176	0.046	0.59	68.223	67.175	1EY AEP, 15 min burst, Storm 1			
E-B7-CULV1	0.117	1.79	67.148	65.693	1EY AEP, 15 min burst, Storm 1			
E-B7-CULV3	0.024	0.93	67.598	67.098	1EY AEP, 10 min burst, Storm 4			
Pipe2927	0.044	0.76	71.596	71.279	1EY AEP, 10 min burst, Storm 4			
Pipe178	0	0	70.4	70.265	1EY AEP, 10 min burst, Storm 5			
P13783	0	0	69.3	69.236	1EY AEP, 10 min burst, Storm 5			
Pipe177	0	0	69.236	68	1EY AEP, 2 hour burst, Storm 10			
Pipe8633	0.031	2.32	48.601	47.473	1EY AEP, 6 hour burst, Storm 1			
Pipe8646	0.016	0.66	52.036	50.983	1EY AEP, 6 hour burst, Storm 9			
Pipe8668	0.02	0.87	56.562	55.5	1EY AEP, 2 hour burst, Storm 8			
CHANNEL DETAILS								
Name	Max Q	Max V			Due to Storm			
	(cu.m/s)	(m/s)						
OVERFLOW ROUTE DETAILS								
Name	Max Q U/S	Max Q D/S	Safe Q	Max D	Max DxV	Max Width	Max V	Due to Storm
Basin 1	0.006	0	12.141	3	0	32	0	1EY AEP, 9 hour burst, Storm 6
EAST-B10-O	0.007	0	12.141	3	0	32	0	1EY AEP, 2 hour burst, Storm 8
EAST-B1-O	0.011	0	12.141	3	0	32	0	1EY AEP, 6 hour burst, Storm 1
EAST-B6-0	0.006	0	12.141	3	0	32	0	1EY AEP, 6 hour burst, Storm 7
E-B10-01	0	0.005	0.127	0.135	0.01	1.62	0.09	1EY AEP, 1 hour burst, Storm 1
E-B10-02	0	0.026	0.12	0.135	0.03	1.62	0.24	1EY AEP, 30 min burst, Storm 8
E-B10-03A	0	0.012	0.3	0.062	0.03	0.74	0.55	1EY AEP, 10 min burst, Storm 7
E-B10-03B	0.01	0.01	0.222	0.135	0.03	1.62	0.51	1EY AEP, 30 min burst, Storm 6
E-B10-04	0	0	0.267	0	0	0	0	
E-B10-05	0	0	0.592	0	0	0	0	
E-B1-01	0	0.01	0.122	0.065	0.03	0.78	0.56	1EY AEP, 15 min burst, Storm 1
E-B1-02A	0	0.003	0.126	0.052	0.01	0.62	0.41	1EY AEP, 1 hour burst, Storm 1
E-B1-02B	0.002	0.005	0.285	0.045	0.02	0.54	1.28	1EY AEP, 10 min burst, Storm 7
E-B1-03A	0	0.077	0.247	0.149	0.1	1.79	0.79	1EY AEP, 15 min burst, Storm 1
E-B1-03B	0.03	0.047	0.246	0.108	0.07	1.3	0.71	1EY AEP, 2 hour burst, Storm 4
E-B1-04	0	0	0.244	0	0	0	0	
E-B1-04-CONNECT	0	0	19.197	0	0	0	0	
E-B2-01	0	0.027	0.683	0.089	0.08	0.71	0.85	1EY AEP, 10 min burst, Storm 7
E-B2-02	0	0.027	0.392	0.074	0.06	0.88	0.84	1EY AEP, 10 min burst, Storm 4
E-B3-01	0	0.023	0.192	0.092	0.05	1.1	0.62	1EY AEP, 15 min burst, Storm 1
E-B3-02	0	0.051	0.124	0.265	0.03	3.18	0.22	1EY AEP, 10 min burst, Storm 7
E-B4-01	0	0.046	0.059	0.161	0.13	0.29	0.8	1EY AEP, 10 min burst, Storm 10
E-B4-02	0	0.113	0.315	0.228	0.16	1.83	0.92	1EY AEP, 10 min burst, Storm 7
E-B5-01	0	0.057	0.531	0.574	0.08	4.59	0.66	1EY AEP, 10 min burst, Storm 7
E-B5-02	0	0.256	0.405	0.574	0.22	4.59	0.85	1EY AEP, 10 min burst, Storm 7
E-B6-01	0	0.007	0.336	0.19	0.01	2.28	0.17	1EY AEP, 30 min burst, Storm 5
E-B6-02	0	0.005	0.764	0.19	0.02	1.52	0.33	1EY AEP, 15 min burst, Storm 1
E-B6-03	0	0.011	0.153	0.19	0.01	2.28	0.17	1EY AEP, 1 hour burst, Storm 1
E-B7-01	0	0.023	0.272	0.092	0.04	0.74	0.43	1EY AEP, 10 min burst, Storm 4
E-B7-02	0	0	0.134	0	0	0	0	
E-B7-03	0	0.021	0.184	0.091	0.05	1.09	0.61	1EY AEP, 15 min burst, Storm 1
E-B7-04	0	0.052	0.327	0.285	0.06	2.28	0.38	1EY AEP, 10 min burst, Storm 4
E-B7-05	0	0.022	0.46	0.287	0.04	2.29	0.41	1EY AEP, 10 min burst, Storm 10
E-B7-06	0.066	0.065	0.542	0.226	0.12	1.81	0.9	1EY AEP, 10 min burst, Storm 7
E-B7-07	0	0	0.416	0	0	0	0	
E-B7-08	0	0.054	0.279	0.113	0.06	1.35	0.54	1EY AEP, 10 min burst, Storm 7
E-B7-09	0	0.053	0.206	0.128	0.04	1.53	0.33	1EY AEP, 10 min burst, Storm 7
E-B7-10A	0	0.004	0.24	0.049	0.01	0.59	0.24	1EY AEP, 30 min burst, Storm 8
E-B7-10B	0.003	0.002	0.351	0.185	0.01	1.48	0.29	1EY AEP, 1 hour burst, Storm 1
E-B7-11	0.068	0.077	0.033	0.412	0.11	3.3	0.67	1EY AEP, 3 hour burst, Storm 9
E-B7-O1	0.009	0	12.141	3	0	32	0	1EY AEP, 6 hour burst, Storm 7
E-B8-01A	0	0.013	0.248	0.108	0.04	0.87	0.53	1EY AEP, 10 min burst, Storm 7
E-B8-01B	0	0.011	0.479	0.083	0.04	0.67	0.47	1EY AEP, 10 min burst, Storm 7
E-B9-01	0	0.034	0.324	0.093	0.07	1.11	0.77	1EY AEP, 15 min burst, Storm 1
E-B9-02	0	0.015	0.214	0.077	0.03	0.93	0.44	1EY AEP, 15 min burst, Storm 1
E-B9-03	0	0	0.326	0	0	0	0	
E-B9-04	0	0	0.232	0	0	0	0	
E-B9-05	0	0.012	0.554	0.08	0.04	0.64	0.59	1EY AEP, 10 min burst, Storm 7
E-B9-06	0	0.007	0.389	0.069	0.03	0.55	0.49	1EY AEP, 15 min burst, Storm 1
E-B9-07	0	0	0.425	0	0	0	0	
E-B9-08	0	0	0.322	0	0	0	0	
low-.25	0.009	0	12.141	3	0	32	0	1EY AEP, 3 hour burst, Storm 9
low0.5	0.008	0	12.141	3	0	32	0	1EY AEP, 3 hour burst, Storm 9
O22992	0.007	0	12.141	3	0	32	0	1EY AEP, 2 hour burst, Storm 8
O23058	0.007	0	12.141	3	0	32	0	1EY AEP, 2 hour burst, Storm 8
O29065	0.008	0	12.141	3	0	32	0	1EY AEP, 6 hour burst, Storm 7
O29069	0.008	0	12.141	3	0	32	0	1EY AEP, 6 hour burst, Storm 7
O31534	0	0	12.141	0	0	0	0	
O31545	0	0	12.141	0	0	0	0	
O31559	0	0	12.141	0	0	0	0	
O72267	0.006	0	12.141	3	0	32	0	1EY AEP, 6 hour burst, Storm 7
O72283	0.006	0	12.141	3	0	32	0	1EY AEP, 6 hour burst, Storm 7
O9296	0.004	0	12.141	3	0	32	0	1EY AEP, 3 hour burst, Storm 9
OF139	0	0	0	0	0	0	0	
OF144	0.02	0.021	0.287	0.081	0.05	0.98	0.63	1EY AEP, 15 min burst, Storm 1
OF153	0.019	0.018	0.419	0.08	0.05	0.96	0.82	1EY AEP, 15 min burst, Storm 1
OF159	0.021	0.022	0.166	0.094	0.05	1.13	0.61	1EY AEP, 10 min burst, Storm 7
OF165	0.031	0.032	0.382	0.529	0.07	6.35	0.82	1EY AEP, 25 min burst, Storm 5
OF18	0.006	0.006	19.227	0.081	0	32	0.09	1EY AEP, 9 hour burst, Storm 6
OF22	0	0	1.333	0	0	0	0	
OF226	0.227	0.227	19.201	0.18	0.01	32	0.09	1EY AEP, 30 min burst, Storm 6
OF244	0.315	0.315	19.201	0.537	0.01	32	0.02	1EY AEP, 3 hour burst, Storm 6
OF262	0	0	10.302	0	0	0	0	
OF266	0.013	0.013	0.31	0.096	0.03	1.15	0.55	1EY AEP, 30 min burst, Storm 8
OF293	0	0	19.196	0	0	0	0	
OF309	0.007	0.007	19.13	0.02	0	32	0.11	1EY AEP, 30 min burst, Storm 6
OF311	0	0	0	0	0	0	0	
OF315	0	0	1.403	0	0	0	0	
OF320	0	0	0	0	0	0	0	

OF32192	0.021	0.021	0.003	0.117	0.05	0.94	0.47	1EY AEP, 3 hour burst, Storm 9
OF32197	0	0	0.005	0	0	0	0	
OF322	0	0	1.333	0	0	0	0	
OF32200	0.031	0.031	0.007	0.191	0.09	1.53	1	1EY AEP, 6 hour burst, Storm 1
OF32206	0	0	0	0	0	0	0	
OF32209	0.031	0.031	17.383	0.007	0	32	0.14	1EY AEP, 6 hour burst, Storm 1
OF32213	0.018	0.018	19.179	0.128	0	32	0.2	1EY AEP, 6 hour burst, Storm 7
OF32216	0	0	0	0	0	0	0	
OF32218	0.016	0.016	0.006	0.073	0.06	0.59	0.77	1EY AEP, 6 hour burst, Storm 9
OF32220	0	0	0.005	0	0	0	0	
OF32222	0.02	0.02	0.004	0.152	0.05	1.22	0.6	1EY AEP, 2 hour burst, Storm 8
OF32227	0	0	0	0	0	0	0	
OF32229	0.02	0.02	0.004	0.093	0.05	0.75	0.61	1EY AEP, 2 hour burst, Storm 8
OF324	0	0	0	0	0	0	0	
OF326	0.037	0.037	0.793	0.19	0.1	1.52	1.06	1EY AEP, 6 hour burst, Storm 7
OF330	0	0	1.345	0	0	0	0	
OF334	0	0	0	0	0	0	0	
OF336	0	0	1.393	0	0	0	0	
OF339	0	0	1.337	0	0	0	0	
OF341	0	0	0	0	0	0	0	
OF343	0.045	0.045	0.506	0.094	0.18	1.12	4.36	1EY AEP, 1 hour burst, Storm 5
OF345	0	0	0.429	0	0	0	0	
OF351	0	0	1.347	0	0	0	0	
OF360	0	0	1.343	0	0	0	0	
OF363	0	0	0	0	0	0	0	
OF365	0	0	0	0	0	0	0	
OF367	0	0	0	0	0	0	0	
OF369	0	0	0	0	0	0	0	
OF526	0.031	0.031	0.711	0.093	0.08	0.75	0.89	1EY AEP, 6 hour burst, Storm 1
OF53403	0	0	1.291	0	0	0	0	
DETENTION BASIN DETAILS								
Name	Max WL	MaxVol	Max Q	Max Q	Max Q			
			Total	Low Level	High Level			
EAST-B2	57.22	0	0.006	0	0.006			
EAST-B5	66.82	0	0.021	0	0.021			
EAST-B6	61.19	0	0.018	0	0.018			
EAST-B8	70.58	0	0	0	0			
EAST-B9	63.02	0	0	0	0			
EAST-B1	58.78	0	0.031	0.021	0.011			
EAST-B7	65.53	0	0.039	0.014	0.025			
EAST-B10	62.14	0	0.02	0	0.02			
Bio-retention	73.1	0	0	0	0			
EAST-B4	71.18	0	0	0	0			
EAST-B3	70.27	0	0	0	0			
Run Log for 12546218_AlbanyMotorPark_east run at 02:44:15 on 13/7/2021 using version 2020.036								
No water upwelling from any pit. Freeboard was adequate at all pits.								
The maximum flow in these overflow routes is unsafe: OF32229, OF32222, OF32220, OF32218, OF32200, OF32197, OF32192, OF367, OF365, OF363, OF341, OF334, OF324, OF320, OF311, OF244, OF165, OF139, E-B3-02, E-B								

	Stage 1B (EAST) DRAINS Results								
	DRAINS results prepared from Version 2020.036								
	10% AEP								
	PIT / NODE DETAILS				Version 8				
	Name	Max HGL	Max Pond	Max Surface	Max Pond	Min	Overflow	Constraint	
			HGL	Flow Arriving	Volume	Freeboard	(cu.m/s)		
				(cu.m/s)	(cu.m)	(m)			
	E-B2-02-US	60.5		0					
	N57	56.37		0					
	N58	56.01		0					
	E-B2-01-US	63.5		0					
	E-B5-CULV1-HW	67.9		0.48		0.1	0	None	
	N61643	65.41		0					
	N302	64.74		0					
	DUMMY-SCALE2	10		0					
	DUMMY-SCALE1	8		0					
	E-B5-01-US	71		0					
	E-B5-02-US	72.5		0					
	E-B7-CULV2-HW	72.8		0.091		0.7	0	None	
	E-B7-CULV2-DS	72.17		0					
	E-B7-04-US	73		0					
	E-B7-05-US	73		0					
	E-B9-CULV1-HW	67.73		0.099		0.77	0	None	
	E-B9-CULV1-DS	66.54		0.055					
	E-B9-07-US	73		0					
	E-B9-08-US	68.5		0					
	E-B9-05-US	71		0					
	E-B9-06-US	68		0					
	E-B9-CULV2-HW	65.27		0.204		0.73	0	None	
	E-B9-CULV2-DS	64.15		0.122					
	E-B9-03-US	71		0					
	E-B9-04-US	67		0					
	E-B9-01-US	69.5		0					
	E-B9-02-US	65.5		0					
	N306	60.37		0					
	N297	55.52		0.039					
	E-B7-07-US	70.01		0					
	N296	62.23		0					
	N305	57.08		0					
	N304	53.7		0					
	N61649	64.34		0					
	N298	63.2		0					
	N367	61.47		0					
	N294	60.71		0					
	E-B9-CULV3-HW	60.92		0		1.08	0	None	
	E-B9-CULV3-DS	60.01		0					
	E-B10-01-US	63		0					
	E-B10-02-US	63.5		0					
	E-B10-03-US	65.5		0					
	E-B10-CULV1-HW	64.59		0.038		0.91	0	None	
	E-B10-CULV1-DS	63.02		0.03					
	E-B10-04-US	67		0					
	E-B10-05-US	68		0					
	E-B6-01-US	66.5		0					
	E-B6-02-US	69.5		0					
	E-B6-03-US	63.5		0					
	E-B7-01-US	69.5		0					
	E-B7-02-DS	69.6		0.071					
	E-B7-03-DS	70.61		0.042					
	E-B7-02-US	70.5		0					
	E-B7-03-US	72		0					
	E-B7-CULV1-HW	68.36		0.149		0.64	0	None	
	Pit1448	67.36	68.06	0.154	0.1	0.55	0	Inlet Capacity	
	E-B7-CULV1-DS	65.79		0.073					
	E-B7-08-US	72		0					
	E-B7-09-US	70		0					
	E-B7-10-US	69.5		0					
	E-B7-11-DS	65.66		0.319					
	E-B3-02-US	70.6		0					
	E-B3-01-US	72		0					
	E-B4-01-US	72		0					
	E-B4-02-DS	71.34		0.168					
	E-B4-02-US	73		0					
	E-B1-01-US	58.5		0					
	E-B1-CULV1-DS	59.91		0.054					
	E-B1-02-US	60.5		0					
	E-B1-03-SPLIT	65.64		0.115					
	E-B1-03-US	68.5		0					
	E-B1-04-DS	68.51		0.038					
	E-B1-04-US	69.5		0					
	Pit8	67.73	69.08	0.063	1.7	1.27	0	Inlet Capacity	
	E-B7-CULV3-DS	67.16		0					
	N266	66.9		0.22					
	E-B8-01A-US	71.2		0					
	E-B8-01B-US	73		0					
	N388	55.51		0.026					
	N511	67.15		0.034					
	N539	51.67		0.341					
	Pit1296	71.69	71.88	0.055	0	0.11	0	Inlet Capacity	
	N61629	69.31		0					
	N299	68.1		0					
	HW1478	48.93		0.286		0.57	0	None	
	N59	47.43		0					
	HW1479	52.4		0.637		0.6	0	None	
	N38873	51.12		0					
	HW1480	56.87		0.343		0.63	0	None	
	N38880	55.61		0					
	SUB-CATCHMENT DETAILS								
	Name	Max	Paved	Grassed	Paved	Grassed	Supp.	Due to Storm	
		Flow Q	Max Q	Max Q	Tc	Tc	Tc		
		(cu.m/s)	(cu.m/s)	(cu.m/s)	(min)	(min)	(min)		
	EAST-B2-CAT	0.264	0.031	0.021	3.83	8.9	4.34	10% AEP, 10 min burst, Storm 3	
	E-B5	0.807	216.25	52.036	3.92	0	0	10% AEP, 10 min burst, Storm 1	
	EAST-B5-CAT	0.045	0	0.02	0	41.19	0	10% AEP, 3 hour burst, Storm 2	
	E-B7-A	0.157	50.983	0	4.69	0	0	10% AEP, 10 min burst, Storm 4	
	E-B9-A	0.099	0	0	0	20.71	0	10% AEP, 2 hour burst, Storm 2	
	E-B9-B	0.08	56.562	0	1.34	3.12	0	10% AEP, 10 min burst, Storm 3	
	E-B9-C	0.067	0	0	0	5.16	0	10% AEP, 15 min burst, Storm 7	
	E-B9-D	0.192	0	0	2.04	4.74	2.31	10% AEP, 10 min burst, Storm 8	
	EAST-B6-CAT	0.493	0	61.741	2.46	5.71	2.78	10% AEP, 10 min burst, Storm 3	
	EAST-B8-CAT	0.119	0	0	1.25	2.91	0	10% AEP, 10 min burst, Storm 9	
	EAST-B9-CAT	0.013	0.037	0	0	2.77	0	10% AEP, 10 min burst, Storm 6	
	EAST-B1-CAT	0.275	0	0	2.63	6.12	2.98	10% AEP, 10 min burst, Storm 7	
	EAST-B7-CAT	0.014	0	0	0	15.98	0	10% AEP, 2 hour burst, Storm 2	
	EAST-B10-CAT	0.47	0	0	1.86	4.32	2.11	10% AEP, 10 min burst, Storm 3	
	E-B10-A	0.052	0	0	1.33	3.08	1.5	10% AEP, 10 min burst, Storm 8	
	E-B10-03-CATA	0.045	0	0	1.48	3.43	1.67	10% AEP, 10 min burst, Storm 9	
	E-B7-02-CAT	0.028	57.217	118.72	0	7.5	0	10% AEP, 15 min burst, Storm 4	
	E-B7-03-CAT	0.068	0	0	2.68	6.23	3.03	10% AEP, 10 min burst, Storm 7	
	E-B7-B-CAT	0.049	0	1.489	0	25.01	0	10% AEP, 2 hour burst, Storm 2	
	E-B7-C	0.27	8	0	2.82	6.56	3.2	10% AEP, 10 min burst, Storm 4	
	E-B7-10-CATB	0.008	0	0	3.47	8.06	3.93	10% AEP, 15 min burst, Storm 1	
	E-B7-11-CAT	0.016	60.92	67.598	0	4.98	0	10% AEP, 15 min burst, Storm 1	
	E-B4-02-CAT	0.292	0	0	5.11	0	0	10% AEP, 10 min burst, Storm 4	
	E-B1-02-CATA	0.082	0	0	2.14	4.97	2.42	10% AEP, 10 min burst, Storm 3	
	E-B1-03-US-CAT	0.198	0	0	2.96	6.89	3.36	10% AEP, 10 min burst, Storm 9	
	E-B1-04-CAT	0.046	0	0	0	3.15	0	10% AEP, 10 min burst, Storm 7	
	E-B7-01-CAT	0.106	0.006	0	3.15	7.33	3.57	10% AEP, 10 min burst, Storm 3	

	Cat314	0.014	64.335	0.139	0	15.98	0	10% AEP, 2 hour burst, Storm 2	
	E-B8-02	0.036	0	0	0	37.2	0	10% AEP, 3 hour burst, Storm 8	
	E-B1-01-CAT	0.042	65.004	0.099	1.85	4.29	2.09	10% AEP, 10 min burst, Storm 9	
	E-B7-10-CATA	0.059	0	0	3.47	8.06	3.93	10% AEP, 15 min burst, Storm 7	
	E-B4-01-CAT	0.092	56	0	1.85	0	0	10% AEP, 10 min burst, Storm 1	
	EAST-B4-CAT	0.023	0.076	0	4.39	10.2	4.97	10% AEP, 10 min burst, Storm 5	
	EAST-B3-CAT	0.307	0.409	73	2.65	6.16	3	10% AEP, 10 min burst, Storm 7	
	PIPE DETAILS								
	Name	Max Q	Max V	Max U/S	Max D/S	Due to Storm			
		(cu.m/s)	(m/s)	HGL (m)	HGL (m)				
	Pipe10	0.043	1.37	56.928	56.369	10% AEP, 3 hour burst, Storm 4			
	P21	0.055	2.24	56.369	56.095	10% AEP, 3 hour burst, Storm 4			
	E-B5-CULV1	0.335	2.11	67.696	67.105	10% AEP, 15 min burst, Storm 7			
	P13826	0.138	2.5	66.175	65.411	10% AEP, 2 hour burst, Storm 5			
	Pipe179	0.174	3.1	65.412	64.735	10% AEP, 2 hour burst, Storm 5			
	DUMMY-SCALE	0	0	10	8	10% AEP, 10 min burst, Storm 5			
	E-B7-CULV2	0.121	2.19	72.652	72.17	10% AEP, 10 min burst, Storm 7			
	E-B9-CULV1	0.089	2.39	67.617	66.538	10% AEP, 2 hour burst, Storm 2			
	E-B9-CULV2	0.105	2.13	65.135	64.156	10% AEP, 2 hour burst, Storm 2			
	Pipe283	0.377	4.15	60.884	60.369	10% AEP, 2 hour burst, Storm 8			
	Pipe183	0.405	5.99	60.369	55.673	10% AEP, 2 hour burst, Storm 8			
	Pipe184	0	0	70.053	70.008	10% AEP, 10 min burst, Storm 5			
	Pipe185	0	0	62.303	62.225	10% AEP, 10 min burst, Storm 5			
	Pipe213	0.184	3.48	57.978	57.08	10% AEP, 2 hour burst, Storm 2			
	Pipe220	0.196	3.66	57.082	53.705	10% AEP, 2 hour burst, Storm 2			
	P13854	0.258	3.8	64.999	64.344	10% AEP, 2 hour burst, Storm 3			
	Pipe182	0.287	4.22	64.344	63.204	10% AEP, 2 hour burst, Storm 3			
	Pipe349	0.146	1.75	61.914	61.47	10% AEP, 2 hour burst, Storm 8			
	Pipe186	0.189	2.27	61.47	60.712	10% AEP, 2 hour burst, Storm 8			
	E-B9-CULV3	0	0	60.916	60.006	10% AEP, 10 min burst, Storm 5			
	Pipe122	0.026	0.81	64.585	63.025	10% AEP, 30 min burst, Storm 5			
	P3176	0.118	0.86	68.363	67.363	10% AEP, 15 min burst, Storm 2			
	E-B7-CULV1	0.282	2.4	67.282	65.812	10% AEP, 15 min burst, Storm 6			
	E-B7-CULV3	0.098	1.29	67.718	67.217	10% AEP, 15 min burst, Storm 8			
	Pipe2927	0.087	1.08	71.657	71.342	10% AEP, 10 min burst, Storm 5			
	Pipe178	0.111	0.7	71.012	70.616	10% AEP, 25 min burst, Storm 10			
	P13783	0	0	69.923	69.31	10% AEP, 10 min burst, Storm 5			
	Pipe177	0.031	1.47	69.309	68.1	10% AEP, 1 hour burst, Storm 4			
	Pipe8633	0.194	3.47	48.718	47.582	10% AEP, 2 hour burst, Storm 8			
	Pipe8646	0.29	2.5	52.266	51.124	10% AEP, 2 hour burst, Storm 8			
	Pipe8668	0.158	2.33	56.687	55.609	10% AEP, 2 hour burst, Storm 3			
	CHANNEL DETAILS								
	Name	Max Q	Max V			Due to Storm			
		(cu.m/s)	(m/s)						
	OVERFLOW ROUTE DETAILS								
	Name	Max Q U/S	Max Q D/S	Safe Q	Max D	Max DxV	Max Width	Max V	Due to Storm
	Basin 1	0.011	0	12.141	3	0	32	0	10% AEP, 3 hour burst, Storm 4
	EAST-B10-O	0.015	0	12.141	3	0	32	0	10% AEP, 2 hour burst, Storm 8
	EAST-B1-O	0.012	0	12.141	3	0	32	0	10% AEP, 2 hour burst, Storm 2
	EAST-B6-0	0.009	0	12.141	3	0	32	0	10% AEP, 2 hour burst, Storm 8
	E-B10-01	0	0.042	0.127	0.358	0.03	4.3	0.18	10% AEP, 15 min burst, Storm 5
	E-B10-02	0	0.181	0.12	0.358	0.1	4.3	0.41	10% AEP, 15 min burst, Storm 6
	E-B10-03A	0	0.041	0.3	0.11	0.06	1.32	0.57	10% AEP, 10 min burst, Storm 3
	E-B10-03B	0.05	0.064	0.222	0.358	0.07	4.3	0.67	10% AEP, 15 min burst, Storm 6
	E-B10-04	0	0.017	0.267	0.175	0.02	2.1	0.31	10% AEP, 15 min burst, Storm 6
	E-B10-05	0	0.027	0.592	0.175	0.05	1.4	0.55	10% AEP, 10 min burst, Storm 3
	E-B1-01	0	0.037	0.122	0.106	0.07	1.27	0.79	10% AEP, 10 min burst, Storm 3
	E-B1-02A	0	0.052	0.126	0.148	0.08	1.77	0.73	10% AEP, 15 min burst, Storm 10
	E-B1-02B	0.052	0.057	0.285	0.11	0.09	1.32	0.79	10% AEP, 15 min burst, Storm 5
	E-B1-03A	0	0.189	0.247	0.201	0.17	2.41	0.96	10% AEP, 10 min burst, Storm 3
	E-B1-03B	0.096	0.17	0.246	0.174	0.16	2.09	0.93	10% AEP, 1 hour burst, Storm 1
	E-B1-04	0	0.024	0.244	0.14	0.06	1.12	0.68	10% AEP, 2 hour burst, Storm 3
	E-B1-04-CONNECT	0.022	0.02	19.197	0.128	0	32	0.14	10% AEP, 2 hour burst, Storm 3
	E-B2-01	0	0.125	0.683	0.159	0.2	1.27	1.25	10% AEP, 15 min burst, Storm 7
	E-B2-02	0	0.116	0.392	0.128	0.15	1.53	1.21	10% AEP, 10 min burst, Storm 3
	E-B3-01	0	0.067	0.192	0.137	0.09	1.64	0.77	10% AEP, 10 min burst, Storm 3
	E-B3-02	0	0.132	0.124	0.561	0.04	6.74	0.23	10% AEP, 10 min burst, Storm 9
	E-B4-01	0	0.09	0.059	0.27	0.25	0.29	0.92	10% AEP, 10 min burst, Storm 4
	E-B4-02	0	0.248	0.315	0.286	0.26	2.29	1.08	10% AEP, 10 min burst, Storm 7
	E-B5-01	0	0.113	0.531	0.991	0.13	7.92	0.74	10% AEP, 10 min burst, Storm 5
	E-B5-02	0	0.53	0.405	0.991	0.31	7.92	0.94	10% AEP, 10 min burst, Storm 9
	E-B6-01	0	0.094	0.336	0.399	0.08	4.78	0.66	10% AEP, 15 min burst, Storm 7
	E-B6-02	0	0.051	0.764	0.399	0.09	3.19	0.8	10% AEP, 15 min burst, Storm 8
	E-B6-03	0	0.158	0.153	0.399	0.1	4.78	0.5	10% AEP, 20 min burst, Storm 5
	E-B7-01	0	0.098	0.272	0.208	0.08	1.66	0.36	10% AEP, 15 min burst, Storm 7
	E-B7-02	0	0.025	0.134	0.108	0.05	1.29	0.5	10% AEP, 2 hour burst, Storm 3
	E-B7-03	0	0.06	0.184	0.135	0.09	1.62	0.75	10% AEP, 10 min burst, Storm 3
	E-B7-04	0	0.101	0.327	0.385	0.08	3.08	0.41	10% AEP, 10 min burst, Storm 1
	E-B7-05	0	0.042	0.46	0.385	0.03	3.08	0.31	10% AEP, 10 min burst, Storm 1
	E-B7-06	0.121	0.13	0.542	0.365	0.18	2.92	1.04	10% AEP, 10 min burst, Storm 5
	E-B7-07	0	0.033	0.416	0.395	0.05	3.16	0.41	10% AEP, 2 hour burst, Storm 2
	E-B7-08	0	0.115	0.279	0.146	0.1	1.75	0.69	10% AEP, 10 min burst, Storm 5
	E-B7-09	0	0.113	0.206	0.163	0.07	1.96	0.43	10% AEP, 10 min burst, Storm 7
	E-B7-10A	0	0.054	0.24	0.146	0.06	1.75	0.44	10% AEP, 15 min burst, Storm 5
	E-B7-10B	0.051	0.05	0.351	0.281	0.09	2.24	0.61	10% AEP, 15 min burst, Storm 4
	E-B7-11	0.233	0.227	0.033	0.473	0.2	3.78	0.67	10% AEP, 25 min burst, Storm 8
	E-B7-O1	0.01	0	12.141	3	0	32	0	10% AEP, 2 hour burst, Storm 3
	E-B8-01A	0	0.037	0.248	0.269	0.03	2.15	0.22	10% AEP, 10 min burst, Storm 3
	E-B8-01B	0	0.032	0.479	0.269	0.04	2.15	0.4	10% AEP, 10 min burst, Storm 3
	E-B9-01	0	0.129	0.324	0.147	0.15	1.76	1.07	10% AEP, 10 min burst, Storm 3
	E-B9-02	0	0.059	0.214	0.141	0.07	1.69	0.5	10% AEP, 10 min burst, Storm 3
	E-B9-03	0	0.03	0.326	0.388	0.04	4.66	0.54	10% AEP, 2 hour burst, Storm 3
	E-B9-04	0	0.019	0.232	0.388	0.02	4.66	0.28	10% AEP, 2 hour burst, Storm 3
	E-B9-05	0	0.04	0.554	0.116	0.09	0.93	0.8	10% AEP, 10 min burst, Storm 3
	E-B9-06	0	0.023	0.389	0.105	0.06	0.84	0.58	10% AEP, 10 min burst, Storm 3
	E-B9-07	0	0.072	0.425	0.322	0.1	2.58	0.65	10% AEP, 2 hour burst, Storm 2
	E-B9-08	0	0.024	0.322	0.322	0.03	2.58	0.31	10% AEP, 2 hour burst, Storm 2
	low-.25	0.011	0	12.141	3	0	32	0	10% AEP, 2 hour burst, Storm 5
	low0.5	0.011	0	12.141	3	0	32	0	10% AEP, 2 hour burst, Storm 5
	O22992	0.015	0	12.141	3	0	32	0	10% AEP, 2 hour burst, Storm 8
	O23058	0.015	0	12.141	3	0	32	0	10% AEP, 2 hour burst, Storm 8
	O29065	0.01	0	12.141	3	0	32	0	10% AEP, 2 hour burst, Storm 3
	O29069	0.01	0	12.141	3	0	32	0	10% AEP, 2 hour burst, Storm 3
	O31534	0.01	0	12.141	3	0	32	0	10% AEP, 1 hour burst, Storm 4
	O31545	0.01	0	12.141	3	0	32	0	10% AEP, 1 hour burst, Storm 4
	O31559	0.01	0	12.141	3	0	32	0	10% AEP, 1 hour burst, Storm 4
	O72267	0.009	0	12.141	3	0	32	0	10% AEP, 2 hour burst, Storm 8
	O72283	0.009	0	12.141	3	0	32	0	10% AEP, 2 hour burst, Storm 8
	O9296	0.013	0	12.141	3	0	32	0	10% AEP, 2 hour burst, Storm 5
	OF139	0	0	0	0	0	0	0	
	OF144	0.059	0.082	0.287	0.129	0.11	1.55	0.88	10% AEP, 15 min burst, Storm 6
	OF153	0.061	0.064	0.419	0.148	0.11	1.78	1.12	10% AEP, 10 min burst, Storm 3
	OF159	0.096	0.1	0.166	0.164	0.11	1.97	0.76	10% AEP, 15 min burst, Storm 5
	OF165	0.161	0.173	0.382	0.656	0.18	7.88	1.23	10% AEP, 15 min burst, Storm 6
	OF18	0.054	0.053	19.227	0.158	0	32	0.22	10% AEP, 3 hour burst, Storm 4
	OF22	0	0	1.333	0	0	0	0	
	OF226	0.729	0.729	19.201	0.342	0.02	32	0.09	10% AEP, 10 min burst, Storm 7
	OF244	0.794	0.794	19.201	0.656	0.02	32	0.04	10% AEP, 2 hour burst, Storm 3
	OF262	0	0	10.302	0	0	0	0	
	OF266	0.094	0.094	0.31	0.357	0.12	4.28	0.96	10% AEP, 2 hour burst, Storm 2
	OF293	0	0	19.196	0	0	0	0	
	OF309	0.031	0.029	19.13	0.067	0	32	0.19	10% AEP, 15 min burst, Storm 6
	OF311	0	0	0	0	0	0	0	
	OF315	0	0	1.403	0	0	0	0	
	OF320	0	0	0	0	0	0	0	

	OF32192	0.174	0.174	0.003	0.241	0.18	1.93	0.78	10% AEP, 2 hour burst, Storm 5
	OF32197	0.03	0.03	0.005	0.517	0.07	4.14	0.75	10% AEP, 1 hour burst, Storm 4
	OF322	0	0	1.333	0	0	0	0	
	OF32200	0.174	0.174	0.007	0.518	0.26	4.14	1.52	10% AEP, 2 hour burst, Storm 3
	OF32206	0	0	0	0	0	0	0	
	OF32209	0.193	0.193	17.383	0.02	0.01	32	0.3	10% AEP, 2 hour burst, Storm 8
	OF32213	0.404	0.404	19.179	0.488	0.01	32	0.69	10% AEP, 2 hour burst, Storm 8
	OF32216	0	0	0	0	0	0	0	
	OF32218	0.29	0.29	0.006	0.217	0.34	1.73	1.58	10% AEP, 2 hour burst, Storm 8
	OF32220	0	0	0.005	0	0	0	0	
	OF32222	0.182	0.181	0.004	0.458	0.21	3.67	1.01	10% AEP, 2 hour burst, Storm 8
	OF32227	0	0	0	0	0	0	0	
	OF32229	0.158	0.158	0.004	0.199	0.2	1.59	1	10% AEP, 2 hour burst, Storm 3
	OF324	0	0	0	0	0	0	0	
	OF326	0.282	0.282	0.793	0.402	0.35	3.22	1.7	10% AEP, 2 hour burst, Storm 3
	OF330	0	0	1.345	0	0	0	0	
	OF334	0	0	0	0	0	0	0	
	OF336	0	0	1.393	0	0	0	0	
	OF339	0	0	1.337	0	0	0	0	
	OF341	0	0	0	0	0	0	0	
	OF343	0.163	0.163	0.506	0.296	0.19	3.55	1.29	10% AEP, 15 min burst, Storm 7
	OF345	0	0	0.429	0	0	0	0	
	OF351	0	0	1.347	0	0	0	0	
	OF360	0	0	1.343	0	0	0	0	
	OF363	0	0	0	0	0	0	0	
	OF365	0	0	0	0	0	0	0	
	OF367	0	0	0	0	0	0	0	
	OF369	0	0	0	0	0	0	0	
	OF526	0.19	0.19	0.711	0.189	0.26	1.51	1.42	10% AEP, 2 hour burst, Storm 3
	OF53403	0	0	1.291	0	0	0	0	
	DETENTION BASIN DETAILS								
	Name	Max WL	MaxVol	Max Q	Max Q	Max Q			
				Total	Low Level	High Level			
	EAST-B2	57.55	0	0.055	0.043	0.011			
	EAST-B5	67.1	0	0.174	0.138	0.036			
	EAST-B6	61.4	0	0.405	0.377	0.028			
	EAST-B8	70.77	0	0	0	0			
	EAST-B9	63.3	0	0	0	0			
	EAST-B1	58.88	0	0.196	0.184	0.012			
	EAST-B7	65.66	0	0.288	0.258	0.03			
	EAST-B10	62.36	0	0.189	0.146	0.044			
	Bio-retention	73.1	0	0	0	0			
	EAST-B4	71.34	0	0.111	0.111	0			
	EAST-B3	70.56	0	0.031	0	0.031			
	Run Log for 12546218_AlbanyMotorPark_east run at 03:08:44 on 13/7/2021 using version 2020.036								
	No water upwelling from any pit.								
7-11, E-B5-	Freeboard was less than 0.15m at Pit1296								
	The maximum flow in these overflow routes is unsafe: OF32229, OF32222, OF32220, OF32218, OF32213, OF32200, OF32197, OF32192, OF367, OF365, OF363, OF343, OF341, OF339, OF334, OF326, OF324, OF320, OF311								

Stage 1B (EAST) DRAINS Results

DRAINS results prepared from Version 2020.036

1% AEP

PIT / NODE DETAILS

Name	Max HGL	Max Pond HGL	Max Surface Flow Arriving (cu.m/s)	Max Pond Volume (cu.m)	Min Freeboard (m)	Overflow (cu.m/s)	Constraint
E-B2-02-US	60.5		0				
N57	56.49		0				
N58	56.02		0				
E-B2-01-US	63.5		0				
E-B5-CULV1-HW	68.16		0.761		-0.16	0.406	Headwall height/system capacity
N61643	65.55		0				
N302	64.85		0.176				
DUMMY-SCALE2	10		0				
DUMMY-SCALE1	8		0				
E-B5-01-US	71		0				
E-B5-02-US	72.5		0				
E-B7-CULV2-HW	72.93		0.15		0.57	0	None
E-B7-CULV2-DS	72.21		0				
E-B7-04-US	73		0				
E-B7-05-US	73		0				
E-B9-CULV1-HW	68.19		0.317		0.31	0	None
E-B9-CULV1-DS	66.62		0.125				
E-B9-07-US	73		0				
E-B9-08-US	68.5		0				
E-B9-05-US	71		0				
E-B9-06-US	68		0				
E-B9-CULV2-HW	65.71		0.49		0.29	0	None
E-B9-CULV2-DS	64.21		0.227				
E-B9-03-US	71		0				
E-B9-04-US	67		0				
E-B9-01-US	69.5		0				
E-B9-02-US	65.5		0				
N306	60.42		0				
N297	55.54		1.878				
E-B7-07-US	70.1		0				
N296	62.39		0				
N305	57.19		0				
N304	53.78		0				
N61649	64.45		0				
N298	63.35		1.119				
N367	61.64		0				
N294	60.83		0.33				
E-B9-CULV3-HW	61.52		0.332		0.48	0	None
E-B9-CULV3-DS	60.22		0				
E-B10-01-US	63		0				
E-B10-02-US	63.5		0				
E-B10-03-US	65.5		0				
E-B10-CULV1-HW	64.73		0.074		0.77	0	None
E-B10-CULV1-DS	63.09		0.057				
E-B10-04-US	67		0				
E-B10-05-US	68		0				
E-B6-01-US	66.5		0				
E-B6-02-US	69.5		0				
E-B6-03-US	63.5		0				
E-B7-01-US	69.57		0				
E-B7-02-DS	69.66		0.146				
E-B7-03-DS	70.65		0.078				
E-B7-02-US	70.5		0				
E-B7-03-US	72		0				
E-B7-CULV1-HW	68.83		0.372		0.17	0	None
Pit1448	68.18	68.3	0.267	0.4	0	0	Outlet System
E-B7-CULV1-DS	65.94		0.213				
E-B7-08-US	72		0				
E-B7-09-US	70		0				
E-B7-10-US	69.5		0				
E-B7-11-DS	65.92		0.628				
E-B3-02-US	70.75		0				
E-B3-01-US	72		0				
E-B4-01-US	72		0				
E-B4-02-DS	71.41		0.277				
E-B4-02-US	73		0				
E-B1-01-US	58.5		0				
E-B1-CULV1-DS	59.98		0.156				
E-B1-02-US	60.5		0				
E-B1-03-SPLIT	65.7		0.266				
E-B1-03-US	68.5		0				
E-B1-04-DS	68.51		0.09				
E-B1-04-US	69.5		0				
Pit8	68.57	69.17	0.173	3.5	0.43	0	Inlet Capacity
E-B7-CULV3-DS	67.25		0				
N266	66.99		0.654				
E-B8-01A-US	71.2		0				
E-B8-01B-US	73		0				
N388	55.51		0.056				
N511	67.23		0.107				
N539	51.79		0.876				
Pit1296	72.06	72.16	0.087	0.2	0	0	Outlet System
N61629	69.47		0				
N299	68.23		0				
HW1478	49.6		1.196		-0.1	0.545	Headwall height/system capacity
N59	47.46		0.801				
HW1479	52.97		2.531		0.03	0	None
N38873	51.27		1.1				
HW1480	57.53		0.878		-0.03	0.088	Headwall height/system capacity
N38880	55.7		0.383				

SUB-CATCHMENT DETAILS

Name	Max Flow Q (cu.m/s)	Paved Max Q (cu.m/s)	Grassed Max Q (cu.m/s)	Paved Tc (min)	Grassed Tc (min)	Supp. Tc (min)	Due to Storm
EAST-B2-CAT	0.71	0	-0.013	3.1	7.2	3.51	1% AEP, 10 min burst, Storm 2
E-B5	1.304	0	0	3.17	0	0	1% AEP, 10 min burst, Storm 4
EAST-B5-CAT	0.264	0	0	0	19.2	0	1% AEP, 20 min burst, Storm 7
E-B7-A	0.256	0	0	3.8	0	0	1% AEP, 10 min burst, Storm 4
E-B9-A	0.602	0	0	0	9.96	0	1% AEP, 15 min burst, Storm 5
E-B9-B	0.206	0	0	1.19	2.77	0	1% AEP, 15 min burst, Storm 8
E-B9-C	0.297	0	0	0	4.18	0	1% AEP, 15 min burst, Storm 8
E-B9-D	0.384	0	0	1.65	3.84	1.87	1% AEP, 10 min burst, Storm 4
EAST-B6-CAT	1.694	0	824.713	2.18	5.06	2.47	1% AEP, 15 min burst, Storm 1
EAST-B8-CAT	0.28	0	443.483	1.11	2.58	0	1% AEP, 15 min burst, Storm 8
EAST-B9-CAT	0.035	0	0	0	2.24	0	1% AEP, 10 min burst, Storm 4
EAST-B1-CAT	0.646	0.023	0	2.13	4.96	2.42	1% AEP, 10 min burst, Storm 10
EAST-B7-CAT	0.078	61.47	0	0	7.02	0	1% AEP, 10 min burst, Storm 10
EAST-B10-CAT	1.225	0	0	1.65	3.83	1.87	1% AEP, 15 min burst, Storm 8
E-B10-A	0.122	0.362	60.712	1.07	2.5	1.22	1% AEP, 10 min burst, Storm 4
E-B10-03-CATA	0.095	1108.18	72	1.31	3.04	1.48	1% AEP, 15 min burst, Storm 8
E-B7-02-CAT	0.155	0.011	57.552	0	6.08	0	1% AEP, 15 min burst, Storm 1
E-B7-03-CAT	0.133	0	63.5	2.17	5.04	2.46	1% AEP, 10 min burst, Storm 9
E-B7-B-CAT	0.298	0.113	0.121	0	12.03	0	1% AEP, 15 min burst, Storm 7
E-B7-C	0.455	73	0	2.5	5.81	2.83	1% AEP, 15 min burst, Storm 9
E-B7-10-CATB	0.041	10	0	2.81	6.53	3.18	1% AEP, 15 min burst, Storm 1
E-B7-11-CAT	0.071	0	0	0	4.04	0	1% AEP, 15 min burst, Storm 8
E-B4-02-CAT	0.48	0.137	0.023	4.14	0	0	1% AEP, 10 min burst, Storm 4
E-B1-02-CATA	0.256	0	0	1.89	4.4	2.15	1% AEP, 15 min burst, Storm 8
E-B1-03-US-CAT	0.356	0.105	0	2.4	5.58	2.72	1% AEP, 10 min burst, Storm 6
E-B1-04-CAT	0.144	70.769	0.145	0	2.55	0	1% AEP, 10 min burst, Storm 4
E-B7-01-CAT	0.29	56.369	0.054	2.55	5.94	2.89	1% AEP, 10 min burst, Storm 2

	Cat314	0.078	0	0	0	7.02	0	1% AEP, 10 min burst, Storm 10	
	E-B8-02	0.222	0	0.493	0	17.34	0	1% AEP, 20 min burst, Storm 5	
	E-B1-01-CAT	0.093	62.358	71.342	1.64	3.81	1.86	1% AEP, 15 min burst, Storm 8	
	E-B7-10-CATA	0.182	0.174	0	2.57	5.96	2.91	1% AEP, 10 min burst, Storm 2	
	E-B4-01-CAT	0.148	0.101	0.02	1.5	0	0	1% AEP, 10 min burst, Storm 4	
	EAST-B4-CAT	0.05	0	68	3.56	8.26	4.03	1% AEP, 10 min burst, Storm 6	
	EAST-B3-CAT	0.72	0	0.024	2.15	4.99	2.43	1% AEP, 10 min burst, Storm 10	
	PIPE DETAILS								
	Name	Max Q	Max V	Max U/S	Max D/S	Due to Storm			
		(cu.m/s)	(m/s)	HGL (m)	HGL (m)				
	Pipe10	0.241	2.81	57.071	56.494	1% AEP, 1 hour burst, Storm 10			
	P21	0.254	3.13	56.494	56.228	1% AEP, 1 hour burst, Storm 10			
	E-B5-CULV1	0.386	2.43	67.978	67.238	1% AEP, 15 min burst, Storm 6			
	P13826	0.424	3.65	66.388	65.548	1% AEP, 1 hour burst, Storm 7			
	Pipe179	0.464	3.97	65.55	64.847	1% AEP, 1 hour burst, Storm 7			
	DUMMY-SCALE	0	0	10	8	1% AEP, 10 min burst, Storm 5			
	E-B7-CULV2	0.214	3.02	72.734	72.206	1% AEP, 10 min burst, Storm 3			
	E-B9-CULV1	0.29	4.01	67.785	66.619	1% AEP, 30 min burst, Storm 8			
	E-B9-CULV2	0.295	3.38	65.375	64.242	1% AEP, 2 hour burst, Storm 5			
	Pipe283	0.592	4.87	61.018	60.422	1% AEP, 30 min burst, Storm 2			
	Pipe183	0.628	6.51	60.422	55.724	1% AEP, 30 min burst, Storm 2			
	Pipe184	0.024	0.88	70.56	70.103	1% AEP, 2 hour burst, Storm 3			
	Pipe185	0.255	1.9	63.117	62.579	1% AEP, 2 hour burst, Storm 3			
	Pipe213	0.45	4.38	58.124	57.192	1% AEP, 30 min burst, Storm 8			
	Pipe220	0.464	4.52	57.192	53.781	1% AEP, 30 min burst, Storm 8			
	P13854	0.663	5.09	65.212	64.452	1% AEP, 30 min burst, Storm 8			
	Pipe182	0.702	5.38	64.452	63.352	1% AEP, 30 min burst, Storm 8			
	Pipe349	0.496	2.66	62.083	61.644	1% AEP, 30 min burst, Storm 8			
	Pipe186	0.55	3.01	61.644	60.87	1% AEP, 30 min burst, Storm 8			
	E-B9-CULV3	0.249	2.63	61.333	60.258	1% AEP, 2 hour burst, Storm 3			
	Pipe122	0.086	1.51	64.614	63.085	1% AEP, 15 min burst, Storm 1			
	P3176	0.301	1.89	68.741	68.187	1% AEP, 15 min burst, Storm 6			
	E-B7-CULV1	0.479	3.03	67.487	65.942	1% AEP, 15 min burst, Storm 8			
	E-B7-CULV3	0.284	2.02	68.38	67.373	1% AEP, 15 min burst, Storm 1			
	Pipe2927	0.137	1.24	71.973	71.424	1% AEP, 10 min burst, Storm 4			
	Pipe178	0.201	1.26	71.099	70.758	1% AEP, 10 min burst, Storm 7			
	P13783	0.241	2.37	70.108	69.466	1% AEP, 1 hour burst, Storm 2			
	Pipe177	0.282	2.77	69.466	68.233	1% AEP, 1 hour burst, Storm 2			
	Pipe8633	0.374	4.24	48.975	47.655	1% AEP, 1 hour burst, Storm 6			
	Pipe8646	1.207	5.03	52.521	51.272	1% AEP, 1 hour burst, Storm 6			
	Pipe8668	0.362	3.31	57.08	55.702	1% AEP, 2 hour burst, Storm 1			
	CHANNEL DETAILS								
	Name	Max Q	Max V			Due to Storm			
		(cu.m/s)	(m/s)						
	OVERFLOW ROUTE DETAILS								
	Name	Max Q U/S	Max Q D/S	Safe Q	Max D	Max DxV	Max Width	Max V	Due to Storm
	Basin 1	0.012	0	12.141	3	0	32	0	1% AEP, 1 hour burst, Storm 10
	EAST-B10-O	0.018	0	12.141	3	0	32	0	1% AEP, 30 min burst, Storm 8
	EAST-B1-O	0.014	0	12.141	3	0	32	0	1% AEP, 30 min burst, Storm 8
	EAST-B6-0	0.012	0	12.141	3	0	32	0	1% AEP, 30 min burst, Storm 2
	E-B10-01	0	0.15	0.373	0.521	0.06	6.26	0.29	1% AEP, 15 min burst, Storm 9
	E-B10-02	0	0.617	0.352	0.521	0.22	6.26	0.59	1% AEP, 15 min burst, Storm 1
	E-B10-03A	0	0.095	0.885	0.176	0.09	2.11	0.66	1% AEP, 10 min burst, Storm 9
	E-B10-03B	0.161	0.21	0.655	0.521	0.15	6.26	0.87	1% AEP, 15 min burst, Storm 1
	E-B10-04	0	0.059	0.787	0.319	0.06	3.83	0.59	1% AEP, 10 min burst, Storm 9
	E-B10-05	0	0.061	1.746	0.319	0.08	2.56	0.7	1% AEP, 10 min burst, Storm 9
	E-B1-01	0	0.092	0.36	0.144	0.13	1.73	1.04	1% AEP, 10 min burst, Storm 9
	E-B1-02A	0	0.212	0.37	0.244	0.18	2.92	0.97	1% AEP, 15 min burst, Storm 8
	E-B1-02B	0.212	0.233	0.84	0.186	0.21	2.23	1.13	1% AEP, 15 min burst, Storm 1
	E-B1-03A	0	0.352	0.73	0.253	0.26	3.03	1.14	1% AEP, 10 min burst, Storm 6
	E-B1-03B	0.265	0.431	0.726	0.247	0.29	2.96	1.18	1% AEP, 30 min burst, Storm 8
	E-B1-04	0	0.104	0.719	0.23	0.15	1.84	0.91	1% AEP, 15 min burst, Storm 1
	E-B1-04-CONNECT	0.09	0.077	19.197	0.201	0	32	0.24	1% AEP, 15 min burst, Storm 8
	E-B2-01	0	0.338	1.685	0.231	0.37	1.85	1.59	1% AEP, 10 min burst, Storm 2
	E-B2-02	0	0.317	1.157	0.185	0.29	2.22	1.54	1% AEP, 10 min burst, Storm 2
	E-B3-01	0	0.171	0.565	0.249	0.11	2.99	0.5	1% AEP, 15 min burst, Storm 8
	E-B3-02	0.01	0.291	0.367	0.749	0.06	8.99	0.1	1% AEP, 10 min burst, Storm 6
	E-B4-01	0	0.15	0.099	0.405	0.41	0.54	1.02	1% AEP, 10 min burst, Storm 4
	E-B4-02	0	0.436	0.929	0.348	0.36	2.79	1.21	1% AEP, 10 min burst, Storm 4
	E-B5-01	0	0.228	1.566	1.247	0.2	9.97	1.11	1% AEP, 10 min burst, Storm 8
	E-B5-02	0	0.946	1.195	1.247	0.43	9.97	1.04	1% AEP, 10 min burst, Storm 7
	E-B6-01	0	0.32	0.991	0.614	0.18	7.37	0.93	1% AEP, 15 min burst, Storm 8
	E-B6-02	0	0.18	1.569	0.614	0.21	4.91	1.19	1% AEP, 15 min burst, Storm 8
	E-B6-03	0	0.655	0.45	0.614	0.26	7.37	0.76	1% AEP, 15 min burst, Storm 8
	E-B7-01	0.003	0.285	0.801	0.304	0.15	2.43	0.51	1% AEP, 15 min burst, Storm 1
	E-B7-02	0	0.128	0.396	0.195	0.13	2.34	0.83	1% AEP, 15 min burst, Storm 8
	E-B7-03	0	0.127	0.542	0.174	0.14	2.09	0.91	1% AEP, 10 min burst, Storm 6
	E-B7-04	0	0.164	0.964	0.524	0.08	4.19	0.34	1% AEP, 10 min burst, Storm 9
	E-B7-05	0	0.063	1.356	0.524	0.03	4.19	0.19	1% AEP, 10 min burst, Storm 9
	E-B7-06	0.207	0.289	1.599	0.854	0.27	6.83	1.21	1% AEP, 15 min burst, Storm 8
	E-B7-07	0.024	0.192	1.226	0.832	0.14	6.66	0.63	1% AEP, 15 min burst, Storm 6
	E-B7-08	0	0.222	0.821	0.179	0.17	2.14	0.92	1% AEP, 10 min burst, Storm 9
	E-B7-09	0	0.222	0.606	0.203	0.12	2.44	0.59	1% AEP, 15 min burst, Storm 9
	E-B7-10A	0	0.174	0.707	0.226	0.13	2.71	0.61	1% AEP, 15 min burst, Storm 9
	E-B7-10B	0.169	0.193	1.036	0.431	0.19	3.45	0.82	1% AEP, 15 min burst, Storm 8
	E-B7-11	0.592	0.579	0.098	0.691	0.34	5.53	0.8	1% AEP, 15 min burst, Storm 8
	E-B7-O1	0.012	0	12.141	3	0	32	0	1% AEP, 30 min burst, Storm 8
	E-B8-01A	0	0.113	0.732	0.53	0.06	4.24	0.29	1% AEP, 15 min burst, Storm 8
	E-B8-01B	0	0.087	1.412	0.53	0.09	4.24	0.6	1% AEP, 10 min burst, Storm 9
	E-B9-01	0	0.255	0.955	0.211	0.2	2.53	1.05	1% AEP, 10 min burst, Storm 9
	E-B9-02	0	0.115	0.631	0.211	0.09	2.53	0.51	1% AEP, 10 min burst, Storm 9
	E-B9-03	0	0.163	0.962	0.802	0.14	9.62	0.89	1% AEP, 15 min burst, Storm 8
	E-B9-04	0	0.105	0.685	0.802	0.07	9.62	0.5	1% AEP, 15 min burst, Storm 8
	E-B9-05	0	0.132	1.632	0.203	0.16	1.62	0.83	1% AEP, 15 min burst, Storm 8
	E-B9-06	0	0.073	1.146	0.206	0.09	1.65	0.47	1% AEP, 15 min burst, Storm 9
	E-B9-07	0	0.402	1.254	0.781	0.29	6.25	0.99	1% AEP, 15 min burst, Storm 6
	E-B9-08	0	0.125	0.949	0.781	0.05	6.25	0.27	1% AEP, 10 min burst, Storm 10
	low-.25	0.012	0	12.141	3	0	32	0	1% AEP, 1 hour burst, Storm 7
	low0.5	0.012	0	12.141	3	0	32	0	1% AEP, 1 hour burst, Storm 7
	O22992	0.018	0	12.141	3	0	32	0	1% AEP, 30 min burst, Storm 8
	O23058	0.018	0	12.141	3	0	32	0	1% AEP, 30 min burst, Storm 8
	O29065	0.013	0	12.141	3	0	32	0	1% AEP, 30 min burst, Storm 8
	O29069	0.014	0	12.141	3	0	32	0	1% AEP, 30 min burst, Storm 8
	O31534	0.013	0	12.141	3	0	32	0	1% AEP, 1 hour burst, Storm 2
	O31545	0.013	0	12.141	3	0	32	0	1% AEP, 1 hour burst, Storm 2
	O31559	0.013	0	12.141	3	0	32	0	1% AEP, 1 hour burst, Storm 2
	O72267	0.012	0	12.141	3	0	32	0	1% AEP, 30 min burst, Storm 2
	O72283	0.012	0	12.141	3	0	32	0	1% AEP, 30 min burst, Storm 2
	O9296	0.016	0	12.141	3	0	32	0	1% AEP, 1 hour burst, Storm 7
	OF139	0	0	1.7	0	0	0	0	
	OF144	0.131	0.282	0.847	0.201	0.24	2.41	1.19	1% AEP, 15 min burst, Storm 1
	OF153	0.239	0.277	1.234	0.242	0.26	2.9	1.57	1% AEP, 15 min burst, Storm 1
	OF159	0.284	0.319	0.488	0.248	0.22	2.98	0.94	1% AEP, 10 min burst, Storm 2
	OF165	0.592	0.837	1.126	0.972	0.54	11.67	2.2	1% AEP, 15 min burst, Storm 1
	OF18	0.253	0.252	19.227	0.286	0.01	32	0.41	1% AEP, 1 hour burst, Storm 10
	OF22	0	0	1.333	0	0	0	0	
	OF226	0.953	0.953	19.201	0.413	0.03	32	0.1	1% AEP, 10 min burst, Storm 2
	OF244	1.294	1.294	19.201	0.972	0.04	32	0.05	1% AEP, 30 min burst, Storm 3
	OF262	0	0	10.302	0	0	0	0	
	OF266	0.36	0.36	0.915	0.802	0.29	9.62	1.37	1% AEP, 30 min burst, Storm 9
	OF293	0	0	19.196	0	0	0	0	
	OF309	0.089	0.085	19.13	0.206	0	32	0.29	1% AEP, 15 min burst, Storm 9
	OF311	0	0	0.9	0	0	0	0	
	OF315	0	0	1.403	0	0	0	0	
	OF320	0	0	0.644	0	0	0	0	

	OF32192	0.494	0.494	0.029	0.347	0.36	2.78	1.03	1% AEP, 1 hour burst, Storm 7
	OF32197	0.264	0.266	0.047	1.189	0.29	9.51	1.28	1% AEP, 1 hour burst, Storm 2
	OF322	0.03	0.03	1.333	0.347	0.06	4	5.34	1% AEP, 1 hour burst, Storm 7
	OF32200	0.706	0.706	0.069	1.189	0.62	9.51	2.17	1% AEP, 1 hour burst, Storm 2
	OF32206	0.545	0.545	0.644	0.046	0.07	11.31	1.57	1% AEP, 1 hour burst, Storm 6
	OF32209	0.919	0.919	17.383	0.051	0.03	32	0.56	1% AEP, 1 hour burst, Storm 6
	OF32213	1.385	1.385	19.179	1.041	0.04	32	1.12	1% AEP, 30 min burst, Storm 2
	OF32216	0	0	0.744	0	0	0	0	
	OF32218	1.183	1.183	0.062	0.351	0.84	2.81	2.41	1% AEP, 1 hour burst, Storm 6
	OF32220	0.244	0.243	0.049	1.122	0.28	8.98	1.29	1% AEP, 2 hour burst, Storm 3
	OF32222	0.58	0.579	0.04	1.122	0.44	8.98	1.35	1% AEP, 30 min burst, Storm 8
	OF32227	0.088	0.088	0.576	0.022	0.02	7.74	0.82	1% AEP, 2 hour burst, Storm 1
	OF32229	0.45	0.45	0.041	0.292	0.38	2.34	1.32	1% AEP, 2 hour burst, Storm 1
	OF324	0.045	0.039	0.576	0.328	0.01	31.6	0.66	1% AEP, 30 min burst, Storm 8
	OF326	1.224	1.224	1.533	0.614	0.87	4.91	2.48	1% AEP, 9 hour burst, Storm 10
	OF330	0.497	0.497	1.345	0.352	0.17	4	3.21	1% AEP, 9 hour burst, Storm 10
	OF334	0.759	0.759	1.115	0.043	0.11	10.95	2.9	1% AEP, 30 min burst, Storm 2
	OF336	0.406	0.406	1.393	0.228	0.14	4	2.31	1% AEP, 15 min burst, Storm 6
	OF339	0	0	1.337	0	0	0	0	
	OF341	0	0	1.559	0	0	0	0	
	OF343	0.499	0.499	1.491	0.655	0.39	7.86	1.87	1% AEP, 15 min burst, Storm 1
	OF345	0.255	0.255	1.266	0.609	0.26	7.31	1.58	1% AEP, 2 hour burst, Storm 3
	OF351	0	0	1.347	0	0	0	0	
	OF360	0	0	1.343	0	0	0	0	
	OF363	0	0	0.766	0	0	0	0	
	OF365	0	0	1.125	0	0	0	0	
	OF367	0	0	0.582	0	0	0	0	
	OF369	0	0	0.531	0	0	0	0	
	OF526	0.484	0.484	1.639	0.28	0.45	2.24	1.66	1% AEP, 30 min burst, Storm 2
	OF53403	0	0	1.291	0	0	0	0	
	DETENTION BASIN DETAILS								
	Name	Max WL	MaxVol	Max Q	Max Q	Max Q			
				Total	Low Level	High Level			
	EAST-B2	57.65	0	0.254	0.241	0.012			
	EAST-B5	67.23	0	0.494	0.424	0.07			
	EAST-B6	61.61	0	1.387	0.592	0.794			
	EAST-B8	71.04	0	0.024	0.024	0			
	EAST-B9	63.65	0	0.255	0.255	0			
	EAST-B1	59.06	0	0.464	0.45	0.014			
	EAST-B7	65.97	0	1.199	0.663	0.535			
	EAST-B10	62.52	0	0.595	0.496	0.098			
	Bio-retention	73.19	0	0	0	0			
	EAST-B4	71.41	0	0.201	0.201	0			
	EAST-B3	70.75	0	0.281	0.241	0.04			
	Run Log for 12546218_AlbanyMotorPark_east run at 03:50:40 on 13/7/2021 using version 2020.036								
, E-B10-03	The maximum water level in these storages exceeds the maximum elevation you specified: EAST-B10, EAST-B6.								
	DRAINS has extrapolated the Elevation vs Storage table to a higher Elevation. Please provide accurate values for higher elevations.								
	No water upwelling from any pit.								
	Freeboard was less than 0.15m at Pit1448, Pit1296								
	The maximum pond depth in these sag pits is unsafe: Pit1296								
	Peak water levels spilled in these Overflow Routes: OF324 spilled. You cannot rely on these results. You really MUST specify data for higher levels for these cross sections.								
	IGNORE THESE WARNINGS AT YOUR OWN PERIL.\cf1								

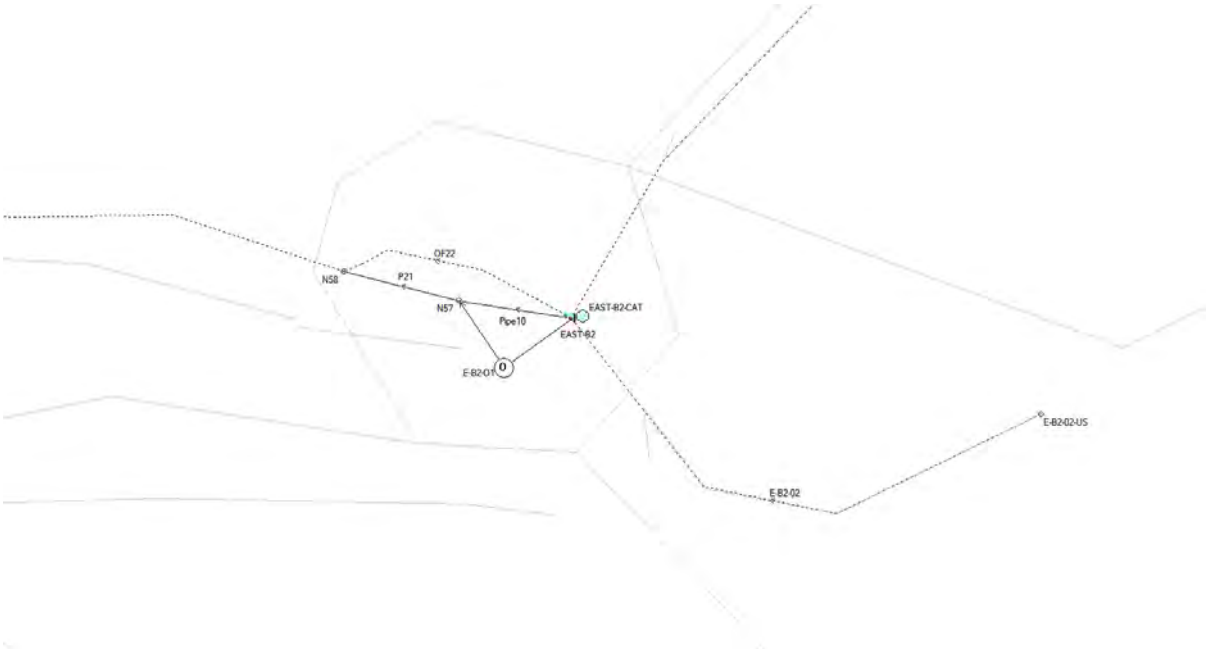

Figure G.1 Typical basin set-up

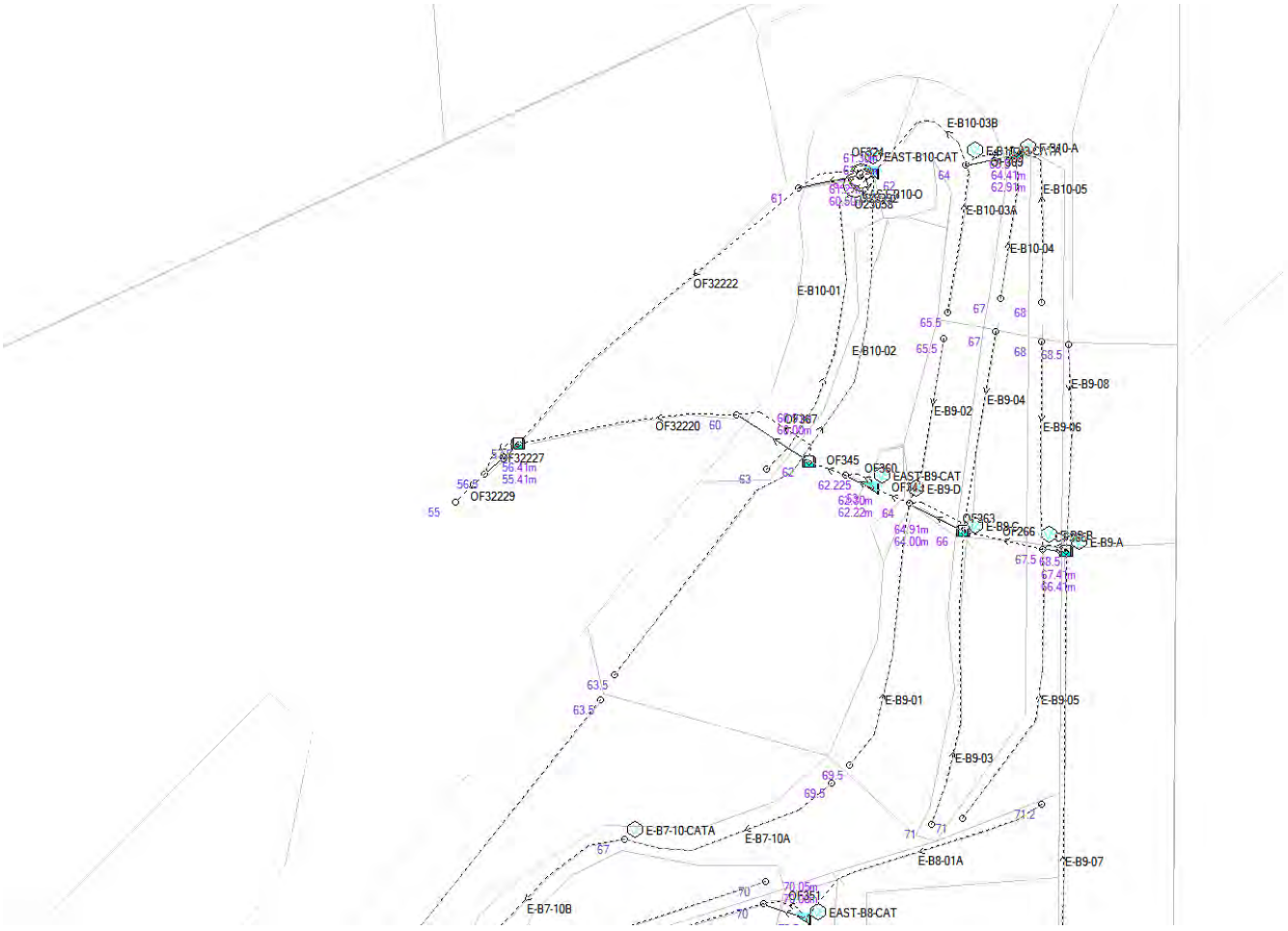

Figure G.2 East-1 schematic diagram

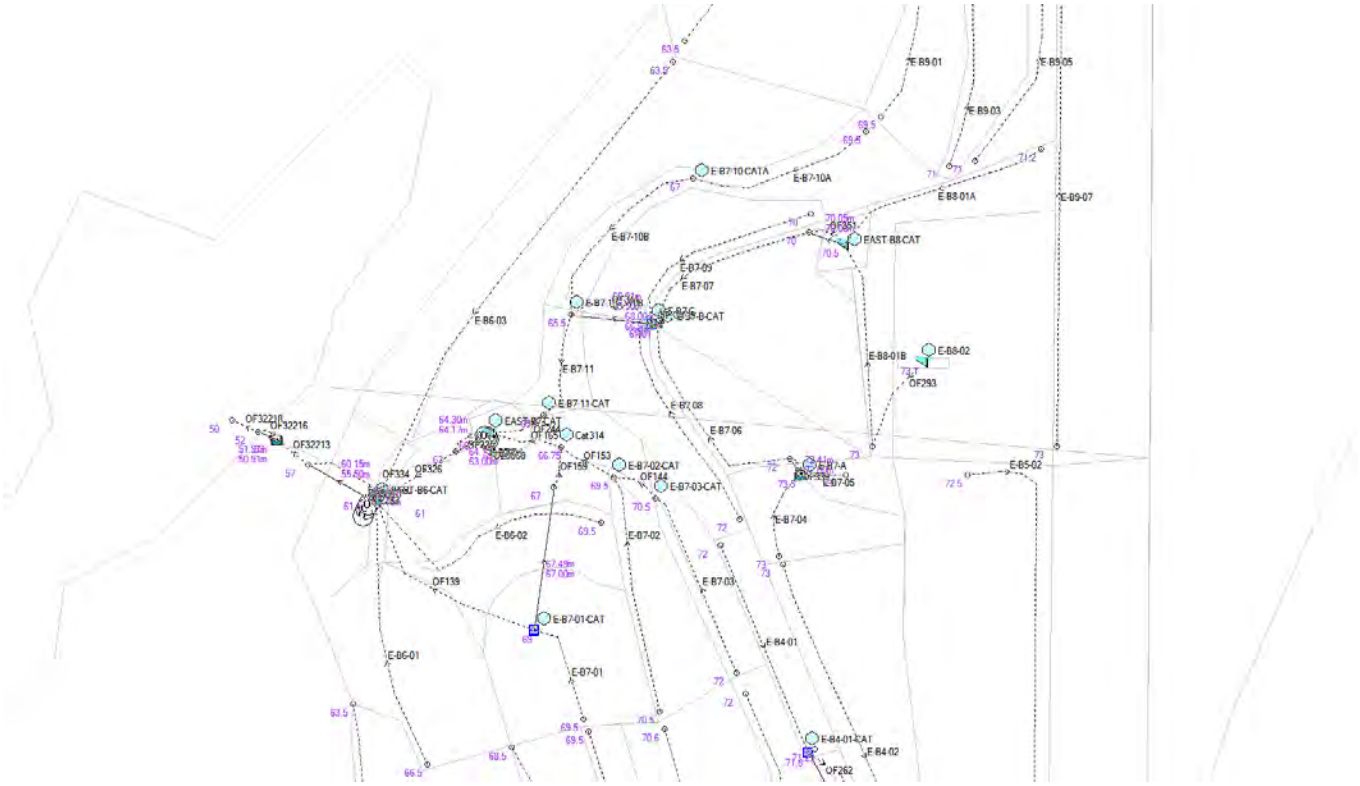

Figure G.3 East-2 schematic diagram

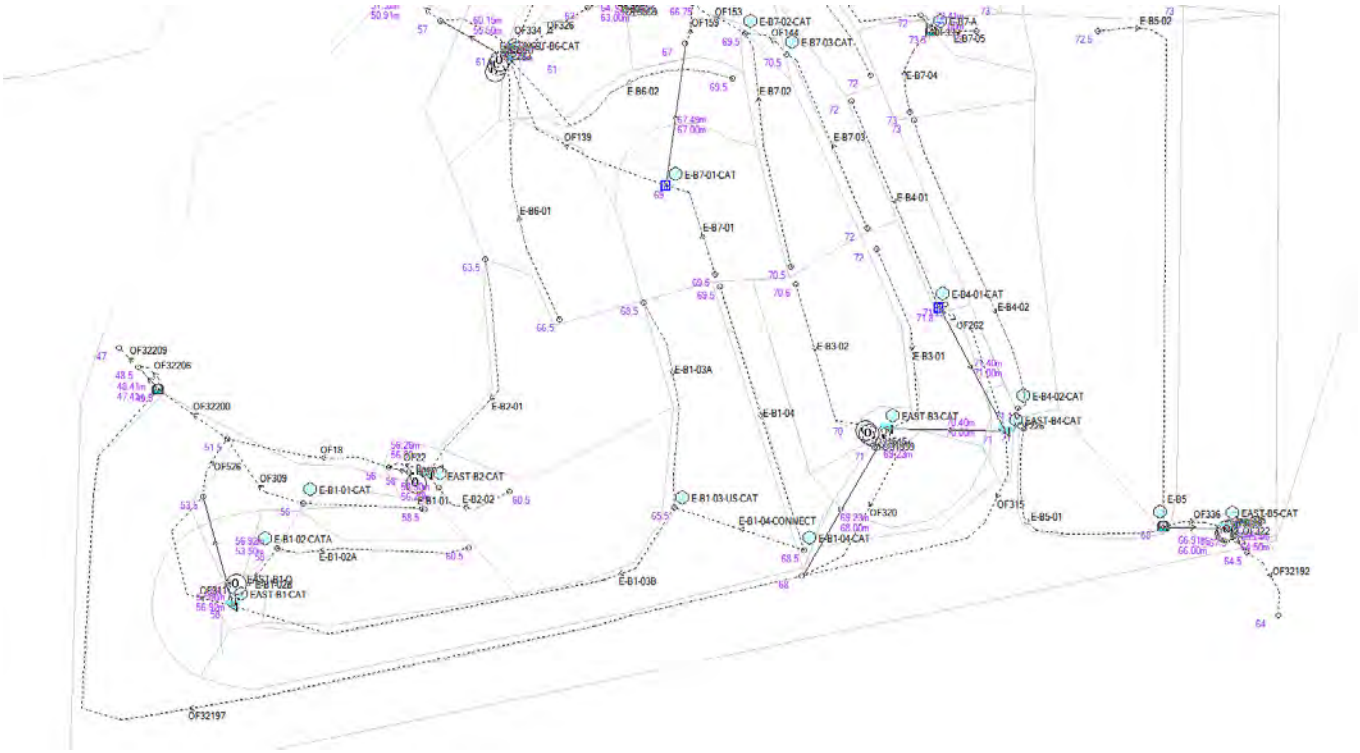

Figure G.4 East-3 and East-4 schematic diagram

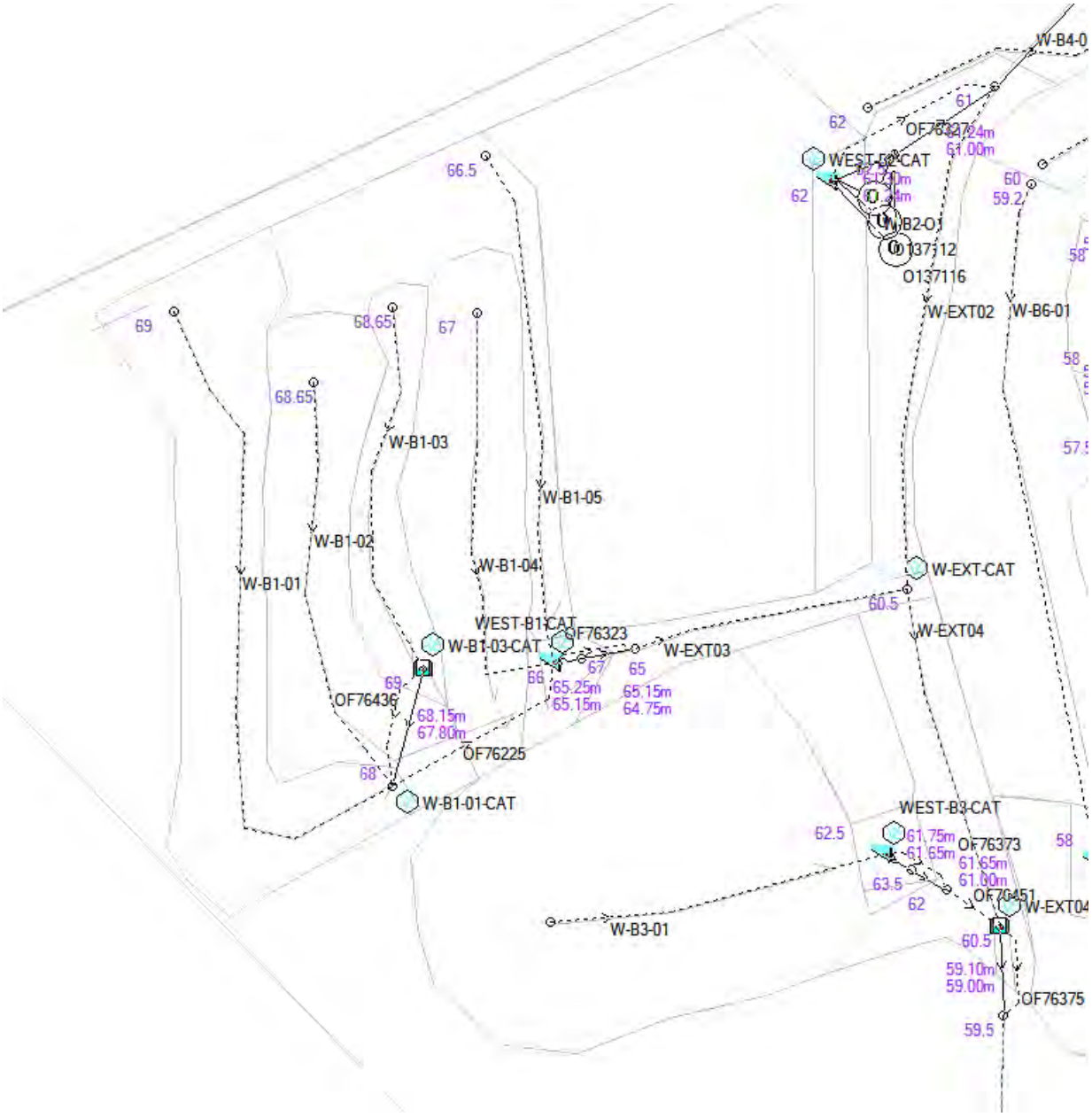

Figure G.5 West-3 schematic diagram

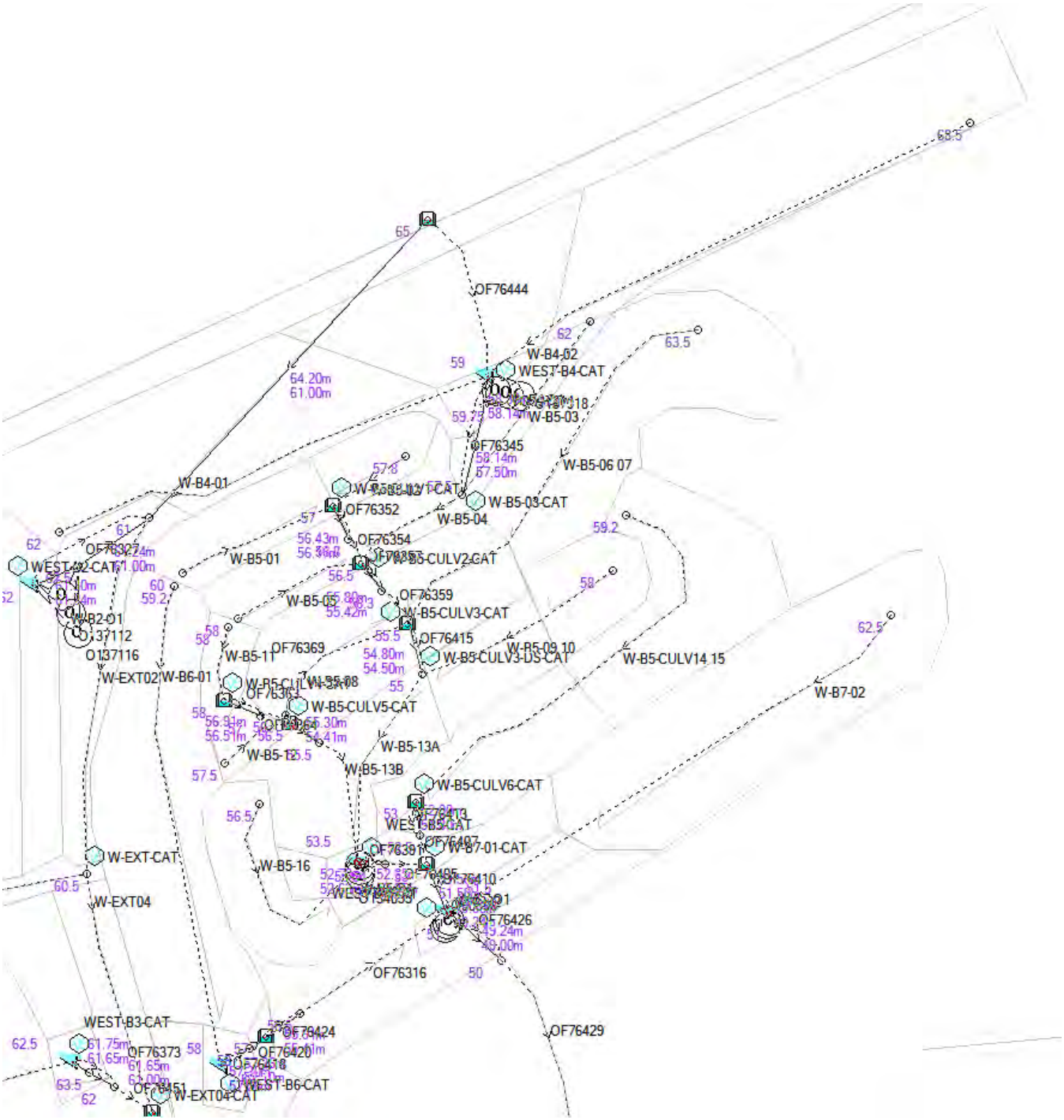

Figure G.6 West-2 schematic diagram

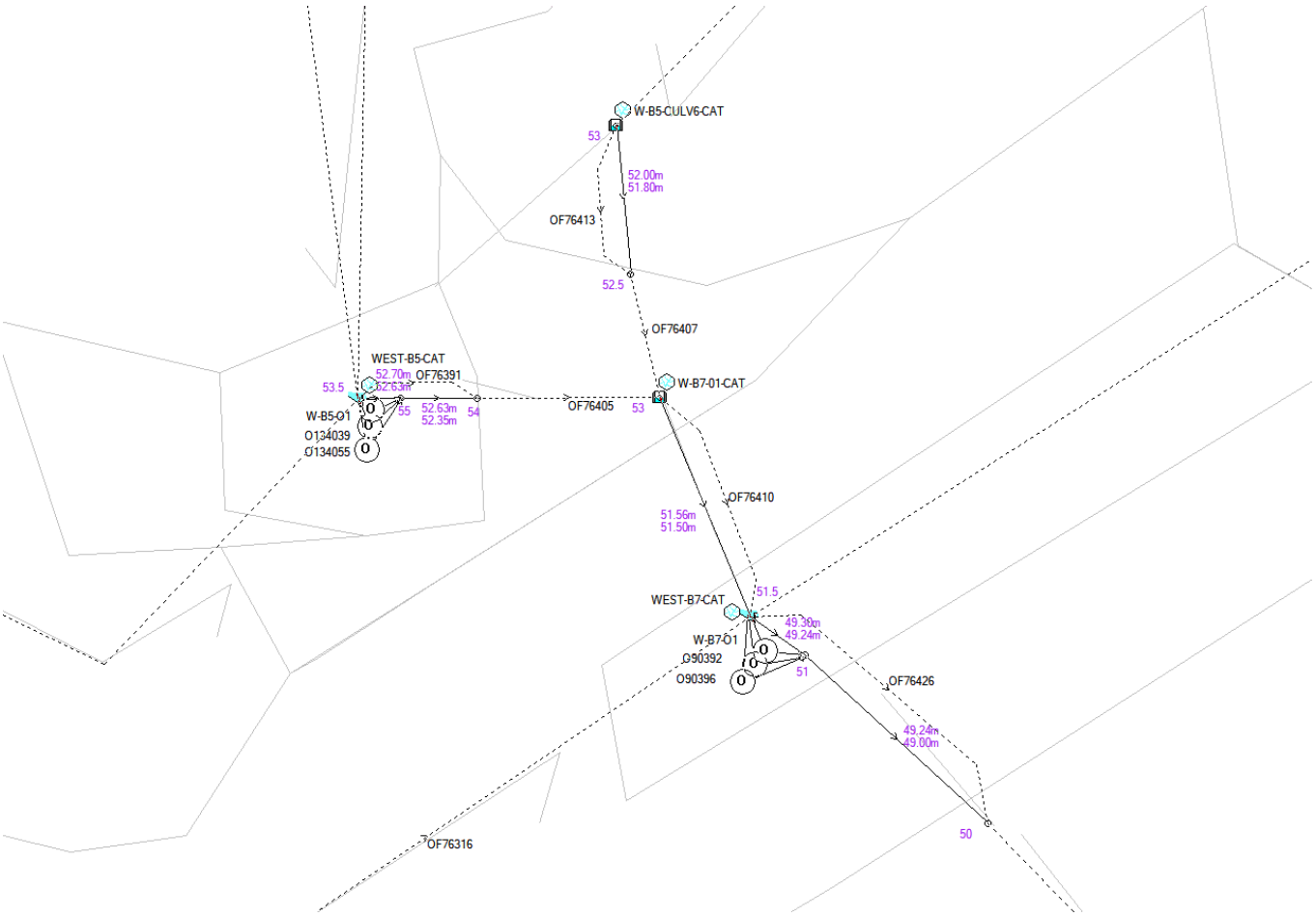

Figure G.7 West-B7 schematic diagram

Appendix H

Site and soil evaluation for onsite wastewater management

Albany Motorsport Park – Development Application

Site and Soil Evaluation for Onsite Wastewater Management

City of Albany

19 August 2021

→ The Power of Commitment

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Author	Jeff Foley/ Vicki Davies
Project manager	Vicki Davies
Client name	City of Albany
Project name	Albany Motorsport Park - Development Application
Document title	Albany Motorsport Park – Development Application | Site and Soil Evaluation for Onsite Wastewater Management
Revision version	0
Project number	12546218

Document status

Status Code	Revision	Author	Reviewer		Approved for issue		
			Name	Signature	Name	Signature	Date
S3	A	J. Foley/ V. Davies	J. Foley		J. Foley		16/08/2021
S4	0	J. Foley/ V. Davies	J. Foley		J. Foley		19.08.21

Executive summary

The City of Albany (CoA) has engaged GHD to prepare a Site and Soil Evaluation for Onsite Wastewater Management report for the staged construction of the Albany Motorsport Park (AMP) at Lot 5780 (No. 54) Down Road South, Drome (the Site) (Figure 1, Appendix A). The project Proponent is the Great Southern Motorplex Group Inc. (GSMG).

Due to the scale and nature of the proposed development, the works have been broken down into two key stages which comprise the following:

– Stage 1:
  - Stage 1A: Construction of motocross track and 4WD driver training, ATV area and associated infrastructure.
  - Stage 1B: Construction of racetrack and associated infrastructure (subject to funding).
– Future Development: Construction and replacement of final permanent structures to support the function of the motorsports complex (subject to funding). Stage 2 will be addressed as a separate Development Application.

This Site and Soil Evaluation for Onsite Wastewater Management report has been developed as per the Department of Health, Western Australia (DOHWA) template report based on the *Health (Treatment of Sewage and Disposal of Effluent and Liquid Waste) Regulations 1974*, Government Sewerage Policy 2019, State Planning Policy 2.9, AS/NZS 1547 and other supporting documentation (DOHWA, 2021).

The purpose of this Site and Soil Evaluation (SSE) report is to outline the site, soil and groundwater conditions at the proposed AMP site with regarding to suitability for onsite effluent disposal during operation of the AMP. This report provides supporting information for the Development Application for the Stage 1 of the Site.

Based on an assessment of the soil physical and chemical results for the six test pit locations, it is recommended that the LAAs for the Race Track Precinct and Motocross Precinct are located at TP01 and TP06, respectively. The sizing for a wastewater treatment system and LAA has been developed in this SSE report for Stage 1A in the Motocross Precinct only.

The proposed clubhouse within the Motocross Precinct will be constructed in Stage 1A of the development. It is anticipated that this will be an unlicenced facility (15 L/ person/ day) however provision has been made for anticipated wastewater volumes for a licenced facility (35 L/ person/ day), to allow for possible increased loading at the site if it were to become a licenced facility.

The Motocross Precinct clubhouse is expected to have intermittent use throughout the Motocross season and on a weekly basis, with up to 300 patrons on Sunday or Saturday followed by minimal usage during the week and off-season downtime. Therefore, for the purpose of calculating anticipated wastewater volumes it is assumed that there is an average of 100 people/ day.

In order to accommodate spikes in wastewater volumes on event days when there is up to 300 patrons using the Motocross Precinct clubhouse facilities, it is proposed to install a 15,000 L holding tank, to balance storage over the course of a typical week.

The results of a water balance for the Motocross Precinct, for an average of 100 persons/day, indicate that 1,100 m^2 will be required for the sub-soil irrigation area. There is adequate area of land available within the vicinity of TP01 to accommodate the site of the required LAA.

As per the requirements of the Department of Water *WQPN 100* (DoW, 2007) and the *Government Sewerage Policy* (DPLH, 2019) a ‘Secondary’ wastewater treatment plant, with engineering certification to meet effluent quality of Biological Oxygen Demand (BOD) < 20 mg/L; Total Suspended Solids (TSS) < 30 mg/L; Total Nitrogen (TN) < 10 mg/L; Total Phosphorus (TP) < 1 mg/L; and *Escherichia coli* < 10 cfu/100mL is required in a Priority 2 PDWSA.

It is recommended that a DOHWA approved ‘Secondary’ treatment system, certified to AS1546.3:2008, is selected and installed for the Motocross Precinct during Stage 1A of development.

At time of writing, an onsite effluent disposal system was not proposed to be installed in the Race Track Precinct. All liquid waste from transportable buildings, toilets and washdown facilities is proposed to be removed offsite, as required, by an approved contractor. If onsite effluent disposal is proposed in the future is it expected a similar system, with holding tank, will be utilised to manage spikes in wastewater volumes for events and off-season downtime.

This report is subject to, and must be read in conjunction with, the limitations set out in section 1.2 and the assumptions and qualifications contained throughout the Report.

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1. Introduction

1.1 Background

The City of Albany (CoA) has engaged GHD to prepare a Site and Soil Evaluation for Onsite Wastewater Management report for the staged construction of the Albany Motorsport Park (AMP) at Lot 5780 (No. 54) Down Road South, Drome (the Site) (Figure 1, Appendix A). The project Proponent is the Great Southern Motorplex Group Inc. (GSMG).

The Great Southern Motorplex Group Inc. (GSMG), the Proponent, in partnership with the City of Albany, intend to develop the site as a regional motorsport facility. In October 2018, the City of Albany Council resolved to purchase the site and settlement of the land purchase was concluded in 2019. Once constructed, the AMP will be operated and managed by Albany Motorsport Venue Incorporated (AMV Inc.).

The proposed AMP forms part of the CoA's strategy to expand upon its existing motorsports facilities within the greater Albany area. The AMP is to be the largest facility of its kind in Western Australia and will support the local economy.

1.2 Purpose of this report

This Site and Soil Evaluation for Onsite Wastewater Management report has been developed as per the Department of Health, Western Australia (DOHWA) template report based on the *Health (Treatment of Sewage and Disposal of Effluent and Liquid Waste) Regulations 1974*, Government Sewerage Policy 2019, State Planning Policy 2.9, AS/NZS 1547 and other supporting documentation (DOHWA, 2021).

The purpose of this Site and Soil Evaluation (SSE) report is to outline the site, soil and groundwater conditions at the proposed AMP site with regarding to suitability for onsite effluent disposal during operation of the AMP. This report provides supporting information for the Development Application for the Stage 1 of the Site.

1.3 Evaluator's qualifications, experience and professional indemnity

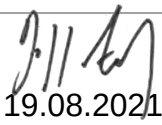
The SSE has been undertaken by Dr Jeff Foley who is a Chemical Engineer with 20 years' technical experience specialising in the areas of wastewater treatment and recycling and integrated water management. His involvement in water cycle projects has ranged from policy and planning, concept design and process modelling, through to detailed design, construction, commissioning and process optimisation.

GHD's site evaluation has been supported in the field by Great Southern Geotechnics (GSG), who specialise in high-quality testing of construction materials and consultancy services to the civil construction, agriculture, environmental, mining and resources industries across WA's Great Southern region. GSG operates an independent NATA Accredited Construction Materials Testing Laboratory, in compliance with AS ISO/IEC 17025 and ISO 9001.

Dr Foley is suitably qualified to provide interpretation of site, soil and climate conditions, undertake water balances, selection and design of appropriate wastewater treatment systems, disposal and reuse options. A summary of the Dr Foley's site evaluator details has been provided in Table 1 and a copy of his CV and qualifications can be provided on request.

A copy of GHD's Professional Indemnity Insurance certificate is included in Appendix C.

Table 1 Site Evaluator Details

Site evaluator details	
Name Company	Dr Jeff Foley, Technical Director – Wastewater process engineering GHD Pty Ltd
Phone Email	(08) 9840 5101 Jeff.Foley@ghd.com
Qualification Knowledge, skills and practical experience	MIEAust, BE(Chem) (Hons I), BA, PhD (UQ) – *Life cycle assessment of wastewater treatment systems* Employed as a wastewater process designer (inc. on-site systems) by GHD 2001 – 2021.
Date of site assessment	16/08/2021
Signature Date	 19.08.2021

1.4 Scope and limitations

This report: has been prepared by GHD for City of Albany and may only be used and relied on by City of Albany for the purpose agreed between GHD and City of Albany as set out in section 1.2 of this report.

GHD otherwise disclaims responsibility to any person other than City of Albany arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report. GHD disclaims liability arising from any of the assumptions being incorrect.

The opinions, conclusions and any recommendations in this report are based on information obtained from, and testing undertaken at or in connection with, specific sample points. Site conditions at other parts of the site may be different from the site conditions found at the specific sample points.

Investigations undertaken in respect of this report are constrained by the particular site conditions, such as the location of buildings, services and vegetation. As a result, not all relevant site features and conditions may have been identified in this report.

Site conditions (including the presence of hazardous substances and/or site contamination) may change after the date of this Report. GHD does not accept responsibility arising from, or in connection with, any change to the site conditions. GHD is also not responsible for updating this report if the site conditions change.

GHD has prepared this report on the basis of information provided by City of Albany and others who provided information to GHD (including Government authorities), which GHD has not independently verified or checked beyond the agreed scope of work. GHD does not accept liability in connection with such unverified information, including errors and omissions in the report which were caused by errors or omissions in that information.

2. Site development description

The AMP is proposed to be developed at Lot 5780 Down Road South, Drome which is located approximately 20 km to the north of the Albany CBD and is 192.34 ha in size. The AMP comprises 141.7 ha (including 0.2 ha for crossovers) in the eastern portion of the Site. Two areas within Lot 5780 are excluded from the AMP development and include 49.47 ha at the western end of the Site which is covered with native vegetation and a dam area (1.37 ha) on the northern boundary which is subleased to Plantation Energy.

The Site is zoned as 'Special Use – SU26' under Local Planning Scheme No. 1, Scheme Amendment No. 35.

At full development, the proposed AMP will consist of:

- Sealed, configurable multi-use track (3.5 km long × 12 m wide) for motor car racing, motorcycle racing, drifting, driver training and cycling:
  - Designed to comply with Motorsport Australia *Track Operator's Safety Guide* (CAMS, 2012) and Motorcycling Australia (MA) *Track Guidelines* (MA, 2011)
  - To be licensed by Motorsport Australia for Fédération Internationalé de l'Automobile (FIA) Grade 2 and Fédération Internationalé Motocyclisme (FIM) Grade B (i.e. up to second-tier international motor racing)
- A motocross circuit designed and constructed in association with MA guidelines.
- An off-road four-wheel drive (4WD) and all-terrain vehicle (ATV) training area.
- Associated buildings and infrastructure.

2.1 Staging of the development

Due to the scale and nature of the proposed development, the works have been broken down into two key stages which comprise the following:

- Stage 1:
  - Stage 1A: Construction of motocross track and 4WD driver training, ATV area and associated infrastructure.
  - Stage 1B: Construction of racetrack and associated infrastructure (subject to funding).
- Future Development: Construction and replacement of final permanent structures to support the function of the motorsports complex (subject to funding). Stage 2 will be addressed as a separate Development Application.

A Master Plan, which illustrates the various aspects of the Site and staging areas, has been developed by the GSMG and CoA to support the Development Application for the AMP (Figure 2, Appendix A).

2.2 Anticipated wastewater volumes

The proposed clubhouse within the Motocross Precinct will be constructed in Stage 1A of the development. It is anticipated that this will initially be an unlicenced facility (15 L/ person/ day) however provision has been made for anticipated wastewater volumes for a licenced facility (35 L/ person/ day), to allow for possible increased loading at the site if it were to become a licenced facility.

The Motocross Precinct clubhouse is expected to have intermittent use throughout the Motocross season (approx. March to October) and on a weekly basis, with up to 300 patrons on Sunday or Saturday followed by minimal usage (max. 20 persons per day) during the week and off-season downtime. Therefore, for the purpose of calculating anticipated wastewater volumes (Table 2) it is assumed that there is an average of 100 people/ day (Appendix B).

In order to accommodate spikes in wastewater volumes on event days when there is up to 300 patrons using the Motocross Precinct clubhouse facilities, it is proposed to install a 15,000 L holding tank, to balance out wastewater flows over the course of a typical week. The holding tank will also help store effluent during the off-season period.

At this stage, an onsite effluent disposal system is not proposed to be installed in the Race Track Precinct. All liquid waste from transportable buildings, toilets and washdown facilities is proposed to be removed offsite, as required, by an approved contractor. If onsite effluent disposal is proposed in the future is it expected a similar system, with holding tank, will be utilised to manage spikes in wastewater volumes for events and off-season downtime.

Table 2 Anticipated wastewater volumes

Type	Input volume	Load per person	Daily flow (L/day)
Stage 1A – Motocross Precinct			
Permanent building (5 x sinks, 4 x toilet pans, urinal)	Up to 300 persons (average 100 persons/day)	35 L/person/day	3,500 L/day (average)
Transportable toilets	One permanent block and additional transportables for special events	35 L/person/day	Liquid waste to be removed offsite by an approved contractor, as required
Washdown area	Variable	-	
Total			**3,500 L/day (average)**
Stage 1B – Racetrack Precinct			
Transportable building	500 persons	35 L/person/day	Liquid waste to be removed offsite by an approved contractor, as required
Transportable toilets	Special events	35 L/person/day	
Washdown area	Variable	-	
Total			

2.3 Site development description

The AMP site development description is outlined in Table 3.

Table 3 Description of the development

Development characteristic	Description		
Site address	Lot 5780 (No. 54) Down Road South, Drome		
Owner/ developer	City of Albany		
Proponent	Great Southern Motorplex Group (GSMG)		
Postal address	PO Box 484, ALBANY WA 6331		
Contact for SSE	Ph: 9840 5101	Mob: 0410 541 971	Email: jeff.foley@ghd.com
Date of field work	25 June 2021		
Local Government	City of Albany		
Zoning	Special Use		
Lot size	192.34 ha		
Proposal	Albany Motorsport Park		
Water supply	Bore and rainwater		
Availability of sewer	Unavailable		
Development located within:	Public drinking water source area: Yes – Priority 2 PDWSA	Sewage sensitive areas Yes – Sewerage Category (f) Within 1 km of significant wetlands	
Anticipated wastewater volume:	Sewage (L): Motocross Precinct 3,500 L/day (average)	Trade waste (L): Zero	

3. Site and soil assessment

3.1 Site assessment

GHD have undertaken a number of site walkovers for the AMP site from 2018 to 2021 and are very familiar with the existing site conditions. In addition, an intrusive field investigation was undertaken, by Great Southern Geotechnics, on 25 June 2021. This investigation involved excavating six test pits to a depth of 2500 mm below ground level (bgl), using a mini excavator with a 300 mm auger. Soil types, profiles and groundwater levels were then visually assessed and recorded onsite at time of site investigation, as per the DOHWA (2021) SSE template guidelines (Great Southern Geotechnics, 2021).

The findings of the desktop and field assessment, level of constraint and proposed mitigation measures, for the proposed Motocross Precinct and Race Track Precinct onsite effluent disposal locations, have been summarised in Table 4.

Table 4 Key site characteristics, level of constraint and proposed mitigation measures for the proposed Motocross Precinct and Race Track Precinct effluent disposal areas

<table>
<tr><th>Site characteristics</th><th>Investigations and reporting</th><th>Level of constraint</th><th>Mitigation measures</th></tr>
<tr><td>Climate</td><td>Albany is located on the south coast of Western Australia and the climate is broadly described as Mediterranean, with warm dry summers and mild wet winters. The nearest Bureau of Meteorology (BoM) official recording station that has mean daily evaporation data (1968 to 2012) is the Albany Airport Comparison weather station (Site number 9741) (BoM, 2021).
Mean monthly rainfall levels at the Albany Airport Comparison weather station (BoM, 2021) and pan evaporation data (DPIRD, 1987) are presented below. This shows that mean monthly evaporation exceeds mean monthly rainfall for seven months of the year, from November to April.
<table>
<tr><th>Month</th><th>Jan</th><th>Feb</th><th>Mar</th><th>Apr</th><th>May</th><th>Jun</th><th>Jul</th><th>Aug</th><th>Sep</th><th>Oct</th><th>Nov</th><th>Dec</th></tr>
<tr><td>Mean Rainfall (mm)</td><td>23.6</td><td>22.3</td><td>33.6</td><td>61.3</td><td>89.8</td><td>108.0</td><td>119.3</td><td>106.3</td><td>88.5</td><td>70.8</td><td>47.0</td><td>27.8</td></tr>
<tr><td>Evap. (mm)</td><td>220</td><td>171</td><td>150</td><td>91</td><td>63</td><td>47</td><td>49</td><td>67</td><td>84</td><td>106</td><td>150</td><td>199</td></tr>
<tr><td>Evap. Exceeds Rainfall</td><td>Yes</td><td>Yes</td><td>Yes</td><td>Yes</td><td>No</td><td>No</td><td>No</td><td>No</td><td>No</td><td>Yes</td><td>Yes</td><td>Yes</td></tr>
</table>
</td><td>High</td><td>Divert stormwater from upslope around sub-soil irrigation area</td></tr>
<tr><td>Exposure</td><td>The proposed Land Application Areas (LAA) within the Race Track and Motocross Precincts have a high exposure to sun, with no shade cover and good ventilation.</td><td>Nil to Low</td><td>Not required</td></tr>
</table>

Site characteristics	Investigations and reporting	Level of constraint	Mitigation measures
Vegetation	The majority of the Site has been previously cleared for agriculture with isolated stands of trees (112.9 ha). The proposed Land Application Area (LAA) is open grassland. Refer to site photographs in the Great Southern Geotechnics (2021) Site Investigation report (Appendix D).	Nil to Low	Maintain grassed area within the LAA
Landform and drainage	The Site is mapped as the following Department of Primary Industries and Regional Development (DPIRD) landscape mapping units (Figure 3, Appendix A): TP01-TP03 – 242KgDMc Sands on laterite on elongate crests. TP04-TP05 – 242ReDMc Sands on laterite on elongate crests. TP06 – Broad valleys in sedimentary in sedimentary rocks; 30 m relief, smooth slopes. Deep sands and iron podzols on slopes.	Nil to Low	Not required
Slope	Slope of land within the site investigation areas for the Race Track Precinct and Motocross Precinct is approximately 6% (Figure 4, Appendix A).	Nil to Low	Diversion of stormwater from upslope around sub-soil irrigation area proposed
Fill (imported)	No imported fill was encountered during the site investigation	Nil to Low	Not required
Surface gravel and rock outcrops	During the Site Investigation, the soil profile (to 2500 mm blg) was generally found to have Topsoil over Sandy GRAVEL over Sandy CLAY. No rock outcrops were observed within the test pit location areas and gravel soils had approximately 10% coarse fragments (Great Southern Geotechnics, 2021)	Nil to Low	Not required
Erosion potential	The water erosion risk mapped by DPIRD indicates that for test pit locations TP01 – TP05 "*<3% of map unit has a high to extreme water erosion risk*". TP06 is mapped as "*3-10% of map unit has a high to extreme water erosion risk*" (Figure 5, Appendix A). The test pit locations within the Site are currently grassed and considered likely to be Nil or low if sub-soil irrigation is installed and grassed surface is maintained. Refer to photos in the Site Investigation report (Appendix D).	Nil to Low	Maintain as grassed area and divert stormwater from upslope around sub-soil irrigation area to maintain Nil or Low risk rating
Separation from groundwater	During the Site Investigation, undertaken in late June (Appendix D), ground water was not intercepted at 2500 mm bgl at any of the six test pit locations (Figure 4, Appendix A). These locations meet the vertical separation of greater than 2 m separation to groundwater in PDWSA.	Nil to Low	Not required
Public Drinking Water Source Area (PDWSA) and Sewage Sensitive Area (SSA)	The Site is located in a Priority 2 PDWSA – Marbellup Brook Catchment Area and SSA (<1 km from conservation category wetland) (Figure 4, Appendix A).	High	Maintain >2 m vertical separation to groundwater

Site characteristics	Investigations and reporting	Level of constraint	Mitigation measures
Surface waters and separation from water resources	All sub-soil irrigation areas will be located >100 m to Protected Exclusion Area and Marbelup Flats (Conservation Class wetland) (Figure 3, Appendix A).	Nil to Low	Not required
Rainfall run-off and seepage	The test pit location areas, in both the Race Track Precinct and Motocross Precinct, are located on waxing upperslope (UX) (National Committee on Soil and Terrain, 2009). No evidence of evidence of water pooling on the surface or seepage was observed during the Site Investigation (Great Southern Geotechnics, 2021) or during site walkovers undertaken by GHD.	Nil to Low	Diversion of stormwater from upslope around sub-soil irrigation area proposed
Flood potential	The flood erosion risk mapped by DPIRD indicates that test pit locations TP01 – TP05 that "*<3% of map unit has a moderate to high flood risk*". TP06 is mapped as "*3-10% of map unit has a moderate to high flood risk*" (Figure 9, Appendix A).	Nil to Low	Not required
Horizontal setback distances	All sub-soil irrigation areas will be setback >100 m to site boundaries, Protected Exclusion Area and Marbelup Flats (Conservation Class wetland) (Figure 3, Appendix A).	Nil to Low	Not required
Available Land Application Area (LAA)	Sufficient land is available within the Race Track and Motocross Precinct area for sub-soil irrigation of wastewater.	Nil to Low	Not required

3.2 Soil assessment

During the Site Investigation, undertaken by Great Southern Geotechnics, three test pits were excavated in each of the Motocross Track Area and Race Track Area. Table 5 includes a summary of the soil physical and chemical characteristics (Appendix E) for SSE at the six test pit locations.

Table 5 Summary of soil physical and chemical characteristics for SSE of the AMP site

Location	Layer depth (mm)	Sample depth (mm)	Soil strata	Depth to GW	Coarse fragments (%)	Soil colour & mottling	Soil field texture	Soil structure	Indicative soil permeability (m/d) (Ksa^{-1})	Design loading rate (DLR) (mm/d) Trenches and beds			pH	EC (dS/m)	Sodicity (ESP) (%)	Phosphate Sorption Capacity (mg P sorbed/kg)
										Primary treated effluent		Secondary treated effluent				
										Conservative rate	Maximum rate					
Race Track Precinct																
TP01	0-180		(Topsoil) SAND with silt	Not intercepted	Roots and root fibres	Dark grey	Sand - Fine to medium	Structureless	>3.0	20	35	50	-	-	-	-
TP01	180-490		Sandy GRAVEL		Contains approximately 10% Cobbles and Boulders in excess of 250 mm diameter	Brown	Gravel and sand - Fine to coarse, sub-rounded to sub-angular, (F:20% / M:20% / C:15%)	Structureless	>3.0	20	35	50	-	-	-	-
TP01	550-2500	900-1100	Sandy CLAY		NA	Brown/red mottled Light brown/orange (40%)	Light Clay - Low to medium plasticity	Massive	<0.06	NA	NA	8	6.1	0.022	5.8	688
TP02	0-140		(Topsoil) SAND with silt	Not intercepted	Roots and root fibres	Dark grey	Sand - Fine to medium	Structureless	>3.0	20	35	50	-	-	-	-
TP02	140-400		Sandy GRAVEL		Contains approximately 10% Cobbles and Boulders in excess of 400 mm diameter	Brown	Gravel and sand - Moderately cemented - Fine to coarse, sub-rounded to sub-angular, (F:20% / M:20% / C:15%)	Structureless	>3.0	20	35	50	-	-	-	-
TP02	400-1400	500-900	Sandy CLAY		NA	Light brown	Low to medium plasticity	Massive	<0.06	NA	NA	8	6.1	0.025	4.8	1650
TP02	1400-2500		Sandy CLAY		NA	Brown/red mottled Light brown/orange (40%)	Low to medium plasticity	Massive	<0.06	NA	NA	8	-	-	-	-
TP03	0-250		(Topsoil) SAND with silt	Not intercepted	Roots and root fibres	Dark grey to grey	Sand - Fine to medium	Structureless	>3.0	20	35	50	-	-	-	-
TP03	250-830	300-600	Sandy GRAVEL		Contains approximately 10% Cobbles and Boulders in excess of 400 mm diameter	Brown	Gravel and sand - Fine to medium, sub-rounded to sub-angular, (F:30% / M:30%)	Structureless	>3.0	20	35	50	5.7	0.028	5.7	3660
TP03	830-1600		Sandy CLAY		NA	Light brown	Low to medium plasticity	Massive	<0.06	NA	NA	8	-	-	-	-
TP03	1600-2500		Sandy CLAY		NA	Brown/red mottled Light brown/grey (30%)	Low to medium plasticity	Massive	<0.06	NA	NA	8	-	-	-	-

Location	Layer depth (mm)	Sample depth (mm)	Soil strata	Depth to GW	Coarse fragments (%)	Soil colour & mottling	Soil field texture	Soil structure	Indicative soil permeability (m/d) (Ksa^{-1})	Design loading rate (DLR) (mm/d) Trenches and beds			pH	EC (dS/m)	Sodicity (ESP) (%)	Phosphate Sorption Capacity (mg P sorbed/kg)
										Primary treated effluent		Secondary treated effluent				
										Conservative rate	Maximum rate					
Motocross Precinct																
TP04	0-220		(Topsoil) SAND with silt	Not intercepted	Roots and root fibres	Dark grey	Sand - Fine to medium	Structureless	>3.0	20	35	50	-	-	-	-
TP04	220-1250	400-800	Sandy GRAVEL		Contains approximately 10% Cobbles and Boulders in excess of 400 mm diameter	Brown	Gravel and sand - Fine to coarse, sub-rounded to sub-angular, (F:25% / M:20% / C:10%)	Structureless	>3.0	20	35	50	5.8	0.028	6.2	3000
TP04	1250-1750		Sandy CLAY		NA	Light brown/ orange	Low to medium plasticity	Massive	<0.06	NA	NA	8	-	-	-	-
TP04	1750-2500		Sandy CLAY		NA	Grey mottled red (30%) & orange (10%).	Low to medium plasticity	Massive	<0.06	NA	NA	8	-	-	-	-
TP05	0-230		(Topsoil) SAND with silt	Not intercepted	Roots and root fibres	Dark grey	Sand - Fine to medium	Structureless	>3.0	20	35	50	-	-	-	-
TP05	230-880	400-800	SAND with silt		NA	Grey	Sand - Fine to medium	Structureless	>3.0	20	35	50	5.4	0.004	<0.1	<250
TP05	880-2500		Sandy GRAVEL		Contains approximately 10% Cobbles and Boulders in excess of 400 mm diameter	Brown	Gravel and sand - Fine to coarse, sub-rounded to sub-angular, (F:15% / M:30% / C:10%).	Structureless	>3.0	20	35	50	-	-	-	-
TP06	0-350		(Topsoil) SAND with silt	Not intercepted	Roots and root fibres	Dark grey	Sand - Fine to medium	Structureless	>3.0	20	35	50	-	-	-	-
TP06	350-1200	500-800	Sandy GRAVEL		Contains approximately 10% Cobbles and Boulders in excess of 400 mm diameter	Brown	Gravel and sand - Fine to coarse, sub-rounded to sub-angular, (F:20% / M:20% / C:10%)	Structureless	>3.0	20	35	50	5.9	0.02	1.4	966
TP06	1200-1800		Sandy GRAVEL			Brown	Gravel and sand - Fine to coarse, sub-rounded to sub-angular, (F:20% / M:30% / C:10%)	Structureless	>3.0	20	35	50	-	-	-	-
TP06	1800-2500		Sandy GRAVEL			Brown	Gravel and sand - Fine to coarse, sub-rounded to sub-angular, (F:40% / M:20%)	Structureless	>3.0	20	35	50	-	-	-	-

3.3 Site assessment results

Based on an assessment of the soil physical and chemical results for the six test pit locations in Table 5, it is recommended that the LAAs for the Race Track and Motocross Precincts are located at TP01 and TP06, respectively.

– Motocross Precinct (TP06):
  - AS1547 soil type = Gravel
  - Indicative soil permeability (Ksat) = > 3.0 m/d
  - Design irrigation rate = 5 mm/d
– Race Track Precinct (TP01):
  - AS1547 soil type = Light clay
  - Indicative soil permeability (Ksat) = < 0.06 m/d
  - Design irrigation rate = 3 mm/d

As per the DOHWA (2021) guidance, a Level of Constraint (Low, Moderate or High) is determined by applying a risk assessment to each site characteristic and the following mitigation measures may be applied:

– Nil or Low
  - *If all constraints are Low, standard designs are generally satisfactory and no mitigation measures are required.*
– Moderate
  - *For each Moderate constraint an appropriate mitigation measure or design modification over and above that of a standard design, should be outlined.*
– High
  - *Any High constraint might prove an impediment to successful on-site wastewater management, or alternatively will require in-depth investigation and incorporation of sophisticated mitigation measures in the design to permit compliant onsite wastewater management.*

A summary of site assessment results, including the level of constraint for each characteristic, within the Motocross Precinct in Table 6 and Race Track Precinct is outlined in Table 7.

3.3.1 Motocross Precinct

A summary of site assessment results for SSE for the recommended LAA within the Motocross Precinct (TP06) has been provided in Table 6.

Table 6 Summary of site assessment results for SSE of the proposed LAA within the Motocross Precinct (TP06)

Characteristic	Level of Constraint			Results for TP06	Assessed Level of Constraint for Site
	Nil or Low	Moderate	High		
General Characteristics					
Climate (difference between average annual rainfall and average pan evaporation, mm/year)	Excess of evaporation over rainfall in the wettest months	Rainfall approximates to evaporation	Excess of rainfall over evaporation in the wettest months	Rainfall in excess of evaporation from May to September	**High**
Exposure to sun and wind	Full sun and/or high wind or minimal shading and North / North-East	Dappled light East / West / South-East / South-West aspect	Limited patches of light and little wind to heavily shaded all day and South aspect	Full sun	**Nil or Low**

Characteristic	Level of Constraint			Results for TP06	Assessed Level of Constraint for Site
	Nil or Low	Moderate	High		
	/North-West aspect				
Vegetation coverage over the site	Plentiful vegetation with healthy growth and good potential for nutrient uptake Turf or pasture	Limited variety of vegetation	Sparse vegetation or no vegetation, dense forest with little understorey	Good cover of existing pasture	**Nil or Low**
Landslip (or landslip potential)	Nil	Low to moderate	High or Severe	No landslip evident	**Nil or Low**
Slope Form (affects water shedding ability)	Hill crests, convex or divergent side-slopes and plains	Straight side-slopes and footslopes	Floodplains, concave or convergent side-slopes and incised channels	Straight waxing upperslope (UX)	**Moderate**
Site Drainage (qualitative)	No visible signs or likelihood of dampness, even in wet season	Some signs or likelihood of dampness Moist soil but no standing water in soil pit	Wet soil, moisture-loving plants, standing water in pit; water ponding on surface	No visible signs or likelihood of dampness, even in wet season	**Nil or Low**
Slope gradient (%)					
(a) for absorption trenches and beds	<5%	5-15%	>15%	Approximately 6%	**Moderate**
(b) for surface/ subsurface irrigation	<10%	10-20%	>20%	Approximately 6%	**Nil or Low**
Erosion (or potential for erosion)	Nil or Low	Moderate	Severe	Good cover of existing pasture, upslope stormwater diversion and sub-surface irrigation proposed	**Nil or Low**
Fill (imported)	No fill at present or fill is good quality topsoil or minimal fill required	Moderate coverage and good quality fill	Extensive poor-quality fill and variable quality fill	No fill at present	**Nil or Low**
Flood frequency (AEP)	Less than 1 in 100 years	Between 100 and 20 years	More than 1 in 20 years	Less than 1 in 100 years	**Nil or Low**
Private bore used for household/drinking water purposes	No bores onsite or on neighbouring properties	>30 m to the nearest private bore	<30 m to the nearest private bore	APEC bores located >30 m	**Moderate**
Proximity to water resources	>100 m	<100 m but reduced setback is supported (refer to Section 5.2.2 of the GSP)	<100 m and reduced setback is not supported (refer to Section 5.2.2 of the GSP)	>100 m to Protected Exclusion Area and Marbellup Flats	**Nil or Low**

Characteristic	Level of Constraint			Results for TP06	Assessed Level of Constraint for Site
	Nil or Low	Moderate	High		
Public Drinking Water Source Areas (PDWSA) and Sewage Sensitive Areas (SSA)	Site not located within a PDWSA or SSA	Site located within a PDWSA or SSA	Site located within both a PDWSA and SSA	Priority 2 PDWSA – Marbellup Brook Catchment Area SSA (<1 km from conservation category wetland)	**High**
Groundwater (wettest time of the year)	>2 m	2.0 – 0.6 m need for fill to achieve setbacks listed in Appendix 1	<0.6 m fill is not practical to achieve setbacks listed in Appendix 1	Groundwater not intercepted >2.5 m	**Nil or Low**
Land area available for LAA	Exceeds the minimum required LAA size of AS1547 or Schedule 2 of the GSP	Meets the minimum required LAA size of AS1547 or Schedule 2 of the GSP	Insufficient area available for LAA as per AS1547 or Schedule 2 of the GSP	550 m^2 available for sub-surface irrigation	**Nil or Low**
Rock outcrops (% of surface)	<10%	10-20%	>20%	No rock outcrops observed	**Nil or Low**
Site Drainage (qualitative)	No visible signs or likelihood of dampness, even in wet season	Some signs or likelihood of dampness Moist soil but no standing water in soil pit.	Wet soil, moisture-loving plants, standing water in pit; water ponding on surface	No visible signs or likelihood of dampness, even in wet season	**Nil or Low**
Stormwater run-on/run-off	Low likelihood of stormwater run-on/run-off	Moderate likelihood of stormwater run-on/run-off, need for diversionary structures	High likelihood of inundation by stormwater run-on/run-off, diversion not practical	Upslope stormwater diversion proposed	**Nil or Low**
Soil profile characteristics					
Soil permeability Category (AS1547)	2 and 3	4 and 5	1 and 6	1	**High**
Profile depth	>2 m	2.0-1.0	< 1.0 m	2.5 m bgl	**Nil or Low**
Hardpan or bedrock	>1.5 m	1.5-0.6 m Special design requirements and distribution techniques or soil modification will be necessary, depends on quality of treated wastewater and type of LAS	<0.6 m	Sandy GRAVEL encountered to 2.5 m bgl	**Nil or Low**
Presence of mottling	None	Moderate	Extensive	None	**Nil or Low**
Coarse fragments	< 10%	10-40%	>40%	10% Cobbles and boulders in excess of 400 mm diameter	**Nil or Low**

Characteristic	Level of Constraint			Results for TP06	Assessed Level of Constraint for Site
	Nil or Low	Moderate	High		
pH	6.0 - 8.0	4.5 – 6.0	<4.5, >8	5.9 - pH between <5 and >8 therefore likely to be suitable for plant growth	**Moderate**
Electrical Conductivity (ECe)(dS/m)	<0.3	0.3 - 2	>2	0.02	**Nil or Low**
Sodicity ESP%	<3	3.0 - 8.0	>8	1.4	**Nil or Low**
Phosphorus adsorption (mg/kg)	>500	200-500	<200	966	**Nil or Low**

3.3.2 Race Track Precinct

A summary of site assessment results for SSE for the recommended LAA within the Race Track Precinct (TP01) has been provided in Table 7.

Table 7 Summary of site assessment results for SSE of the proposed LAA within the Race Track Precinct (TP01)

Characteristic	Level of Constraint			Results for TP01	Assessed Level of Constraint for Site
	Nil or Low	Moderate	High		
General Characteristics					
Climate (difference between average annual rainfall and average pan evaporation, mm/year)	Excess of evaporation over rainfall in the wettest months	Rainfall approximates to evaporation	Excess of rainfall over evaporation in the wettest months	Rainfall in excess of evaporation from May to September	**High**
Exposure to sun and wind	Full sun and/or high wind or minimal shading and North / North-East /North-West aspect	Dappled light East / West / South-East / South-West aspect	Limited patches of light and little wind to heavily shaded all day and South aspect	Full sun	**Nil or Low**
Vegetation coverage over the site	Plentiful vegetation with healthy growth and good potential for nutrient uptake Turf or pasture	Limited variety of vegetation	Sparse vegetation or no vegetation, dense forest with little understorey	Good cover of existing pasture	**Nil or Low**
Landslip (or landslip potential)	Nil	Low to moderate	High or Severe	No landslip evident	**Nil or Low**
Slope Form (affects water shedding ability)	Hill crests, convex or divergent side-slopes and plains	Straight side-slopes and footslopes	Floodplains, concave or convergent side-slopes and incised channels	Straight waxing upperslope (UX)	**Moderate**

Characteristic	Level of Constraint			Results for TP01	Assessed Level of Constraint for Site
	Nil or Low	Moderate	High		
Site Drainage (qualitative)	No visible signs or likelihood of dampness, even in wet season	Some signs or likelihood of dampness Moist soil but no standing water in soil pit	Wet soil, moisture-loving plants, standing water in pit; water ponding on surface	No visible signs or likelihood of dampness, even in wet season	**Nil or Low**
Slope gradient (%)					
(a) for absorption trenches and beds	<5%	5-15%	>15%	Approximately 6%	**Moderate**
(b) for surface/ subsurface irrigation	<10%	10-20%	>20%	Approximately 6%	**Nil or Low**
Erosion (or potential for erosion)	Nil or Low	Moderate	Severe	Good cover of existing pasture, upslope stormwater diversion and sub-surface irrigation proposed	**Nil or Low**
Fill (imported)	No fill at present or fill is good quality topsoil or minimal fill required	Moderate coverage and good quality fill	Extensive poor-quality fill and variable quality fill	No fill at present	**Nil or Low**
Flood frequency (AEP)	Less than 1 in 100 years	Between 100 and 20 years	More than 1 in 20 years	Less than 1 in 100 years	**Nil or Low**
Private bore used for household/drinking water purposes	No bores onsite or on neighbouring properties	>30 m to the nearest private bore	<30 m to the nearest private bore	APEC bores located >30 m	**Moderate**
Proximity to water resources	>100 m	<100 m but reduced setback is supported (refer to Section 5.2.2 of the GSP)	<100 m and reduced setback is not supported (refer to Section 5.2.2 of the GSP)	>100 m to Protected Exclusion Area and Marbellup Flats	**Nil or Low**
Public Drinking Water Source Areas (PDWSAs) and Sewage Sensitive Areas (SSA)	Site not located within a PDWSA or SSA	Site located within a PDWSA or SSA	Site located within both a PDWSA and SSA	Priority 2 PDWSA – Marbellup Brook Catchment Area and SSA (<1 km from conservation category wetland)	**High**
Groundwater (wettest time of the year)	>2 m	2.0 – 0.6 m need for fill to achieve setbacks listed in Appendix 1	<0.6 m fill is not practical to achieve setbacks listed in Appendix 1	Groundwater not intercepted >2.5 m	**Nil or Low**
Land area available for LAA	Exceeds the minimum required LAA size of AS1547 or Schedule 2 of the GSP	Meets the minimum required LAA size of AS1547 or Schedule 2 of the GSP	Insufficient area available for LAA as per AS1547 or Schedule 2 of the GSP	Sufficient area available for sub-surface irrigation	**Nil or Low**
Rock outcrops (% of surface)	<10%	10-20%	>20%	No rock outcrops observed	**Nil or Low**

Characteristic	Level of Constraint			Results for TP01	Assessed Level of Constraint for Site
	Nil or Low	Moderate	High		
Site Drainage (qualitative)	No visible signs or likelihood of dampness, even in wet season	Some signs or likelihood of dampness Moist soil but no standing water in soil pit.	Wet soil, moisture-loving plants, standing water in pit; water ponding on surface	No visible signs or likelihood of dampness, even in wet season	**Nil or Low**
Stormwater run-on/run-off	Low likelihood of stormwater run-on/run-off	Moderate likelihood of stormwater run-on/run-off, need for diversionary structures	High likelihood of inundation by stormwater run-on/run-off, diversion not practical	Upslope stormwater diversion proposed	**Nil Low**
Soil profile characteristics					
Soil permeability Category (AS1547)	2 and 3	4 and 5	1 and 6	5	**Moderate**
Profile depth	>2 m	2.0-1.0	< 1.0 m	2.5 m bgl	**Nil or Low**
Hardpan or bedrock	>1.5 m	1.5-0.6 m Special design requirements and distribution techniques or soil modification will be necessary, depends on quality of treated wastewater and type of LAS	<0.6 m	Sandy CLAY intercepted at 550 mm bgl	**High**
Presence of mottling	None	Moderate	Extensive	Sandy CLAY mottled	**Moderate**
Course fragments	< 10%	10-40%	>40%	10% Cobbles and boulders in excess of 250 mm diameter	**Nil or Low**
pH	6.0 - 8.0	4.5 – 6.0	<4.5, >8	6.1	**Nil or Low**
Electrical Conductivity (ECe)(dS/m)	<0.3	0.3-2	>2	0.022	**Nil or Low**
Sodicity Exchangeable sodium percentage (ESP%)	<3	3.0 - 8.0	>8	5.8 – no evidence of dispersion, slaking, or structural decline	**Moderate**
Phosphorus adsorption (mg/kg)	>500	200-500	<200	688	**Nil or Low**

3.3.3 Mitigation measures

The majority of constraints assessed in 3.3.1 and 3.3.1 were found to be Nil or Low, however several key constraints were found to be High or Moderate. Proposed mitigation measures for the aspects which are considered to have a High or Moderate constraint within the Race Track Precinct and Motocross Precinct are included in Table 8.

Table 8 Proposed mitigation measures for High and Moderate constraints

Constraints		
Race Track Precinct	**Motocross Precinct**	**Proposed mitigation measures**
High		
Climate - Rainfall in excess of evaporation from May to September		Diversion of stormwater from upslope around sub-soil irrigation area
Priority 2 PDWSA – Marbellup Brook Catchment Area and SSA (<1 km from conservation category wetland)		The proposed LAA achieves a 2 m vertical separation to groundwater
Hardpan or bedrock <0.6 m - Sandy CLAY intercepted at 550 mm bgl	-	Amend soils in LAA
-	Soil permeability Category (AS1547) – (1) Gravels and sands	Accommodate permeability via Design Loading Rates (DLRs) and Design Irrigation Rates (DIRs)
Moderate		
Slope Form (affects water shedding ability) – Straight waxing upperslope		Diversion of stormwater from upslope around sub-soil irrigation area
Slope gradient (%) (a) for absorption trenches and beds – 5-15%		No absorption trenches or beds proposed
APEC bores located >30 m		APEC bore located 250 m away – no modification considered necessary
Presence of mottling - Sandy CLAY mottled	-	Amend soils in potential LAA
Soil permeability Category (AS1547) – (5) Light clay	-	Accommodate permeability via Design Loading Rates (DLRs) and Design Irrigation Rates (DIRs)
Sodicity ESP – 5.8%	-	No evidence of dispersion, slaking or structural decline in the soils on or near the potential LAA
-	pH 5.9	No evidence of scald or bare areas on or near the potential LAA

4. Wastewater management system type and design

4.1 Specific assessment SSE – Sizing for treatment system and land application area

The sizing for a wastewater treatment system and LAA has been developed in this SSE report for Stage 1A in the Motocross Precinct only.

As per the requirements of the Department of Water *WQPN 100* (DoW, 2007) and the *Government Sewerage Policy* (DPLH, 2019) a 'Secondary' wastewater treatment plant, with engineering certification to meet effluent quality of Biological Oxygen Demand (BOD) < 20 mg/L; Total Suspended Solids (TSS) < 30 mg/L; Total Nitrogen (TN) < 10 mg/L; Total Phosphorus (TP) < 1 mg/L; and *Escherichia coli* < 10 cfu/100mL is required in a Priority 2 PDWSA.

It is recommended to install a 'Secondary' treatment system, with nutrient removal such as Aquarius Wastewater Systems Pty Ltd, which provide DOHWA approved systems. An example of the type of system that would meet the requirement of a 'Secondary' treatment system is provided in Appendix F. These systems have a nutrient reduction capability of which includes reduction of TN to < 10 mg/L and TP to < 1 mg/L and are certified to AS1546.3:2008.

4.1.1 Water balance

A water balance has been developed for the operation of the wastewater system, as per the water balance in the DOHWA (2021) guidance, for Stage 1A of the AMP development in the Motocross Precinct and included in Appendix B.

The water balance has been developed based on the following:

– A design wastewater flow of 3,500 L/day (average of 100 persons and 15,000 L storage tank)
– Design irrigation rate for sub-surface irrigation of 5.0 mm/day
– Rainfall run-off factor of 0.9
– Mean monthly rainfall levels at the Albany Airport Comparison weather station (BoM, 2021)
– Pan evaporation data (DPIRD, 1987)

The results of the water balance for the Motocross Precinct, for an average of 100 persons/day, indicate that 1,100 m^2 will be required for the sub-soil irrigation area. There is adequate area of land available within the vicinity of TP06 to accommodate the site of the required LAA.

4.2 Siting and configuration of the Land Application Area

4.2.1 Setback distances

Based on an assessment of the soil physical and chemical results for the six test pit locations in Table 5, it is recommended that the LAAs for the Race Track and Motocross Precincts are located at TP01 and TP06, respectively.

All sub-soil irrigation areas will be located >100 m to Protected Exclusion Area and Marbelup Flats (Conservation Class wetland) (Figure 3, Appendix A).

The sub-soil irrigation area will be fenced and will be separate from the activities within the Precinct to maintain public amenity.

4.2.2 Stormwater management

Stormwater management will include diversion drains, water treatment areas and attenuation basins to control stormwater across the Race Track Precinct and Motocross Precinct as per the Stormwater Management Plan (GHD, 2021) prepared for the Development Application for the AMP.

5. Monitoring, operation and maintenance

Baseline groundwater and surface water quality sampling of the Site was undertaken by Bio Diverse Solutions in 2018 and 2019 (Bio Diverse Solutions, 2018). DWER has been consulted during the development of the Site Local Water Management Strategy (LWMS) (GHD, 2021) as part of the Scheme Amendment process. The following surface and groundwater pre-development, construction and post-development monitoring is outlined as per the approved LWMS.

5.1 Surface water monitoring

5.1.1 Pre-development and construction monitoring

Ongoing quarterly monitoring of existing Site surface water conditions shall be continued prior to development, and during construction of the AMP as per the Local Water Management Strategy approved by DWER as part of the Scheme Amendment process.

In combination with the existing 2018 and 2019 data, the ongoing monitoring will be used as a baseline for ongoing assessment of the potential impact of the development on shallow groundwater and surface water quality. Additionally, pre-development water monitoring data will be used to identify water quality trigger levels at which a response is required.

For surface water monitoring during the construction phase of the development, a CEMP shall be prepared by the Contractor which will include erosion and sedimentation control measures, as well as drainage and dewatering systems (if required) in order to minimise potential pollution impacts and prevent contamination to surface water and groundwater.

5.1.2 Post-development monitoring

Ongoing monthly monitoring of surface water conditions shall be continued post-development (for the duration of the operation of the facility), with continued monitoring at sites CS01 and CS02, and establishment of a new upstream monitoring location. Additional sampling shall also be undertaken in response to any spill events.

The post-development monitoring program will also involve the collection of grab samples from the compensating basins. Sampling of basins should comprise 3-4 events per year, during or immediately following significant rainfall events (1EY, 1 year ARI event). It is assumed the first flush events will have the highest level of nutrients and chemicals, therefore sampling should occur at the time/after the first significant rainfall event of each wet season, and after extended dry periods. Field notes should include details of the rainfall events, site conditions, time of sampling and time of sample testing.

Monitoring of the compensation basin inlet and outlet water quality will be used to assess performance of the basins in improving stormwater quality.

Annual water monitoring reports shall be submitted to DWER and the Water Corporation. A water quality response and contingency plan will be prepared and provided to the Water Corporation, City of Albany and DWER for advice.

5.1.3 Monitoring program summary

The recommended monitoring parameters for the ongoing pre-development, construction and post-development monitoring program are outlined in Table 9.

Table 9 Summary of surface water monitoring

Site	Frequency	Duration	Parameters
Surface water - Upstream of the site (TBC) - Mid-stream (CS02) - Downstream of the site (CS01)	Monthly	Ongoing, with annual reporting	In-situ: pH, EC, temperature Unfiltered sample: pH, EC, TN, FRP, TKN, ammonia, TP, TRH, PAH, BTEXN, Surfactants, microbial analysis Filtered sample: Filtered total nitrogen and filtered total phosphorus (to quantify organic component), NO_2/NO_3, PO_4, dissolved heavy metals (As, Cd, Cr, Cu, Pb, Ni, Zn, Hg)
Compensating basin - Inlet (4 No.) - Outlet (4 No.)	3-4 events per year following 1EY rainfall events		

5.2 Groundwater monitoring

5.2.1 Pre-development and construction monitoring

Ongoing monitoring of existing Project Site shallow groundwater conditions shall be continued prior to development, and during construction of the AMP. In combination with the existing 2018 and 2019 data, the ongoing monitoring will be used as a baseline for ongoing assessment of the potential impact of the development on shallow groundwater and surface water quality.

Additionally, pre-development water monitoring data will be used to identify water quality trigger levels at which a response is required.

5.2.2 Post-development monitoring

A groundwater monitoring network should be established post development, the locations of which will be based on groundwater monitoring strategy.

Ongoing monitoring of the groundwater monitoring bores shall be conducted for the duration of the operation of the facility and in accordance with the groundwater monitoring program in Table 10.

Annual water monitoring reports will be submitted to DWER and the Water Corporation.

A water quality response and contingency plan will be prepared and provided to the Water Corporation, City of Albany and DWER for advice.

In addition if the development proposal seeks a licence to take water and approval to install a production bore for abstraction of groundwater as a water supply source for the development, then six-monthly groundwater monitoring for water levels and salinity will be a required.

5.2.3 Monitoring program summary

The program and parameters outlined in Table 10 will provide a suitable representation of groundwater quality at the site. The groundwater bores established for pre-development monitoring will be used for construction phase and incorporated into the post-development monitoring network.

Table 10 Summary of groundwater monitoring

Site	Frequency	Duration	Parameters
Monitoring bores Production bore	Monthly	Pre-development, during construction, on-going throughout the life of development.	Water level
			In-situ: pH, EC, temperature Unfiltered sample: pH, EC, TN, FRP, TKN, ammonia, TP, TRH, PAH, BTEXN, Surfactants, microbial analysis Filtered sample: Filtered total nitrogen and filtered total phosphorus (to quantify organic component), NO_2/NO_3, PO_4, dissolved heavy metals (As, Cd, Cr, Cu, Pb, Ni, Zn, Hg)

5.2.4 Contingency measures

Pre-development water monitoring data shall be used to identify water quality trigger levels at which a management response is required. A water quality response and contingency plan shall be included in the surface and groundwater monitoring plans.

In the event of a major water quality incident at the Site, it is recommended that increased monitoring be undertaken to quantify if there is any impact to surface and groundwater quality. Contingency monitoring and response measures shall be developed in consultation with DWER and documented in the post-development monitoring program.

Potential incidents due to system failure and/ or mechanical breakdown during operation and maintenance of the installed system shall be addressed, as required, as per the manufacturer and installation instructions.

6. Conclusion and recommendations

The SSE report for the AMP site involved evaluation of site and soil, physical and chemical properties, to identify appropriate onsite effluent disposal LAAs within the Race Track Precinct and Motocross Precinct. Based on an assessment of the soil physical and chemical results for the six test pit locations, it is recommended that the LAAs for the Race Track Precinct and Motocross Precinct are located at TP01 and TP06, respectively.

The sizing for a wastewater treatment system and LAA has been developed in this SSE report for Stage 1A in the Motocross Precinct only.

The proposed clubhouse within the Motocross Precinct will be constructed in Stage 1A of the development. It is anticipated that this will be an unlicenced facility (15 L/ person/ day) however provision has been made for anticipated wastewater volumes for a licenced facility (35 L/ person/ day), to allow for possible increased loading at the site if it were to become a licenced facility.

The Motocross Precinct clubhouse is expected to have intermittent use throughout the Motocross season and on a weekly basis, with up to 300 patrons on Sunday or Saturday followed by minimal usage during the week and off-season downtime. Therefore, for the purpose of calculating anticipated wastewater volumes it is assumed that there is an average of 100 people/ day.

In order to accommodate spikes in wastewater volumes on event days when there is up to 300 patrons using the Motocross Precinct clubhouse facilities, it is proposed to install a 15,000 L holding tank, to balance storage over the course of a typical week.

The results of a water balance for the Motocross Precinct, for an average of 100 persons/day, indicate that 1,100 m^2 will be required for the sub-soil irrigation area. There is adequate area of land available within the vicinity of TP06 to accommodate the site of the required LAA.

As per the requirements of the Department of Water *WQPN 100* (DoW, 2007) and the *Government Sewerage Policy* (DPLH, 2019) a 'Secondary' wastewater treatment plant, with engineering certification to meet effluent quality of Biological Oxygen Demand (BOD) < 20 mg/L; Total Suspended Solids (TSS) < 30 mg/L; Total Nitrogen (TN) < 10 mg/L; Total Phosphorus (TP) < 1 mg/L; and *Escherichia coli* < 10 cfu/100mL is required in a Priority 2 PDWSA.

It is recommended that a DOHWA approved 'Secondary' treatment system, certified to AS1546.3:2008, is selected and installed for the Motocross Precinct during Stage 1A of development.

At time of writing, an onsite effluent disposal system was not proposed to be installed in the Race Track Precinct. All liquid waste from transportable buildings, toilets and washdown facilities is proposed to be removed offsite, as required, by an approved contractor. If onsite effluent disposal is proposed in the future is it expected a similar system, with holding tank, will be utilised to manage spikes in wastewater volumes for events and off-season downtime.

In addition it is recommended, as per the DOHWA (2021) guidelines, that the following is undertaken:

- *Have a suitably qualified maintenance contractor service the secondary and advanced secondary treatment system every three months, as required by Council under the approval to operate.*
- *Annual inspections should be undertaken on treatment tanks and desludging undertaken on annual, two yearly or four yearly cycles depending on the size of the tank installed.*
- *All land application systems should be sited in an area that will not be frequented by vehicle or foot traffic or will not be built on or covered with paved over.*
- *Any subsurface irrigation areas should be vegetated (i.e. with grass that can be mown regularly) to encourage growth and maximise nutrient uptake.*
- *Irrigation lines should be maintained as per manufacturer's instructions (e.g. flushing).*
- *Stormwater and surface run-on should be diverted around, or away from, land application areas.*

- *Landowners should be cognisant of the operation of their system and monitor the treatment and land application area to identify any potential issues (e.g. insufficient septic treatment, clogging of the system, pooling of treated effluent).*
- *The volume of wastewater produced should remain the same and not exceed the operational capacity of the system, it will ensure the effective long-term operation of the systems*
- *Chemicals, large quantities of cleaning products, fats, oils and grease, and food scraps should not be discharged to the wastewater treatment and disposal system, as they risk overloading or interfering with the functioning of the system.*

7. References

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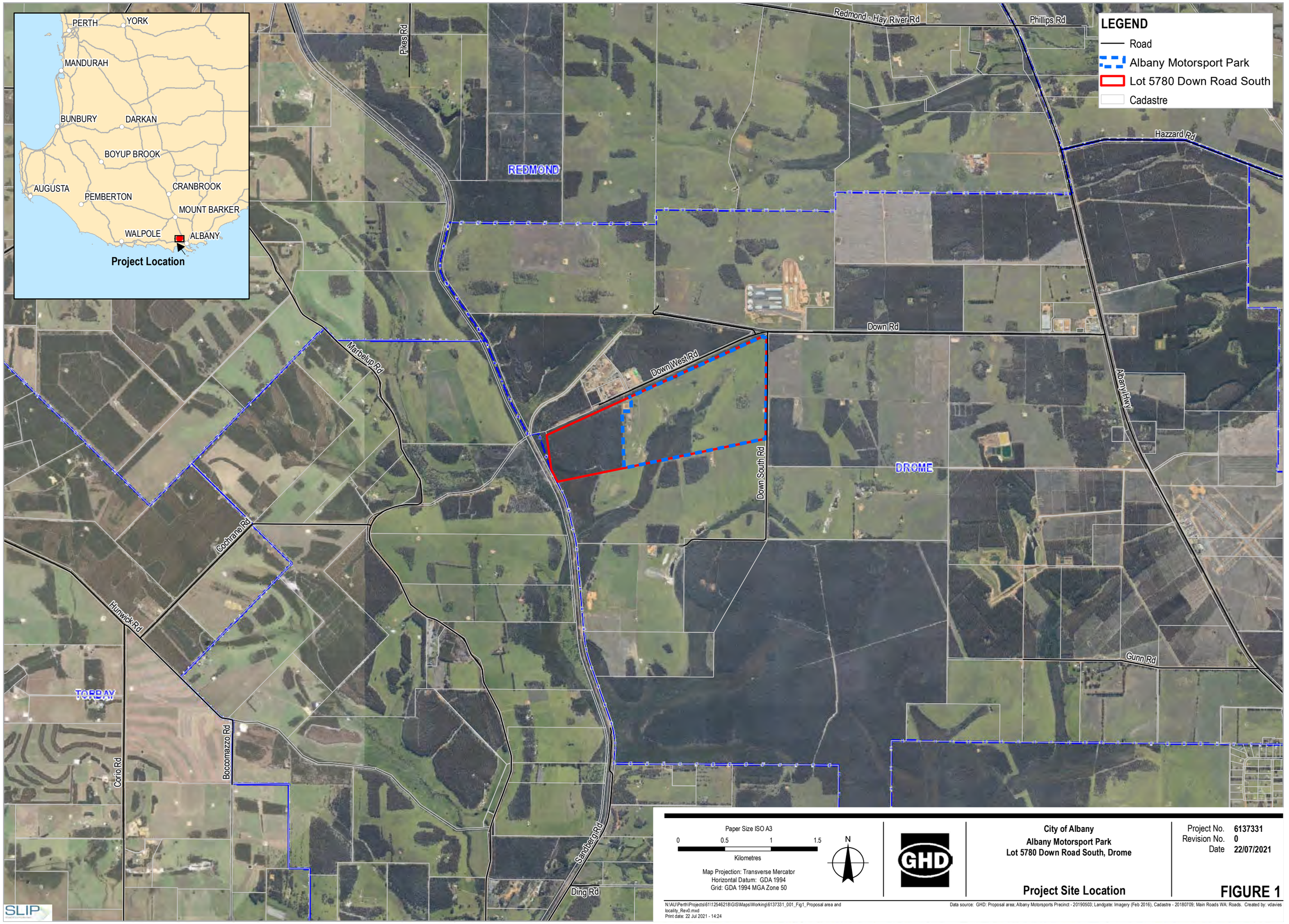
Appendix A

Figures



Paper Size ISO A3

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Kilometres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

N

GHD

City of Albany
Albany Motorsport Park
Lot 5780 Down Road South, Drome

Project Site Location

Project No. **6137331**
Revision No. **0**
Date **22/07/2021**

FIGURE 1

N:\AU\Perth\Projects\61\12546218\GIS\Maps\Working\6137331_001_Fig1_Proposal area and locality_Rev0.mxd
Print date: 22 Jul 2021 - 14:24

Data source: GHD: Proposal area; Albany Motorsports Precinct - 20190503; Landgate: Imagery (Feb 2016), Cadastre - 20180709; Main Roads WA: Roads. Created by: vdavies

LEGEND

STAGE 1A

STAGE 1B

MB - MONITORING BORE

DMB - DEEP MONITORING BORE

DOWN ROAD

RT ROAD 7m GRAVEL WITH 2m WIDE VERGES

BOUNDARY AND PRECINCT FENCING - 1.8m HIGH

PROPOSED LEFT TURN LANE OFF DOWN ROAD

ENTRY / EXIT TO PARK

SECURE GATE

SECURITY FENCE

FUTURE RACE TRACK GATEHOUSE

7m WIDE GRAVEL EMERGENCY EXIT (GATED 8m)

POTENTIAL LOCATION WATER SUPPLY FOR FIRE FIGHTING - 110,000L / OR SIMILAR SUITABLE SOURCE

7m WIDE GRAVEL EMERGENCY EXIT (GATED 8m)

POTENTIAL EFFLUENT SYSTEM LOCATION

TRIALS TRACK

BUNDED CONCRETE RE-FUELING & WASHDOWN AREA WITH WASTE WATER TRAP & WATER TANK

AREA FOR SELF-CONTAINED TEMPORARY FOOD VANS

TRANSPORTABLE TOILETS ZONE

PROPOSED SINGLE STOREY MULTIPURPOSE BUILDING (FIRST AID, SCRUTINEERING & STORAGE) BUILDING (~250m² - WOODLAND GREY) WITH WATER TANK & ADJACENT DISABLED BAYS AS REQUIRED

EXISTING DAM

JUNIOR MOTOCROSS AREA

GATE

COVERED CONCRETE BUNDED AREAS FOR GENERATOR (FUEL)

OPEN AIR EMERGENCY MUSTER AREA

NATIVE BUSH

EXISTING FENCE

FENCE - 1.8m HIGH

4WD DRIVER TRAINING & ATV PRECINCT

4m FIRE ACCESS TRACK (GRAVEL) WITH 1m HARDENED SHOULDERS

BOUNDARY

PEDESTRIAN ACCESS

OVERFLOW PARKING SPECTATOR ZONE

MOTOCROSS TRACK 2.1km x 8m WIDE

MOTOCROSS PRECINCT

FENCE - 1.8m HIGH

GRASSED AREA - LOW FUEL MAINTAINED

WETLAND FENCING - 1.2m HIGH

50m WIDE LOW FUEL BUFFER

PROTECTED EXCLUSION AREA

EXISTING VEGETATED CREEK ZONE NO PROPOSED WORK

FUTURE MOTOCROSS GATEHOUSE

4m FIRE ACCESS TRACK (GRAVEL) WITH 1m HARDENED SHOULDERS

WETLAND FENCED IN STAGE 1A

4m FIRE ACCESS TRACK (GRAVEL) WITH 1m HARDENED SHOULDERS

RE-VEGETATED CREEK ZONE

PROTECTED EXCLUSION AREA

GRASSED AREA - LOW FUEL MAINTAINED

GRASSED AREA - LOW FUEL MAINTAINED

RACE TRACK PRECINCT

3.5km x 12m RACE TRACK

TURN 1

TURN 2

TURN 3

TURN 4

TURN 5

TURN 6

TURN 7

TURN 8

TURN 9

TURN 10

TURN 11

SECTION DETAIL REFER A-02

SEALED RECOVERY AREA

GRAVEL BED RUN-OFF

GRAVEL BED RUN-OFF

CONCRETE BARRIER & SAFETY FENCE

SPECTATOR VIEWING AREA (GRASSED & TREES - LOW FUEL)

SPECTATOR PARKING HARDSTAND (250 BAYS) AND FUTURE OVERFLOW PARKING AREA

OVERFLOW PARKING

BOUNDARY (FENCE)

DOWN ROAD SOUTH (GRAVEL)

TRANSPORTABLE SINGLE STOREY CLUBROOMS & TOILETS ~350m²

POTENTIAL EFFLUENT SYSTEM LOCATION

EMERGENCY MUSTER AREA (BITUMEN)

DRIFT TRAINING AREA

COVERED PIT LANE STRUCTURE & HARD STAND

EXISTING WESTERN POWER AERIAL POWER LINE

TRANSPORTABLE FIRST AID / AMBULANCE CONTROL ROOM ~50m²

COMPETITOR PARKING / MARSHALLING

EXISTING GRAVEL ROAD

FUTURE STORAGE SHEDS - NO FUEL OR COMBUSTIBLE MATERIALS STORAGE

WATER SUPPLY FOR FIRE FIGHTING - 110,000L

WATER BORE

TREES ONLY STAGE 1A

EARTH BACKED TYRE / CONCRETE BARRIER AND TREE LINED SHELTER BELT

4m FIRE ACCESS TRACK (GRAVEL) WITH 1m HARDENED SHOULDERS

7m WIDE GRAVEL EMERGENCY EXIT (GATED 8m)

MB

DMB

MASTERPLAN

SCALE 1:2500 @ A1

SCALE 1:5000 @ A3

rev	date	description
A	15-04-2021	ISSUED FOR CLIENT REVIEW
B	27-04-2021	ISSUED FOR CLIENT REVIEW
C	12-05-2021	ISSUED FOR CLIENT REVIEW
D	26-05-2021	ISSUED FOR CLIENT REVIEW
E	05-07-2021	ISSUED FOR DA

p.o. box 1502, albany, western australia 6331
telephone: (08) 9841 5455
email: admin@rgarchitects.com.au

Roberts Gardiner Architects

project
Albany Motorsport Park
Lot 5780 Down Rd, Drome, WA 6330
client
City of Albany

Masterplan - Stage 1

cad file

drawn CB

project number 21-002

scale 1:2500 @A1

date JULY 2021

dwg no. A-01

rev. E

Soil Landscape Mapping

242KgDMc - Sands and laterite on elongate crests; Jarrah-Albany Blackbutt-Marri forest.

242KgS7f - Footslopes and swampy valley floors of minor valleys

242KgS7h - Broad valleys in sedimentary rocks; 30 m relief; smooth slopes. Deep sands and iron podzols on slopes; Albany Blackbutt-jarrah-sheoak woodland. Podzols and yellow duplex soils on floors; paperbark woodland, teatree heath.

242ReDMc - Sands and laterite on elongate crests; Jarrah-Albany Blackbutt-Marri forest.

242ReRD - Broadly undulating plateau; scattered lakes and depressions. Yellow duplex soils and laterite on plains. Marri-Jarrah-Albany Blackbutt forest. Yellow solonetzic soils in depressions; Paperbark woodland.

LEGEND

- Project Site
- Cadastre
- Test Pit Locations

242ReRD

Down Rd

242ReDMc

Down West Rd

242KgS7h

242KgDMc

TP04

TP05

TP06

TP01

TP02

TP03

Down South Rd

242KgS7h

242KgS7h

242KgS7f

242KgDMc

242KgS7h

242KgDMc

SLIP

Paper Size ISO A3

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Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

N

GHD

City of Albany
Albany Motorsport Park
Lot 5780 Down Road South, Drome

DPIRD Soil Landscape Mapping Units and Test Pit Locations

Project No. **12546218**
Revision No. **0**
Date **02/08/2021**

FIGURE 3

Data source: GHD: Project Site - 20180702; Landgate: Imagery (Feb 2016), Cadastre, Roads - 20180709; DPIRD: Soil Landscape Mapping (Best Available) - 20171220. Created by: vdavies

Paper Size ISO A3

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Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

N

GHD

City of Albany
Albany Motorsport Park

Groundwater Conditions, Topography and Test Pit Locations

Project No. **12546218**
Revision No. **0**
Date **2/08/2021**

FIGURE 4

N:\AU\Perth\Projects\61\12546218\GIS\Maps\Working\12546218\12546218_Effluent disposal.aprx\12546218_SMP_GroundwaterConditions_RevA
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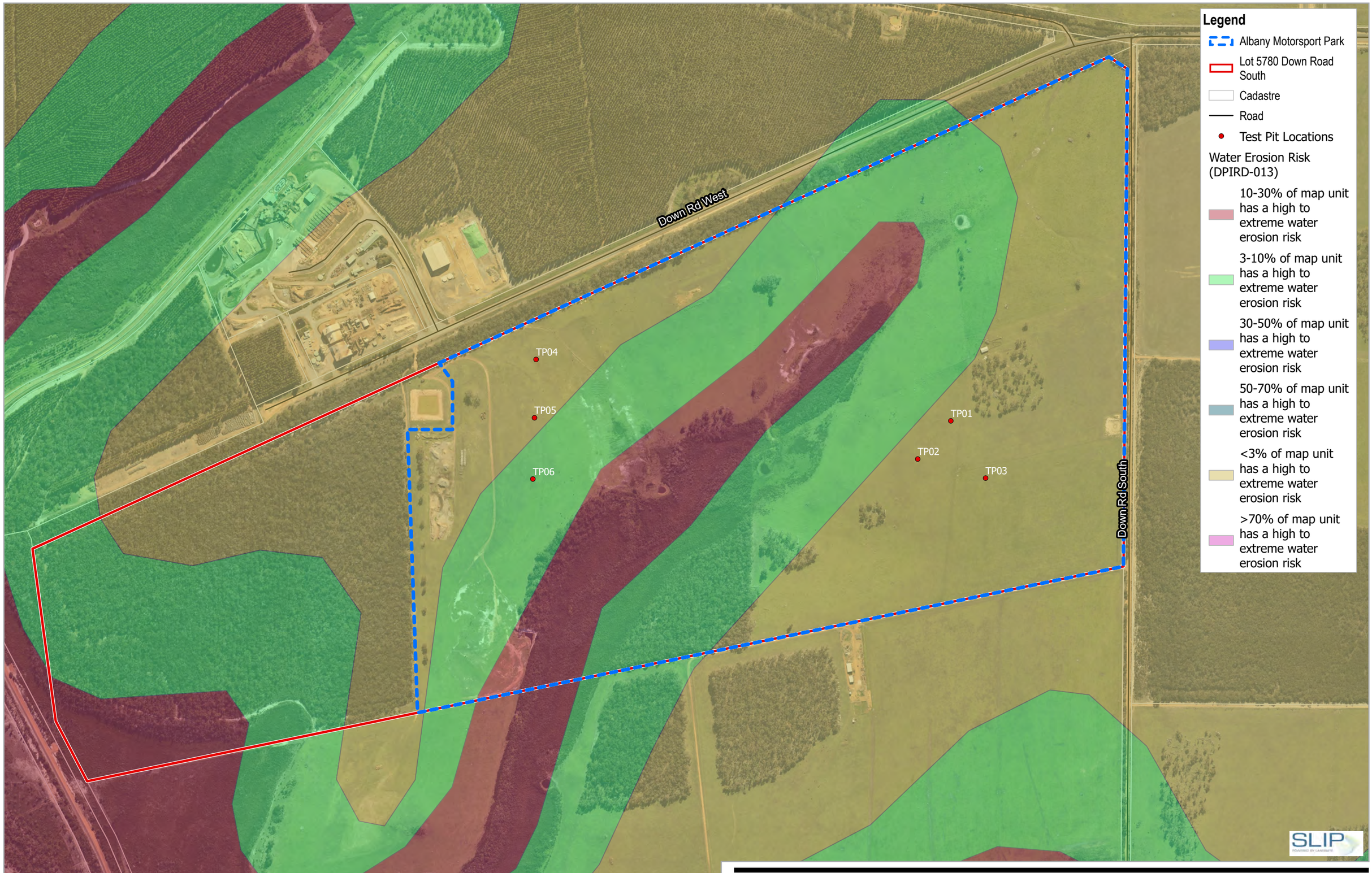

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Map Projection: Transverse Mercator
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Grid: GDA 1994 MGA Zone 50

GHD

City of Albany
Albany Motorsport Park

Water Erosion Risk (DPIRD-013)

Project No. **12546218**
Revision No. **0**
Date **4/08/2021**

Figure 5

C:\Users\vdavies\Desktop\Motor sports\12546218_Effluent disposal.aprx\12546218_SMP_SSE_Water Erosion Risk_Rev0
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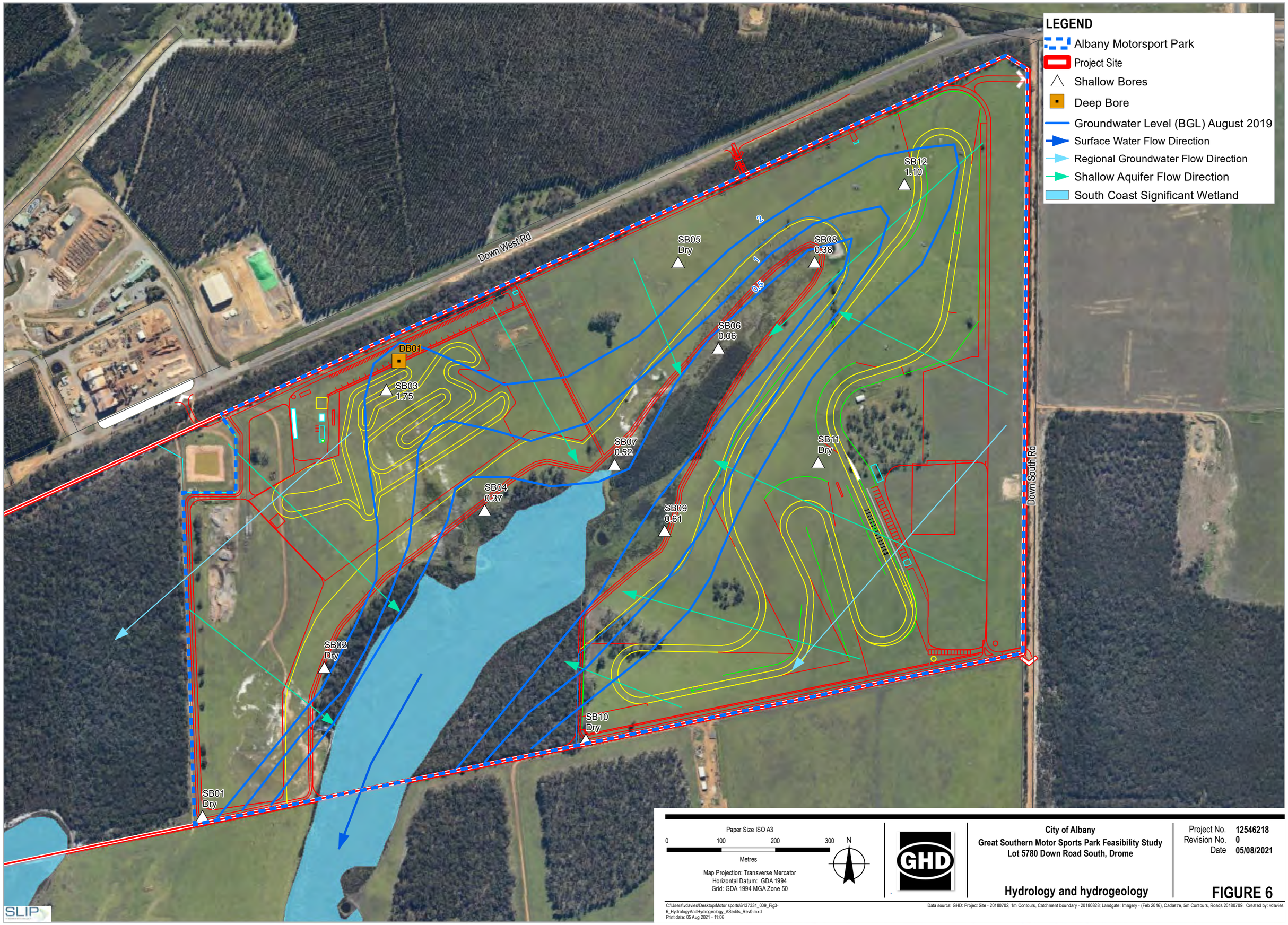

Paper Size ISO A3

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Metres

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Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

GHD

City of Albany
Great Southern Motor Sports Park Feasibility Study
Lot 5780 Down Road South, Drome

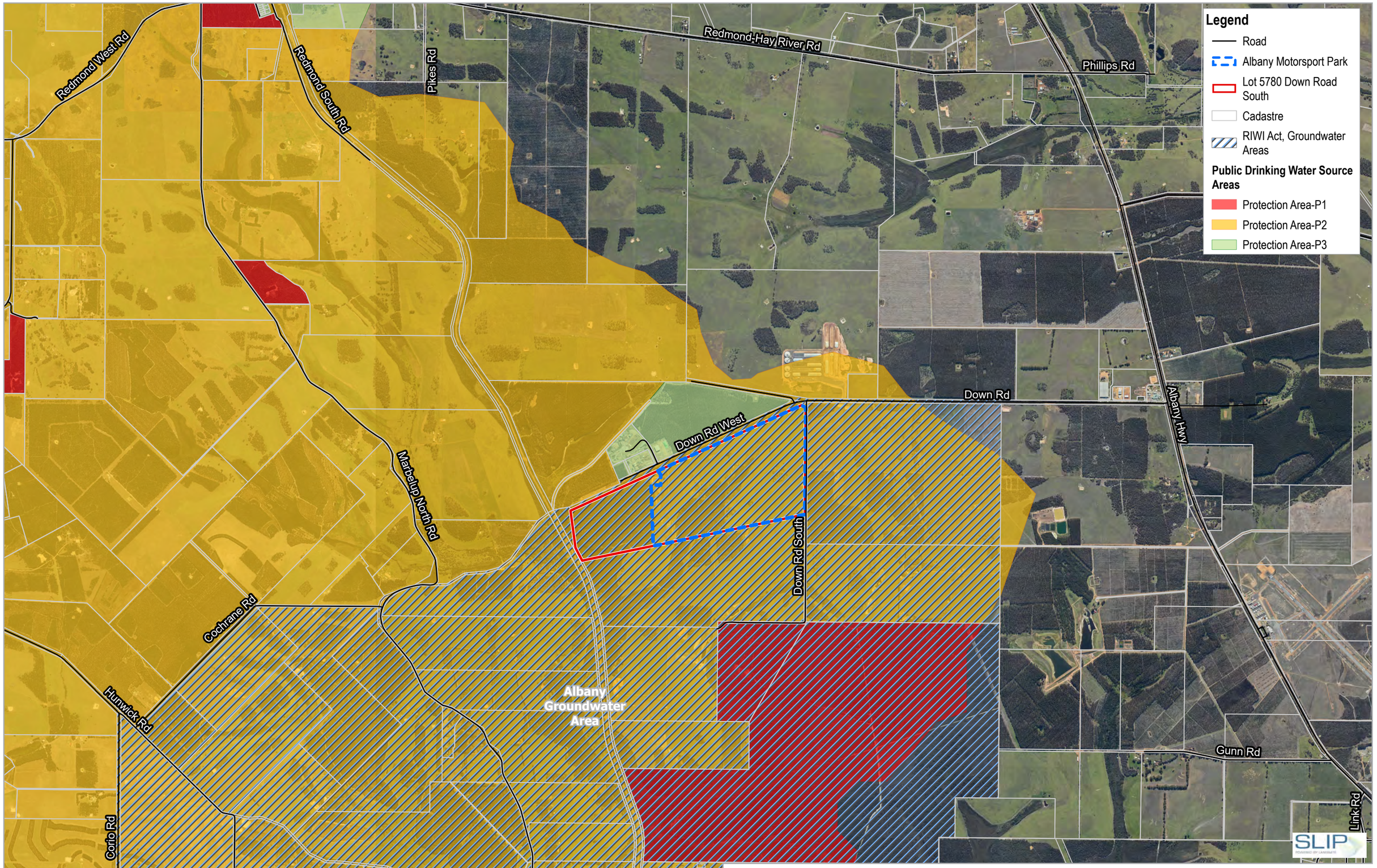
Hydrology and hydrogeology

Project No. **12546218**
Revision No. **0**
Date **05/08/2021**

FIGURE 6

C:\Users\vdavies\Desktop\Motor sports\6137331_009_Fig3-6_HydrologyAndHydrogeology_ASedits_Rev0.mxd
Print date: 05 Aug 2021 - 11:06

Data source: GHD: Project Site - 20180702, 1m Contours, Catchment boundary - 20180828; Landgate: Imagery - (Feb 2016), Cadastre, 5m Contours, Roads 20180709. Created by: vdavies



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Metres

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Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

N

GHD

City of Albany
Albany Motorsport Park

PDWSA and Water Management Areas

Project No. 12546218
Revision No. 0
Date 23/07/2021

FIGURE 7

N:
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Metres

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Grid: GDA 1994 MGA Zone 50

N

GHD

City of Albany
Albany Motorsport Park

Master Plan - 100 m setback to Protected Exclusion Area and Marbellup Flats (Conservation Class)

Project No. **12546218**
Revision No. **0**
Date **5/08/2021**

FIGURE 8

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Paper Size ISO A3

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Metres

Map Projection: Transverse Mercator
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Grid: GDA 1994 MGA Zone 50

GHD

City of Albany
Albany Motorsport Park

Flood Risk (DPIRD-007)

Project No. **12546218**
Revision No. **0**
Date **4/08/2021**

FIGURE 9

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Data source: Landgate_Subscription_Imagery\WANow: Landgate / SLIP. Created by: vdavies

Appendix B

Water balance

Albany Motorsport Park

Motocross - Effluent Disposal Water Balance

Hydraulic loading: 35 L/person/d

Section 29 of *Health (Treatment of Sewage and Disposal of Effluent and Liquid Waste) Regulations 1974*

Activity	**Mon**	**Tues**	**Wed**	**Thu**	**Fri**	**Sat**	**Sun**			
Training - attendees	20	20	20	20	20					
Club event - attendees						300	300			
Flow	700	700	700	700	700	10500	10500	**24,500**	L/week (total)	
								3,500	L/d (average)	
									100	persons
Cum. IN	700	1400	2100	2800	3500	14000	24500			
Cum. OUT	3,500	7,000	10,500	14,000	17,500	21,000	24,500			
	11,200	8,400	5,600	2,800	0	7,000	14,000		Tank size:	14,000

Water Balance for Zero Storage

Site Address:	**Lot 5780 Down Road South, Drome**		
Date:	Thursday, 12 August 2021	**Assessor:**	Jeff Foley

INPUT DATA

Design Wastewater Flow	Q	3,500	L/day	Based on maximum potential occupancy and derived from the Supplement to Regulation 29 and Schedule 9 - Wastewater system loading rates
Design Irrigation Rate	DIR	5.0	mm/day	Based on soil texture class/permeability and derived from Table M1 of AS/NZS 1547:2012
Nominated Land Application Area	L	1100	m^2	[1]
Crop Factor	C	0.8-1.0	unitless	Estimates evapotranspiration as a fraction of pan evaporation; varies with season and crop type[2]
Rainfall Runoff Factor	RF	0.9	untiless	Proportion of rainfall that remains onsite and infiltrates, allowing for any runoff
Mean Monthly Rainfall Data	om.gov.au/climate/averages/tables/cw_009			BoM Station and number
Mean Monthly Pan Evaporation Data	Albany - Agric reference			BoM Station and number or data from the Evaporation Data for Western Australia Report (https://researchlibrary.agric.wa.gov.au/cgi/viewcontent.cgi?article=1058&context=rmtr

Parameter	Symbol	Formula	Units	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Days in month	D		days	31	28	31	30	31	30	31	31	30	31	30	31	**365**
Rainfall	R		mm/month	23.6	22.3	33.6	61.3	89.8	108	119.3	106.8	88.5	70.8	47	27.8	**798.8**
Evaporation	E		mm/month	220	171	150	91	63	47	59	67	84	106	150	199	**1407**
Crop Factor	C		unitless	1.00	1.00	0.90	0.90	0.80	0.80	0.80	0.80	0.90	1.00	1.00	1.00	
OUTPUTS																
Evapotranspiration	ET	ExC	mm/month	220	171	135	82	50	38	47	54	76	106	150	199	**1327.3**
Percolation	B	DIRxD	mm/month	155.0	140	155.0	150.0	155.0	150.0	155.0	155.0	150.0	155.0	150.0	155.0	**1825.0**
Outputs		ET+B	mm/month	375.0	311	290.0	231.9	205.4	187.6	202.2	208.6	225.6	261.0	300.0	354.0	**3152.3**
INPUTS																
Retained Rainfall	RR	RxRF	mm/month	20.06	18.955	28.56	52.105	76.33	91.8	101.405	90.78	75.225	60.18	39.95	23.63	**678.98**
Applied Effluent	W	(QxD)/L	mm/month	98.6	89.1	98.6	95.5	98.6	95.5	98.6	98.6	95.5	98.6	95.5	98.6	**1161.4**
Inputs		RR+W	mm/month	118.7	108.0	127.2	147.6	175.0	187.3	200.0	189.4	170.7	158.8	135.4	122.3	**1840.3**
STORAGE CALCULATION																
Storage remaining from previous month			mm/month	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Storage for the month	S	(RR+W)-(ET+B)	mm/month	-256.3	-203.0	-162.8	-84.3	-30.4	-0.3	-2.2	-19.2	-54.9	-102.2	-164.6	-231.7	
Cumulative Storage	M		mm	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Maximum Storage for Nominated Area	N		mm	0.00												
	V	NxL	L	0												
LAND AREA REQUIRED FOR ZERO STORAGE			m^2	306	336	415	584	841	1096	1076	921	698	540	404	328	

MINIMUM AREA REQUIRED FOR ZERO STORAGE: **1097** m^2

CELLS

	Please enter data in blue cells
XX	Enter available Land Application Area
XX	Data in yellow cells is calculated by the spreadsheet, DO NOT ALTER THESE CELLS

NOTES

[1] This value should be the largest of the following: land application area required based on the most limiting nutrient balance or minimum area required for zero storage

[2] Values selected are suitable for grass in WA

Appendix C

GHD Pty Ltd Professional Indemnity Insurance Certificate

Willis Towers Watson

Telephone: +61 2 9285 4000
Fax: +61 2 9995 7297
Website: www.willistowerswatson.com.au
Direct Line: +61 2 9285 4060
Email: tanya.stevenson@willistowerswatson.com

Issue Date: 24 November 2020

To Whom It May Concern

Certificate of Placement – Professional Indemnity

In our capacity as Insurance Broker to the Named Insured shown below, we confirm having arranged the following insurance, the details of which are correct as at the Issue Date:

Named Insured:	GHD Group Limited and Subsidiaries including GHD Pty Ltd
Form:	Civil Liability Wording which includes coverage for the Trade Practices Act and the Competition and Consumer Act
Policy Number:	B080113856P20
Limit of Indemnity:	AUD2,000,000 any one claim and in the aggregate
Period of Insurance:	1 December 2020 at 4.00pm to 1 December 2021 at 4.00pm
Insurer:	Certain Underwriters at Lloyd's of London

Signed for and on behalf of
Willis Australia Ltd ("Willis Towers Watson")

Willis Australia Limited
ABN 90 000 321 237
AFSL No: 240600
Version 2016 1.0 18 Apr 2016

Appendix D

Albany Motorsport Park Development - Site Investigation Report 4626/1 (Great Southern Geotechnics, 2021)

GREAT SOUTHERN GEOTECHNICS

CONSTRUCTION MATERIALS TESTING

Site Investigation

Report 4626/1

Monday, 28 June 2021

GHD

Albany Motorsport Park Development

GREAT SOUTHERN GEOTECHNICS

1.0 INTRODUCTION

As authorised by GHD
an investigation for the proposed Albany Motorsport Park Development adjacent to Down Rd, Mirambeena was performed on the 25/06/2021

2.0 GENERAL

The intent of the investigation was to determine the following:

- Soil types and profiles.
- Groundwater levels at time of investigation.

3.0 SITE INVESTIGATION

Site conditions and test pit locations were recorded and are displayed in Appendix A - Maps.
Test pits logs/ soil profiles are noted in Appendix B - Test Pit Logs

The field investigation consisted of 6 Boreholes excavated on-site to depths of up to 2.5 meters using a Kubota KX41-3V mini excavator with a 300mm Auger.

Test pits were spread across the extent of the proposed development and locations were predetermined by GHD.
All soil layers encountered were visually assessed and classified on-site.

Samples gathered from site were the taken back to Great Southern Geotechnics Albany Laboratory then

IMPORTANT NOTE: The test pits have been spread so that they are representative of the subsurface materials across the intended reconstruction area, however, soil conditions may change dramatically over short distances and our investigations may not locate all soil variations across the site.

4.0 LABORATORY TESTING

No laboratory testing have been undertaken at Great southern Geotechnics laboratory.
Sampled taken have been transported by freight to Eurofins Scientific for further analysis.
Testing requirements will be confirmed by GHD post review of investigation findings.

This report and associated documentation was undertaken for the specific purpose described in the report and shall not be relied on for other purposes.

This report was prepared solely for the use by GHD any reliance assumed by other parties on this report shall be at such parties own risk.

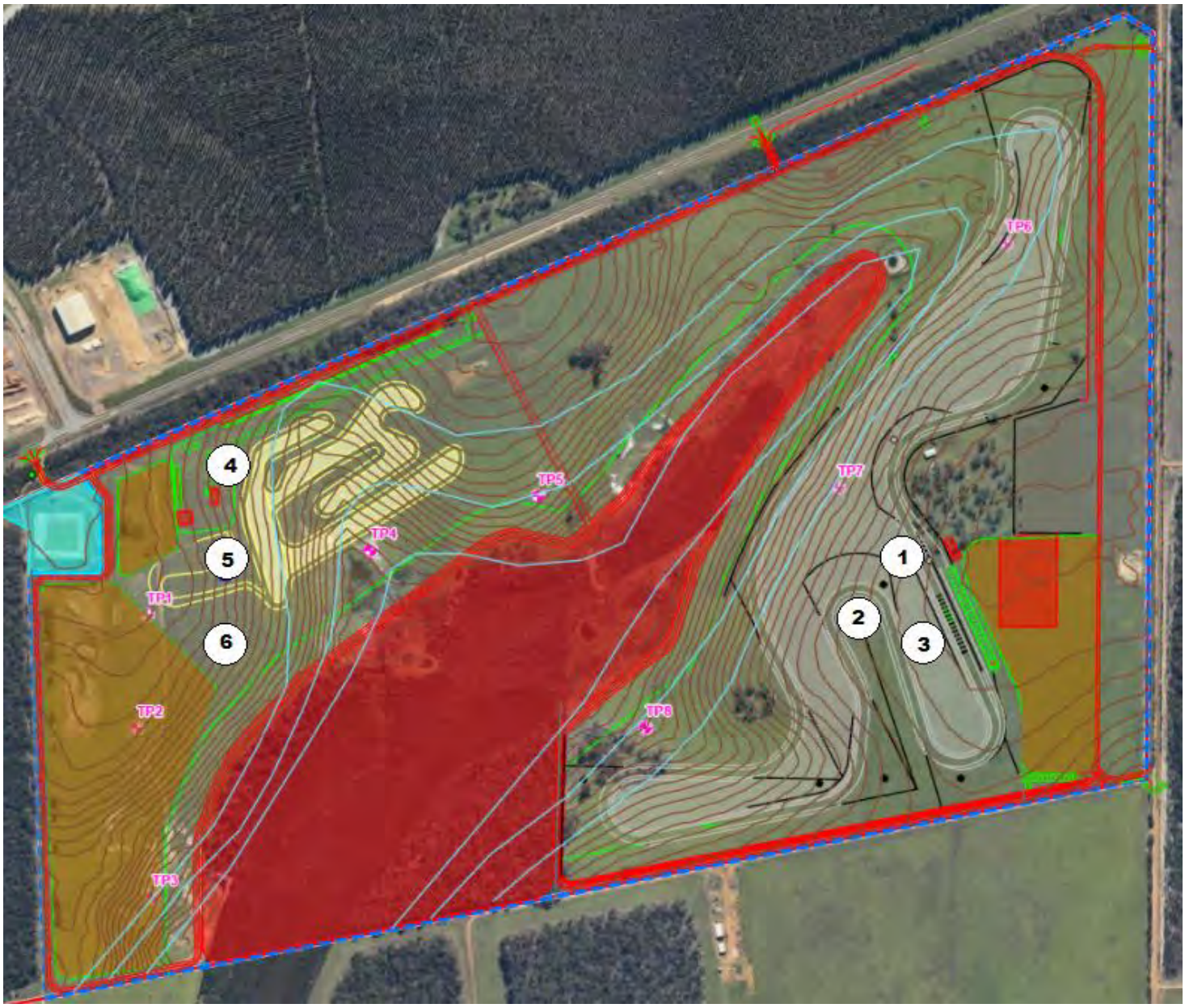
Appendix A

Maps

Figure 1

Test Pits 1 to 6

Test Pit Locations



GREAT SOUTHERN GEOTECHNICS
CONSTRUCTION MATERIALS TESTING

Job No: 4626
Client: GHD
Project: Albany Motorsport Park Development

Appendix B

Test Pit Logs

GREAT SOUTHERN GEOTECHNICS
CONSTRUCTION MATERIALS TESTING

Job No	Test Pit No.	Sample No.	Sheet		
4626	1	4626G1	1	of	12

Client:	GHD	**Date Commenced**	**Operator/Contractor:**	GSG
Project:	Albany Motorsport Park Development	25/06/2021	**Equipment type:**	Kubota KX41-3V
Project No.	QU-0498	**Logged By**	**Excavation Method :**	300mm Auger
Location:	34°55'55.6"S 117°44'53.0"E	M.Coffey	**Position:**	Refer to site plan

Depth Below Surface (mm)	Layer Depth (mm)	Material Description SOIL TYPE, Plasticity, Colour, Particle characteristics, Secondary and other minor components	Moist. Condition	Consistency / Strength	Cementation	Water Table	Classification Symbol	Sample/Test
						No water table encountered.		
0 - 180	180	**(Topsoil) SAND with silt:** Dark grey, fine to medium. Roots and root fibres.	M	L-MD				
180 - 490	310	**Sandy GRAVEL:** Brown, fine to coarse, sub-rounded to sub-angular,	M	MD-D				#
		(F:20% / M:20% / C:15%). Fine to medium grained sand.						
		Contains approximately 10% Cobbles & Boulders in excess of 250mm diameter.						
550 - 2500	1950	**Sandy CLAY:** Low to medium plasticity, Brown/red mottled Light brown/orange (40%).	M	F				#
		Fine to medium grained sand.						

Samples Taken			
TP1 - 180mm to 490mm	Target Depth	✓	2500
TP1 - 900mm to 1100mm	Cave In		
	Refusal		
	Near Refusal		
	Flooding		
	Lack of Reach		

Cohesive	Non-Cohesive	Rock	Cementation
VS - Very Soft	VL - Very Loose	EL - Extremely Low	IN - Indurated
S - Soft	L - Loose	VL - Very Low	PC - Poorly Cemented
F - Firm	MD - Medium Dense	L - Low	
St - Stiff	D - Dense	M - Medium	MC - moderately Cemented
VSt - Very Stiff	VD - Very Dense	H - High	
H - Hard	CO - Compact	VH - Very High	WC - Well Cemented
		EH - Extremely High	

General

D - Dry M - Moist W - Wet
N/A - Not Applicable
N/D - Not Determined

Test Pit No.1

Excavation

Spoil

GREAT SOUTHERN GEOTECHNICS CONSTRUCTION MATERIALS TESTING	**Job No:** 4626 **Client:** GHD **Project:** Albany Motorsport Park Development	**Sheet** 2 **of** 12

GREAT SOUTHERN GEOTECHNICS
CONSTRUCTION MATERIALS TESTING

Job No	Test Pit No.	Sample No.	Sheet		
4626	2	4626G2	3	of	12

Client:	GHD	**Date Commenced**	**Operator/Contractor:**	GSG
Project:	Albany Motorsport Park Development	25/06/2021	**Equipment type:**	Kubota KX41-3V
Project No.	QU-0498	**Logged By**	**Excavation Method :**	300mm Auger
Location:	34°55'58.3"S 117°44'50.2"E	M.Coffey	**Position:**	Refer to site plan

Depth Below Surface (mm)	Layer Depth (mm)	Material Description SOIL TYPE, Plasticity, Colour, Particle characteristics, Secondary and other minor components	Moist. Condition	Consistency / Strength	Cementation	Water Table	Classification Symbol	Sample/Test
						No water table encountered.		
0 - 140	140	**(Topsoil) SAND with silt:** Dark grey, fine to medium. Roots and root fibres.	M	L-MD				
140 - 400	260	**Sandy GRAVEL:** Brown, fine to coarse, sub-rounded to sub-angular,	M	VD	MC			
		(F:20% / M:20% / C:15%). Fine to medium grained sand.						
		Contains approximately 10% Cobbles & Boulders in excess of 400mm diameter.						
400 - 1400	1000	**Sandy CLAY:** Low to medium plasticity, Light brown.	M	F				#
		Fine to medium grained sand.						
1400 - 2500	1100	**Sandy CLAY:** Low to medium plasticity, Brown/red mottled Light brown/orange (40%).	M	F				#
		Fine to medium grained sand.						

Samples Taken		
TP2 - 500mm to 900mm	Cave In	
TP2 - 1700mm to 2000mm	Refusal	
	Near Refusal	
	Flooding	
	Lack of Reach	

Target Depth	✓	2500

Cohesive	Non-Cohesive	Rock	Cementation
VS - Very Soft	VL - Very Loose	EL - Extremely Low	IN - Indurated
S - Soft	L - Loose	VL - Very Low	PC - Poorly Cemented
F - Firm	MD - Medium Dense	L - Low	
St - Stiff	D - Dense	M - Medium	MC - moderately Cemented
VSt - Very Stiff	VD - Very Dense	H - High	
H - Hard	CO - Compact	VH - Very High	WC - Well Cemented
		EH - Extremely High	

General

D - Dry M - Moist W - Wet

N/A - Not Applicable

N/D - Not Determined

Test Pit No.2

Excavation

Spoil

GREAT SOUTHERN GEOTECHNICS CONSTRUCTION MATERIALS TESTING	**Job No:** 4626 **Client:** GHD **Project:** Albany Motorsport Park Development	**Sheet** 4 **of** 12

GREAT SOUTHERN GEOTECHNICS
CONSTRUCTION MATERIALS TESTING

Job No	Test Pit No.	Sample No.	Sheet		
4626	3	4626G3	5	of	12

Client:	GHD	**Date Commenced**	**Operator/Contractor:**	GSG
Project:	Albany Motorsport Park Development	25/06/2021	**Equipment type:**	Kubota KX41-3V
Project No.	QU-0498	**Logged By**	**Excavation Method :**	300mm Auger
Location:	34°55'59.6"S 117°44'56.4"E	M.Coffey	**Position:**	Refer to site plan

Depth Below Surface (mm)	Layer Depth (mm)	Material Description SOIL TYPE, Plasticity, Colour, Particle characteristics, Secondary and other minor components	Moist. Condition	Consistency / Strength	Cementation	Water Table	Classification Symbol	Sample/Test
						No water table encountered.		
0 - 250	250	**(Topsoil) SAND with silt:** Dark grey to grey, fine to medium. Roots and root fibres.	M	L-MD				
250 - 830	580	**Sandy GRAVEL:** Brown, fine to medium, sub-rounded to sub-angular**,**	M	MD-D				#
		(F:30% / M:30%). Fine to medium grained sand.						
		Contains approximately 10% Cobbles & Boulders in excess of 400mm diameter.						
830 - 1600	770	**Sandy CLAY:** Low to medium plasticity, Light brown.	M	F				#
		Fine to medium grained sand.						
1600 - 2500	900	**Sandy CLAY:** Low to medium plasticity, Brown/red mottled Light brown/grey (30%).	M	F				#
		Fine to medium grained sand.						

Samples Taken			
TP3 - 300mm to 600mm			
TP3 - 900mm to 1200mm			
TP3 - 1600mm to 2000mm			

Target Depth	✓	2500
Cave In		
Refusal		
Near Refusal		
Flooding		
Lack of Reach		

Cohesive	Non-Cohesive	Rock	Cementation
VS - Very Soft	VL - Very Loose	EL - Extremely Low	IN - Indurated
S - Soft	L - Loose	VL - Very Low	PC - Poorly Cemented
F - Firm	MD - Medium Dense	L - Low	
St - Stiff	D - Dense	M - Medium	MC - moderately Cemented
VSt - Very Stiff	VD - Very Dense	H - High	
H - Hard	CO - Compact	VH - Very High	WC - Well Cemented
		EH - Extremely High	

General

D - Dry M - Moist W - Wet

N/A - Not Applicable

N/D - Not Determined

Test Pit No.3

Excavation

Spoil

GREAT SOUTHERN GEOTECHNICS CONSTRUCTION MATERIALS TESTING	**Job No:** 4626 **Client:** GHD **Project:** Albany Motorsport Park Development	**Sheet** 6 **of** 12

GREAT SOUTHERN GEOTECHNICS
CONSTRUCTION MATERIALS TESTING

Job No	Test Pit No.	Sample No.	Sheet		of	
4626	4	4626G4	7		12	

Client:	GHD	**Date Commenced**	**Operator/Contractor:**	GSG	
Project:	Albany Motorsport Park Development	25/06/2021	**Equipment type:**	Kubota KX41-3V	
Project No.	QU-0498	**Logged By**	**Excavation Method :**	300mm Auger	
Location:	34°55'51.5"S 117°44'17.6"E	M.Coffey	**Position:**	Refer to site plan	

Depth Below Surface (mm)	Layer Depth (mm)	Material Description SOIL TYPE, Plasticity, Colour, Particle characteristics, Secondary and other minor components	Moist. Condition	Consistency / Strength	Cementation	Water Table	Classification Symbol	Sample/Test
						No water table encountered.		
0 - 220	220	**(Topsoil) SAND with silt:** Dark grey, fine to medium. Roots and root fibres.	M	L-MD				
220 - 1250	1030	**Sandy GRAVEL:** Brown, fine to coarse, sub-rounded to sub-angular,	M	D				#
		(F:25% / M:20% / C:10%). Fine to medium grained sand.						
		Contains approximately 10% Cobbles & Boulders in excess of 400mm diameter.						
1250 - 1750	500	**Sandy CLAY:** Low to medium plasticity, Light brown/orange.	M	F				#
		Fine to medium grained sand.						
1750 - 2500	750	**Sandy CLAY:** Low to medium plasticity, grey mottled red (30%) & orange (10%).	M	F				#
		Fine to medium grained sand.						

Samples Taken			
TP4 - 400mm to 800mm			
TP4 - 1350mm to 1650mm			
TP4 - 1800mm to 2200mm			

Target Depth	✓	2500
Cave In		
Refusal		
Near Refusal		
Flooding		
Lack of Reach		

Cohesive	Non-Cohesive	Rock	Cementation
VS - Very Soft	VL - Very Loose	EL - Extremely Low	IN - Indurated
S - Soft	L - Loose	VL - Very Low	PC - Poorly Cemented
F - Firm	MD - Medium Dense	L - Low	
St - Stiff	D - Dense	M - Medium	MC - moderately Cemented
VSt - Very Stiff	VD - Very Dense	H - High	
H - Hard	CO - Compact	VH - Very High	WC - Well Cemented
		EH - Extremely High	

General

D - Dry M - Moist W - Wet

N/A - Not Applicable

N/D - Not Determined

Test Pit No.4

Excavation

Spoil

GREAT SOUTHERN GEOTECHNICS
CONSTRUCTION MATERIALS TESTING

Job No	Test Pit No.	Sample No.	Sheet		
4626	5	4626G5	9	of	12

Client:	GHD	**Date Commenced**	**Operator/Contractor:**	GSG
Project:	Albany Motorsport Park Development	25/06/2021	**Equipment type:**	Kubota KX41-3V
Project No.	QU-0498	**Logged By**	**Excavation Method :**	300mm Auger
Location:	34°55'55.6"S 117°44'17.5"E	M.Coffey	**Position:**	Refer to site plan

Depth Below Surface (mm)	Layer Depth (mm)	Material Description SOIL TYPE, Plasticity, Colour, Particle characteristics, Secondary and other minor components	Moist. Condition	Consistency / Strength	Cementation	Water Table	Classification Symbol	Sample/Test
						No water table encountered.		
0 - 230	230	**(Topsoil) SAND with silt:** Dark grey, fine to medium. Roots and root fibres.	M	L-MD				
230 - 880	650	**SAND with silt:** Grey, fine to medium.	M	MD				#
880 - 2500	1620	**Sandy GRAVEL:** Brown, fine to coarse, sub-rounded to sub-angular,	M	MD-D				#
		(F:15% / M:30% / C:10%). Fine to medium grained sand.						
		Contains approximately 10% Cobbles & Boulders in excess of 400mm diameter.						

Samples Taken			
TP5 - 400mm to 800mm	Target Depth	✓	2500
TP5 - 1200mm to 1500mm	Cave In		
	Refusal		
	Near Refusal		
	Flooding		
	Lack of Reach		

Cohesive	Non-Cohesive	Rock	Cementation
VS - Very Soft	VL - Very Loose	EL - Extremely Low	IN - Indurated
S - Soft	L - Loose	VL - Very Low	PC - Poorly Cemented
F - Firm	MD - Medium Dense	L - Low	
St - Stiff	D - Dense	M - Medium	MC - moderately Cemented
VSt - Very Stiff	VD - Very Dense	H - High	
H - Hard	CO - Compact	VH - Very High	WC - Well Cemented
		EH - Extremely High	

General

D - Dry M - Moist W - Wet

N/A - Not Applicable

N/D - Not Determined

Test Pit No.5

Excavation

Spoil

GREAT SOUTHERN GEOTECHNICS CONSTRUCTION MATERIALS TESTING	**Job No:** 4626 **Client:** GHD **Project:** Albany Motorsport Park Development	**Sheet** 10 **of** 12

GREAT SOUTHERN GEOTECHNICS
CONSTRUCTION MATERIALS TESTING

Job No	Test Pit No.	Sample No.	Sheet		of	
4626	6	4626G6	11		12	

Client:	GHD	**Date Commenced**	**Operator/Contractor:**	GSG
Project:	Albany Motorsport Park Development	25/06/2021	**Equipment type:**	Kubota KX41-3V
Project No.	QU-0498	**Logged By**	**Excavation Method :**	300mm Auger
Location:	34°55'59.9"S 117°44'17.4"E	M.Coffey	**Position:**	Refer to site plan

Depth Below Surface (mm)	Layer Depth (mm)	Material Description SOIL TYPE, Plasticity, Colour, Particle characteristics, Secondary and other minor components	Moist. Condition	Consistency / Strength	Cementation	Water Table	Classification Symbol	Sample/Test
						No water table encountered.		
0 - 350	350	**(Topsoil) SAND with silt:** Dark grey, fine to medium. Roots and root fibres.	M	L-MD				
350 - 1200	850	**Sandy GRAVEL:** Brown, fine to coarse, sub-rounded to sub-angular,	M	D-VD				#
		(F:20% / M:20% / C:10%). Fine to medium grained sand.						
		Contains approximately 10% Cobbles & Boulders in excess of 400mm diameter.						
1200 - 1800	600	**Sandy GRAVEL:** Light brown, fine to coarse, sub-rounded to sub-angular,	M	D				#
		(F:20% / M:30% / C:10%). Fine to medium grained sand.						
1800 - 2500	700	**Sandy GRAVEL:** Brown/orange, fine to medium, sub-rounded to sub-angular,	M	MD-D				#
		(F:40% / M:20%). Fine to medium grained sand.						

Samples Taken		
TP6 - 500mm to 800mm	Cave In	
TP6 - 1300mm to 1600mm	Refusal	
TP6 - 2000mm to 2300mm	Near Refusal	
	Flooding	
	Lack of Reach	

Target Depth	✓	2500

Cohesive	Non-Cohesive	Rock	Cementation
VS - Very Soft	VL - Very Loose	EL - Extremely Low	IN - Indurated
S - Soft	L - Loose	VL - Very Low	PC - Poorly Cemented
F - Firm	MD - Medium Dense	L - Low	
St - Stiff	D - Dense	M - Medium	MC - moderately Cemented
VSt - Very Stiff	VD - Very Dense	H - High	
H - Hard	CO - Compact	VH - Very High	WC - Well Cemented
		EH - Extremely High	

General

D - Dry M - Moist W - Wet

N/A - Not Applicable

N/D - Not Determined

Test Pit No.6

Excavation

Spoil

GREAT SOUTHERN GEOTECHNICS CONSTRUCTION MATERIALS TESTING	**Job No:** 4626 **Client:** GHD **Project:** Albany Motorsport Park Development	**Sheet** 12 **of** 12

GREAT SOUTHERN GEOTECHNICS
CONSTRUCTION MATERIALS TESTING

COLOURS

BLACK – BROWN (bk)	BLUE (bl)	ORANGE (or)
BROWN (br)	BLUE – GREEN (bl/gr)	RED (rd)
GREY – BROWN (gy/br)	GREEN (gr)	RED – BROWN (rd/br)
GREY (gy)	YELLOW (yl)	PINK (pk)
BLUE – GREY (bl/gy)	YELLOW – BROWN (yl/br)	PURPLE (pr)

MOISTURE CONDITION OF SOIL

TERM	DESCRIPTION
Dry	Cohesive soils; hard and friable or powdery, well dry of plastic limit. Granular soils; cohesionless and free-running.
Moist	Soil feels cool, darkened in colour. Cohesive soils can be moulded. Granular soils tend to cohere.
Wet	Soil feels cool, darkened in colour. Cohesive soils usually weakened and free water forms on hands when handling. Granular soils tend to cohere and free water forms on hands when handling.

PARTICLE SHAPES

ANGULAR	SUB-ANGULAR	SUB-ROUNDED	ROUNDED




PARTICLE SIZES

BOULDERS	COBBLES	COARSE GRAVEL	MEDIUM GRAVEL	FINE GRAVEL	COARSE SAND	MEDIUM SAND	FINE SAND	SILT	CLAY
>200mm	63-200mm	20-63mm	6-20mm	2.36-6mm	0.6-2.36mm	0.2-0.6mm	0.075-0.2mm	0.002-0.075mm	<0.002mm

GRAIN SIZE

SOIL TYPE (ABBREV.)	CLAY (CL)	SILT (SI)	←	SAND (SA)	→	←	GRAVEL (GR)	→	COBBLES (CO)
SIZE	< 2µm	2–75µm	Fine 0.075-0.2mm	Medium 0.2-0.6mm	Coarse 0.6-2.36mm	Fine 2.36-6mm	Medium 6-20mm	Coarse 20-63mm	63-200mm
SHAPE & TEXTURE	Shiny	Dull	← angular or sub angular or sub rounded or rounded →						
FIELD GUIDE	Not visible under 10x	Visible under 10x	Visible by eye	Visible at < 1m	Visible at < 3m	Visible at < 5m	Road gravel	Rail ballast	Beaching

GREAT SOUTHERN GEOTECHNICS
CONSTRUCTION MATERIALS TESTING

CLASSIFICATION CHART

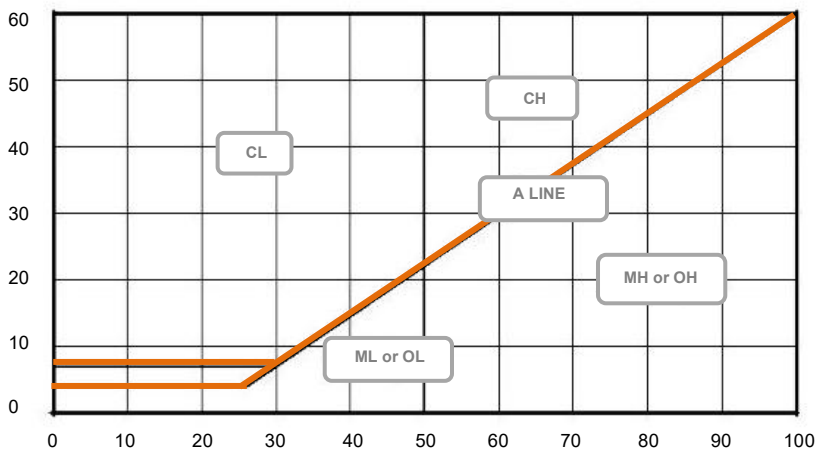
FIELD IDENTIFICATION PROCEDURES (Excluding particles larger than 60mm and basing fractions on estimated mass)				GROUP SYMBOLS	TYPICAL NAMES
COARSE GRAINED SOILS More than 50% of material less than 63 mm is larger than 0.075 mm	GRAVELS More than 50% of coarse fraction is larger than 2.36mm	CLEAN GRAVELS (Little or no fines)	Wide range in grain size and substantial amounts of all intermediate sizes, not enough fines to bind coarse grains, no dry strength	GW	Well graded gravels, gravel-sand mixtures, little or no fines
			Predominantly one size or range of sizes with some intermediate sizes missing, not enough fines to bind coarse grains, no dry strength	GP	Poorly Graded gravels and gravel-sand mixtures, little or no fines, uniform gravels
		GRAVELS WITH FINES (Appreciable amount of fines)	Dirty' materials with excess of non-plastic fines, zero to medium dry strength	GM	Silty gravels, gravel-sand-silt mixtures
			'Dirty' materials with excess of plastic fines, medium to high dry strength	GC	Clayey gravels, gravel-sand-clay mixtures
	SANDS More than 50% of coarse fraction is smaller than 2.36mm	CLEAN SANDS (Little or no fines)	Wide range in grain size and substantial amounts of all intermediate sizes, not enough fines to bind coarse grains, no dry strength	SW	Well graded sands, gravelly sands, little or no fines
			Predominantly one size or range of sizes with some intermediate sizes missing, not enough fines to bind coarse grains, no dry strength '	SP	Poorly graded sands and gravelly sands; little or no fines, uniform sands
		SANDS WITH FINES (Appreciable amount of fines)	Dirty' materials with excess of non-plastic fines, zero to medium dry strength	SM	Silty sands, sand-silt mixtures
			'Dirty' materials with excess of plastic fines, medium to high dry strength	SC	Clayey sands, sand-clay mixtures

FINE GRAINED SOILS More than 50% of material less than 63 mm is smaller than 0.075 mm	IDENTIFICATION PROCEDURES ON FRACTIONS <0.2mm					
		DRY STRENGTH	DILATANCY	TOUGHNESS		
	SILTS AND CLAYS Liquid limit less than 50	None to low	Quick to slow	None	ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands with low plasticity. Silts of low to medium Liquid Limit.
		Medium to high	None to very slow	Medium	CL, CI	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays.
		Low to medium	Slow	Low	OL	Organic silts and organic silt-clays of low to medium plasticity.
	SILTS AND CLAYS Liquid limit greater than 50	Low to medium	Slow to none	Low to medium	MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, silts of high Liquid Limit.
		High to very high	None	High	CH	Inorganic clays of high plasticity.
		Medium to high	None to very slow	Low to medium	OH	Organic clays of high plasticity

HIGHLY ORGANIC SOILS	Readily identified by colour, odour, spongy feel and frequently by fibrous texture	Pt	Peat and other highly organic soils

PLASTICITY CHART

For laboratory classification of fine grained soils



GREAT SOUTHERN GEOTECHNICS
CONSTRUCTION MATERIALS TESTING

PLASTICITY

DESCRIPTIVE TERM	OF LOW PLASTICITY	OF MEDIUM PLASTICITY	OF HIGH PLASTICITY
Range Of Liquid Limit (%)	≤ 35	> 35 ≤ 50	> 50

DESCRIPTION OF ORGANIC OR ARTIFICIAL MATERIALS

PREFERRED TERMS	SECONDARY DESCRIPTION
Organic Matter	Fibrous Peat/ Charcoal/ Wood Fragments/ Roots (greater than approximately 2mm diameter)/ Root Fibres (less than approximately 2mm diameter)
Waste Fill	Domestic Refuse/ Oil/ Bitumen/ Brickbats/ Concrete Rubble/ Fibrous Plaster/ Wood Pieces/ Wood Shavings/ Sawdust/ Iron Filings/ Drums/ Steel Bars/ Steel Scrap/ Bottles/ Broken Glass/ Leather

CONSISTENCY - Cohesive soils

TERM	VERY SOFT	SOFT	FIRM	STIFF	VERY STIFF	HARD
Symbol	VS	S	F	St	VSt	H
Undrained Shear Strength (kPa)	< 12	12 - 25	25 - 50	50 - 100	100 - 200	> 200
SPT (N) Blowcount	0 - 2	2 - 4	4 - 8	8 - 15	15 - 30	> 30
Field Guide	Exudes between the fingers when squeezed	Can be moulded by light finger pressure	Can be moulded by strong finger pressure	Cannot be moulded by fingers. Can be indented by thumb nail	Can be indented by thumb nail	Can be indented with difficulty with thumb nail

CONSISTENCY - Non-cohesive soils

TERM	VERY LOOSE	LOOSE	MEDIUM DENSE	DENSE	VERY DENSE	COMPACT
Symbol	VL	L	MD	D	VD	CO
SPT (N) Blowcount	0 - 4	4 - 10	10 - 30	30 - 50	50 - 100	> 50/150 mm
Density Index (%)	< 15	15 - 35	35 - 65	65 - 85	85 - 95	> 95
Field Guide	Ravels	Shovels easily	Shovelling very difficult	Pick required	Pick difficult	Cannot be picked

MINOR COMPONENTS

TERM	TRACE	WITH
% Minor Component	Coarse grained soils: < 5% Fine grained soils: <15%	Coarse grained soils: 5 – 12% Fine grained soils: 15 – 30%
Field Guide	Presence just detectable by feel or eye, but soil properties little or no different to general properties of primary components	Presence easily detectable by feel or eye, soil properties little different to general properties of primary component

GREAT SOUTHERN GEOTECHNICS
CONSTRUCTION MATERIALS TESTING

GEOLOGICAL ORIGIN

	TYPE	DETAILS
TRANSPORTED SOILS	Aeolian Soils	Deposited by wind
	Alluvial Soils	Deposited by streams and rivers
	Colluvial Soils	Deposited on slopes
	Lacustrine Soils	Deposited by lakes
	Marine Soils	Deposited in ocean, bays, beaches and estuaries
FILL MATERIALS	Soil Fill	Describe soil type, UCS symbol and add 'FILL'
	Rock Fill	Rock type, degree of weathering, and word 'FILL'.
	Domestic Fill	Percent soil or rock, whether pretrucible or not.
	Industrial Fill	Percent soil, whether contaminated, particle size & type of waste product, ie brick, concrete, metal

STRENGTH OF ROCK MATERIAL

TERM	SYMBOL	IS(50)	(MPA)	FIELD GUIDE TO STRENGTH
Extremely Low	EL	≤0.03		Easily remoulded by hand to a material with soil properties.
Very Low	VL	>0.03	≤0.1	Material crumbles under firm blows with sharp end of pick; can be peeled with knife; too hard to cut a triaxle sample by hand. Pieces up to 3 cm thick can be broken by finger pressure.
Low	L	>0.1	≤0.3	Easily scored with a knife; indentations 1 mm to 3 mm show in the specimen with firm blows of the pick point; has dull sound under hammer. A piece of core 150 mm long by 50 mm diameter may be broken by hand. Sharp edges of core may be friable and break during handling.
Medium	M	>0.3	≤1.0	Readily scored with a knife; a piece of core 150 mm long by 50 mm diameter can be broken by hand with difficulty.
High	H	>1	≤3	A piece of core 150 mm long by 50 mm diameter cannot be broken by hand but can be broken by a pick with a single firm blow; rock rings under hammer.
Very High	VH	>3	≤10	Hand specimen breaks with pick after more than one blow; rock rings under hammer.
Extremely High	EH	>10		Specimen requires many blows with geological pick to break through intact material; rock rings under hammer.

ROCK MATERIAL WEATHERING CLASSIFICATION

TERM	SYMBOL	DEFINITION
Residual Soil	RS	Soil developed on extremely weathered rock; the mass structure and substance fabric are no longer evident; there is a large change in volume but the soil has not been significantly transported
Extremely Weathered Rock	XW	Rock is weathered to such an extent that it has 'soil' properties, i.e. it either disintegrates or can be remoulded, in water.
Distinctly Weathered Rock	DW	Rock strength usually changed by weathering. Rock may be highly discoloured, usually be iron staining. Porosity may be increased by leaching or may be decreased due to deposition of weathering products in pores.
Slightly Weathered Rock	SW	Rock is slightly discoloured but shows little or no change of strength from fresh rock.
Fresh Rock	FR	Rock shows no sign of decomposition or staining.

Appendix E

Laboratory results

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EP2107544**	Page	: 1 of 4
Client	: **GHD PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: MS VICKI DAVIES	Contact	: Nick Courts
Address	: 999 HAY STREET PERTH WA, AUSTRALIA 6000	Address	: 26 Rigali Way Wangara WA Australia 6065
Telephone	: ----	Telephone	: +61-8-9406 1301
Project	: 12546218 Albany Motorsports Park DA	Date Samples Received	: 01-Jul-2021 13:30
Order number	: 12546218	Date Analysis Commenced	: 02-Jul-2021
C-O-C number	: ----	Issue Date	: 13-Jul-2021 13:47
Sampler	: ----		
Site	: ----		
Quote number	: EP/444/21		
No. of samples received	: 15		
No. of samples analysed	: 6		

ilac-MRA NATA
Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Ankit Joshi	Inorganic Chemist	Sydney Inorganics, Smithfield, NSW
Chris Lemaitre	Laboratory Manager (Perth)	Perth Inorganics, Wangara, WA

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- Phosphorus Sorption Index + Capacity conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- ED007 and ED008: When Exchangeable Al is reported from these methods, it should be noted that Rayment & Lyons (2011) suggests Exchange Acidity by 1M KCl - Method 15G1 (ED005) is a more suitable method for the determination of exchange acidity (H+ + Al3+).

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	TP1 - 900mm to 1100mm	TP2 - 500mm to 900mm	TP3 - 300mm to 600mm	TP4 - 400mm to 800mm	TP5 - 400mm to 800mm
			Sampling date / time	25-Jun-2021 00:00	25-Jun-2021 00:00	25-Jun-2021 00:00	25-Jun-2021 00:00	25-Jun-2021 00:00
Compound	CAS Number	LOR	Unit	EP2107544-002	EP2107544-003	EP2107544-005	EP2107544-008	EP2107544-011
				Result	Result	Result	Result	Result
EA002: pH 1:5 (Soils)								
pH Value	----	0.1	pH Unit	**6.1**	**6.1**	**5.7**	**5.8**	**5.4**
EA010: Conductivity (1:5)								
Electrical Conductivity @ 25°C	----	1	µS/cm	**22**	**25**	**28**	**24**	**4**
ED007: Exchangeable Cations								
Exchangeable Calcium	----	0.1	meq/100g	**0.8**	**0.8**	**1.6**	**0.8**	<0.1
Exchangeable Magnesium	----	0.1	meq/100g	**0.5**	**1.0**	**0.2**	**0.2**	<0.1
Exchangeable Potassium	----	0.1	meq/100g	<0.1	<0.1	<0.1	<0.1	<0.1
Exchangeable Sodium	----	0.1	meq/100g	<0.1	<0.1	**0.1**	<0.1	<0.1
Cation Exchange Capacity	----	0.1	meq/100g	**1.4**	**1.9**	**2.0**	**1.1**	**0.1**
Exchangeable Sodium Percent	----	0.1	%	**5.8**	**4.8**	**5.7**	**6.2**	<0.1
EK072: Phosphate Sorption Capacity								
Phosphate Sorption Capacity	----	250	mg P sorbed/kg	**688**	**1650**	**3660**	**3000**	<250
Phosphate Sorption Index	----	1	mgkg-1/log10 ugL-1	**60**	**157**	**289**	**244**	<1

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	TP6 - 500mm to 800mm	----	----	----	----
			Sampling date / time	25-Jun-2021 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit	EP2107544-013	--------	--------	--------	--------
				Result	----	----	----	----
EA002: pH 1:5 (Soils)								
pH Value	----	0.1	pH Unit	**5.9**	----	----	----	----
EA010: Conductivity (1:5)								
Electrical Conductivity @ 25°C	----	1	µS/cm	**20**	----	----	----	----
ED007: Exchangeable Cations								
Exchangeable Calcium	----	0.1	meq/100g	**1.0**	----	----	----	----
Exchangeable Magnesium	----	0.1	meq/100g	**0.2**	----	----	----	----
Exchangeable Potassium	----	0.1	meq/100g	<0.1	----	----	----	----
Exchangeable Sodium	----	0.1	meq/100g	<0.1	----	----	----	----
Cation Exchange Capacity	----	0.1	meq/100g	**1.3**	----	----	----	----
Exchangeable Sodium Percent	----	0.1	%	**1.4**	----	----	----	----
EK072: Phosphate Sorption Capacity								
Phosphate Sorption Capacity	----	250	mg P sorbed/kg	**966**	----	----	----	----
Phosphate Sorption Index	----	1	mgkg-1/log10 ugL-1	**62**	----	----	----	----

Inter-Laboratory Testing

Analysis conducted by ALS Sydney, NATA accreditation no. 825, site no. 10911 (Chemistry) 14913 (Biology).

(SOIL) EK072: Phosphate Sorption Capacity

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **EP2107544**	Page	: 1 of 3
Client	: **GHD PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: MS VICKI DAVIES	Contact	: Nick Courts
Address	: 999 HAY STREET PERTH WA, AUSTRALIA 6000	Address	: 26 Rigali Way Wangara WA Australia 6065
Telephone	: ----	Telephone	: +61-8-9406 1301
Project	: 12546218 Albany Motorsports Park DA	Date Samples Received	: 01-Jul-2021
Order number	: 12546218	Date Analysis Commenced	: 02-Jul-2021
C-O-C number	: ----	Issue Date	: 13-Jul-2021
Sampler	: ----		
Site	: ----		
Quote number	: EP/444/21		
No. of samples received	: 15		
No. of samples analysed	: 6		

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Ankit Joshi	Inorganic Chemist	Sydney Inorganics, Smithfield, NSW
Chris Lemaitre	Laboratory Manager (Perth)	Perth Inorganics, Wangara, WA

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EA002: pH 1:5 (Soils) (QC Lot: 3770355)									
EP2107544-002	TP1 - 900mm to 1100mm	EA002: pH Value	----	0.1	pH Unit	6.1	6.1	0.0	0% - 20%
EA010: Conductivity (1:5) (QC Lot: 3770356)									
EP2107544-002	TP1 - 900mm to 1100mm	EA010: Electrical Conductivity @ 25°C	----	1	µS/cm	22	22	0.0	0% - 20%
ED007: Exchangeable Cations (QC Lot: 3780436)									
EP2107521-057	Anonymous	ED007: Exchangeable Sodium Percent	----	0.1	%	2.9	3.0	3.6	0% - 20%
		ED007: Exchangeable Calcium	----	0.1	meq/100g	16.8	14.7	13.3	0% - 20%
		ED007: Exchangeable Magnesium	----	0.1	meq/100g	0.4	0.4	0.0	No Limit
		ED007: Exchangeable Potassium	----	0.1	meq/100g	<0.1	<0.1	0.0	No Limit
		ED007: Exchangeable Sodium	----	0.1	meq/100g	0.5	0.5	0.0	No Limit
		ED007: Cation Exchange Capacity	----	0.1	meq/100g	17.8	15.6	13.1	0% - 20%
EK072: Phosphate Sorption Capacity (QC Lot: 3776718)									
EP2107544-002	TP1 - 900mm to 1100mm	EK072: Phosphate Sorption Capacity	----	250	mg P sorbed/kg	688	409	50.9	No Limit
		EK072: Phosphate Sorption Index	----	1	mgkg-1/log10ug L-1	60	60	0.0	0% - 20%

Method Blank (MB) and Laboratory Control Sample (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Sample (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **SOIL**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EA002: pH 1:5 (Soils) (QCLot: 3770355)								
EA002: pH Value	----	----	pH Unit	----	4 pH Unit	100	70.0	130
				----	7 pH Unit	100	70.0	130
EA010: Conductivity (1:5) (QCLot: 3770356)								
EA010: Electrical Conductivity @ 25°C	----	1	µS/cm	<1	1412 µS/cm	99.6	93.6	106
ED007: Exchangeable Cations (QCLot: 3780436)								
ED007: Exchangeable Calcium	----	0.1	meq/100g	<0.1	21.6 meq/100g	91.0	82.9	117
ED007: Exchangeable Magnesium	----	0.1	meq/100g	<0.1	1.76 meq/100g	91.3	78.4	119
ED007: Exchangeable Potassium	----	0.1	meq/100g	<0.1	1 meq/100g	107	87.9	129
ED007: Exchangeable Sodium	----	0.1	meq/100g	<0.1	0.9 meq/100g	103	92.9	132
ED007: Cation Exchange Capacity	----	0.1	meq/100g	<0.1	25.3 meq/100g	92.0	84.7	117
ED007: Exchangeable Sodium Percent	----	0.1	%	<0.1	----	----	----	----

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

- **No Matrix Spike (MS) or Matrix Spike Duplicate (MSD) Results are required to be reported.**

ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **EP2107544**	Page	: 1 of 4
Client	: **GHD PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: MS VICKI DAVIES	Telephone	: +61-8-9406 1301
Project	: 12546218 Albany Motorsports Park DA	Date Samples Received	: 01-Jul-2021
Site	: ----	Issue Date	: 13-Jul-2021
Sampler	: ----	No. of samples received	: 15
Order number	: 12546218	No. of samples analysed	: 6

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Duplicate outliers occur.**
- **NO Laboratory Control outliers occur.**
- **NO Matrix Spike outliers occur.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **NO Analysis Holding Time Outliers exist.**

Outliers : Frequency of Quality Control Samples

- **NO Quality Control Sample Frequency Outliers exist.**

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA002: pH 1:5 (Soils)							
Snap Lock Bag (EA002)							
TP3 - 300mm to 600mm, TP4 - 400mm to 800mm, TP5 - 400mm to 800mm, TP6 - 500mm to 800mm	**25-Jun-2021**	**02-Jul-2021**	02-Jul-2021	✓	**02-Jul-2021**	02-Jul-2021	✓
Soil Glass Jar - Unpreserved (EA002)							
TP1 - 900mm to 1100mm, TP2 - 500mm to 900mm	**25-Jun-2021**	**02-Jul-2021**	02-Jul-2021	✓	**02-Jul-2021**	02-Jul-2021	✓
EA010: Conductivity (1:5)							
Snap Lock Bag (EA010)							
TP3 - 300mm to 600mm, TP4 - 400mm to 800mm, TP5 - 400mm to 800mm, TP6 - 500mm to 800mm	**25-Jun-2021**	**02-Jul-2021**	02-Jul-2021	✓	**02-Jul-2021**	30-Jul-2021	✓
Soil Glass Jar - Unpreserved (EA010)							
TP1 - 900mm to 1100mm, TP2 - 500mm to 900mm	**25-Jun-2021**	**02-Jul-2021**	02-Jul-2021	✓	**02-Jul-2021**	30-Jul-2021	✓
ED007: Exchangeable Cations							
Snap Lock Bag (ED007)							
TP3 - 300mm to 600mm, TP4 - 400mm to 800mm, TP5 - 400mm to 800mm, TP6 - 500mm to 800mm	**25-Jun-2021**	**08-Jul-2021**	23-Jul-2021	✓	**08-Jul-2021**	23-Jul-2021	✓
Soil Glass Jar - Unpreserved (ED007)							
TP1 - 900mm to 1100mm, TP2 - 500mm to 900mm	**25-Jun-2021**	**08-Jul-2021**	23-Jul-2021	✓	**08-Jul-2021**	23-Jul-2021	✓
EK072: Phosphate Sorption Capacity							
Soil Glass Jar - Unpreserved (EK072)							
TP1 - 900mm to 1100mm, TP2 - 500mm to 900mm, TP3 - 300mm to 600mm, TP4 - 400mm to 800mm, TP5 - 400mm to 800mm, TP6 - 500mm to 800mm	**25-Jun-2021**	**----**	----	----	**06-Jul-2021**	22-Dec-2021	✓

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **SOIL**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Electrical Conductivity (1:5)	EA010	1	6	**16.67**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations	ED007	1	8	**12.50**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
P Sorption Index & P Sorption Capacity	EK072	1	6	**16.67**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
pH (1:5)	EA002	1	6	**16.67**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Electrical Conductivity (1:5)	EA010	1	6	**16.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations	ED007	1	8	**12.50**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
pH (1:5)	EA002	2	6	**33.33**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Electrical Conductivity (1:5)	EA010	1	6	**16.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations	ED007	1	8	**12.50**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
pH (1:5)	EA002	SOIL	In house: Referenced to Rayment and Lyons 4A1 and APHA 4500H+. pH is determined on soil samples after a 1:5 soil/water leach. This method is compliant with NEPM Schedule B(3).
Electrical Conductivity (1:5)	EA010	SOIL	In house: Referenced to Rayment and Lyons 3A1 and APHA 2510. Conductivity is determined on soil samples using a 1:5 soil/water leach. This method is compliant with NEPM Schedule B(3).
Exchangeable Cations	ED007	SOIL	In house: Referenced to Rayment & Lyons Method 15A1. Cations are exchanged from the sample by contact with Ammonium Chloride. They are then quantitated in the final solution by ICPAES and reported as meq/100g of original soil. This method is compliant with NEPM Schedule B(3).
P Sorption Index & P Sorption Capacity	EK072	SOIL	In house: Referenced to Rayment & Lyons Method 9H1 & 9I1 Soil is bought to equilibrium with a solution of P at known concentration. P absorbed, released is determined by FIA analysis of the final solution.

Preparation Methods	Method	Matrix	Method Descriptions
Exchangeable Cations Preparation Method	ED007PR	SOIL	In house: Referenced to Rayment & Lyons method 15A1. A 1M NH4Cl extraction by end over end tumbling at a ratio of 1:20. There is no pretreatment for soluble salts. Extracts can be run by ICP for cations.
1:5 solid / water leach for soluble analytes	EN34	SOIL	10 g of soil is mixed with 50 mL of reagent grade water and tumbled end over end for 1 hour. Water soluble salts are leached from the soil by the continuous suspension. Samples are settled and the water filtered off for analysis.

CHAIN OF CUSTODY RECORD AND ANALYSIS REQUEST

GHD House 999 Hay Street Perth WA 6000
PO Box Y3106 Perth WA 6832
Telephone 08 6222 8222 Facsimile 08 6222 8555

COC No.

Project Albany Motorsports Park DA		**Laboratory:** ~~Eurofins | mgt~~ redirected to ALS	
Client City of Albany	**Job No.** 12546218	**Address:** ~~46-48 Banksia Road, WELSHPOOL, WA 6106~~	
Laboratory Quote No. EP/444/21	**Turnaround Time** Standard	**Laboratory Contact:**	
Job Manager (Invoice) Vicki.Davies@ghd.com & GHD accounts	**Email Address (Results)** Vicki.Davies@ghd.com		

Sample ID	Laboratory Sample ID	Date	Time	Sample Matrix S-Soil/ SL-Sludge/ W-Water/ A-Air	Container: Type B-Bottle/J-Jar/V-Vial/Bag/G-Glass/P-Plastic	Container: Preservative Unpreserved/ HCl/ H2SO4/HNO3/Other	Container: No	Container: Total Volume (mL)	Analyses: pH plus EC (1:5)	Analyses: CEC/ Exchangeabe Cations (ED007) - Default Parameters	Analyses: P Sorption Index & P Sorption Capacity	HOLD	Remarks
TP1 - 180mm to 490mm	1	25/06/2021		S								✔	
TP1 - 900mm to 1100mm	2	25/06/2021		S					✔	✔	✔		
TP2 - 500mm to 900mm	3	25/06/2021		S					✔	✔	✔		
TP2 - 1700mm to 2000mm	4	25/06/2021		S								✔	
TP3 - 300mm to 600mm	5	25/06/2021		S					✔	✔	✔		
TP3- 900mm to 1200mm	6	25/06/2021		S								✔	
TP3 - 1600mm to 2000mm	7	25/06/2021		S								✔	
TP4 - 400mm to 800mm	8	25/06/2021		S					✔	✔	✔		
TP4 - 1350mm to 1650mm	9	25/06/2021		S								✔	
TP4 - 1800mm to 2200mm	10	25/06/2021		S								✔	
TP5 - 400mm to 800mm	11	25/06/2021		S					✔	✔	✔		
TP5 - 1200mm to 1500mm	12	25/06/2021		S								✔	
TP6 - 500mm to 800mm	13	25/06/2021		S					✔	✔	✔		
TP6 - 1300mm to 1600mm	14	25/06/2021		S								✔	
TP6 - 2000mm to 2300mm	15	25/06/2021		S								✔	
				S									
				S									
				S									

Sampled by: Great Southern Geotechnics	Date/Time:	Relinquished by: Great Southern Geotechnics	Date/ Time:
Received by:	Date/Time:	Relinquished by:	Date/ Time:
Received by Lab: SP	Date/Time: 630 1/7/21	Courier/ Transport Company:	
Sample Conditions:	Remarks:		

Environmental Division
Perth
Work Order Reference
EP2107544

Telephone : +61-8-9406 1301

Appendix F

Aquarius Wastewater Systems Pty Ltd

AQUARIUS® Systems

1 – 5 Bedrooms	O-3 ATU	O-2 NR ATU	O-2 ATU
6 – 9 Bedrooms	O-3 3KL ATU	O-2 NR 3KL ATU	O-2 3KL ATU
Commercial	AQUARIUS® Standard or Custom Designed Commercial Systems Please speak to our Sales Consultant		

Specifications

	O-3	**O-2 NR**	**O-2**
System Features Poly/Duralen Plastic or Concrete Tank Construction	✓	✓	✓
Nutrient Retentive (Phosphorous removal)	✓	✓	
Ozone Disinfection	✓		
Recycles all wastewater through irrigation into gardens, orchards, etc.	✓	✓	✓
Supplied complete with irrigation components, electrical components and pumps	✓	✓	✓
Footprint required approx 6m x 2.5m x 2m**	✓	✓	✓
Low Energy use	✓	✓	✓
Irrigation Area Above Ground Dripper Irrigation Sub-Surface Dripper Irrigation Irrigation area in sandy soil conditions – *150m^2	 ✓ ✓ ✓	 ✓ ✓	 ✓ ✓
Other Disposal options Leach Drains / Soakwells / Aquasafe Drains	✓	✓	✓
Maintenance Service calls per year as per DoH WA requirements	2	2	2
Manufacturers Warranties Poly/Duralen Plastic Tanks 15 years Orange Pumps 1 year Irrigation and Electrical components 1 year	 ✓ ✓ ✓	 ✓ ✓ ✓	 ✓ ✓ ✓
Approvals Fully approved by the WA Department of Health	✓	✓	✓
Australian Standards approved AS/NZS 1546.3	✓	✓	✓
Why choose Aquarius Wholly owned West Australian Company	✓	✓	✓
Manufactured in Western Australia	✓	✓	✓
Extensive Support Network covering all of WA	✓	✓	✓
Local Agents fully trained and registered with Department of Health WA	✓	✓	✓

*Subject to local authority approval

**Subject to configuration of ATU

Treatment Process

	O-3	O-2 NR	O-2
Primary Tank Retains the solids and uses aerobic and anaerobic bacteria to breakdown the BOD_5 levels in the sewage.	✓	✓	✓
Alum Tank Doses the Clarifying chamber of the Treatment tank with Alum. Alum acts as a flocculent to remove the nutrients and suspended solids and settle them to the bottom of the tank for further aerobic bacteria breakdown.	✓	✓	
Treatment Tank **Secondary / Aeration Chamber** Incorporates aeration to further break down BOD_5 and nitrates.	✓	✓	✓
Clarifying Chamber The Clarifying Chamber provides a settling and clarifying period for the water prior to discharge.	✓	✓	✓
Discharge Chamber The Discharge chamber contains the Discharge Pump to pump the treated water out to irrigation or other disposal methods.	✓	✓	✓
Ozonation Pump Ozone is a powerful disinfectant, many times more effective than chlorine and kills all bacteria.	✓		
DoH WA ATU Water Quality Criteria			
<20mg/L BOD_5	✓	✓	✓
<30mg/L suspended solids	✓	✓	✓
<10 E.coli/100ml	✓		
>3mg/L Ozone concentration	✓		
<1mg/L (98.5%) TP (% removal)	✓	✓	
<10mg/L (97.8%) TN (% removal)	✓	✓	✓

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→ The Power of Commitment